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PROCEEDINGS

The one meeting held thus far during 1961 took place in Room 43 of the United States National Museum.

1031st Meeting—19 June 1961

EIGHTY-SECOND ANNUAL MEETING

President Johnson in the chair; 52 members and guests present.

The following officers and members of the council were elected: President, David H. Johnson; Vice Presidents, A. C. Smith, C. F. W. Muesebeck, A. J. Duvall, Henry W. Setzer; Corresponding Secretary, John L. Paradiso; Recording Secretary, Richard S. Cowan; Treasurer, John W. Armstrong; Council, C. O. Handley, Jr., J. P. E. Morrison, L. M. Russell, V. S. Schantz, F. M. Bayer.

Formal Communication: Mr. J. Q. Tierney, Hydrographic Office, U.S. Navy. Operations Deep Freeze—U.S. Antarctic Expeditions 1955–59.

The 1032nd meeting will be held in December 1961.

Vol. 74, pp. 1–2 19 May 1961

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A NEW SPECIES OF *CINARA* FROM KNOB-CONE PINE (APHIDAE)

By F. C. Hottes

This new species of *Cinara* is named for Prof. E. O. Essig who for half a century has contributed materially to our knowledge of the family Aphidae.

Cinara essigi, new species

Apterous viviporous female: Length from vertex to end of cauda 4.5 mm. Color in life not recorded. As cleared, stained and mounted it is as follows: Head and first antennal segment dark dusky with median transverse suture much darker; thorax dusky; abdomen pale, reticulated, wax glands small, arranged in four rows, rather more lateral than dorsal; cornicles dark dusky, often with clear areas; cauda and anal plate dusky; anterior to the transverse pigmented areas there are two narrow, very irregular pigmented areas; second antennal segment not as dark as first; basal portion of third antennal segment pale, apical third dusky; basal half of fourth antennal segment pale, remainder dusky, fifth segment similar to fourth; all of sixth antennal segment dusky; all femora pale dusky with basal portions not quite so dark; all tibiae with short portion near base dusky brown, this followed by pale area, which in the case of the metathoracic tibiae is 0.75 mm in length; remainder of tibiae dusky brown; tarsal segments brown.

Head and thorax: Width of head through the eyes 0.825 mm. Length of antennal segments as follows: III 0.55 mm, IV 0.275 mm, V 0.30 mm, VI 0.15 + 0.045 mm. Third antennal segment without sensoria. Fourth antennal segment with or without primary sensorium. Fifth antennal segment with one secondary sensorium, and the primary. Marginal sensoria on sixth antennal segment three, arranged in a straight row. Hairs on antennal segments sparse, upstanding, on third antennal segment varying from 0.03–0.075 mm. Hairs on vertex of head 0.09 mm in length. Ocular tubercles small. Last three segments of the rostrum with the following lengths: 0.31, 0.30, 0.12 mm. Rostrum reaching to mid region of cornicles. Mesosternal tubercle well developed, about 0.09 mm in length, with a distinct neck, apex enlarged. Metathoracic femora 1.53 mm in length. Metathoracic tibiae 2.70 mm in length. Hairs on metathoracic tibiae set at an angle slightly less than 45 degrees, but more than 30 degrees. Hairs on outer margin of tibiae not uniform in length, varying from 0.05–0.075

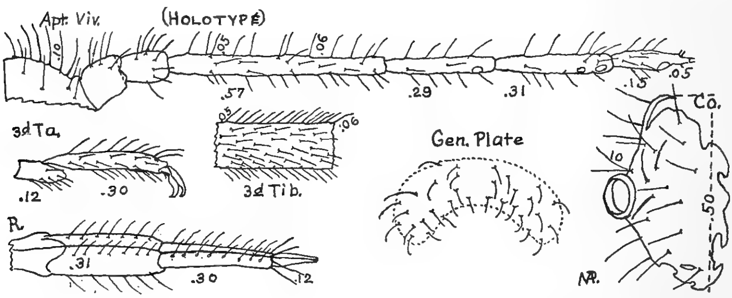
mm, fine, sharp pointed, hardly numerous, and not droopy. First segment of metatarsus 0.12 mm in length, provided on the ventral surface with about eighteen hairs. Second segment of metatarsus 0.30 mm in length, joined to first segment by a distance about equal to the width of segment, the hairs on the dorsal surface longer than the hairs on the ventral surface.

Abdomen: Dorsal surface of abdomen reticulated. Hairs on dorsal surface of abdomen not numerous, about 0.075 mm in length. Hairs on ventral surface of abdomen not as long or as numerous as hairs on dorsal surface. Hairs on transverse pigmented area rather coarse, varying from 0.13–0.15 mm in length, and with the exception of two or three, arranged along the posterior margin. Cornicles with outer margin very irregular, 0.45 mm across. The orifice of the cornicles is acentric, much more lateral than median. Hairs on cornicles sparse, about 0.10 mm in length. Genital plate with posterior margin concave; median anterior margin free from hairs.

Remarks: Antennal segments varying in length as follows: III 0.525–0.57 mm, IV 0.275–0.30 mm, V 0.285–0.30 mm, VI 0.105–0.15 mm + 0.045–0.05 mm. Hairs on vertex of head varying from 0.09–0.10 mm. Rostrum in one case with segments 3, 4 and 5 reaching beyond cornicles. In one case the metathoracic tibiae are only 1.77 mm in length.

In some respects this species is allied to *C. ponderosae* (W) but it has a mesosternal tubercle which is lacking in that species. The hairs on the metathoracic tibiae are more numerous and less spinelike, and the abdomen is free from small pigmented spots. This species is difficult to key in Palmer's key to the genus *Cinara* in Aphids of the Rocky Mountain Region, because the limited number of specimens (six) fall in both alternatives of couplet number 18. However, the hairs on the metathoracic tibiae are shorter than 0.08 mm and not semi-spinelike. It is not the species *C. brevispinosa* (G & P). It is not *C. apini* (G & P), inasmuch as the antennal segments are too long, the tibial hairs longer and rostral segment IV is 0.30 mm not 0.17–0.20 mm.

Holotype: Apterous viviparous female deposited in collection of the United States National Museum. Paratype slide in collection of author. The host is knob-cone pine (*Pinus attenuata*). Oak Glen, San Bernardino Co., California. R. C. Dickson, 20 November 1938.



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NOTES ON VENEZUELAN BIRDS AND DESCRIPTION OF A NEW SUBSPECIES OF TROCHILIDAE

By William H. Phelps and William H. Phelps, Jr.

Our thanks to the Curators of the American Museum of Natural History, Carnegie Museum, Museum of Comparative Zoology and U. S. National Museum for access to their collections during our research for this paper. Specimens listed are in the Phelps Collection, Caracas, unless otherwise specified. Names of colors are capitalized when direct comparison has been made with Ridgway's "Color Standards and Color Nomenclature," 1912. Wing measurements are of the chord.

Lafresnaya lafresnayi greenewalti, new subspecies

Type: From Llano Rucio, Estado Mérida, Venezuela; 2500 meters. Number 14185, Phelps Collection, Caracas. Adult male collected 7 September 1941, by Fulvio Benedetti. (Type on deposit at the American Museum of Natural History.)

Diagnosis: Differs from *L. lafresnayi liriope* Bangs, of the Santa Marta Mountains, by having a more yellowish tint, being less greenish blue; from *L. l. saül* Delattre and Bourcier, of western Colombia and Ecuador, differs by having a straighter bill and longer wings without overlap; and from *L. l. lafresnayi* Boissoneau, of eastern Colombia and the Páramo de Tamá, by having white on the rectrices instead of yellow.

Range: The Cordillera de los Andes in eastern Táchira and Mérida, in forests in the Subtropical and Temperate zones at altitudes from 2200 to 3000 meters.

Description of type: Sides of head, back and uropygium Calliste Green × Scheele's Green, crown with a dusky tint. Chin, throat and upper breast Deep Turtle Green with metallic luster; center of lower breast and abdomen black; sides, flanks and under tail-coverts and axillaries similar to back, base of under tail-coverts white. Remiges Burnt Umber; greater wing-coverts similar to remiges; the median, lesser and under ones similar to back. The two central rectrices near Olive Lake, the others white partially margined apically with dark greenish.

Mandible (in life) "black"; maxilla "flesh"; feet "flesh"; iris "dark." Wing, 65 mm; tail, 39; exposed culmen, 26; culmen from base, 32.

Remarks: Sexes unlike in color, males with longer wings. Range of measurements: seven adult males, including type—wing, 64–68 (65.7); tail, 32–39 (36.7); exposed culmen, 25–26 (25.6); three adult females—wing, 61–62 (61.3); tail, 37–37 (37); exposed culmen, 26–27 (26.7). Measurements of *liriope,* of the Santa Marta Mountains: four adult males—wing, 63–69 (65.2); tail (3), 37.5–39 (38.1); exposed culmen (2), 24–24.5 (24.2). Measurements of *saül,* from Ecuador: fifteen adult males—wing, 59–63 (61.5); tail (5), 36–38 (37.4); exposed culmen (7), 25–27 (25.9).

The adult female differs from the male by having a yellowish breast, whitish abdomen and immaculate yellow under tail-coverts, the breast lightly spotted with greenish.

The juvenile male differs from the female by having the breast yellowish green instead of yellow; the under tail-coverts are as in the adult.

The ranges of the white-tailed forms *saül* and *liriope* are separated from that of the other white-tailed form, the new *greenewalti,* by the yellow-tailed *lafresnayi* of the eastern Andes of Colombia.

It is with special pleasure that we dedicate this new subspecies to our friend, Crawford H. Greenewalt, photographer extraordinary of hummingbirds, in recognition of his important contributions to the knowledge of the Trochilidae.

Specimens Examined

Lafresnaya lafresnayi liriope.—Colombia: Sierra Nevada de Santa Marta, San Miguel, 1 ♂[2], 1 ♂[3], 1 ♂[4]; Páramo de Chirucua, 1 ♂[4] (type); Chinchicua, 1 ♀[3]; Río Guatapuri, 6 ♀[3].

L. l. lafresnayi.—Venezuela: Páramo de Tamá, 2 ♀. Colombia:[1] "Bogotá," 12 ♂, 4 ♀, 3 juv. ♂; El Piñón, 1 ♂; Subía, 1 ♂; El Roble, 1 ♀; Río Toche, 1 juv. ♂; Chipaqua, 1 ♀.

L. l. greenewalti.—Venezuela: Cordillera de los Andes, Boca de Monte, Táchira, 1 ♂; Valle, Mérida, 1 juv. ♂; Llano Rucio, 1 ♂ (type), 1 juv. ♂; Páramo Aricagua, 1 ♂; "Merida,"[1] 3 ♂, 2 ♀; Montañas Culata, 1 ♂[1]; páramos Escorial, 1 ♀[1] y Tambor, 1 ♀[1]; Nevados, 1 ♀[1]; Montañas Conejos, 1 ♀[1].

L. l. saül.—Ecuador: (var. loc.)[1]; 16 ♂, 15 ♀.

L. l. orestes.—Perú: (var. loc.)[1]; 4 ♂, 4 ♀, 2 juv. ♂.

L. l. rectirostris.—Perú: Ramicruz, Junín,[1] 2 ♂, 3 ♀.

Veniliornis fumigatus fumigatus (D'Orbigny and Lafresnaye)

Picus fumigatus D'Orbigny and Lafresnaye, Voy. Am. Merid., Ois., 1840; p. 380, 1847. (Yungas, Bolivia.)

Phaeonerpes reichenbachi Cabanis and Heine, Mus. Hein., 4: 141, 1863. (Caracas, Venezuela.)

Veniliornis oleaginus tectricialis Chapman, Amer. Mus. Novit., no. 191, p. 6, 1925. (Turumiquire, 7900 ft, northeastern Venezuela.)

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[1] Specimens in American Museum of Natural History.

[2] Specimens in Carnegie Museum.

[3] Specimens in U. S. National Museum.

[4] Specimens in Museum of Comparative Zoology.

Todd (1946: 308) was correct in considering that these three races, inhabiting the northern mountains of Venezuela, could not be separated one from the other.

Comparison of the 64 Venezuelan specimens in our collection: 27 *fumigatus* from the Perijá and Mérida regions; 32 former *reichenbachi* from the Caracas region; 5 former *tectricialis* from the Turumiquire (northeastern) region; and the 36 specimens of *fumigatus* in the American Museum of Natural History from Colombia, Ecuador, Perú and Bolivia, shows that these three races are similar the one to the other, in color and in size.

The supposed shorter wing of *reichenbachi* of the Caracas region (Cory, 1911: 473; Zimmer, 1942: 8) is not apparent. Chapman (1925: 6) described *tectricialis* on two specimens based on the character that both webs of the tectrices were barred. Our five specimens and those of the Carnegie Museum, from localities in the same mountain range, also lack the barring on the outer webs of the tectrices. Emmet R. Blake, Curator of birds at the Chicago Natural History Museum, writes to us that his five topotypical specimens from Mt. Turumiquire have the barring on the wing feathers restricted to the inner web. Four specimens in our collection from the Caracas region and one from the Mérida region have indications of barring on the outer web. Consequently we presume the character on Chapman's two specimens is individual variation.

These are the specimens in our collection: Perijá region: Kunana, 1♂, 1(?); cerros Pejochaina, 3♂, Tetarí, 1♀ and Mashirampé, 2♂, 2♀; ríos Macoita-Apón, 1♀. Mérida region: Táchira—Las Delicias, Páramo de Tamá, 2♀; Río Chiquito, 1(?); Queniquea, 3♂, 1♀, 2(?); Páramo Zumbador, 1♂; Mérida—Valle, 1♀; La Azulita, 1♀; Santo Domingo, 1♂, 1♀. Caracas region: Yaracuy—Cerro Aroa, 2♀, 2(?); Aragua—Colonia Tovar, 3♂, 5♀, 3(?); Cerro Golfo Triste, 4♂, 1(?); Distrito Federal—Galipán, 1♂, 3♀; El Junquito, 2♂, 4♀, 1(?); Miranda—Guarenas, 2♀. Turumiquire region: Anzoátegui—Bergantin, 1♀; Monagas—Caripe, 1♀; Cerro Negro, 1♀, 1(?).

Thamnophilus punctatus subcinereus (Todd)

Erionotus punctatus subcinereus Todd, Proc. Biol. Soc. Washington, 28: 80. 1915. (Don Diego, Santa Marta, Colombia.)

In our "Lista de las Aves de Venezuela y su Distribución," p. 73, 1950, we erroneously gave a Venezuelan range to the race *atrinucha* Salvin and Godman. Further material and research show that our specimens are referable to *T. p. subcinereus* Todd, of the Perijá and Mérida regions.

Contopus sordidulus saturatus Bishop

Contopus richardsonii saturatus Bishop, Auk, 17: 116. 1900. (Haines, Alaska.)

1(?), Sierra de Lema, Gran Sabana, Bolívar. Collected on 21 February 1959 at kilometer 125 on the new road from El Dorado.

This is the first record for South America. The A.O.U. Check List, 5th edition, p. 349, 1957, says: "winter home unknown."

Basileuterus tristriatus auricularis Sharpe

Basileuterus auricularis Sharpe, Cat. Birds Brit. Mus., 10: 386. (Bogotá.)

Basileuterus tristriatus perijanus Phelps and Phelps, Jr., Proc. Biol. Soc. Washington, 66: 137. 10 August 1953. (Cerro Pejochaina, upper Río Negro, Sierra de Perijá, Zulia.)

Subsequent research has shown that *B. t. perijanus* is inseparable from *B. t. auricularis* and it thus becomes a synonym.

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Chapman, Frank M. 1925. Remarks on the life zones of northeastern Venezuela with descriptions of new species of birds. Amer. Mus. Novit., no. 191, pp. 1–15. 24 October.

Cory, Charles B. 1919. Catalogue of birds of the Americas and the adjacent islands in Field Museum of Natural History. Part II, no. 2, pp. 317–607.

Todd, W. E. Clyde. 1946. Critical notes on the woodpeckers. Ann. Carnegie Mus., 30: 297–317.

Zimmer, John T. 1942. Studies of Peruvian birds. No. XL. Notes on the genus *Veniliornis*. Amer. Mus. Novit., no. 1159, pp. 1–12. 29 January.

Vol. 74, pp. 7–28 19 May 1961

PROCEEDINGS
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STUDIES ON ANDEAN COMPOSITAE V

BY JOSÉ CUATRECASAS
Department of Botany, Smithsonian Institution, Washington, D.C.

This contribution includes comments and descriptions of species of *Hinterhubera, Erigeron, Diplostephium, Paragynoxys, Senecio,* and *Chaptalia.* The materials used for this study are the South American collections of the U. S. National Museum, mainly those from the author's 1959 expedition to the Sierra Nevada de Santa Marta and Sierra de Perijá, Colombia. This trip was sponsored by the National Science Foundation and received substantial help in Colombia from the Instituto de Ciencias Naturales and from the Ministerio de Agricultura of the Colombian Government. A member of the Institute, R. Romero Castañeda, joined the expedition.

Contributions on novelties in other groups will follow this one, and an account of the expedition and its results will be published when the materials are identified. The work upon which this paper is based has been sponsored by the National Science Foundation. The preceding article of this series was published in Brittonia, 12: 182–195 (1960).

Hinterhubera nevadensis Cuatr., sp. nov.

Frutex 20–50 cm altus caule basi intricato-ramificato, ramis basi prostratis vel erectis exfoliatis cortice griseo-purpurascenti glabrato squamulis brevibus persistentibus munito; ramuli dense foliosi erecti congestique, copiose glandulosi glandulis minutis pedicellatis foliis subimbricatis plusminusve obtecti.

Folia alterna sessilia ascendentia anguste linearia margine valde revoluto-plicata, 5–9 mm longa 0.8–1.2 mm lata, extus utrinque dense pubescenti-villosa glandulosaque pilis sericeis longis (ad 1 mm) patulis plusminusve flexuosis et glandulis globosis minutis stipitatis vestita, intra plicaturam (subtus folii) densissime glandulosa glandulis breviter stipitatis vel subsessilibus. Lamina crassiuscula 3–5 mm longa oblonga basi paulo angustata et sine sensu in vaginam 2–4 mm longam paulo dilatatam margine longe ciliatam ad caulem adpressam producta.

Capitula discoidea heterogama semiorbiculari-campanulata circa 10 mm alta et diamitentia, explanata 17–19 mm diamitentia, ad terminationem ramulorum breviter pedunculata solitaria (pedunculo ad 10 mm longo). Involucrum 9–10 mm altum bracteis 40 et ultra circa 5-seriatis lineari-lanceolatis acutiusculis nervo medio valde conspicuo intus glabris extus copiose ciliato-villosis et glandulosis glandulis stipitatis et sessilibus praeditis, interioribus fertilibus 7.5–8 mm longis circa 1 mm latis exterioribus gradatim brevioribus ad 5 mm longis 1 mm latis. Flores exteriores feminei tubulosi pluriseriati 90–170 in capitulo involucrum non excedentes, corolla albido-flavescenti 4.5–5 mm longa glabra tubulo capillari 3–3.5 mm longo limbo 5-partito vel 4-partito lobis paulo inaequalibus elliptico-lanceolatis circa 1.2 mm longis; rami styli 0.6–0.7 mm longi lineares supra marginibusque minutissime papillosi; ovarium anguste oblongum basim versus angustatum subcompressum paulo villosum parce glandulosum circa 2.5 mm longum; pappus pilis 2–3-seriatis tenuibus breviter strigulosis inaequilongis 0.2–5.5 mm longis stramineis. Flores centrales hermaphroditi 16–60; corolla regularis tubulosa 4–4.5 mm longa sparsis glandulis capitatis munita, tubulo circa 2 mm longo limbo infra tubuloso sursum gradatim ampliato apice 5 lobis late oblongis subacutis circa 1 mm longis; antherae 1.3 mm longae basi breviter auriculatae; styli rami 0.8 mm longi extus marginibusque dense piloso-papillosi; ovarium anguste lineare paulo compressum basi angustatum 3 mm longum glandulis globosis sessilibus et pilis rigidulis subpatulis dense munitum; pappus stramineus circa 5.5 mm longus pilis inaequilongis (aliquis valde brevibus) breviter strigulosis apicem versus paulo dilatatis apice acutis. Receptaculum alveolatum nudum 3.5–4 mm diamitens. (Fig. 1, *a–j.*)

Type locality: Colombia: Magdalena: Sierra Nevada de Santa Marta, southeastern slope: valley descending from the peaks La Reina and Ojeda southwestward; páramos between lakes Naboba and Mamito, 4200–4300 m alt.; shrub 20–50 cm high; involucre brownish, green at base; female corollas pale yellowish white; 3 October 1959, J. Cuatrecasas & R. Romero Castañeda 24585. Holotype, US; isotype, COL.

Remarks: Hinterhubera nevadensis is closely related to the Venezuelan species *H. columbica* Schultz Bip. ex Wedd. and *H. ericoides* Wedd. As in *H. columbica,* it has large heads and glandular leaves, but it differs by its more narrowly linear and smaller leaves and its smaller female corollas which do not surpass the involucre, and which have 5–4 shorter lobes. *H. columbica* has subbilabiate female corollas longer than the involucre, 5–7 mm long, with 3 long-linear lobes (2.3–3 mm long) and 2 additional very short lobes which may be reduced to none; the leaves in the Venezuelan species are more broadly sublanceolate-oblong. *H. nevadensis* differs from *H. ericoides* by its larger heads and leaves and by being densely glandular. In *H. columbica* the extended, pressed heads (in herbarium) are 16–20 mm and in *H. ericoides* only 8–12 mm in diameter.

Erigeron peruvianus (Lam.) Cuatr., comb. nov.
Doronicum peruvianum Lam., Encyclop. Meth. 2: 316. 1786.
Arnica peruviana (Lam.) Pers., Syn. Plant. 2: 454. 1807.
Aster pellitus HBK, Nov. Gen. Sp. Pl. 2: 91. 1820.
Liabum erigeroides Benth., Pl. Hartw. 206. 1845.
Celmisia pellita (HBK) Sch. Bip., Bonplandia 4: 50. 1856.
Erigeron pellitum (HBK) Wedd., Chl. And. 1: 190, Pl. 34. 1857.
Erigeron lehmannii Hieron., Engl. Bot. Jahrb. 19: 49. 1894.
Erigeron hybridus Hieron., Engl. Bot. Jahrb. 21: 334. 1895.
Erigeron loxensis Hieron., Engl. Bot. Jahrb. 21: 334. 1895.
Erigeron stuebelii Hieron., Engl. Bot. Jahrb. 21: 335. 1895.
Aster peruvianus (Lam.) Cabrera, Bol. Soc. Arg. Bot. 7: 234. 1959.

Remarks: In the shape of the leaves and the density of the hairiness, this is a very polymorphic species. The typical form of the species is found not only in Ecuador but also in Peru and on the Central Andes of Colombia. It has oblong, usually broadly oblong and obtuse or subobtuse leaves of about 1–1.5 cm wide; it has rather thick, woolly scapes and very woolly involucre. A divergent form is common on the Cundinamarca páramos, eastern Andes of Colombia, with linear, acute or subobtuse leaves, usually 1–2.5 mm wide, slender peduncles and glabrescent involucres with usually smaller heads. This is the variety *lineata.* At first this appears to be a distinct species, having been described as such by Hieronymus (*E. stuebelii*), but examination of abundant collections shows the existence of intermediate forms between this form and the typical *peruvianus* in Colombia and Ecuador, making impossible a sharp separation. These intermediate forms are those which have been considered in the past as different species by a few botanists following Hieronymus (*Erigeron lehmannii, E. hybridus, E. loxensis*), but the features given as differential are actually variable and of minor importance, such as the density or scarcity of the indument on scapes and phyllaries, small variation in the size of the heads, and the width of leaves, which vary from obtuse and broadly oblong to acute and lanceolate, and to narrowly linear. Another feature is the length of the tube of the ligulate corollas, which is long (2.8–3.5 mm) in the typical form and short (2–2.5 mm) in the form *lineata.* The intermediate forms have the corolla-tube variable in length and rather of the short type. In fact, all these forms are part of a large specific complex.

The collections of *E. peruvianus* are usually distributed and labeled in the herbaria as *Erigeron pellitus* (HBK) Wedd. For the first time last year, Cabrera pointed out that *Doronicum peruvianum* Lamarck, whose type specimen is preserved at the Jussieu Herbarium in Paris, is conspecific with it. Cabrera is of the opinion that this species has to be considered as *Aster,* as it was originally described by Kunth. This species certainly has a somewhat critical generic standing, but its 3–4-seriate involucre of linear and almost equal phyllaries and the narrow multiseriate rays define it as an *Erigeron.* Hieronymus distinguished his *E. stuebelii* from other related species by a silky layer that covers its leaves;

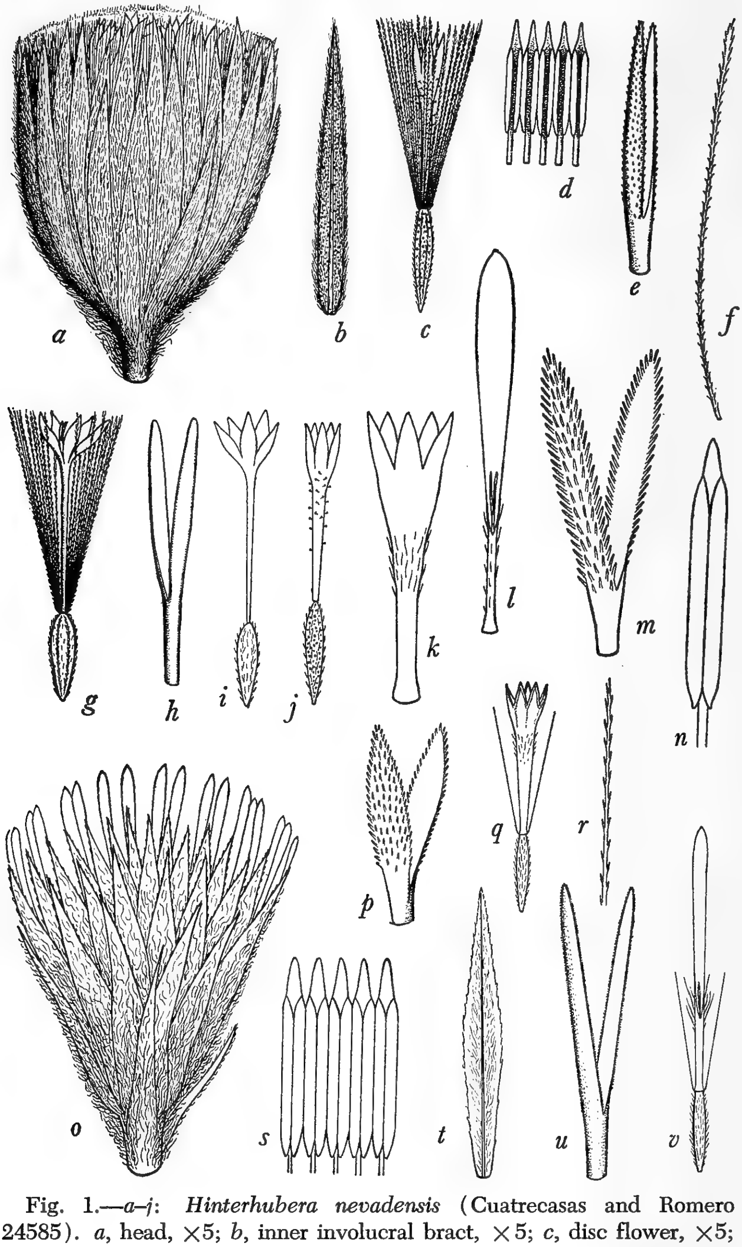

Fig. 1.—*a–j*: *Hinterhubera nevadensis* (Cuatrecasas and Romero 24585). *a*, head, ×5; *b*, inner involucral bract, ×5; *c*, disc flower, ×5; *d*, stamens, ×15; *e*, style end of disc flower, ×25; *f*, pappus hair, ×10;

but this feature actually exists in all varieties of *E. peruvianus.* There is always a silky veil covering the very young leaves which usually separates very soon but sometimes stays on longer until complete maturity; this may happen in forms with narrow leaves but no rules can be established about the longevity of the leaf veil.

Erigeron peruvianus var. **lineatus** Cuatr., var. nov.

Folia radicalia rosulata anguste linearia basim parum angustata apice acuta mucronulata vel mutica margine valde revoluta 3–10 cm longa 1–2.5 cm lata supra velo fibroso-sericeo argentato deciduo tecta subtus crasse crispo-lanata sed costa eminentissima fibroso-sericeo tecta vagina longa dense longeque lanato-villosa. Capitulum hemisphaericum 2 cm latum. Involucrum 0.9 cm altum circa 4-seriatum, bracteis interioribus lineari-lanceolatis 8 mm longis 1 mm latis dorso hirsutulis sursum violaceis. Flores radii feminei 3-seriati circa 65; corolla 7 mm longa tubulo 2 mm longo sursum pilosulo pilis longis tenuibus, lamina oblonga subacuta 0.5 mm lata integra vel obsolete 3–2-dentata; ovarium hirsutulo-villosum; pappus stramineus uniseriatis 3.5 mm longus. Flores disci circa 46; corolla 4 mm longa tubulo 2 mm longo; antherae 1.5 mm basi breviter angustato-auriculatae; rami styli lanceolati crassiusculi longe papillosi, 1 mm longi; ovarium villosum; pappus 3.5–4 mm longus stramineus uniseriatus. (Fig. 1, *o–v.*)

Type locality: Colombia: Cundinamarca, Cordillera Oriental, Páramo de Zipaquirá, between Zipaquirá and Pacho, 3100–3200 m altitude, "ligules white or lilaceous," 16 June 1940, J. Cuatrecasas 9556. Holotype, US; Isotype, COL.

Erigeron tergoalbus Cuatr., sp. nov.

Herba humilis rosulata scapifera rhizomate verticale crassiusculo ad apicem cum vaginis foliorum crassissime tecto radicibus crassiusculis numerosis oriente.

Folia omnia basilaria rosulato-fasciculata crasse subcoriacea oblongo-linearia apice subite angustata subacuta vel subobtusa basim versus sine sensu in petiolum alatum attenuata margine integra revolutaque basi in vaginam membranaceam longam amplectentem dense longeque fulvo-villosam producta, 20–30 cm longa; limbo 14–22 cm longo 1–1.5 cm lato, petiolo 2–6 cm longo, vagina 2–3 cm longa. Lamina in valde juvenile

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g, outer female flower, ×5; *h*, style end of female flower, ×25; *i*, corolla and ovary of female flower, ×5; *j*, corolla and ovary of disc flower, ×5. *k–n*: *Erigeron tergoalbus* (Prieto, Camp P-275). *k*, disc-flower corolla, ×7.5; *l*, ray-flower corolla, ×5; *m*, style end of disc flower, ×20; *n*, anther, ×20. *o–v*: *Erigeron peruvianus* var. *lineatus* (Cuatrecasas 9556). *o*, head, ×5; *p*, style end of female flower, ×40; *q*, disc flower, ×5; *r*, fragment of pappus bristle of outer flower, magnified; *s*, stamens, ×15; *t*, inner involucral bract, ×5; *u*, style end of female flower, ×40; *v*, ray flower, ×5.

plus minusve velo fibrososericeo argenteo tecta demum supra viridis nervo medio sericeo excepto glabra sublaevisque; subtus minute indumento albo crispo-lanato densissimo compressissimo subfarinaceo obtecta sed costa bene elevata velo sericeo-argentato adpresso induta, 4–5 nervis secundariis ascendentibus prominulis utroque latere saepe conspicuis.

Scapi monocephali axillares pauci erecti folia attingentes vel paulo superantes (25–40 cm longi) striolati leviter lanuginosi vel subglabrati foliolis bracteiformibus numerosis lanceolatis basi late amplectentibus paulo lanuginosis vel glabratis 2.5–1 cm longis basi 3–2 mm latis praediti. Capitulum 2.5 cm diamitens erectum radiatum. Involucrum circa 5-seriatum bracteis subaequilongis subulatis acutis interioribus circa 11 mm longis 0.8–1 mm latis subglabris margine sursum eroso-ciliatis purpurascentibus. Flores radii feminei 3-seriati circa 120. Corolla alba 9–10 mm longa tubulo 2 mm longo leviter pilosulo lamina lineari-oblonga subacuta integra vel minutissime tridenticulata 1–3-nervia 0.5–0.7 mm lata. Rami styli lineari subulati subacuti 1.6 mm longi minute papillosuli. Ovarium oblongum compressum densiuscule villosum 3.2 mm longum. Pappus stramineus 4 mm longus pilis uniseriatis inaequilongis. Flores disci hermaphroditi circa 130. Corolla sulphurea 5 mm longa tubulo 2.5 mm longo sursum paulo pilosulo dentibus triangulari-oblongis subacutis margine incrassatis apice minute papillosis 1 mm longis. Antherae 1.8 mm longae basi breviter auriculatae. Rami styli circa 1.5 mm longi lanceolati crassiusculi usque ad basim piloso-papillosi. Ovarium oblongum 3.5 mm longum 5-costatum villosum; pappus pariter floribus femineis. Receptaculum 6 mm diamitente profunde alveolatum marginibus alveolorum undulatis. (Fig. 1, *k–n.*)

Type locality: Ecuador: "Oriente" border, prov. Azuay, crest of the Eastern Cordillera, between Oña and the Río Yacuambí, altitude 10,000–11,200 feet; "plants with pseudobulbs; leaves deep green above, white pubescent below; bracts green tipped with nigrescent-purple; ray flowers white; disc flowers pale sulfur-yellow" collected by F. Prieto in September 1945 under the direction of W. H. Camp, No. P-275. Holotype, NY.

Remarks: Erigeron tergoalbus is distinct from the closely related, polymorphic *E. peruvianus,* although it has the same habit. *E. tergoalbus* differs basically in the nature of the white indument on the underside of the leaves. This consists of a thin, compact, almost smooth layer of densely and minutely crisp hairs with a very smooth and farinose appearance. In *E. peruvianus* on the other hand, this indument is thicker and consists of long, crisp, entangled hairs. In *E. tergoalbus* the leaves are also longer, the tube of the ligulate corollas is shorter and the involucre is less hairy (almost glabrous) than in the typical form of *E. peruvianus.*

Diplostephium antioquense Cuatr., sp. nov.

Arbor 4–5 m alta ramis ultimis exfoliatis tortuosis cortice griseo ruguloso cicatricoso glabrato, ramusculis terminalibus foliosis subteretibus cinereis vel ochro-cinereis crasse dense adpresseque lanulato-tomentosis.

Folia alterna crasse subcoriacea petiolo 8–12 mm longo striolato dense lanuginoso-tomentoso supra sulcato. Lamina subelliptica utrinque attenuata basi breviter cuneata apice angustata obtusiuscula sed calloso-mucronulata, margine subplana leviter revoluta subintegra parte inferiore excepta dentibus callosis minutis mucroniformibus remotis praedita, 3.5–9 cm longa 1.5–4 cm lata, supra in vivo atro-luteolo-viridis siccitate griseo-viridis costa stricte impressa tomentulosa reliqua glabra vel parcissimis pilis, nervis secundariis laxo reticuloque impressis conspicuisque, subtus albida siccitate ochroleuca dense crasseque lanato-tecta, costa eminenti nervis secundariis circa 10 utroque latere patulis plus minusve conspicuis vel cum tomento velatis reticulo venorum laxo conspicuo vel infra tomentum occulto.

Inflorescentiae corymboso-paniculatae folia vix attingentes ramusculos valde foliosos terminantes, e basi foliosa ramosae, 3–7 cm longae et latae, axi robusto rigido etiam ramis mediocribus ascendentibus dense crasseque lanato-tomentosis in vivo canis in sicco ochroleucis, ramulis ultimis seu pedunculis monocephalis 10–2 mm longis vel capitulos 2–3 sessiles ferentibus; bracteis ovato-oblongis vel ovatis acutis amplectentibus extus lanatis 5–2 mm longis pedunculis subtendentibus, 1–3 circa capitulum instructis. Capitula campanulata 8–9 mm longa circa 6 mm diamitentia, radiata. Involucrum 7–7.5 mm altum tomentosum bracteis 4–5 seriatis interioribus oblongis subacutis margine scariosis eroso-subciliatis 6–6.2 mm longis circa 1.5 mm latis dorso sursum tomentellis brunneo-marginatis, ceteris gradatim brevioribus dorso albido-lanatis, exterioribus ovatis acutis 2 mm longis 1.5 mm altis. Flores radii feminei 13–21, corolla alba 5.5–6 mm longa tubulo angusto recto 3.5–4 mm longo puberulo pilis crassiusculis sparsis praedito, lamina obovato-oblonga 0.8 mm lata apice 2–3-denticulata supra papillosa; stylus corolla aequilongus ramis 0.8 mm longis complanatis dilatato-sublanceolatis intus minutissime papillosis extus grosse papillosis; ovarium oblongum 2 mm longum sparse glandulosum; pappus stramineus circa 5 mm longus pilis acutis minute strigosis sursum leviter subplumoso-dilatatis aliquis exterioribus brevioribus inaequalibus. Flores disci hermaphroditi 10–20, corolla 5 mm longa tubulo crasso 2.6 mm longo pilis crassiusculis brevibus sparsis lobis triangulari-oblongis acutiusculis margine incrassatis 1 mm longis; antherae 2 mm longae basi breviter acutiusculeque auriculata; extremitas styli 1.5 mm longa incrassato-lanceolata papilloso-pilosa in 2 ramas stigmaticas lanceolatas crassiusculas conniventes 1–1.2 mm longas fissa; ovarium oblongum 2 mm longum sparse glandulosum; pappus stramineus 5 mm longus pilis acutis quam in floribus femineis paulo crassioribus sursum magis dilatatis, exterioribus minoribus strictioribus. (Fig. 2, *a–i.*)

Type locality: Colombia: Antioquia: Medellín, Mount El Boquerón, Alto de Los Baldíos, páramo 3150 m alt.; tree 4–5 m; leaves rather thick, yellowish green, dark above, whitish beneath; branchlets of the inflorescence whitish, edge of the phyllaris brownish, ligules white; 9 April 1958 José Cuatrecasas, Manuel Llano and Gabriel Gutiérrez 24226. Holotype, US; isotype, MEDEL.

Remarks: Diplostephium antioquense is closely related to *D. denticulatum* Blake, but differs in having more flexible leaves which are shorter, attenuate towards the base, cuneate, entire or almost entire and with nervation more completely concealed by the tomentum; the heads are larger, with broader and more woolly phyllaries; the ligulate corollas have a widely obovate-oblong limb and a long tube. In *D. denticulatum* the tube of the ray-corollas is shorter (2.5–3 mm) and the limb is linear and acutely 2–3-toothed. The ovaries are more scarcely glandular in *D. denticulatum* than in *D. antioquense.* A related species from Nariño, *D. tabanense* Cuatr., differs from it by its more lanceolate, acute or subacute leaves, these usually serrate, having more crowded secondary nerves, by its larger heads, with longer and more lanceolate phyllaries, by larger, linear ray-corollas, and by longer and more slender pedicels.

Diplostephium saxatile Cuatr., sp. nov.

Arbuscula 2–6 m alta ramulis crassis dense cinereo-tomensis cicatricosis ramificatione pseudodichotoma (dichasiali), extremis dense rosulato- seu fasciculato-foliosis.

Folia alterna sessilia, lamina crassa subcoriacea sed mollia lanceolato-oblonga basi paulo attenuata subrotundata amplectentiaque apice acuta margine dimidio superiore parte serrata dentibus callosis acutis patulis brevibus 2–6 mm inter se remotis, 5–11 cm longa 1.2–2.5 cm lata, supra pallide viridis adpresse villosa, costa lata nervis secundariis visibilibus nervulis minus conspicuis, subtus spise cinereo-tomentosa pilis densis flexuosis intricatis vestita, costa crassa elevata 8–9 nervis secundariis utroque latere prominentibus valde ascendentibus marginem versus arcuato-anastomosantibus nervulis venisque recticulum minutum prominentem formantibus.

Inflorescentiae terminales confertae thyrsoideo-paniculatae basi foliosae folia vix attingentes vel paulo excedentes 5–10 cm longae e basi ramosae axi ramisque dense adpresseque cinereo-villosis, pedicellis 0.1–5 mm longis ebracteolatis, bracteis subtendentibus lineari-oblongis 1.5–0.5 cm longis 0.6–1.5 mm latis. Capitula campanulata 10–12 mm alta 8–10 mm lata heterogama sed discoidea. Involucrum campanulatum 9–11 mm altum bracteis herbaceis rigidulis violascentibus 5–6 seriatis interioribus oblongo-lanceolatis acuminatisque 8–10 mm longis 1.5–2 mm latis exterioribus ovato-oblongis et ovatis gradatim brevioribus ovatioribusque infimis 4–5 mm longis 2–3 mm latis subite acutatis omnibus nervio medio notato et marginibus subtiliter lacerato-ciliatis dorso praecipue in exterioribus pilosulis vel subglabris. Flores radii feminei ligulati 21–43 bi-triseriati, corolla 5.5–6.5 mm longa tubulo 3–3.5 mm longo superne papilloso-pilosulo, lamina obovato-oblonga 0.5–0.6 mm lata apice profunde tridentata dentibus linearibus 0.4–0.5 mm longis, dorso sparse papilloso-pilosula; stylus corollam satis excedens circa 7 mm longus crassiusculus ramis circa 0.8 mm longis lingulatis marginibus incrassatis minutissime papillosulis; ovarium obovato-oblongum compressum tricostatum (una costa tenerior) copiose glandulosum sparse pilosum; pappus 7 mm longus in sicco luteus pilis inaequilongis biseriatis basi coalitis, compressis strigulosis sursum paulo dilatatis versus apicem angustatis acutis, brevioribus 4–5 mm longis strictis. Flores disci hermaphroditi 23–48, corolla lutea circa 6–7.5 mm longa parte media pilosula, tubo 3–4.5 mm longo limbo tubuloso-infundibuliformi dentibus 1 mm longis triangulari-oblongis subacutis apice papillosulis; antherae 2 mm longae saccis basi obtusis vel brevissime auriculatis; rami styli 0.8 mm longi lingulato-oblongi (sublanceolati) acutiuscculi extus marginibusque longe denseque papilloso-pilosi; pappus 8 mm longus corollam valde excedens in sicco luteolus pilis inaequi-longis pariter floribus femineis; ovarium 2.5–4 mm longum lineare compressum bicostato-marginatum copiose glandulosum sterile. Receptaculum circa 2 mm diamitente alveolatum marginibus crasse membranaceis obtuse dentatis. (Fig. 2, *j–z.*)

Type locality: Colombia: Magdalena: Sierra Nevada de Santa Marta; southeastern slopes: Hoya del Río Donachuí, between Laguna Esacuriba and the big rocks about 3870 m altitude; rocky páramo 4043–3870 m alt.; "tree 2–6 m; leaves soft, light green above, cinereous beneath; involucre violaceous; corollas yellow," 6 October 1959, José Cuatrecasas and Rafael Romero Castañeda 24620. Holotype, US; isotype, COL.

Remarks: Diplostephium saxatile, strikingly different from the other species of the genus, is a small páramo or subpáramo tree with typical firm, medium-sized, lanceolate, sessile leaves clustered at the end of dichotomic branches. It is also strongly characterized by the small ray-corollas which are much shorter than the styles and the pappus. The short ray-corollas are found only in one other species of *Diplostephium,* namely, *D. anactinotum* Blake. This is also a remarkable endemic of the Sierra Nevada de Santa Marta and is represented by small, dwarf shrubs with small, thick, coriaceous leaves. *D. saxatile* has campanulate, rather large heads with usually a few more female than hermaphroditic flowers; its common proportion is 22 to 25 but some heads can bear twice as many as the regular ones.

Paragynoxys undatifolia Cuatr., sp. nov.

Arbor 6 m alta trunco medulloso recto basi 12 cm diamitente cortice resinoso superne tomentoso, simplex vel candelabriformis 3–5 ramis dense crasseque ochraceo-lanato-tomentosis extremo conferte subrosulato-foliosis deorsum cicatricibus foliorum semi-amplectentibus glabris signatis.

Folia magna alterna crasse coriacea valde convexo-undata. Petiolus validus circa 20 cm longus 12–16 cm crassus striatus leviter verruculosus basi vaginato-dilatatus amplectens dense crasseque ochraceo-lanato-tomentosus. Lamina subovato-elliptica apice attenuata obtusaque basi profunde cordata margine integra sed leviter irregulariterque undulata 50–70 cm longa 28–40 cm lata sinu basali asymmetrico 3–9 cm profundo, supra costa dense lanato-tomentosa cetera juvenili lanato-floccosa mox glabrata, luteolo-viridis nitens sublaevis sed bullato-undata, nervis secundariis conspicuis reliquis obsoletis, subtus dense crasseque ochraceo-tomentoso-lanata, costa crassa valde eminenti nervis secundariis 14 vel

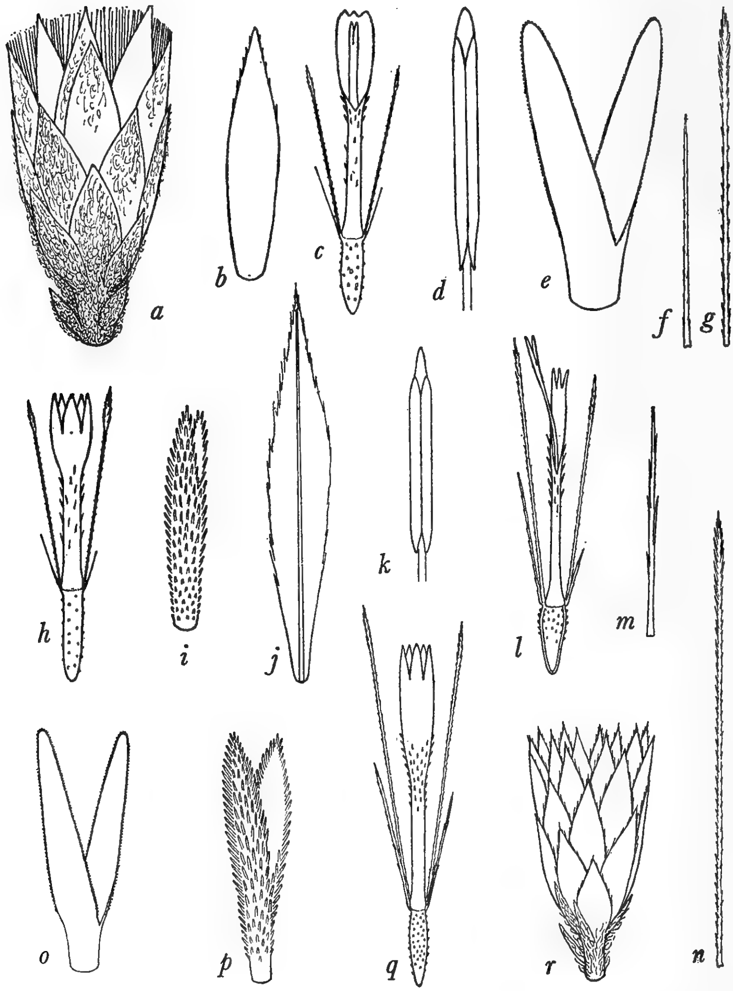


Fig. 2.—*a–i*: *Diplostephium antioquense* (Cuatrecasas et al. 24226). *a*, head, ×5; *b*, inner involucral bract, ×5; *c*, ray flower, × 5; *d*, anther, ×15; *e*, style end of female flower, ×40; *f*, outer pappus bristle of disc flower, × 15; *g*, fragment of inner pappus bristle of disc flower, ×10; *h*, disc flower, ×5; *i*, style end of disc flower, ×20. *j–r*: *Diplostephium saxatile* (Cuatrecasas and Romero 24620). *j*, inner involucral bract, × 5; *k*, anther, ×15; *l*, ray flower, ×5; *m*, outer pappus bristle of disc flower, ×10; *n*, inner pappus bristle of disc flower, ×7.5; *o*, style end of ray flower, × 30; *p*, style end of disc flower, ×30; *q*, disc flower, ×5; *r*, involucre, × 5.

15 utroque latere prominentibus patulis marginem versus ramoso-furcatis anastomosantibus, nervis tertiis reticulo laxo prominenti instructis venulis reticulatis prominulis sed cum indumento cancellatis. Folia valde juvenilia brevia utrinque crasse denseque crispo-lanata.

Inflorescentiae magnae thyrsoideo-paniculatae axillares 50–60 cm longae 30–60 cm latae pedunculo robusto striato dense ochraceo lanato sparse leviterque verruculoso circa 25 cm longo, ramis numerosis crassis paulo flexuosis striolatis ochraceo-lanatis bracteis subtendentibus linearibus 3–7 cm longis crasse villoso-lanatis; bracteis inferioribus foliaceis 10–20 cm longis 5–7 cm latis. Pedicelli teneri 4–15 mm longi 5–6-bracteolati bracteolis anguste subulatis teneris flexuosis 5–8 mm longis circa 0.5 mm latis. Ramusculi pedicelli bracteolaeque lanuginosi-villosi pilis longis capillaribus intricatis flexuosis. Capitula homogama discoidea 5-flora. Involucrum cylindraceum 8–8.5 mm altum circa 4 mm diamitens 5 bracteis chartaceis plus minusve violascentibus oblongis 8–8.5 mm longis apice subacutis ciliatisque, externis circa 2 mm latis intus 6–7-nervatis internis margine scariosis 3–3.5 mm latis intus 3–4-nervatis, margine eroso-ciliatis dorso sparse villosis vel glabratis. Flores omnes hermaphroditi, corolla alba glabra 11 mm longa tubulo crassiusculo 5.5–6 mm longo laciniis linearibus 5 mm longis 0.6 mm latis marginatis 1-nervatis apice acuto minute papilloso. Antherae maturitate exsertae 3 mm longae basi breviter sagittatae acute auriculatae fertiles. Stylus exsertus ramis 3 mm longis contortis crassiusculis subacutis subcomplanatis supra canaliculatis papillosulis sursum extus papilloso-pilosis apice acute panicillatis. Ovarium glabrum 3 mm longum subtriangulare compressum 10-striatum. Pappus stramineus 8 mm longus setis crassiusculis rigidis minute strigulosis numerosis 2–3-seriatis persistentibus basi in brevem annulum achaenium coronantem coalitis. Receptaculum planum leviter 5-foveolatum 1 mm diamitente.

Type locality: Colombia: Magdalena: Sierra Nevada de Santa Marta, southeastern slope: Hoya del Río Donachuí, below Sabanita Diricune, near Col., 3200 m altitude, "tree 6 m high, leaves rigid, coriaceous, bullate, yellowish green above, ochraceous green beneath, corolla white, styles light yellow," 29 September 1959, J. Cuatrecasas and R. Romero-Castañeda 24485. Holotype, US; isotype, COL.

Remarks: Paragynoxys undatifolia is closely related to *P. meridana* Cuatr., but it can be distinguished by its thicker coriaceous leaves, which are more elliptical or oblong, convex and strongly waved, smooth without prominent reticulum on the upper side, and covered beneath with thicker woolly indument of very long, intricate hairs. The petiole, midribs and inflorescence-branches are sparsely and obsoletely verrucose. The flowers are always hermaphrodite, and the corolla tube is equal to or longer than the limb. *P. meridana,* on the other hand, has ovate, flat and less thick leaves with prominent reticulum above, and dense but shorter lanate tomentum beneath and on the petioles. In addition, *P. meridana* has very conspicuously verrucose petioles, midribs and inflorescences. Female flowers often develop through abortion of the anthers. The corolla tube

(4–5 mm) is shorter than the lobes (6 mm). The flowers also have a longer pappus than those of the new species.

Of this striking genus eight species were known (see Cuatrecasas in Brittonia 8: 151–160, 1955), each endemic to a restricted area in the Sierra Nevada de Merida, Venezuela, and eastern Andes and Antioquia in Colombia. *P. undatifolia* is an uncommon small tree found in bushy or rocky protected places in the subpáramos or inside the Andean forest on the southern slopes of the Sierra Nevada de Santa Marta. I have seen it between 2500 and 3200 m altitude; inside the forest it may reach a height of 12 m. The pith of the stem is rather soft and I found it to be edible and palatable.

Senecio doryphyllus Cuatr., sp. nov.

Suffrutex 0.2–1 m alta ramis flexuosis striatis inferne cicatricosis, juvenilibus valde foliosis arachnoideis demum glabris plus minusve violaceis.

Folia alterna saepe patentia crassiuscula, lamina oblongo-lanceolata acuta vel acuminata margine leviter revoluta calloso-dentata basi in petiolum valde brevem vel in ramis adultis elongatisque ad 2 cm longum petiolum angustata, in supremis sessilia 3–15 cm longa 0.3–2 cm lata, basi late amplectente vaginata seu brevissime auriculata, utrinque juvenilis arachnoidea denique glabrata, supra atroviridis costa angusta notata reliqua sublaevis sed nervulis reticulatis impressis plus minusve visibilibus, subtus costa prominenti nervis secundariis circa 20 utroque latere conspicuis tenuibus patulis et cum venulis in reticulum laxum anastomosatis, superficie viridis nervis violaceis.

Inflorescentiae terminales paniculatae ad 20 capitulos ferentes (vulgo 8–10), ramis ramulisque tenuibus patulis violascentibus primum arachnoideis deinde glabratis, basi foliosis, foliis cum caulinis similibus sed sessilibus amplectentibus, sursum gradatim minoribus supremis in bracteis linearibus subulatis 20–5 mm longis 1–0.6 mm latis commutatis. Pedicelli 1–3 cm longi teneri bracteolati apice plurimis bracteolis lanceolatis acuminatisque parce arachnoideis vel glabris 3.5–6 mm longis calyculum formantibus. Capitula homogama campanulata 1.2–1.5 cm longa et lata saepe cernua vel nutantia. Involucrum herbaceum circa 1 cm altum 14–21 bracteis crassiusculis oblongo-lanceolatis apice ciliatis reliquis glabris 7.5–9 mm longis 1.5–2.8 mm latis exterioribus anguste interioribus late membranaceo-marginatis sursum purpurascentibus. Flores omnes hermaphroditi 56–100, corolla lutea 7–9.5 mm longa glabra tubulo angusto 4–5 mm longo limbo tubuloso paulo ampliato, dentibus triangularibus acutis apice leviter incrassato minutissime papilloso 0.8 mm longis. Antherae 2.5 mm longae basi brevissime vel obsolete auriculatae. Rami styli crassiusculi 1.2 mm longi curvati apice truncati penicillati et saepe piloso-caudati. Ovarium glabrum 1.8 mm longum. Pappus albus 7–9 mm longus pilis sericeis tenuibus strigulosis 2–3-seriatis.

Type locality: Colombia: Magdalena: Sierra Nevada de Santa Marta, southeastern slopes: Hoya del Río Donachuí; between Laguna Esacuriba and the big rocks about 3870 m altitude; rocky páramo 4043–3870 m alt., "undershrub 0.3–1 m high, branches flexuose; leaves soft, dark green above, lighter with violaceous veins beneath; branchlets more or less violaceous; involucral bracts rather dark or purplish at tip; corollas yellow"; 6 October 1959, José Cuatrecasas and Rafael Romero Castañeda 24618. Holotype, US; isotype, COL.

Remarks: Senecio doryphyllus belongs to the section *Aetheolena* (Cass.) Hoff., being closely related to S. *patens* (HBK) DC. and S. *cuencanus* Hieron. It can be distinguished by its firm, narrowly lanceolate and dentate leaves, by its broadly oblong-lanceolate phyllaries, and by the deciduous arachnoid (not woolly or tomentose) indument of young leaves and branchlets which, when adult, are glabrous. The Venezuelan S. *longipenicillatus* Sandwith is also related to it, but differs primarily by being densely tomentose. S. *doryphyllus* varies in the size of the leaves, inflorescences and flowers according to environmental conditions. In open places, the plants may develop smaller, densely arachnoideous leaves and more compact inflorescences; under protection and in the shade of large rocks and tall shrubs, the branchlets become elongate, the leaves larger, and the inflorescences larger, spreading and looser. There is also a degree of variation in the size of heads and, accordingly, in the size and number of phyllaries and flowers.

Senecio harrietae Cuatr., sp. nov.

Suffrutex 1–2 m alta caulibus foliosis erectis anguloso-striatis violaceis villosulis pilis brunneis longis subadpressis vel plus minusve flexuosis.

Folia alterna crassiuscula sessilia lanceolata vel lineari-lanceolata apice acuta calloso-mucronulata basim versus angustata basi subite dilatato-auriculata amplexicaulia margine revoluta breviter repandoque denticulata dentibus minutis callosis 3–8 mm distantibus, 2–8 cm longa 4–13 mm lata auriculis semirotundatis 2–10 mm latis, supra pallide viridia juvenilia dense deinde sparse villosa pilis fuscis longis basi incrassatis subadpressis leviterque flexuosis, costa impressa ceteris nervis obsoletis, subtus pallidiora magis villosa costa prominenti nervis secundariis acute ascendentibus 6–8 utroque latere conspicuis reliquis nervis inconspicuis.

Inflorescentia terminalis floribunda corymboso-paniculata folia valde superans, 8–12 cm lata ramis ramulisque violaceis angulato-striatis brunneo-villosis inferne e foliis subtendentibus superne bracteis gradatim brevioribus linearibus et subulatis villosulis 10–4 mm longis. Pedicelli teneri flexuosi vel erecti 3–15 mm longi villosuli plus minusve bracteolati ad apicem 6–8 bracteolis subulatis villosis 3–4 mm longis ad modum calyculi laxi. Capitula heterogama semiglobosa radiata circa 12 mm diamitentia. Involucrum campanulatum 5–6 mm altum, 13 bracteis herbaceis viridibus brunnescenti-villosulis sublanceolato-linearibus acutiusculis circa 5 mm longis apice ciliatis margine integris, exterioribus 1.2–1.5 mm latis interioribus late scarioso-marginatis 1.8–2 mm latis. Receptaculum nudum alveolatum. Flores radii feminei ligulati 13, corolla lutea glabra patenti 8 mm longa tubulo 2.3 mm longo lamina elliptico-oblonga 5-nervata 1.5–1.8 mm lata apice minute 3-denticulata; ramuli styli 1 mm longi tubuli corollae paulo exserti lineari minutissime papillosi apice subtruncati papillosuli; ovarium 1 mm longum ellipsoideo-oblongum 5-costatum glabrum; pappus sericeus albus 2.8–3 mm longus pilis inaequilongis biseriatis minute strigulosis basi coalitis. Flores disci hermaphroditi 32–44, corolla tubulosa glabra lutea 4.6 mm longa tubulo 1.5 mm longo limbo tubuloso-infundibuliformi dentibus triangulari-oblongis 0.6 mm longis subacutis apice papillosis; antherae 1.2 mm longae sagittatae caudis 0.15 mm longis; filamenta extremo in 0.5 mm longitudine incrassata; rami styli 1 mm longi crassiusculi paulo complanati apice subtruncati breviter papilloso-piloso-coronati; ovarium 1.2 mm longum glabrum acute 5-costatum; pappus 3 mm longus albus sericeus pilis biseriatis minute strigilosis.

Type locality: Colombia: Magdalena: Sierra Nevada de Santa Marta, headquarters of Río Sevilla, western slopes of the Sierra, in river canyon below camp at an altitude of 3400 m, January 1959, Harriet Barclay 6690. "Shrub to 2 m tall; stem dark red-purple to green with dark hairs; leaves auricled with branch above each leaf; leaves dark green above, lighter below, revolute, brown hairs on both sides; small heads with yellow rays; involucral bracts margined with brown, tipped with hairs; disc flowers yellow." Holotype, US.

Remarks: Senecio harrietae is somewhat similar to S. *subarachnoideus* Sch. Bip., from the northern slopes of the Sierra Nevada, but the latter has almost coriaceous, obtuse leaves dentate only at apex, large heads, and another kind of indument. The natural affinities of S. *harrietae* are toward S. *pectioides* Rusby, from the Bolivian Andes, from which it differs by the villous and loose nature of the indument, its smaller heads and flowers, the shorter and wider involucral bracts, and by other differences in the shape of the leaves.

Senecio favillosus Cuatr., sp. nov.

Suffrutex 1 m alta ramis flexuosis scandentibus argute striatis tomento subadpresso lanato-arachnoideo albo-cinereo tectis.

Folia alterna subcoriacea crassiuscula. Petiolus 5–12 mm longus lanuginoso-arachnoideus cinereus. Lamina ovato-lanceolata basi obtusa apice attenuata obtusiuscula vel subacuta minute calloso-mucronata margine remote serrulata dentibus callosis 2–5 mm distantibus, 3–8 cm longa 1.3–4 cm lata, supra juvenilis dense lanuginoso-arachnoidea subargentea deinde subglabrata sparse arachnoidea viridis laevis costa nervisque secundariis paulo conspicuis, subtus juvenilis albo-argentata dense induta deinde cinerea indumento lanato-arachnoideo mucido tecta costa eminenti nervis secundariis 5–7 utroque latere ascendentibus marginem versus curvatis evanescentibus vel anastomosatis nervulis inconspicuis vel laxo reticulo leviter notato.

Inflorescentiae paniculatae breves 3–7 cm longae ramulos breves terminantes folia paulo superantes, pedunculo ramulisque cinereo-arachnoideo-lanatis bracteolis subulatis circa 8–5 mm longis 1–0.5 mm latis lanato-cinereis. Pedicelli 2–5 mm longi cinereo-lanati paucis bracteolis subulatis 3–4 mm longis 0.5 mm latis flexuosis instructi. Capitula subglobosa parva homogama circa 7–8 mm alta lataque. Involucrum cupulatum 5 mm altum 11–13 bracteis herbaceis ovato-lanceolatis acutis vel paulo acuminatis crassiusculis 4.5–5 mm longis, exterioribus haud vel anguste scarioso-marginatis uno latere 1–1.8 mm latis, interioribus marginibus late scariosis 2–2.5 mm latis, dorso apiceque albo-lanatis. Calyculum 5–6 bracteolis subulatis flexuosis 3.5–4 mm longis 0.5 mm latis basi capituli apiceque pedicelli. Flores omnes hermaphroditi 55–58 in capitulo, corolla tubulosa lutea 5 mm longa glabra tubulo 2 mm longo limbo infundibuliformi 5-lobato lobis oblongis subacutis 0.8–0.9 mm longis apice minute papillosulis. Antherae 1 mm. longae basi sagittatae caudatae, caudae 0.2 mm longae. Rami styli curvati 0.8 mm longi crassiusculi subcomplanati minutissime papillosi apice subtruncati papillosi breviter coronato-penicillati. Ovarium 1.5 mm altum 5-costatum glabrum. Pappus albo-sericeus 4 mm longis setis subbiseriatis scabris deciduis.

Type locality: Colombia: Magdalena: Cordillera Oriental: Serranía de Perijá, Corregimiento de Manaure: Sabana Rubia, "bosque dentro del páramo," 2700 m alt., 5 March 1959, R. Romero Castañeda 7449. Holotype, US; isotype, COL.

Remarks: Senecio favillosus is a subshrub with spreading or climbing branchlets, which superficially resembles some members of the section *Streptothamnus* Greenm., but actually it has no close relationship to any other species of Andean *Senecio.* It is distinguished by its discoid, rather small heads and by its subappressed, woolly-arachnoid, cinereous tomentum covering branchlets, inflorescences and the ovate-lanceolate, not reticulate, leaves.

Senecio romeroi Cuatr., sp. nov.

Herba 60–90 cm alta radice tenui caule simplici erecto robustiusculo striato indumento albo arachnoideo deciduo tecto.

Folia basilaria rosulato-fasciculata 10–12 crasse herbacea longe petiolata. Petiolus 10–18 cm longus 2–3 mm latus striatus arachnoideo-lanuginosus sursum anguste marginatus basi breviter amplectente vaginatus vagina submembranacea nervata circa 1 cm longa lataque. Lamina elliptico-oblongissima, 12–20 cm longa 1.8–3.5 cm lata, basi subite cuneato-attenuata plus minusve cum petiolo decurrens apice paulo attenuata obtusa, margine leviter revoluta vel adulta plana dentata dentibus callosis 0.5–1 mm eminentibus 2–4 mm inter se distantibus, supra atro-luteolo-viridis in juvenilibus sparse arachnoidea demum glabra costa conspicua nervis secundariis 12–14 utroque latere curvato-ascendentibus tenuibus cum reticulo impresso leviterque conspicuo anastomosatis, subtus albo-cinerea tomento lanato denso tecta tantum costa plus minusve glabrata prominenti relquis nervis occultis vel leviter notatis. Folia caulina numerosa alterna, inferiora cum basilaribus similia sed sursum petiolo gradatim breviori latiorique et lamina magis decurrenti, media sessilia oblonga cordato-amplectentia 20–14 cm longa, suprema lanceolata acutiuscula basi cordata amplectenti 14–8 cm longa 1.6–1.8 cm lata.

Inflorescentia corymboso-paniculata circa 15 cm longa et lata 25–30 capitulis ramis erectis striatis arachnoideis bracteis lanceolatis subtus albo-cinereo-lanatis inferioribus foliaceis 5–6 × 1 cm sursum gradatim minoribus supremis linearibus acutis 8–5 mm longis 1.5–1 mm latis. Pedicelli 5–2.5 cm longi recti erecti sparsis bracteolis linearibus muniti. Capitula radiata erecta 3–3.5 cm diamitentia. Involucrum campanulatum circa 1 cm altum 1 cm diamitente 32 bracteis subbiseriatis herbaceis viridibus lineari-lanceolatis acutis 8–9 mm longis dorso crassis, externis 1–1.2 mm latis margine anguste scariosis, internis 1.5–2 mm latis margine late scariosis, glabris apice ciliato-penicillato excepto. Calyculum breve 14–16 bracteolis lineari-lanceolatis acutis 4–5 mm longis glabris vel parce arachnoideis ad apicem pedicelli imbricatis dimidium involucri non attingentibus. Flores radii feminei ligulati circa 17, corolla lutea 16–18 mm longa tubulo subcapillari 7–7.5 mm longo sursum parce puberulo, lamina oblongo-elliptica apice minute 3-denticulata circa 8-nervata saepe 4 nervis conspicuioribus 9–10 mm longa 3–5 mm lata; rami styli vix exserti 1 mm longi lineares subobtusi minutissime papillosi; ovarium glabrum 1.2 mm longum; pappus albus circa 7 mm longus pilis sericeis tenuibus minute scabrosis pluriseriatis. Flores disci hermaphroditi circa 140, corolla tubulosa lutea glabra 8 mm longa tubulo subcapillari 4 mm longo limbo tubuloso 5-nervato 5-dentato dentibus oblongo-triangularibus 0.6 mm longis apice incrassatis minute papillosis; anthaerae 1.5 mm longae basi brevissime auriculatae; rami styli 1 mm longi crassiusculi minute papilllosi supra sulcati apice truncati papilloso-pilosi; ovarium glabrum 1.5 mm longum striolatum; pappus 7 mm longus sericeo-albus pilis tenuibus pluriseriatis.

Type locality: Colombia: Magdalena: Sierra Nevada de Santa Marta, southeastern slopes: Hoya del Río Donachuí, páramos near Meollaca, about 3560–3500 m altitude; "herb 60 cm, leaves rather thick, soft, dark yellowish green above, cinereous beneath; petioles and midribs violaceous; involucre green; ligules and florets yellow," 6 October 1959, José Cuatrecasas and Rafael Romero Castañeda 24622. Holotype, US; isotype, COL.

Remarks: Senecio romeroi is closely allied to *S. folidentatus* Cuatr., from which it differs by its narrower, oblong, almost linear, obtuse basal leaves, with shorter and more obtuse dentation, the whitish, lanate tomentum that covers the leaves beneath, the longer calyculus (attaining half the length of the involucre), and by the higher number of phyllaries (32 in *S. romeroi*, 20 in *S. folidentatus*). The same features may distinguish *S. romeroi* from the Venezuelan *S. funckii* Sch. Bip. This Venezuelan species, furthermore, differs by its shorter ovate-elliptic, cordate basal leaves; the rosette-leaves of *S. funckii* were unknown by Schultz Bipontinus and also by Weddell, who wrote in Chloris Andina 1:125, 1855, "inferioribus petiolatis s. valde angustatis." These words probably refer to the lower leaves of the stem and not to the rosular leaves. Rosette leaves are present in specimens of later collections now preserved at the U.S.N.M. (Jahn 1130, Aristeguieta 2640, etc.), allowing a more complete concept of S. *funckii.*

Senecio rugosus Cuatr., sp. nov.

Frutex scandens ramis strictis tortuosis striolatis viridibus juvenilibus albo-lanuginosis demum glabratis, ramulis ultimis valde divaricatis seu reflexis.

Folia alterna subcoriacea rugosa petiolo 1–2 cm longo albo-lanato supra sulcato basi biauriculato vaginato amplexicauli auriculis suborbicularibus 3–10 mm latis, lamina oblongo-ovata vel subovato-lanceolata basi obtusa apice attenuata subacuta vel acuta calloso-mucronulata, margine leviter revoluta subintegra, 3–7 cm longa 1.1–3.6 cm lata, supra rugoso-nervata saepe bullata dilute lanuginosa vel glabrata luteolo-viridis nitidaque costa angusta impressa reliquis nervis impressis reticulatis, subtus in vivo albido-lanata in sicco viridi-flavescenti vel ochroleuca indumento crispo lanato tecta costa valde eminenti nervis secundariis 6–8 utroque latere curvato ascendentibus prominentibus cum nervulis prominentibus laxe reticulatis anastomosatis.

Inflorescentiae dichotomo-paniculatae ad ramos ultimos breves pseudopaniculam foliosam compositam formantes; ramuli divaricati albido-lanuginosi 1–3 cm longi basi foliosi sursum bracteis linearibus vel subulatis 5–3 mm longis albatis; pedicelli 0.1–3 mm longi lanati parcis bracteolis aliquando 1–3 capitulis sessilibus instructis. Capitula homogama parva campanulata 7–8 mm longa 6 mm lata. Involucrum cupulatum 4–4.5 mm altum, bracteis 8 raro 9–10 crassiusculis ovatis et lance-ovatis acutis extus albo-lanatis 3–3.5 mm longis, exterioribus circa 1 mm latis magis acuminatis, interioribus margine late scariosis 1.7–2 mm latis. Calyculum 3–4 bracteolis subulatis flexuosis lanuginosis 3–3.5 mm longis ad basim capituli apicemque pedicelli. Flores omnes hermaphroditi 21–28 in capitulo, corolla tubulosa lutea 5 mm longa glabra tubulo 1.6 mm longo limbo tubuloso-infundibuliformi dentibus linearibus subacutis ad apicem leviter incrassatis, circa 1.3 mm longis. Antherae 1.5 mm longae basi longe caudatae caudiculis subulatis tenuibus 0.3–0.4 mm longis. Rami styli crassiusculi 1.2 mm longi minute papillosuli apice truncati papilloso-penicillati saepe piloso-caudati. Ovarium leviter striatum glabrum 1 mm longum. Pappus albo-sericeus 4.5 mm longus pilis breviter strigulosis 2–3-seriatis. Receptaculum circa 1.5 mm diamitens alveolatum marginibus argute elevato-dentatis.

Type locality: Colombia: Magdalena: Cordillera Oriental, Sierra de Perijá east of Manaure at Quebrada de Floridablanca, in bushes and Andean forests, 2700–2800 m alt.; "climbing undershrub; leaves subcoriaceous, rugose, yellowish green above, whitish beneath; involucre light green; corollas yellow," 10 November 1959, José Cuatrecasas and Rafael Romero Castañeda 25180. Holotype, US; isotype, COL.

Remarks: Senecio rugosus, somewhat resembling *S. bullatus* Benth., is unique among the Andean climbing species of the genus by its strongly rugose, auriculate leaves and small heads.

Chaptalia incana Cuatr., sp. nov.

Herba rosulata scapigera lana alba plus minusve dense obtecta, rhizomate tenui obliquo fibroso-radicifero.

Folia omnia basilaria rosulato-fasciculata lineari-oblonga vel lanceolato-linearia crasse subcoriacea rigidula subapicem attenuata apice calloso-mucronulata basim versus sine sensu in brevem petiolum angustata basi subite in longam vaginam scariosam amplectentem araneoso-lanatam ampliata, margine revoluto dentibus callosis mucroniformibus remotis (6–10 mm distantibus) munita, 5–14 cm longa 4–12 mm lata, vagina 3–4 cm longa 0.8–0.9 cm lata, limbo supra albo-arachnoideo-lanato aliquando vetusti glabrato viridique laevi enervato, subtus dense crasseque candido-lanato tantum costa prominenti.

Scapi floriferi axillares solitarii (1–3 in roseta) tenues erecti monocephali dense albo-lanati 7–26 cm longi, juveniles folia attingentia vetustiores valde superantes, bracteis lineari-subulatis flexuosis 10–7 mm longis 1–0.5 mm latis lanuginosis inferne remotissimis sursum numerosis basi capitulum cum involucro subimbricatis muniti. Capitula erecta vel reclinata campanulata radiata 2–2.5 cm alta. Involucrum basi conicum, bracteis 4–5 seriatis imbricatis herbaceis rigidulis plus minusve purpurascentibus interioribus fertilibus circa 12 uniseriatis sublanceolato-linearibus acutis integerrimis, dorso albo-lanuginosis, costa eminenti margine basique scariosis 17–22 mm longis 2–2.5 mm latis, bracteis exterioribus gradatim brevioribus angustioribusque et magis acutis, inferioribus 7–9 mm longis sine sensu et cum bracteolis pedunculi imbricatis descendentibus. Flores marginales feminei ligulati uniseriati 17–21 involucrum excedentes; corolla glabra 14–16 mm longa lamina supra alba subtus lilacina oblonga 3-dentata nervis 4 paulo visibilibus 1.6–1.8 mm lata tubulo subcapillari 5–6 mm longo basi lamina saepe 2 dentibus brevibus munita; rami styli anguste lineares obtusi glabri supra margineque minutissime papillosi; ovarium lineare sursum subrostrato-angustatum glabrum compressum submarginatum; pappus flavo-stramineus 7 mm longus pilis triseriatis minute strigulosis basi in annulo connatis. Flores feminei interiores biseriati 10–16 tubulosi; corolla glabra 6.5–7 mm longa imperfecte bilabiata, tubulo subcapillari apice limbo 1–1.2 mm longo labio exteriori breviter ligulato tridentatoque interiori 2-dentato vel tubo apice valde oblique 5-dentato; stylus ovarium pappusque cum floribus ligulatis similes. Flores disci hermaphroditi 14–25 bilabiati; corolla 9–10 mm longa basi 4 mm longe tubulosa cetera gradatim ampliata, limbo bilabiato labio exteriori 2.5 mm longi 3-dentato dentibus acutis circa 0.8 mm longis interiori in 2 lacinias lineares revolutas partito; antherae 3.5 mm longae basi longe caudatae (caudae 0.8 mm longae); styli rami crassiusculi subspathulati obtusi 0.8 mm longi sursum apiceque breviter crasseque pilosulo-papillosi; ovaria sublaevia subcompressa bimarginata et 3 costis tenuissimis fere inconspicuis. Achaenia non evoluta. Receptaculum nudum foveolatum. (Fig. 3, *k–w.*)

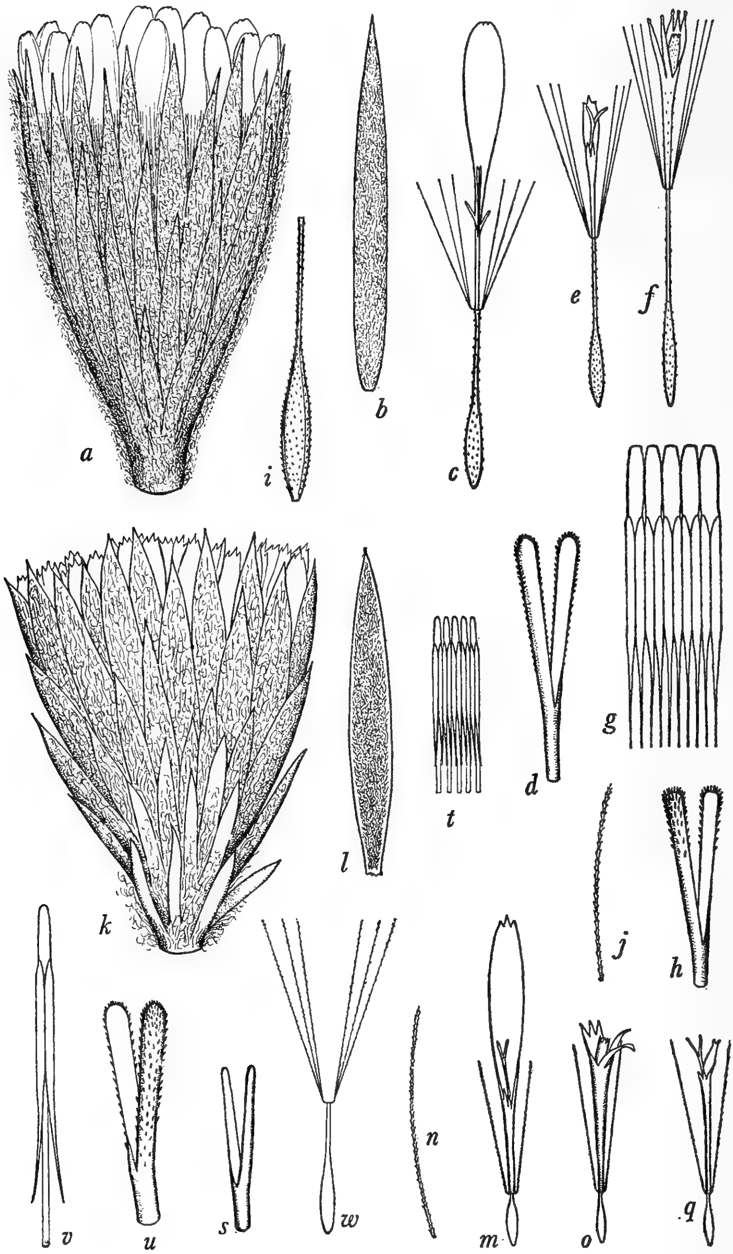
Type locality: Colombia: Magdalena: Sierra Nevada de Santa Marta, southeastern slopes: Hoya del Río Donachuí: Meollaca (or Meuyaca), páramo, bushy prairies 3320–3260 m alt.; ligules white above, lilaceous beneath; 28 September 1959, J. Cuatrecasas and R. Romero Castañeda 24438; Holotype, US; isotype, COL. Sierra Nevada de Santa Marta, southeastern slopes: Hoya del Río Donachuí: Laguna de Calocribe, east of Meollaca, páramo 3600–3700 m alt.; leaves greenish above, white beneath; involucral bracts green purplish; ligules white above, ± violaceous beneath 30 September 1959, J. Cuatrecasas and R. Romero Castañeda 24549; paratypes, US, COL.

Remarks: Chaptalia incana must be placed in the section *Leria* (DC.) Burkart. It differs from all other species chiefly by its narrow-linear white-woolly leaves and its general white tomentum. The shape of its heads and of its three kinds of corollas distinguishes *Chaptalia incana* from other species which may have somewhat similar leaves (such as *Ch. runcinata* var. *graminifolia* (Dus.) Burkart).

Chaptalia paramensis Cuatr., sp. nov.

Herba rosulata scapigera rhizomate inclinato fibroso-radicifero. Folia omnia basilaria alterna petiolata subcoriaceo-herbacea crassiuscula, petiolo 2–7 cm longo crassiusculo striato ochroleuco vel griseo-lanato basi subite in vaginam scariosam amplectentem circa 1 cm longam et latam dilatato; lamina ovoidea vel oblongo-ovoidea apice obtusa vel paulo attenuata basi plus minusve inaequilatera subcordata vel truncata aliquando leviter subiteque decurrens margine leviter grosse dentata 3–8 cm longa 2.5–5 cm lata, supra juvenilis indumento arachnoideo-lanato ochroleuco deciduo adulta glabrata atroviridis nervis secundariis tenuibus paulo conspicuis, subtus dense crasseque ochroleuco- vel griseo-lanata costa eminenti nervis secundariis circa 5 utroque latere bene ascendentibus plus minusve conspicuis.

Scapi axillares singuli monocephali 15–26 cm longi suberecti crassiusculi ochroleuco-lanati ebracteati ad apicem incrassati saepe deflexi. Capitula radiata campanulato-conica 20–25 mm alta cernua vel nutantia. Involucrum turbinatum bracteis imbricatis 6-seriatis subherbaceis lineari-lanceolatis acutis margine scariosis plus minusve violaceis dorso lanatis, interioribus 20 fertilibus 20–21 mm longis 2–2.5 mm latis reliquis gradatim brevioribus exterioribus 6–4 mm longis 1–0.7 mm latis. Flores radii feminei 22–33 subuniseriati; corolla alba glabra ligulata subbilabiata 15–16 mm longa ligula oblonga 2 mm lata oscure 4-nervata apice attenuata integerrima vel minute 2–3-denticulata basi 2 dentibus linearibus 0.6–0.7 mm longis praedita, tubulo subcapillari 5–5.5 mm longo; rami styli tubulum superantes lineares obtusiusculi supra minute papillosi; ovarium fusiforme subcompressum bimarginatum sparse minuteque pilosulum 3.5 mm longus apice rostrum filiformen 4–4.5 mm longum productum; pappus stramineus 6–7 mm longus pilis breviter strigulosis triseriatis. Flores feminei interiores 35–45, corolla brevi subbilabiata 9–9.5 mm longa tubulo angusto 5–5.5 mm longo labio exteriori ligulato lamina 3.5 mm longa 0.6 mm lata apice tridentata interiori brevi 2 laciniis brevibus saepe inaequalibus 0.5–0.7 mm longis instructo; rami styli 1.5–2 mm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longi lineares obtusi supra minute papillosi; ovarium 4.5–5 mm longum fusiforme subadpressum bimarginatum apice rostratum minutis pilis sparsis praeditum. Flores disci hermaphroditi circa 41 tubuloso-zygomorphi; corolla 9–9.5 mm longa bilabiata, tubulo circa 4 mm longo sursum in limbum tubulosum sine sensu ampliatum producto, labio exteriori oblongo 2-nervato circa 3 mm longo 1.3 mm lato apice profunde tridentato labio interno in 2 lacinias lanceolato-lineares 2.5–3 mm longas partito, apice dentibus laciniisque capitato-incrassatis papilloso-glandulosis; antherae sagittatae 4.5 mm longae appendicibus apicalibus obtusis 1.4 mm longis ad basim caudiculis subulato-filiformibus circa 1.5 mm longis. Rami styli lineares crassi 1 mm longi ad apicem rotundati papilloso-pilosi intus minutissime papillosuli; ovarium tenue cum rostro circa 9 mm longum, sparse minuteque pilosulo; pappus stramineus 8–9 mm longus pilis tenuibus rigidis minute strigulosis 3-seriatis. Achaenia immatura subfusiformia 4.5 mm longa tenuiter 5-costata minute sparseque pilosula apice in rostrum 4–4.5 mm longam producta. Receptaculum nudum foveolatum. (Fig. 3, *a–j.*)

Type locality: Colombia: Magdalena: Sierra de Perijá, plain between Cerro Venado and Cerro Avión, páramo 3270–3350 m alt.; leaves rather thick, dark green above, white and more or less purplish beneath; involucre more or less purplish, 8 November 1959, J. Cuatrecasas and R. Romero Castañeda 25117. Holotype, US; isotype, COL.

Remarks: Chaptalia paramensis has a similar appearance and is closely related to *C. meridensis* Blake, from the Sierra Nevada de Mérida, Venezuela. The Sierra de Perijá species has more markedly herbaceous, although thick, subcarnose leaves which have shorter petioles and ovate blades. The floral scapes are also thicker, especially near the apex, the heads are larger and include a greater number of larger flowers, the involucre is woolly-tomentose, and the ovaries and achenes are minutely pilose and long-rostrate.

Fig. 3.—*a–j*: *Chaptalia paramensis* (Cuatrecasas and Romero 25117). *a*, head, ×2.5; *b*, inner involucral bract, ×2.5; *c*, outer female flower, ×2.5; *d*, style end of outer flower, ×10; *e*, inner female flower, ×2.5; *f*, disc flower, ×2.5; *g*, anthers, ×10; *h*, style end of disc flower, ×10; *i*, achene, ×2.5 (the rostrum sectioned below the pappus); *j*, fragment of pappus bristle, ×10. *k–w*: *Chaptalia incana* (Cuatrecasas and Romero 24438). *k*, head, ×2.5; *l*, inner involucral bract, ×2.5; *m*, outer female flower, ×2.5; *n*, fragment of pappus bristle, ×10; *o*, disc flower, ×2.5; *q*, inner female flower, ×2.5; *s*, style end of female flower, ×12.5; *t*, anthers, ×5; *u*, style end of disc flower, ×10; *v*, stamen, ×10; *w*, diagrammatic young achene with its pappus, ×2.5. The pappus in the figured flowers (in *m*, *o* and *q*) is represented by only 2 bristles.

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A NEW *LYSIOSQUILLA* (CRUSTACEA: STOMATOPODA) FROM THE GULF OF CALIFORNIA, WITH A REDESCRIPTION OF *L. DECEMSPINOSA* RATHBUN

By Raymond B. Manning
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In 1910 Rathbun briefly described a small stomatopod from Peru and placed it in the genus *Lysiosquilla*. Schmitt (1940) reported the same species from Costa Rica; he felt that the species was based on immature specimens because of the shape of the telson and the size of the animals. Neither Schmitt nor Rathbun figured the species in detail.

Since the description of *L. decemspinosa*, two other similar species have been described, *L. chilensis* Dahl, 1954, from Chile, and *L. grayi* Chace, 1958, from Massachusetts, on the Atlantic coast of America. These three species form a small, compact group within the genus *Lysiosquilla*. They can be characterized by their small size, 40 mm or less at maturity, the loosely articulated body, and the shape and spination of the telson, inasmuch as the posterior margin of the telson forms a false eave over the true marginal spines. Also, these three species lack the mandibular palp, have no papillae on the antennal protopod, and have but four epipods.

Discovery of several undescribed related species in the western Atlantic led the author to re-examine the available specimens of *L. decemspinosa* in the collections of the U. S. National Museum. During examination of other species of *Lysiosquilla* for comparative purposes, the author found that the small broken male referred to *L. digueti* Coutiere by Schmitt (1940) was actually an undescribed species, allied to *L. decemspinosa*.

Contribution No. 307 from The Marine Laboratory, University of Miami, Miami 49, Florida.

In order to clarify the status of these species within the genus, and to bring attention to their existence, a redescription of Rathbun's species and a description of the new species is here presented.

In the following discussion, the number of teeth arming the raptorial dactylus always includes the terminal tooth.

I am indebted to Fenner A. Chace, Jr., Curator, Division of Marine Invertebrates, U. S. National Museum, for providing working space in the National Museum and for the loan of comparative material.

This paper constitutes a technical report to the National Science Foundation under Grant No. G-11235.

Lysiosquilla decemspinosa Rathbun, 1910

Figs. 1–3

Lysiosquilla decemspinosa Rathbun, 1910: 566, Pl. 53, Fig. 3; Kemp, 1913: 203 (listed only); Schmitt, 1940: 189, Fig. 20.

Material examined: 1 ♀, 23.7 mm, total length; inside beach at Capon, Peru; 30 January 1908; R. E. Coker; lectotype, USNM 40498. 1 ♂, 21.3 mm, total length; 2 ♀ ♀, 16.2–24.7 mm, total length; inside beach at Capon, Peru; 30 January 1908; R. E. Coker; paratypes, USNM 105352. 2 ♀ ♀, damaged; Isla San Lucas, Gulf of Nicoya, Costa Rica; 15 January 1930; M. Valerio; USNM 64138. 1 ♂, about 18 mm, total length; Playas Blancas, Costa Rica; 3–5 fms.; 8 February 1935; Hancock Pacific Exped., Stat. 460. USNM 81684.

Description: Eyes small, cornea globular, slightly overhanging lateral margin of stalk, not extending to end of antennular peduncle.

Antennal scale small, not as long as rostral plate, antennal protopodite lacking papillae.

Rostral plate half again broader than long; lateral margins convex and subparallel, anterior margins concave, sloping forward to an obtuse apex which is in advance of the acute anterolateral angles. Rostral plate completely covers the dorsal processes of the antennular and ophthalmic somites and the base of the eyes.

Carapace smooth, short, without carinae; gastric grooves present, cervical groove faintly indicated lateral to each gastric groove. Carapace rounded anterolaterally and posterolaterally.

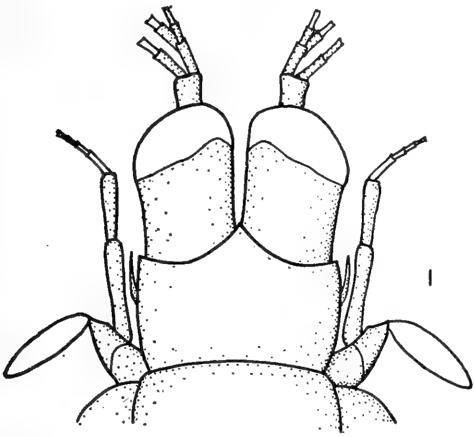
Raptorial claw small; dactylus armed with 11 teeth, with a prominent notch followed by a low lobe on outer, proximal margin; propodus armed with four movable teeth on inner, proximal margin, and a row of pectinations on outer margin; dorsal ridge of carpus undivided, obscure, ending in a blunt prominence.

Width of propodus of fourth thoracic appendage half again as great as length; width of propodus of fifth thoracic appendage equal to length, the width of the propodus of the fifth thoracic appendage half that of the fourth. Mandibular palp absent. Epipods present on first 4 thoracic appendages only.

Exposed thoracic somites truncate laterally, corners rounded. Inner branch of walking legs almost circular on appendages of sixth and seventh thoracic somites, ovate on the eighth somite. Copulatory tubes well-developed in the males.

Abdomen smooth, flattened, loosely articulated, not increasing in width distally.

Telson almost half again wider than long, smooth dorsally and convex in all directions; posterior false eave with a slight rounded, median



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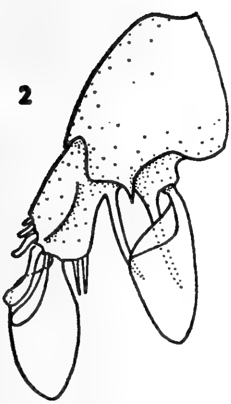

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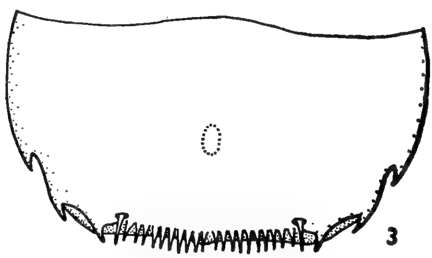

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Figs. 1–3. *Lysiosquilla decemspinosa* Rathbun: Fig. 1.—Anterior portion of body of lectotype, ×18. Fig. 2.—Left uropod of lectotype, ×18. Fig. 3.—Ventral view of telson of female from Isla San Lucas, Costa Rica, ×22.

projection, and a concave emargination on either side; tips of submarginal teeth visible dorsally. Posterior armature, on each side, consisting of a transverse row of 9–11 small, fixed submedian spines; a large, movable submedian tooth, outside of these and slightly in front of them, and 3 marginal spines. In one specimen (USNM 81684, ♂) there are two additional denticles, one between each of the lateral spines.

Basal segment of uropod with a small spine on anterior half of ventral surface; five movable, graded, spatulate spines on outer margin of penultimate segment, the last extending to the midpoint of the ultimate segment; penultimate segment also armed with two or three slender fixed spines on inner distal margin; inner branch of uropod spatulate, with anterior portion of inner margin folded over. Inner spine of basal prolongation much the longer.

Color: Almost completely faded, but with a few dark chromatophores scattered on the exposed surfaces.

Measurements: ♀ Lectotype. Total length, 23.7 mm; carapace length, 3.2 mm; rostral plate length, 1.0 mm; telson length, 1.9 mm; telson width, 2.9 mm. ♂ Paratype. Total length, ca. 22.5 mm; carapace length, 3.2 mm; rostral plate length, 1.1 mm; telson length, 1.8 mm, telson width, 2.9 mm.

L. decemspinosa can immediately be separated from *L. chilensis* and *L. grayi* by the angled anterolateral angles of the rostral plate, the smaller number of teeth on the raptorial dactylus, and the smaller number of denticles in the submedian row of the telson.

L. perpasta Hale from Australia somewhat resembles these species, but differs in the configuration and spination of the telson. The body is more compactly put together, the carapace is comparatively longer, and the rostral plate is longer than wide. Although *L. perpasta* lacks the mandibular palp, it has a full complement of epipods and has definite papillae on the antennal protopod. It possibly represents the Indo-Pacific parallel to the American group of species allied to *L. decemspinosa.*

Remarks: There is little doubt that the small specimens referred to this species are mature, as the males have the copulatory tubes well-developed. The size of the species is somewhat smaller than *L. grayi* Chace.

Discussion: There is some variation in the amount of swelling of the telson. In several of the paratypes the posterior margin is almost circular, not emarginate, as figured.

The rostral plate of the Isla San Lucas specimen has the anterolateral corners of the rostral plate less produced than in the type material.

Habitat: The type series was collected from vertical holes in the muddy sand of the inside beach at Capon; small yellow eggs were noted attached to the sides of the holes.

The Hancock specimen was taken in the middle of the bay at Playas Blancas in mud, sand, and algae at three to five fathoms.

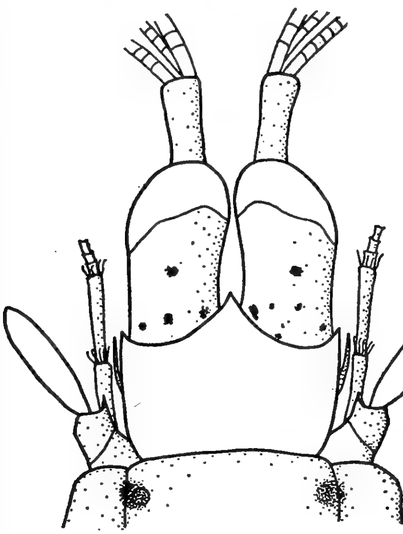
Lysiosquilla californiensis, new species

Figs. 4–6

Lysiosquilla digueti Schmitt, 1940: 194 (reference to the male specimen only, Hancock Exped. Stat. 595-36).

Material examined: 1 damaged ♂, ca. 20 mm; total length; Puerto Escondido, west side of Gulf of California; 26 fms.; Hancock Exped. Stat. 595-36. Holotype USNM 76375.

Description: Eyes small, cornea subglobular, set obliquely on stalk.



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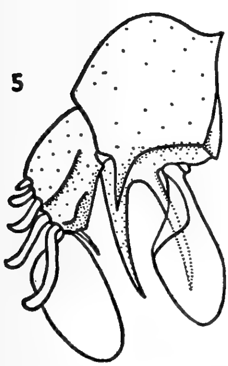

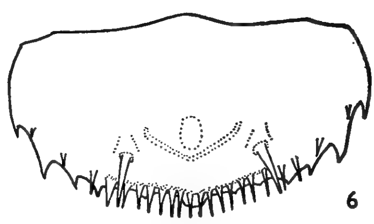

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Figs. 4–6. *Lysiosquilla californiensis,* new species: Fig. 4.—Anterior portion of body of holotype, ×20. Fig. 5.—Left uropod of holotype, ×20. Fig. 6.—Ventral view of telson of holotype, ×20.

Eyes extend over the articulation of the second and third segments of the antennular peduncle.

Antennules short; bases of dorsal processes of antennular somite covered by rostral plate, although the spinous terminations of these processes are visible lateral to the rostral plate.

Rostral plate much wider than long, with anterolateral angles sharp, acute; anterior margins concave, acute apex in advance of anterolateral angles.

Carapace smooth, short, without carinae; gastric grooves distinct, cervical grooves much reduced, visible lateral to each gastric groove. Posterolateral angles broadly rounded.

Antennal scale small, not as long as rostral plate; papillae not present on antennal protopod.

Raptorial claw small; dactylus armed with eight teeth on inner margin, outer margin with a deep notch at base followed by a broad lobe. Propodus with four movable teeth, second much the smallest, on inner proximal margin, and a row of pectinations on upper margin. Dorsal ridge of carpus ending in a strong tooth.

Propodus of fourth thoracic appendage about twice as broad as that of the third and almost three times as broad as that of the fifth. Epipods present on first four thoracic appendages. Mandibular palp absent.

Thoracic somites truncate laterally. Inner branch of walking legs two-segmented, almost circular on the sixth and seventh legs, more ovate on that of the eighth.

Abdomen smooth dorsally, without trace of carinae, spined only at the posterolateral corners of the sixth somite.

Telson twice as wide as long, unarmed dorsally. Posterior margin emarginate, forming a false eave overhanging the true posterior spines. There are thirteen projections on the false eave, a large median one, rounded distally, and six, smaller acute ones on either side. The posterior armature, on either side, under the false eave, consists of a row of eight sharp submedian denticles, a large, movable submedian tooth, mesiad and anterior to the outermost denticle, and three more immovable spines laterally. There is a raised ridge on the ventral surface posterior to and half way around the anal pore.

Basal segment of uropods with a sharp spine on the ventral surface. The two spines of the basal prolongation are subequal in length. Penultimate segment of outer branch with five, graded, movable, spatulate spines on its outer margin, the last extending to the midpoint of the ultimate segment, and one or two slender, movable spines on the inner, distal margin.

Color: The pigment is largely faded. There are several dark chromatophores on the dorsal surface of the eyestalks. Carapace with three pairs of large spots, one anteriorly, on and inside the gastric grooves, a second pair posterior to these on the lateral plates, and a third pair in the region of the cervical groove. Thoracic somites and abdomen with paired pigment spots on each somite, with a larger spot at the postero-lateral angle of the fifth abdominal somite.

Measurements: Holotype. Total length, ca. 20 mm; carapace length, 2.8 mm; rostral plate length, 1.1 mm; telson length, 1.2 mm; telson width, 2.4 mm.

Discussion: *L. californiensis* is very closely related to *L. decemspinosa* and its allies. It can be distinguished from them by the almost spinous anterolateral angles of the rostral plate and the large number of projections of the false eave of the telson.

The absence of dorsal spines on the telson distinguishes these species from *L. digueti* and its Atlantic counterpart, *L. biminiensis* Bigelow.

Schmitt was misled by the configuration of the telson and size of this specimen. He felt that it was the "first littoral stage" of *L. digueti* although it is only about three mm shorter than the female of that species taken by the Hancock Expedition. He pointed out the differences between the two specimens, but attributed them to age.

Remarks: Although the specimen is broken in half, its diagnostic features are easily discernible. The second tooth on the left side of the posterior margin of the telson is more triangular and not as sharp as the remainder of the teeth.

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PROCEEDINGS

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REPTILES (EXCLUSIVE OF SNAKES) OF THE CHILPANCINGO REGION, MEXICO

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In the course of biological investigations carried on in central Guerrero from 1952 to 1958, the senior author and his associates collected 1011 lizards representing 44 species and 15 turtles of one species. These specimens are deposited in the Texas Cooperative Wildlife Collections (TCWC) and constitute the basis for this report. Since collecting was not selective (except for *Ctenosaurus*), the number of specimens taken is a crude measure of the relative abundance of each species during the period of the survey. In presenting our report we have given special attention to data on reproduction and on the habitat occupied by each species.

In a report on the snakes of the Chilpancingo Region, Davis and Dixon (1959) describe the physiography and vegetation of the region here under consideration. Briefly, the area is that lying between latitudes 17° N and 18° N and longitudes 99° W and 100° W. Chilpancingo lies approximately in the center of this quadrangle.

The following lizards were not collected by us although they have been reported in the literature from the Chilpancingo Region: *Hemidactylus frenatus*, Tierra Colorada (Smith and Taylor, 1950); *Anolis nebuloides*, ca. Tierra Colorada, 2 mi N Xaltianguis (Smith, 1933); *Sceloporus horridus oligoporus*, ca. Xaltianguis (Smith, 1939b); *Sceloporus asper*, Chilapa (Ahl, 1934). Smith and Taylor (1950) question the identification of the last-named species.

Family BIPEDIDAE Stejneger

Bipes canaliculatus Bonnaterre

TCWC (1), Arid Tropical Scrub. Mexcala, 1600 ft. Other records: Balsas, Tecuaiziapan (Smith and Taylor, 1950). Our specimen was found in a trash pile after a rain. S–V length, 207 mm; tail, 36 mm; ventral body annuli, 166; caudal annuli, 33; dorsal annuli, 252; preanal pores, 6. These measurements and scale counts appear to be near the maximum for the species. Smith's (1949) largest specimen, of 12 reported on, had the following measurements and counts: S–V length, 192 mm; tail, 30 mm; ventral body annuli, 164; caudal annuli, 35+; dorsal annuli, 201. The fifth finger in our specimen is minute and lacks a claw.

Family GEKKONIDAE Stejneger

Coleonyx elegans nemoralis Klauber

TCWC (2), Arid Tropical Scrub and Tropical Deciduous forest. Acahuizotla, 2800 ft (1♀); 1 mi SW Colotlipa, 2700 ft (1♀). Other record: Agua del Obispo (Klauber, 1945). In both of our specimens the prenasals are distinctly separated. The one from Colotlipa, taken 2 July, was found after heavy rains under a rock in a rather dry chaparral zone which appears to be a finger of the Balsas Basin. The specimen from Acahuizotla, taken 11 June, is from a broadleaf forest association. Each female contained two large eggs nearly ready for deposition. Snout–vent length, 83 mm and 91 mm, respectively.

Phyllodactylus bordai Taylor

TCWC (1), Arid Tropical Scrub. Mexcala, 1600 ft. This specimen, a juvenile captured near Mexcala on 26 June, is 40 mm in snout–vent length. The identification is tentative until a larger series becomes available. It was found in a rocky situation where large boulders and crevices offered concealment.

Phyllodactylus delcampi Mosauer

TCWC (1♀), Tropical Deciduous forest. 1 mi SW Tierra Colorada, 900 ft. Other record: Tierra Colorada (Mosauer, 1936). This gecko, one of the largest *Phyllodactylus* in Mexico, attains a snout–vent length of 90 mm. Our specimen has 21 rows of scales between the orbits, 22 across snout between third labials; transverse row of 6 scales bordering postmentals; no enlarged tubercles on tail, but 16 rows of low, moderately keeled tubercles on the dorsum, four more rows than the maximum given by Smith and Taylor (1950). Mosauer (1936), however, reported 13 rows in one of the two specimens on which the original description of *delcampi* was based. The purplish brown dorsal coloration, with irregular dark brown cross bands, agrees with the type description. This specimen, captured 2 July, was not gravid. Snout–vent length, 75 mm.

Phyllodactylus lanei Smith

TCWC (54), Tropical Deciduous and Pine-oak forests. Acahuizotla, 2800 ft (9♂♂, 16♀♀, 1 juv.); 1 mi SW Tierra Colorada, 900 ft (3♂♂, 4♀♀); 5 mi SW Tierra Colorada, 1000 ft (1♂, 7♀♀, 1 juv.); Agua del Obispo, 3300 ft (4♂♂, 5♀♀, 2 juv.); Rincón, 2600 ft (1♂). Other records: 2 mi S Garrapatas; between Rincón and Cajones; Tierra Colorada (Smith, 1935b). The number of scales between the orbits in the series studied ranged from 14 to 18, with more than 80 per cent of the specimens having 15, 16, or 17. In this series the three or four subdigital lamellae preceding the penultimate are tripartite. Snout–vent length in sexually mature males varied from 60 mm to 75 mm (mean, 68 mm); in females, from 55 mm to 72 mm (mean about 62 mm). Females taken in June contained enlarged ovarian follicles; four juveniles, 28 mm, 35 mm, 40 mm, and 41 mm in snout–vent length were captured. Males can readily be distinguished by the presence of a large, conspicuous postanal scale.

These geckos were found mainly at night on boulders along hillsides and streams; many were found in caves near Acahuizotla.

Phyllodactylus magnus Taylor

TCWC (31), Tropical Deciduous and Pine-oak forests. Acahuizotla, 2800 ft (9♂♂); Agua del Obispo, 3300 ft (6♂♂, 6♀♀); 1 mi SW Colotlipa, 2700 ft (4♂♂, 4♀♀); Rincón, 2600 ft (1♂, 1 yg.). Other records: El Ocotito; Garrápatas; Tierra Colorada (Taylor, 1942). In a series of three females and eight males, the number of scales across the interorbital region ranges from 19 to 29, a somewhat greater range (23–29) than reported by Taylor (1942). However, in those specimens with 19 and 21 interorbital scales the subdigital lamellae, except for the outer one, are undivided and the abdomen was yellow in life. The largest female in our series is 80 mm in snout–vent length; the largest male, 93 mm. We can find no suitable means of distinguishing males from females by external characters.

Males taken from mid-June to early July had enlarged testes; females contained enlarged ovarian follicles and enlarged fallopian tubes. A juvenile 37 mm in snout–vent length was captured at Rincón on 26 June. Most of our specimens were found in caves; one was found on the trunk of a fig tree, others on boulders.

In the Pine-oak forest above Agua del Obispo, *P. magnus* and *P. lanei* have been captured together on the same boulder.

Family IGUANIDAE Gray

Anolis dunni Smith

TCWC (37), Tropical Deciduous and Pine-oak forests. Acahuizotla, 2800–3000 ft (10♂♂, 10♀♀); Agua del Obispo, 3300 ft (8♂♂, 11♀♀); 1 mi SW Colotlipa, 2800 ft (3♂♂, 3♀♀). Other record: Agua del Obispo (Smith, 1933). Gular fan ruby red; hind leg to eye in males (shorter in females); ventrals smooth; white stripe under eye; moderately large size. Our specimens were found on boulders and tree trunks, especially in riparian situations. Females taken in early June had ova about

4 mm in diameter; those taken in late June and early July had large eggs, 7 × 10 mm, some with shells and nearly ready for deposition.

Anolis gadovi Boulenger

TCWC (7), Tropical Deciduous forest. 1 mi S Tierra Colorada, 900 ft (6♂♂, 1♀). Other record: Tierra Colorada (Boulenger, 1905). Gular fan ruby red; hind foot to eye or beyond; ventrals smooth; four gulars in contact with mental. Our specimens were found mainly on large boulders. A female taken 2 July, had two eggs with well-developed shells, 7 × 15 mm, in the oviducts.

Anolis liogaster Boulenger

TCWC (3♀♀), Cloud forest. 2 mi W Omiltemi, 7900–8100 ft. Other record: Omiltemi (Boulenger, 1905; Gadow, 1905). Upper parts coppery brown with scalloped, light paravertebral stripes; one female with broad, straight-edged, cream-colored stripe as is found occasionally in females of *A. dunni* and *A. nebulosus.* Ventrals smooth; hind toe to eye (or nearly so); gular fan reddish. The three females collected 7–11 June 1953, were gravid, each with two large eggs; the largest measured 7 × 13 mm. The three specimens were found on fallen pine logs on a ridge northwest of Omiltemi. Five specimens in the U. S. National Museum have been preserved so long (1903) that the scalloped paravertebral stripes are obscure, but they are still discernible in some specimens.

Anolis megapholidotus Smith

TCWC (33), Tropical Deciduous and Pine-oak forests. Acahuizotla, 2800–3500 ft (6♂♂, 5♀♀); near Agua del Obispo, 3300–4000 ft (6♂♂, 13♀♀); SW of Colotlipa, 5000 ft (1♂, 2♀♀). Other record: Between Rincón and Cajones (= Agua del Obispo) (Smith, 1933). Gular fan red; dorsals as large or larger than keeled ventrals. Most of our specimens were found on tree trunks in coniferous forests. Females taken in June were gravid—8 June, ova about 2 mm in diameter; on 16 June, 8 × 5 mm, but without shell; on 27 June, 10 × 6 mm with shell. The enlarged ova were almost always two in number. Testes in males taken in June were small, indicating that the breeding season had passed.

Anolis microlepidotus Davis

TCWC (5), Pine-oak and Tropical Deciduous forests. 2.5 mi S Almolonga, 5600 ft (3♂♂) 4 mi W Chilpancingo, 5800 ft (1♂, 1♀). Other record: Chilpancingo (Davis, 1954). A small anole with ruby red gular fan; ventrals keeled and much larger than dorsals; hind toe fails to reach ear with hind leg laid forward. This species seems to be restricted to the chaparral-oak belt at middle elevations near Chilpancingo. One specimen from near Almolonga was captured in a swampy situation, but all the others came from xeric sites.

Anolis nebulosus Wiegmann

TCWC (48), Tropical Deciduous and Pine-oak forests. Acahuizotla, 2800 ft (16♂♂, 6♀♀); Agua del Obispo, 3300 ft (6♂♂, 3♀♀); 1 mi SW Colotlipa, 2700 ft (6♂♂, 10♀♀); 2 mi S Palo Blanco, 3500 ft (1♂). A moderate sized anole; gular fan yellow with bluish spot in anterior "corner"; dorsals enlarged, but much smaller than keeled ventrals; ear opening very small; hind toe to ear or nearly so. Females taken in June and early July were gravid with one to three (usually two) enlarged ova; the largest measured 10 × 6 mm. This lizard is normally found on rocks or on trunks of broad-leaved trees, usually below the pine belt. It is most common in riparian situations.

Anolis omiltemanus Davis

TCWC (8), Pine-oak and Cloud forests. 2 mi W Omiltemi, 7800 ft (3♂♂, 2♀♀); 4 mi W Mazatlán, 7800 ft (1♂, 2♀♀). A small anole with yellowish-orange gular fan; two to four postrostrals; ventrals smooth, larger than dorsals; hind toe to ear or less; loreals usually in three or four rows, rarely in five. Two females taken 11 June and two taken 24 June were gravid, each with two enlarged ova.

Anolis subocularis Davis

TCWC (3), Tropical Deciduous forest. 1 mi S Tierra Colorada, 1000 ft (2♂♂); 30 km N Acapulco (1♂). Other records: 2 mi S Garrapatas; Rincón; Tierra Colorada (Davis, 1954). Medium-sized anole, ventral scales keeled; supralabials and suboculars separated by posterior extension of lowest row of loreals, or nearly so; hind toe to eye. Seemingly the most common anole below an elevation of 1500 ft on the Pacific slope of Guerrero.

Basiliscus vittatus Wiegmann

TCWC (49), Tropical Deciduous forest. Acahuizotla, 2800 ft (21♂♂, 8♀♀); 1 mi SW Colotlipa, 2800 ft (6♂♂, 2♀♀); 5 km SW Tierra Colorada, 1000 ft (2♂♂, 7♀♀); 1 mi SW Tierra Colorada, 1000 ft (3♀♀). Other records: Tierra Colorada (Gadow, 1905), 1 mi N Organos (Smith, 1935b).

Our specimens were all found near permanent water, particularly in areas strewn with large boulders. Adult females captured in the last half of June contained large eggs (12 mm × 20 mm) nearly ready for deposition. The larger females (snout–vent length 120 mm or more) usually contained six to eight eggs; the smaller, sexually mature ones, four or five. Those females less than 70 mm in snout–vent length were sexually immature. Recently hatched juveniles (34 to 40 mm in snout–vent length) were captured 5 June, 22 June, and 2 July. Old females taken after 2 July were sexually inactive. These data suggest a breeding season extending from April to July.

The dorsal fin, characteristic of males, is not evident in individuals less than 80 mm in snout–vent length. In males 90–110 mm in snout–vent length, the fin is about 2 mm high; and in fully adult males, snout–vent length 138 or more, it is 8 to 10 mm high. The occipital fan exhibits a similar pattern of development with age. In newly hatched males it is not evident; in those 75 mm in snout–vent length the fan is 12 mm in length; in subadults, 28 to 30 mm in length; and in old males, 40 to 50 mm (Fig. 1). Females develop neither a dorsal fin nor an occipital fan.

In this species the ratio of length of tail to snout–vent length is nearly constant from infancy to old age (Fig. 2).

Ctenosaura pectinata Wiegmann

TCWC (11), Arid Tropical Scrub, Dry and Humid Tropical Deciduous forest, and Lower Pine-oak forest. Acahuizotla, 2800 ft (1 ad. ♂, 3 ad. ♀♀, 2 yg.); Agua del Obispo 3500 ft (1 juv.); 10 mi SE Colotlipa,

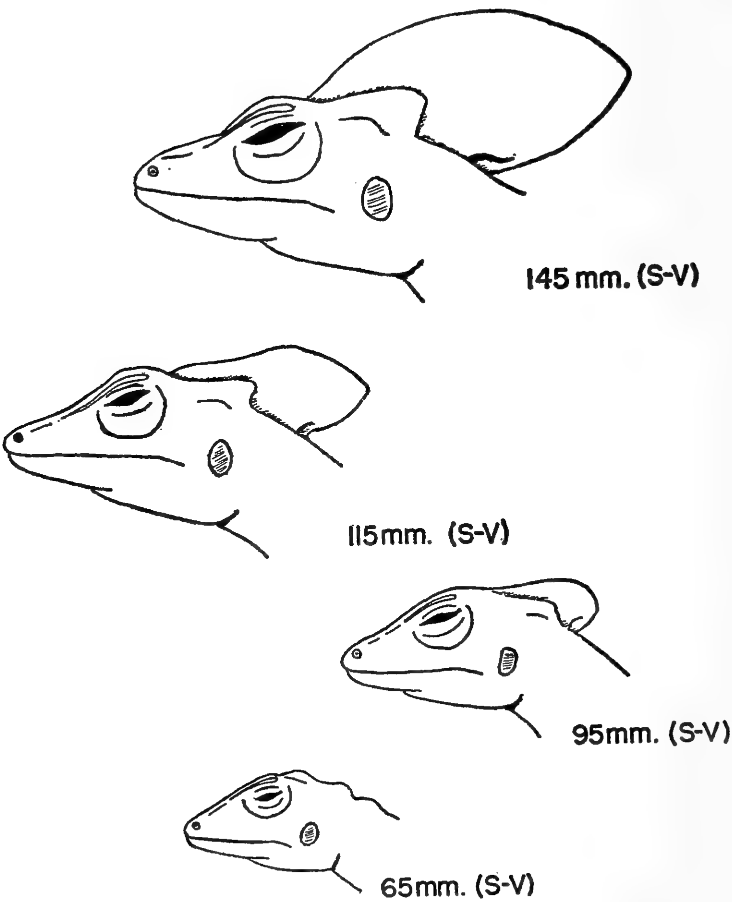


Fig. 1. Ontogenetic changes in the occipital fan of male *Basiliscus vittatus*.

4000 ft (1 yg.); 5 mi S Puenta de Mexcala, 1800 ft (1 subad. ♀, 1 yg.); 5 mi SW Tierra Colorada, 1000 ft (1 yg. ♂). Other records: Balsas, (Smith, 1939a) Cocoyul, Río Balsas (Gadow, 1905); near Mexcala, 1 mi N Organos, Tierra Colorada, 16 mi S Tierra Colorada (Smith, 1935b).

This is a widespread lizard in Guerrero at elevations below 6000 ft. It prefers rocky situations, particularly canyon walls and bluffs. In many localities it is regularly hunted by local residents for food.

Sexually mature adults measure 200 mm or more in snout–vent length. Gonads of animals smaller than that appear to be immature. Breeding probably takes place in early spring. None of the adults examined in June was sexually active, but small (snout–vent length 59–65 mm), green-colored juveniles were abundant then. Most of them were probably not more than a month old.

Phrynosoma asio Cope

TCWC (12), Arid Tropical Scrub. Near Mexcala 1600 ft (8♂♂, 1♀); Puente de Mexcala 1650 ft (2♂♂); 5 mi S Puente de Mexcala, 1800 ft (1 yg. ♀). Other record: Río Balsas (Gadow, 1905).

Three of our 12 specimens were found at the side of the highway or dead on the pavement south of the Río Balsas; most of the others were found during the heat of mid-day under bits of bark beside an old match factory on the south bank of the Río Balsas. A male and female were found copulating on 26 June. Both animals were taken alive and kept in captivity. On 13 August, the female laid four eggs, but died, probably from malnutrition, in the process. Autopsy revealed 17 additional eggs ready for deposition.

Phrynosoma taurus Dugès

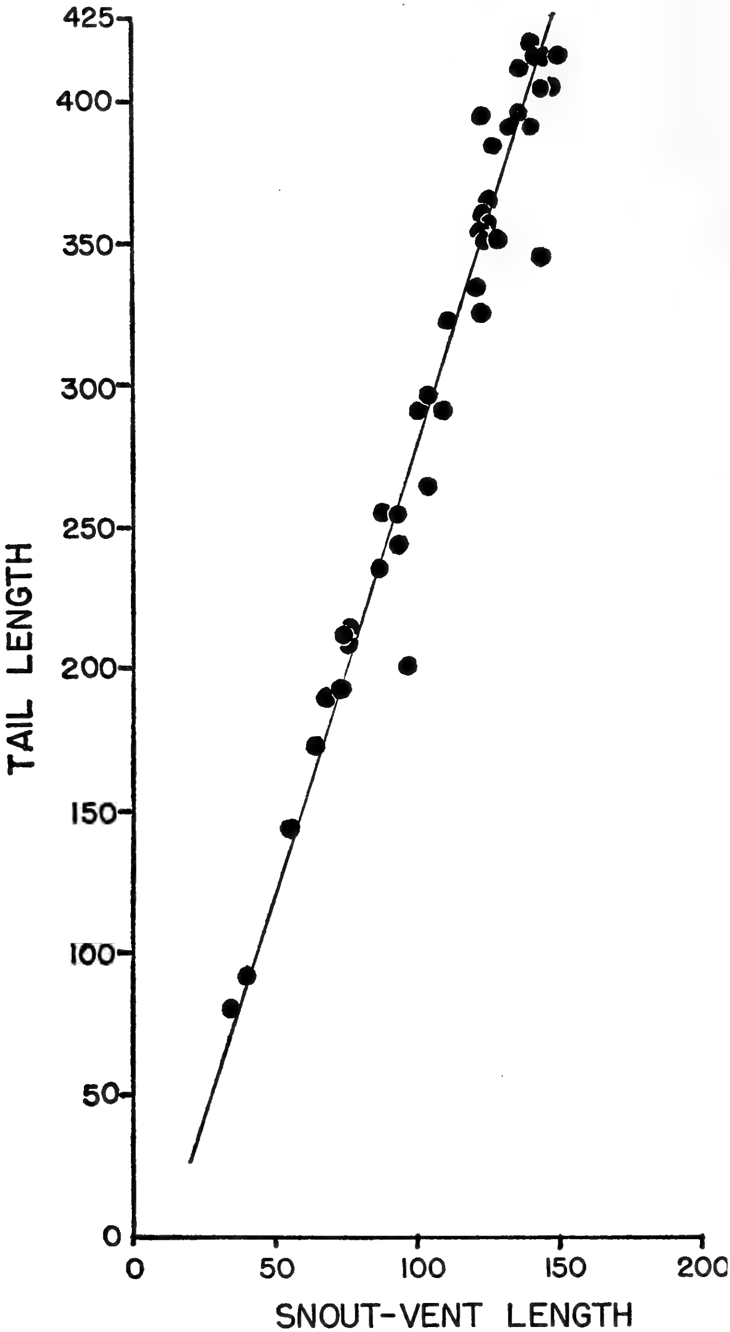
TCWC (1♀), Chaparral-oak forest. 3 mi W Chilpancingo, 5000 ft. Other records: Amula; 5 mi N Chilpancingo (Smith & Taylor, 1950).

Our specimen, taken 17 June, is a young, sexually inactive female 52 mm in snout–vent length. It was found on a dry, rocky, brush-covered hill. Seemingly the species is rare and restricted in its distribution in Guerrero.

Sceloporus formosus scitulus Smith

TCWC (97), Chaparral-oak, Pine-oak and Cloud forests. 15 km SW Chilpancingo, 9000 ft (1♂); 4–5 mi W Mazatlán, 7800–8200 ft (25♂♂, 14♀♀, 2 juv.); 2 mi SW Omiltemi, 7900 ft (12♂♂, 14♀♀); Tejocote (= Tejocotal) 7000 ft (5♂♂, 3♀♀); 2.5 mi S Almolonga, 5600–5800 ft (10♂♂, 9♀♀, 2 juv.). Other records: Chilpancingo (Gadow, 1905), Omiltemi (Smith, 1942).

We found individuals of this species most commonly on stumps, logs, and fallen trees in the pine-oak forest west of Chilpancingo, but east of there, at Almolonga, they occurred in the oak belt. All females 56 mm in snout–vent length and larger were gravid in mid-June. Small females, probably in their first breeding season, contained three or four enlarged ova; fully adult females usually contained eight or nine. Males seem



425
400
350
300
250
200
150
100
50
0
TAIL LENGTH
0
50
100
150
200
SNOUT-VENT LENGTH

to reach sexual maturity at an earlier age than females. Young males no longer than 40 mm in snout–vent length had enlarged testes, yet they had not developed the color pattern of adult males. Snout–vent length of the largest male was 83 mm; of the largest female, 77 mm.

Sceloporus stejnegeri Smith

TCWC (4), Tropical Deciduous forest. 1 mi SW Tierra Colorada, 900 ft (1♂, 3♀♀). Other record: Tierra Colorada (Smith, 1942).

A member of the *formosus* group, with complete, or nearly complete, black nuchal collar, not light bordered; bluish green color above. None of our specimens, captured 2 July, was sexually active. The largest specimen, an adult female, measured 83 mm in snout–vent length.

Sceloporus melanorhinus calligaster Smith

TCWC (5), Tropical Deciduous forest. Acahuizotla, 2800 ft (3♀♀); 1 mi SW Colotlipa, 2700 ft (1♀); 4 mi W Ocotito, 2600 ft (1♂). Other records: Tierra Colorada (Gadow, 1905); Garrapatas, Mexcala (Smith, 1939b).

Our specimens were all found in trees. All of the adult females taken in June contained from five to eight enlarged ova; those nearly ready for deposition (6 June) measured 11 × 18 mm. Snout–vent length of females, 87–96 mm; tail, 116–127 mm; of one male, 80 mm and 113 mm, respectively. One specimen from 8 km N Taxco (5500 ft), northeast of the Chilpancingo area, seems to represent an altitudinal record; most specimens have been captured at elevations below 3500 feet.

Sceloporus horridus horridus Wiegmann

TCWC (82), Arid Tropical Scrub, Chaparral-oak, Pine-oak and Tropical Deciduous forests. Acahuizotla, 2800 ft (14♂♂, 19♀♀); Agua del Obispo, 3300 ft (1♂); Almolonga (= Amula) 5600 ft (6♂♂, 9♀♀); 16 km S Chilpancingo, 4300 ft (1♀), 4 mi W Chilpancingo 5800 ft (5♂♂, 6♀♀); 14 mi W Chilpancingo, 6500 ft (1♂); 1 mi SW Colotlipa, 2700 ft (8♂♂, 4♀♀); Mexcala, 1600 ft (1♂, 2♀♀); 5 mi S Puente de Mexcala, 1800 ft (2♂♂); 1 mi S Tierra Colorada, 900 ft (1♂, 1♀); 2 mi N Tixtla, 4400 ft (1♀). Other records: between Cajones and Acahuizotla; Chilpancingo; 16 km N Mexcala; Palo Blanco; Tierra Colorada (Smith, 1939b); Chilapa (Ahl, 1934).

This species seems to be the most common lizard in Guerrero at elevations between 1000 feet and 6000 feet, especially in rocky areas.

Breeding probably takes place from May to September. Most of the sexually mature females (70 mm or more in snout–vent length) taken in Guerrero contained large ova in June and early July. Davis and Smith (1953: 103) found the same condition existing in females from the state of Morelos in late July and August. The larger (85–100 mm snout–vent

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Fig. 2. Correlation of snout–vent length and tail length in *Basiliscus vittatus*.

length), hence probably the older, females contained an average of 12 (9–15) large eggs, whereas smaller females (70–82 mm), probably in their first breeding season, contained an average of 9 (5–13). This difference is probably a function of body size of the female because we could detect no appreciable difference in size (8×15 mm) of eggs nearly ready for deposition. There is evidence that two or more broods are produced annually. Several adult females taken early in June and another lot taken the first week in July contained numerous ovarian eggs 3 mm to 4 mm in diameter and at the same time had large, flabby oviducts. This condition suggests that these females had already laid one clutch of eggs and that another was in process of developing.

Sexually mature males (testes 5–10 mm in diameter) ranged from 67 mm to 115 mm in snout–vent length. Two males 65 mm in snout–vent length had small (1 mm) testes and three females 60 to 65 mm in snout–vent length had infantile ovaries. These five animals were probably from late broods of the previous year. No specimens smaller than 60 mm were found in June and July. Davis and Smith (*op. cit.*), reported finding newly hatched young early in August in the adjacent state of Morelos.

Sceloporus grammicus grammicus Wiegmann

TCWC (18), Pine-oak and Cloud forests. 4–5 mi W Mazatlán, 7800–8500 ft (2♂♂, 1 juv.); 2 mi W Omiltemi, 7900 ft (3♂♂, 4♀♀); 2.5 mi S Almolonga, 5600 ft (3♂♂, 1♀, 4 juv.). Other records: Chilpancingo, Omiltemi (Smith and Taylor, 1950).

These lizards are mainly arboreal and live on trees in the mixed forest. None of the three adult females taken 9 June and 2 July was gravid, but adult males had large testes. Four juveniles captured in early July range in size from 35 mm to 43 mm (snout–vent length) and appear to be young-of-the-year. If so, the breeding season must be in April and May. Sexual maturity is reached when the lizard has attained a snout–vent length of about 45 mm. The largest male measured 71 mm (snout–vent length); the largest female, 62 mm.

Sceloporus mucronatus omiltemanus Günther

TCWC (38), Chaparral-oak, Pine-oak, and Cloud forests. 4 mi W Mazatlán, 7400–7800 ft (3♂♂, 5♀♀, 2 juv.); 5 mi W Mazatlán, 8000–8500 ft (1♂, 1♀, 4 juv.); Omiltemi, 7900 ft (5♂♂, 9♀♀, 2 juv.); Tecojote, 7000 ft (3♂♂, 1 juv.); 2.5 mi S Almolonga, 5800 ft (1♀, 1 juv.). Other record: Sierra de Burro ca. Omiltemi (Smith, 1939b).

West of Chilpancingo, this species is an inhabitant of the pine-oak community at high elevations, but east of there in the vicinity of Almolonga, it occurs on the oak-covered ridges. Individuals have a decided preference for logs and stumps, or snags with cavities or crevices in them, in openings in the forest where they can sun themselves.

Breeding must take place in March or April because by the first week in June young-of-the-year (34–36 mm in snout–vent length) were abundant. All sexually mature females we collected in June had quiescent ovaries, but large, convoluted oviducts. Some of the males still had enlarged testes (8 mm in diameter), but in most of them the size was only 4 mm or 5 mm. These data suggest a single brood yearly.

Sceloporus siniferus siniferus Cope

TCWC (94), Tropical Deciduous and Pine-oak forests. Acahuizotla, 2800 ft (8♂♂, 16♀♀); 2 mi W Acahuizotla, 3500 ft (10♂♂, 8♀♀); Agua del Obispo, 3300 ft (8♂♂, 10♀♀); mountains W of Agua del Obispo, 4000 ft (4♂♂, 5♀♀); 10 mi SE Colotlipa, 4000 ft (1♂, 2♀♀); 1 mi SW Colotlipa, 2700 ft (9♂♂, 8♀♀); 5 mi W Mazatlán, 8000 ft (2♀♀); Tierra Colorada, 1000 ft (2♂♂); 5 mi SW Tierra Colorada, 1000 ft (1♂). Other records: 2–3 km S Acahuizotla; 2 mi S Garrapatas; 1 mi N Organos; between Rincón and Cajones; Xaltianguis (Smith, 1939b). Buena Vista, Rincón (Gadow, 1905); Omiltemi (Günther, 1890). Río Balsas (Smith, 1939b) is probably in error.

This species appears to be widespread throughout Guerrero south of the Río Balsas. Our specimens were found mainly on the trunks of trees.

Because all females taken in June and early July were gravid, with eggs ranging up to 11 × 6 mm in size, and no young-of-the-year were seen by us, we assume that courtship and breeding begin in May. There is evidence that at least some females produce two clutches of eggs in rapid succession. The number of large eggs contained per female ranged from 2 to 9, averaging 6. Sexual maturity seems to be attained in one year.

Snout–vent length of 53 females taken in June and July ranged from 44 to 60 mm, averaging 53 mm; of 50 males, from 46 to 60 mm, averaging 55 mm. These data indicate no sexual difference in size in this species.

Sceloporus ochoterenai Smith

TCWC (44), Arid Tropical Scrub, Chaparral-oak, and Tropical Deciduous forests. 2.5 mi S Almolonga, 5600 ft (9♂♂, 9♀♀); 4 mi W Chilpancingo, 5800 ft (9♂♂, 12♀♀); 1 mi SW Colotlipa, 2700 ft (2♂♂, 2♀♀); Mexcala, 1600 ft (1♀). Other records: Balsas, between Cajones and Acahuizotla, Chilpancingo, 16 km S Chilpancingo, 2 mi N Mazatlán, 16 km N Mexcala (Smith, 1939b); Tierra Colorada (Gadow, 1905).

Our specimens were all found on the ground in relatively dry situations. Seemingly the species is a good indicator of the xeric Balsas Basin Biotic Province. The record from Tierra Colorada is open to question until additional specimens from that locality are available.

All females taken by us in June were gravid; some with ova no more than 2 mm in diameter, others with eggs measuring as much as 10 × 6 mm and nearly ready for deposition. The average number of eggs per female was slightly less than six. Adult females ranged from 43 mm to 50 mm (average about 46) in snout–vent length; males from 46 mm to 56 mm (average about 50). Since there appears to be only one age-class (adult) in our series of 62 specimens, it seems reasonable to assume that adult size and sexual maturity are attained in the first year. The only record we have for newly hatched young is for 12 August (see Davis and Smith, 1953).

Sceloporus gadoviae Boulenger

TCWC (10), Arid Tropical Scrub, and Chaparral-oak forest. Mexcala, 1600 ft (4♀♀); 5 mi S Puente de Mexcala, 1800 ft (4♂♂, 2♀♀). Other record: Near Río Balsas (Smith, 1939b).

Our specimens were found on the vertical faces of rocky out-croppings and cuts along the highway. Most of the adult females taken in June contained 3 or 4 large ova; those nearly ready for deposition measured 14 × 8 mm. Adult males measured 60–65 mm in snout–vent length; females, 52–57 mm.

Sceloporus pyrocephalus Cope

TCWC (2♂♂), Arid Tropical Scrub. 5 mi S Puente de Mexcala, 1800 ft (1); Mexcala, 1600 ft (1). Other record: Near Balsas (Smith, 1939b).

These lizards occur in open rocky areas, especially among large boulders and on limestone bluffs. They are exceedingly wary, the males more so than the females, and it is difficult for the collector to get within effective range of shot shells used in a .22 calibre pistol. When disturbed, they quickly seek refuge under the boulders or in cracks and crevices in the bluffs.

One of the females collected near Acapulco in mid-June (11 to 16 June) contained five large eggs (7 × 11 mm). All the others had flacid oviducts, but the ova were small, measuring from 2 mm to 4 mm in diameter. We judged from this condition that most of the females had oviposited by mid-June. Since Smith (1939b) reported the capture of females with 5 to 7 eggs on 5 and 21 July, it seems likely that this lizard lays two (or more) clutches of eggs during the summer.

Males and females are markedly different in size and color. Only the females have the reddish-brown head. Females range from 53 mm to 58 mm in snout–vent length; males, from 60 mm to 70 mm, and they are much more robust.

Sceloporus spinosus caeruleopunctatus Smith

TCWC (1♂), Chaparral-oak forest. 2 mi S Almolonga, 5600 ft.

This specimen, a juvenile 60 mm in snout–vent length, is referred to *caeruleopunctatus* on the basis of five supraoculars and 31 dorsal scales. It is like S. *s. spinosus* in the presence of only eight femoral pores on each side. This appears to be a new record for Guerrero and a marked extension of the known range of *caeruleopunctatus*.

Urosaurus bicarinatus bicarinatus Duméril

TCWC (3), Chaparral-oak forest and Arid Tropical Scrub. 5 mi S Puente de Mexcala, 1800 ft (1♀); 2.5 mi S Almolonga, 5800 ft (1♂, 1♀). Other records: 12 mi S Chilpancingo; Mexcala (Smith, 1935a);

Chilpancingo, Río Balsas, Tierra Colorada (Gadow, 1905); Agua del Obispo (Smith and Taylor, 1950).

This lizard seems to inhabit the open sparse vegetation in the Chilpancingo region. Our three specimens were taken from logs and trees. Both sexes are very dark on the ventral surfaces, more so than in typical *bicarinatus*. The belly patch of the male extends to the posterior third of the venter. None of them shows tendencies toward intergradation with *U. b. anonymorphus* from Colotlipa, an airline distance of only 13 miles.

Urosaurus bicarinatus anonymorphus Mittleman

TCWC (35), Tropical Deciduous and Pine-oak forests. Acahuizotla, 2800 ft (8♂♂, 7♀♀); Agua del Obispo, 3300 ft (3♂♂, 3♀♀); mountains W of Agua del Obispo, 4000 ft (2♂♂, 1♀); 1 mi SW Colotlipa, 2700 ft (3♂♂, 4♀♀); 1 mi SW Tierra Colorada, 900 ft (2♂♂, 1♀); 5 mi SW Tierra Colorada, 1000 ft (1♂). Other record: Tierra Colorada (Mittleman, 1942).

All of our specimens of *anonymorphus* are adults. There is a general tendency for specimens from the Tropical Deciduous forest to have dark venters and the belly patches fused medially. Males taken from the Pine-oak forest are paler ventrally and have two distinct belly patches separated medially by the lighter ventral coloration.

One specimen taken 6 miles east of Acapulco is typical of *anonymorphus*. This does not agree with the distributional pattern given by Mittleman (1942) who states that all *bicarinatus* east of Tierra Colorada belong to the subspecies *anonymorphus*. There seems to be a parallel situation in the distribution of *U. b. anonymorphus* and the snake *Conophis vittatus viduus*. Both are surrounded on three sides by the nominal subspecies. There appears to be a narrow corridor through which these two reptiles range from Tehuantepec, Oaxaca, to the Chilpancingo region of Guerrero.

Family SCINCIDAE Gray

Mabuya brachypoda Taylor

TCWC (16), Tropical Deciduous and Chaparral-oak forests. Acahuizotla, 2800 ft (4♂♂, 2 yg.); 2.5 mi S Almolonga, 5600 ft (2♂♂, 1♀, 2 juv.); 4 mi W Chilpancingo, 6000 ft (1♂); 1 mi SW Colotlipa 2700 ft (1♂, 2♀♀, 1 juv.). Other record: Tierra Colorada (Gadow, 1905). We have followed the systematic arrangement of Mexican *Mabuya* set forth by Webb (1958).

This skink occupies an altitudinal range on the Pacific slopes of Guerrero from 500 feet near Acapulco to at least 6,000 feet in the mountains west of Chilpancingo. It occurs in leaf litter, under logs and boulders, and in clumps of bunch grass.

This is one of the few ovoviviparous lizards. Four adult females taken from 21 June through 2 July were either gravid with young or, in one instance, had given birth to young. The gravid females contained 2, 3 and 4 nearly full-term fetuses measuring about 28 mm in snout–vent length. On 15 June and 3 July, young, recently born skinks, measuring 32 mm in snout–vent length, were found near Acahuizotla, and a slightly larger one (35 mm) was found near Colotlipa on 30 June. These data suggest that most of the young are born in June and early July.

Little sexual dimorphism is evident in this species. Adult males range from 62 mm to 72 mm in snout–vent length; females, from 63 mm to 87 mm. Like skinks of the genus *Lygosoma,* individuals of *Mabuya* have a transparent window in the lower eyelid which readily distinguishes them from members of the genus *Eumeces.*

Lygosoma assata taylori Oliver

TCWC (13), Tropical Deciduous and Pine-oak forests. Acahuizotla, 2800 ft (1♂, 2♀♀); Agua del Obispo, 3300 ft (3♂♂, 3♀♀); mountains W of Agua del Obispo, 4000 ft (3♀♀); 1 mi SW Colotlipa, 2700 ft (1♀). Other records: Chilpancingo, Tierra Colorada (Smith and Taylor, 1950); near Mazatlán; between Rincón and Cajones (Oliver, 1937).

These small, pale brown lizards were found in leaf litter and under rotten logs in the mixed forest at elevations from 2700 feet to near 4500 feet. Most of our females, which were taken in the last two weeks of June, were gravid with 1 to 4 eggs. Those nearly ready for deposition measured about 5×8 mm. Seemingly, one could expect to find newly hatched young ones in late July or August. Three adult males ranged from 44 mm to 51 mm in snout–vent length; 9 females, from 45 to 53.

Eumeces ochoterenae Taylor

TCWC (6), Tropical Deciduous, Pine-oak and Cloud forests. Acahuizotla, 2800 ft (1 juv.); Agua del Obispo 3300 ft (1♂); 3 mi W Chilpancingo, 5000 ft (1♀); 4 mi W Mazatlán, 7800 ft (1♀, 2 yg.). Other records: 7 mi E Chilpancingo; Chilapa (Smith and Taylor, 1950). Mazatlán; between Rincón and Cajones (Taylor, 1933).

Our specimens were found under rocks or rotting logs at elevations varying from 2800 feet to 7800 feet. Adult females taken in June appeared to have oviposited earlier in the season; one recently hatched juvenile 25 mm in snout–vent length was captured 18 June. The largest specimen, a female that has nearly lost the white dorsolateral stripes, measured 64 mm in snout–vent length.

Family TEIIDAE Gray

Ameiva undulata dextra Smith and Laufe

TCWC (15), Tropical Deciduous and Pine-oak forests. Acahuizotla, 2800 ft (4♂♂, 2♀♀); Agua del Obispo, 3300 ft (1♂); mountains W of Agua del Obispo, 4000 ft (1♂); Almolonga, 5800 ft (3♂♂, 1 juv.); 5 mi W Chilpancingo 6000 ft (1♂); 1 mi SW Colotlipa, 2700 ft (1♂); 1 mi SW Tierra Colorada, 900 ft (1♂). Other records: Los Cajones (Gadow, 1905); Chilpancingo (Smith and Taylor, 1950); near Rincón (Smith and Laufe, 1946).

This species occupies an altitudinal range in southern Guerrero from near sea level to at least 6000 feet in the vicinity of Chilpancingo. Most of our specimens were found in rocky terrain. These lizards apparently are not common wherever they occur, and they seem to be much more shy and retiring than the related *Cnemidophorus.*

Little information is available on their breeding habits. Large males taken in late June and early July had enlarged testes; females, however, had small ovarian follicles. A young lizard 42 mm in snout–vent length was taken 1 July.

Adult males varied from 76 to 97 mm in snout–vent length; our two females measured 60 mm and 80 mm, respectively.

Cnemidophorus guttatus immutabilis Cope

TCWC (90), Tropical Deciduous and Pine-oak forests. Acahuizotla, 2800 ft (32♂♂, 23♀♀); Agua del Obispo, 3300 ft (13♂♂, 4♀♀); mountains W of Agua del Obispo, 4000 ft (1 juv.); 1 mi SW Colotlipa, 2700 ft (4♂♂, 4♀♀); 1 mi SW Tierra Colorada, 900 ft (1♂, 2♀♀); 5 mi SW Tierra Colorada, 1000 ft (3♂♂, 3♀♀). Other record: Tierra Colorada (Gadow, 1905).

In our series of 116 specimens of this species from Guerrero, all of them from elevations above 1000 feet are distinctly striped; a few adult males from near Acapulco are spotted with obscure lines. Adults from Acahuizotla, Agua del Obispo, and Colotlipa, at elevations above 2600 feet, are strikingly marked by a broad cream-colored stripe that sets them apart from all other specimens of this species we have seen. Further collecting at middle altitudes on the Pacific slope of the Sierra Madre del Sur may reveal that this sample represents an unnamed geographic race.

Most of the adult females taken in June were gravid; a newly hatched juvenile (snout–vent length 35 mm) was captured in the mountains west of Agua del Obispo on 24 June.

Cnemidophorus gigas Davis and Smith

TCWC (23), Tropical Deciduous and Chaparral-oak forests and Arid Tropical Scrub. 3 mi W Chilpancingo, 5000 ft (1♂, 1♀); 4 mi W Chilpancingo, 5800 ft (6♂♂, 3♀♀); 5 mi SW Chilpancingo, 6000 ft (1♂); 1 mi SW Colotlipa 2700 ft (6♂♂, 2♀♀); Mexcala, 1600 ft (1♀); 5 km S Puente de Mexcala, 1800 ft (2♂♂).

This species is probably widely distributed in the Balsas Basin and its extensions through such low passes as the valley of Colotlipa onto the Pacific slope of the Sierra Madre del Sur. Wherever found it is associated with rocky terrain and xeric chaparral.

Davis and Smith (1952) point out that this species appears to breed earlier in the season than *C. sacki.* One female taken 25 June at Colotlipa contained six eggs (12 mm × 20 mm) nearly ready for deposition.

Cnemidophorus deppei deppei Wiegmann

TCWC (32), Tropical Deciduous forest. 1 mi SW Tierra Colorada, 1000 ft (6♂♂); 5 mi SW Tierra Colorada, 1000 ft (17♂♂, 5♀♀); 5 mi SE Tierra Colorada, 1000 ft (4♂♂). Other records: Organos, Xaltinanguis (Duellman and Wellman, 1960).

All except two of our adult male specimens have bluish gray throats. The dorsal count varies from 93 to 112 granules and falls well within the range of variation recorded by Duellman and Wellman (*op. cit.*) for the Guerreran population. Femoral counts varied from 37 to 40, slightly higher than the recorded average of 35.9 (32–42).

Cnemidophorus deppei infernalis Duellman and Wellman

TCWC (6), Arid Tropical Scrub. Mexcala, 1600 ft (1♂, 2♀♀); 5 mi S Puente de Mexcala, 1800 ft (3♀♀). Other records: 3 km S Mexcala, 14 km N Zumpango del Rio (Duellman and Wellman, 1960).

All of our specimens, three of which are from the type locality, agree with the characters designated for this subspecies by Duellman and Wellman.

Cnemidophorus sacki sacki Wiegmann

TCWC (51), Arid Tropical Scrub, Tropical Deciduous and Chaparral-oak forests. 2.5 mi S Almolonga, 5600 ft (7♂♂, 4♀♀); 3 mi W Chilpancingo, 5000 ft (1♂); 4 mi W Chilpancingo, 5800 ft (8♂♂, 2♀♀); 1 mi SW Colotlipa, 2700 ft (7♂♂, 3♀♀); Mexcala, 1600 ft (10♂♂, 6♀♀); 5 mi S Puente de Mexcala, 1800 ft (3♀♀). Other records: Chilpancingo, Río Balsas, Rincón (Gadow, 1906).

Eight of the 36 males ranged from 100 to 108 mm in snout–vent length, the others ranged from 80 to 98 mm. Females ranged from 60 to 90 mm in snout–vent length ($M = 73.7$). In the last half of June, the younger females (60–72 mm) contained two to four eggs, 1 to 8 mm in diameter; older females (75–90 mm) contained four to six eggs from 7 to 10 mm in diameter. This species was the most common lizard encountered in localities from which it was taken.

Family ANGUIDAE Cope

Abronia deppi Wiegmann

TCWC (1♀), Pine-oak and Cloud forests. 1 mi SW Omiltemi, 7700 ft. Other record: Omiltemi (Smith and Taylor, 1950).

Our female, which was found on the trunk of a tree on 10 June, contained enlarged ovarian follicles. Snout–vent length, 63 mm; tail, 90 mm.

Barisia gadovi gadovi Boulenger

TCWC (15), Pine-oak and Cloud forests. 4–5 mi W Mazatlán, 7800–8000 ft (4♂♂, 1♀, 1 juv.); Omiltemi 7600 ft (1♀); 2.5 mi W Omiltemi, 8500 ft (5♂♂, 2♀♀); 2 mi SW Omiltemi, 7800 ft (1♀). Other records: Chilpancingo (Tihen, 1949); mountains W Chilpancingo (Smith and Taylor, 1950); vicinity of Chilpancingo (Hall, 1951).

Our specimens were all found on or near the ground in the coniferous forests at high elevations in June. None of the females had ova larger than one millimeter in diameter, but several of the larger males had enlarged testes. Snout–vent length of adult males ranged from 90 to 101 mm; of females 85 to 93. A juvenile taken 24 June measured 35 mm.

Tihen's (1949) report of specimens from Chilpancingo most certainly does not refer to the immediate vicinity of that town which is in a valley surrounded by xeric conditions.

Gerrhonotus liocephalus liocephalus Wiegmann

TCWC (2♀♀), Pine-oak and Cloud forests. Acahuizotla, 2800 ft. Other record: Omiltemi (Gadow, 1905; Smith and Taylor, 1950).

Our two specimens came from the mixed pine-oak forest a short distance west of the village of Acahuizotla. The adult female is 153 mm in snout–vent length; the tail, 170 mm. The juvenile is 83 mm from snout to vent. The adult, taken 21 July, had small ovarian folilcles.

Family HELODERMIDAE Gray

Heloderma horridum Wiegmann

TCWC (1 yg.), Tropical Deciduous forest. 1 mi SW Colotlipa, 2700 ft (collected 30 June 1953). Our specimen, 212 mm in total length (130 mm S–V length), is brilliantly colored yellow and black. The mid-dorsum has eight bright yellow spots in a row from rear of head to base of tail. The tail has five bright yellow crossbands, slightly narrower than the black interspaces. The testes are two millimeters in diameter.

Family KINOSTERNIDAE

Kinosternon integrum Le Conte

TCWC (15), Tropical Deciduous and Chaparral-oak forests. Acahuizotla, 2800 ft (5♂♂, 5♀♀, 1 yg.); 1 mi SW Colotlipa, 2700 ft (2♂♂, 1♀); 2.5 mi S Almolonga, 5600 ft (1♂). Most of our specimens were collected along a small stream near the village of Acahuizotla. The single specimen from near Almolonga was taken from a small pond after a heavy rain.

Measurements (in mm) of six adult males and six adult females are as follows, males and females, respectively: Length of plastron, 123–157 (M = 138.7), 103–145 (M = 127.0); width of fore lobe of plastron, 67–76 (M = 71.7), 54–77 (M = 66.7); width of hind lobe of plastron, 63–72 (M = 66.7), 51–74 (M = 64.2); width of bridge, 36–44 (M = 38.9), 28–45 (M = 38.7); width of carapace, 85–108 (M = 94.5), 80–101 (M = 89.3); length of carapace, 137–175 (M = 156.9), 110–158 (M = 137.2); depth of shell, 50–62 (M = 55.2), 41–60 (M = 53.5). Females average smaller in size, but the width of the plastral bridge is proportionally larger than that of the males. All adult males have well-developed claws on the front feet. Seemingly there are no other records of this species, nor of any other turtle, from the Chilpancingo region.

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SYNONYMICAL NOTES ON SOME SOUTH AMERICAN SPECIES OF *GELASTOCORIS* KIRKALDY (HEMIPTERA: GELASTOCORIDAE)

By E. L. Todd
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De Carlo, 1954, Misión de Estudios de Patología Regional Argentina, 24(83–84): 87–102, proposed eight new specific names in the Gelastocorinae (Gelastocoridae: Hemiptera). In 1955, Univ. Kansas Sci. Bull., 37, pt. 1(11): 332–335, 336–337, 339–342, I treated his names as synonyms of *Gelastocoris nebulosus* (Guérin-Méneville), *G. fuscus* Martin and *G. angulatus* (Melin). The latter species and its synonyms were placed by De Carlo in the genus *Montandonius* Melin. I treated *Montandonius* as, and still consider it to be, a junior synonym of *Gelastocoris* Kirkaldy. De Carlo has recently published, 1959 (1960), Acta Zoologica Lilloana, 17: 53–85, a second paper in which he maintains that most of his specific names apply to valid species and that *Montandonius* Melin (1929: 154, 169) is a distinct genus. He also proposes another new specific name, *Gelastocoris monrosi*.

After a careful review of De Carlo's papers and a restudy of the species concerned, it is very obvious that we have very different concepts of species insofar as the Gelastocorinae are concerned. Accordingly, I do not wish to become further involved in an argument based on differences of opinion. However, since De Carlo has utilized some different characters in defining his species in his second paper, since he has modified some of his original illustrations and included additional ones, and since his names must be treated in a checklist of the family, now in preparation, I feel obligated to discuss his names once more. I shall then trust to other workers in Hemiptera, both of the present and future, and to future developments in our knowledge of the Gelastocoridae to determine which of the two specific concepts is correct.

Four of the names proposed by De Carlo in 1954, *i.e., Gelastocoris vianai, G. bergi, G. paraguayensis* and *G. bolivianus,* are in my opinion synonyms of *G. nebulosus* (Guérin-Méneville) and were so placed by me in 1955. The new name proposed by De Carlo in his last paper, *Gelastocoris monrosi,* I also place in the synonomy of *nebulosus,* but I must admit that I do not now have specimens that agree in all respects with those so named by De Carlo.

The male genitalia of *nebulosus* differs from those of the other species in that the tumescence of the right clasper is adnate to the base of the clasper; the pan more or less flat, wider than long and truncate or slightly rounded apically; the keel hook recurved back across the pan; and the right clasper hook, stout, with a large lateral projection which gives the hook a footlike appearance. The male genitalia of all five of the De Carlo species mentioned above agree with those of *nebulosus.* The slight differences in the shape and size of the keel hook which De Carlo considers in his latest paper to be constant, but which he did not mention or illustrate in his first paper, are in my opinion merely variations of this structure within the species *nebulosus.* Martin (1929: 356) was of the same opinion. He stated: "The hook on the distal end of the keel (keel hook) has a characteristic shape for each species that possesses it. In some species there is quite a range of variation in the size of this hook. In the species *G. quadrimaculatus* (Guer.) the size and shape might be quite misleading unless one is familiar with the species." *G. quadrimaculatus* (Guer.) is the name Martin used for *nebulosus*! Unfortunately, in 1954, De Carlo overlooked the generic revision by Martin.

G. nebulosus (Guérin-Méneville)

De Carlo treated this name as a synonym of *G. flavus* (Guérin-Méneville) in 1954, but he reverses the usage in 1959(1960). He follows my explanation (1955: 334–335) as to why the name *nebulosus* must be used for the species. Also he now states that his *vianai* is the "true" *nebulosus* and places *vianai* as a synonym of the latter. So, we are in agreement that *vianai* De Carlo is a synonym of *nebulosus.*

G. quadrimaculatus (Guérin-Méneville)

In 1954 De Carlo followed Montandon (1910: 2) and Hussey (1952:

70) in considering *quadrimaculatus* to be an older name for *G. vicinus* Champion. However, I showed (1955: 321–322) that his synonomy was extremely unlikely. In his latest paper De Carlo has applied the name to specimens which I consider to be *nebulosus*, but which he insists are specifically distinct. He also places the specimens he identified as *G. flavus* (Guérin-Méneville) and *G. bergi* De Carlo in 1954 as the same species. This last action is difficult to understand because in 1954 he stated that *bergi* differed from *flavus* by the shape of the pronotum, by having the tubercles of the pronotum a little more pronounced, by the crossing of the hemelytra less, by the different shape of the harpes (parameres) and in the presence of granulations numbers 9 and 10 on the hemelytra. Yet he insists that comparable differences of the same structures are of importance in the separation of *quadrimaculatus, nebulosus, bolivianus, paraguayensis* and *monrosi.*

There are two specimens before me that exhibit an identical pattern of coloration to that given by De Carlo for *quadrimaculatus.* One of these, a specimen from Argentina from the Museum of Vienna, Austria, has granulation number 10 present. Therefore one may conclude that the name *quadrimaculatus* might also be applied to the specimens called *bolivianus* by De Carlo, or that the presence or absence of granulation number 10 is not of specific value. The other specimen with the "quadrimaculatus" type of coloration does not possess granulation number 10. The specimen is from Organ Mountains, Minas Gerais, Brazil, and is in the United States National Museum.

G. bolivianus De Carlo

I agree with De Carlo that the blisterlike granulations of the hemelytra of specimens of *nebulosus* from Bolivia are usually more prominent, with numbers 9 and 10 of De Carlo usually developed and with the membrane frequently reduced. I do not, however, consider these variations to be of specific value. Specimens of *nebulosus* from other areas of South America may also have enlarged granulations and may even possess granulations such as 9 and 10, as indicated above in the discussion of *quadrimaculatus* of De Carlo. Some of the other specimens in the United States National Museum from the series from Organ Mountains, Minas Gerais, Brazil, have granulations 9 and 10 slightly developed. The reduction of the membrane is commonly observed in specimens from the Andean regions in other species as well as in *nebulosus.*

G. paraguayensis De Carlo

I have not observed any constant differences in the elevations or depressions of the pronotum or the scutellum in the series of specimens of *nebulosus.* I cannot, therefore, accept De Carlo's statements that there are constant differences in these structures. De Carlo also states that the shape and size of the keel hook is constant for this species and different from *nebulosus, quadrimaculatus,* etc. I have already discussed in this paper the variation of the keel hook in *nebulosus.* De Carlo states, 1959(1960) in "Remarks" under *paraguayensis* that if I had carefully observed his drawing, Fig. 8, Plate 2, p. 91 in his original paper that I would not have considered *paraguayensis* to be a synonym of *nebulosus*. I still fail to see any specific differences in the drawing. The illustration of *paraguayensis*, is smaller than the others, but then the specimen was smaller. Even so, it is only slightly smaller than the illustration of the genitalia of *vianai*, Fig. 10 which De Carlo now claims is the same as *flavus* Guérin-Méneville of De Carlo, 1954, illustrated in Fig. 7.

G. monrosi De Carlo

I place this name also as a synonym of *nebulosus* because the genitalia as illustrated by De Carlo (1959(1960): Figs. 22–25) belong to *nebulosus* as I consider the species. I do not have any specimens before me in which the posterior margin of the seventh abdominal sternite is formed as in Figs. 39 and 40 of De Carlo's last paper. The small specimens from Plaumann, referred to by De Carlo are in the collection of the University of Kansas. I do have three males from the collections of the United States National Museum, from Ceara, Brazil that are even smaller than those called *monrosi* by De Carlo. These range from 5.4 to 5.7 mm in length and 3.7 to 3.8 mm in width. The genitalia are not unlike those figured by De Carlo, but the posterior margin of the seventh abdominal sternite is like that in the larger specimens of *nebulosus*.

In the course of my studies of the Gelastocoridae, I have examined more than 800 specimens of *G. nebulosus* (Guérin-Méneville). It is an extremely variable species. My conclusion that it is a variable species and not a complex is based on the variation found in other species of *Gelastocoris* as well as in *Nerthra* Say, on a comparative study of differences in the male genitalia of the species of *Gelastocoris* and on the lack of constancy of the variations of specimens of *nebulosus*. I am fully aware that complexes of closely related species do occur, in fact, I have named entities that I believed belonged to such complexes. Furthermore, I know that within such complexes, any morphological structure, *i.e.*, male genitalia, may indeed be very similar in the species concerned. Nevertheless, it is my opinion that *nebulosus* does not represent such a complex. It is true that I have not seen, or at least have not recognized, specimens in which the seventh abdominal sternite is modified as described by De Carlo for *monrosi*. If the difference is real and not due to distortion resulting from methods of preservation or preparation, and if it develops that the difference is constant and that the specimens are geographically isolated from *nebulosus*, then *monrosi* should be considered to be a subspecies of *nebulosus*. More collections and further study will be required, however, before the proper status of the name can be determined. Further biological and ecological studies are certainly needed. We know, for example, that some species of *Gelastocoris* sometimes are found in colonies or in aggregates in small areas along the margins of bodies of water. But we do not know whether such aggregations represent the offspring of one or a few females or whether specimens of quite different ancestries have collected in such an area because of an abundant food supply or for some other reason. We do not know, therefore, how to evaluate the individual variations found in such populations. Many other similar problems undoubtedly will need to be resolved before we can accurately discuss the species, subspecies and forms of *Gelastocoris.*

G. martinezi De Carlo

This is clearly a synonym of *G. fuscus* Martin. As stated before, De Carlo was not aware of Martin's study of the genus. Therefore, when De Carlo described *martinezi,* he did not compare it with *fuscus.* In his more recent paper, De Carlo maintains that the two differ in the shape of the right clasper hook and in the shape of the lateral margin of the pronotum, especially the posterior part. The right clasper hook is quite variable in this species as in the other species of *Gelastocoris.* Martin, 1929, illustrated some of the variation found in this species in Figs. 17, 19A and 19B. De Carlo refigured Martin's Fig. 19A, but not 19B which more nearly approaches the shape of the right clasper hook of his *martinezi.* I illustrated another variation, Fig. 40, in 1955. After the examination of one paratype of *fuscus,* De Carlo remarks that my illustration is incorrect, but it was made from one of the specimens in the collection of the University of Kansas. Furthermore, there is a specimen from Rurrenabaque, Beni, Bolivia, in the United States National Museum that has the right clasper hook similarly formed. The right clasper hook is not at all heavily sclerotized in this species. In fact, in some specimens it is rather membraneous basally and along the outer margin. Consequently when specimens are relaxed for dissection, it is frequently found to be extremely pliable and may dry in various positions according to the degree of sclerotization of the hook. A series of males in the United States National Museum collected in Bolivia by W. M. Mann in 1921–22 demonstrate the range of variation to be found in the right clasper hook. In the genitalia of *fuscus* the shape of the pan, the shape of the keel hood and the extent of the fringe of the keel hood are distinctive. The series of males from Bolivia mentioned above also show that the supposed difference in the shape of the lateral margin of the pronotum is not constant and that it too is a variable character.

G. angulatus (Melin)

Three names proposed by De Carlo, *i.e., Montandonius willineri, M. mansosotoi* and *M. bridarollii,* I treated as synonyms of *angulatus* in 1955. I also placed *angulatus* in *Gelastocoris* since I did not consider the differences utilized by Melin and De Carlo to be generic. *G. angulatus* is, indeed, a very distinct species, but I feel the relationship to the other species can best be expressed by including *angulatus* in *Gelastocoris.* The situation is comparable to that of *Nerthra tuberculata* (Montandon) and the other species of the *alaticollis* group in Australia. In 1954 De Carlo stated that one of the main differences between the two genera was that *Montandonius* species lacked a clavus. I pointed out, in 1955, however, that *angulatus* does have a clavus and that the species is variable in the development of the claval suture on the upper surface of the hemelytra. Mr. Izzard of the British Museum (Natural History), at De Carlo's request, confirmed the existence of a clavus in *angulatus*. De Carlo, thus, abandoned this character in his subsequent generic diagnosis, but states that his three species differ from *angulatus* in that they lack a clavus.

G. angulatus does have the apex of the head truncate or slightly concave whereas in the other species of *Gelastocoris* it is rounded. There are six small, longitudinal carinae on the posterior part of the pronotum of *angulatus* which are not found in the other species. The blisterlike granules are mostly elevated in *angulatus,* but the number, degree of elevation and coloration of the granulations is variable. De Carlo has used such differences in separation of his species. In the majority of the other species of *Gelastocoris* the blisterlike granules are only rarely elevated to the degree usually found in specimens of *angulatus,* and even then only a few granulations are elevated. In *G. major* Montandon, however, the blisterlike granules are generally elevated and approach those of some specimens of *angulatus*. The embolium of *angulatus* is usually a little wider than in the other species, but it too is variable and differences in the width of expansion of the embolium have also been used by De Carlo to separate his species. The rugosity of the front of the head is variable as in the other species and not noticeably rougher than some specimens of other species, *i.e., major, fuscus* and even *nebulosus.* The lateral expansion of the pronotum is not proportionally greater than that of *bufo,* as has been stated by De Carlo. The posterior portion of the lateral margin of the pronotum is usually more convex than in the other species.

In consideration of the above comments, I feel that generic separation of *angulatus* is not warranted. On the other hand, if I believed that *angulatus* was, in fact, a complex of species, I probably would agree with De Carlo that *Montandonius* should be used to separate those species from the species of *Gelastocoris*. But, I do not consider that De Carlo's names apply to valid species.

M. willineri De Carlo

De Carlo states (1959(1960): 82) that I was in error in treating this species as a synonym of *angulatus* because the shape of the right clasper hook is obviously different according to Figs. 49, p. 76 and 59, p. 81. I admit the figures appear very different, but this is not surprising since they do not represent the same aspect. Figure 49 of De Carlo represents a lateral view, not a ventral view as in Fig. 59. This is certain because the peglike spines of the right paramere occur on the dorsal surface of the paramere and are not visible in a ventral view in *angulatus*. They are shown in the illustration of *willineri*. Furthermore, the right clasper hook of specimens of *angulatus* have the appearance of that figured for *willineri* when viewed from the right side. De Carlo states that he mounted the genitalia of his species on slides, so it seems likely that the genitalia of his single male specimen of *angulatus* (his *willineri*) somehow came to rest so that a lateral aspect was presented. I should also comment at this point that the right clasper hook is also variable in shape and size in *angulatus* as in the other species of *Gelastocoris*. The width of the shaft, the total length and the shape is variable. In one male, now before me, a specimen from Rurrenabaque, Beni, Bolivia, in the United States National Museum, the apical, recurved part is scarcely developed. The other differences between *willineri* and *angulatus*, as well as between *willineri* and the other two De Carlo species referred to *Montandonius*, are in my opinion merely individual variation within the species.

M. mansosotoi De Carlo and *M. bridarollii* De Carlo

I consider the female specimens so named to be *angulatus*, and the differences listed by De Carlo to be only variations found in those species. In his last paper, De Carlo has illustrated, Fig. 56, p. 81, the right ovipositor for his species *mansosotoi*. It should be noted that this figure does not agree with the illustration, Fig. 18, of the ovipositor of the same species presented in 1954. Fig. 56, lacks many of the spines shown in Fig. 18.

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A NEW *CYLINDROSTETHUS* FROM PERU (HEMIPTERA: GERRIDAE)

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The genus *Cylindrostethus* Mayr (1865) is represented in the Western Hemisphere by seven species, all from the Neotropical Region. The members of the genus are very long, nearly cylindrical, and are the largest of the American water-striders. The type species of the genus is *C. fieberi* Mayr from Ceylon.

The present paper characterizes a new species from Peru, which belongs to the "*regulus* group" of species, the members of which have the seventh sternum in the male with only a broadly rounded excavation on hind margin.

Cylindrostethus stygius, new species

Very long, terete, blackish, rather densely clothed with short, grayish, appressed, pubescent hairs, the hairs on sides of body a little longer than those on dorsal and inferior surfaces; vertex and most of genital segments yellowish brown. Antennae dark brownish fuscous. Legs brownish fuscous, with most of femora, coxae, trochanters, and acetabula yellowish brown; fore femora with front face and inferior side of tibiae blackish. Pronotum, mesonotum, and metanotum with a narrow, longitudinal, dark fuscous stripe on each side. Connexiva brownish to blackish brown with exterior margin blackish fuscous. Pronotum impressed medially, mesonotum and metanotum with impressed, median, longitudinal line. Entire surface feebly shiny, with sides of body slightly silvery. Length 18 mm, width (base of metanotum) 2 mm. Macropterous form unknown.

Antennal measurements: segment I, 2.6 mm; II, 0.8 mm; III, 0.5 mm; IV, 1.28 mm. Rostrum short, with last segment shining black, not reaching to base of head. Legs very long, middle and hind pairs with apices of femora extending considerably beyond tip of last genital segment in male; hind femora only slightly projecting beyond apex of last genital in female, connexiva moderately wide, nearly erect, each terminating behind in a backward-directed spine in both sexes, these spines extending to middle of first genital segment in male, slightly longer in female.

Male: Seventh abdominal sternum deeply, broadly, concavely excavated behind. First genital segment above subquadrate in outline, impressed on each side of median ridge, broadly rounded behind; beneath longer than wide. Second genital segment very long, above strongly compressed laterally at base so as to be ridge-like, thence tapering posteriorly to a point, the lateral processes (one on each side) subtriangular, blackish, shiny.

Female: First genital segment slowly narrowed posteriorly, rounded at apex, beneath longer than above with apex obtusely rounded; second genital segment very long, tapering backwards to a point.

Holotype (male), *allotype* (female): San Alejandro River, Peru, July 1956, F. Woythowski. *Paratypes:* 1 male (genital segments missing) and 4 females, same data as type label. Types in Drake Collection (USNM).

This species belongs to the group of species of *Cylindrostethus* that have the abdominal sternum in male broadly concavely emarginate behind. It differs from *C. palmaris* Drake and Harris, *C. hungerfordi* Drake and Harris, and *C. regulus* (Buchanan-White) by its blackish color, short, grayish pubescence, very narrow, parallel, thoracic stripes (one on each side of dorsal surface), and genital segments as described in the description. The color of the body reminds one of *C. linearis* (Erichson) and related forms, but the members of this group have the hind margin of the seventh abdominal sternum double-emarginate (second notch subquadrate and located at middle of first emargination).

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PROCEEDINGS

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FURTHER ADVANCES IN THE TAXONOMY AND DISTRIBUTION OF THE GRYLLOBLATTIDAE (ORTHOPTERA)

By Ashley B. Gurney

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In this paper the important developments in the study of the Grylloblattidae since 1953 are summarized. As in my 1953 report and my two earlier ones, new species are described, and recent papers of other authors are cited, with annotations included for some of them.

In addition to the material reported here, some other species have been made available to J. W. Kamp of Redding, Calif., who has a longtime interest in the group, and from whom a valuable contribution may be expected. He was one of the first entomologists to find grylloblattids in caves, a habitat which since has been worked very successfully by several collectors.

Since 1924, when Caudell and King described the first Japanese grylloblattid, it has been apparent that the group once must have had a faunal connection by a Bering Sea land bridge. The notable discovery in 1959, by Robin E. Leech and E. R. MacDougall, of *Grylloblatta* in northern British Columbia, whets the hope that some day a species will be found in Alaska. As recently as 1951, a new genus was described from Siberia by Bei-Bienko, so the tie-in between the Asiatic and American faunas has become much closer than it was 10 years ago. Papers by Griffin (1960) and Simpson (1947) give helpful background on Siberian-Alaskan land connections.

It has become increasingly evident that male genitalia are important in distinguishing species, and that, when more localities and habitats have been examined, many species may be found. Here I have adopted mainly Walker's (1956) terminology for the male genitalia. Thus, "coxopodite" is used in place of the "coxite" of my 1953 paper, "first accessory copulatory process" in place of "accessory sclerite of right phallomere," and "principal copulatory sclerite" instead of "main phallic sclerite." In lieu of the last-named, Walker used "process" instead of "sclerite," but I prefer "sclerite" for the sclerotized structure, with "process" for the pointed apical portion.

As with my earlier papers, the interest and cooperation of numerous individuals enable me to report on significant discoveries made by them by virtue of hard work in the field. I am deeply indebted for the sustained help of the following persons, as well as for the privilege of retaining specimens for the National Museum: Thomas C. Barr, Jr., Tennessee Polytechnic Institute, Cookeville; M. Chûjô, Kagawa University, Takamatsu-shi, Japan; David G. Fellin, John D. Lattin, and H. A. Scullen, Oregon State College, Corvallis; W. J. Gertsch, American Museum of Natural History, New York, New York; Wm. R. Halliday, Seattle, Washington; George P. Holland and John E. H. Martin, Canadian Department of Agriculture, Ottawa; K. Morimoto and K. Yasumatsu, Kyushu University, Fukuoka City, Japan; Harry Reese and his family, Ariel, Washington; Vincent D. Roth, El Centro, California; E. M. Walker, Toronto, Canada.

GRYLLOBLATTA Walker

Grylloblatta washoa, new species

(Figs. 10–17)

Male (holotype): Size medium for genus; minutely pubescent; major body setae inconspicuous; antennae with 28 segments (left), 23 (right, broken); compound eye (Fig. 10) about as in *rothi*; pronotum with greatest width nearly as much as length (see measurements), proportionately less elongate than in *rothi*; leg ratios (length divided by width) as follows: front femur, 3.2; hind femur, 4.6; front tibia, 5.5; hind tibia, 9.4.

Supra-anal plate (Fig. 12) with posterior margin weakly asymmetrical, less so than in *rothi*, anterior margin strongly asymmetrical; left coxopodite about as in *rothi*, but left stylus borne basally (Fig. 15); right coxopodite lacking strong lateral setae, and with stylus short and borne basally (Fig. 16); principal copulatory sclerite differing from *rothi* in that apex of copulatory process (Fig. 13, *e*) is less elongate and the lateral margin is less protruding; apical process of first accessory copulatory process (Fig. 11) more sharply constricted at base than in *rothi*, and the apex nearly truncate; hooklike apical process of second accessory copulatory process (Fig. 14) much as in *rothi* (Fig. 9); cerci (Fig. 17) with few major setae (others broken?), segments in apical half proportionately more elongate than in *rothi*.

Coloration: General coloration pale straw, major leg spurs somewhat darker; thoracic nota, antennae and cerci very pale; segments of latter whitish basally and apically as shown by dotted areas in Fig. 17; eyes black.

Measurements (length in millimeters): Body, about 22; antenna, about 9; eye, 0.6; pronotum, 2.3; hind femur, 3.2; hind tibia, 3.3; cercus, 4.0; width of head, 2.4; of pronotum, 2.2; of hind femur, 0.7.

Type: American Museum of Natural History. A male from Echo Summit, 7,382 ft altitude, 4 miles south of Meyers, Eldorado County, California. Collected 9 September 1959, by Willis J. Gertsch and Vincent D. Roth. Echo Summit, a high point on Highway 50, is near Echo Peak, which is about one mile directly north of Upper Echo Lake.

Three nymphs, ranging in length from 4 to 8 mm, were collected with the type. Mr. Roth has written me that the specimens were "dug out from a shaded three-foot-diameter rotten log which was buried one-third by soil, leaf mold, and bark. The specimens were in the lower one-third in a very damp, cold and dark habitat. The location was no more than 100 feet from the paved highway."

In my 1953 key to the species of *Grylloblatta, washoa* runs to *bifratrilecta*, from which it differs in being smaller, with the cerci shorter as a whole as well as with respect to individual segments. The styli of *washoa* also are shorter. The supra-anal plate of *bifratrilecta* is similar but differs in details, as the original 1953 figures show. The cerci and general habitus of *washoa* suggest close relationship to *rothi*, but the latter differs in the laterally attached styli, in the shape of the supra-anal plate, and in the proportionally shorter segments in the apical half of the cercus.

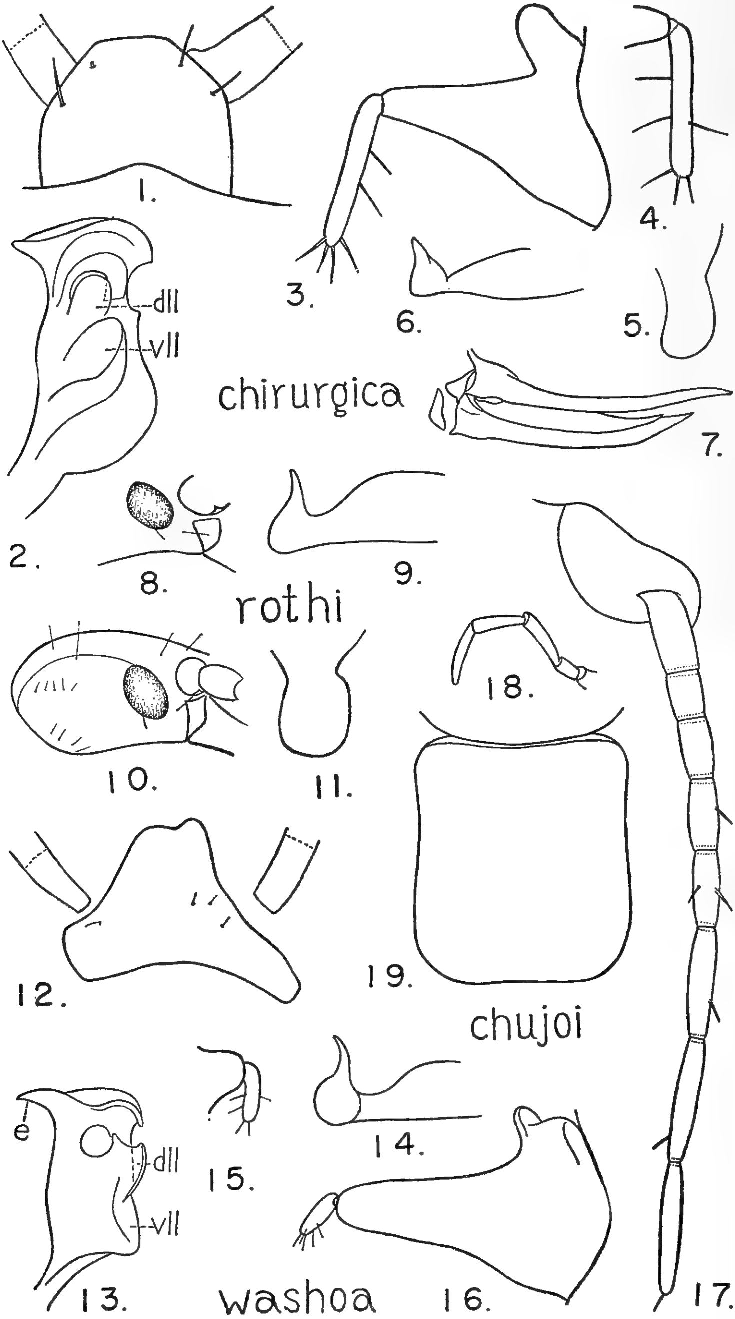
The specific name refers to the Washo people, a small Indian tribe which occupied the upper drainage of the Truckee and Carson Rivers, including the area around Echo Peak.

Grylloblatta chirurgica, new species

(Figs. 1–7)

Male (holotype): Size medium for genus; fine body pubescence moderately conspicuous; major setae well developed; antennae with 29 segments (left), 28 (right, broken); compound eye barely smaller than in *washoa* (as 15 to 17) in greatest length, but much smaller in proportion to head size; pronotum with greatest width one-third of length behind anterior margin; leg ratios (length divided by width) as follows: front femur, 3.5; hind femur, 5.5; front tibia, 6.4; hind tibia, 10.4.

Supra-anal plate (Fig. 1) nearly symmetrical, except at base (normally concealed) which is much extended on left side; left coxopodite with only gently curved mesal margin, with stylus borne basally (Fig. 4);


1.
2.
dll
vll
3.
4.
5.
6.
7.
chirurgica
8.
9.
rothi
10.
11.
12.
18.
19.
chujoi
13.
e
dll
vll
14.
15.
16.
17.
washoa

right coxopodite with numerous pale weak setae and several somewhat stronger setae, scarcely any as strong or heavily pigmented as the weakest major seta of stylus, latter borne basally (Fig. 3); principal copulatory sclerite (Fig. 2) with copulatory process relatively short, dorsolateral and ventrolateral lobes (*dll, vll*) extending laterally from main body of sclerite; apical process of first accessory copulatory process (Fig. 5) narrower than in *washoa;* hooklike apical process of second accessory copulatory process (Fig. 6) with terminal hook shorter than in *washoa.*

Coloration: General coloration yellow straw, major setae and leg spurs darker; thoracic nota darker than abdomen; head light brown, antennae pale; eyes black.

Measurements (length in millimeters): Body, about 17; antenna, about 15; eye, 0.5; pronotum, 3.3; hind femur, 5.0; hind tibia, 3.2; cercus, 7.2; width of head, 3.3; of pronotum, 2.9; of hind femur, 0.9; of hind tibia, 0.5.

Female (allotype): Differing from male in the usual sexual features. Both antennae with 34 segments; leg ratios (length divided by width) as follows: front femur, 3.5; hind femur, 5.5; front tibia, 6.6; hind tibia, 11.2. Ovipositor (Fig. 7) with dorsal valve reaching to apex of segment 5 of cercus, apical fourth of ovipositor with moderate dorsal curvature.

Measurements (length in millimeters): Body, about 18; antenna, about 15; eye, 0.5; pronotum, 3.5; hind femur, 3.9; hind tibia, 5.6; cercus, 6.5; width of head, 3.5; of pronotum, 3.1; of hind femur, 0.9; of hind tibia, 0.5.

Type: U. S. National Museum No. 65377. Ape Cave, Skamania County, Washington, 22 and 28 November 1959, Harry Reese and family.

The allotype and 2 female paratypes were taken at type locality, in the lower part of the cave, where conditions were very wet, with a running stream and constant dripping from the ceiling. Specimens apparently

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Figs. 1–7. *Grylloblatta chirurgica.* Fig. 1.—Dorsal view of supra-anal plate, holotype. Fig. 2.—Lateral view of principal copulatory sclerite, holotype. Fig. 3.—Right coxopodite and stylus, holotype. Fig. 4.—Left stylus, holotype. Fig. 5.—Apical process of first accessory copulatory sclerite, holotype. Fig. 6.—Apical portion of second accessory copulatory sclerite, holotype. Fig. 7.—Ovipositor, allotype.

Figs. 8–9. *G. rothi.* Fig. 8.—Compound eye and associated structures, holotype. Fig. 9.—Apical portion of second accessory copulatory sclerite, holotype.

Figs. 10–17. *G. washoa,* all from holotype. Fig. 10.—Lateral view of head capsule. Fig. 11.—Apical process of first accessory copulatory sclerite. Fig. 12.—Dorsal view of supra-anal plate. Fig. 13.—Lateral view of principal copulatory sclerite. Fig. 14.—Apical portion of second accessory copulatory sclerite. Fig. 15.—Left stylus. Fig. 16.—Right coxopodite and stylus. Fig. 17.—Left cercus.

Figs. 18–19. *Galloisiana chujoi,* all from holotype. Fig. 18.—Left maxillary palpus. Fig. 19.—Pronotum and posterior margin of head. (Parts of principal copulatory sclerite: *dll*—dorsolateral lobe; *e*—apex; *vll*—ventrolateral lobe.) (Drawings by the author.)

were active, as one escaped. Ape Cave, near Cougar, Washington, and more than 2 miles long, is said by Halliday (1959: 38) to be the largest individual lava tube in the United States.

A third female paratype was taken in moss in the twilight zone of Lake Cave, Skamania County, Washington (Sec. 8, T 7N, R 5E), elevation 1,900 ft, 28 December 1958 (W. R. Halliday, collector). In 1958 Halliday found 2 small nymphs, which may be this species, in Nielsen's Cave, which is in Skamania County about 1,000 ft southeast of Big Cave, about 2 miles south of the intersection of a road extending west from Trout Lake and one running south to Willard.

Two of the paratypes have the ovipositor reaching across the basal third of segment 6 of the cercus. There are only 3 unbroken antennae among the paratypes, 2 of them with 34 segments, the other with 33 segments. Size and proportions do not appear to vary significantly from the allotype.

The specific name is adapted from two Latin words, meaning "pertaining to the surgeon," with reference to the great assistance contributed by W. R. Halliday in obtaining specimens. For an introduction to western caves, readers are referred to his recent book (Halliday, 1959).

Grylloblatta sculleni Gurney

Two adult females of *sculleni* taken in the Three Sisters area of Oregon on 1 August 1959, have been examined. One was taken by H. A. Scullen at Scott Camp, the type locality, elevation 6,600 ft. The right and left antennae have 35 and 39 segments, respectively. The other was found by H. H. Crowell at nearby Sunshine Meadow, elevation 6,600 ft. One antenna has 38 segments; the other apparently is broken. Both of the specimens are pale amber, much lighter than the holotype.

A single nymph about 6 mm long, with the following data, has been examined: Oregon, Linn County, Quartzville Creek, one-half mile east of Green Creek (Sec. 26, T 11S, R 4E), elevation 1,900 ft, 14 November 1959, on ground under piece of bark in western hemlock-Douglas fir forest, frost on ground (H. A. Hacker, collector). The nymph cannot be identified, and may be either *sculleni* or *rothi*. Both species are known only from altitudes above 6,000 ft, so this new locality for the genus at a decidedly low elevation is of much interest.

Grylloblatta campodeiformis campodeiformis Walker

In 1953 I summarized the Montana records, and Chapman (1953) contributed ecological notes on observations made at several localities in western Montana. Several new records from the vicinity of Missoula and many ecological notes have recently been assembled by David G. Fellin, whose material has been sent to me for examination. Henson has published (1957a, 1957b) results of his studies in Alberta.

A very significant collection questionably identified as *G. campodeiformis campodeiformis* from Summit Lake, British Columbia, on the Alaska Highway, 392 miles from Dawson Creek, was made in 1959 through the diligent efforts of Robin E. Leech. In the absence of an adult male, confirmation of the identification is lacking. Leech collected 23 nymphs ranging from 8 to 15 mm long on 16 June under stones at the snow line, at 4,700 ft elevation; 3 adult females on 20 June on the east slope of Mt. St. Paul; and one adult female on 21 June at 5,400 ft elevation. E. E. MacDougall collected 2 adult females on 19 June.

Several structures of the Summit Lake species appear to have slightly different proportions from Montana examples of *campodeiformis*. Many measurements have been made, and the front and hind femora average more slender in the northern population. However, it is not entirely certain that the Summit Lake species warrants a different name. That is particularly true because very little material from the Banff area of Alberta, type locality for *campodeiformis*, has been available to me for comparison. A male from Summit Lake might clarify the situation quickly.

Summit Lake is in northern British Columbia about 450 miles northwest of the Jasper Park area of Alberta, previously the most northern locality for *Grylloblatta*. Interruptions in the main mountain ranges between those two areas suggest that isolation may have been a factor in speciation, if subsequent material demonstrates the existence of distinct entities.

Grylloblatta sp.

What may prove to be a new species occurs about 8 miles west of Wallace, Shoshone County, Idaho. Material collected by David G. Fellin includes one adult female and two small nymphs taken 21 November 1959, and two female nymphs each about 15 mm long, collected 21 December 1959. This is the first record of the family in Idaho. The specimens were all found under rocks in the Coeur d'Alene National Forest at a point about one mile northwest of Polaris Peak, and near where the West Fork of Big Creek joins Big Creek.

The body length of the female is about 18 mm, each antenna has 38 segments, and the ovipositor reaches to the middle of the 4th cercal segment. The apical third of the ovipositor shows significant dorsal curvature, whereas that of *campodeiformis* is nearly straight. The species runs near *sculleni* and *barberi* in my 1953 key, and males are needed for best comparisons of these species. Although the two female nymphs are the same size, it is interesting that one has 37 and 38 segments in right and left antennae, respectively, whereas the other has 29 and 28. The latter specimen may be an earlier instar, in spite of size similarity and almost no difference in ovipositor development. The alimentary tract of one of the nymphs taken 21 November measuring 5 mm in length, contains tiny fragments of arthropod sclerites.

Galloisiana chujoi, new species

(Figs. 18–19)

Female (holotype): Size medium to large for genus; fine body pubescence and major setae conspicuous; antennae with 43 segments (left), 36 (right, broken), third segment slightly over twice length of second (as 18 to 7, left; 18 to 8, right); penultimate (4th) segment of maxillary palpus subequal to length of 3rd, as measured along ventral margin (Fig. 18); compound eye absent, with no trace of facets or dark pigmentation, but with slightly paler scelrotization in vicinity of the more dorsal of 2 genal setae corresponding to ocular setae of *nipponensis*, suggesting rudimentary internal light-sensitive organ; pronotum with posterior lateral angles well-rounded, greatest posterior width slightly more than greatest anterior width (as 35 to 34) (Fig. 19); legs more elongate than in type of *nipponensis* (see below).

Abdomen similar to *nipponensis*; cercus with segments comparable to *nipponensis* in slenderness, comparative lengths of the 8 segments as 41, 27, 37, 42, 47, 50, 50, 45; ovipositor with apex of dorsal valve extending to a point across basal one-fourth of segment 4 of cercus.

Coloration: General coloration yellow-amber; head and pronotum noticeably darker; setae pale brown.

Type: U. S. National Museum No. 65378. Female from Oninoiwaya Cave, Megi-shima, Kagawa Prefecture, Japan, collected 2 April 1957, by T. Fujisawa. Megi-shima, about 34° 25′ N Lat., is a small island about 8 miles from the nearest point on Honshu, and about 2.5 miles north of the city of Takamatsu, which in turn is on the north coast of the middle Japanese island of Shikoku.

The type is the only specimen I have examined. It was briefly described, but not named, by Chûjô (1958). Kawasawa (1950) reported, but did not name, a male grylloblattid collected 6 August 1949, crawling beneath a damp stone about 50 meters from the entrance inside Rakan Cave, Ehime Prefecture, a few miles south of Yusahara, in southwestern Shikoku. The cave is in a limestone formation. Through the cooperation of Chûjô, I have learned that this male is preserved in the Entomological Laboratory of Kyushu University, and Morimoto of that Laboratory has furnished detailed drawings of the specimen. These drawings show that the specimen is immature, probably in the instar immediately preceding maturity, and I cannot identify it to species. Chûjô has written me of finding nymphs beneath pieces of limestone on Mt. Tsurugi, Tokushima Prefecture, Shikoku, though he pointed out the difficulty of finding specimens.

The species which evidently is most closely related to *chujoi* is *Galloisiana notabilis* (Silvestri), based on a male nymph, without eyes, taken under a stone at Michino-o, a village near Nagasaki, Kyushu. The latter is the southernmost major island of Japan, and the type locality is some 275 miles from Megi-shima. Because of the immaturity of *notabilis*, a satisfactory comparison cannot be made, but Silvestri's figures show the 4th segment of the maxillary palpus decidedly shorter than the 3rd segment, and the 3rd antennal segment less than twice the length of the 2nd antennal segment. The discovery of topotypic adults of *notabilis* and their description to provide fuller information on the characters of that species are critically needed.

Galloisiana nipponensis (Caudell and King), of Honshu, has small but distinct compound eyes, and the ovipositor extends to about the middle of the 3rd cercal segment, thus being proportionally shorter in comparison to the cercus than the ovipositor of *chujoi.* The legs of *nipponensis* appear more robust than those of *chujoi,* as demonstrated by the following ratios of length divided by maximum width, measured from holotypes of the two species: Front femur, *nipponensis* 2.13, *chujoi* 2.9; hind femur, *nipponensis* 2.46, *chujoi* 4.4; front tibia, *nipponensis* 4.16, *chujoi* 6.4; hind tibia, *nipponensis* 6.83, *chujoi* 10.0.

Two species of *Galloisiana,* recently described from the mountains of Honshu by Asahina (1959), are compared with *chujoi* on the basis of their descriptions. *G. yuasai* is described as a smaller species with only 31 to 35 antennal segments. The eyes, though usually well-pigmented, are said to be sometimes quite absent. Asahina shows that the pronotum of *G. kiyosawai* is as broad as long, and the 3rd antennal segment is 3.5 to 4 times as long as the second segment. He also refers to topotypes of *nipponensis,* and it is hoped that future studies will analyze the limits of variation in the various Japanese species.

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TAXONOMIC NOTES ON THE TUNDRA VOLE (*MICROTUS OECONOMUS*) IN ALASKA

By John L. Paradiso and Richard H. Manville
Bureau of Sport Fisheries and Wildlife

This study was undertaken to determine the subspecific status of several hundred Alaskan tundra voles (*Microtus oeconomus*) submitted for identification by the University of Alaska. During the course of the investigation, 1236 specimens were examined, mostly in the collections of the U. S. National Museum. The type specimens of all the named forms have been examined, with the exception of *M. o. punukensis*, for which a good series of topotypes was available. For the loan of specimens in their charge, appreciation is extended to: A. W. F. Banfield, National Museum of Canada (NMC); William H. Burt, Museum of Zoology, University of Michigan (UM); E. Raymond Hall, Museum of Natural History, University of Kansas (KU); Ludwig J. Rowinski, University of Alaska (UA); and Richard G. Van Gelder, American Museum of Natural History (AMNH). This material was deemed sufficient to give a satisfactory picture of the distribution of the Alaskan forms of the species.

Standard cranial measurements were taken with a vernier caliper. The average larger size of males necessitated recording the measurements of the sexes separately, and where two sets of measurements are given, those for the males precede those for females. External measurements were taken in the flesh by the collectors, unless otherwise noted. All measurements are in millimeters unless otherwise stated. Color comparisons were made only on adult specimens in summer pelage. Capitalized color terms are from Ridgway (Color Standards and Color Nomenclature, 1912).

Microtus oeconomus (Pallas, 1776)

Mus oeconomus Pallas, Reise durch Verschiedene Provinzen des Russischen Reichs, III: 693, 1776.

According to Ognev (1944: 165), *Mus oeconomus* of Pallas (1776) is not *Mus oeconomus* of later authors. He suggests that the name was based on a form of *Mus* (*Stenocranius*) *gregalis*, and proposes to use the name *Microtus ratticeps* for the present species. The usage of Ellerman and Morrison-Scott (1951: 705) and other authors such as Vinogradov and Argyropulo (1941: 205), and Kuznetzov (1944: 351) has been followed, however, in retaining the specific name *oeconomus* in this study.

The tundra vole is described by Hall and Cockrum (1953: 423) as varying in total length from about 160 to 225 mm, with a tail length of 36 to 53 mm and a hind foot measurement from 20 to 24 mm. The upper parts vary from dusky gray through rich buff, tawny or cinnamon brown and rusty brown. In all, there is a mixture of black-tipped hairs; sides paler, with the abdomen white, and in some subspecies washed with buff. The tail is bicolored, dusky to black above, whitish to pale buff below. The anterior lower molar (m_1) has only four closed triangles, the fifth triangle being open and confluent with short terminal loop (except in *M. o. sitkensis*, where the fifth triangle is usually closed). The incisive foramina are short and constricted posteriorly.

As pointed out by Zimmermann (1942) and confirmed by Rausch (1950), the species is holarctic in distribution. The differences between specimens from opposite sides of the Bering Sea, in eastern Siberia and western Alaska, are insufficient for specific separation of the two populations. It was found, in fact, that the two populations are so similar that even subspecific separation is questionable.

Geographic variation in the New World forms is slight. Some characters in which significant geographic variation is exhibited are: The size and shape of the auditory bullae; length of upper molar toothrow; shape of interparietal; slope of occipital plane; coloration; tail length, and over-all size of the animal. In general, it may be said that there is a cline for darker coloration and rounder, more inflated auditory bullae, from west to east. All insular forms examined are larger than mainland forms.

The distribution in Alaska of the ten recognized subspecies is indicated on the accompanying map, p. 83.

Microtus oeconomus operarius (Nelson)

Arvicola operarius Nelson, Proc. Biol. Soc. Wash., 8: 139, 28 December 1893.

M[*icrotus*] *oec*[*onomus*] *operarius*, Zimmermann, Arch. f. Naturgesch., 11: 187, 10 September 1942.

Microtus kadiacensis Merriam, Proc. Biol. Soc. Wash., 11: 222, 15 July 1897. (Type from Kodiak Island, Alaska.)

Microtus oeconomus gilmorei Setzer, Proc. Biol. Soc. Wash., 65: 75, 25 April 1952. (Type from Point Lay, 163° 04′ W Long. and 69° 46′ N Lat., Alaska.)

Type: No. 14379/22225, U. S. National Museum; immature skin and skull, collected at St. Michael, Norton Sound, Alaska, in November 1879, by E. W. Nelson, original number 122.

Distribution: Southern and western mainland Alaska, from Point Lay on the NW coast to Ophir and Takotna on the east, south to the north shore of Prince William Sound, including Kodiak and Afognak Islands.

Coloration: The adult summer pelage of the upperparts is between Snuff Brown and Bister; abdomen pale, grayish white, lightly washed with buff.

Molar tooth pattern: Four closed triangles on m_1, two inner and two outer, and usually one unclosed inner triangle; m^3 with three triangles, generally closed, with normally three inner and three outer salient angles.

Measurements: The averages and extremes of nine adult males and five adult females from the type locality are as follows: Total length 170 (167–181), 169 (165–176); tail 44 (36–49), 44 (40–48); hind foot 20 (19–22), 20 (19–21); condylobasal length of skull 27.5 (26.8–28.9), 26.3 (25.5–26.9); zygomatic breadth 15.5 (14.8–16.5), 14.8 (14.4–15.0); least interorbital breadth 3.5 (3.2–3.8), 3.4 (3.2–3.5); mastoidal breadth 11.9 (11.6–12.7), 11.3 (11.0–11.7); length of incisive foramina 5.4 (5.0–5.9), 5.1 (4.9–5.2); alveolar length of upper molar toothrow 6.2 (5.9–6.4), 6.0 (5.8–6.4); length of nasals 7.9 (7.5–8.5), 7.3 (6.8–7.7); interparietal breadth 6.7 (5.9–7.8), 7.0 (6.4–7.8); interparietal length 3.5 (3.2–3.9), 3.3 (3.0–3.6).

Measurements of series from Point Lay and from English Bay, Kodiak Island, Alaska, show no significant differences from the topotypes of *M. o. operarius.*

Comparisons: From *M. o. macfarlani, M. o. operarius* may be distinguished by its paler coloration, and the following cranial characters: Skull more lightly built; auditory bullae smaller, less inflated, and more elongated antero-posteriorly; mastoidal breadth relatively less; zygomatic arches flaring anteriorly, rather than parallel-sided.

Comparisons of *M. o. operarius* with other Alaskan forms will be found under accounts of those subspecies.

M. o. operarius was compared with specimens of *M. o. tshuktschorum* Miller 1899, from eastern Siberia, to determine the relationships of the two populations of *Microtus oeconomus* from opposite sides of the Bering Sea. The following Siberian material was examined: Cape Shelagskij, 14; East Cape, 4 (NMC); Emma Harbor, 9. The differences between this Siberian material and specimens of *M. o. operarius* from the Seward Peninsula and St. Michael, Alaska, are slight, and the advisability of recognizing them as two distinct subspecies is questionable. If in the future, when more Siberian material is available for a thorough analysis, they prove to be identical, it will be necessary to consider *M. o. tshuktschorum* Miller 1899, as a synonym of *M. o. operarius* (Nelson) 1893. If *M. o. tshuktschorum* Miller, proves to be identical with *M. o. kamtschaticus* Pallas 1778, as Ognev (1944: 168) contends, then *M. o. operarius* (Nelson), would become a synonym of *M. o. kamtschaticus* Pallas.

For the present, however, owing to the geographic separation of the two populations, the lack of Siberian material for a satisfactory analysis, and the disagreement on the names and distribution of the Asiatic forms, it seems advisable to retain the name *M. o. operarius* for the Alaskan population.

Remarks: Setzer (1952) applied the name *Microtus oeconomus gilmorei* to that population of the species which ranges from the "arctic slope of Alaska from Point Lay on the west at least to Umiat on the east, and from the Meade River on the north at least to the crest of the Brooks Range on the south," and designated Point Lay (163° 04′ W Long. and 69° 46′ N Lat.), Alaska, as the type locality.

Our findings corroborate those of Rausch (1953: 130), who considered *gilmorei* as indistinguishable. The Point Lay material has been examined and found to agree with typical *M. o. operarius* in coloration and in size and shape of the auditory bullae. In fact, the more abundant comparative material of *M. o. macfarlani* and *M. o. operarius* now available shows that many of the diagnostic characters of *M. o. gilmorei* mentioned by Setzer in separating it from *M. o. macfarlani* (longer, narrower auditory bullae; paler, more yellowish coloration; zygomatic arches flaring anteriorly as opposed to nearly parallel-sided) are characters in which *M. o. operarius* differs from *M. o. macfarlani.*

Setzer designated other diagnostic features to distinguish *M. o. gilmorei* from *M. o. macfarlani,* such as: Upper incisors more recurved; maxillary teeth heavier; and skull averaging larger. New comparative material shows that, in these characters, *M. o. gilmorei* falls within the range of individual variation of both *M. o. macfarlani* and *M. o. operarius.*

Bee and Hall (1956: 127) recognize the validity of *M. o. gilmorei,* and give the range as the entire Arctic slope of Alaska. They designate characters to separate it from *M. o. endoecus* (= *macfarlani*) as follows: Smaller size; lambdoidal crest more developed; lachrymal and frontal protuberances sharper; interorbital ridge more pronounced; zygomatic arches thinner; sculpturing of frontal and parietal slightly deeper; and pelage paler.

The paler pelage is a character of *M. o. operarius,* but it is pronounced only in Point Lay specimens. Farther east on the Arctic slope, coloration is as in typical *M. o. macfarlani.* The other characters mentioned either fall within the range of individual variation of both *M. o. macfarlani* and *M. o. operarius,* or are too poorly marked and inconsistent to distinguish *M. o. gilmorei* as a distinct subspecies, and the Point Lay specimens are herein considered to represent *M. o. operarius.*

In southwestern Alaska, the range of *M. o. operarius* includes most of the Alaska Peninsula, and the area as far inland as Ophir and Takotna. Specimens from Kodiak Island and Afognak Island, formerly assigned to *M. o. kadiacensis* Merriam, are indistinguishable from *M. o. operarius* from the type locality.

A specimen from the north shore of Prince William Sound in the collections of the U. S. National Museum, which was the basis for Bailey's extension of the range of *M. o. yakutatensis* westward to this area (1900: 41) was examined and found to differ in no significant way from *M. o. operarius.* This specimen represents at present the easternmost extension of the range of *M. o. operarius.*

Specimens examined: 441, as follows (all from Alaska, and in the collections of the U. S. National Museum): Afognak Island, Litnik, 7; Becharof Lake, 1; Bethel, 11; Chalitna, 3; Chignik, 6; Chogiung, 12; Cold Bay, 3; English Bay, Kodiak Island, 31; Goodnews Bay, 1; Hooper Creek, 14; Hope, Cook Inlet, 5; Igiak Bay, 10; Iliamna Bay, 3; Iron Creek, 3; Kakhtul River, 4; Kodiak (near), 12; Kokwok River, 45; Kruzgamepa Hot Springs, 2; Lake Aleknegik, 3; Lake Clark, 3; Lake Iliamna (near mouth of Nogheling River), 9; Lake Iliamna (Iliamna Village), 1; Nome, 5; Nome River, 10 miles from coast, 7; Nushagak, 3; Ophir, 1; Point Lay, 27; Point Protection, 5; Prince William Sound (N. shore), 1; St. Michael, 41; Sawtooth Mountains (Kigluaik),10; Seward, 3; Takotna, 4; Tyoonok, 32; Uyak Bay, 4; Wales Island, 3.

Microtus oeconomus macfarlani Merriam

Microtus macfarlani Merriam, Proc. Wash. Acad. Sci., 2: 24, 14 March 1900.

M[icrotus] oec[onomus] macfarlani, Zimmermann, Arch. f. Naturgesch., 11: 187, 10 September 1942.

Microtus operarius endoecus Osgood, N. Amer. Fauna, 30: 23, 7 October 1909. (Type from mouth of Charlie Creek, Yukon River, about 50 miles above Circle, Alaska.)

Type: No. 9155/37347 U. S. National Museum; adult skin and skull, collected at Fort Anderson, Anderson River, Mackenzie, by R. Macfarlane.

Distribution: Northern and eastern Alaska, Yukon, and Northwest Territories east to Coronation Gulf. In Alaska, the distribution is approximately east of the Utukok River, 200 miles SW of Point Barrow, and the north fork of the Huslia River, south to Mt. McKinley, and Chitina, Alaska, and Kluane in the Yukon.

Coloration: In summer pelage, *M. o. macfarlani* is darker and brighter than *M. o. operarius.* The dorsum is between Mummy Brown and Prout's Brown; pale grayish white, suffused with buff on the abdomen.

Molar tooth pattern: As in *M. o. operarius.*

Measurements: The averages and extremes of 13 males and 19 females from Bettles are as follows: Total length 176 (155–186), 170 (153–188); tail 51 (44–53), 49 (44–54); hind foot 20 (19–21), 20 (19–21); condylobasal length of skull 29.3 (28.0–30.0), 28.5 (27.0–29.5); zygomatic breadth 16.8 (15.6–17.5), 16.2 (15.1–16.9); least interorbital breadth 3.5 (3.2–3.8), 3.5 (3.2–3.9); mastoidal breadth 12.8 (12.4–13.2), 12.5 (12.0–13.1); length of incisive foramina 5.4 (5.0–5.8), 5.3 (4.2–6.0); alveolar length of upper molar toothrow 6.5 (6.0–6.9), 6.6 (6.0–6.9); length of nasals 8.2 (7.9–8.7), 8.1 (7.5–8.7); interparietal breadth 6.9 (5.8–8.9), 6.9 (5.8–7.8); interparietal length 3.4 (3.2–3.8), 3.4 (2.8–4.0).

Eleven males from Tuktoyaktuk, Mackenzie, measure as follows: Condylobasal length of skull 27.9 (26.9–29.9); zygomatic breadth 15.8 (15.1–17.6); least interorbital constriction 3.7 (3.6–3.8); mastoidal breadth 12.5 (12.1–12.9); length of incisive foramina 5.1 (4.7–5.6); alveolar length of upper molar toothrow 6.3 (6.2–6.4); length of nasals 7.6 (6.9–8.4); interparietal breadth 7.1 (6.7–8.0); interparietal length 3.3 (2.9–3.7).

Comparisons: M. o. macfarlani differs from *M. o. operarius* in the following characters: Auditory bullae larger, rounder and more inflated; skull heavier, more massive; skull broader in the mastoidal region; zygomata parallel-sided as opposed to flaring anteriorly; teeth larger; and coloration darker and brighter.

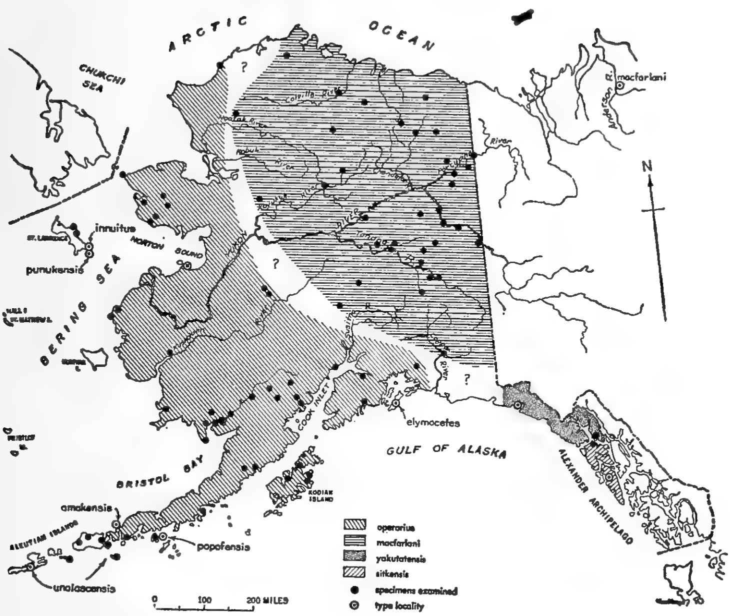
M. o. macfarlani differs from *M. o. yakutatensis* in having a narrower interorbital region; smaller teeth; average smaller and shorter interparietal; less massive skull; and coloration not as dark, and suffused with black.

Remarks: This subspecies is best distinguished near the central portion of its range rather than at the type locality. A large series from Bettles, Alaska, is typical, and is characterized by large, rounded bullae, a broad mastoidal region and dark coloration. Specimens from Circle and Charlie Creek are almost identical. Farther to the east, in the Anderson River region of Mackenzie, which is nearer the type locality of *M. o. macfarlani,* there is a slight but inconsistent tendency toward reduction in the size of the bullae, and skulls average smaller in total length and zygomatic breadth, and are less massive. Nevertheless, the differences are so slight and variable between the Anderson River region specimens and those from Charlie Creek, Alaska (type locality of *M. o. endoecus* Osgood), that we cannot recognize two subspecies within this range, and *M. o. endoecus* Osgood is herein considered a synonym of *M. o. macfarlani.*

Specimens assigned by Setzer (1952) to *M. o. gilmorei* from Utukok River (200 miles SW of Point Barrow), mouth of Chandler River, Anaktuvuk Pass, and Umiat and Killik Rivers, were found to agree with *M. o. macfarlani* and are referable to this subspecies. Representative series from the Arctic Slope, designated by Bee and Hall (1956: 135–136) as *M. o. gilmorei,* were examined and are referable to *M. o. macfarlani,* although specimens from the type locality of *M. o. gilmorei* (Pt. Lay, Alaska) are referable to *M. o. operarius.*

Populations of *M. o. macfarlani* that show intergradation with *operarius* in coloration and size and shape of auditory bullae are from the north fork of the Huslia River, Mt. McKinley and Chitina, Alaska.

Specimens examined: 555, as follows: ALASKA: Alatna, 4; Anaktuvuk Pass, 16; Barter Island, 2; Bettles, 42 (part KU); Chandler Lake, 13 (KU); Chandler River (mouth of), 1; Charlie Creek, 14; Chatanika River, 2; Chitina, 2; Black River, 13 (UA); Circle, 19; Driftwood, 12 (KU); Eagle (mountains near), 31; Elliot Highway, mile 13, 4 (UA); Fairbanks, 2; Huslia River (north fork), 13 (UA); Killik River, 3; Lake



Gavia, 20 (KU); Lake Schrader, 3 (KU); Little Moose Creek, 2; McDonald Creek, 1; Meade River, 50.5 mi S and 9 mi W of Point Barrow, 3 (KU); Mt. McKinley, 3; Old John Lake, 32 (UA); Old Rampart, 2 (UA); Paxon Region, Denali Highway, mile 1, 1 (UM); Paxon Region, Richardson Highway, mile 179, 1 (UM); Porcupine Lake, 12 (KU); Porcupine River, 5; Richardson 4; Salcha River (headwaters), 6 (UA); Sheenjek River (near Lobo Lake), 2 (UA); Small Lake, 5 (UA); Tanana Crossing, 24; Tanana River and Clearwater Creek (between), 2 (UA); Umiat (near), 22 (part KU); Utukok River, 200 mi SW Point Barrow, 5.

NORTHWEST TERRITORIES: Aklavik, 3 (NMC): Cape Bathurst, 1 (NMC); Coppermine, 2 (AMNH, NMC); Coronation Gulf, 1 (NMC); Fort Anderson, 5; Horton River, Coal Creek, 2 (AMNH); Langton Bay, 32 (AMNH); mouth of Anderson River, 5 (NMC); Reindeer Station, 1 (NMC); Toker Point, 6 (AMNH); Tuktoyaktuk, 44 (NMC).

YUKON: Burwash Landing, 1 (NMC); Coak Creek (head of), 14; Donjek Bridge, 2 (NMC); Kluane Lake (head of), 2 (NMC); Macmillan Pass, Canol Road, 10 (NMC); Old Crow (near), 20; Rampart House, 25 (NMC); Ross River, Canol Road, 7 (NMC).

Microtus oeconomus yakutatensis Merriam

Microtus yakutatensis Merriam, Proc .Wash. Acad. Sci., 2: 22, 14 March 1900.

M[*icrotus*] *oec*[*onomus*] *yakutatensis,* Zimmermann, Arch. f. Naturgesch., 11: 187, 10 September 1942.

Type: No. 98005, U. S. National Museum (Biological Survey Collection); adult ♂ skin and skull, collected on the north shore of Yakutat Bay, Alaska, on 19 June 1899, by A. K. Fisher, original number 2101.

Distribution: From the north shore of Yakutat Bay, south to Point Gustavus. Also reported at Chitina River Glacier, at about 4500 feet elevation, by Laing, Taverner and Anderson (1929: 102).

Coloration: This is one of the darkest American forms of the species, being nearest to Mummy Brown on the dorsum in summer pelage. The abdomen is heavily washed with ochraceous.

Molar tooth pattern: As in *M. o. operarius,* except that frequently four outer and four inner salient angles are present on m^3.

Measurements: The averages and extremes of four adult males and nine adult females from the type locality are as follows: Total length 167 (160–172), 160 (152–168); tail 37 (36–38), 37 (35–39); hind foot 21, 20; condylobasal length of skull 29.1 (28.5–39.5), 27.6 (26.7–28.7); zygomatic breadth 16.5 (16.1–16.8), 15.6 (15.0–15.9); least interorbital breadth 3.8 (3.7–3.9), 3.9 (3.9–4.0); mastoidal breadth 13.1 (13.0–13.3), 12.2 (12.0–12.5); length of incisive foramina 5.1 (5.0–5.2), 5.0 (4.8–5.0); alveolar length of upper molar toothrow 7.0 (6.9–7.1), 6.9 (6.5–7.4); length of nasals 8.0 (7.8–8.2), 7.8 (7.7–8.0); interparietal breadth 7.6 (7.0–7.9), 7.0 (6.8–7.4); interparietal length 4.6 (3.9–5.0), 4.1 (3.9–4.2).

Comparisons: This well-marked subspecies is distinguished from both *M. o. operarius* and *M. o. macfarlani* by its darker coloration and larger molar teeth, as well as its relatively broader mastoidal and interorbital regions.

Remarks: The range of this subspecies has been reported as the "north shore of Prince William Sound" (Bailey, 1900: 40) to Glacier Bay, Point Gustavus. The specimen from the north shore of Prince William Sound was examined and found to be referable to *M. o. operarius.* Specimens from Chitina are referable to *M. o. macfarlani.* Laing, Taverner and Anderson (1929) identified five specimens from Chitina River Glacier, at about 4500 feet elevation, as *M. o. yakutatensis.* These specimens have not been examined, but are presumed to be the ones recorded by Anderson (1947: 200) from near the head of Chitina River, on the west side of Mt. Logan, Alaska. This represents the westernmost, and furthest inland, locality for the subspecies.

Specimens examined: 48, as follows: ALASKA: Glacier Bay, Point Gustavus, 17; Yakutat Bay, 31.

Microtus oeconomus innuitus Merriam

Microtus innuitus Merriam, Proc. Wash. Acad. Sci., 2: 21, 14 March 1900.
M[icrotus] oec[onomus] innuitus, Zimmermann, Arch. f. Naturgesch., 11: 187, 10 September 1942.

Type: No. 99373, U. S. National Museum (Biological Survey Collection); adult ♂, skull only, collected at Northeast Cape, St. Lawrence Island, Bering Sea, Alaska, on 13 July 1899, by C. Hart Merriam.

Distribution: St. Lawrence Island, Alaska.

Coloration: In summer pelage, darker, more reddish brown than *M. o. operarius*; most nearly approaches *M. o. unalascensis*.

Distinctly melanistic individuals have been recorded by Murie (1934) from several localities in the middle portion of St. Lawrence Island. Others have been taken in the hills south of Savoonga, St. Lawrence Island (Murie, 1936: 345).

Molar tooth pattern: As in *M. o. operarius*.

Measurements: Cranial measurements of the type are as follows: Condylobasal length of skull 33.0; zygomatic breadth 19.5; least interorbital breadth 4.2; mastoidal breadth 15.2; length of incisive foramina 6.3; alveolar length of upper molar toothrow 7.4; length of nasals 9.4; interparietal breadth 8.4; interparietal length 3.7.

There are no external measurements for the series in the U. S. National Museum. Hall and Gilmore (1932: 400) give the external measurements of their series as follows: Total length range from 163 to 220; length of tail average 36.1 (extremes 30–48); length of hind foot 22.2 (extremes 21–24).

Comparisons: M. o. innuitus differs from *M. o. operarius,* the only mainland form with which it needs comparison, in being darker in coloration and larger in size. The auditory bullae, although similar in shape to those of *M. o. operarius,* are relatively larger. The braincase is more angular and more strongly marked by muscular impressions.

Comparisons with *M. o. punukensis* are included under that subspecies.

Specimens examined: 16 skins and 9 skulls from St. Lawrence Island, Alaska.

Microtus oeconomus punukensis Hall and Gilmore

Microtus innuitus punukensis Hall and Gilmore, Univ. Calif. Publ. Zool., 38: 399, 17 September 1932.

M[*icrotus*] *oec*[*onomus*] *punukensis,* Zimmermann, Arch. f. Naturgesch., 11: 187, 10 September 1942.

Type: No. 51392, Museum of Vertebrate Zoology; adult ♀, skin and skull, collected on Big Punuk Island, near east end of St. Lawrence Island, Alaska, on 19 August 1931, by Otto Wm. Geist, original No. 2330 R. M. Gilmore.

Distribution: Punuk Islands, Alaska.

Coloration: As in *M. o. innuitus.*

Molar tooth pattern: As in *M. o. operarius.*

Measurements: Cranial measurements of an adult ♀ in the collections of the U. S. National Museum are as follows: Condylobasal length 32.0; zygomatic breadth 17.9; least interorbital breadth 4.1; mastoidal breadth 13.7; length of incisive foramina 5.0; alveolar length of upper molar toothrow 7.4; length of nasals 9.6; interparietal breadth 7.3; interparietal length 3.9.

No external measurements are available for the series in the collections of the U. S. National Museum. Hall and Gilmore (1932) give the external measurements of the type and four female topotypes as follows: Total length 177 (162–196); tail 37.0 (33.0–40.5); hind foot 21.8 (20.0–23.0).

Comparisons: This form is like *M. o. innuitus* in size and coloration, but differs in that the occipital surface of the skull is vertical rather than strongly inclined forward, resembling in this respect *M. o. amakensis* from Amak Island, Alaska. *M. o. punukensis* further differs from *M. o. innuitus* in that, in the former, the interparietal is compressed antero-posteriorly, while in the latter it is large and wedge-shaped.

Specimens examined: 29 from Punuk Island (center island), Alaska.

Microtus oeconomus unalascensis Merriam

Microtus unalascensis Merriam, Proc. Biol. Soc. Wash., 11: 222, 15 July 1897.

M[*icrotus*] *oec*[*onomus*] *unalascensis,* Zimmermann, Arch. f. Naturgesch., 11: 187, 10 September 1942.

Type: No. 30772/42672, U. S. National Museum (Biological Survey Collection); immature ♀, skin and skull, collected at Unalaska, Alaska, on 13 August 1891, by C. Hart Merriam, original number z.

Distribution: Unimak, Sanak, Tigalda, and Unalaska Islands, Alaska.

Coloration: Summer pelage similar to *M. o. operarius,* but somewhat darker; dorsal portion of tail darker.

Molar tooth pattern: Upper m^3 as in *M. o. operarius,* that is, with three closed triangles, and three inner and three outer salient angles. Lower m_1 with four closed triangles, two outer and two inner. Usually two open triangles are also formed on the inner side of m_1, but frequently the anterior one is poorly developed, and occasionally it is lacking. The development of the extra unclosed triangle, or loop, on the inner side of m_1, however, is not confined to this subspecies, but is observed in some specimens throughout the range of the species. It is most frequent, and best developed, however, in the southern part of the range, and especially on Unimak, Sanak and Unalaska Islands.

Measurements: Averages and extremes of seven adult males from Unalaska Island are as follows: Total length (average of three) 170 (162–175); tail (average of three) 39 (35–42); hind foot (average of three) 21 (20–21); condylobasal length of skull 29.6 (27.9–31.0); zygomatic breadth 16.9 (15.5–17.5); least interorbital breadth 3.8 (3.7–4.0); mastoidal breadth 13.1 (12.5–13.9); length of incisive foramina 5.0 (4.7–5.2); alveolar length of upper molar toothrow 7.0 (6.8–7.4); length of nasals 8.0 (7.3–8.4); interparietal breadth 6.8 (6.5–7.5); interparietal length 3.7 (3.2–4.1).

The external measurements of an adult ♀ from Unalaska Island are: Total length 162; tail 46; hind foot 21. Cranial measurements of two adult females are: Condylobasal length of skull 28.6, 28.9; zygomatic breadth 15.2, 16.5; least interorbital breadth 3.8, 3.9; mastoidal breadth 12.5, 12.5; length of incisive foramina 5.2, 5.0; alveolar length of upper molar toothrow 7.0, 7.1; length of nasals 7.9, 7.8; interparietal breadth 6.1, 7.4; interparietal length 3.6, 4.0.

Comparisons: Externally this form is like *M. o. operarius,* but is darker in comparable pelage, and has a shorter tail, which is more distinctly bicolored. Cranially, *M. o. unalascensis* differs from *M. o. operarius* in that the auditory bullae are larger, more rounded and inflated, resembling the bullae of *M. o. macfarlani.* The teeth are larger than in *M. o. operarius* and approach those of *M. o. yakutatensis* in size.

Remarks: M. o. unalascensis was thought to be confined to Unalaska Island, but examination of specimens from Sanak and Unimak Islands shows that they too are referable to this subspecies, although the Unimak specimens exhibit intergradation with *M. o. operarius.* Specimens from King Cove, on the southern tip of the Alaska Peninsula, are intergrades with *M. o. unalascensis* in shape and size of auditory bullae but are referable to *M. o. operarius.*

Specimens examined: 76, from Alaska, as follows: Sanak Island, 5; Tigalda Island, 1; Unalaska Island, 46; Unimak Island: False Pass, 6; Ikatan Peninsula, 4; St. Catherine Cove, 7; Urilia Bay, 7.

Microtus oeconomus amakensis O. J. Murie

Microtus amakensis O. J. Murie, Jour. Mamm., 11: 74, 11 February 1930.
Microtus oeconomus amakensis, Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5: 309, 17 November 1952.

Type: No. 246449, U. S. National Museum (Biological Survey Collection); adult ♂, skin and skull, collected on Amak Island, Bering Sea, Alaska, on 8 July 1925, by Donald H. Stevenson, original number 80.

Distribution: Amak Island, Alaska.

Coloration: In summer pelage, almost identical with *M. o. operarius.*

Molar tooth pattern: Like *M. o. operarius* except that frequently four outer and inner salient angles are formed on m^3.

Measurements: The averages and extremes of three adult males and nine adult females are as follows: Total length 189 (179–198), 181 (168–192); tail 49 (44–53), 48 (38–53); hind foot 22 (21–22), 21 (20–22); condylobasal length of skull 29.8 (29.3–30.6), 28.7 (27.9–29.9); zygomatic breadth 17.3 (17.0–17.7), 16.2 (15.8–17.0); least interorbital breadth 4.0 (3.8–4.2), 3.9 (3.8–4.1); mastoidal breadth 13.2 (12.7–13.8), 12.7 (12.2–13.0); length of incisive foramina 4.6, 4.3 (4.0–4.8); alveolar length of upper molar toothrow 6.8 (6.7–6.9), 6.8 (6.5–7.2); length of nasals 8.4 (8.3–8.5), 8.1 (7.8–8.4); interparietal breadth 6.9 (6.7–7.2); 7.0 (6.4–7.5); interparietal length 4.1 (3.8–4.5), 3.9 (3.4–4.4).

Comparisons: Externally this form is like *M. o. operarius,* but differs in that the upper part of the tail and hind feet are paler. Cranially, *M. o. amakensis* averages larger, and has a flattened, vertical occipital surface. The incisive foramina are shorter and more opened than in *M. o. operarius.*

Specimens examined: 33 from the type locality.

Microtus oeconomus popofensis Merriam

Microtus unalascensis popofensis Merriam, Proc. Wash. Acad. Sci., 2: 22, 14 March 1900.

M[*icrotus*] *oec*[*onomus*] *popofensis*, Zimmermann, Arch. f. Naturgesch., 11: 187, 10 September 1942.

Type: No. 97956, U. S. National Museum (Biological Survey Collection); adult ♂, skin and skull, collected on Popof Island, Shumagin Islands, Alaska, on 16 July 1899, by W. E. Ritter, original number 2200.

Distribution: Known from Popof and Unga Islands, Alaska.

Coloration: As in *M. o. operarius.*

Molar tooth pattern: Similar to *M. o. unalascensis* in that usually two open triangles are formed on the inner side of m_1; frequently, however, the anterior one is poorly developed or is lacking. Upper m^3 is as in *M. o. operarius.*

Measurements: Cranial measurements of the type are as follows: Condylobasal length of skull 31.0; zygomatic breadth 17.6; least interorbital breadth 3.9; mastoidal breadth 13.4; length of incisive foramina 5.9; alveolar length of upper molar toothrow 7.2; length of nasals 9.0; interparietal breadth 7.0; interparietal length 4.4.

A female from the type locality measures as follows: Total length 189; tail 42; hind foot 23; condylobasal length of skull 32.4; zygomatic breadth 18.6; least interorbital breadth 3.8; mastoidal breadth 14.0; length of incisive foramina 7.0; alveolar length of upper molar toothrow 7.4; length of nasals 9.2; interparietal breadth 7.3; interparietal length 4.6.

A male from Unga Island has the following cranial measurements: Condylobasal length of skull 32.3; zygomatic breadth 18.7; least interorbital breadth 3.5; mastoidal breadth 14.3; length of incisive foramina 6.1; alveolar length of upper molar toothrow 7.4; length of nasals 8.8; interparietal breadth 7.8; interparietal length 3.8.

Comparisons: M. o. popofensis differs from *M. o. operarius* in larger size, and in having blunter, more rounded and inflated auditory bullae.

It differs from *M. o. unalascensis* as follows: Paler coloration; larger size; auditory bullae smaller and less inflated; incisive foramina more open anteriorly.

Specimens examined: 23, from Alaska, as follows: Popof Island, 11; Unga Island, 12.

Microtus oeconomus elymocetes Osgood

Microtus elymocetes Osgood, Proc. Biol. Soc. Wash., 19: 71, 1 May 1906.

M[*icrotus*] *oec*[*onomus*] *elymocetes*, Zimmermann, Arch. f. Naturgesch., 11: 188, 10 September 1942.

Type: No. 137323, U. S. National Museum (Biological Survey Collection); adult ♂, skin and skull, collected on the east side of Montague Island, Prince William Sound, Alaska, on 12 May 1905, by C. Sheldon, original number 8(5448-X).

Distribution: Montague Island, Alaska.

Coloration: Most nearly approaches *M. o. yakutatensis* in summer pelage. The underparts are considerably suffused with buff, and are darker than in *M. o. operarius.*

Molar tooth pattern: Lower m_1 as in *M. o. operarius,* with four enclosed triangles. Three enclosed loops or triangles on m^3, five of the specimens examined having three inner and four outer salient angles, and two specimens having four inner and four outer salient angles.

Measurements: The type specimen and three adult males measure as follows: Condylobasal length of skull 31.7 (31.2–32.7); zygomatic breadth 17.9 (17.2–18.6); least interorbital breadth 3.8 (3.6–4.0); mastoidal breadth 13.4 (13.0–13.7); length of incisive foramina 5.7 (5.4–5.8); alveolar length of upper molar toothrow 7.2 (7.1–7.3); length of nasals 8.5 (8.1–9.2); interparietal breadth 6.9 (6.3–7.4); interparietal length 3.8 (3.2–4.4).

The external measurements for the series in the collections of the U. S. National Museum could not be located. Osgood (1906), however, gives external measurements for the type and two topotypes as follows: Total length 201, 191, 180; tail 40, 40, 35; hind foot (dry) 23.5, 23, 22.

Comparisons: From *M. o. operarius, M. o. elymocetes* differs in being larger and darker.

It is similar to *M. o. yakutatensis,* from which it may be distinguished by its larger size.

Remarks: Heller (1910: 342–343) found this vole abundant on Montague Island. He estimated that there was perhaps not a square rod of ground on the island without its runways. The largest specimen he collected exceeds considerably in size any of Osgood's material. His largest specimen, an adult female, measures: Total length 255; tail 49, hind foot 24.

Heller says that this island form is easily distinguished from any other form inhabiting the region by its larger size and darker coloration, the buffy wash on the underparts being heavier than in allied forms.

Specimens examined: 7, from the type locality.

Microtus oeconomus sitkensis Merriam

Microtus sitkensis Merriam, Proc. Biol. Soc. Wash., 11: 221, 15 July 1897.
M[icrotus] oec[onomus] sitkensis, Zimmermann, Arch. f. Naturgesch., 11: 187, 10 September 1942.

Type: No. 73839, U. S. National Museum (Biological Survey Collection); immature ♂, skin and skull, collected at Sitka, Alaska, on 3 August 1895, by C. P. Streator, original number 4745.

Distribution: Baranof and Chichagof Islands.

Coloration: Similar in summer pelage to *M. o. yakutatensis.*

Molar tooth pattern: Usually five closed triangles on m_1 instead of four; m^3 has three closed triangles and generally four inner and four outer salient angles.

Measurements: An adult female from Sitka measures as follows: Total length 190; tail 45; hind foot 22; condylobasal length of skull 29.2; zygomatic breadth 16.0; least interorbital breadth 3.9; mastoidal breadth 12.4; length of incisive foramina 5.4; alveolar length of upper molar toothrow 7.2; length of nasals 7.7; interparietal breadth 7.2; interparietal length 3.7.

An adult male from Mud Bay, Chichagof Island, measures as follows: Total length 190; tail 43; hind foot 21; condylobasal length of skull 31.7; zygomatic breadth 18.2; least interorbital breadth 4.3; mastoidal breadth 13.7; length of incisive foramina 6.2; alveolar length of upper molar toothrow 7.2; length of nasals 8.7; interparietal breadth 6.9; interparietal length 4.0.

Comparisons: This subspecies closely resembles *M. o. yakutatensis*, both cranially and in coloration. It is larger, however, and has longer, narrower incisive foramina, and usually an extra closed triangle on m_1.

It differs from *M. o. operarius* and *M. o. macfarlani* in being larger in size and darker in coloration, as well as in having the extra closed triangle on m_1.

Specimens examined: 3, from Alaska, as follows: Mud Bay, Chichagof Island, 1; Sitka, 2.

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PROCEEDINGS
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NOTES ON SOME TOAD BUGS (HEMIPTERA: GELASTOCORIDAE) FROM INDIA

By E. L. Todd
Falls Church, Virginia

A small collection of gelastocorids from the Darjiling district of India was recently sent to me by A. P. Kapur, Assistant Director of the Zoological Survey of India for identification. While only two species are represented, the information garnered through the study of the material increases our knowledge in several respects.

Nerthra asiatica (Horvath)

Mononyx asiaticus Horvath, 1892, Természetrajzi Füzetek, 15, pt. 3: 136. —Oshanin, 1909, Verzeichnis der Palaearktischen Hemipteren, vol. 1, p. 956; 1912, Katalog der paläarktischen Hemipteren, p. 89.—Kiritshenko, 1926, Konowia (Zeitsch. syst. Insekt. Mitwirk. fuhr. Ent.), 5(3): 226; 1930, Ann. Mus. Zool. Acad. Sci. URSS, p. 435.—Hoffmann, 1933, Lingnan Sci. Journ., 12, Suppl., p. 250.—Wu, Catalogus Insectorum Sinensium, 2: 559.—Hoffmann, 1941, Lingnan Sci. Journ., 20(1): 44.

Nerthra asiatica (Horvath).—Todd, 1955, Univ. Kansas Sci. Bull., 37, pt. 1(11): 410, Pl. 14, Fig. 128; 1957, Proc. Ent. Soc. Washington, 59(4): 154.

Mononyx grossus Montandon, 1899, Bull. Soc. Sci. Bucarest-Roumanie, 8(4/5): 398.—Distant, 1906, Fauna British India, 3: 16.

One ♀ specimen from Sureil, 5000 ft, Darjiling district, India, 11–31 October 1917, N. A. & F. G. This is the first specimen I have examined from India, but the species has been previously reported from there. This specimen is smaller than those previously examined. The range in size may now be stated as follows. Female: Length, 11.0 to 12.2 mm; width of pronotum, 8.0 to 8.1 mm; width of abdomen, 8.0 to 8.5 mm. I have not seen a male of this species. Accordingly, the male genitalia have not been illustrated.

Nerthra indica (Atkinson)

Mononyx indicus Atkinson, 1888, Jour. Asiatic Soc. Bengal, 57, pt. 2: 345.—Montandon, 1899, Bull. Soc. Sci. Bucarest-Roumanie, 8(4/5):

397.—Distant, 1906, Fauna British India, 3: 15.—Paiva, 1919, Rec. Indian Mus., 16, pt. 5(23): 372.

Nerthra indica (Atkinson).—Todd, 1955, Univ. Kansas Sci. Bull., 37, pt. 1(11): 405, Pl. 11, Fig. 98; 1957, Proc. Ent. Soc. Washington, 59(4): 152.

Mononyx projectus Distant, 1906, Fauna British India, 3: 15, Fig. 174.

Mononyx turgidulus Distant, 1906, Fauna British India, 5: 311, Fig. 175. [New synonomy.]

Nerthra turgidula (Distant).—Todd, 1955, Univ. Kansas Sci. Bull., 37, pt. 1(11): 406.

Thirteen specimens (5 ♂ ♂, 7 ♀ ♀ and 1 nymph), all but two from the Carmichael Collection from the following localities in the Darjiling district complete the collection. Ghumti, 1500–5000 ft, June 1914; Sureil, 5000 ft, 11–31 October 1917, N. A. & F. G.; Soom, 4000–5000 ft, 8 July 1914; Singla, 1500 ft, June 1913; Sukna, 1000 ft, May 1913 and Kalimpong, 600–4500 ft.

The study of these specimens requires modifications in previous statements of size range. Male: Length, 8.2 to 9.1 mm; width of pronotum, 5.5 to 6.7 mm; width of abdomen, 5.7 to 6.4 mm. Female: Length, 8.5 to 10.2 mm; width of pronotum, 6.4 to 7.8 mm; width of abdomen, 6.4 to 8.0 mm.

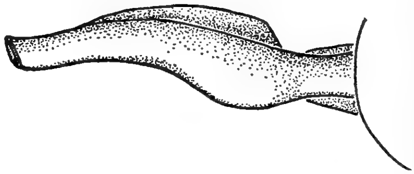

Fig. 1. Right paramere, ventral view of *Nerthra indica* (Atkinson).

The specimens under consideration verify the fact that both sexes are extremely variable in the relative widths of the pronotum and abdomen. In some instances the pronotum is wider, in others the abdomen is the wider. Correspondingly, the width of the connexivum is also variable. The species is also variable in the shape of the lateral margin of the pronotum, but those presently studied have that part less irregular in shape than in those specimens previously studied and in a few instances the specimens from the Darjiling area agree with the illustration of *Mononyx turgidulus* Distant in the shape of the margin. Therefore, I have placed that name in the synonymy of *indica*.

Because my illustration (Todd, 1955, *loc. cit.*, Fig. 98) of the entire right paramere of the male represents a different aspect than that observed when the specimen is relaxed and the paramere directed to the venter, it has been necessary to refigure (Fig. 1) the apical part of the paramere in the latter position.

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PROCEEDINGS

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TWO NEW SPECIES OF *CINARA* FROM CALIFORNIA (APHIDAE) WHICH HAVE *PINUS COULTERI* AS HOST

By F. C. Hottes

The new species described herewith were sent me for determination by R. C. Dickson and it is a pleasure to acknowledge his assistance.

Cinara diabola, new species

Alate viviparous female: The heads of the two alate specimens have been removed so that the body length of 2.89 mm is only approximate for the holotype. Color notes from living specimens are not available. The specimen has been cleared and stained but shows the following color: Head and thorax dark dusky brown, with the median transverse suture much darker; first and second antennal segments concolorous with head, or with the second segment slightly lighter; third antennal segment with apical half dusky; fourth and fifth antennal segments dusky with apical regions slightly darker; sixth antennal segment dusky; thoracic lobes dusky brown with the margins much darker. Lateral lobes with a few scattered hairs which are short. The median portion of these lobes free from hairs. Posterior lobe of thorax with a few very short hairs in the lateral posterior region. Costal margin of forewing dusky. All femora dusky brown with the basal portion not so dark. Metathoracic femora darkest. Pro- and mesothoracic tibiae with a short basal region dark brown, this followed by light dusky which shades to dark dusky before middle. Metathoracic tibiae with short basal region dark brown, this followed by pale dusky for about one-third the length of the tibiae, remainder of tibiae dark dusky brown. Tarsal segments brown. Median region of dorsum of abdomen with six rows of wax pore plates, the two median plates being much smaller. Cornicles dusky. Transverse pigmented area anterior to cauda not divided and very wide. Cauda and anal plate brown.

Head and thorax. Antennal segments with the following lengths: III, .45 mm; IV, .16 mm; V, .22 mm; VI, .13 + .06 mm. The hairs on antennal segment three vary from .03–.045 mm in length; they are not numerous, nor are they set at the same angle, but most are at an angle of more than 45 degrees. Secondary sensoria on antennal segment three on morphotype seven, on paratype three, each with primary sensorium. The secondary sensoria are small, tuburculate and arranged in a straight row. The fourth antennal segment of the holotype varies: one antenna has a small tuberculate sensorium, the other antenna is without this. Fifth antennal segment with one secondary sensorium and the primary sensorium. Marginal sensoria on sixth antennal segment small. Last three segments of the rostrum with the following lengths: .22, .25, and .12 mm. Media of forewings once branched. Metathoracic femora .915 mm in length. Metathoracic tibiae 1.56 mm. Hairs on outer margin metathoracic tibiae comparatively few, set almost at right angles, varying in length from .045–.08 mm, spaced for the most part not much closer than their length. Hairs on inner margin of hind tibiae more numerous than those on outer margin, not so upstanding. First metatarsal segment .12 mm long, ventral surface with nine hairs; second metatarsal segment .25 mm long.

Abdomen. Hairs on dorsum of abdomen shorter than width of pigmented area from which they arise. Cornicles with base measuring about .14 mm; cornicles about as high as width of base with rim reflexed. Hairs on cornicles about .05 mm in length and few. Base of cornicles with a few concentric rows of figures made by reticulations on the surface. Hairs on pigmented area anterior to cauda few, confined largely to the ends, rather spinelike, varying as to length but none very long. Genital plate large, with a wide notch in the anterior margin, posterior margin with a concave area. Ventral surface of abdomen with numerous long (.045 mm) hairs which are spinelike. The ventral surface of the abdomen has transverse rows of coarse setulae.

Apterous viviparous female: Length from vertex to end of cauda 3.38 mm. Width of head through the eyes .74 mm. Color notes from life not available but as indicated by cleared, stained specimens as follows: Head dark brown with margins of head darker; antennae dusky brown with the sixth segment darkest; femora dusky brown; tibiae dusky brown, almost uniform in color; dorsum of abdomen with a large dusky saddle, area of dorsum not covered by saddle, pale; cornicles brown, distinct from saddle. Length of antennal segments as follows: III, .50 mm; IV, .16 mm; V, .19 mm; VI, .15 + .09 mm. Third and fourth antennal segments without sensoria; fifth segment with only secondary sensorium. Hairs on antennal segments not numerous; on third .03–.04 mm in length, longer and more numerous on anterior margin, where they are set at an angle of about 90 degrees. Ocular tubercles very small. Rostrum reaching beyond cornicles, and in paratype to genital plate. Last three segments of rostrum with the following length: III, .26; IV, .30, and V, .15 mm. Third segment of rostrum with numerous hairs along the lateral margins. Hairs along the outer margin of the prothoracic tibiae spaced about as far apart as their length, rather spinelike, set at angle slightly less than 90 degrees. Hairs on outer margin of metathoracic tibiae .05 mm in length, spaced about as far apart as their length, set at angle of about 90 degrees, not more numerous towards the apex. Saddle on dorsum with hairs sparse, not much longer than width of pale area from which they arise. Saddle with a broad, irregular depression in mid-anterior region. Base of cornicles .15 mm, slightly larger in paratype, rather high, with rim reflexed. Genital plate large. Pigmented band anterior to cauda very wide. Ventral surface of abdomen with transverse rows of setulae, and a few sharp pointed hairs which are about .045 mm in length.

Remarks: There is no question about this species being closely allied to *C. glabra* Gillette and Palmer. It may be keyed to that species in Palmer's key to the genus *Cinara* in Aphids of the Rocky Mountain Region. It differs from *glabra* as follows: fewer coarser, more upstanding hairs on the tibiae; a wide depression, not a deep notch in the anterior margin of the saddle; tibiae not with apical portions darker.

Holotype apterous viviparous female, morphotype alate viviparous female, on same slide as holotype of *C. montanesa.* Holotype on slide with one apterous viviparous female. Both types deposited in U. S. National Museum. Host, *Pinus coulteri* (Pitch Pine). Collected by R. C. Dickson, San Bernardino Mts., 9 August 1939.

Cinara montanesa, new species

Apterous viviparous female: Length from vertex to end of anal plate 5.70 mm. Width of head through the eyes .75 mm. Specimens of this species have been cleared, stained and mounted, there are no color notes from living specimens. Color indicated by mounted specimens as follows: Head and thorax light dusky; first and second antennal segments concolorous with head; antennal segments three, four and five with apical regions dusky, remainder of segment pale; antennal segment six uniformly dusky; femora dusky; tibiae with a very short region near base very dark dusky brown followed by a pale region which is about .75 mm in length, remainder of tibiae dusky brown; tarsal segments brown. Cornicles pale brown with clear areas; outer margin of cornicles very much broken and irregular; transverse pigmented areas anterior to cauda with a row of long and pointed hairs along the posterior margin.

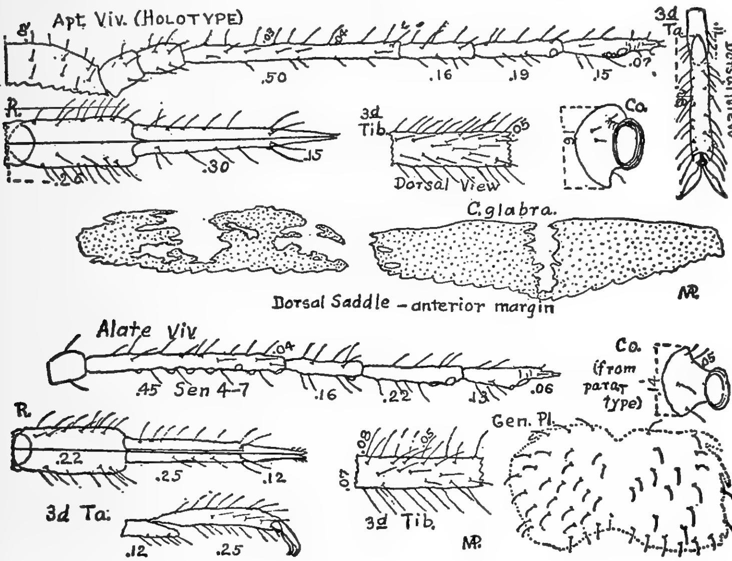
Head and thorax. Antennal segments with the following lengths: III, .60 mm; IV, .30 mm; V, .31 mm; VI, .15 + .05 mm. Hair on antennal segments set at an angle of 45 degrees or more. Third antennal segment without primary sensorium. The single sensorium present on one antenna is small and more like a secondary sensorium than it is to a primary; it is also rather far removed from the end. The fourth antennal segment is like that of the third as to sensoria. The fifth antennal segment has a large primary sensorium and one secondary sensorium. The marginal sensoria on the sixth segment are small and arranged in a row. The rostrum reaches well beyond the cornicles; the last three segments measure .26, .24 and .10 mm. The mesosternal tubercle is well developed; it is more or less truncate in shape and about as long as wide at the base. The metathoracic femora are 1.66 mm in length. The metathoracic tibiae are 2.15 mm in length. The hairs on the metathoracic tibiae are fairly numerous, similar on the outer and inner margins, and quite evenly distributed. The hairs are set at an angle of about 45 degrees and are .05 mm in length. The hairs on the ventral surface of the first metatarsal segment number about eighteen; this segment is .13 mm in length. The second metatarsal segment is .33 mm in length.

Abdomen. The hairs on the dorsal surface of the abdomen vary from those that are shorter than the width of the pigmented area from which they arise to those that are .06 mm in length. On this surface both types of hair are sparse, but the longer hairs are by far the fewest, and confined largely to the anterior end of the abdomen. The hairs on the ventral surface of the abdomen are about .07 mm in length and are numerous. The dorsal surface of the abdomen is reticulated. The posterior ventral surface has very poorly developed setulae arranged in transverse rows. The outer margin of the cornicles is very irregular. Hairs on cornicles few, about .08 mm in length, except for the hairs near the margin which are somewhat thicker and very short. Genital plate with median posterior region concave.

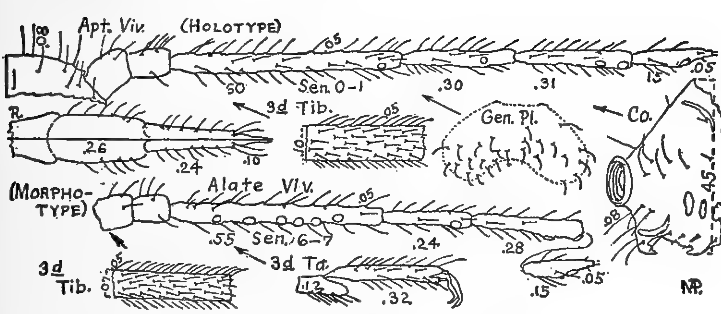
Alate viviparous female: Length from vertex to end of cauda 3.52 mm. Color much the same as apterous viviparous female. Length of antennal segments as follows: III, .55 mm; IV, .24 mm; V, .28 mm; VI, .5 + .05 mm. The third antennal segment has six secondary sensoria plus the primary. Hairs on third antennal segment not numerous; about .05 mm in length set at an angle of slightly more than 45 degrees. The media of one wing is twice branched; the other media is only once branched. Lateral lobes of thorax with fairly numerous hairs. Median posterior lobe of thorax with a few hairs on posterior margin and a few hairs scattered over the surface. Prothoracic tibiae 1.50 mm long. Hairs on outer margin of this segment fewer than those on the inner margin and spaced further apart than their length. Length of metathoracic femora 1.53 mm. Length of metathoracic tibiae 2.92 mm. Hairs on metathoracic tibiae numerous, not procumbent, set at angle of about 45 degrees, about .05 mm in length. On the outer margin of this segment the hairs are hardly more numerous towards the apex and not set at a lesser angle. Hairs on ventral surface of second metatarsal segment much more numerous than the hairs on the dorsal surface. Cornicles across outer margin measuring .37 mm. The outer margin is much more regular than the margin in the apterous form. The hairs on the cornicles are more numerous than the hairs on the cornicles of the apterous form, but are confined largely to the restricted area. The hairs near the margin are not short nor are they thick. The hairs on the dorsal surface of the abdomen are .03 mm in length; they are extremely sparse. The hairs on the ventral surface of the abdomen are very numerous and vary in length from .04–.06 mm.

Remarks: In Palmer's key to the genus *Cinara* in Aphids of the Rocky Mountain Region, this species presents difficulties, and cannot be keyed without question. The cornicles bear both long and short hairs (couplet 4) but the short hairs might be overlooked. If noted, it does not become

C. solitaria because the hairs on the cornicles are too few, and the hairs on the tibiae too short and fine. It is not *C. osborni* Knowlton because the cornicles have too few hairs and they are too fine and short, and the hairs on the abdomen too few and not of the correct type. If the cornicles are looked upon as having only one type of hairs as to length this species may be keyed to *C. glabra* (Gillette and Palmer) but to get to this species, the longer hairs on the anterior portion of the dorsum have to be overlooked. *C. glabra* in the apterous form has a large dorsal pigmented



CINARA DIABLA



CINARA MONTANESA

saddle which is lacking in this species, the setulae are too poorly developed, and the cornicles too large. This species seems to be most closely allied to *C. schwarzii* (Wilson) to which it will not key unless one overlooks the short hairs on the dorsum of the abdomen. This species differs from *schwarzii* in the longer pro- and metathoracic tibiae, short hairs on the dorsum of the abdomen, fewer hairs on the metathoracic tibiae and the hairs not more numerous towards the apex, two lengths of hair on the cornicles and shorter, less spinelike hairs on the pigmented areas anterior to the cauda.

Data host, *Pinus coulteri,* San Bernardino Mts., 9 July 1939, R. C. Dickson. Holotype apterous viviparous female, morphotype alate viviparous female, mounted on same slide with one alate and two apterous specimens of the same species, and two alates (one of which is the morphotype of *C. diabla* Hottes.

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PROCEEDINGS

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BIOLOGICAL SOCIETY OF WASHINGTON

A SYNTYPE OF *PEROMYSCUS MANICULATUS NEBRASCENSIS* (COUES)

By J. Knox Jones, Jr., and B. Mursaloğlu

The name *Peromyscus maniculatus nebrascensis* was originally proposed by Elliot Coues (*in* Coues and Allen, Bull. U. S. Geol. Surv. Territories, 11:79, 1877) in synonymy under *Hesperomys leucopus sonoriensis* as "*Hesperomys sonoriensis* var. *nebrascensis*." Coues credited the name to Baird, but the latter employed it as a nomen nudum, and *nebrascensis* has since been credited to Coues (see Jones, Proc. Biol. Soc. Washington, 71: 107–111, 1958, for a review of the history), although he obviously did not intend his usage of the name as an original description. Subsequent revisers designated "Deer Creek, Nebr." [= Wyoming], from which Coues (*op. cit.*: 80) listed two specimens (U. S. National Museum nos. 4310–11), as the type locality of *nebrascensis,* thereby establishing the two specimens from Deer Creek as syntypes. One of us (Jones) searched unsuccessfully several years ago in the collections of the U. S. National Museum for the specimens concerned and concluded that they probably were no longer in existence (*op. cit.*: 109). Subsequently, one of the specimens from Deer Creek was discovered among the contents of a routine loan of "Nebraskan" mammals from the Museum of Comparative Zoology at Harvard, and it is this specimen that is here discussed.

The specimen (now MCZ 5528) has four different labels attached to the left hind leg. One, a faded blue label that appears to be the original, bears printed across the top, "Expl. head waters, Missouri, Yellowstone. Capt. Raynolds, U.S.A.," and in the lower right hand corner, "Dr. F. V. Hayden." Handwritten in ink between the two is "Deer Creek January 19th 1860." The back of the label bears two numbers, "7" and "80." The latter is the original field number of the specimen, but we do not know the significance of the other. A second label bears essentially the same printed information as the first, along with "Deer Creek, Nebraska," printed in the lower left hand corner. This label also bears the date, the original number, 80, and the U.S. National Museum number, 4310. The third is the regular MCZ specimen label and the fourth simply repeats the MCZ number, 5528.

The skin was well prepared and, considering its age, is in excellent condition; no external measurements are listed, nor is the sex indicated. The skull is broken and some parts are missing. The anterior portion is fairly complete except that the lateral anterior margin of the right nasal is missing as are the anterior portions of the left nasal and premaxillary. Both zygoma are missing save for a part of the maxillary and squamosal arms on each side. The entire portion of the skull posterior to the parietals dorsally, posterior to the squamosal arms of the zygoma laterally, and posterior to about midway along the mesopterygoid fossa ventrally is missing, save for a disassociated piece of the basioccipital. Each ramus is incomplete, but the left one lacks only the angular process. The teeth

TABLE 1. Cranial measurements of the syntype of *Peromyscus maniculatus nebrascensis*, and of recently acquired specimens of the subspecies *P. m. nebrascensis* and *P. m. luteus*.

Catalogue number or number of specimens averaged, and sex	Occipitonasal length	Length of nasals	Zygomatic breadth	Least interorbital constriction	Length of rostrum	Length of incisive foramina	Depth of skull	Alveolar length of maxillary tooth-row
Peromyscus maniculatus nebrascensis, syntype								
MCZ 5528, ?	—	10.5	—	3.9	9.8	5.3	—	3.8
Converse and Natrona counties, Wyoming								
Average 10 (5♂, 5♀)	25.6*	10.6	13.4	4.1*	10.1	5.5	9.2*	3.9
Minimum	24.8	10.1	12.8	4.0	9.6	5.1	9.0	3.6
Maximum	26.9	11.2	13.6	4.4	10.5	5.8	9.7	4.2
Sioux County, Nebraska								
Average 25 (15♂,10♀)	25.6	10.6	13.6	3.9	10.0	5.5	9.2	4.0
Minimum	24.3	10.2	13.0	3.7	9.3	5.1	8.6	3.6
Maximum	26.5	11.5	14.3	4.3	10.3	5.9	9.9	4.3
Peromyscus maniculatus luteus, Cherry County, Nebraska								
Average 20 (11♂,9♀)	24.5	9.9	13.3	4.0	9.4	5.2	9.0	3.8
Minimum	23.3	9.5	12.6	3.7	8.9	4.8	8.8	3.6
Maximum	25.5	10.8	13.7	4.2	10.1	4.6	9.3	4.3

* 9 specimens

show moderate wear. A label in the vial with the skull bears the notation "from Boston Soc. Nat. Hist.," indicating that the specimen was deposited in that collection prior to its acquisition by the Museum of Comparative Zoology.

Osgood (N. Amer. Fauna, 28:79, 1909), who did not recognize Coues' description as valid (but instead regarded *nebrascensis* of Coues as a nomen nudum), assigned one of the two original specimens from Deer Creek (possibly the one here under discussion) to his *Peromyscus maniculatus luteus,* with geographic distribution on the Sand Hills of Nebraska and adjacent areas to the east of the range of *P. m. nebrascensis.* The dorsum of MCZ 5528 is tawny ochraceous differing from the buffy gray color of typical *nebrascensis,* but differing also from the ochraceous buff color of *luteus.* We cannot explain with certainty the difference in color between the syntype of *nebrascensis* and specimens taken in recent years from the vicinity of the type locality, but probably it relates to post-mortem changes in color ("foxing"). It should be noted, however, that populations of *P. m. nebrascensis* from mountainous areas in southern Wyoming average slightly more reddish dorsally than populations from adjacent arid plains. The place on Deer Creek from which the syntypes came lies only approximately 20 miles northeastward from the Laramie Mountains, where slightly reddish-colored specimens of *nebrascensis* have been obtained, and it is conceivable that the syntype reflects relationship with the nearby montane populations of the subspecies. The measurable cranial dimensions of the skull of MCZ 5528 (Table 1) are slightly smaller than the average for *nebrascensis,* but are well within the range of variation found in that subspecies.

In summary, the two specimens from Deer Creek, Wyoming, the restricted type locality of *Peromyscus maniculatus nebrascensis,* that were listed by Coues (*loc. cit.*) were previously thought to be no longer in existence. One of these specimens (formerly USNM 4310, now MCZ 5528) has been found. It differs from specimens of *P. m. nebrascensis* taken in recent years in being more reddish dorsally, probably owing to post-mortem changes in color; available cranial measurements, however, provide no basis for doubting its origin or identity.

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PROCEEDINGS

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A NEW CATFISH, *CORYDORAS CONCOLOR* (CALLICHTHYIDAE) FROM VENEZUELA

By Stanley H. Weitzman

Department of Anatomy, School of Medicine,
Stanford University, California

In a collection of *Corydoras* sent to me for identification by Franz Weibezahn of the Universidad Central de Venezuela were six large, deep bodied specimens of an unknown species from the Río Parguaza, Venezuela. Another new species, *Corydoras habrosus* Weitzman (1960a), from this collection has already been described. The remainder of the species in this collection of Venezuelan *Corydoras* appears to belong to known species and will be treated in subsequent papers. The present contribution is part of a series of papers on the genus *Corydoras*, the purpose of which is to illustrate and describe every available species of the genus. References to other papers in this series may be found in Weitzman (1960a and b). I wish to thank Franz Weibezahn for the gift of the specimens, George S. Myers for use of the facilities and specimens of the Natural History Museum, Stanford University and W. I. Follett, Curator of Fishes at the California Academy of Sciences, San Francisco for loan of specimens.

Corydoras concolor, new species

Figs. 1 and 2

Holotype: Stanford University 54131, 43.8 mm in standard length, collected 17 February 1946 by Agustin Fernandez-Yepez at Las Mangas, in a tributary to the Río Parguaza, western part of the State of Bolivar, Venezuela. The Río Parguaza is a stream arising in the Serranía de Parguaza, flowing northwest and into the Río Orinoco almost opposite the island of El Gallo, 6°20′ N latitude and 67°10′ W longitude.

Paratypes: SU 54132, one specimen, standard length 41.5 mm, bearing same data as holotype. SU 54133, four specimens, standard length 51.8–

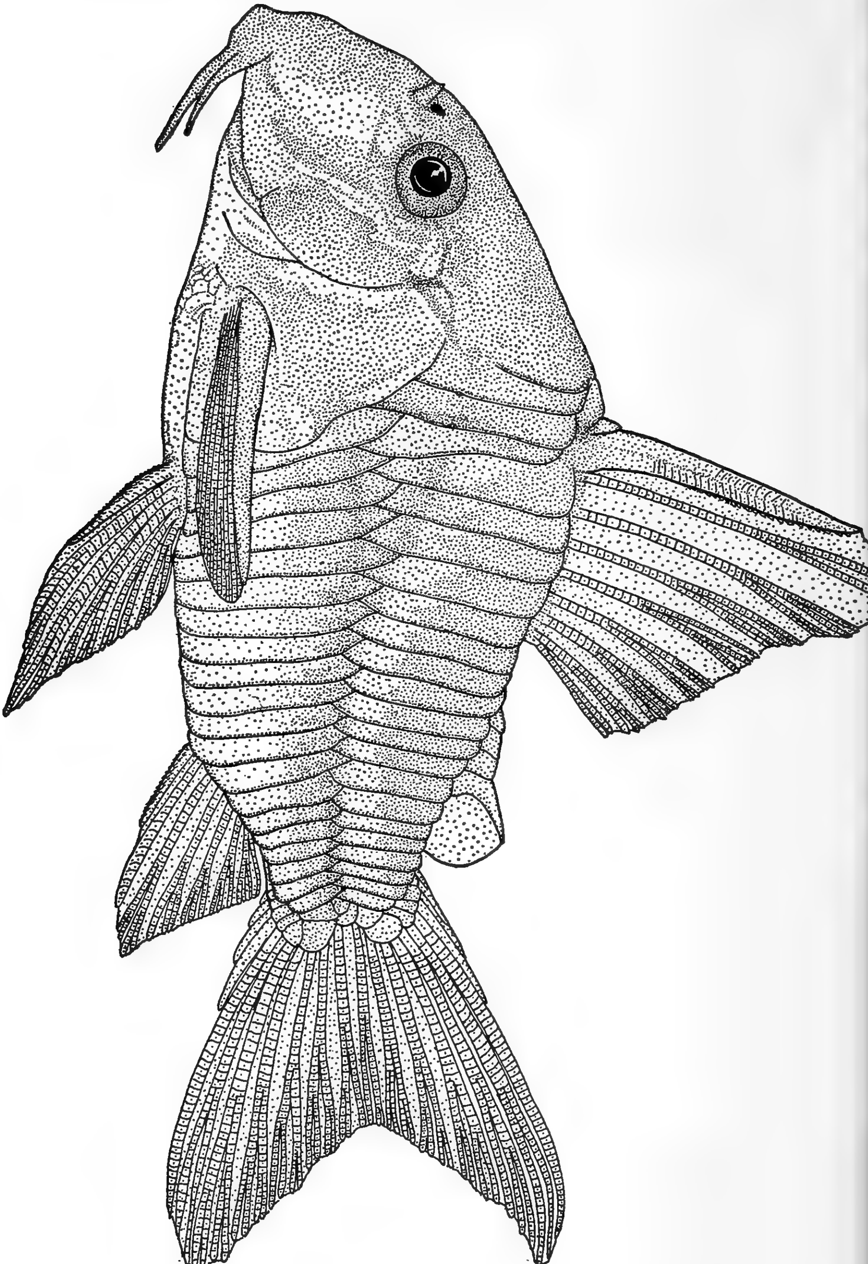

FIG. 1. *Corydoras concolor*, holotype, SU 54131. Standard length 43.8 mm.

54.2 mm, collected 7 April 1952 by Manuel Vincent Ramirez from the Río Parguaza, State of Bolivar, Venezuela.

Diagnosis: Corydoras concolor may be distinguished from other species of *Corydoras* by the following combination of characters. It lacks dark markings, has a very deep body (2.1 to 2.4 in standard length), has a large eye (3.2 to 4.0 in head length), pectoral fins incompletely surrounded by the coracoids, and a moderately high dorsal fin spine (1.1 to 1.2 in head length).

Description (holotype first, paratypes in parentheses): See Table 1 for measurements. Body relatively deep, greatest depth 2.1 (2.2–2.4). Least depth of caudal peduncle 5.9 (5.9–6.9). Dorsal fin origin nearer to snout tip than to caudal fin base. Distance between snout tip and

TABLE 1. Measurements in millimeters of specimens of *Corydoras concolor*.

MEASUREMENTS	HOLOTYPE 54131	PARATYPE 54132	PARATYPES 54133			
Standard length	43.8	41.5	51.8	52.6	54.1	54.2
Head length	14.6	13.7	17.0	16.9	17.9	17.9
Snout length	8.7	8.2	10.4	10.0	11.3	10.5
Least width of bony interorbital	7.0	6.1	7.9	7.4	7.9	7.5
Greatest diameter of bony orbit	4.2	3.4	5.1	5.2	4.7	5.0
Greatest width of suborbital	3.2	3.8	3.4	3.0	4.5	3.2
Length of fontanel	3.5	3.8	6.5	5.6	4.7	5.2
Length of predorsal scale	2.5	2.4	3.5	2.4	3.6	4.1
Greatest width of head	12.5	11.8	14.0	13.9	14.9	16.1
Snout tip to dorsal fin origin	24.0	21.8	28.9	28.3	29.1	29.5
Snout tip to adipose fin origin	37.3	34.8	45.1	44.8	46.6	46.5
Snout tip to anal fin origin	35.4	33.2	41.7	42.2	44.1	44.7
Snout tip to anterior edge of anus	24.6	22.5	27.2	27.7	29.5	27.8
Greatest body depth	20.6	18.1	22.2	22.3	23.3	24.1
Least depth of caudal peduncle	7.5	7.0	7.5	7.8	8.6	8.5
Distance between coracoids	5.4	5.1	5.3	5.5	6.2	6.7
Length of dorsal spine	13.8	12.0	15.4	14.4	15.8	14.6
Length of pectoral spine	14.9	13.0	18.2	17.5	16.8	18.3
Length of adipose spine	3.2	3.8	4.1	3.8	3.5	4.0

dorsal fin origin 1.8 (1.8–1.9). Distance between snout tip and anus 1.8 (1.8–1.9). Anal fin origin to snout tip 1.2 (1.2–1.3). Lateral scutes 23/20 (23/20 in 4 and 24/21 in one paratype). Abdomen with small granular plates, especially near the base of pelvic and pectoral fins. Azygous middorsal scutes 3 (2–4) before adipose fin and 1 before dorsal fin in all specimens. Pectoral fin base incompletely surrounded by coracoid. Area between coracoids 8.1 (8.1–10.0). Head length 3.0 (3.0–3.1); its greatest width 1.2 (1.1–1.2) in its length. Least width of bony interorbital 2.1 (2.2–2.3) in head length. Snout acute in dorsal view and snout tip slightly rounded; its length 1.7 (1.6–1.7) in head length. Dorsal profile of snout straight to slightly convex. When directed posteriorly, inferior rictal barbel reaches slightly beyond a point directly below the posterior margin of eye. Greatest diameter of orbit 3.5 (3.2–4.0) in head length. Greatest width of suborbital 1.3 (0.9–1.7) in orbit.

Dorsal fin I,7 in all specimens, last fin ray split to its base or almost to its base. In holotype first soft ray of depressed dorsal fin (but not spine) reaches adipose fin spine. Adipose fin spine 1.3 (0.9–1.4) in orbit. Anal fin i,7 in all specimens, last ray split to its base. Pectoral fin I,8 (I,8 in SU 54132; I,8 in one and I,9 in other specimens of SU 54133). Pelvic fin rays i,5 in all specimens. Caudal fin with principal rays 7/7 in all specimens. Pectoral fin spine (Fig. 2) has 28 spinules along its posterior border in the holotype, 26 in SU 54132 and 26 to 40 in specimens from SU 54133.

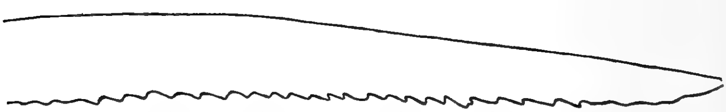

FIG. 2. *Corydoras concolor*, pectoral fin spine, ventral view, left spine.

Color: The holotype has the following color in alcohol. The over-all body color is a pale tan, slightly darker over the dorsum of the body and head. The belly and ventral region of the mouth are white. There are no dark marks of any kind over the sides of the body or head. There is, however, a faint pattern of darker tan over the body and sides of the head. This pattern is illustrated in Fig. 1. The color in life is unknown. The color of the paratypes is similar to that of the holotype.

The name *concolor* is Latin, and means uniformly colored.

Discussion: As with so many members of this genus, the relationships of this species to others are obscure. One of the most characteristic features of *Corydoras concolor* is its lack of heavy dark marks, blotches, bars or lines. In this respect it somewhat resembles some specimens of *Corydoras aeneus* (Gill 1858). However, among many other differences, the eye of *concolor* is proportionately much larger, the dorsal fin spine proportionately much longer, and the snout much less rounded. Also, most preserved specimens of *aeneus* have a large dark blotch centered about the junction of the upper and lower rows of body scutes at a vertical below the dorsal fin.

Regan (1912:218) questionably synonymized *Corydoras venezuelanus* von Ihering (1911) with *Corydoras aeneus*. Gosline (1940:19) accepted Regan's referral of *venezuelanus* without question. Whether *venezuelanus* is a synonym of *aeneus* or not is, in my opinion, uncertain, but for the present it does seem best to follow Regan and questionably refer *venezuelanus* to the synonymy of *aeneus*. In any case, comparison of *concolor* with von Ihering's very brief description of *venezuelanus* indicates that the two are not the same.

The steep, rather straight, long profile of the snout of *concolor* suggests the long snouts of such species as *Corydoras treitlii* Steindachner (1906), *acutus* (Cope 1912), *septentrionalis* Gosline (1940) and *ellisae* Gosline (1940). However, even though *concolor* appears to have a long snout it does not key to the long-snouted group in Gosline's key (1940). This is because it has a rather wide interorbital. The bony interorbital in *concolor* is contained 1.1 to 1.4 in the snout whereas in Gosline's key, the long-snouted group of *Corydoras* are stated to have the bony interorbital contained 1.7 or more times in the snout. In addition *concolor* differs from all the long-snouted *Corydoras* in color pattern. Of the *Corydoras* described subsequent to Gosline's paper (1940), *fowleri* Böhlke (1950) also has a long snout. *Corydoras concolor* differs from *fowleri* in having a different color pattern, a much deeper body and a larger eye.

If one attempts to key *concolor* in the short-snouted group of Gosline's key, the species runs to the end of the key where it matches most closely *Corydoras latus* Pearson (1924) or *Corydoras polystictus* Regan (1912). Comparison of the holotype of *latus* with that of *concolor* shows a much greater snout length in *concolor* (5.0 in standard length) than in *latus* (8.1 in standard length). Both specimens have nearly the same standard length. In addition, the dorsal spine of *latus* is proportionately shorter than that of *concolor*. The dark markings of *latus* are absent in *concolor*. *Corydoras concolor* differs from Regan's description of *polystictus* in having no dark spots on the sides of the body and dorsal fin, and in having a more acute snout in profile. Regan (1912:216) records the snout of *polystictus* as being a little longer than the diameter of the eye. In *concolor* the snout is just about twice as long as the horizontal diameter of the eye.

Corydoras concolor does not seem to be closely related to either *latus* or *polystictus* or any other short-snouted *Corydoras*. It would seem that its relationships are with the long snouted *Corydoras* but it differs from any known species of this rather artificial group to such an extent that it cannot be very closely compared with or related to any particular long-snouted species.

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PROCEEDINGS

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NOTES ON AND A KEY TO SPECIES OF THE GENUS *CINARA* (APHIDAE) WHICH HAVE *TSUGA* AND *PSEUDOTSUGA* FOR HOST

By F. C. Hottes

Once again I am indebted to Miriam A. Palmer for her generous help and the loan of material in bringing this paper to fruition.

Cinara commatula Hottes and Essig

Cinara commatula Hottes and Essig, Proc. Biol. Soc. Washington, 67: 152–153. 1954. Figs. opposite p. 153. Original description apterous and alate viviparous females.

Holotype and morphotype in Essig collection.

Were it not for the fact that Essig may be expected to have correctly determined the host of this species as *Pseudotsuga* one might question the correct determination of the host of this species, for it is the only species thus far known from *Pseudotsuga* which has the cornicles on a well-developed conical base.

Cinara dubia Hottes and Essig

Cinara dubia Hottes and Essig, Proc. Biol. Soc. Washington, 67: 156–157. 1954. Figs. p. 154 (if numbered). Original description apterous viviparous female.

Holotype in Essig collection.

I have been informed that the holotype of this species cannot at this time be located in the Essig collection. However I have seen three slides with the same data as the holotype, which were unknown to me when the species was described. They carry the determination *C. pseudotaxifoliae* Palmer. They are *C. dubia* Hottes and Essig.

As indicated in the original description, this species is closely allied to *C. pseudotaxifoliae* Palmer; however, the tibial hairs are never so numerous as in the species described by Palmer.

Cinara pseudotsugae (Wilson)

Lachnus pseudotsugae Wilson, Canadian Ent., 44: 302–303. 1912. Original description stem mother, alate male, oviparous female and alate viviparous female. These descriptions were also published in the same volume but without name on pp. 191–193.

According to Palmer the type is in the Granovsky collection.

This species is characterized by having short, coarse, spinelike hairs on the dorsum of the abdomen; and coarse, spinelike hairs which are shorter than the width of the tibiae of the apterous viviparous female. The tibial hairs are much longer in the alate.

This species is common in Colorado; I have also taken it in Arizona.

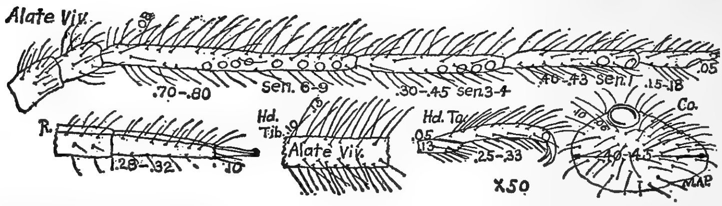
Cinara pseudotaxifoliae Palmer

Cinara pseudotaxifoliae Palmer, Aphids of the Rocky Mountain Region, pp. 42–43. 1952. Figs. Original description.

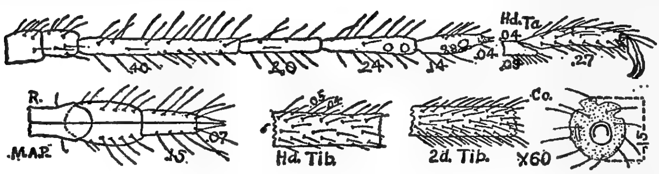
Lachnus taxifoliae Swain. Palmer, Annals Ent. Soc. America, 19: 304–307. 1926. Descriptions of all forms (misidentification).

Type in the United States National Museum.

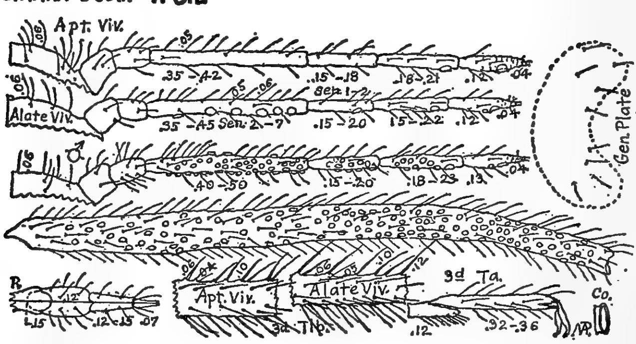
Apterous viviparous females of this species as determined by Palmer



CINARA COMMATULA H&E



CINARA DUBIA H &E



CINARA PSEUDOTSUGAE (W)

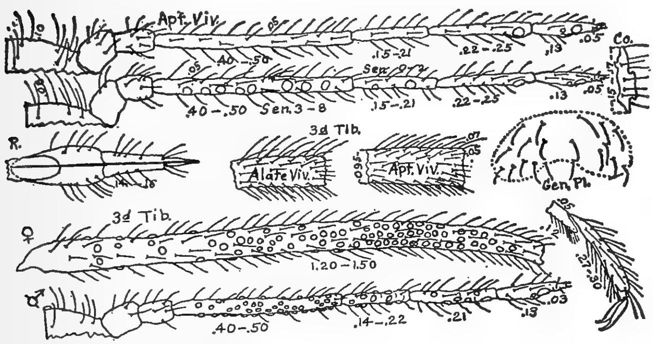
have the tibiae with two types of hairs: one most likely represented by the stem mothers or early spring generations with the hairs rather sparse and the tibiae dark; the other with the tibial hairs very numerous and more or less bunched at the apex. Palmer's figure of the tibiae (Fig. 14, Pl. XXV, Ann. Ent. Soc. America) appears to be in error.

Cinara splendens (Gillette and Palmer)

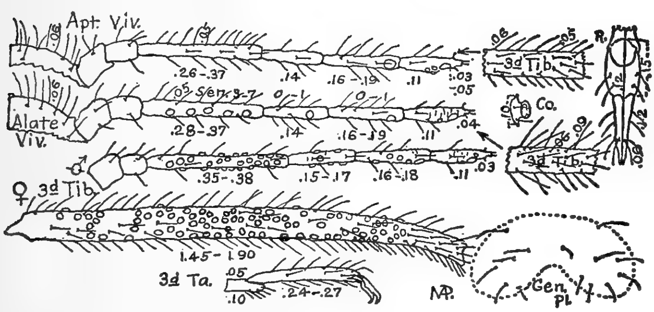
Lachnus splendens Gillette and Palmer, Ann. Ent. Soc. America, 17: 14–17. 1924. Figs. Plates V and VI. Original descriptions of all forms.

Type in U. S. National Museum.

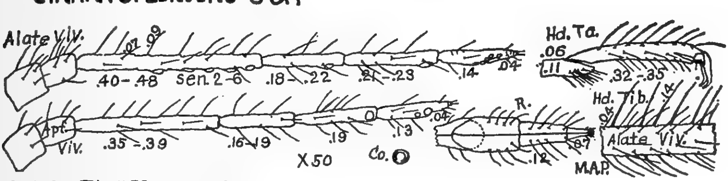
This species may be easily separated from other species of this group



CINARA PSEUDOTAXIFOLIAE P



CINARA SPLENDENS G & P



CINARA TAXIFOLIAE (S)

which have the cornicles reduced by the fact that only the apices of the tibiae are dusky. The hairs on the dorsum of the abdomen and on the tibiae are comparatively short and spinelike.

Cinara taxifoliae (Swain)

Lachnus taxifoliae Swain, Trans. American Ent. Soc., 44: 11–14. 1918. Original description alate and apterous females. Figs. Pls. I and II.
Cinara taxifoliae (Swain), Hottes and Essig, Proc. Biol. Soc. Washington, 67: 94–95. 1954. Description of alate and apterous viviparous females. Figs. p. 96.

Specimens of this species may be easily differentiated from other species of *Cinara* with reduced cornicles, by the tibial hairs being almost at right angles and the longest hairs varying in length from .14–.15 mm in length. The dorsum of the abdomen has numerous hairs which are about .08 mm in length. On the tibiae the long hairs are intermixed with hairs which are much shorter.

Lectotype: Apterous viviparous female in the Essig collection.

Apparently this is a very rare species; I have never taken it. I have seen one slide of this species taken by Dickson in Arizona, the first recorded outside of California.

Cinara tsugae Bradley

Cinara tsugae Bradley, Canadian Ent., 92: 605–608. 1960. Figs. p. 607.

This species has for its host *Tsuga heterophylla.* I have not seen specimens. The base of the cornicles ranges from .20–.29 mm.

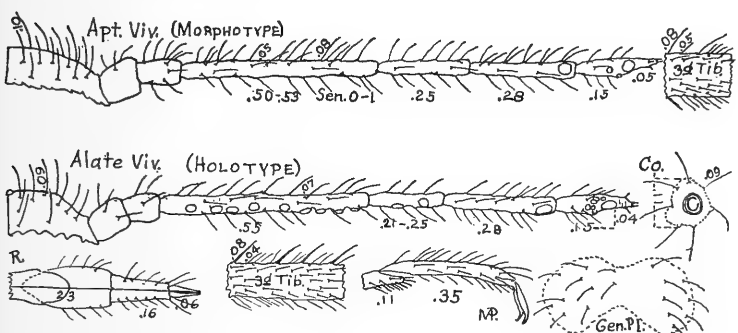
Cinara vagabunda Hottes and Essig

Cinara vagabunda Hottes and Essig, Proc. Biol. Soc. Washington, 66: 206–208. 1953. Original description alate viviparous female.

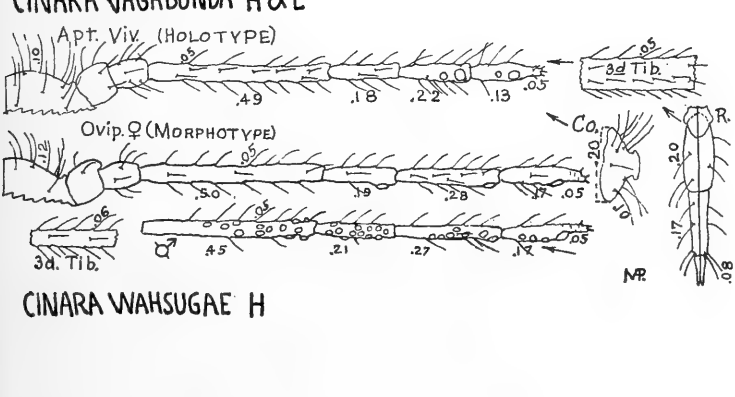
Holotype in Essig collection.

This species heretofore known only from the alate form may be easily differentiated from other species of *Cinara* by the fact that the hairs on the dorsum of the abdomen of both the alate and apterous viviparous females are longer than the hairs on the outer margin of the tibiae. In the original description the host of this species was given as *Pinus* sp., but questioned. It can now be stated that the host is *Pseudotsuga menziesii,* apterous viviparous females having been taken on this host 15 July 1954 on Mt. Graham (Graham County, Arizona).

Apterous viviparous female: Length 3.57 mm, width of head through the eyes .83 mm; length of prothoracic femora and tibiae 1.02 and 1.28 mm; length of metathoracic femora and tibiae 1.65 and 2.54 mm; length of first and second metatarsal segments .12 and .33 mm; length of antennal segments as follows: III .50 mm, IV .25 mm, V .28 mm, VI .15 + .05 mm. Color notes from life not available, as shown by cleared mounted specimen as follows: Head and thorax dark dusky brown; abdomen dark brown but not as dark as the head; cornicles dark brown, much darker than the abdomen; transverse pigmented areas very dark brown; cauda and anal plate brown; prothoracic and mesothoracic femora dark brown; metathoracic femora almost entirely black, only extreme base brown. Pro- and mesothoracic tibiae with short region near base almost black, remainder of tibiae shading from light dusky to dark dusky brown at apex; metathoracic tibiae brownish black following black basal region. Ocular tubercles small. First and second antennal segments not quite as dark as head. Third antennal segment pale dusky except for darker apex. Fourth antennal segment like third, except for darker apex. Fifth antennal segment about half dark dusky. Sixth antennal segment uniform dusky brown. Third and fourth antennal segments without sensoria. Fifth antennal segment only with primary sensorium, or with one small secondary sensorium. Apex of fifth and all of sixth antennal segments coarsely imbricated. Hairs on vertex and dorsum of head numerous, about .10 mm in length. The rostrum on the morphotype is absent, on a second apterous form segments three, four and five extend beyond the coxae of the metathoracic legs. Neither apterous form shows a mesosternal tubercle. Hairs on metathoracic tibiae rather coarse but not spinelike, on the outer margin not all of the same length, the shorter hairs being intermixed among the longer. The tibial hairs are set at an angle of about 45 degrees or slightly more, and are not more numerous towards



CINARA VAGABUNDA H & E



CINARA WAHSUGAE H

the apex. Hairs on the dorsum of the abdomen varying from .07–.10 mm in length are fairly numerous. The hairs on the ventral surface of the abdomen vary from .06–.07 mm in length; they are more numerous than the hairs on the dorsum. Width of pigmented area of the cornicles about .10 mm; this area provided with a few hairs which are about .10 mm long.

Morphotype: Apterous viviparous female, mounted on a mixed slide with one other specimen of *vagabunda.* Deposited in the collection of the U. S. National Museum.

Apparently this species is most closely allied to *Cinara pseudotaxifoliae* Palmer. It differs from the species described by Palmer by having the second metatarsal segment longer, longer antennal segments in the alate, longer fourth and fifth antennal segments in the apterous form. It has longer hairs on the dorsum of the abdomen, longer femora and tibiae, and fewer coarser hairs on the tibiae.

Cinara wahsugae Hottes

Cinara wahsugae Hottes, Proc. Biol. Soc. Washington, 73: 197. 1960.

Since the description of this species was sent to press in June, Joe Schuh has sent me (November) apterous specimens of this species taken by him on *Tsuga mertensiae* in Oregon. I am led to believe that the host mentioned in the original description as *Pseudotsuga* is not correct. G. A. Bradley has sent me a reprint of his description of *Cinara tsugae.* There is no question that the two species are closely allied. I have not seen specimens of the species described by Bradley, but the species appear to differ in the total lack of a mesosternal tubercle in *wahsugae,* the tubercle not being slightly developed, the cornicles being higher, and in the oviparous female having fewer sensoria on the metathoracic tibiae.

Key to Apterous Viviparous Females Having *PSEUDOTSUGA* and *TSUGA* for Hosts

1. Cornicles on distinct conical base 2
   Cornicles not on distinct conical base 3
2. Cornicle base .40–.45 mm .... *C. commatula* Hottes and Essig
   Cornicle base .15–.20 mm .... *C. wahsugae* Hottes
3. Tibiae pale except for apices .... *C. splendens* (Gillette and Palmer)
   Tibiae with more than apices pigmented 4
4. Longest hairs on outer margin of metathoracic tibiae about .15 mm, set at angle of about 90 degrees .... *C. taxifoliae* (Swain)
   Longest hairs on outer margin of metathoracic tibiae not longer than .12 mm, set at angle much less than 90 degrees 5
5. Hairs on dorsum of abdomen up to .105 mm in length .... *C. vagabunda* Hottes and Essig
   Hairs on dorsum of abdomen much less than .105 mm 6
6. Cornicle base .20–.29 mm .... *C. tsugae* Bradley
   Cornicle base about .15 mm or less 7
7. Hairs on metathoracic tibiae and dorsum of abdomen distinctly

spinelike .... *C. pseudotsugae* (Wilson)
Hairs on metathoracic tibiae and dorsum of abdomen fine, not distinctly spinelike 8

8. Almost one half of metathoracic tibiae paler than the rest, hairs on metathoracic tibiae hardly numerous .. *C. dubia* Hottes and Essig
Much less than one half of metathoracic tibiae paler than the rest, hairs on metathoracic tibiae numerous .... *C. pseudotaxifoliae* Palmer

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A NEW SUBSPECIES OF FLYING SQUIRREL (*GLAUCOMYS SABRINUS*) FROM SOUTHWESTERN UTAH

By Guy G. Musser

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In his *Mammals of Utah*, Durrant (Univ. Kansas Publs., Mus. Nat. Hist., 6: 151–153, 10 August 1952) referred all specimens of flying squirrels available to him from Utah to *Glaucomys sabrinus lucifugus* Hall. He studied specimens from the Uinta and Wasatch mountains in northern Utah and from the Aquarius Plateau in southern Utah. An additional record from ten miles southwest of Bryce Canyon National Park provided the extreme southwestern record of this subspecies in the state. Subsequent work by Rasmussen (Unpubl. Master's Thesis, Univ. of Utah, June, 1958) and Chamberlain (Unpubl. Master's Thesis, Univ. of Utah, March, 1958) provided specimens from the Wasatch Plateau and Fish Lake Mountains respectively, which were likewise referred to *G. s. lucifugus*. During the summer of 1960, in the course of a study of the mammalian fauna in southwestern Utah, a series of flying squirrels was obtained by the writer from the Tushar Mountains and the Pavant Range. Critical study of these specimens indicates that they are neither referable to *G. s. lucifugus*, nor to any other known subspecies, and are sufficiently distinct to warrant recognition as a new subspecies.

The writer is indebted to Seth B. Benson, Museum of Vertebrate Zoology, University of California, Berkeley, California, for the loan of comparative material and Stephen D. Durrant, Department of Zoology and Entomology, University of Utah, for his valuable suggestions and critical reading of the manuscript. The measurements of weight are in grams; all others are in millimeters. Unless otherwise indicated, all specimens are in the collections of the Museum of Zoology, University of Utah, Salt Lake City, Utah. Capitalized color terms are after Ridgway (Color Standards and Color Nomenclature, Washington, D. C., 1912).

Glaucomys sabrinus murinauralis, new subspecies

Type: Male, adult, skin and skull, no. 15652, Museum of Zoology, University of Utah; Timid Springs (SW¼ NE¼ Sec. 7, T. 29S., R. 4W.), 10,300 feet, one mile north of Big Flat Guard Station, Tushar Mountains, Beaver County, Utah; 15 August 1960; collected by Guy G. Musser; original number, 1232.

Range: Tushar Mountains and the Pavant Range in southwestern Utah, limits unknown.

Diagnosis: Based upon the type and ten paratypes (7 males, 4 females). Size: See measurements (Table 1). Color (Summer Pelage): Hairs of upper parts Sayal Brown apically, suffused with Dark Neutral Gray from basal portion; dorsal surface of gliding membrane Blackish Mouse Gray, diffused with Sayal Brown, anterior margins light gray; head lighter than body, grayer; face uniformly gray; cheeks whitish, diffusing into gray in postauricular regions; ears diagnostically Mouse Gray, cranial margins and area surrounding external auditory meatus blackish; dorsal surface of forefeet between Light Mouse Gray and Mouse Gray; dorsal surface of hind feet between Mouse Gray and Deep Mouse Gray, margined laterally with white; dorsal surface of tail between Vinaceous-Buff and Avellaneous basally, diffused with grayish-black apically, producing over-all dark Fuscous tone; apical one-third of tail darkest, being uniformly Blackish Mouse Gray, darker mid-dorsal stripe uniformly indistinct; underparts between Cinnamon-Buff and Pinkish Buff, suffused with light Neutral Gray and small areas of white; ventral anterior and posterior areas of gliding membrane Light Neutral Gray; throat Light Neutral Gray diffused with whitish-buff; ventral surface of feet grayish-buff; ventral surface of tail between Vinaceous-Buff and Avellaneous.

The pelage of the tail on the four specimens from the Pavant Range is thicker and the hairs are appreciably longer than in specimens from the Tushar Mountains.

Four juveniles in immature darker pelage possess the grayer head, gray face, Mouse Gray ears and extent of venter coloration, characteristic of this subspecies.

Skull: Nasals long, widely inflated distally, internasal suture extends caudad of frontopremaxillary suture; infraorbital foramina small; interorbital and postorbital regions narrow; braincase greatly inflated; incisive foramina short, constricted laterally so as to appear slit-like; sphenopalatine foramina large; interpterygoid space at posterior margin of palate wide, somewhat lyre-shaped; foramen ovale small; sphenopterygoid canals completely enclosed along entire length; roof of each alisphenoid canal incomplete for half its length.

Comparisons: The type and paratypes of *G. s. murinauralis* differ from near topotypes of *Glaucomys sabrinus lucifugus,* which it most closely resembles, as follows: Size: Total length averages longer; tail longer; ears longer. Color: Upper parts more yellowish-orange; head and face distinctly grayer; ears grayer, Mouse Gray as opposed to brown, blackish cranial margins are in contrast to dark brown of *G. s. lucifugus;* dorsolateral margins of gliding membrane markedly grayer; dorsal surface of tail uniformly grayer, lacking rufescence, particularly darker on apical one-third of tail, mid-dorsal tail stripe generally not as pronounced; dorsal surface of forefeet gray as opposed to brown; dorsal surface of hind feet Deep Mouse Gray as opposed to Hair Brown; dorsal surface of gliding membrane darker; hairs of underparts dominantly Pinkish Buff apically, with some whitish, as opposed to whitish apically, with area of Pinkish Buff generally reduced; throat uniformly grayer; ventral surface of feet grayer; ventral surface of tail less rufescent. Skull: Nasals average slightly longer and expanded slightly wider distally, internasal suture extends caudad of frontopremaxillary suture as opposed to terminating at level of frontopremaxillary suture; interorbital and postorbital breadths significantly less; braincase slightly more inflated; incisive foramina significantly shorter, narrower; sphenopalatine foramina generally larger; interpterygoid space at posterior border of palate significantly wider; foramen ovale smaller in seventy per cent of specimens studied; foramen magnum slightly smaller.

From near topotypes of *Glaucomys sabrinus bangsi* (Rhoads), the type and paratypes of *G. s. murinauralis* differs as follows: Size: Tail longer; hind foot averages shorter; ears longer; weight significantly less. Color (comparisons made with three specimens of *G. s. bangsi* in comparable pelage): Upper parts lighter, more yellowish-orange, hairs Sayal Brown in contrast to dark Wood Brown apically, hairs lighter basally; head distinctly grayer; face gray as opposed to brown; ears markedly grayer, Mouse Gray as opposed to dark brown; postauricular region whitish-gray as opposed to Avellaneous; dorsal surface of tail lighter, more yellowish-orange; dorsal surface of forefeet gray as opposed to brown; dorsal surface of hind feet Deep Mouse Gray in contrast to Clove Brown; hairs of underparts generally lighter basally, apically more Pinkish Buff than Cinnamon-Buff; ventral surface of tail grayer; ventral surface of feet gray in contrast to dark brown. Skull: Smaller in all measurements except postorbital breadth which averages slightly larger in *G. s. murinauralis*; nasals narrower; braincase markedly more vaulted; frontal process of zygoma higher, more pronounced; orbit smaller; sphenopalatine foramina markedly larger; foramen ovale smaller; sphenopterygoid canals completely enclosed throughout entire length as opposed to sphenopterygoid canals open medially throughout entire length except at anterior and posterior openings; roof of each alisphenoid canal incomplete for half its length in contrast to roof of each alisphenoid canal complete throughout entire length, terminating at anterior border of each foramen ovale; tympanic bullae smaller; foramen magnum narrower, slightly higher.

Systematic remarks: Flying squirrels of the subspecies *G. s. murinauralis* are apparently restricted to the Tushar Mountains and the Pavant Range. At the present time, only one specimen, a juvenile, is available from the Markagunt Plateau, the nearest highland to the south. Compared with juvenile specimens in comparable pelage from the Tushar Mountains, the specimen from the Markagunt Plateau is similar in the possession of the diagnostic Mouse Gray ears, gray face and head, and extent of venter coloration. The diagnostic cranial characters, however, are not well developed in juvenile specimens. In view of this fact and because subspecific determinations should be based on a larger sample of the population than one individual, subspecific assignment of the Markagunt Plateau specimen is tentatively held in abeyance until a series of adult specimens from the latter area is available. Acquisition and study of adult material from the Markagunt Plateau may show them to be referable to *G. s. murinauralis.*

G. s. murinauralis has its closest affinities both geographically and morphologically with *G. s. lucifugus,* the subspecies occupying the Uinta and Wasatch mountains and central high plateaus of Utah. Two specimens of *G. s. lucifugus* from the Fish Lake Mountains; one from Seven Mile Valley, the other from Lost Lake, demonstrate some intergradational tendencies toward *G. s. murinauralis* in both cranial and skin characters. The skulls of both specimens possess the characters of *G. s. lucifugus* except for the shorter incisive foramina and smaller foramen ovale, both characteristic of *G. s. murinauralis.* The specimen from Seven Mile Valley possesses dorsal coloration identical with that of *G. s. murinauralis,* but all other skin characters are as found in *G. s. lucifugus.*

Flying squirrels belonging to the subspecies *G. s. lucifugus* and *G. s. murinauralis* form a closely related subspecies complex which is markedly differentiated from those of *G. s. bangsi.* Study of ten near topotypes of *G. s. bangsi* from Idaho County, Idaho, reveals that although this subspecies is the closest geographic race to the two subspecies from Utah, it is markedly different morphologically, and close morphological relationships are not apparent. This is particularly well demonstrated in the cranial characters. Skulls of the animals belonging to the *lucifugus-murinauralis* complex are smaller in every measurement taken except the postorbital breadth. The greatest length of the skull is significantly longer in specimens of *G. s. bangsi.* This apparent shortening of the skull in the *lucifugus-murinauralis* group is reflected in the vertical height of the braincase, which is markedly more vaulted than in members of *G. s. bangsi.* The outstanding cranial differences, however, are in the arrangement of the sphenopterygoid and alisphenoid canals. In representatives of *G. s. bangsi,* the sphenopterygoid canals are open medially throughout their entire lengths except at the anterior and posterior openings and the roof of each alisphenoid canal is complete along its entire length, terminating at the anterior border of each foramen ovale. In those specimens of the *lucifugus- murinauralis* complex, however, the sphenopterygoid canals are completely enclosed throughout their entire lengths and the roof of each alisphenoid canal is incomplete, extending only halfway between the anterior opening of each canal and the anterior border of each formen ovale. In the series of flying squirrels studied by the writer, the cranial characters separating members of *G. s. bangsi* from those of the *lucifugus-murinauralis* complex are constant. Indeed, there was no specimen studied of each group which possessed any intergradational tendencies in the aforementioned characters. When Hall (Occ. papers Mus. Zool. Univ. Michigan, no. 296: 2, 2 November 1934) described *G. s. lucifugus,* one of the distinguishing cranial characters he found was the width of the rostrum, which expressed as a percentage in relation to the length of the nasals was less than 53 per cent of the length of the nasals. This was in contrast to *G. s. bangsi* in which the width of the rostrum was more than 53 per cent of the length of the nasals. Durrant (op. cit.: 153) referred a specimen from Wolf Creek Summit to *G. s. lucifugus,* although it suggested an intergradational tendency towards *G. s. bangsi* in that the width of the rostrum was slightly over 53 per cent of the length of the nasals. The writer has found that this percentage as a comparative value is inconsistent and unreliable. Percentages computed on the width of the rostrum to the length of the nasals on ten near topotypes of *G. s. bangsi* reveal that only two specimens exceed 53 per cent, the remainder being less than 53 per cent; on eleven near topotypes of *G. s. lucifugus,* three specimens exceed 53 per cent and eight are less; on eleven specimens of *G. s. murinauralis,* two specimens exceed 53 per cent. There is no doubt that the width of the rostrum is greater in specimens of *G. s. bangsi* than in those of the *lucifugus-murinauralis* complex, but because the nasals are also longer in the former, the percentage value as a distinguishing character is invalid.

Habitat: On the Tushar Mountains, flying squirrels were taken in Engelmann spruce (*Picea engelmanni* [Parry] Engelm.) from elevations of 7,875 feet to 10,300 feet. Those from the Pavant Range were trapped in stream-bottom stands of white fir (*Abies concolor* [Gordon and Glendinning] Hoopes) interspersed with narrowleaf cottonwood (*Populus angustifolia* James) at an elevation of 6,800 feet. On both the Tushar Mountains and Pavant Range, trapping in stands containing only cottonwoods or aspen (*Populus tremuloides* Michx.) proved unsuccessful. At 7,975 feet on the Tushar Mountains, rat snap traps were nailed to both spruce and aspen trees which existed together at this locality. A flying squirrel was taken from the spruce only. On the Pavant Range where white fir and narrowleaf cottonwoods were found in association, the former tended to be concentrated higher on the canyon slopes, the latter below and along the stream banks. Here, flying squirrels were taken in the white fir, although one individual was seen ascending a cottonwood. The largest single population of these animals observed was in Engelmann spruce at 10,300 feet on the Tushar Mountains. These data suggest that flying squirrels on these two highlands prefer a habitat in which conifers are the dominant trees. It is suspected that the source of food coupled with the rough texture of the bark on conifers are probably important factors in the selection of this habitat.

On both the Tushar Mountains and Pavant Range, flying squirrels appear to show a decided affinity for camp grounds and picnic areas when such areas are located in suitable habitat. This statement is based upon trapping results. Although suitable habitat was trapped in locations far removed from camping and picnic areas, flying squirrels were taken only at these latter areas. Open garbage pits and refuse left by campers and picnickers in coniferous areas are great attractions as a food source not only to flying squirrels but to other sciurids as well. In observing the nocturnal activity of flying squirrels (using artificial light), several were seen foraging in garbage pits, around garbage cans, and on picnic tables. One individual was seen ascending a spruce tree with a slice of bread in its mouth, while another was seen feeding on the remains of discarded corn cobs. Analyses of stomach samples from four individuals taken at a picnic area on the Tushar Mountains revealed only unidentifiable

TABLE 1.—Measurements of the Type and Paratypes of *Glaucomys sabrinus murinauralis* from the Tushar Mountains and Pavant Range

MEASUREMENT	n[a]	$\bar{x} \pm 2$ S.E.[b]	S.D.[c]	EXTREMES
Total length	12	328.8 ± 3.4	5.9	318 –338
Tail length	12	156.7 ± 3.2	5.6	148 –167
Hind foot	12	40.2 ± 1.3	2.3	34 – 43
Height of ear	12	27.5 ± 0.8	1.4	25 – 30
Weight	11	133.9 ± 3.8	6.2	126 –146
Greatest length of skull	10	40.0 ± 0.3	0.6	39.1– 40.1
Zygomatic breadth	11	24.1 ± 0.1	0.4	23.7– 24.4
Mastoid breadth	10	18.3 ± 0.1	0.1	18.0– 18.5
Interorbital breadth	11	7.4 ± 0.1	0.2	7.1– 7.7
Postorbital breadth	11	8.9 ± 0.2	0.4	8.4– 9.4
Length of nasals	11	12.5 ± 0.2	0.4	12.0– 13.5
Breadth of rostrum	11	6.4 ± 0.1	0.1	6.2– 6.5
Toothrow	11	8.2 ± 0.4	0.4	7.1– 8.6
Length of incisive foramina	11	2.2 ± 0.1	0.2	2.0– 2.6
Interpterygoid width[d]	11	3.9 ± 0.1	0.1	3.7– 4.1

[a] Size of sample.
[b] The mean and standard error of the mean.
[c] Standard deviation.
[d] Taken at posterior margin of palatines.

amorphous vegetable matter, suggestive of ingested refuse from this area.

The Tushar Mountains and Pavant Range are separated from the central high plateaus to the east by the semi-arid Sevier River Valley, and from the Markagunt Plateau to the south by intervening foothills and semi-arid valleys. At the present time, the intervening valleys serve as effective barriers in the distribution of coniferous habitat on the Tushar and Pavant highlands. The isolation of coniferous areas has in turn served as an isolating mechanism to the populations of flying squirrels on these highlands apparently dependent upon this type of habitat.

Specimens examined: Total 17, distributed as follows: MILLARD COUNTY: Pistol-Rock Picnic Area, Fillmore Canyon, 8 miles E Fillmore, 6,800 feet, Pavant Range, 1; Balsam Picnic Area, Fillmore Canyon, 8 miles E Fillmore, 6,800 feet, Pavant Range, 1; Buckskin Charley Picnic Area, Fillmore Canyon, 8 miles E Fillmore, Pavant Range, 2; BEAVER COUNTY: Indian Creek Guard Station, 9 miles E Highway 91, 7,875 feet, Tushar Mountains, 1; Kent's Lake, 8,800 feet, Tushar Mountains, 1; conifers behind M.I.A. cabin, Britts Meadow (Delano Ranger Station), 8,850 feet, Tushar Mountains, 1; Timid Springs, 1 mile N Big Flat Guard Station, 10,300 feet, Tushar Mountains, 10.

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NORTH AMERICAN MONOGENETIC TREMATODES IX. THE FAMILIES MAZOCRAEIDAE AND PLECTANOCOTYLIDAE*

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This paper is a continuation of the series dealing with the North American monogenetic trematodes and of a general revision of the Monogenea. The purpose and organization of this installment are the same as for previous sections (Price, 1937, 1938, 1939a, 1939b, 1942, 1943a, 1943b, and 1961).

The present installment deals primarily with the Mazocraeidae. The inclusion of the Plectanocotylidae is largely for convenience; it is a small group the relationships of which are not too well established. Sproston (1946) regarded it as a subfamily of the family Discocotylidae, whereas Bychowsky (1957) considered it as a family of the suborder Discocotylinea. The present writer cannot agree with either of these viewpoints, and regards Phillocotylidae as a more or less intermediate group with its greatest affinities with the Mazocraeidae of the suborder Mazocracraeinea Bychowsky.

Family Mazocraeidae Price, 1936

Synonyms: Octocotylidae Monticelli, 1888; Octobothriidae Monticelli, 1888, in part; Octobothriidae Taschenberg, 1879, in part; Hexacotylidae Monticelli, 1903; Mazocriidae Southwell and Kirshner, 1937, in part; Pleurocotylidae Monticelli, 1903; Grubeidae Poche, 1926.

Diagnosis: Body elongate to clavate. Prohaptors in form of two well-developed suckers opening into oral cavity; opisthohaptor bearing four pairs of clamps (except in *Grubea*) of a special sort; middle and ventral

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loop elements fused to form inverted U-shaped pieces, dorsal loop elements incomplete, and center piece more or less scoop-shaped, usually weakly cuticularized; anchors usually two to three pairs, unequal and dissimilar, outer pair larger than others, on terminal lappet. Genital aperture armed with hooks of two types, a pair of larger, outwardly directed laterals, and several pairs of smaller, medially directed inner hooks arranged in two, either transverse or vertical, rows or in a circle. Testes either follicular or as a lobed mass. Ovary U-shaped, with proximal and distal limbs directed anteriad. Vagina, when present, single and opening on mid-dorsal surface, or, rarely, Y-shaped and opening laterally.

Type genus: Mazocraes Hermann, 1782.

This family consists of a number of more or less heterogeneous species which may be grouped into five reasonably well-defined groups; these groups are regarded as worthy of subfamily rank and may be separated by the following key:

Key to Subfamilies of Mazocraeidae

1.—Opisthohaptor asymmetrical, with four large clamps on right side and a single small clamp corresponding to most distal of large clamps on left side; inner hooks of genital corona arranged in a circle .... Grubeinae new subfamily
Opisthohaptor symmetrical, with four pairs of clamps; inner hooks of genital corona in two either transverse or vertical rows 2

2.—Inner hooks of genital corona in two transverse rows .... Mazocraeinae new subfamily
Inner hooks of genital corona in two vertical rows 3

3.—Vagina double .... Neomazocraeinae new subfamily
Vagina, if and when present, single 4

4.—Opisthohaptor embracing area of gonads, either of testes or of both ovary and testes .... Mazocraeoidinae new subfamily
Opisthohaptor terminal, not involving area of gonads 5

5.—With large ventral, sucker-like depression posterior to genital aperture; hook-bearing lappet of opisthohaptor divided into two cone-like lobes .... Clupecotylinae new subfamily
Without ventral, sucker-like depression posterior to genital aperture; hook-bearing lappet of opisthohaptor not divided .... Kuhniinae new subfamily

Mazocraeinae, new subfamily

Synonyms: Octocotylinae Braun, 1893; Octobothriidae Monticelli, 1903.

Diagnosis: Opisthohaptor terminal, more or less triangular; clamps four pairs, equal or unequal in size; anchors two or three pairs, dissimilar. Genital corona with two kinds of hooks, one pair of laterals with outwardly directed tips and several pairs of inner hooks arranged in two transverse rows, with medially directed tips. Vagina present or (?) absent, opening dorsally. Other characters as for family.

Type genus: Mazocraes Hermann, 1782.

As presently conceived, this subfamily contains three genera, one of questionable validity, which may be separated as follows:

Key to Genera of Mazocraeinae

1.—Opisthoptoral clamps not uniform, anterior pair larger than others .... *Pseudanthocotyloides* Price

Opisthohaptoral clamps uniform in size 2

2.—Opisthohaptor with terminal lappet bearing two pairs of minute suckers in addition to anchors .... *Ophicotyle* Beneden and Hesse

Opisthohaptor without suckers on terminal, hook-bearing lappet .... *Mazocraes* Hermann

Genus *Mazocraes* Hermann, 1782

Synonyms: Octobothrium Leuckart, 1827; *Octostoma* Kuhn, 1829, not Otto, 1823; *Octocotyle* Diesing, 1850; *Octoplectanum* Diesing, 1858; *Octobothrium* (*Octocotyle*) Saint-Remy, 1891; *Glossocotyle* Beneden and Hesse, 1863.[1]

Diagnosis: Opisthohaptor lobe-like, bearing four pairs of clamps of the mazocraeid type, and with terminal lappet bearing two or three pairs of dissimilar anchors, outermost or large anchors with bifid roots and recurved tips. Genital corona with two lateral large hooks and an anterior and posterior transverse row of about four hooks each. Testis deeply lobed or divided into indistinct follicles, postovarial. Ovary U-shaped, pretesticular Vitelline follicles extending into opisthohaptor. Vagina present, opening dorsally in median line posterior to intestinal bifurcation. Eggs usually with filament at each pole.

Type species: Mazocraes alosae Hermann, 1782, from *Clupea alosa, Alosa finta, Caspialosa kessleri, C. kessleri volgensis,* and *C. caspia.*

Included species: Mazocraes harengi (Beneden and Hesse, 1863) Nicoll, 1915, from *Clupea harengus; M. heterocotyle* (Beneden, 1870) Sproston, 1946 (sp. inq.), from *C. sprattus; M. pilchardi* (Beneden and Hesse, 1863) Sproston, 1946, from *C. pilchardus*; *M. tripathii* n. n., for *M. orientalis* Tripathi, 1959, not Chauhan, 1950,[2] from *Dussumiera acuta*; *M. vilelai* Tendeiro and Valdez, 1955, from "*Alosa alosa*"; and *M. gonialosae* Tripathi, 1959, from *Gonialosa manmina.*

None of the species listed above has, so far, been reported from North American hosts.

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[1] See discussion of *Mazocraes* and *Glossocotyle* by Sproston (1946).

[2] The new name *Mazocraes tripathii* is here proposed for the species described by Tripathi (1959) as *M. orientalis* Chauhan, 1950. The description and figures given by Chauhan (1950) for his *M. orientalis* are not detailed but assuming the correctness of the arrangement of the genital hooks it must be referred to the genus *Kuhnia,* and becomes *K. orientalis* (Chauhan, 1950) new combination. The species reported as *M. orientalis* Chauhan is, according to the arrangement of the genital hooks, a species of *Mazocraes* and *M. orientalis* Tripathi, not Chauhan, becomes a homonym of *M. orientalis* Chauhan (=*Kuhnia orientalis* Chauhan).

Genus *Ophicotyle* Beneden and Hesse, 1863

Diagnosis: Opisthohaptor elongate, bearing four pairs of equal clamps and with a terminal lappet provided with two pairs of minute suckers and two pairs of anchors. Genital hooks as in *Mazocraes.*

Type species: Ophicotyle fintae Beneden and Hesse, 1863, from *Alosa fintae.*

This genus is closely related to *Mazocraes* Hermann and is represented by only the type species; it is of questionable validity. The minute accessory suckers on the terminal lappet of the opisthohaptor may eventually be shown to be artifacts in which case the genus should be suppressed as a synonym of *Mazocraes.*

Genus *Pseudanthocotyloides* Price, 1959

Diagnosis: Anterior pair of opisthohaptoral clamps much larger than posterior three pairs. Vagina (?) absent. Egg with filament at posterior pole. Genital hooks and other characters as in *Mazocraes.*

Type species: Pseudanthocotyloides banghami Price, 1959.

Inasmuch as the type and only species of this genus was originally described briefly in abstract (Price, 1959), a more detailed account is given below.

Pseudanthocotyloides banghami Price, 1959

Figs. 1–6

Description: Body elongate to clavate, 1.4 to 3.5 mm long by 0.3 to 0.5 mm wide. Prohaptoral suckers circular, 0.040 to 0.060 mm in diameter. Opisthohaptor consisting of four pairs of mazocraeid clamps, occupying approximately 0.5 mm of total body length; clamps of anterior pair largest, 0.12 to 0.14, second pair 0.08 to 0.09, third pair 0.07, and fourth and most distal pair 0.06 mm in diameter, respectively; opisthohaptoral anchors two pairs, outer 0.060 to 0.068 mm long, inner pair 0.020 to 0.024 mm long, and a flask-shaped intermediate hook guard about 0.010 mm long between large and small anchors. Pharynx oval, about 0.060 mm long by 0.036 to 0.040 mm wide; esophagus about 0.45 mm long in extended specimens, heavily pigmented; intestinal branches extending into opisthohaptor to about level of distal pair of clamps, provided with short medial and longer lateral, branched, heavily pigmented diverticula. Genital aperture about 0.12 mm distal to base of pharynx; genital corona consisting of a pair of lateral hooks each about 0.014 mm long and two transverse rows of inner hooks each about 0.014 mm long; hooks of anterior transverse row four in number, staggered, those of poste-

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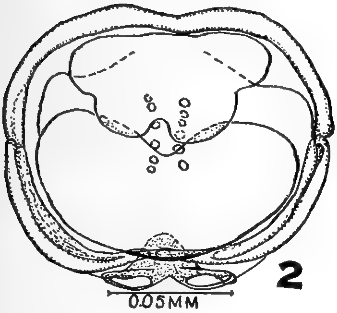
FIGS. 1–6. *Pseudanthocotyloides banghami.* 1.—holotype, ventral view; 2.—opisthohaptoral clamp of anterior pair; 3.—clamp of posterior pair; 4.—opisthohaptoral anchors; 5.—genital corona; 6.—egg.

FIG. 7. *Plectanocotyle elliptica.* Complete worm, ventral view. From Diesing, 1858.



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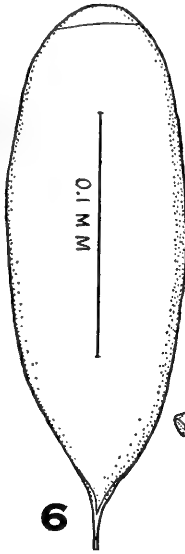

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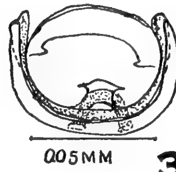

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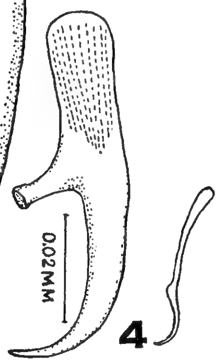

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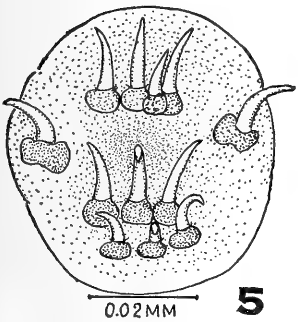

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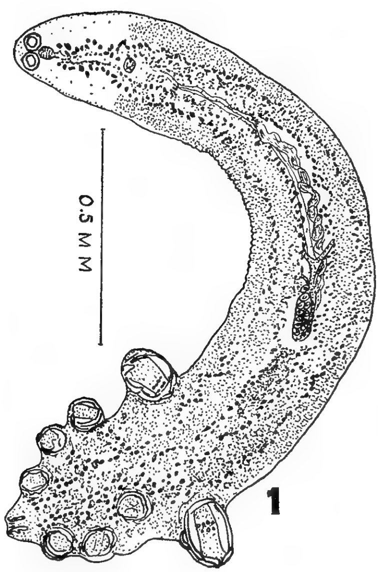

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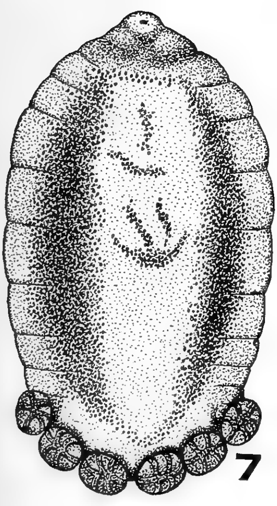

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rior row six in number, actually two alternating rows of three hooks each. Testicular arrangement not ascertainable because obscured by vitelline follicles; vas deferens convoluted, in median field. Ovary U-shaped, with left limb about twice as long as right, in equatorial zone; genito-intestinal canal opening into right intestinal branch about level of distal pole of ovary; vitelline follicles extending from about level of genital aperture to level of distal pair of opisthohaptoral clamps, obscuring greater part of internal organs. Vagina not observed. Uterus thick-walled. Egg oval, about 0.2 mm long by 0.07 mm wide, with long, slender filament at posterior pole.

Host: Dorosoma cepedianum.

Location: Gills.

Distribution: United States (Reelfoot and Norris lakes, Tennessee, and Guntersville Lake, Alabama).

Specimens: USNM Helm. Coll. no. 37716 (holotype), 37717–37718 (paratypes) and 37719.

The above description is based on a study of eight specimens, as follows: five collected in 1938 at Norris Lake, Tennessee, and two collected in 1939 at Reelfoot Lake, Tennessee, by Ralph G. Bangham, and one from a gizzard shad caught in 1959 at Guntersville, Alabama, by Harold S. Strickland.

Kuhniinae, new subfamily

Diagnosis: Opisthohaptor terminal, cordate or linguiform, bearing four pairs of equal or unequal clamps of mazocraeid type and two pairs of anchors; outermost anchors relatively large. Hooks of genital corona of two types, one pair of outwardly directed laterals each arising from a reniform muscular pad, and two vertical rows of smaller inwardly directed hooks. Vagina present or (?) absent. Other characters as given for family.

Type genus: Kuhnia Sproston, 1945.

Three genera are included in this subfamily and may be separated by the following key:

Key to Genera of Kuhniinae

1.—Genital hooks of vertical rows of two types ... *Paramazocraes* Tripathi
Genital hooks of vertical rows of one type 2
2.—Opisthohaptoral clamps of anterior pair larger than those of other pairs .... *Pseudanthocotyle* Bychowsky and Nagibina
Opisthohaptoral clamps of uniform size .... *Kuhnia* Sproston

Genus *Kuhnia* Sproston, 1945

Synonyms: Octobothrium Leuckart, 1827, in part; *Octocotyle* Diesing, 1850, in part; *Octoplectanum* Diesing, 1858, in part; *Mazocraes* Hermann, 1782, in part.

Diagnosis: Opisthohaptor cordate to linguiform, bearing four pairs of more or less equal-sized clamps of mazocraeid type, and with two, sometimes three, pairs of anchors. Median hooks of genital corona of one kind, arranged in vertical rows. Vitelline follicles rarely entering opisthohaptoral area. Vagina absent.

Type species: Kuhnia scombri (Kuhn, 1829) Sproston, 1945, from *Scomber scombrus, S. japonicus,* and *S. kanagunta.*

Included species:[3] *Kuhnia brevoortia* Hargis, 1955, from *Brevoortia partonus; K. macracantha* (Meserve, 1938) Sproston, 1946, from unidentified species of mackerel; *K. minor* (Goto, 1894) Sproston, 1946, from *Scomber japonicus* (= *S. colias*); *K. indica* Tripathi, 1959, from *Cybium guttatus; K. orientalis* (Chauhan, 1950) new combination, from *Dussumieria* sp.; *K. singaporensis* new species, from "Ikan Trubot"; *K. sprostonae* new name (synonym: *K. minor* Sproston, 1945, not Goto, 1894),[4] from *Scomber scombrus;* and *K. thunni* (Ishii, in Ishii and Sawada, 1938) Sproston, 1946 (synonym: *Dactylocotyle minor* Ishii, 1936),[5] from *Thunnus orientalis.*

In addition to a consideration of *K. scombri* and *K. brevoortia,* the only members of the genus so far reported from American hosts, a description of an apparently new exotic species is included.

Kuhnia scombri (Kuhn, 1829) Sproston, 1945

Figs. 8–14

Synonyms: Octostoma scombri Kuhn, 1929; *Octobothrium scombri* (Kuhn, 1829) Nordmann, 1832; *Octocotyle scombri* (Kuhn, 1829) Bene-

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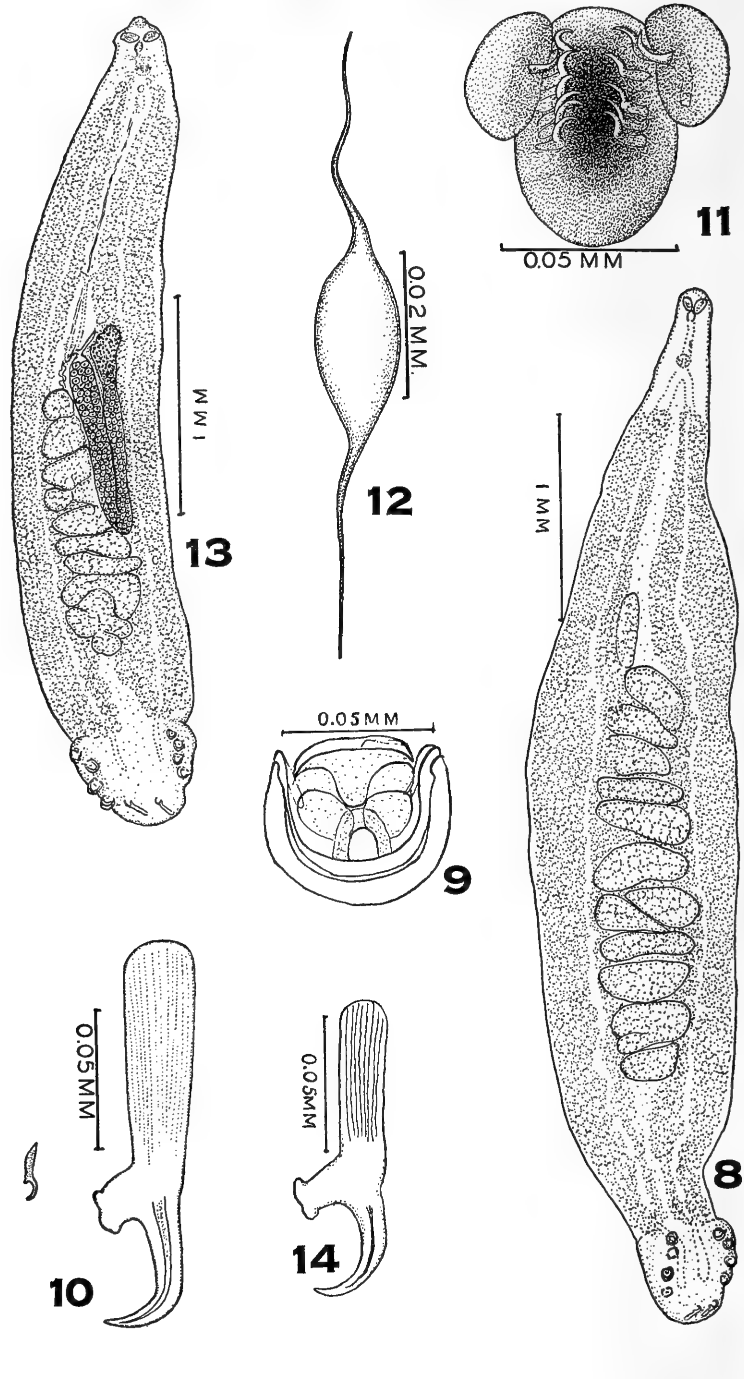
[3] *Kuhnia otolithis,* which was described by Yamaguti (1953), has been transferred by Hargis (1955) to the genus *Tagia* Sproston which he placed in the family Discocotylidae, since the type of opisthohaptoral clamps and the type and arrangement of the genital hooks eliminated it from the genus *Kuhnia.* Tripathi (1959) was in agreement with Hargis in eliminating this species from the genus *Kuhnia,* but believed that it "belongs to Diclidophoridae as suggested by its genital coronet and the asymmetrical advanced clamp structure."

Kuhnia brami (Parona and Perugia, 1896) Sproston, 1946 has been shown by Bychowsky (1957) to belong to the genus *Winkenthughesia* Price and, accordingly, is referable to the family Gastrocotylidae.

[4] *Kuhnia minor* (Goto) of Sproston (1945) which she reported from *Scomber scombrus* in the English Channel area, on the basis of shape of the large anchors, cannot be the same as the species described by Goto (1894) under that name from *Scomber colias* (= *S. japonicus*). The large anchors described and figured by Sproston for the species which she regarded as *K. minor* are "Slender and wholly solid with thin U-shaped hook and spur about midlength. The shaft is ridged." The corresponding anchors of Goto's species have short, wide shafts which are not ridged. There are also differences in the number and arrangement of the hooks of the genital corona. In view of these differences, the writer proposes for *Kuhnia minor,* Sproston, 1945 (not Goto) the name *Kuhnia sprostonae* new name.

[5] *Kuhnia thunni* (Ishii, in Ishii and Sawada, 1938) Sproston, 1946, is properly allocated to *Kuhnia* Sproston. The writer (Price, 1943) noted that "*Dactylocotyle minor* Ishii (1936) renamed *D. thunni* Ishii, in Ishii and Sawada (1938), does not belong to the genus *Dactylocotyle* (= *Diclidophora*) but is a species of *Mazocraes.*" This statement was based on an examination of a paratype specimen kindly supplied by Prof. Ishii. The specimen was not in the best of condition, but was sufficiently good to show its generic affinities. Figs. 15–18 of Ishii's specimen are included herein for comparison with other species of *Kuhnia.* The allocation of this species to *Mazocraes* was made before Sproston (1945) had established the genus *Kuhnia.*



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den and Hesse, 1864; *O. truncata* Diesing, 1850; *O. major* Goto, 1894; *Octoplectanum truncatum* (Diesing, 1850) Diesing, 1858; *Kuhnia major* Yamaguti, 1953.

Description: Body lanceolate, 3.5 to 4.9 mm long by 0.68 to 1 mm wide. Prohaptoral suckers 0.057 to 0.068 mm wide. Opisthohaptor linguiform, 0.43 to 0.51 mm long by 0.30 to 0.51 mm wide, set off from body proper by slight constriction, bearing four pairs of clamps arranged in two more or less parallel rows and with two pairs of anchors near tip; clamps of mazocraeid type, 0.057 to 0.064 mm wide; lateral anchors 0.095 to 0.1 mm long, median anchors about 0.020 mm long. Oral aperture slightly subterminal; pharynx oval, 0.057 mm long by 0.040 mm wide; esophagus about 0.3 to 0.5 mm long; intestinal branches with numerous median and longer, branched lateral diverticula, terminating at or near level of most distal pair of opisthohaptoral clamps. Genital aperture median, 0.20 to 0.60 mm from anterior end of body. Genital corona consisting of five to six pairs of inner hooks arranged in two vertical rows, and a pair of somewhat larger lateral hooks which arise from kidney-shaped pads; inner hooks about 0.018 mm long, outer or lateral hooks about 0.030 mm long. Testes about 10 to 12 in number, median and largely postovarial. Ovary U-shaped, occupying anteriormost portion of testicular field. Genito-intestinal canal opening into right intestinal limb about level of proximal end of ovary. Vitelline follicles numerous, extending from shortly posterior to genital aperture to anterior margin of opisthohaptor. Eggs about 0.28 mm long by 0.18 mm wide, with polar prolongations about 0.32 mm long.

Hosts: Scomber scombrus and *Pomatomus saltatrix.*

Location: Gills.

Distribution: Europe, Asia and North America (Canada; United States: Baltimore, Maryland; Woods Hole, Massachusetts; Newport, Rhode Island; and New York, New York).

Specimens: USNM Helm. Coll. no. 35615 (four specimens, *Scomber scombrus,* Baltimore, Maryland, 10 May 1909); 35616 (one specimen, *S. scombrus,* New York Aquarium, 1911); 35617 (one specimen, *Pomatomus saltatrix,* New York Aquarium, 2 April 1912); 35618 (four specimens, *S. scombrus,* Woods Hole, Massachusetts, 23 July 1920); 35619 (one specimen, *S. scombrus,* New York Aquarium, 17 June 1915); 35620 (four specimens, *S. scombrus,* Baltimore, Maryland, 30 April 1927); and 35621 (six specimens, *S. scombrus,* Baltimore, Maryland, 10 October 1927). All of these specimens were collected by G. A. MacCallum.

Most of the specimens available were not in the best of condition,

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FIGS. 8–14. *Kuhnia scombri.* 8.—complete worm, male phase; 9.—opisthohaptoral clamp; 10.—opisthohaptoral anchors; 11.—genital corona; 12.—egg; 13.—complete worm, dorsal view—British specimen supplied by Hon. Miriam Rothschild; 14.—large opisthohaptoral anchor from British specimen.

showing evidence of considerable abuse in technique of preserving and staining. All of the specimens were in or approaching the male sex phase, as described by Sproston (1945), since the ovary showed varying degrees of atrophy. In general the specimens agreed in all essentials with those described by Parona and Perugia (1889), Goto (1894, 1899), Layman (1930), and Sproston (1945).

Kuhnia brevoortia Hargis, 1955

Fig. 19

Description: See Hargis (1955).

Host: Brevoortia patronus.

Location: Gills.

Distribution: United States (Alligator Harbor, Florida).

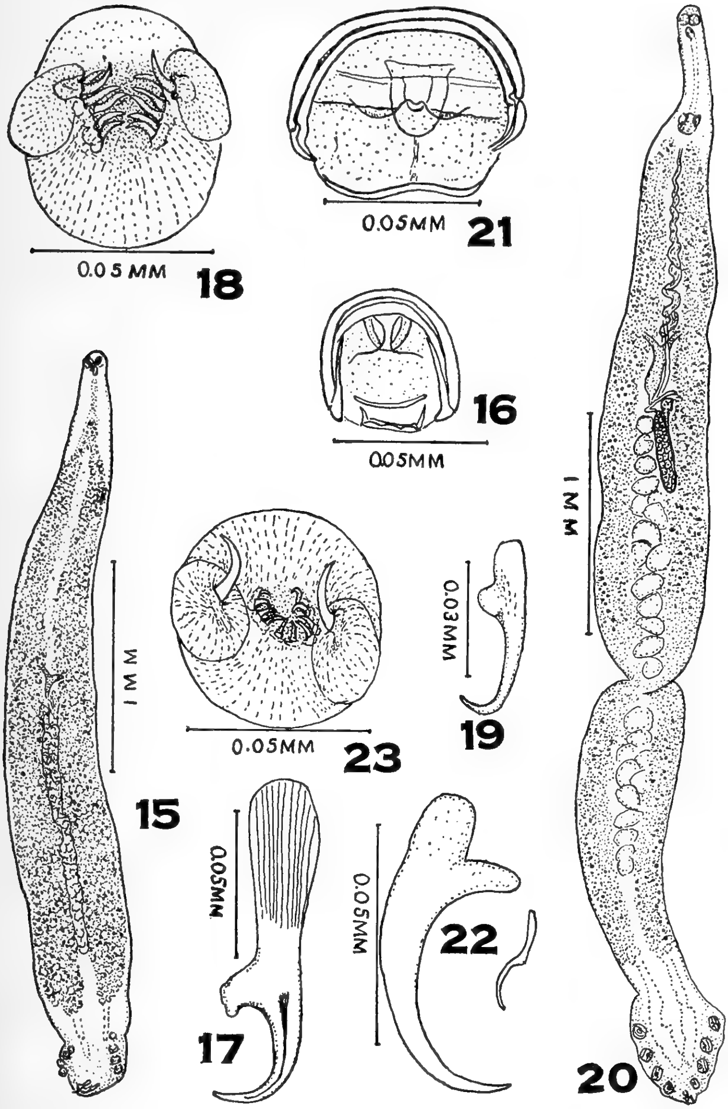
Specimen: USNM Helm. Coll. no. 37491 (holotype).

The description given by Hargis (1955a) is adequate except for the number of spines in the genital corona. An examination of the holotype specimen shows that there are twelve inner hooks or spines instead of eleven as given by Hargis. The arrangement of these hooks is similar to that described for *K. minor* (Goto), and for the species described later on in this paper as *K. singaporensis,* in that the two vertical rows converge posteriorly to form a semicircle. The large opisthohaptoral anchors are probably similar to those of the above mentioned species rather than to those of the other species of *Kuhnia,* but this cannot be determined with certainty because they are not in a position to be observed laterally.

Kuhnia singaporensis, new species

Figs. 20–23

Description: Body elongate, slender, 3.25 to 5 mm long by 0.4 to 0.5 mm wide. Prohaptoral suckers cup-like, about 0.050 mm in diameter. Opisthohaptor somewhat triangular, 0.4 to 0.5 mm long by 0.3 to 0.5 mm wide, bearing four pairs of mazocraeid-type clamps in convergent rows; clamps of anterior three pairs 0.054 to 0.060 mm long by 0.072 to 0.080 mm wide, those of posterior pair slightly smaller, 0.050 to 0.055 mm long by 0.063 to 0.070 mm wide; anchors two pairs, those of outer pair about 0.045 to 0.050 mm long with long, curved blade and short, solid roots and those of inner pair about 0.014 to 0.018 mm long. Oral aperture subterminal; pharynx oval, 0.023 mm long by 0.018 mm wide; esophagus about 0.6 mm long; intestine apparently as in other species, terminating at about level of third pair of opisthohaptoral clamps. Genital aperture immediately anterior to esophageal bifurcation. Genital corona consisting of five pairs of inner hooks arranged in converging vertical rows, forming an ill-defined semicircle, and a larger pair with outwardly directed tips; hooks of inner circle about 0.018 mm long, those of outer pair about 0.024 mm long, including roots. Vas deferens convoluted and distended with sperm. Testes indistinctly follicular, about 20 or more, extending in median field from level of anterior pole of ovary to about one-fifth of body length from posterior end. Ovary U-shaped, to right of median



FIGS. 15–18. *Kuhnia thunni.* 15.—complete worm, ventral view; 16.—opisthohaptoral clamp; 17.—large opisthohaptoral anchor; 18.—genital corona.

FIG. 19. *Kuhnia brevoortia.* Large opisthohaptoral anchor.

FIGS. 20–23. *Kuhnia singaporensis.* 20.—complete worm, twisted specimen; 21.—opisthohaptoral clamp; 22.—opisthohaptoral anchors; 23.—genital corona.

line. Genito-intestinal canal opening into right intestinal branch about level of anterior tip of ovary. Vitelline reservoir Y-shaped, preovarial; vitelline follicles extending from esophageal bifurcation to a short distance anterior to opisthohaptor. No eggs present.

Host: "Ikan Trubot."

Location: Gills.

Distribution: Asia (Singapore).

Specimens: USNM Helm. Coll. no. 36302 (syntypes).

This species is based on three specimens on a slide from the collection of the late G. A. MacCallum. They were presumably collected by his son, the late W. G. MacCallum, at Singapore, 20 July 1916. *Kuhnia singaporensis* resembles *K. minor* (Goto) and *K. brevoortia* Hargis more closely than any of the other species of the genus. It differs from *K. minor* particularly in having the opisthohaptor distinctly set off from the body and in not having the vitellaria extending into the haptoral area; in this respect it resembles *K. brevoortia.* The large anchors, on the other hand, are of the same type as those of *K. minor,* and different from those of the other species except possibly *K. brevoortia.*

Genus *Paramazocraes* Tripathi, 1959

Diagnosis: Opisthohaptor with clamps unequal in size, of mazocraeid type, with long, thin terminal lappet bearing three pairs of anchors. Genital corona with a pair of lateral hooks and four pairs of inner hooks, the latter dissimilar and in vertical rows, anterior two pairs sickle-like and posterior two pairs palmate. Vitelline follicles entering opisthohaptor. Vagina single, opening dorsally and medially.

Type species: Paramazocraes thrissocles Tripathi, 1959, from *Thrissocles mystax.*

Included species: Paramazocraes phasae Tripathi, 1959, from *Setipinna phasa.*

Both species of *Paramazocraes* are parasites of Indian fishes and will not be considered further in this paper.

Genus *Pseudanthocotyle* Bychowsky and Nagibina, 1954

Synonym: Indomazocraes Tripathi, 1959.

Diagnosis: Opisthohaptor with unequal clamps, anterior pair much larger than posterior three pairs, all of mazocraeid type, and with three pairs of anchors, those of outer pair much larger than inner pairs. Genital corona similar to that of *Kuhnia.* Vitelline follicles not entering opisthohaptor. Vagina apparently absent.

Type species: Pseudanthocotyle pavlovskyi Bychowsky and Nagibina, 1954, from *Scomber canagurta.*

Included species: Pseudanthocotyle jagannath (Tripathi, 1959) new combination (synonym: *Indomazocraes jagannath* Tripathi, 1959), from *Rastrelliger kanagurata.*

As no representative of this genus has been reported from North American hosts, it will not be considered further.

Neomazocraeinae, new subfamily

Diagnosis: Opisthohaptor with four pairs of clamps of a modified mazocraeid type, and with two pairs of anchors. Genital corona similar to that of *Kuhnia.* Ovary convoluted, with distal end directed anteriad. Vitelline follicles entering opisthohaptor. Vagina Y-shaped, openings dorsolateral.

Type genus: Neomazocraes Price, 1943.

Genus *Neomazocraes* Price, 1943

Diagnosis: Characters of subfamily.

Type species: Neomazocraes dorosomatis (Yamaguti, 1938) Price, 1943 (synonym: *Discocotyle dorosomatis* Yamaguti, 1938), from *Dorosoma thrissa* and *Gonialosa manmina.*

Included species: Neomazocraes anadontostomae Tripathi, 1959, from *Anodontostoma chacunda.*

No representative of this genus is known to occur on North American hosts.

Mazocraeoidinae, new subfamily

Diagnosis: Opisthohaptor consisting of four pairs of mazocraeid clamps distributed along sides of body and embracing area occupied by gonads; anchors two or three dissimilar pairs. Genital corona of *Kuhnia* type. Vagina present or (?) absent.

Type genus: Mazocraeoides Price, 1936.

Key to Genera of Mazocraeoidinae

1.—Opisthohaptoral area embracing zones of ovary and testes .... *Mazocraeoides* Price

Opisthohaptoral area embracing zone of testes only .... *Pseudomazocraeoides* new genus

Genus *Mazocraeoides* Price, 1936

Synonym: Pseudocotyla Yamaguti, 1938.

Diagnosis: Opisthohaptoral clamps relatively small, usually open, occupying area embracing zones of ovary and testes. Vagina present or (?) absent.

Type species: Mazocraeoides georgei Price, 1936, from *Pomolobus pseudoharengus, P. mediocris,* and *Clupea harengus.*

Included species: Mazocraeoides dorosomatis (Yamaguti, 1938) Sproston, 1946, from *Dorosoma thrissa; M. gonialosae* Tripathi, 1959, from *Gonialosa manmina; M. hargisi* new species, from *Brevoortia patronus; M. nematalosae* Tripathi, 1959, from *Nematalosa nasus; M. olentangiensis* Sroufe, 1958 (synonym: *M. simile* Price, 1959), from *Dorosoma cepedianum; M. opisthonema* Hargis, 1955, from *Opisthonema oglinum; M. prashadi* Chauhan, 1952, from body surface of a clupeid fish; *M. tennesseensis* new species, from *Dorosoma cepedianum;* and *M.*

esmarkii (T. Scott, 1901) new combination,[6] from *Gadus esmarkii* Nielss. Of these, *M. georgei, M. hargisi, M. olentangiensis, M. opisthonema* and *M. tennesseensis* occur on North American hosts.

Mazocraeoides georgei Price, 1936
Figs. 24–27

Description: Body clavate to oval, 1.5 to 2.2 mm long by 0.34 to 0.76 mm wide. Prohaptor in form of a pair of suckers, 0.026 to 0.030 mm, opening into oral cavity. Opisthohaptor consisting of four pairs of clamps, ventrolateral, sessile or slightly pedunculated, occupying zone of testis and ovary, and of a small terminal lappet bearing three pairs of anchors. Clamps of open mazocraeid type, about 0.040 mm in length and width. Anchors of outer pair 0.060 to 0.065 mm long, those of intermediate pair about 0.012 mm long, and those of inner pair about 0.015 mm long. Oral aperture slightly subterminal; pharynx oval, 0.050 to 0.053 mm long by 0.026 to 0.030 mm wide; remainder of digestive system obscured by vitelline follicles. Genital aperture 0.14 to 0.21 mm from anterior end. Genital corona consisting of five to six pairs of inner hooks arranged in two vertical rows and one pair of lateral hooks, each situated on a reniform pad; hooks of inner rows about 0.009 to 0.010 mm long, outer hooks 0.010 to 0.014 mm long. Testis elongate, deeply lobed, in posterior third of body. Ovary U-shaped, to right of testis. Genito-intestinal canal strongly developed, curving around proximal tip of ovary and entering right intestinal limb near level of distal pole of ovary. Vitelline reservoir somewhat triangular to Y-shaped, lying largely in zone of proximal portion of ovary. Vaginal aperture dorsal, median, about 0.3 to 0.4 mm from anterior end. Vitelline follicles dense, extending from a short distance distal to genital aperture to posterior end of body, almost completely obscuring internal structures in most specimens. Egg about 0.23 mm by 0.068 mm, with polar prolongations of variable lengths.

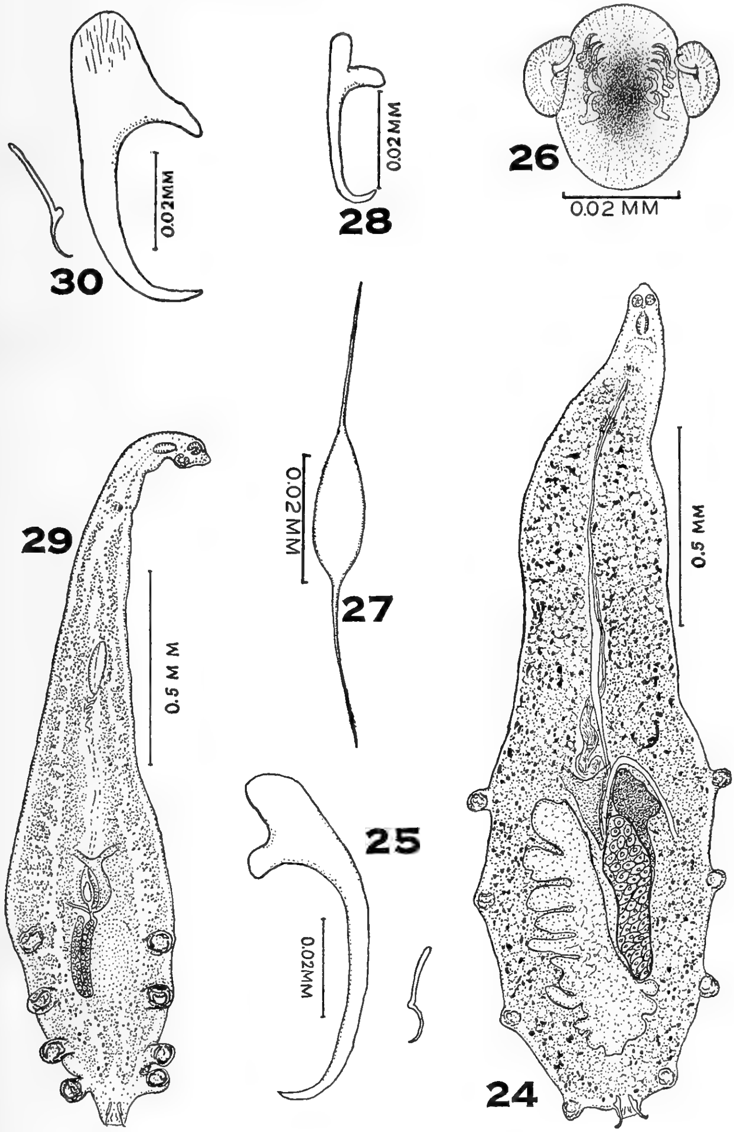
Hosts: Pomolobus pseudoharengus, P. mediocris, and *Clupea harengus.*

Location: Gills.

Distribution: United States (Woods Hole, Massachusetts).

Specimens: USNM Helm. Coll. no. 8159 (nine specimens, *Pomolobus pseudoharengus,* 11 August 1908); 35079 (nine specimens, *P. pseudoharengus,* 29 July 1913); 35623 (syntypes) (seven specimens, *P. pseudoharengus,* 7 July 1913); 35624 (five specimens, *P. pseudoharengus,* 30

[6] The inclusion of *M. esmarkii* in the genus *Mazocraeoides* is questionable, since it was reported from a host other than that customarily parasitized by species of Mazocraeidae. The species in question was briefly described as *Octobothrium* (?) *esmarkii* by T. Scott (1901) from "the gills of a specimen of *Gadus esmarkii* Nilss., captured about sixty miles to the southeastward of Sumburgh Head, Shetland." The size given—scarcely 4 mm in length and about 2 mm in width—is considerably greater than for other species of *Mazocraeoides.* In spite of its host relationship, the brief description and figure seem to indicate its inclusion in this genus. It can hardly belong in the genus *Diclidophora,* in spite of its host, as Sproston (1946) suggests.



FIGS. 24–27. *Mazocraeoides georgei.* 24.—complete worm, dorsal view; 25.—opisthohaptoral anchors; 26.—genital corona; 27.—egg.

FIG. 28. *Mazocraeoides opisthonema.* Large opisthohaptoral anchor.

FIGS. 29–30. *Mazocraeoides olentangiensis.* 29.—complete specimen, greatly extended; 30.—opisthohaptoral anchors.

July 1912); 35625 (one specimen, *Clupea harengus,* 27 July 1913); 35626 (one specimen, *P. pseudoharengus,* 13 July 1922); and 35627 (nine specimens, *C. harengus,* 15 July 1924). Of these, those listed as 8159 were collected by Edwin Linton and all others were by G. A. MacCallum. The record from the hickory shad, *P. mediocris,* is based on Linton's (1940) record of one specimen having been collected from this host at Woods Hole, Massachusetts, 20 August 1910.

Most of the specimens available, with the exception of nos. 8159 and 35623, were in rather poor condition, having been excessively flattened or otherwise mistreated during preservation.

This species was originally described (Price, 1936) briefly as the type of a monotypic genus and the characters given were largely generic. Linton (1940) redescribed the species in greater detail and, subsequently, Hargis (1955a) gave a description of it based on a part of the original specimens (USNM Helm. Coll. no. 35623) from the MacCallum Collection (not Linton's as stated). This description was as accurate as the condition of the specimens would permit except for the number of hooks in the genital corona. He stated that there were "three pairs of dorsally curved spines" but actually there are five to six pairs. Hargis also pointed out that the eggs were variable in shape, some with filaments at both ends, others with none. This statement is correct. However, it appears reasonably obvious from a study of the eggs that those without filaments were abnormally developed, the filaments being represented by small, button-like knobs at the poles.

Mazocraeoides hargisi, new species

Synonym: Mazocraeoides georgei, of Hargis, 1955, not Price, 1936.

Description: See Hargis (1955).

Host: Brevoortia patronus.

Location: Gills.

Distribution: United States (Alligator Harbor, Florida).

Hargis (1955) gave two descriptions of *Mazocraeoides georgei* Price, one based on specimens from the MacCallum collection and the other on material which he collected from Gulf Menhaden in Florida. In the paper mentioned, and also later, Hargis (1955b, 1959) pointed out that the specimens differed noticeably and consistently from those from *Promolobus* spp. However, "he did not wish to mix the two groups because specific separation might later be necessary." While the present writer has not been able to secure Hargis' material for study, a comparison of his description with specimens of *M. georgei* from the MacCallum collection showed that the two forms are unquestionably similar. However, since the measurements, particularly of the anchors and other hard parts, show considerable differences, in addition to differences in hosts, it seems preferable to regard the form from *Brevoortia patronus* as distinct from *M. georgei* and propose for it the name *Mazocraeoides hargisi* new species.

Mazocraeoides opisthonema Hargis, 1955

Fig. 28

Description: See Hargis (1955).

Host: Opisthonema oglinum.

Location: Gills.

Distribution: United States (Tampa Bay, Florida).

Specimen: USNM Helm. Coll. no. 37490 (holotype).

The description of this species as given by Hargis (1955b) appears to be as accurate as the condition of the specimen permits. An examination of the holotype specimen showed it to be somewhat mutilated, apparently due to excessive pressure during mounting, and was not well stained differentially. Aside from the features mentioned by Hargis, the small size of the opisthohaptoral anchors appears to be distinctive.

Mazocraeoides olentangiensis Sroufe, 1958

Figs. 29–30

Synonyms: Mazocraeoides similis Price, 1959; (?) *Mazocraes cepedianum* Kimpel, 1938 (nomen nudum).

Description: See Sroufe (1958).

Host: Dorosoma cepedianum.

Location: Gills.

Distribution: United States (Ohio, Tennessee, Alabama and (?) Illinois).

Specimens: USNM Helm. Coll. nos. 38339 (holotype) and 38340 (paratypes)—collected by Stanley A. Sroufe, Jr., from Olentangy River near Columbus, Ohio; 37711 and 37712—collected by Ralph G. Bangham from Norris and Reelfoot Lakes, Tennessee, respectively; and 37713—collected by E. W. Price from Tennessee River at Guntersville, Alabama.

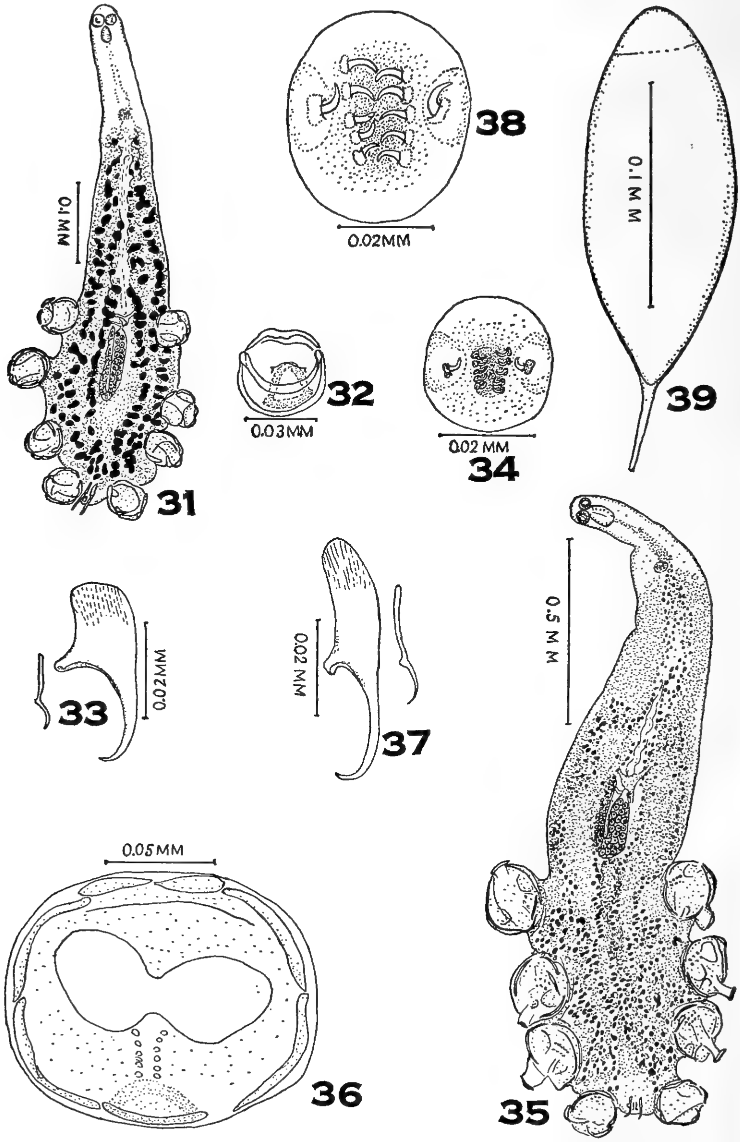
A study of the specimens listed above shows that Sroufe's (1958) description is adequate and need not be repeated here. The species, aside from host relationship and other differences listed by Sroufe, may easily be distinguished from *Mazocraeoides georgei* in the absence of a vaginal opening and in the morphology of the large anchors.

The inclusion in the synonomy of *Mazocraes capedianum* Kimpel (1938) is questionable since there are at present at least four species of mazocraeids known from that host. However, since *M. olentangiensis* is the species commonly found on that host, it appears more than likely this was the form Kimpel had before him.

Mazocraeoides tennesseensis, new species

Figs. 31–34

Description: Body clavate, 0.38 to 0.67 mm long by 0.1 to 0.3 mm wide in haptoral region. Prohaptoral suckers circular, about 0.016 mm in diameter. Opisthohaptor consisting of four pairs of open type mazocraeid clamps, situated along body margins and embracing greater portion of posterior half of body, and two pairs of terminal anchors; clamps



FIGS. 31–34. *Mazocraeoides tenesseensis.* 31.—complete worm, ventral view; 32.—opisthohaptoral clamp; 33.—opisthohaptoral anchors; 34.—genital corona.

FIGS. 35–39. *Pseudomazocraeoides megalocotyle.* 35. — complete worm, ventral view; 36.—opisthohaptoral clamp; 37.—opisthohaptoral anchors; 38.—genital corona; 39.—egg.

approximately uniform, about 0.040 to 0.048 mm wide; outer anchors 0.040 to 0.044 mm long, inner about 0.018 to 0.020 mm long. Pharynx oval, about 0.020 mm long by 0.016 mm wide. Esophagus about 0.16 mm long; intestine similar to that of other mazocraeids, containing numerous large masses of dark granules. Genital aperture prefurcal, about 0.13 mm from anterior end of body. Genital corona consisting of two vertical rows of inner hooks, five to each row, and a pair of outer hooks; inner hooks about 0.005 to 0.006 mm long, outer hooks about 0.010 mm long. Testis apparently unlobed, posterolateral to ovary. Ovary U-shaped, occupying zone roughly representing that of the anterior two pairs of opisthohaptoral clamps. Genito-intestinal canal present, opening into right intestinal branch slightly anterior to level of ovarian poles. Vitelline reservoir Y-shaped, preovarial. Vitelline follicles extending from slightly distal to genital aperture to posterior end of body. Vagina not observed. Egg oval, 0.170 to 0.175 mm long by 0.065 to 0.075 mm wide, provided with relatively long posterior filament.

Host: Dorosoma cepedianum.

Location: Gills.

Distribution: United States (Reelfoot Lake, Tennessee).

Specimens: USNM Helm. Coll. no. 37714 (syntypes).

The above description is based on 16 specimens collected in 1941 from gizzard shad caught in Reelfoot Lake by Ralph G. Bangham. This species is distinct from all other members of the genus in the relatively large opisthohaptoral clamps in comparison with body size, in size and shape of anchors, and in the heavily pigmented intestinal tract.

Pseudomazocraeoides, new genus

Synonym: Mazocraeoides Price, 1936, in part.

Diagnosis: Opisthohaptoral clamps relatively large, open, of mazocraeid type, embracing zone of testes only. Vagina (?) absent.

Type species: Pseudomazocraeoides megalocotyle (Price, 1959) new combination.

Pseudomazocraeoides megalocotyle (Price, 1959)

Figs. 35–39

Synonym: Mazocraeoides megalocotyle Price, 1959.

Description: Body clavate, 1.6 to 1.75 mm long by 0.34 to 0.40 mm wide in opisthohaptoral region. Prohaptoral suckers circular, about 0.040 mm in diameter. Opisthohaptor consisting of four pairs of relatively large, slightly pedunculate, open, mazocraeid clamps situated along margins of body and occupying greater part of posterior third of body length; anterior three pairs of clamps 0.16 by 0.14 mm and posterior pair 0.12 mm in diameter; anchors consisting of an outer pair about 0.040 mm long and an inner pair about 0.020 mm long, situated on an indistinct lappet between posterior pair of clamps. Pharynx oval, about 0.070 mm long by 0.040 mm wide. Esophagus long, about one-third or more of total body length, heavily pigmented; intestine with numerous median and lateral, heavily pigmented diverticula, extending to level of posterior pair of opisthohaptoral clamps. Genital aperture about 0.20 to 0.28 mm from anterior end of body. Genital corona of *Kuhnia* type, consisting of two vertical rows of five inwardly directed hooks each and a pair of lateral, outwardly curved, hooks; inner hooks about 0.012 mm long; outer hooks about 0.015 mm long. Testis apparently deeply lobed, median, in opisthohaptoral zone. Ovary U-shaped, in median field slightly anterior to level of proximal pair of opisthohaptoral clamps. Genito-intestinal canal opening into right intestinal limb at or near level of proximal pole of ovary. Vitelline reservoir Y-shaped, immediately pre-ovarial. Vitelline follicles numerous, extending from slightly distal to genital aperture almost to posterior end of body. Vagina not observed. Eggs not present in specimens available.

Host: Dorosoma cepedianum.

Location: Gills.

Distribution: United States (Reelfoot Lake, Tennessee).

Specimens: USNM Helm. Coll. no. 37715 (syntypes).

Clupecotylinae, new subfamily

Diagnosis: Opisthohaptor with four pairs of pedunculate, dorsoventrally reversed, mazocraeid clamps; terminal lappet bifid, each portion bearing an anchor. Esophagus about one-half length of body, with lateral diverticula. Intestine diverticulate, confluent distally. Genital corona of *Kuhnia* type. Oval, crater-like structure of unknown function on ventral side near anterior end of body.

Type genus: Clupecotyle Hargis, 1955.

This subfamily contains two genera which may be separated as follows:

Key to Genera of Clupecotylinae

1.—Opisthohaptoral clamps about equal in size .... *Clupecotyle* Hargis
Opisthohaptoral clamps unequal in size .... *Neoclupecotyle* new genus

Genus *Clupecotyle* Hargis, 1955

Diagnosis: Opisthohaptor provided with four pairs of pedunculate clamps of equal size. Vitelline follicles entering opisthohaptor. Other characters as for subfamily.

Type species: Clupecotyle brevoortia Hargis, 1955, from *Brevoortia patronus* and *B. tyrannus.*

Included species: Clupecotyle lintoni (Koratha, 1955) Hargis, 1959, from *Brevoortia gunteri.*

Clupecotyle brevoortia Hargis, 1955

Figs. 40–41

Synonym: Dactylocotyle sp. Linton, 1901.

Description: The description given by Hargis (1955) appears to be adequate and need not be repeated here.

Hosts: Brevoortia patronus and *B. tyrannus.*

Location: Gills.

Distribution: United States (Alligator Harbor, Florida; Woods Hole, Massachusetts; and Beaufort, North Carolina).

Specimens: USNM Helm. Coll. nos. 37492 (holotype) and 51569.

Four specimens of what appears to be this species were found in the collection of the late H. B. Ward (USNM no. 51569). These had been collected 1 July 1916 from *Brevoortia tyrannus* by A. R. Cooper at Woods Hole, Massachusetts. A comparison of these with the holotype and with Hargis' description indicated that they were identical. Cooper's specimens were on the whole slightly larger than those from Florida—2.7 to 4.7 mm long by 0.60 to 0.85 mm wide; anchors 0.057 to 0.066 mm long; egg 0.285 long by 0.067 mm wide and polar filaments about 0.20 mm long—but otherwise showed no significant differences. No connections with any structure that might be regarded as a vagina were observed with the oval ventral structure that Hargis reported as possibly being a vaginal aperture. The function of this structure is unknown, but the possibility that it may serve as a haptor or adhesive structure is suggested.

The occurrence of this parasite on *Brevoortia tyrannus* makes it almost certain that the specimen reported from that host by Linton (1905) from Beaufort, North Carolina, as *Dactylocotyle* sp. was *C. brevoortia* rather than *C. lintoni* Koratha, assuming that these species are actually distinct.

Clupecotyle lintoni (Koratha, 1955) Hargis, 1959

Fig. 42

Synonym: Diclidophora lintoni Koratha, 1955.

Description: See Koratha (1955).

Host: Brevoortia gunteri.

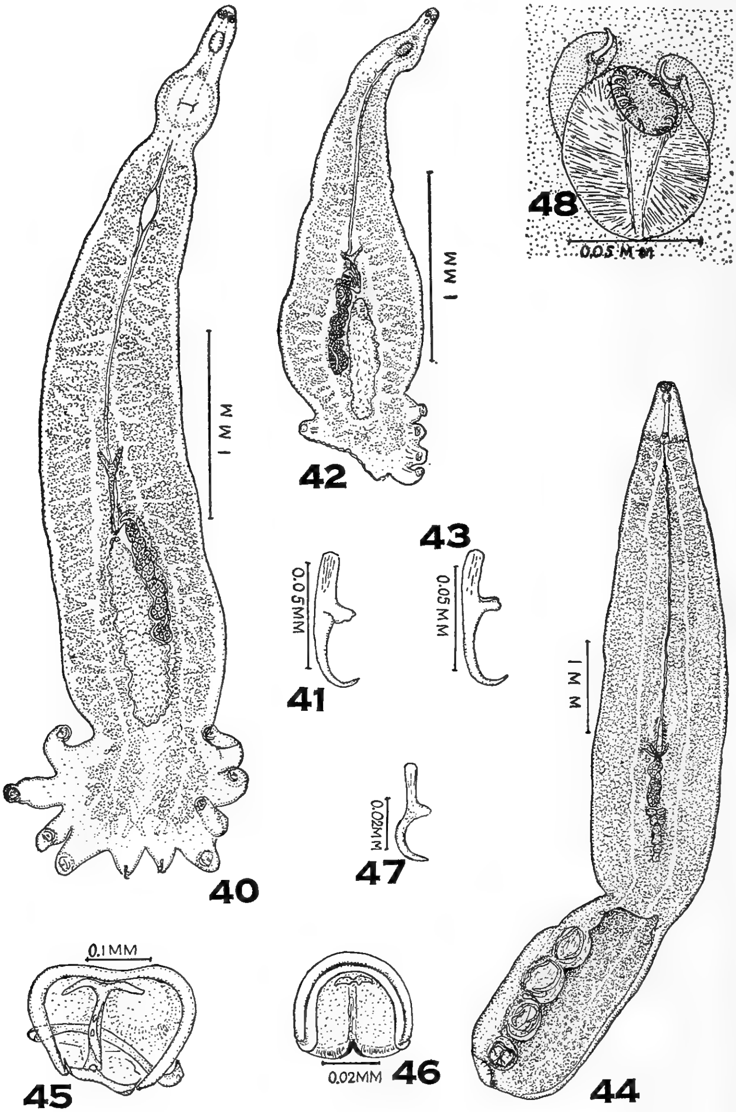
Location: Gills.

Distribution: United States (Port Aransas, Texas).

Specimen: USNM Helm. Coll. no. 54759 (holotype).

A study of the holotype shows that the description given by Koratha (1955) is about as complete as the condition of the specimen permits. In addition to mutilation of the opisthohaptor, the specimen is broken into three parts. It has the appearance of having been allowed to dry, causing it to become brittle and interfering with its ability to stain properly. The hooks of the genital coronet could not be made out with certainty but they appear similar to those of *C. brevoortia* Hargis. The structure near the genital aperture, which Koratha thought was "probably an egg," is the sucker-like ventral depression that Hargis regarded as the vaginal aperture in *C. brevoortia.*

There is little reason to believe that *C. lintoni* is distinct from *C. brevoortia* other than its somewhat smaller size and host. It is probable when an adequate study can be made from additional and better specimens that *C. lintoni* will be found to be a synonym of *C. brevoortia,* as Hargis (1959) suspects.



FIGS. 40–41. *Clupecotyle brevoortia.* 40.—complete worm, dorsal view, from *Brevoortia tyrannus;* 41.—opisthohaptoral anchor.

FIG. 42. *Clupecotyle lintoni.* Holotype, ventral view.

FIG. 43. *Neoclupecotyle megaconfibula,* opisthohaptoral anchor.

FIGS. 44–48. *Grubea pneumatophori.* 44.—holotype, ventral view;

Neoclupecotyle, new genus

Diagnosis: Anterior two pairs of opisthohaptoral clamps much larger than posterior two pairs. Vitelline follicles not extending into opisthohaptor. Other characters as for subfamily.

Type species: Neoclupecotyle megaconfibula (Hargis, 1955) new combination.

This genus differs from *Clupecotyle* mainly in the marked disparity in the size of the opisthohaptoral clamps. The validity of this character may be questioned by some workers but it can hardly be an aberrancy as Hargis (1955a) suggested, especially since the genera *Pseudanthocotyle* Bychowsky and Nagibina, 1954 (Kuhniinae), *Pseudanthocotyloides* Price, 1960 (Mazocraeinae) and *Anthocotyle* Beneden and Hesse, 1863 (Anthocotylidae) were based largely on comparable characters. So far the genus contains only the type species.

Neoclupecotyle megaconfibula (Hargis, 1955)

Fig. 43

Synonym: Clupecotyle megaconfibula Hargis, 1955.

Description: The description given by Hargis (1955) is adequate and need not be repeated.

Host: Brevoortia patronus.

Location: Gills.

Distribution: United States (Alligator Harbor, Florida).

Specimen: USNM Helm. Coll. no. 37493 (holotype).

Grubeinae, new subfamily

Synonym: Pleurocotylinae Monticelli, 1903.

Diagnosis: Opisthohaptor asymmetrical, scoop-shaped, with four modified mazocraeid clamps in a vertical row along right margin and a single minute clamp on left side, comparable in position to most posterior of right clamps; terminal lappet armed with two pairs of dissimilar anchors. Genital corona consisting of a circle of inner hooks and a pair of lateral, outwardly curved hooks. Other characters as in Mazocraeidae.

Type genus: Grubea Diesing, 1858.

Genus *Grubea* Diesing, 1858

Synonyms: Pleurocotyle Gervais and Beneden, 1859; *Pleurocotylus* Gervais and Beneden, 1859.

Diagnosis: Characters of subfamily.

Type species: Grubea cochlear Diesing, 1858, from *Scomber scombrus* and *S. colias.*

Included species: Grubea pneumatophori new species from *Pneumatophorus grex.*

45.—large clamp from right side of opisthohaptor; 46.—small clamp from left side of opisthohaptor; 47.—large opisthohaptoral anchor; 48.—genital corona.

Grubea pneumatophori, new species

Figs. 44–48

Synonym: Pleurocotyle scombri, of Linton, 1940, not Gervais and Beneden, 1859.

Description: Body 8.6 mm long by 1.5 mm wide; anterior part lanceolate, separated from scoop-shaped opisthohaptoral portion by slight constriction. Prohaptoral suckers oval, 0.096 mm long by 0.056 mm wide. Opisthohaptor concave, bearing a row of four clamps on right side and a minute clamp on left side opposite most distal of large clamps; first three of large clamps somewhat larger than most distal one but distorted so that measurements would be of little value; distal large clamp about 0.43 mm wide; small left clamp about 0.044 mm wide. Terminal lappet of opisthohaptor delicate, bearing two pairs of anchors, outermost about 0.040 mm long, innermost about 0.028 mm long. Oral aperture subterminal; pharynx oval, 0.09 mm long by 0.08 mm wide; esophagus bifurcating about 0.86 mm from anterior end; intestinal branches extending almost to end of body, with short median and longer, lateral dendritic diverticula. Genital aperture about 0.6 mm from anterior end of body; genital corona consisting of a circle of 13, possibly 14, inwardly curved hooks, about 0.02 mm long on a muscular bulb-like structure and two outwardly curved hooks, about 0.02 mm long, each on a muscular pad lateral to bulb. Testes relatively few, number not ascertainable, in median field, postovarial. Ovary U-shaped, in median field. Vitelline follicles occupying almost entire body from level of genital aperture to posterior end of opisthohaptor. Vagina double, openings dorsolateral and only slightly posterior to level of genital aperture. No eggs present.

Host: Pneumatophorus grex.

Location: Gills.

Distribution: United States (Woods Hole, Massachusetts).

Specimen: USNM Helm. Coll. no. 8160 (holotype).

This species was described by Linton (1940) as *Pleurocotyle scombri* (Gervais and van Beneden) from a single specimen, collected 9 August 1908, from the gills of a chub mackerel. The specimen was in fair condition but not well stained. It had also been abused during the process of fixing so that the opisthohaptoral clamps and genital corona were somewhat distorted.

That this species may be identical with the European *G. cochlear* Diesing (= *Pleurocotyle scombri* Gervais and Beneden, = *Octobothrium scombri* Grube, not Kuhn) cannot be denied. However, there are some differences such as size of opisthohaptoral clamps, number and arrangement of genital hooks, and host that suggest that the two species are distinct. The size of the large opisthohaptoral clamps are figured by European authors as equal in size whereas in the American species the most posterior clamp is distinctly smaller than the others. The genital hooks are given by Parona and Perugia (1890) as 16 of which the laterals are strongest. Palombi (1949) gave the number as 13 and no laterals were mentioned. In the species considered herein there are 13, possibly 14, inner hooks arranged in a circle on a conspicuous muscular bulb and one pair of laterals, each situated on a distinct pad as in other mazocraeids.

Family Plectanocotylidae Poche, 1925

Synonym: Hexacotylidae Monticelli, 1899 (not based on any corresponding genus, hence invalid).

Diagnosis: Body elongate. Prohaptor in form of two suckers opening into oral cavity. Opisthohaptor provided with three to four pairs of clamps and a terminal hook-bearing lappet; ventral loop elements not fused medially; middle loop elements either not fused medially or united by a bow-shaped piece; center piece more or less scoop-shaped, suggesting that of mazocraeids; anchors two or three pairs, unequal and dissimilar, outer pair larger. Genital corona consisting either of a sheaf of slender spines or a cuticularized sheath-like structure. Testes numerous, either postovarial or both pre- and postovarial. Ovary U-shaped, with limbs directed posteriad. Vitelline follicles extending from near genital atrium to opisthohaptor. Genito-intestinal canal present. Vagina absent.

Type genus: Plectanocotyle Diesing, 1850.

This family contains at present only two genera. These differ in the number of opisthohaptoral clamps and in other characters of equivalent value to those used for subfamily separation in other families. Consequently, the family Plectanocotylidae is here divided into two monogeneric subfamilies, namely Plectanocotylinae Monticelli, 1903, and Octoplectanocotylinae, new subfamily.

Key to Subfamilies of Plectanocotylidae

1.—Opisthohaptor with three pairs of clamps .... Plectanocotylinae Monticelli
Opisthohaptor with four pairs of clamps .... Octoplectanocotylinae, new subfamily

Subfamily Plectanocotylinae Monticelli, 1903

Diagnosis: Opisthohaptor bearing three pairs of clamps and terminal lappet armed with two to three pairs of anchors. Genital corona consisting of a sheaf of needle-like spines. Testes postovarial.

Type genus: Plectanocotyle Diesing, 1850.

Genus *Plectanocotyle* Diesing, 1850

Synonyms: Phyllocotyle Beneden and Hesse, 1863; *Plectanophora* Diesing, 1858; *Plectanophorus* Diesing, 1858; *Platycotyle* Beneden and Hesse, 1863.

Diagnosis: Characters of subfamily.

Type species: Plectanocotyle elliptica Diesing, 1850, from *Labrax mucronatus* (= *Morone americana*).

Included species: Plectanocotyle gurnardi (Beneden and Hesse, 1863) Llewellyn, 1941 (synonyms: *P. caudata* Lebour, 1908, *P. lorenzii* Monticelli, 1899, vide Llewellyn (1941), and *Platycotyle gurnardi* Beneden and Hesse, 1863, vide Sproston (1946), from *Trigla gurnardus, T. lucerna* (= *T. hirundo*), *T. cuculus* (= *T. pini*), and *T. lineata.*

Earlier the writer (Price, 1936) in an abstract listed both *Phyllocotyle* Beneden and Hesse and *Plectanocotyle* Diesing as distinct genera. Because of space limitations the rationale for this action could not be given in the abstract. However, the reasoning at that time was that the description of the type of *Plectanocotyle* was inadequate for identification and that the host belonged to a different family than that of *Phyllocotyle.* The only resemblance between the two genera was the three pairs of opisthohaptoral clamps. No hook-bearing lappet was described for *Plectanocotyle,* suggesting that *P. elliptica* was based on a mutilated specimen. Since this species has not been reported again from the type, or any other host, it seems possible that either the host fish had been misidentified or the specimen had been mislabeled as to origin.

In spite of the fact that the species on which *Plectanocotyle* is based is unrecognizable, the writer is following Sproston (1946) Bychowsky (1957) and others in accepting *Plectanocotyle* and *Phyllocotyle* as possibly identical genera. He is doing so, however, only to preserve the availability of an old genus as he did in the case of *Erpocotyle* Beneden and Hesse (Hexabothriidae) and *Cyclocotyla* Otto (Diclidophoridae). In this connection, it may be noted that both of the abovementioned authorities recognized without question the validity of *Plectanocotyle* and at the same time rejected both the better characterized *Erpocotyle* and *Cyclocotyla* as unrecognizable.

Plectanocotyle elliptica Diesing, 1850

Fig. 7

Synonym: Plectanophorus ellipticus (Diesing, 1850) Diesing, 1858.

Description: The only descriptions of this species are those of Diesing (1850, 1858) or of others based on these. Diesing's (1858) description is only slightly modified from that given earlier; it is quoted here as follows:

"Corpus lata ellipticum planum. Caput corpore continuum. Os terminale prominulum. Repla sex in postico corporis margino, ventralia, serie simplici, bivalvia, valvulus convexiusculus oppositis, valvula singula fulcris duodus unciformibus apice arcuatim conniventibus et tertio intermedio breviore recto, articulatis membrana inter se juctis. Acetabula duo juxtaposita hemisphaerica infra os sita. Genitalium aperturae . . . Porus excretorius . . . Tractus intestinalis bicruris coccus—Ovipara—Piscium marinorus ectoparasita."

"Longit. 2‴; latit. 1‴."

Host: Labrax mucronatus (= *Morone americana*).

Location: Gills.

Distribution: America.

This species appears not to have been collected since Koller in 1836 obtained the specimens on which Diesing based the above description. It is included here because the host from which the specimens were collected occurs only in American waters.

Octoplectanocotylinae, new subfamily

Diagnosis: Opisthohaptor with four pairs of clamps and a terminal lappet bearing two pairs of dissimilar anchors. Genital armature consisting of a striated cuticularized tube or of slender spines. Testes pre- and postovarial.

Type genus: Octoplectanocotyla Yamaguti, 1937.

Genus *Octoplectanocotyla* Yamaguti, 1937

Diagnosis: Characters of subfamily.

Type species: Octoplectanocotyla trichiuri Yamaguti, 1937, from *Trichiurus japonicus* in Japan. Tripathi (1959) reports what he regards as this species from *Trichiurus muticus* and *T. savala* in India. Assuming the correctness of Yamaguti's (1937) observation on the nature of the genital armature, Tripathi's species can hardly be the same as *O. trichiuri.*

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PROCEEDINGS

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HYBRIDIZATION IN U. S. TREEFROGS OF THE GENUS *HYLA*

By William F. Pyburn and J. P. Kennedy

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The experimental combination of anuran gametes has proved to be an important source of information in investigation of species relationships and of post-mating reproductive isolation. The purpose of this report is to present a list of recent hybrid crosses involving U. S. species of the genus *Hyla*. Only those crosses that have been attempted since the appearance of Moore's (1955) review are included here.

For most hybrid combinations, the terminology of the latest developmental stage reached is that of the author cited. The twelve crosses for which there are no author citations were performed by us. In describing our results, the term "adult" is used if the hybrid attained a size as large as sexually mature frogs of the smallest parental species. Crosses reported by Johnson (1959) between the call races of *Hyla versicolor* are not included in this list since their taxonomic status is still uncertain.

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FEMALE	MALE	LATEST STAGE REACHED	AUTHORS
Gastrophryne carolinensis	*Hyla squirella*	no fertilization	Volpe, 1956
Hyla arenicolor	*Hyla femoralis*	metamorphosed, nearly grown	W. F. Blair, 1958
Hyla arenicolor	*Hyla avivoca*	metamorphosed, nearly grown	W. F. Blair, 1958
Hyla arenicolor	*Hyla versicolor*	metamorphosed, nearly grown	W. F. Blair, 1958

FEMALE	MALE	LATEST STAGE REACHED	AUTHORS
Hyla arenicolor	*Hyla regilla*	yolk plug	W. F. Blair, 1958
Hyla avivoca	*Hyla versicolor*	normal larvae, through metamorphosis	Mecham, 1960a
Hyla avivoca	*Hyla femoralis*	not stated	Mecham, 1960a
Hyla cinerea	*Hyla avivoca*	adult	
Hyla cinerea	*Hyla gratiosa*	adult	
Hyla cinerea	*Hyla gratiosa*	normal larvae, through metamorphosis	Mecham, 1960b
Hyla cinerea	Natural hybrid (*H. cinerea–H. gratiosa*)	normal larvae, through metamorphosis	Mecham, 1960b
Natural hybrid (*H. cinerea–H. gratiosa*)	*Hyla cinerea*	normal larvae, through metamorphosis	Mecham, 1960b
Natural hybrid (*H. cinerea–H. gratiosa*)	Natural hybrid (*H. cinerea–H. gratiosa*)	normal larvae, through metamorphosis	Mecham, 1960b
Hyla cinerea	*Hyla squirella*	adult	
Hyla cinerea	*Hyla versicolor*	adult	
Hyla cinerea	*Hyla crucifer*	tadpole	
Hyla cinerea	*Hyla baudini*	tadpole	
Hyla cinerea	*Hyla raniformis*	tadpole	
Hyla cinerea	*Pseudacris clarki*	tadpole	
Hyla cinerea	*Acris crepitans*	tadpole	
Hyla crucifer	*Pseudacris streckeri*	young frog	Mecham, 1957
Hyla crucifer	*Pseudacris nigrita*	cleavage, no normal larvae	Mecham, 1957
Hyla crucifer	*Pseudacris nigrita*	young frog	Crenshaw, 1958
Hyla crucifer	*Pseudacris nigrita*	young frog	Gosner, 1956
Hyla gratiosa	*Hyla versicolor*	hatched	W. F. Blair, 1958
Hyla gratiosa	*Hyla cinerea*	maturity	W. F. Blair, 1958
Hyla gratiosa	*Hyla cinerea*	normal larvae, through metamorphosis	Mecham, 1960b
Hyla gratiosa	Natural hybrid (*H. cinerea–H. gratiosa*)	normal larvae, through metamorphosis	Mecham, 1960b
Hyla gratiosa	*Hyla arborea*	tadpole	W. F. Blair, 1958

FEMALE	MALE	LATEST STAGE REACHED	AUTHORS
Hyla squirella	*Gastrophryne carolinensis*	no fertilization	Volpe, 1956
Hyla versicolor	*Hyla baudini*	adult	Pyburn and Kennedy, 1960
Hyla versicolor	*Hyla squirella*	adult	Pyburn and Kennedy, 1960
Hyla versicolor	*Hyla avivoca*	normal larvae, through metamorphosis	Mecham, 1960a
Hyla versicolor	*Hyla cinerea*	young tadpole	Pyburn and Kennedy, 1960
Hyla versicolor	*Hyla avivoca*	adult	
Hyla versicolor	F_1 (♀ *H. versicolor* × ♂ *H. avivoca*)	adult	
Hyla versicolor	Natural hybrid (*H. avivoca–H. versicolor*)	normal larvae, through metamorphosis	Mecham, 1960a
Hyla versicolor	*Hyla femoralis*	adult	Pyburn, 1960
Hyla versicolor	F_1 (♀ *H. versicolor* × ♂ *H. femoralis*)	adult	
Hyla versicolor	*Pseudacris clarki*	adult	Pyburn and Kennedy, 1960
Hyla versicolor	*Bufo compactilis*	tail bud	Pyburn and Kennedy, 1960
Hyla versicolor	*Gastrophryne olivacea*	blastula	Pyburn and Kennedy, 1960
Pseudacris nigrita	*Hyla crucifer*	adult	Crenshaw, 1958
Pseudacris nigrita	F_1 (♀ *P. nigrita* × ♂ *Hyla crucifer*)	tail bud	Crenshaw, 1958
Pseudacris nigrita	*Hyla crucifer*	young frog	Gosner, 1956
Pseudacris streckeri	*Hyla crucifer*	young tadpole	Mecham, 1957

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PROCEEDINGS
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TADARIDA AURISPINOSA (PEALE) (CHIROPTERA: MOLOSSIDAE) IN NORTH AMERICA

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On 20–21 November 1959, Clyde F. Herreid, Arturo Jiménez, and the senior author visited the Cueva del Abra, 6 miles NNE of Antiguo Morelos, Tamaulipas, México (see Villa, Jour. Mamm., 41: 314–319, 1960) where they collected more than 100 specimens of *Tadarida yucatanica* (Miller) (= *T. laticaudata ferruginea* Goodwin). Also collected were four specimens of a larger bat which at the time was thought to be *T. femorosacca* (Merriam). Three of the larger *Tadarida* were alive and were taken back to the Instituto de Biologia, Universidad Nacional Autónoma de México, by Jiménez who wished to examine them for rabies. The fourth specimen was prepared as a skin and skull and deposited in the Texas Cooperative Wildlife Collection as No. 6573. Jiménez later prepared his three specimens as skins and skulls for the Instituto de Biologia mammal collection (Nos. 4838, 4839, and 4841). All the bats were collected with a .22-calibre shot pistol and a .410-gauge shotgun either from the walls and ceiling of the cave or from the evening flight as the bats left the cave. Whether the larger bats came from the walls and ceiling or from the evening flight is not known.

On 17 June 1960, Craig E. Nelson and the senior author again collected *Tadarida* from the evening flight as the bats left Cueva del Abra. As in November 1959, there were 10,000 to 20,000 *Tadarida* in the cave. *T. yucatanica* left the cave more or less in groups of varying size and occasionally bats of a size larger than *T. yucatanica* were seen leaving the cave. One of them (TCWC 6574) was collected, and it proved to

TABLE 1.—External measurements of bats referred to *Tadarida aurispinosa*. The type (No. 3726) and No. 6574 TCWC were measured by Handley, the other five by Carter.

MUS. NO.	LOCALITY	HIND FOOT	TIBIA	FOREARM	III META-CARPAL	DIGIT III, PHALANX 1	DIGIT III, PHALANX 2	IV META-CARPAL	DIGIT IV, PHALANX 1	DIGIT IV, PHALANX 2	V META-CARPAL	DIGIT V, PHALANX 1	DIGIT V, PHALANX 2
USNM 3726 ♂	Brazil	11.0	13.6	50.0	50.1	21.1	19.9	48.1	18.8	3.2	28.7	15.3	3.7
CNHM 68561 ♀	Cuzco, Peru	9.9	13.8	51.4	48.4	21.1	18.5	46.8	18.1	2.8	26.9	14.6	3.4
TCWC 6573 ♂	Tamaulipas, México	10.3	13.7	50.3	47.9	21.5	19.4	47.3	18.6	2.8	27.5	14.1	3.7
TCWC 6574 ♂	Tamaulipas, México	10.0	13.3	49.9	49.3	20.3	18.5	47.4	17.4	2.4	27.9	14.7	3.7
IB 4838 ♂	Tamaulipas, México	10.4	13.1	49.7	48.2	21.4	18.8	46.8	18.7	2.9	26.6	15.0	3.7
IB 4839 ♀	Tamaulipas, México	9.9	13.2	49.2	46.9	21.2	17.4	46.4	17.8	2.7	27.0	13.8	3.9
IB 4841 ♀	Tamaulipas, México	10.5	13.7	47.8	46.2	20.9	18.3	44.9	17.6	3.2	26.0	14.3	3.8

be the same as the large *Tadarida* previously collected there. Since the small clusters of bats seen on the walls and ceiling can account for only a small part of the numbers that roost in the cave, the great majority of the *Tadarida* spend the day in the numerous crevices.

Upon comparison with *T. femorosacca*, it became obvious that the large bats from Cueva del Abra could not be associated with that species. They are larger than *T. yucatanica*, *T. femorosacca*, *T. laticaudata* (E. Geoffroy), and *T. europs* (H. Allen), but smaller than *T. molossa* (Pallas). They compared favorably with *T. similis* Sanborn. One of the specimens was sent to Charles O. Handley, U.S. National Museum, to be compared with the type of *T. aurispinosa* (Peale). Handley made the following comments. "Externally, I cannot see any means of distinguishing your specimen from *aurispinosa*. Measurements coincide almost exactly . . . and coloration apparently is similar." The other Mexican specimens (collected in November) are somewhat grayish in color and would seem to correspond more closely to the type of *T. similis* which is described as grayish brown. As shown in the tables, the Mexican

TABLE 2.—Cranial measurements of bats referred to *Tadarida aurispinosa.* Measurements of the type of "*similis*" (CNHM 48560) after Sanborn.

MUS. NO.	LOCALITY	TOTAL LENGTH	ZYGOMATIC BREADTH	INTERORBITAL BREADTH	OCCIPITAL DEPTH	CRANIAL BREADTH	MASTOIDAL BREADTH	CONDYLOBASAL LENGTH	BASAL LENGTH	MAXILLARY TOOTHROW	BREADTH AT M^3	BREADTH AT CANINES	MANDIBULAR TOOTHROW
CNHM 48560 ♂	Bogotá, Colombia	20.7	11.6	3.9	–	9.3	10.4	18.8	–	7.8	8.5	4.7	8.5
CNHM 68561 ♀	Cuzco, Peru	20.8	11.7	3.6	7.5	9.5	10.9	19.1	17.3	7.8	8.4	4.8	8.9
TCWC 6573 ♂	Tamaulipas, México	21.2	11.9	3.7	7.3	9.5	11.3	20.0	18.2	8.2	8.4	4.8	9.4
TCWC 6574 ♂	Tamaulipas, México	21.6	11.7	–	7.1	9.1	10.2	19.9	17.9	8.1	8.1	4.7	9.1
IB 4838 ♂	Tamaulipas, México	21.2	12.0	4.0	7.1	9.7	11.1	19.7	17.8	7.9	8.4	4.6	8.9
IB 4839 ♀	Tamaulipas, México	20.5	11.4	3.7	7.0	9.2	11.0	19.1	17.1	7.8	8.2	4.9	8.8
IB 4841 ♀	Tamaulipas, México	20.7	11.8	3.8	7.2	9.5	11.1	19.1	17.4	7.8	8.6	4.4	9.0

specimens are indistinguishable from either *T. similis* or *T. aurispinosa.*

Shamel (Proc. U.S. Nat. Mus., 78: 1–27, 1931) considered *T. aurispinosa* a synonym of *T. laticaudata.* Sanborn (Field Mus. Nat. Hist., Zool. Ser., 27: 371–387, 1941) named *T. similis* on the basis of one specimen from Bogotá, Colombia, and said that it is a west coast representative of *T. aurispinosa.* Sanborn (Publ. Mus. Hist. Nat. "Javier Prado," Ser. A. Zool., no. 6, 26 pp.,1951) also reported a second specimen of *T. similis* taken with three *T. molossa* in a cave at Huajyumbe, Cuzco, Peru. He defends the recognition of the Colombian and Peruvian specimens as representing a distinct species mainly on the basis that the altitude at Bogotá is high for a tropical bat (*T. aurispinosa*). Since there is no skull for the type of *T. aurispinosa,* Sanborn proposed that the name *T. similis* should be retained at least until more specimens of *T. aurispinosa* were available for study. Now that the five Mexican specimens are available and compare so closely with the type of *T. aurispinosa* and also with the two known specimens of *T. similis,* it is apparent, at least to us, that the two are conspecific and that the name *T. similis* Sanborn should be placed as a synonym of *Tadarida aurispinosa* (Peale). A full synonymy for *T. aurispinosa* is given by Shamel (op. cit., 9–10). *T. aurispinosa* is now known by eight specimens from four localities: Brazil (type, adult male, no. 3726, U.S. Nat. Mus.), Colombia (adult male, No. 48560, Chicago Nat. Hist. Mus.), Peru (adult female, No. 68561, Chicago Nat. Hist. Mus.), and México (two adult males, nos. 6573 and 6574, Texas Cooperative Wildlife Collection; one adult male and two adult females, Nos. 4838, 4839, and 4841, Instituto de Biologia, Universidad Nacional Autónoma de México).

Since the discovery of *T. aurispinosa* in Cueva del Abra constitutes the fifth form of *Tadarida* reported in the literature from that cave, comments on the similarity of three of these forms seems warranted. Villa (op. cit.) found that Goodwin's *T. l. ferruginea* falls within the range of variation of the form he (Villa) recognized as *T. yucatanica.* Dalquest and Hall (U. Kansas Publ. Mus. Nat. Hist., 1: 245–248, 1947) reported that *T. femorosacca* occurs in this same cave. The skull length and basal length of the two specimens collected by Dalquest are 18 mm and 15.0–15.2 mm, respectively. These, the authors state, are less than the minimum given by Shamel (op. cit.) for *T. femorosacca,* but otherwise the specimens agreed with that species. Total length of skull and basal length seem to be two of the three skull measurements that are useful in separating *T. yucatanica* and *T. femorosacca.* The other is the length of the maxillary toothrow, which is slightly greater in *T. femorosacca.* The fact that these two skull measurements in Dalquest's specimens fall within the range of individual variation for *T. yucatanica* from Peten, Guatemala; Yucatán, and Tamaulipas, México and not within that for *T. femorosacca* leads us to believe that Dalquest's two "*T. femorosacca*" from Cueva del Abra are the same as Villa's *T. yucatanica* and Goodwin's *T. l. ferruginea.*

Villa (op. cit.) believes this cave is occupied by large numbers of *T. mexicana* from January to April, but none is known to have been collected there. Of all the *Tadarida* collected there, only two species can be distinguished: *T. yucatanica* (= *T. l. ferruginea* = *T. femorosacca, auct.*) and *T. aurispinosa.*

Although *T. yucatanica* and *T. laticaudata* are very similar, and may in time prove to be conspecific, we prefer to assign all the small *Tadarida* from Cueva del Abra to *T. yucatanica* on geographic grounds. *T. laticaudata* is a South American bat whose geographic range seems to complement that of *T. yucatanica*.

We wish to express our gratitude to Charles O. Handley, U.S. National Museum, for comparing one of the Mexican specimens with the type of *T. aurispinosa*; to Karl F. Koopman, Chicago Natural History Museum, for the loan of the Peruvian specimen; and to Bernardo Villa R., Instituto de Biologia, Universidad Nacional Autónoma de México, for the loan of three Mexican specimens.

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NEW SPECIES OF POLYCHAETE WORMS FROM THE ATLANTIC OCEAN, WITH A REVISION OF THE DORVILLEIDAE

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The five new species and four new genera of polychaete worms described herein were obtained from four sources:

1. Two species, a hesionid and a dorvilleid, collected by Pierre Brunel and others in the Gulf of St. Lawrence and found in the collections of polychaetes at the Station de Biologie Marine, Grande-Rivière, Gaspé, Province of Quebec, Canada, where I worked during the summer of 1959.
2. One species of polynoid, collected by Roland L. Wigley and others off Massachusetts and found in the collections of polychaetes at the U.S. Fish and Wildlife Station at Woods Hole, Massachusetts, where I worked during the summer of 1960.
3. One species of polynoid from the Gulf of Mexico, a part of a collection from Seahorse Key, Florida, sent to me by John L. Taylor.
4. One species of hesionid (some 200 specimens) from the Middle Congo, West Africa, found in the mantle cavities of *Tellina* and sent to me by Arthur G. Humes.

In working up the new genus and species of dorvilleid, it seemed advisable to revise the genera of Dorvilleidae by erecting another new genus and re-establishing a third. The types are deposited in the United States National Museum, Smithsonian Institution.

This study was aided by a grant from the National Science Foundation (NSF G-4833).

FAMILY POLYNOIDAE

Phyllosheila, new genus

Type species: P. wigleyi new species.

Diagnosis: Prostomium with three antennae, with lateral antennae inserted ventrally, without cephalic peaks. Elytra 15 pairs, inserted on segments 2, 4, 5, 7, 9, . . . 21, 23, 26, 29, 32. Segments less than 50. Parapodia biramous. Notosetae stouter than neurosetae, faintly spinous. Neurosetae smooth, bidentate. Ventral cirri enlarged, leaf-like. Ventral surface densely papillated.

Phyllosheila wigleyi, new species

Fig. 1

The species is based on a single specimen (USNM Cat. No. 30007) collected on muddy bottom south of Marthas Vineyard, Massachusetts, *Delaware* cruise No. 59-10, Station 17, 39° 44′ N, 70° 53′ W, 870–970 fathoms, 28 August 1959, R. Fritz, collector. The specimen was snuggled along the ambulacral groove of a large starfish, *Brisinga* sp. The species is named for Roland L. Wigley, who is carrying on interesting benthic studies in the Georges Bank area.

Description: Length 12 mm, width with setae 3 mm, segments 45 (last three small). Body without color, flattened dorsoventrally, tapered gradually posteriorly. Prostomium (Fig. 1, a,b) wider than long, bilobed, rounded anteriorly, lacking cephalic peaks. Median antenna with ceratophore inserted in anterior median notch, with style short, smooth, clavate, with filiform tip. Lateral antennae with short ceratophores inserted ventrally, with short styles. Palps smooth, long (about three times length of prostomium), tapering to short slender tips. Two pairs eyes very large, contiguous, occupying nearly all the lateral surfaces, darker around the periphery, greyish within.

Cirrophores of tentacular cirri lateral to prostomium. Dorsal pair tentacular cirri missing; ventral pair similar to median antenna, only longer. Elytra missing, 15 pairs, as indicated by the elytrophores. Dorsal cirri mostly missing, the few remaining ones cylindrical, with short filiform tip, not extending beyond the setae (Fig. 1, c). Ventral cirri of first setigerous segment (buccal cirri of segment 2) similar to median antenna; from second setigerous segment on, ventral cirri large, leaf-like, tapering laterally to rounded or slightly pointed tips (Fig. 1, b,d,e). Ventral cirri densely papillated on ventral surface; papillae long, slender, longer toward lateral tips of cirri (Fig. 1, f). Ventral surface of papapodia densely covered with larger papillae (Fig. 1, d,g).

Parapodia biramous (Fig. 1, d,e). Notopodia shorter than neuropodia, with projecting acicular lobes and spreading bundles of relatively few (about 6–10), stout, crystal clear setae. Notosetae about twice as thick as neurosetae, with faint spinous markings, tapering to blunt tips (some may be slightly irregular; Fig. 1, h). Neuropodia with bluntly conical presetal and postsetal lips, with a fan-shaped bundle of very numerous

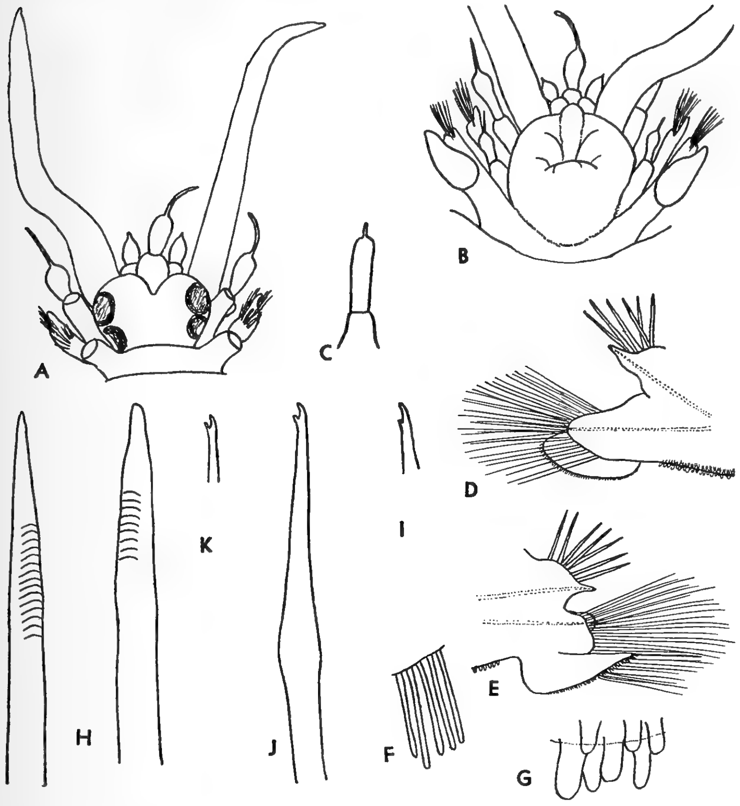

FIG. 1. *Phyllosheila wigleyi* new species: *a*, Dorsal view anterior end (dorsal pair tentacular cirri and elytra missing); *b*, ventral view anterior end (bases of palps only shown); *c*, dorsal cirrus from posterior region; *d*, middle parapodium, anterior view; *e*, same, posterior view; *f*, few papillae from ventral surface of ventral cirri; *g*, few papillae from ventral surface of parapodia; *h*, notosetae; *i–k*, tips of upper, middle and lower neurosetae.

crystal clear setae, suggesting superficially the setal bundles of a heteronereid. Neurosetae with slender stem regions, enlarging distally, then tapering to bidentate hooked tips, without spinous markings (Fig. 1, i–k).

Distribution: Known only from the type locality.

Remarks: Phyllosheila differs from other genera of polynoids in the enlarged ventral cirri, suggestive of the Phyllodocidae. *Gastrolepidia* Schmarda, 1861, and *Phyllohartmania* new genus (see below) are characterized by conspicuous paired ventral foliaceous appendages but the latter are present in addition to and medial to the usual type of ventral cirri.

Phyllosheila wigleyi resembles the bathypelagic polynoid, *Sheila bathypelagica* Monro, 1930, from the Antarctic, in regard to the very large eyes, the glassy and transparent setae, and the general shape of the neurosetae.

Phyllohartmania, new genus

Type species: P. taylori new species.

Diagnosis: Prostomium harmothoid, with distinct cephalic peaks and

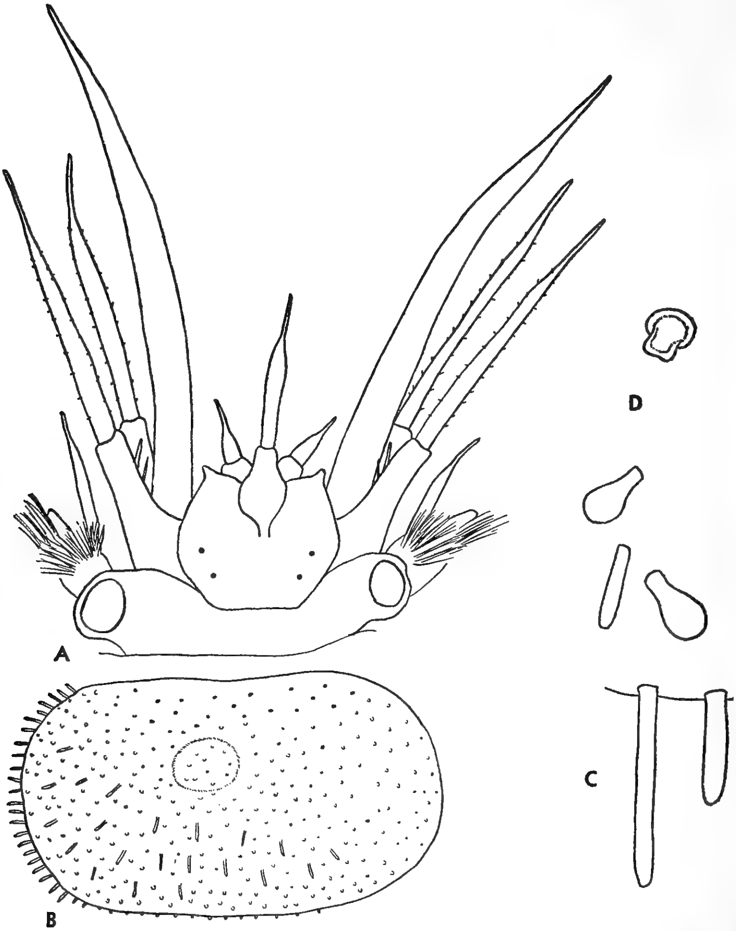

FIG. 2. *Phyllohartmania taylori* new species: *a,* Dorsal view anterior end, elytra removed; *b,* elytron; *c,* few papillae from elytron; *d,* microtubercle from anterior part of elytron.

lateral antennae inserted ventral to median antenna. Elytra 15 pairs, inserted on segments 2, 4, 5, 7, 9, . . . 21, 23, 26, 29, 32. Elytra large, covering the dorsum. Segments less than 40. Parapodia biramous. Notosetae more slender than neurosetae, faintly spinous, tapering to capillary tips. Neurosetae spinous, tapering to slender sharp tips (not hooked). Ventral surface with paired segmental foliaceous appendages.

Phyllohartmania taylori, new species

Figs. 2 and 3

The species is based on a single specimen (USNM Cat. No. 30010) collected at low water, in sand, at Bird Point, Seahorse Key, Florida, in

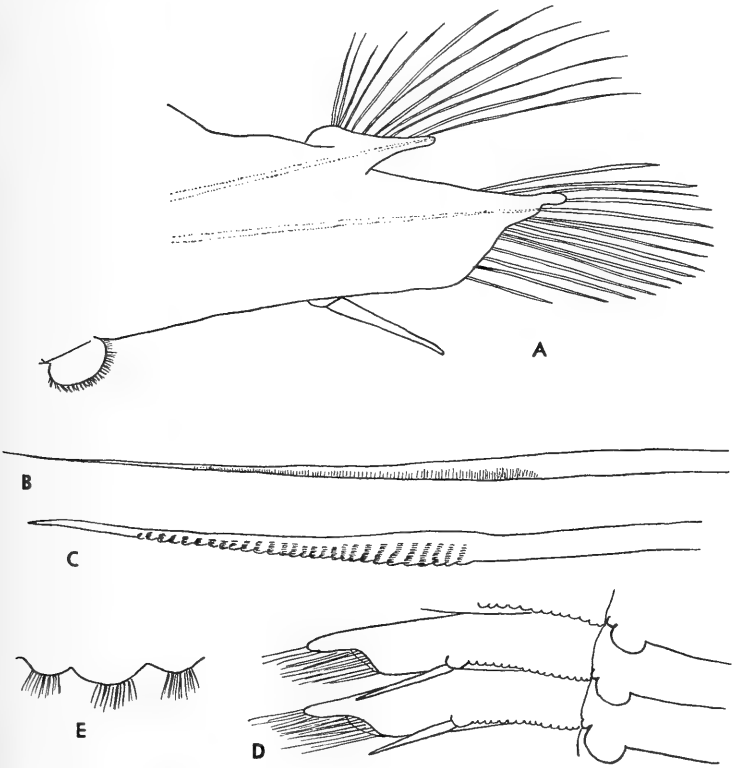

FIG. 3. *Phyllohartmania taylori* new species: *a*, Middle left parapodium and ventral ciliated lamella at base of parapodium, anterior view; *b*, notoseta from same; *c*, middle neuroseta from same; *d*, ventral view of portion of right half of body showing position of ventral lamellae, segmental papillae, papillated ciliated ridges, ventral cirri, parapodia 13 and 14; *e*, portion of ciliated papillated ridge.

the Gulf of Mexico by E. Lowe Pierce, 20 July 1958. The species is named for John L. Taylor, who is working on the polychaetes from Seahorse Key.

Description: Length 21 mm, width with setae 8 mm, segments 37 (last one small). Body widest in the middle third, tapering anteriorly and posteriorly, flattened dorsoventrally. Body iridescent tannish in color, setae yellowish. Elytra 15 pairs, rather large, imbricated, covering the dorsum, oval to subreniform in shape, colorless, thin, transparent. Exposed part of elytra (Fig. 2, b,c) papillate, with papillae of two kinds: 1) slender, filiform, on external border and scattered on surface; 2) short, capitate, on posterior border and scattered on surface. Anterior part of elytra with few scattered microtubercles (Fig. 2, d).

Prostomium (Fig. 2, a) about as wide as long, bilobed, with distinct cephalic peaks. Median antenna with bulbous ceratophore inserted in anterior notch, with style about as long as prostomium, smooth, tapering to filiform tip. Lateral antenna with short bulbous ceratophores inserted ventral to median antenna on prostomium, with short styles. Palps smooth, long, extending beyond tentacular cirri, tapering to slender tips. Two pairs of small eyes on posterior half of prostomium.

Cirrophores of tentacular cirri lateral to prostomium, with projecting aciculum and single stout seta. Two pairs tentacular cirri subequal in length, longer than median antenna, tapering to slender tips, with scattered short papillae. Dorsal cirri with cirrophores bulbous basally; styles long, slender, tapering to slender tips and extending beyond tips of setae, with scattered, short, slightly capitate papillae. Ventral cirri short, slender, tapering. Pair of long slender anal cirri, longer than dorsal cirri.

Parapodia biramous, long, slender, as long as body width (Fig. 3, a). Notopodium shorter than neuropodium, tapering to prominent acicular lobe. Notosetae numerous, forming a radiating bundle, fine, more slender than neurosetae, tapering to capillary tips; upper notosetae stouter and shorter, the rest more slender basally, tapering to longer capillary tips (Fig. 3, b). Neuropodium diagonally truncate distally, with prominent acicular lobe and projecting supraacicular digitiform lobe. Neurosetae basally with long shafts of uniform width, with enlarged distal spinous regions of prominent spinous rows, tapering to slender pointed tips (not hooked); upper neurosetae more slender, with spinous rows extending to near the tips; middle neurosetae (Fig. 3, c) with long bare tips; lower neurosetae shorter, with long bare tips.

Ventral posterior border of parapodia, between cirrophores of ventral cirri and body proper, with tufts of long cilia on a papillated ridge (Fig. 3, d,e). Ventral surface with paired lamellae at base of parapodia, beginning on setigerous segment 3 and continuing posteriorly; lamellae semicircular, equipped with long cilia (Fig. 3, a,d). Segmental papillae (Fig. 3, d) short, globular, inconspicuous, lateral to ventral lamellae, beginning on segment 7, continuing posteriorly. Proboscis of usual polynoid type, with two pairs of interlocking jaws and eleven pairs of papillae around opening, some papillae splotched with black pigment.

Distribution: Known only from the type locality.

Remarks: Phyllohartmania resembles *Hartmania* Pettibone, 1955, in most respects. It differs in the presence of the paired foliaceous appendages on the ventral surface, similar in position to the ventral lamellae characteristic of *Gastrolepidia* Schmarda, 1861.

Phyllohartmania taylori resembles *Hartmania moorei* Pettibone, 1955, in regard to the small eyes, the capillary notosetae, the neurosetae ending in slender sharp tips. It differs in the presence of the paired ventral lamellae (lacking on *H. moorei*) and elytra with papillae (elytra smooth in *H. moorei*).

FAMILY HESIONIDAE

Parasyllidea, new genus

Type species: Parasyllidea humesi new species.

Diagnosis: Prostomium with two antennae (without median antenna), two biarticulate palps. Tentacular cirri six pairs (three pairs on each side). Parapodia subbiramous. Notopodia indistinct, represented by acicula in elongate cirriphores of dorsal cirri, with or without few capillary notosetae. Neuropodia conical (without extra lobes, as in *Nereimyra*). Neurosetae compound, heterogomph, with blades short to long. Proboscis unarmed, with fine hairs around opening.

Parasyllidea humesi, new species

Fig. 4

The species is based on some 200 specimens (USNM Cat No. 30011, holotype, and 30012), collected at Loango, 19 kilometers north of Point Noire, Middle Congo, West Africa, 27 April 1955, by Arthur G. Humes. They were found in the mantle cavities of *Tellina nymphalis* Lamark. The bivalves were found intertidally in muddy sand in estuarine regions, in the vicinity of mangrove swamps where fresh-water streams entered the ocean. Only one hesionid was found in a bivalve. While hesionids, like polynoids, are rather frequently commensalistic, to my knowledge, this is the first record of a hesionid in the mantle cavity of a bivalve. The species is named for Dr. Humes, who collected the specimens.

Description: Length up to 25 mm, width up to 5 mm, segments up to 74. Body relatively short, widest in anterior two-thirds, tapering posteriorly, flattened ventrally, arched dorsally. Color (in life): Light orange to tan with intestine dark reddish brown; (preserved): Cream to yellowish with amber-colored neurosetae. Prostomium (Fig. 4, a,b) subrectangular, wider than long, with a median ridge which disappears when pharynx is extended, with two pairs of black eyes, the anterior pair larger than the posterior pair; lateral antennae and biarticulate palps on anterior margin of prostomium subequal in length, about as long as prostomium, the palps lateral and slightly ventral to antennae.

Tentacular cirri with cylindrical basal cirrophores, three pairs on each side, first pair lateral to prostomium, next two pairs lateral and posterior to prostomium, with 1–2 tentacular segments distinct dorsally; styles of

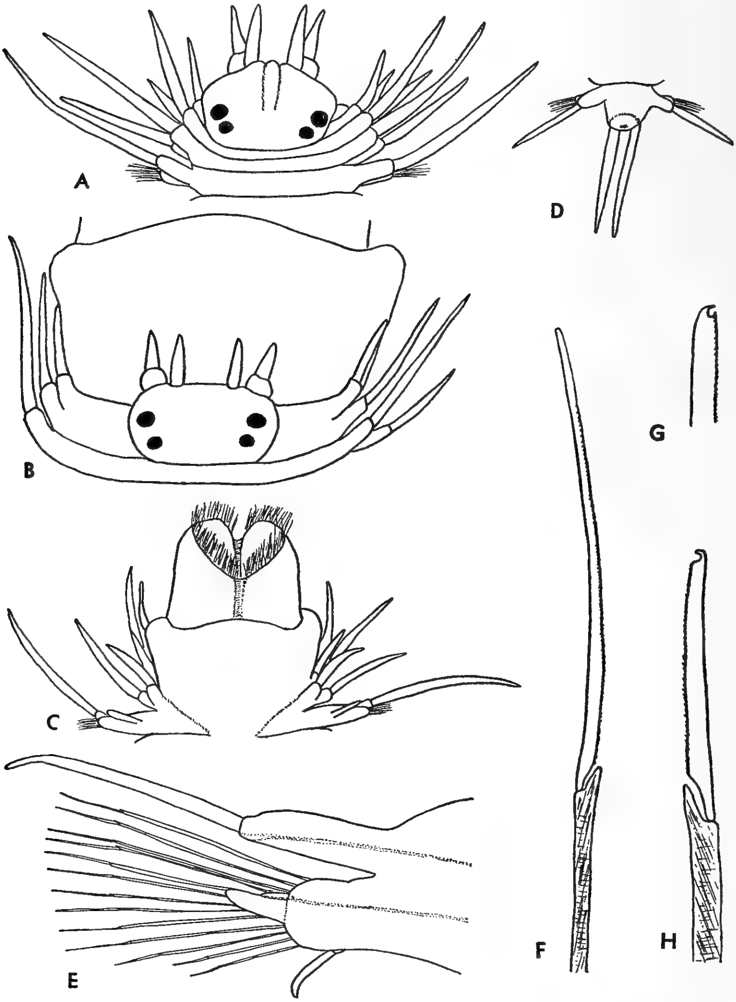

FIG. 4. *Parasyllidea humesi* new species: *a*, Dorsal view anterior end; *b*, same, with pharynx extended, basal part of pharynx only shown; *c*, ventral view anterior end with pharynx extended; *d*, dorsal view posterior end; *e*, middle right parapodium, anterior view; *f*, middle neuroseta; *g*, tip of same, enlarged; *h*, lower neuroseta.

tentacular cirri slender, tapering, upper pairs longer than lower pairs, all shorter than dorsal cirri.

Parapodia (Fig. 4, e) prominent, about as long as width of body, subbiramous, the notopodia represented by few slender curved acicula within the prominent, elongated dorsal cirrophores, without notosetae; styles of dorsal cirri tapering gradually, extending slightly beyond setal tips. Neuropodia elongated, subconical, postsetal lip rounded, presetal lip extending beyond tips of acicula into a digitiform acicular lobe, with 1–2 acicula which are dark amber-colored distally. Neurosetae (Fig. 4, f–h) numerous, forming fan-shaped bundles, light to dark amber-colored, compound, with heterogomph stems, with blades finely pectinate and tips blunt, hooked (may be finely bidentate); middle neurosetae with long blades, upper neurosetae with slightly shorter blades and lower neurosetae with still shorter blades. Ventral cirri slender, digitiform, extending to about length of acicular lobes. Anal end (Fig. 4, d) rounded, with pair of anal cirri slightly longer than the dorsal cirri. Pharynx or proboscis (Fig. 4, c) thick, muscular, with wider basal part and narrower distal ring which is thinner middorsally and midventrally. Opening of pharynx encircled by ring of very fine filmy hairs, without jaws. Some specimens were filled with developing eggs or sperm.

Distribution: Known only from the type locality.

Remarks: Parasyllidea resembles the hesionid genera *Nereimyra* Blainville, 1828 (= *Castalia* Savigny, 1820, preoccupied), *Syllidea* Quatrefages, 1865 (= *Magalia* Marion and Bobretzky, 1875), *Micropodarke* Okuda, 1938, and *Parahesione* Pettibone, 1956, in having two antennae (no median antenna) and two palps on the prostomium and six pairs of tentacular cirri. The five genera can be distinguished as indicated in the following key:

Key to the Hesionid Genera with Two Antennae, Two Palps, and Six Pairs Tentacular Cirri

1.—Parapodia biramous or subbiramous 2

Parapodia uniramous. Without notoacicula. Neuropodia with bilobed presetal lips and rounded postsetal lips. Proboscis unarmed, with filiform papillae .... *Micropodarke* Okuda

2.—Parapodia subbiramous. Notopodia represented by acicula in cirrophores of dorsal cirri, with or without few capillary notosetae 3

Parapodia biramous. Notopodia form distinct lobes, smaller than or subequal to neuropodia, with notoacicula and numerous capillary notosetae. Neuropodia subconical, without extra lobes. Proboscis unarmed, with numerous fine papillae .... *Parahesione* Pettibone

3.—Neuropodia subconical, without extra lobes 4

Neuropodia with three conical lobes. Proboscis with ten or more papillae, with or without pair of ventrolateral ridges .... *Nereimyra* Blainville (= *Castalia* Savigny)

4.—Proboscis bordered with papillae and hairs, with two lateral horny jaws and median stylet .... *Syllidea* Quatrefages (= *Magalia* Marion and Bobretzky)
Proboscis without papillae, with fine hairs around opening, without jaws .... *Parasyllidea* new genus

According to the above revision, *Nereimyra blacki* Knox, 1960, dredged off New Zealand, is referred to *Parasyllidea*. *Parasyllidea humesi* is close to *P. blacki*. The latter lacks eyes (two pairs in *P. humesi*) and has about six capillary notosetae projecting from the dorsal cirrophores (notosetae lacking in *P. humesi*).

Genus *Parahesione* Pettibone, 1956, emended

Type species (original designation): *P. luteola* (Webster, 1880).

Diagnosis: Prostomium with two lateral antennae, without median antenna, with two unjointed (typically) or biarticulate palps, two pairs eyes (typically) or eyes lacking. Tentacular segments three, somewhat fused; tentacular cirri six pairs (three pairs on each side). Parapodia biramous. Notopodia forming distinct lobes below cirrophores of dorsal cirri (typically) or notopodia subequal to neuropodia, with numerous capillary notosetae. Neurosetae compound, with blades long and slender. Proboscis with numerous papillae around opening, without jaws.

Parahesione bruneli, new species

Fig. 5

The species is known from a single incomplete specimen (USNM Cat. No. 30009), dredged on muddy bottom in the Gulf of St. Lawrence, 10 miles off Grande-Rivière, Gaspé South, 48° 18′ N, 64° 18′ W, 60 fathoms, 16 July 1959. It is named for Pierre Brunel, who collected the specimen.

Description: Length for 22 segments 7 mm, width including setae up to 3 mm. Body widest in middle, tapering gradually anteriorly (incomplete posteriorly), flattened dorsoventrally. With wide brownish bands dorsally (in life), colorless (preserved). Prostomium (Fig. 5, a) subrectangular, wider than long, with lateral antennae digitiform, about as long as prostomium, with palps slightly shorter, thicker than and lateral to antennae, distinctly biarticulate, with eyes and median antenna lacking. First tentacular segment indistinct dorsally, cirrophores of the first pairs tentacular cirri lateral to prostomium. Second and third tentacular segments distinct dorsally. Tentacular cirri six pairs, variable in length (easily broken), some long, the upper pairs longer than lower pairs.

Parapodia biramous (Fig. 5, b), with both notopodia and neuropodia well developed, subequal, both with projecting acicular lobes from which 2–3 transparent acicula may project. Both notosetae and neurosetae numerous, arranged in radiating bundles, slender, subequal in diameter basally (some neurosetae slightly stouter than the notosetae), transparent,

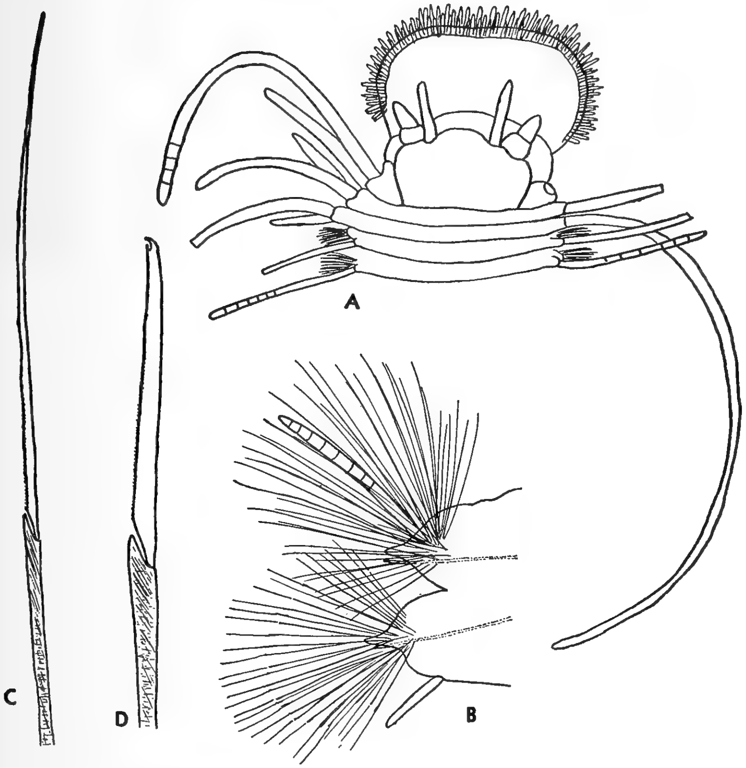

Fig. 5. *Parahesione bruneli* new species: *a*, Dorsal view anterior end, with proboscis extended, first right pair tentacular cirri missing and some of dorsal and tentacular cirri broken; *b*, right parapodium from segment 15, anterior view; *c*, compound neuroseta with long blade; *d*, same, with shorter blade.

iridescent, transversely striated microscopically. Notosetae simple, tapering to capillary tips. Neurosetae (Fig. 5, c,d) compound, finely spinous, the majority with blades long, tapering to fine tips; some of lower neurosetae with blades shorter, with tips hooked, faintly bidentate. Dorsal cirri on posterior faces of notopodia, slender, tapering, sometimes articulate, especially distally, variable in length (easily broken), at least some extending beyond tips of setae. Ventral cirri digitiform, extending slightly beyond parapodial lobes. Proboscis (Fig. 5, a) somewhat flared distally, with numerous papillae around opening, arranged in about 4–5 rows, the papillae tapering to pointed tips.

Distribution: Known only from the type locality.

Remarks: Parahesione bruneli differs from *P. luteola* (Webster) in the following:

	Parahesione luteola	*Parahesione bruneli*
Prostomial eyes:	Two pairs.	Lacking.
Prostomial palps:	Without distinct basal articles.	Distinctly biarticulate.
Three tentacular segments:	One visible dorsally.	Two visible dorsally.
Notopodia:	Smaller than neuropodia, appearing as stout papillae below bases of dorsal cirri.	Subequal to neuropodia.

Family DORVILLEIDAE

Protodorvillea, new genus

Type species: Staurocephalus kefersteini McIntosh, 1869.

Diagnosis: Prostomium with two short dorsal antennae (antennae rarely absent, as in *P. atlantica*), two longer ventral palps. Without nuchal papilla. Parapodia uniramous, without dorsal cirrophores or notoacicula. Dorsal and ventral cirri short, ovoid (dorsal cirri rarely lacking, as in *P. gaspeensis*). Neurosetae of three kinds: (1) simple, capillary; (2) simple, forked; (3) compound, heterogomph. Mandibles elongated pieces, flared and denticled anteriorly. Maxillae four longitudinal rows of numerous denticled plates (two rows on each side).

Protodorvillea gaspeensis, new species

Fig. 6

The species is known from a single incomplete specimen (USNM Cat. No. 30008), collected intertidally among rocks and algae in the Gulf of St. Lawrence at Grande-Rivière, Gaspé South, 2 December 1955, by Pierre Brunel.

Description: Length more than 7 mm (incomplete posteriorly), width up to 0.5 mm, segments more than 27. Body slender, threadlike, having general appearance of a syllid, such as *Exogone,* without color (in alcohol). Prostomium (Fig. 6, a,b) subconical, with faint transverse groove, without eyes, with two short clavate dorsal antennae and two short biarticulate ventral palps. First two tentacular segments apodous and achaetous, first slightly longer than following. Dark mandibles (Fig. 6, b,c) visible ventrally through thin integument, wider, flared, and denticled anteriorly. Dark maxillae visible more dorsally (not dissected out).

Parapodia (Fig. 6, d) uniramous, with single neuroaciculum, without indication of dorsal cirrophores, notoacicula or dorsal cirri. Neuropodia cylindrical. Ventral cirri short, cylindrical. Neurosetae of three kinds: (1) upper ones (1–2 in number, Fig. 6, d,e) simple, slender, arched,

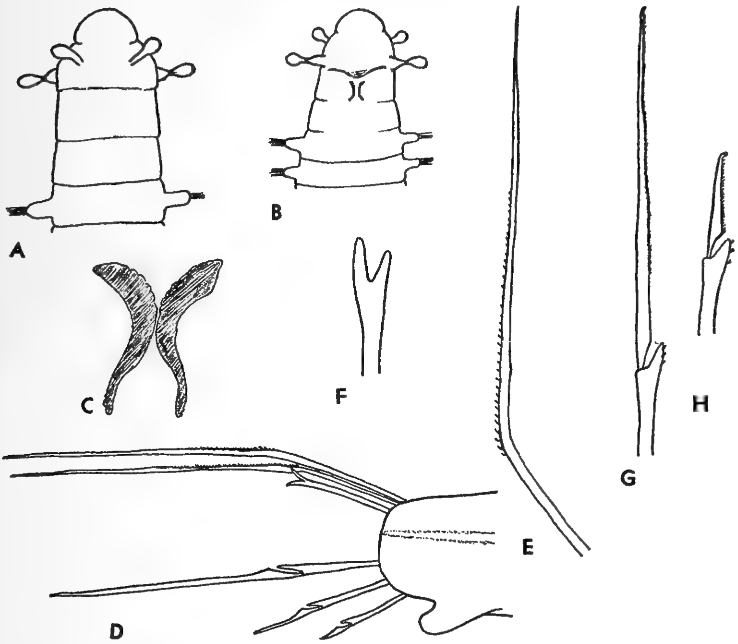

FIG. 6. *Protodorvillea gaspeensis* new species: *a*, Dorsal view anterior end; *b*, ventral view anterior end; *c*, ventral mandibles as seen through the integument; *d*, middle parapodium; *e*, upper simple capillary neuroseta; *f*, upper simple forked neuroseta; *g*, upper subacicular compound neuroseta; *h*, lower subacicular compound neuroseta.

finely spinous; (2) upper one (1 in number, Fig. 6, f) simple, forked, with branches smooth, nearly equal; (3) subacicular ones (3–4 in number, Fig. 6, g,h) compound, heterogomph, with blades long to short, finely spinous, with tips entire, slightly hooked; stems with few spines distally. The single specimen found in December contained very large yolky eggs, beginning in setigerous segment 11, about 2–3 eggs per segment.

Distribution: Known only from type locality.

Remarks: Protodorvillea, as herein defined, includes the following species:

P. kefersteini (McIntosh, 1869), *P. atlantica* (McIntosh, 1885), *P. egena* (Ehlers, 1913), *P. gracilis* (Hartman, 1938), and *P. mandapamae* (Banse, 1959).

Protodorvillea gaspeensis differs from the other species of *Protodorvillea* by lacking dorsal cirri and by having short biarticulate palps. The distinguishing characters of the different species of *Protodorvillea* are indicated in the following key:

Key to the Known Species of *Protodorvillea*

1.—Antennae lacking. Without eyes. Palps long, with distal palpostyles. Dorsal cirri lacking on first setiger. Neuropodia without postsetal lobes. Blades of compound neurosetae with tips entire. .... *P. atlantica* (McIntosh)
(Atlantic, off Azores, 1,000 fathoms)

Antennae present 2

2.—Dorsal cirri lacking on all segments. Palps short, biarticulate. Antennae short, clavate. Without eyes. Neuropodia without postsetal lobes. Blades of compound neurosetae with tips entire, slightly hooked. .... *P. gaspeensis* new species
(Gulf of St. Lawrence, low water)

Dorsal cirri present, short, ovoid or conical. Palps long, with distal palpostyles 3

3.—Dorsal cirri lacking on first setiger. Neuropodia with postsetal lobes. Antennae short, clavate. Four eyes 4

Dorsal cirri present on first setiger. Two eyes. Blades of compound neurosetae with tips bidentate, hooked 5

4.—Blades of compound neurosetae with tips bidentate, hooked .... *P. mandapamae* (Banse)
(South India, Gulf of Mannar, low water)

Blades of compound neurosetae with tips entire .... *P. egena* (Ehlers)
(South Africa)

5.—Neuropodia with postsetal lobes. Antennae rather short, indistinctly articled .... *P. kefersteini* (McIntosh)
(Scotland, low water)

Neuropodia without postsetal lobes. Antennae short, clavate .... *P. gracilis* (Hartman)
(Central California, low water)

Revision of the Family Dorvilleidae Chamberlin, 1919
(Staurocephalidae Kinberg, 1865; Stauronereidae Verrill, 1900)

The family Dorvilleidae is usually recognized through two genera, *Dorvillea* Parfitt and *Ophryotrocha* Claparède and Mecznikow. *Dorvillea* has included a heterogeneous grouping of species. Crossland (1924) and Hartman (1944) have indicated some of the characters that could be used in separating the dorvilleid species. They, as well as others, have hesitated to establish different genera, since a number of species are poorly known and inadequately described. The species of *Dorvillea sensu lata* have herein been separated into four genera, *Dorvillea* Parfitt, *Stauronereis* Verrill, *Papilliodorvillea* new genus and *Protodorvillea*. The revision has been based mainly on external characters. The mandibles and maxillae have not been used in separating the genera, since the species are characteristically very small, making it extremely difficult to dissect out the jaw pieces and describe them adequately. Synonymies and diagnoses for the five genera of the Dorvilleidae are given below.

The better known species of dorvilleids are referred to the appropriate genera.

Genus *Ophryotrocha* Claparède and Mecznikow, 1869

Type species: O. puerilis Claparède and Mecznikow, 1869 (monotypy).

Paractius Levinsen, 1879. *Type species: P. littoralis* Levinsen, 1879 (monotypy).

Eteonopsis Esmark, 1874. *Type species: E. geryonicola* Esmark, 1874 (monotypy).

Diagnosis: Prostomium with four similar small papilla-like appendages, two dorsal antennae and two ventral palps. Without nuchal papilla. Parapodia uniramous, without dorsal cirrophores and notoacicula. Dorsal and ventral cirri small lobes. Neurosetae of two kinds: (1) simple, slender; (2) compound, heterogomph. Mandibles two elongated pieces, flared and denticled anteriorly. Maxillae consisting of two sets of relatively few denticled pieces.

Ophryotrocha includes the following species: *O. puerilis* Claparède and Mecznikow, 1869, *O. geryonicola* (Esmark, 1874), *O. claparedii* Studer, 1878, *O. littoralis* (Levinsen, 1879), and *O. minuta* Levi, 1954.

Genus *Protodorvillea*

See above (p. 178).

Genus *Stauronereis* Verrill, 1900

Type species: Nereis rudolphi Delle Chiaje, 1828 (original designation).

Prionognathus Keferstein, 1862 (preoccupied by Laferté, 1851, in Coleoptera). *Type species: P. ciliata* Keferstein, 1862 (monotypy); = *Stauronereis rudolphi* (Delle Chiaje, 1828).

Diagnosis: Prostomium with two long antennae, two long palps. Without nuchal papilla. Parapodia subbiramous, with elongate dorsal cirrophores with enclosed notoacicula. Dorsal and ventral cirri short. Neurosetae of three kinds: (1) simple, capillary; (2) simple, forked; (3) compound, heterogomph. Mandibles elongated pieces, flared and denticled anteriorly. Maxillae consisting of four longitudinal rows of numerous denticled plates (two rows on each side).

Stauronereis includes the following species: S. *rudolphi* (Delle Chiaje, 1828), S. *incertus* (Schmarda, 1861), S. *caecus* (Webster and Benedict, 1884), S. *neglectus* (Fauvel, 1923), S. *japonicus* (Annenkova, 1937), and S. *furcatus* (Hartman, 1953).

Genus *Papilliodorvillea* new genus

Type species: Staurocephalus (*Dorvillea*) *gardineri* Crossland, 1924.

Anisoceras Grube, 1856 (preoccupied by Dejean, 1833, in Coleoptera). *Type species* (here designated): *A. rubra* Grube, 1856.

Diagnosis: Prostomium with two long antennae, two long palps. With nuchal papilla. First tentacular segment enlarged, nearly encircling prostomium. Parapodia subbiramous, with elongate dorsal cirrophores with enclosed notoacicula. Dorsal and ventral cirri short. Neurosetae of two kinds: (1) simple, slender; (2) compound, heterogomph. Mandibles elongated pieces, flared and denticled anteriorly. Maxillae consisting of four longitudinal rows of numerous denticled plates (two rows on each side).

Papilliodorvillea includes the following species: *P. rubra* (Grube, 1856), *P. australiensis* (McIntosh, 1885), *P. crassa* (Chamberlin, 1919), and *P. gardineri* (Crossland, 1924).

Genus *Dorvillea* Parfitt, 1866

Type species: D. lobata Parfitt, 1866 (monotypy); = *D. rubrovittata* (Grube, 1855).

Staurocephalus Grube, 1855 (preoccupied by Barrande, 1846, in Crustacea). *Type species: S. rubrovittatus* Grube, 1855 (monotypy).

Teleonereis Verrill, 1900. *Type species: Staurocephalus rubrovittatus* Grube, 1855 (original designation).

Stauroceps Verrill, 1900. *Type species: Staurocephalus erucaeformis* Malmgren, 1865 (original designation); = *D. rubrovittata* (Grube, 1855).

Diagnosis: Prostomium with two long antennae, two long palps. Without nuchal papilla. First tentacular segment about twice as long as following segment, partly surrounding prostomium. Parapodia subbiramous, with elongate dorsal cirrophores with enclosed notoacicula. Dorsal and ventral cirri short. Neurosetae of two kinds: (1) simple, slender; (2) compound, heterogomph. Mandibles elongated pieces, flared and denticled anteriorly. Maxillae consisting of four longitudinal rows of denticled plates (two rows on each side).

Dorvillea contains the following species: *D. rubrovittata* (Grube, 1855), *D. vittata* (Grube, 1856), *D. sociabilis* (Webster, 1879), *D. cerasina* (Ehlers, 1901), *D. moniloceras* (Moore, 1909), *D. romeri* (Augener, 1912), *D. angolana* (Augener, 1918), *D. similis* (Crossland, 1924), *D. pseudorubrovittata* Berkeley, 1927, and *D. matsushimaensis* (Okuda, 1954).

The differences among the dorvilleid genera may be summarized in the following key:

Key to the Known Genera of Dorvilleidae

1.—Parapodia uniramous, without elongate dorsal cirrophores and notoacicula 2

Parapodia subbiramous, with elongate dorsal cirrophores and enclosed notoacicula. Prostomium with two long antennae and two long palps. Maxillae consisting of four longitudinal rows (two on each side), each with numerous denticled plates 3

2.—Neurosetae of two kinds: (1) simple, slender; (2) compound, heterogomph. Prostomium with four similar small papilla-like appendages, two dorsal antennae and two ventral palps. Maxillae consisting of two series of plates, each consisting of less than 16 plates .... *Ophryotrocha* Claparède and Mecznikow

Neurosetae of three kinds: (1) simple, capillary; (2) simple, forked; (3) compound, heterogomph. Prostomium with two short antennae, two palps longer than antennae. Maxillae consisting of four longitudinal rows (two on each side), each with numerous denticled plates .... *Protodorvillea*

3.—Neurosetae of three kinds: (1) simple, capillary; (2) simple, forked; (3) compound, heterogomph .... *Stauronereis* Verrill

Neurosetae of two kinds: (1) simple, slender; (2) compound, heterogomph 4

4.—With nuchal papilla. First achaetous tentacular segment enlarged, nearly encircling prostomium .... *Papilliodorvillea*

Without nuchal papilla. First achaetous tentacular segment somewhat enlarged, partly encircling prostomium ..*Dorvillea* Parfitt

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PROCEEDINGS

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THREE NEW SPECIES OF MALLOPHAGA FROM THE GREAT HORNED OWL

By K. C. Emerson
Stillwater, Oklahoma

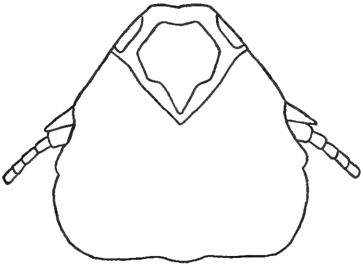
The Mallophaga collection of the U.S. National Museum contains several new species of Mallophaga found on North American owls. Described herewith are three new species found on the Great Horned Owl, *Bubo virginianus* (Gmelin). Heretofore only one species has been described from this host.

Strigiphilus oculatus (Rudow, 1870)

The form with a short, wide, dorsal anterior plate of the forehead as shown in Fig. 1, has generally been accepted as *Strigiphilus oculatus* (Rudow, 1870). The type has not been located, but the first line of Rudow's description "Kopf so lang wie hinten breit" and the specific name leave no doubt as to which form he described. *Strigiphilus bubonis* (Osborn, 1896) is conspecific with this form.

The only other interpretation of *S. oculatus* was that advanced by Carriker in 1958. Carriker noted that at least two and probably three new species of *Strigiphilus* were found on this host. He designated as "neoparatype" of *S. oculatus,* an undescribed female of an unknown species. He reasoned that Rudow described a narrow forehead form because it was placed in the old genus *Nirmus.* He apparently did not consider the name given by Rudow, or the two portions of Rudow's description: "Kopf so lang wie hinten breit" and "Das Thier sieht ganz einem *Docophorus* ähnlich." The present genus *Strigiphilus* was included in *Docophorus* for many years. Carriker's primary reason appears to be the desire to apply the name *S. oculatus* in a manner so that *S. bubonis* would be valid for the broad forehead form.

I think it is unwise to consider any interpretation except the one which has been well established for 88 years, unless the types when located should indicate otherwise. Carriker's action is not accepted for the additional reasons that he did not describe and erect a neotype. Even if this had been done, a neotype has no standing unless accepted by the International Commission on Zoological Nomenclature. I feel that for



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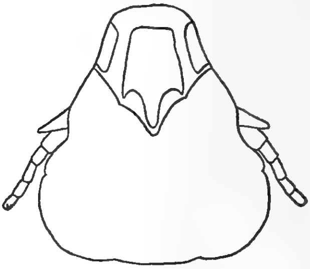

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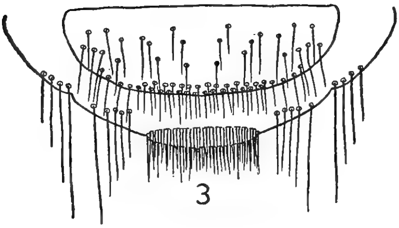

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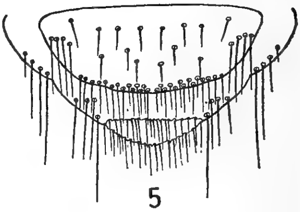

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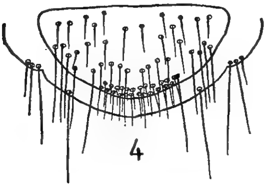

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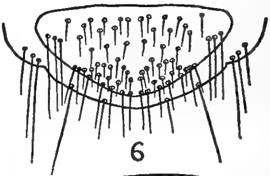

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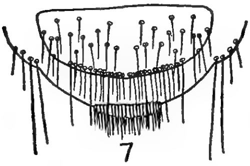

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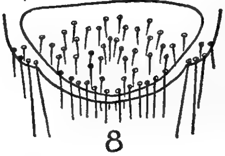

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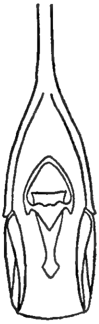

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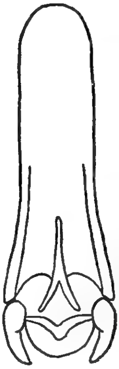

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the reason given, the Commission would reject any attempt to change such a well-established interpretation.

Strigiphilus acutifrons, new species

Holotype male: Shape of head and dorsal anterior plate of forehead as shown in Fig. 2. Pterothorax with dorsal chaetotaxy of 2-3-3-2 long setae. Chaetotaxy of abdominal tergites: II-16, III-20, IV-20, V-20, VI-16, VII-16, and VIII-6. Chaetotaxy of abdominal sternites: II-6, III-14, IV-14, V-14, VI-14, VII-2, and VIII-4. Genital plate narrow and elongated with two long setae located centrally in the anterior portion. Genitalia as shown in Fig. 10.

Allotype female: Essentially same as the male except for size and terminal abdominal segments. Genital plate rectangular-shaped and with only sparsely scattered small setae. Terminal abdominal segment bilobed and ventrally with six long setae laterally on each lobe.

Measurements (in millimeters)

	HOLOTYPE MALE	ALLOTYPE FEMALE
Length of head	0.65	0.70
Width of head	0.57	0.62
Width of prothorax	0.34	0.38
Width of pterothorax	0.51	0.56
Width of abdomen	0.82	0.90
Total length	1.88	2.15

Diagnosis: The most obvious difference between this species and *S. oculatus* is the shape of the dorsal anterior plate of the forehead as illustrated. Abdominal chaetotaxy is more dense in *S. acutifrons* than in *S. oculatus*. The long narrow male genital plate in *S. acutifrons* is distinctive; in *S. oculatus* this structure is triangular-shaped with the widest portion being anterior. There appears to be no significant difference in

FIGS. 1–10. 1.—*Strigiphilus oculatus* (Rudow, 1870), outline of head, ♂. 2.—*Strigiphilus acutifrons* new species, outline of head, ♂. 3.—*Kurodaia edwardsi* new species, ventral view, terminal abdominal segments, ♀. 4.—*Kurodaia edwardsi* new species, ventral view, terminal abdominal segments, ♂. 5.—*Kurodaia magna* Emerson, 1960, ventral view, terminal abdominal segments, ♀. 6.—*Kurodaia magna* Emerson, 1960, ventral view, terminal abdominal segments, ♂. 7.—*Kurodaia keleri* new species, ventral view, terminal abdominal segments, ♀. 8.—*Kurodaia keleri* new species, ventral view, terminal abdominal segments, ♂. 9.—*Kurodaia keleri* new species, male genitalia. 10.—*Strigiphilus acutifrons* new species, male genitalia. (Figures 1–8 are drawn to the same scale.)

the female genital structures of the two species. The male genitalia are the same type, but smaller than in *S. cursor* (Burmeister, 1838).

Type material: Holotype male (USNM 65485), allotype female, and two paratypes collected in Quebec Province by Father Hubert in December 1956. Nine paratypes collected at Springdale, Oregon on 30 July 1933 by S. G. Jewett; four paratypes collected in 1914 by M. H. Spaulding at Boseman, Montana; two paratypes collected at Uvalde, Texas by D. C. Parman on 27 November 1915; eight paratypes collected at Tillamook, Oregon on 23 November 1930 by Alex Walker; and eight paratypes collected at Corvallis, Oregon on 16 November 1931 by M. F. Conova; all in the U. S. National Museum.

The British Museum (Natural History) has the following paratypes: seven collected in California (no other data); and twelve collected at Thue, Beaver Creek, Saskatchewan, Canada, during 14 October–2 November 1959 by R. Connell.

The University of Saskatchewan has the following paratypes: five collected on 14 October 1959, 19 collected on 2 November 1959, and six collected on 6 November 1959 by R. Connell at Thue, Beaver Creek, Saskatchewan, Canada.

Kurodaia edwardsi, new species

This species is closely related to *K. magna* Emerson, 1960 which was completely illustrated recently; so only significant differences are given. Some specimens of the type series have the expanded preantennal region as commented on in my paper on *K. magna.* There is no doubt that this expansion resulted from the mounting technique employed in all instances.

Holotype male: Chaetotaxy, except for terminal abdominal segments, with two long setae per tergite and sternite less than in *K. magna.* Ventral chaetotaxy of terminal abdominal segments as shown in Fig. 4, that of *K. magna* is shown in Fig. 6. The male genitalia do not appear to be distinctive.

Allotype female: Chaetotaxy, except for terminal abdominal segments, with two long setae per tergite and sternite less than in *K. magna.* Ventral chaetotaxy of terminal abdominal segments as shown in Fig. 3, that of *K. magna* is shown in Fig. 5.

Measurements (in millimeters)

	HOLOTYPE MALE	ALLOTYPE FEMALE
Length of head	0.40	0.44
Width of head	0.69	0.74
Width of prothorax	0.47	0.49
Width of metathorax	0.60	0.67
Width of abdomen	0.99	1.16
Total length	2.09	2.30

These measurements are greater, especially in widths, than for *K. magna*, as may be seen by comparing Figs. 3 and 4 with 5 and 6.

Type material: Holotype male (USNM 65483) and eleven paratypes collected at Nashville, Tennessee on 20 December 1940 by Mrs. A. R. Laskey. Allotype female collected at Church Creek, Maryland on 11 February 1932 by F. R. Smith. Three paratypes collected at Hamilton, New York in December 1946 by R. L. Edwards; two paratypes collected at Hamando, Mississippi on 18 September 1918 by O. G. Babcock; two paratypes collected at Raleigh, North Carolina on 4 February 1931 by C. S. Brimley; two paratypes collected at Jackson, Michigan on 1 June 1930 by W. G. Fargo; three paratypes collected at Brunswick, Maine on 27 October 1926 by A. O. Gross; five paratypes collected at Monton, New York in January 1930 by G. M. Smith; seven paratypes collected at Toronto, Canada on 28 October 1927 by J. L. Baillie; six paratypes collected in Quebec Province in December 1956 by Father Hubert; and 43 paratypes collected at Tillamook, Oregon on 23 November 1930 by Alex Walker; all in the U. S. National Museum.

In the British Museum (Natural History) are the following paratypes: two collected at Thue, Beaver Creek, Saskatchewan, Canada on 7 October 1959 by R. Connell; four collected at Beaver Creek, Saskatchewan, Canada, during December 1958–January 1959 by R. Connell; and two collected at Vancouver, British Columbia, Canada, on 13 February 1948 by G. J. Spencer.

The University of Saskatchewan has the following paratypes: six collected on 7 October 1959, 20 collected on 31 March 1959, and six collected during 23 December 1958–26 January 1959 by R. Connell at Thue, Beaver Creek, Saskatchewan.

This species is named for a coworker in Mallophaga, R. L. Edwards, who collected part of the type series.

Kurodaia keleri, new species

Holotype male: Temples angular as in *K. pectinata* (Osborn, 1902). Dorsally, prothorax with four medium-length setae and eight long setae on posterior margin. Metathorax with dorsal and ventral chaetotaxy as in *K. magna*. Chaetotaxy of abdominal tergites, except terminal, and paratergites same as in *K. magna*. Abdominal sternite I with six medium-length setae; II with 42 medium-length setae in three transverse rows. Each posterior-lateral angle of sternite III with three combs of setae; the two posterior combs with about 14 short setae each, and the anterior comb with five short setae. Chaetotaxy of sternites IV–VII same as in *K. magna*. Ventral chaetotaxy of terminal abdominal segments as shown in Fig. 8. Male genitalia, except for sac, as shown in Fig. 9. Genital sac serrated with stout, short and medium-length teeth.

Allotype female: Essentially same as the male, except for terminal abdominal segments and size. Ventral chaetotaxy of terminal abdominal segments as shown in Fig. 7.

Measurements (in millimeters)

	HOLOTYPE MALE	ALLOTYPE FEMALE
Length of head	0.35	0.38
Width of head	0.55	0.60
Width of prothorax	0.35	0.38
Width of metathorax	0.47	0.54
Width of abdomen	0.62	0.75
Total length	1.71	1.85

Diagnosis: In general shape, this species has a relatively narrow head and abdomen as in *K. pectinata.* The chaetotaxy is more nearly that of *K. magna.* The chaetotaxy of the terminal abdominal segments as illustrated, is distinctive. The male genitalia, also illustrated, are of a type not heretofore encountered in the genus.

Type material: Holotype male (USNM 65484) and allotype female collected in Charlton County, Georgia by Francis Harper during 13–14 December 1935. Twelve paratypes collected at Ocala, Marion County, Florida on 15 August 1956 by C. H. Wharton; two paratypes collected on Oatland Island, Georgia on 12 September 1949; three paratypes collected at Menard, Texas on 2 October 1937 by H. E. Parish; and nine paratypes collected at Carleton, South Carolina on 15 December 1934 by H. S. Peters; all in the U. S. National Museum.

This species is named for Stefan von Keler, the noted German specialist on Mallophaga.

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PROCEEDINGS
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A NEW RACE OF *BUFO VALLICEPS* FROM GUATEMALA

By Edward R. Baylor and L. C. Stuart
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Through a grant provided by the Horace H. Rackham School of Graduate Studies, The University of Michigan, the junior author was able to spend the winter, spring and early summer of 1955 investigating the herpetofauna of the Sierra de los Cuchumatanes of northwestern Guatemala. Extremely dry conditions prevailed throughout this region that year, and the rains, normally anticipated in mid-May, did not break until early June and even these amounted to no more than scattered showers. As a result few amphibians were secured. The junior author was fortunate, however, to be on hand for several showers that fell upon the village of Jacaltenango during the first week of June.

Jacaltenango lies on a terrace of sandstone, high above the Rio Azul, and small depressions in the bed-rock fill rapidly and retain water for a considerable period after showers. In these shallow rain-ponds within the village were encountered breeding choruses of *Smilisca baudini* Dumerit and Bibron, 1841, *Hypopachus championi* Stuart, 1940, and an apparently undescribed race of *Bufo valliceps* Weigmann, 1833. This last it is now our pleasure to describe and to dedicate to our good friend Leonard S. Wilson, Chief, Environmental Sciences Division, O/C R and D, Department of the Army. The new race may be known as

Bufo valliceps wilsoni, new subspecies

Holotype: The University of Michigan, Museum of Zoology 119391. An adult male collected in a rain-pond in Jacaltenango (ca. 50 air-line kilometers northwest of Huehuetenango), Huehuetenango, Guatemala on the night of 6 June 1955. Elevation, ca. 1525 meters. Collector, L. C. Stuart.

Paratopotypes: The University of Michigan, Museum of Zoology, 119354–390, 119392, 23 ♂♂ and 15 ♀♀. Collected by L. C. Stuart from rain-ponds in and around Jacaltenango 6–10 June 1955.

Diagnosis: A *Bufo* of the *valliceps* complex distinguished from other populations of the same by its larger and more ovoid parotoid glands and its very short, stout supratympanic crests (Figs. 1–2).

Description of holotype: Head with a full complement of dorsal head-crests. Prefontal and interorbital crests continuous; flaring laterad and caudad; continuous with the postorbital crests in a gentle curve. Parietal crests directed medially and forming a right angle with the postorbitals. Supratympanic crests short and stout (see below); contained in the length of the parotoid gland almost three times and in the length of the head (see below) almost five and one-half times. Preorbital and postorbital ridges evident but not particularly well developed. Snout to about level of nostrils almost vertical in profile. Upper eyelid shorter than parotoid gland but longer than its distance from the end of the snout. Tympanum vertically ovoid; slightly more than half the length of the upper eyelid; strongly overhung by the supratympanic crest. Parotoid glands longitudinally ovoid, more than half as long as the head length (see below) and almost two-thirds as broad as long. Outer palmar pad about 50 per cent larger than inner. Outer metatarsal tubercle about twice the size of the inner. Toes moderately webbed; toe V webbed to joint of ultimate-penultimate phalanges. A row of inconspicuous, low tubercles extending posteroventrally from parotoids but not reaching groin. A row of differentiated conical tubercles with melanoid apices along ventral, outer edge of tarsus. Dorsum covered with low warts, large intermixed with small. The larger warts without definite apices but with many small melanoid (gland?) openings which number 15–20 on warts of average size but may amount to as many as 50 on the largest ones. Laterally the warts become more uniform in size and lack both melanoid apices and small melanoid (gland?) openings. Ventrum uniformly covered with small warts each with a melanoid apex. Upper surfaces of arms and legs with somewhat larger warts either with single melanoid apices or occasionally with a few secondary melanoid (gland?) openings. Upper and inner lateral surfaces of fingers I and II supporting dark nuptial pads, while only the inner surface of finger III is similarly darkened as is about one-half of each inner palmar tubercle.

The ground color of the head and dorsum (following fixation in formalin and preservation in spirits) is grayish buff. The dorsal surface of the head is without markings except for dark brown fleckings on the ridges of the cranial crests. On the sides of the head the ground color fades ventrad to cream on the upper lip. The back, owing to the melanoid (gland?) openings, has a speckled appearance. A suggestion of a narrow, light mid-dorsal stripe. A poorly defined light streak borders the lateral line of warts above and a diffused dark streak forms a lower border. Groin region cream-colored and mottled with gray and black. Upper surfaces of arms and legs cream-colored with irregular, transverse bands of gray or black. Undersurfaces cream-colored with very faint gray mottlings. Parotoids light greenish yellow punctated with tiny, dark brown (gland?) openings.

Head–body length, 63.0 mm; head length (base of parietal crest to tip of snout), 18.3 mm; head width (at jaw angles), 23.0 mm; upper eyelid, 9.1 mm; supratympanic crest (outside length), 3.4 mm; long diameter of tympanum, 4.8 mm; right parotoid gland, 10.1 mm by 6.4 mm; leg (coccyx to distal end of tibia), 45.0 mm; foot (distal end of tibia to tip of toe IV), 36.0 mm.

Variation: Table 1 summarizes variations observed in several populations of *valliceps* with reference to the diagnostic features of *wilsoni*. Comparisons have been confined to males inasmuch as females in the collections studied are too few to permit valid conclusions. It may be noted, however, that females of the paratypic series differ from the males only in having slightly longer supratympanic crests, but this difference is so slight that the figures for the type series as indicated by the males are not appreciably affected. Though the senior author has analyzed these data statistically, they reveal nothing of diagnostic value that is not apparent in the raw data.

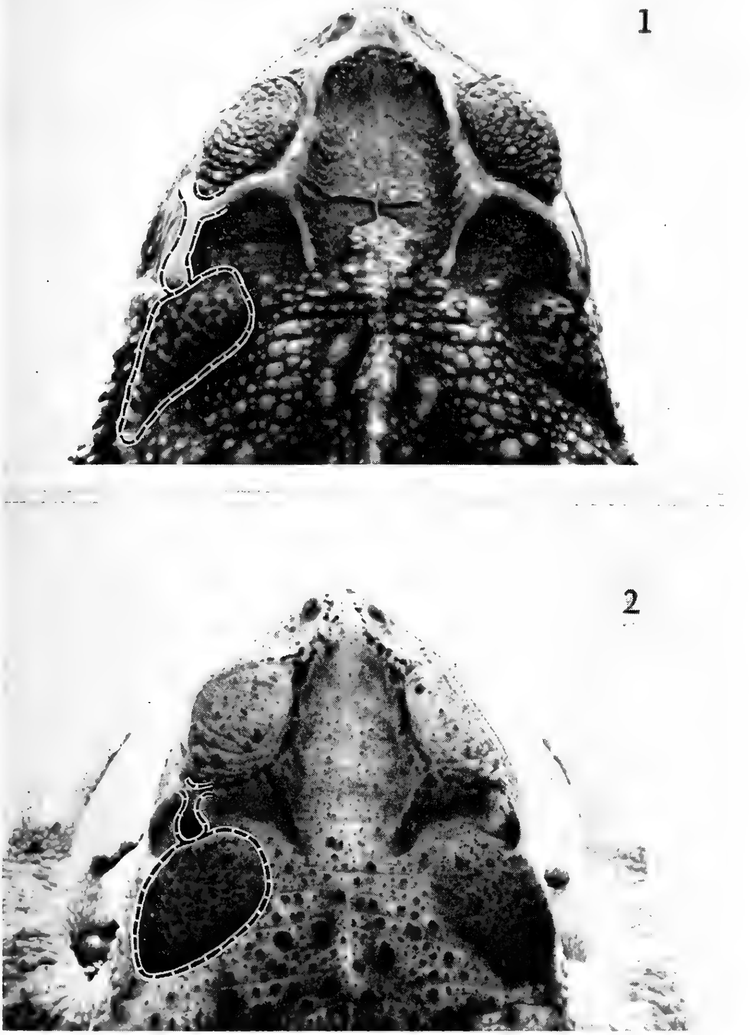
In color and pattern the paratypic series shows considerable variation. Except for the banding on the extremities, all markings may be obliterated owing either to an over-all lightening or to darkening of the ground color which may vary from light brownish cream to very dark brown respectively. The females tend to be much darker than the males. Some individuals are particularly brilliantly marked with dark brown or black blotchings, mottling or reticulations on a light background. This is especially true of the population from the Tuxtla Gutierrez region (Tuxtla Gutierrez and Berriozabal, Chiapas, Mexico). Our colleague, William Duellman, who sampled the latter, informs us that in life these individuals have a light, greenish yellow dorsum with olive markings.

In size, the apparent adults of the paratypic series (males with nuptial pads) vary in head–body length 49.0–64.0 mm in the males and 62.0–76.5 mm in the females. A small male with a head–body length of 41.5 mm displays an early stage of nuptial pad development. Males of the population from the Tuxtla Gutierrez region vary 53.5–69.5 mm head–body length. The largest male I have examined, a specimen from Monte Cristo near Motocintla, Chiapas, Mexico measures 71.5 mm while the largest female, one of what I believe to be an intergrading population between *valliceps* and *wilsoni* from the Monserrat area (ca. 80 kilometers southwest of Ocozocoautla, Chiapas, Mexico), has a head–body length of 93.0 mm.

In addition to the characters analyzed above, the nature of the warts in the differentiated lateral row and the length of the parotoid in relation to the length of the upper eyelid are of some diagnositc value. As generalizations, the lateral row of warts is far less conspicuous and somewhat more broken and shorter in *wilsoni* than in *valliceps,* and the parotoid of the new race tends to be longer than the upper eyelid whereas in *valliceps* it is generally shorter.

Discussion: In a recent paper (Herpetologica 13: 219–221, 1957) Firschein and Smith described *Bufo valliceps macrocristatus* as a population distributed through the foothill region of northern Chiapas, eastern Oaxaca and possibly extreme southern Veracruz, Mexico. Through the courtesy of Hobart Smith the junior author has been privileged to examine the following specimens assigned to that race: two paratopotypes (University of Illinois, Museum of Natural History 11309 and 11311, Palenque, Chiapas), a paratype (UIMNH 35586, La Gloria, near Juchitan, Oaxaca) and a specimen from Cerro Brujo, Chiapas (UIMNH 35764). None of these specimens is in a particularly good state of preservation. All appear to have suffered from desiccation and/or strong formalin fixation. The major diagnostic feature of *macrocristatus* is the extreme hypertrophy of the cranial crests. Other characters include the smaller size of the tympanum which frequently varies with sex and the darker pigmentation of the belly which varies both with size and environment.

Of the paratopotypes UIMNH 11309 appears to me to be typical *valliceps.* Such hypertrophy of the cranial crests as is evident is apparently an artifact caused by tissue shrinkage in the preparotoid region. The second paratopotype, UIMNH 11311, is a moderate-sized female with well hypertrophied crests, an apparent but not necessarily real condition which may also have resulted from preservation. The La Gloria individual is very poorly preserved but does show extreme hypertrophy of the crests. However all three of these paratypes are females and hypertrophy of the crests in large females of *valliceps* is the usual rather than the unusual situation. In fact, allowing for preservation, we do not believe that the hypertrophy exhibited in the above paratypes exceeds to any degree that observed in large, well-preserved *wilsoni* females from the Motocintla region of Chiapas and *valliceps* females from Nicaragua. The Nicaraguan population of *valliceps,* in fact, is characterized by considerable crest hypertrophy. The Cerro Brujo specimen (we assume this to be the well-known plant collecting locality to the south of Ocozocoautla) is a male, and on the basis of parotoid gland and supratympanic crest measurements seems to be close to *wilsoni.* Its locale lies within the area in which *valliceps–wilsoni* intergradation is suggested (see below). In spite of the skepticism with which we view the validity of *macrocristatus* we hesitate to pass judgment on it until more and better materials have been forthcoming. It may be noted, however, that a well-preserved collection of *valliceps* which has recently been secured in the Teapa region of Tabasco, where environmental conditions appear to be identical with those of Palenque, show no approach to the *macrocristatus* condition. Regardless of the status of *macrocristatus,* it is not, on the basis of the paratypes which have been examined, to be confused with *wilsoni.*



FIGS. 1–2. Surface of heads of two races of *Bufo valliceps* contrasting the narrow, elongate parotoid and elongate supratympanic crest of *Bufo valliceps valliceps* with the more ovoid parotoid and short, stout supratympanic crest of *Bufo valliceps wilsoni.* 1.—*Bufo valliceps valliceps,* Museum of Zoology, University of Michigan, No. 70396; Uaxactun, El Peten, Guatemala. 2.—*Bufo valliceps wilsoni,* holotype.

From Chiapas and northwestern Guatemala we have had access to a few individuals which have not been included in the above analysis. These include ten specimens, mostly females, from the Motocintla region (Mazapa, Monte Cristo, Chicomuselo, and Porvenir), three adults from the Monserrat region, a single individual from Bochil (northwest of San Cristobal), three from Comitan and a single female from San Pedro Necta (ca. 50 air-line kilometers north and slightly west of Huehuetenango, Guatemala). Of these, the Motocintla and San Pedro specimens are typical *wilsoni,* the Bochil and Comitan individuals apparently *valliceps,* while the Monserrat material may be regarded as *valliceps-wilsoni* intergrades though somewhat close to the latter. The range of this new race may, therefore, be defined as the upper valley of the Rio Grijalva in Chiapas and its headwater valleys in northwestern Guatemala at elevations between 400 and 1,600 meters. In other words, the race appears to be restricted to the western end of the northern Central American subhumid corridor which the junior author has described previously (Contrib. Lab. Vert. Biol., Univ. Michigan, 65, 1954).

In this same corridor to the east of Huehuetenango the *valliceps* complex is replaced by the *coccifer* complex. At Aguacatan the junior author found *ibarrai,* and this has been traced eastward and southward through the Salama Basin and the Sierra de las Minas to southeastern Guatemala where it is replaced at elevations below about 160 meters by *coccifer.* With one exception there has been found in Guatemala no sympatry between the *coccifer* and *valliceps* groups. The single exception was the occurrence of a few individuals of *valliceps* in the little plaza in Esquipulas in southeastern Guatemala. Inasmuch as *coccifer* alone occurred, and in abundance, on the grasslands immediately around Esquipulas, it is conceivable that the few *valliceps* observed within the village may have stemmed from an importation. Esquipulas, it may be noted, is the most important religious shrine in northern Central America where it holds a position comparable to that of Guadalupe in Mexico.

Inasmuch as *ibarrai* and *wilsoni* are superficially very similar in appearance, it may be pointed out at this time that the *coccifer* and *valliceps* groups may be separated easily on the basis of two characters. The snout of *valliceps* is almost vertical in profile and forms a rounded but distinct angle with the surface of the head. In *coccifer* the dorsal surface of the head and the tip of the snout are continuous, forming an uninterrupted arc in profile. A second character is found in the structure of the larger warts of the dorsum and flanks. In the *coccifer* series, even in adult breeding males, the warts are cone-shaped and generally have sharply pointed, melanoid apices. In *valliceps* the warts are more flattened and may or may not support melanoid apices. The warts in the *valliceps* group are covered with melanoid secondary spinules which in the holotypic description of *wilsoni* were defined as possible multiple gland openings. In females, warts of this nature are more localized than in the males and are frequently confined to the anterior parts of the flanks. The difference in the nature of the warts parallels the condition

TABLE 1.—Summary of Analyses of Three Characters in Several Populations of *Bufo valliceps*.*

LOCALITY	PAROTOID GLAND / SUPRATYMPANIC CREST		HEAD LENGTH / PAROTOID GLAND		HEAD LENGTH / SUPRATYMPANIC CREST	
Jacaltenango (20)	2.4–4.0 (3.0)	90% > 2.6	1.6–2.1 (1.9)	90% < 2.0	4.7–6.9 (5.5)	90% > 4.8
Tuxtla Gutierrez (25)	2.2–3.8 (2.9)	90% > 2.6	1.7–2.2 (1.9)	90% < 2.0	4.4–7.2 (5.5)	90% > 4.6
Totals (45)	2.2–4.0 (2.9)		1.6–2.2 (1.9)		4.4–7.2 (5.5)	
	90% > 2.6 (3.0)		90% < 2.0 (1.9)		90% > 4.7 (5.6)	
	80% > 2.6 (3.0)		80% < 2.0 (1.9)		80% > 5.1 (5.8)	
Tabasco (15)	1.8–2.5 (2.2)	90% < 2.4	1.8–2.3 (2.1)	90% > 2.0	4.0–5.5 (4.6)	90% < 4.8
El Peten (15)	1.4–2.0 (1.8)	90% < 2.0	2.0–2.8 (2.2)	90% > 2.0	3.0–4.6 (3.8)	90% < 4.1
Southern Veracruz (15)	1.7–2.6 (2.1)	90% < 2.3	1.9–2.5 (2.1)	90% > 1.9	4.0–4.9 (4.4)	90% < 4.6
Tamaulipas (13)	1.7–2.5 (2.1)	90% < 2.3	1.8–2.5 (2.2)	90% > 2.0	3.5–5.0 (4.5)	90% < 4.8
Southern Guatemala (9)	1.5–2.5 (2.0)	90% < 2.2	2.0–2.8 (2.4)	90% > 2.2	4.1–5.4 (4.7)	90% < 5.3
Nicaragua (5)	1.8–2.4 (2.1)	90% < 2.4	1.8–2.5 (2.2)	90% > 1.8	4.0–5.0 (4.4)	90% < 5.0
Totals (72)	1.4–2.6 (2.1)		1.8–2.8 (2.2)		3.0–5.5 (4.4)	
	90% < 2.4 (2.0)		90% > 2.0 (2.2)		90% < 4.8 (4.3)	
	80% < 2.3 (2.0)		80% > 2.0 (2.2)		80% < 4.7 (4.2)	

* In the above table are listed the extremes and means (in parentheses) of the several characters utilized in the diagnosis of *Bufo valliceps wilsoni* as observed in samples of males of various populations. The 80 and 90 per cent levels may vary several percentage points above or below the stated levels. Figures in parentheses following the localities indicate the number of individuals examined.

observed in *Bufo regularis* and *Bufo funereus* by Inger and Greenberg (Journ. Morph. 99(3): Figs. 6–9, 1956). The *valliceps* type is shown by Fig. 9 and the *coccifer* type by Fig. 6 and Fig. 8 (in part).

In singling out the Grijalva Valley population as distinct from other populations of *valliceps,* we do not mean to imply that all material from Tamaulipas to Nicaragua utilized in comparisons is conspecific. We mean, rather, that, with reference to the characters examined, the Grijalva Valley population differs from all others of the *valliceps* complex. We would even suggest that the Yucatan (and northern Guatemala) populations will probably have to be separated nomenclaturally from the populations of Veracruz and the Gulf Coastal Plain to the north. The same is indicated for more southern populations.

Acknowledgments: For the privilege of utilizing unreported materials in this study we wish to express our gratitude to our colleagues Norman E. Hartweg and William Duellman. Charles F. Walker has been most generous in aiding and advising us on a number of matters relating to *Bufo valliceps* in general. We are further indebted to Hobart M. Smith for making available to us a series of *Bufo valliceps macrocristatus*.

The authors wish to express their profound gratitude to D. E. S. Brown, without whose able leadership, generous help, sagacious advice and kindly encouragement, this work would have been impossible.

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PROCEEDINGS

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A NEW SPECIES OF MOUSE (*PEROMYSCUS*) FROM NORTHWESTERN VERACRUZ, MEXICO

By E. Raymond Hall and Ticul Alvarez

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Several species of *Peromyscus* are included among mammals recently collected in the northern part of the Mexican state of Veracruz by M. Raymond Lee. One of these species proves to be without a name. The new species is related to *Peromyscus latirostris* Dalquest known from areas farther northwest and to *Peromyscus furvus* Merriam known from areas to the southward. These relationships, coupled with the intermediate geographic position of the area from which Dr. Lee obtained his specimens, caused us initially to suppose that his specimens were intergrades between the two named species. But, the specimens are not intermediate in several morphological features and consequently are not intergrades. Furthermore, the specimens in question differ from both of their relatives to so great a degree that we here accord specific, instead of subspecific, status to the unnamed mouse.

Peromyscus boylii (subspecies *levipes*) was taken in the same trap lines that yielded the new species. According to the field notes of the collector, the area where the mice were trapped supports long-needled pine. Individuals of the new species were caught most commonly around rocks and water seeps.

The new species may be named and described as follows:

Peromyscus angustirostris, new species

Type: Male, old adult, skin and skull, No. 83226 Museum of Natural History, University of Kansas; from 3 kilometers west of Zacualpan, 6,000 feet, Veracruz; obtained on 12 April 1960 by M. Raymond Lee, original number 1886.

Range: Known only from Zacualpan and 3 kilometers west thereof.

Diagnosis: Dorsum near (*n*) Mummy Brown (capitalized color terms after Ridgway, Color Standards and Color Nomenclature, Washington, D.C., 1912); sides approximately (16) Cinnamon; venter whitish; size large (see measurements); tail longer than head and body; nasals posteriorly acuminate, and anteriorly narrow; in M_1, internal terminus of first primary fold (terminology of teeth after Hooper, 1957, Misc. Publ., Mus. Zool., Univ. Michigan, 99: 9) deep and persisting as island when tooth greatly worn, mesostyle prominent, and cingulum only slightly developed.

Comparisons: From both *P. latirostris* and *P. furvus, P. angustirostris* differs in whitish underparts (near (*g*) Pale Smoke Gray in *latirostris,* and Pale Smoke Gray in *furvus*), lesser zygomatic breadth, narrower nasals, larger mesostyle on M_1, and smaller cingulum on each molar, especially on M_1. From *P. latirostris, P. angustirostris* further differs in: upper parts near (*n*) Mummy Brown instead of near (16 *l*) Prout's Brown; sides approximately (16) Cinnamon instead of near (16) Ochraceous Tawny; linear measurements less except length of tail that averages more, and in males ear that is approximately the same; nasals not expanded anteriorly as in many specimens of *latirostris*; posterior margin of palate rounded in most specimens instead of almost always truncate; in M_1, enamel island representing inner end of primary fold deeper. From *P. furvus,* additional differences in *P. angustirostris* are: upper parts less brownish; linear measurements approximately the same except that nasals average longer; tail averaging longer, instead of shorter, than head and body; nasals more acuminate posteriorly; longitudinal, dorsal outline of skull convex instead of almost straight from anterior part of cranium through interorbital region; tympanic bullae larger; in M_2, first secondary fold deeper and broader; in M_3, second primary fold prominent instead of almost absent; in m_1, second secondary fold absent, as also is opposite fold, with result that mesostylid and entoconid are almost united, and ectostylid and hypoconid are nearly united; in m_2, ectostylid better developed.

Measurements: Four old males (KU 83225–83228) and two old females (83231 and 83223), respectively: Total length, 267 (251–275), 275, 270; length of tail, 139 (132–145), 126, 140; length of hind foot, 29.5 (29–30), 28, 29; ear from notch, 21.2 (21–22), 21, 20; greatest length of skull, 34.9 (34.4–36.2), —, 35.0; zygomatic breadth, 16.5 (16.0–17.5), 16.7, 16.5; interorbital constriction, 5.0 (4.8–5.3), 5.2, 4.8; nasals (length), 14.4 (13.4–15.3), 14.3, 14.8; (length of) maxillary tooth-row, 5.0 (4.9–5.1), 5.2, 4.9.

Remarks: Comparison with the two known specimens of *Peromyscus nelsoni* from Jico, Veracruz, reveals that it differs greatly from the three species so far mentioned. *P. nelsoni* lacks the white tip on the tail that each of the three species has, is larger (maxillary tooth-row 6.6 and 6.7 instead of less than 5.4 mm), has the premaxillae extending posterior to nasals instead of vice versa, and mesostyle of M_1 larger anteroposteriorly.

The resemblance is greater between *Peromyscus angustirostris* and *P. latirostris* than between *P. angustirostris* and *P. furvus*, especially in form of the teeth.

For comparison we have used the original series of 32 specimens of *P. latirostris* and 31 recently (1946) collected specimens of *P. furvus*. Of the 31, all from Veracruz, five are from 5 km north of Jalapa, and the other 26 are from 2 km west of Jico, Veracruz. Each of these two series, as well as the series of *P. angustirostris*, contains individuals ranging in age from young having only a slight amount of wear on the teeth to old individuals having most of the crowns of the teeth worn away. There are fewer (6) old individuals of *P. angustirostris* than there are of *P. latirostris* or of *P. furvus*.

In order to accommodate *P. angustirostris*, the key to nominal species of subgenus *Peromyscus* (pp. 609–612, in The Mammals of North America, by E. Raymond Hall and Keith R. Kelson, The Ronald Press, New York, March 31, 1959) needs modification on page 611 of the line reading "46′. Total length more than 240; tail more than 120 ..... *P. furvus*, p. 648." New lines can be substituted as follows:

46′. Total length more than 240; tail more than 120.

a. Tail averaging shorter than head and body; longitudinal dorsal outline of skull almost straight from anterior part of cranium through interorbital region; second primary fold of M_3 almost absent .... *P. furvus*, p. 648.

a′. Tail averaging longer than head and body; longitudinal dorsal outline of skull convex; secondary primary fold of M_3 prominent .... *P. angustirostris*.

Specimens examined: Total, 31, all from Veracruz, as follows: 3 km west of Zacualpan, 6,300 feet, 24; Zacualpan, 6,000 feet, 7.

Acknowledgments: Study in the laboratory was supported by Grant No. 56 G 103 from the National Science Foundation. Field work was supported by grants from the Kansas University Endowment Association and the American Heart Association, Inc. We thank George H. Lowery, Jr., of Louisiana State University, for lending specimens of *Peromyscus latirostris*.

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PROCEEDINGS

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A NEW PEARLFISH (FAMILY CARAPIDAE) FROM THE GULF OF CALIFORNIA[1]

By Richard H. Rosenblatt

Scripps Institution of Oceanography, University of California, La Jolla, California

Recent investigations of the shelf fauna of the Gulf of California, México, have revealed a number of novelties, among which is an undescribed species of pearlfish. Reference to the review by Arnold (1957) leaves little doubt that this new form is referable to the genus *Echiodon* Thompson 1837. This is somewhat surprising since one of the two species placed with certainty in *Echiodon* occurs in the North Atlantic, and the other in the Mediterranean. However, the Pacific specimen shares certain distinctive characters with *Echiodon drummondi* Thompson 1837 and *E. dentatum* (Cuvier, 1817): There is a diastema in the lower jaw, the teeth are arranged in bands, the transverse processes of the third, fourth, and fifth vertebrae are unfused, and the anus is posterior (for a carapid). These features indicate that the present specimen cannot be placed either in *Carapus,* in which the tooth rows of the jaws are continuous, the lateral processes of the third and fourth vertebrae are fused, and the anus is under the pectoral base, or in *Encheliophis,* in which the teeth in the lower jaw are in a single continuous row, the lateral processes of the third, fourth, and fifth vertebrae are fused, and the anus is anterior in position.

Echiodon exsilium, new species

Fig. 1

Holotype: Fish Collection, Scripps Institution of Oceanography, University of California, La Jolla, S.I.O. 60-97-61A, a 100 mm ♀ taken

[1] Contribution from the Scripps Institution of Oceanography, New Series.

by Robert H. Parker on the R. V. "Spencer F. Baird" in 35–41 fathoms on a muddy sand bottom off Estero de Tasiota (from 28° 13.8′ N, 111° 46.7′ W to 28° 15′ N, 111° 48′ W), Golfo de California, Sonora, México, on 21 March 1960. The type was taken in a shrimp trawl and the host is unknown. The specimen may have been free-living, since the collection contained no holothurians, no large lamellibranchs or echinoids, and only two gastropods of moderate size.

Following are counts and measurements in millimeters of the type and single known specimen: Precaudal vertebrae 22; gill rakers 0 + 1 + 2 (+ six rudiments); branchiostegals 7; pectorals 20; dorsal and anal undeterminable. Total length 100.0; snout to dorsal origin 20.9; snout to anal origin 17.1; snout to center of anus 17.0; body depth at anus 7.9; head length 14.1; head depth 6.0; head width 5.9; snout 3.1; bony orbit diameter 3.2; eye diameter 2.9; interorbit 2.0; upper jaw 7.2; pectoral 8+ (tips of middle rays curled).

The body is elongate and tapering; the maximum depth is at the anus and is contained 13 times in the total length. The head is about one-seventh of the total length. The upper profile of the head is slightly convex from the nape to before a point above the middle of the eye, then shallowly concave to a point even with the posterior nostril. Anterior to the posterior nostril the profile descends abruptly to the upper lip. The short, obtuse snout is 5 in the head. Both nostrils are circular, but the anterior ends in a short tube. The nasal capsule is large, half as long as the orbit. The olfactory rosette has five pairs of simple, flattened lamellae. The bony orbit goes 8 times in the snout and 4.8 times in the head. The narrow interorbital is contained 1.7 times in the orbit.

The maxillary extends behind the orbit for a distance somewhat less than one-half an orbit diameter. The lower jaw is slightly shorter than the upper, which overhangs it by a distance about equal to the diameter of the pupil. A fang at the front of each upper jaw is separated by a pronounced diastema from a band of villiform teeth, which is about five rows wide anteriorly and two rows wide posteriorly. The dentition of the lower jaw is similar, except that the diastema is more pronounced, and the bone narrows at this point (see Arnold, 1957: 256, Fig. 3B). The vomer is covered by an oval patch of blunt, almost granular, teeth. The villiform palatine teeth are in a band about four rows wide. The vomerine and palatine tooth patches are well separated. There are two crescentic patches of tiny upper pharyngeal teeth on each side. The toothless tongue ends in a narrow free forward projection.

The anus is posterior for a carapid: 2.8 mm behind a vertical through the middle of the pectoral base. The body cavity extends far back of the anus. It ends 18.4 mm behind the center of the anus, and is empty of any organs for the last 11.8 mm. In *Carapus* a similar cavity is filled by the gas-bladder. In *E. exsilium*, however, the gas-bladder is elongate and tightly applied to the roof of the body cavity. In this respect it resembles the gas-bladder of *E. dentatum* as figured by Emery (1880: Pl. II, Fig. 15).

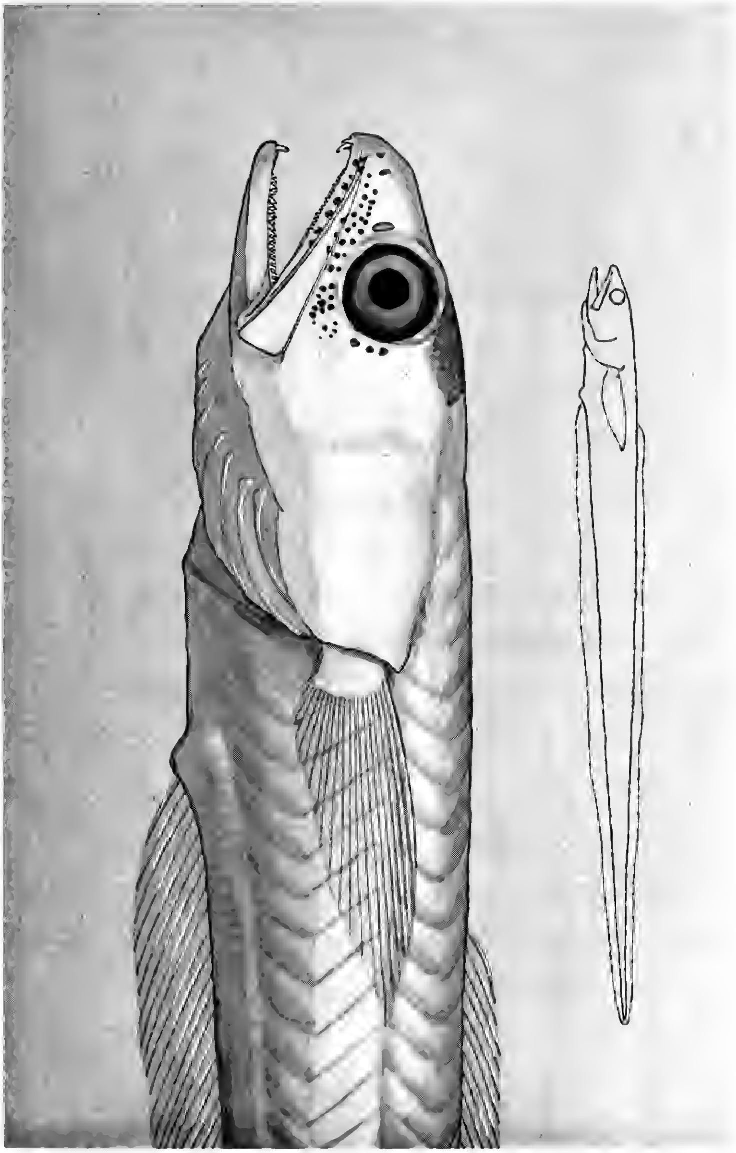

FIG. 1. *Echiodon exsilium* new species. Female holotype, SIO-60-97-61A. Total length, 100 mm.

There is a narrow slit behind the fourth gill arch. There appear to be no pseudobranchiae. The gill rakers are poorly developed. There are none on the upper limb of the first arch, and only the one at the angle and the two immediately below it are well developed. They are about half as long as the eye; the remaining six are developed as low rudiments only. The rakers of the posterior arches are all rudimentary.

I am unable to determine the position of the pores along the sensory canals of the head, nor can I observe any lateral line pores.

The origin of the dorsal is over the posterior third of the pectoral, and above a vertical from the tenth or eleventh anal ray. The dorsal and anal are confluent with the very reduced caudal. The pectoral is long and almost filamentous at the posterior extremity.

The body is mostly pale. The skull is dark brown around the brain case, and some dark pigment runs down either side of the snout and continues back beneath the eye as a feeble bar. The anterior half of the body is completely colorless, but about halfway back there begins a series of dots along the bases of the vertical fins. There is a dusting of black pigment over the posterior third of the body, concentrated mostly along the fin bases and the edges of the myomeres. The peritoneum is mostly white, although there are a few melanophores ventrally, and a larger number dorsally.

The name is derived from the Latin *exsilium,* an exile, and refers to the geographic isolation of the species from other members of the genus.

Echiodon exsilium is not closely related to the carapids reported in the eastern Pacific, *Carapus dubius* (Putnam 1874), *Encheliophis jordani* Heller and Snodgrass, 1903, and *E. hancocki* (Reid, 1940). The characters which separate the genus *Echiodon* from the species of the above genera are discussed in the introduction.

Arnold placed two species in *Echiodon, E. drummondi* Thompson, 1837, and *E. dentatum* (Cuvier, 1817). On the basis of dentition, *E. exsilium* is closer to *dentatum* than to *drummondi.* As in *dentatum* the vomerine tooth patch is rounded posteriorly, and there is a distinct gap between the vomerine and palatine dentition. *E. exsilium* also agrees with *dentatum* in the relatively anterior insertion of the dorsal fin (see Arnold's Figs. 16 and 17). *E. dentatum* and *exsilium* differ markedly in head shape, however. In *E. dentatum* the major outline of the head is concave from the occiput to the snout, whereas in *E. exsilium* the major outline of the upper surface of the head is convex (there is a shallow concavity, just before the eyes). Also, the head is wider (width 42% of head length rather than 32%) and the pectoral fin longer (56% of head length rather than 42%) in *exsilium* than in *dentatum.* In addition there appears to be a difference in the number of precaudal vertebrae. According to Emery (1880: 26), *E. dentatum* has 95 vertebrae of which 26 are precaudal. Radiographs of the type of *E. exsilium,* however, indicate that only the first 22 vertebrae bear unfused haemal arches. In the 23rd vertebra the haemal arches are fused to form a haemal spine. This is not an apparent effect produced by the hiding of one haemal element by another in the picture, since three radiographs, each taken from a different angle, show only 22 precaudal vertebrae. Due to the attenuation of the body, the total number of vertebrae cannot be determined.

Arnold felt that two more species might prove to be referable to *Echiodon*. These are *Carapus rendahli* Whitley, 1940, and *C. cinereus* Smith, 1955. The sketchy description of *C. rendahli* indicates that in that species the pectoral fin is considerably shorter (4 in the head rather than 1.8) and the dorsal origin farther forward (predorsal about .9 in head rather than .66). *Carapus cinereus* differs from *E. exsilium* in a number of respects. The most important difference involves the vomerine dentition. In *C. cinereus* (as in a number of species of *Carapus*) the vomer bears a median row of enlarged teeth, while in *E. exsilium* none of the vomerine teeth is enlarged. Also in *C. cinereus* the dorsal and anal origins are farther forward (predorsal 15% of total length rather than 21%) and the head is somewhat shorter (10.8% of length rather than 14.1%). It is not likely that the observed difference in head length is due to the greater size of the type of *C. cinereus* (215 mm), since the observed tendency in the Carapidae is for the head to become proportionally larger with increasing size (Arnold, 1957).

The zoogeographic implications of the discovery of a species of *Echiodon* in the eastern tropical Pacific are difficult to assess. It is unfortunate that the generic affinities of the Indian Ocean and Pacific species *Carapus cinereus* and *C. rendahli* cannot be determined with certainty, although it seems probable that *rendahli* at least will prove to be referable to *Echiodon*. The available evidence suggests that the affinities of *E. exsilium* lie with the Atlantic species, especially *E. dentatum*. This would suggest that *E. exsilium* or a progenitor entered the eastern Pacific from the east, via a Tertiary Central American water gap (Durham and Allison, 1960: 66–68, Fig. 7), rather than from the west, across the eastern Pacific barrier (Ekman, 1953: 72–75). If this hypothesis is correct, it might reasonably be expected that the western Atlantic might harbor a species of *Echiodon*. That no such form has yet been captured is not surprising considering the rarity of carapids in collections.

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PROCEEDINGS

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REMARKS ON THE SYSTEMATICS OF THE SARKODINA (PROTOZOA), RENAMED HOMONYMS AND NEW AND VALIDATED GENERA

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In a recent publication (Loeblich and Tappan, 1961) the writers presented an outline of the suprageneric classification of the Rhizopodea, which is to be used in the "Treatise on Invertebrate Paleontology." Since completion of that manuscript certain new developments in protozoan systematics have necessitated slight modifications, and these are here presented. In addition, several proposed genera of the "Testacea" and Foraminifera to be included in the "Treatise" have been found to be homonyms or nomina nuda and are here renamed, and five new foraminiferal genera are described so that they may be included in the "Treatise."

In the outline of suprageneric classification above mentioned, the writers recognized three subclasses within the class Rhizopodea. These subclasses, Lobosia, Filosia and Granuloreticulosia are based on the type of pseudopodia. In addition, mention was made of the recent work by Jahn and Rinaldi (1959: 15) on the mechanism of protoplasmic movement, which gave an added means of separation of the subclass Lobosia from the other two subclasses of the Rhizopodea. More recent work by Jahn, Bovee and Small (1960) has shown the advisability of recognizing a major dichotomy of the subphylum Sarkodina on the basis of protoplasmic movement.

Part of the Sarkodina are characterized by a protoplasmic movement based on differential pressure due to contraction of a plasmagel cortex, which results in a flow of plasmasol.

This mechanism has generally been accepted for the Amoebida and Mycetozoida, but is not characteristic of the remaining divisions of the Sarkodina. The remainder of the Sarkodina are characterized by a filiment-streaming type of protoplasmic movement, regarded by Jahn and Rinaldi (1959) as due to a shearing force between two adjacent oppositely moving gel-like filaments within a pseudopod, and without the presence of a plasmagel cortex.

Inasmuch as the protozoan subphyla are separated on the mechanism of movement (by pseudopodia, flagella or cilia), it is logical to assume that the two distinct mechanisms are of taxonomic importance within the Sarkodina. The separation on this basis does not entirely agree with earlier classifications, as the Lobosia are thus separated as one division opposed to the filament-streaming mechanism in both the Filosia and Granuloreticulosia of the old Rhizopodea, and the Radiolaria, Heliozoia and Acantharia of the old class Actinopodea.

A reorganization of the Sarkodina, on the basis of protoplasmic movement has been under discussion by members (including Alfred R. Loeblich, Jr.) of the Committee on Taxonomy and Taxonomic Problems of the Society of Protozoologists. Although final decisions have not yet been reached by this committee, the writers are recognizing this dichotomy in the "Treatise on Invertebrate Paleontology," hence are herein restricting the class Rhizopodea to include only the subclass Lobosia characterized by the pressure flow mechanism and are recognizing the class Reticularia Lankester as distinct, including those subclasses characterized by the filament-streaming mechanism, the Filosia, Granuloreticulosia, Radiolaria, Heliozoia, and Acantharia. These last three subclasses have already been covered for the "Treatise on Invertebrate Paleontology" by Campbell and Moore, 1954.

In the reclassification of the order Foraminiferida by the writers (Loeblich and Tappan, 1961), 17 superfamilies were recognized, based on wall composition, structure and chamber development. As certain of these superfamilies are more closely related than others, it is thought advisable to group these somewhat more concisely into suborders, based solely on wall composition. These are similar in part to the divisions used approximately a century ago by Carpenter, Parker and Jones, 1862, Lankester, 1885, etc.—i.e., Imperforata and Perforata, Arenacidae, etc. The names used herein for the suborders are based on the names of included genera. Although categories of ordinal rank are not required to be recognized on the basis of priority, we have done so when subordinal names based on an included genus were available. These suborders thus are the Allogromiina Loeblich and Tappan, new suborder, Textulariina Delage and Hérouard, 1896, Fusulinina Wedekind, 1937, Miliolina Delage and Hérouard, 1896, and Rotaliina Delage and Hérouard, 1896.

Subphylum SARKODINA Hertwig and Lesser, 1874

Class Rhizopodea von Siebold, 1845

Unicellular organisms with amoeboid principal stage, no meganucleus; pseudopodia lobose, very rarely filiform or anastomosing, naked forms with protoplasm differentiated into endoplasm and ectoplasm, and shelled forms with zonal differentiation of protoplasm frequent. In some forms plasmodia may develop by fusion of individual amoebulae. Protoplasmic movement occurs by means of a flow of plasmasol caused by differential pressure due to contraction of plasmagel cortex (see Jahn and Rinaldi, 1959: 101).

The Rhizopodea is here restricted to include only the subclass Lobosia, with orders Amoebida, Arcellinida, and Mycetozoida.

Subclass Lobosia Carpenter, 1861

Order Arcellinida Kent, 1880

Superfamily Arcellacea Ehrenberg, 1832

Family Hyalospheniidae Schulze, 1877

Apodera Loeblich and Tappan, new genus

Type species: Nebela vas Certes (1891: L15).

Test 130–210 μ in length, with subspherical body, separated from the narrowed neck by a distinct constriction, represented in the interior by a chitinous girdle; wall composed of large, regular, oval plates. Recent: southern hemisphere, South America, Australia, Hawaii, Java, Africa.

Remarks: The genus was proposed by Jung (1942a: 256; 1942b: 369, 380) with the description of two species and one variety, but without type citation and therefore a nomen nudum needing validation.

Certesella Loeblich and Tappan, new genus

Type species: Nebela martiali Certes (1891: L14).

Test chitinous, 80–200 μ in length, flask-shaped with large, very thin, almost transparent, polygonal plates; with 6 large pores in addition to the aperture, arranged in pairs, the first pair about midway on the neck, the other two pairs perpendicular to these at the base of the neck, additional small pores occur near the aperture. Recent: southern hemisphere.

Remarks: Proposed by Jung (1942a: 256, 317; 1942b: 381) as *Penardiella* (*Nebela*) (a homonym of *Penardiella* Kahl, 1930) without type designation and therefore a nomen nudum needing validation. It is interesting to note that *Nebela* Leidy, 1875 was placed as a subgenus of *Penardiella* Jung, 1942.

Jungia Loeblich and Tappan, new genus

Type species: Jungia sundanensis van Oye (1949: 331).

Test sack-like, globular to ovate, not compressed, of polygonal or elongate plates with a rim of sand grains forming a collar around the aperture; aperture round, central. Recent: Java, Venezuela.

Remarks: Proposed by van Oye (1949: 330) with description of two species, but without type citation and therefore a nomen nudum needing validation.

Superfamily CRYPTODIFFLUGIACEA Jung, 1942

Family Cryptodifflugiidae Jung, 1942

Petalopella Loeblich and Tappan, new name

Type species: Petalopus diffluens Claparède and Lachmann (1859: 442).

Petalopella, new name, is proposed for *Petalopus* Claparède and Lachmann (1859: 442), not *Petalopus* Kirby and Spence, 1828, and not *Petalopus* Motschoulsky, 1845.

Class RETICULAREA Lankester, 1885, name corrected

Class Reticularia Lankester, 1885, Encyclopaedia Britannica, 9th Ed., v. 19: 845

Unicellular organisms with amoeboid principal stage; pseudopodia may be filopodia, reticulopodia, or axopodia; may have secreted or agglutinated skeleton; protoplasmic movement by an active shearing or sliding between adjacent gel-like filaments moving in opposite directions in the same pseudopod, and in the absence of a plasmagel cortex.

The class Reticularea includes subclass Filosia with orders Aconchulinida and Gromiida, subclass Granuloreticulosia with orders Athalamida, Foraminiferida (including the order Monothalamida of the earlier publication of the writers, 1961), Xenophyophorida and Labyrinthulida and the subclasses Radiolaria, Heliozoia, and Acantharia.

Subclass FILOSIA Leidy, 1879

Order GROMIDA Claparède and Lachmann, 1859

Superfamily GROMIACEA Reuss, 1862

Family Gromiidae Reuss, 1862

Bargoniella Loeblich and Tappan, new name

Type species: Salpicola amylaceae Bargoni (1894: 43).

Bargoniella, new name, is proposed for *Salpicola* Bargoni (1894: 43), not *Salpicola* Richiardi, 1880.

Family Amphitremidae Poche, 1913

Archerella Loeblich and Tappan, new name

Type species: Ditrema flavum Archer (1877a: 103; 1877b: 336).

Archerella, new name is proposed for *Ditrema* Archer (1877a: 103; 1877b: 336), not *Ditrema* Temminck and Schlegel, 1844.

Subclass GRANULORETICULOSIA de Saedeleer, 1934

Order FORAMINIFERIDA Zborzewski, 1834

Suborder **ALLOGROMIINA** Loeblich and Tappan, new suborder

Test membranous or chitinous, may have ferruginous encrustations or more rarely small quantities of agglutinated material. Includes the superfamily Lagynacea Schultze, 1854.

Suborder TEXTULARIINA Delage and Hérouard, 1896, name corrected

Suborder TEXTULARIDAE Delage and Hérouard, 1896, Traité Zool. Concrète: 139

Test agglutinated with foreign matter held by various cements. Includes superfamilies Ammodiscacea Reuss, 1862, and Lituolacea Lamarck, 1809.

Superfamily AMMODISCACEA Reuss, 1862

Family Saccamminidae Brady, 1884

Subfamily **Diffusulininae** Loeblich and Tappan, new subfamily

Test free or attached, with interior partially subdivided into chamberlets. Type genus: *Diffusulina* Heron-Allen and Earland, 1924.

Oryctoderma Loeblich and Tappan, new genus

Type species: Crithionina rotundata Cushman, 1910: 56.

Test free, large, globular, unilocular; central cavity relatively small, simple and spherical; wall agglutinated, very thick and loosely cemented, with numerous ramifying canals leading from the central cavity to the exterior, the margins of the canals being relatively firmly cemented; apertures consist of numerous circular to polygonal openings on the surface which lead into these canals.

Remarks: The type species of this genus was originally placed in *Crithionina* Goës. However, the redescription of the type species (*C. mamilla* Goës) by Höglund (1947: 31) based on the original material of Goës, has shown that this genus should be restricted to the attached forms with relatively thin and simple wall, and large chamber cavity divided by a single more or less well-developed partial septum. The free-living species with small central cavity and thick wall traversed by labyrinthine canals opening into large surface perforations therefore are removed from *Crithionina* to the new genus *Oryctoderma*. In addition to *C. rotundata*, the Recent *C. pisum* Goës, 1896, and probably *C. rugosa* Goës, 1896, and *C. teicherti* Parr, 1942 (Permian of Australia), belong to the new genus.

Daitrona Loeblich and Tappan, new genus

Type species: Crithionina lens Goës, 1896: 24.

Test free, 2–4 mm in diameter, lenticular in section, rounded to oblong in plan; the single chamber subdivided by radial semisepta or secondary partitions, projecting inward from the wall, sometimes almost completely subdividing the test; wall finely agglutinated, loosely cemented; no localized aperture.

Remarks: *Daitrona*, new genus, differs from *Crithionina* Goës in being free and in having numerous radiating secondary partitions subdividing the chamber. It differs from *Oryctoderma*, new genus, in having a thin wall with secondary partitions nearly completely segmenting the test, rather than a thick wall with labyrinthine passages connecting the smoothly finished inner cavity to the exterior.

Superfamily Lituolacea Lamarck, 1809

Family Ataxophragmiidae Schwager, 1877

Subfamily Eggerellinae Cushman, 1937

Multifidella Loeblich and Tappan, new genus

Type species: Clavulina communis d'Orbigny var. *nodulosa* Cushman (1922a: 85).

Test free, elongate, early portional trochospiral with four or five chambers per whorl, progressively reducing to triserial, biserial, and uniserial, the uniserial stage comprising a large proportion of the adult test; wall finely agglutinated, aperture terminal, cribrate, consisting of variously aligned, elongate slits with bordering lips. Range: Miocene–Recent.

Remarks: Multifidella, new genus, differs from *Cribrogoesella* Cushman in the slender test with elongate uniserial stage and in having a multiple aperture consisting of slits with bordering lips. Originally described as *Clavulina,* the present type species was later transferred to *Listerella* Cushman, 1933 (not *Listerella* Jahn, 1906 = *Schenckiella* Thalmann, 1942) by Cushman (1936: 428), to *Schenckiella* by Cushman and Todd (1945: 8) and to *Martinottiella* by Cushman (1947: 50). *Schenckiella* is regarded by the writers as a synonym of *Martinottiella* Cushman, 1933. The present genus appears to have arisen from *Martinottiella* by the development of a multiple aperture much as *Cribrogoesella* Cushman, 1935, developed from *Goesella* Cushman, 1933. The lectotype of *Multifidella nodulosa* Cushman, here designated (USNM

16312b), is from *Albatross* Station D2547, lat. 39° 54′ 30″ N, long. 70° 20′ 00″ W, at 390 fathoms.

Suborder FUSULININA Wedekind, 1937, name corrected

Suborder Fusulinacea Wedekind, 1937, Einführung in die grundlagen der historischen geol., Band 2: 79

Primitively of microgranular calcite, advanced forms with two or more differentiated layers in the wall. Includes the superfamilies Parathuramminacea Bykova, 1955; Endothyracea Brady, 1884; and Fusulinacea Möller, 1878.

Suborder MILIOLINA Delage and Hérouard, 1896, name corrected

Suborder Miliolidae Delage and Hérouard, 1896, Traité Zool. Concrète: 117

Wall porcellanous, imperforate at least in postembryonic stages. Includes superfamily Miliolacea Ehrenberg, 1839.

Suborder ROTALIINA Delage and Hérouard, 1896, name corrected

Suborder Rotalidae Delage and Hérouard, 1896, Traité Zool. Concrète: 143

Wall calcareous, perforate. Includes superfamilies Nodosariacea Ehrenberg, 1839; Buliminacea Jones, 1875; Asterigerinacea d'Orbigny, 1839; Rotaliacea Ehrenberg, 1839; Globigerinacea Carpenter, Parker and Jones, 1862; Orbitoidacea Schwager, 1876; Cassidulinacea d'Orbigny, 1839; Carterinacea Loeblich and Tappan, 1955; and Spirillinacea Reuss, 1862.

Superfamily NODOSARIACEA Ehrenberg, 1839

Family Nodosariidae Ehrenberg, 1839

Subfamily Nodosariinae Ehrenberg, 1839

Lankesterina Loeblich and Tappan, new genus

Type species: Bolivina frondea Cushman (1922b: 126).

Test free, small, symmetrically biserial throughout, with flattened sides and truncate margins; chambers low and broad as in the later stage of *Dyofrondicularia,* but without an early uniserial stage; wall calcareous, finely perforate; aperture terminal, radial. Range: Oligocene.

Remarks: Originally described as a *Bolivina,* the type species of the present genus was later transferred to *Polymorphina* by Cushman (1929: 41) because of the radial aperture, which was illustrated by Cushman and Ozawa (1930: Pl. 30, Fig. 11). *Lankesterina* differs from *Polymorphina* in being completely symmetrical throughout and in having truncate margins, similar to the other palmate genera of the Nodosariinae (*Dyofrondicularia, Frondicularia,* etc.), but differs from these in being biserial throughout. *Polymorphina* is somewhat asymmetrical particularly in its early development, and may show traces of a sigmoid development.

The genus is named in honor of Sir Edwin Ray Lankester (1847–1929) in recognition of his outstanding contributions to the systematics of the Protozoa, and the foraminifera in particular.

Astacolus Montfort, 1808

Astacolus barrowensis Tappan, new name

Astacolus calliopsis Tappan, 1955, U. S. Geol. Survey Prof. Paper 236-B: 55, Pl. 17, Figs. 12–17 (not *Astacolus calliopsis* (Reuss), 1863, Bartenstein and Brand, 1951).

This species was noted by Thalmann (1958: 761) to be a homonym and it is herewith renamed. It occurs in the lower Jurassic Kingak formation (of Late Pliensbachian age) in South Barrow Test Well 3, south of Point Barrow, northern Alaska. The new specific name refers to the locality from which it was obtained.

Family Glandulinidae Reuss, 1860

Subfamily Glandulininae Reuss, 1860

Entolingulina Loeblich and Tappan, new genus

Type species: Lingulina aselliformis Buchner, 1942: 121.

Test free, elongate, compressed, of two or more chambers in a rectilinear series, commonly with considerable overlap of earlier chambers; wall calcareous, finely perforate, hyaline; aperture ovate or an elongate slit, with a distinct entosolenian tube projecting into the final chamber.

Remarks: Entolingulina, new genus, differs from *Lingulina* in having an entosolenian tube and from *Glandulina* in lacking the early biserial stage, in being compressed, and in the slit or ovate aperture rather than a radiate one. Many two-chambered species have been described which may belong to *Entolingulina,* but may also be twinned or freak specimens of *Fissurina.* This can be determined only by an examination of suites of these species and associated *Fissurina* if any. Among these two-chambered forms possibly referable to *Entolingulina* are *Lingulina armata* Sidebottom, 1907, *L. bicarinata* forma *nasuta* Buchner, 1942, *L. carinata* var. *biloculi* Wright, 1911, *L. cornigera* Buchner, 1942, *L. cucullifera* Buchner, 1942, *L. falcata* Heron-Allen and Earland, 1932, *L. herdmanni* Chaster, 1892, *L. inarimensis* Buchner, 1942, *L. lagenoides* Buchner, 1942, *L. translucida* Heron-Allen and Earland, 1932, and *L. tubulata* Buchner, 1942.

Superfamily Rotaliacea Ehrenberg, 1839

Family Pellatispiridae Hanzawa, 1937

Pokornyella Loeblich and Tappan, new name

Type species: Siderina douvillei Abrard (1926: 31).

Pokornyella, new name, is proposed for *Siderina* Abrard (1926: 31), not *Siderina* Dana, 1848. It is named in honor of Dr. V. Pokorný, Charles University, Prague, Czechoslovakia, in recognition of his contributions to micropaleontology.

Subclass RADIOLARIA J. Müller, 1858

Although four recent monographs have been concerned with this group (Campbell in Moore, 1954; Deflandre in Grassé, 1953; Deflandre in Piveteau, 1952, and Streklov and Lipman in Rauser-Chernousova and Fursenko, 1959) a number of generic homonyms have not yet been renamed. For other homonyms, new names have been proposed in the past, but overlooked or regarded as synonyms of the invalid homonyms. These are here discussed, and the homonyms renamed under the family headings as used by Campbell in Moore, 1954. Some family group names are also changed from those used by Campbell, on the basis of priority. Only family group names applying to the corrected genera are here included.

The publication of Haeckel, 1882, cited by Campbell in Moore (1954) was according to the cover for this number actually published and distributed 25 November 1881, hence dates for the families cited below as Haeckel, 1881, refer to the publication listed by Campbell as 1882.

Superfamily THALLASSOSPHAERACEA Haeckel, 1862, name corrected

Family Thalassosphaeridae Haeckel, 1862

Thalassorhaphis Campbell, 1951

Campbell proposed the genus (1951: 527) as *Thalassorhaphis,* with type species *Thalassoplancta brevispicula* Haeckel, 1887. In a later paper Campbell (1953: 298) corrected this to *Thalassorrhaphis,* stating that it was originally incorrectly derived, and was corrected to agree with rules of Greek word composition. According to the rules, changes are not allowed on the basis of incorrect word formation, only when these can be shown to be a lapsus calami or typographical error.

Family Lithacanthidae Popofsky, 1907

Genus **Tetracina** Loeblich and Tappan, new name

Type species: Tetracanthus simplex Popofsky, 1907.

The name is proposed for *Tetracanthus* Popofsky, 1907, Zool. Anzeiger, vol. 31: 701; not *Tetracanthus* Hemprich and Ehrenberg, 1866, in Schneider, Monogr. Nemat.: 104. Verm. (Nemat.) See Campbell (1954: D46).

Superfamily ETHMOSPHAERACEA Haeckel, 1862, name transferred

Family Ethmosphaeridae Haeckel, 1862, name transferred

[Ethmosphaerida Haeckel, 1862; Ethmosphaerinae Campbell, 1954; Liosphaerida Haeckel, 1881; Liosphaeridae Campbell, 1954; Cenosphaeridae Deflandre, 1952.]

According to the rules, no family can include a subfamily of prior date, hence this family name must be Ethmosphaeridae Haeckel, 1862; not Liosphaeridae Haeckel, 1881.

Subfamily Ethmosphaerinae Haeckel, 1862

Cenosphaera Ehrenberg, 1854

Subgenus **Chaunosphaera** Loeblich and Tappan, new name

Type species: Cenosphaera primordialis Haeckel, 1887.

Cenosphaera (*Chaunosphaera*) is here proposed for *Cenosphaera* (*Porosphaera*), as *Porosphaera* Haeckel, 1887, Rep. Voy. *Challenger* Exped. Zool., vol. 18(1): 67, is preoccupied by *Porosphaera* Steinmann, 1878, Palaeontogr., vol. 25, no. 3: 120, Spong. *Porosphaera* is recognized by Campbell (1954: D50) and Deflandre in Piveteau (1952: 770).

Subfamily Plegmosphaerinae Haeckel, 1881

Dictyoplegma Haeckel, 1862

Type species: Dictyosoma spongiosum Müller, 1858.

Dictyoplegma Haeckel, 1862, Radiolaria, vol. 1: 452, 458, was proposed as a new name for *Dictyosoma* Müller, 1856, Monatsber. Akad. Wiss. Berlin, 1856: 485; not *Dictyosoma* Temminck and Schlegel, 1845, in Siebold, F. Japon. (Pisc.): 139, Pisces. The name *Dictyosphagma* Mivart, 1878, was also proposed as a new name for this genus, and is an objective synonym. Campbell (1954: D50) cites *Spongodictyon* Haeckel, 1862 (= *Spongodictyum*?) as an objective synonym of *Dictyosoma* and *Spongodictyon* also was used by Deflandre in Grassé (1953: 342) and by Strelkov and Lipman in Rauser-Chernousova and Fursenko (1959: 433).

This genus and its type subgenus thus should be referred to *Dictyoplegma* Haeckel, 1862, and the subgenus *Dictyosoma* (*Spongodictyoma*) Haeckel, 1862, should be transferred to *Dictyoplegma* (*Spongodictyoma*).

Family Triposphaeridae Vinassa de Regny, 1898

Vinassaia Cossmann, 1900

Vinassaia was proposed by Cossmann, 1900, Rev. Crit. Palaezool. vol. 4: 42, for *Rustia* Vinassa de Regny, 1898, Riv. Ital. Paleont., vol. 4: 53; not *Rustia* Stål, 1866, Hem. Afric., vol. 4: 8, Hem. Both Deflandre in Grassé (1953: 417) and Campbell in Moore (1954: D56) cite the genus under the homonymous name, without mention of *Vinassaia*, proposed as its replacement.

Family Actinommidae Haeckel, 1862, name corrected and transferred

[Actinommida Haeckel, 1862; Actinommatinae Campbell, 1954]

This family was regarded as Astrosphaeridae Haeckel, 1882, by Campbell in Moore (1954: D60), but as a family cannot contain a subfamily of prior date, the earliest family group name is here used.

Subfamily Astrosphaerinae Haeckel, 1881

Anomalacantha Loeblich and Tappan, new name

Type species: Heteracantha dentata Mast, 1910.

The new name is here proposed for *Heteracantha* Mast, 1910, Ergeb. Tiefsee-Exped., vol. 19, no. 4: 159–161; not *Heteracantha* Brullé, 1834, H. N. Ins., vol. 4, no. 2 (Col.): 383. Col. See Campbell in Moore (1954: D62).

Anomalosoma Loeblich and Tappan, new name

Type species: Heterosoma heptacanthum Mast, 1910.

Anomalosoma is proposed as a new name for *Heterosoma* Mast, 1910, Ergeb. Tiefsee-Exped., vol. 19, no. 4: 167; not *Heterosoma* Schaum, 1845, Ann. Soc. ent. France, ser. 2, vol. 2: 390, 426. Col. (Cetoniid.); and not *Heterosoma* Bernhauer, 1903, Ent. Ztg. Stettin, vol. 64: 33. Col. (Staphylinid). See Deflandre in Grassé (1953: 403–404) and Campbell in Moore (1954: D62).

Superfamily Sponguracea Haeckel, 1862, name transferred

[Spongurida Haeckel, 1862; Ellipsida Haeckel, 1887; Prunoidea Haeckel, 1887; Ellipsidiicae Campbell, 1954]

The superfamily was referred to the Ellipsidiicae by Campbell in Moore (1954: 68) but as a superfamily cannot contain a family or subfamily of prior date, the earliest family group name is here used and elevated to superfamily rank.

Family **Cyphantellidae** Loeblich and Tappan, substitute name

The type genus of the family Cyphantidae Campbell, 1954, is a homonym. As *Cyphantella* Haeckel, 1887, replaces *Cyphanta* Haeckel, 1887, as the valid name for this taxon, the new family name Cyphantellidae is proposed, with *Cyphantella* Haeckel, 1887, as type genus.

Cyphantella Haeckel, 1887

Type species: Cyphanta colpodes Haeckel, 1887.

Both Deflandre in Grassé (1953: 421) and Campbell in Moore (1954: D74) refer to this genus as *Cyphanta* Haeckel, 1887 (Rep. Voy. *Challenger*, Zool., vol. 18, pt. 1: 360), which is a homonym of *Cyphanta* Walker, 1865, List Specimens Lep. Ins. Brit. Mus., vol. 33: 855, Lep. Although *Cyphantella* Haeckel, 1887, was regarded as an objective synonym of *Cyphanta* by Campbell, it is the first valid name available for the genus.

The type subgenus will therefore be referred to *Cyphantella* (*Cyphantella*), and *Cyphanta* (*Cyphantissa*) Haeckel, 1887, becomes *Cyphantella* (*Cyphantissa*).

Superfamily Coccodiscacea Haeckel, 1862, name transferred
[Coccodiscida Haeckel, 1862; Cenodiscida Haeckel, 1887; Cenodiscicae Campbell, 1954]

Subsuperfamily Coccodiscilae Haeckel, 1862, name transferred

The oldest validly proposed family group names within this superfamily are Coccodiscida Haeckel, 1862, and Trematodiscida Haeckel, 1862. The last named is based on the genus *Trematodiscus* Haeckel, 1860, an objective synonym of *Flustrella* Ehrenberg, 1839. Therefore, the superfamily name must be based on the family Coccodiscidae Haeckel, and it is here transferred to superfamily status.

The subsuperfamily Cenodiscilae Haeckel, 1887, of Campbell in Moore (1954: D76) thus becomes the Coccodiscilae Haeckel, 1862. The family names remain unchanged within the Coccodiscilae.

Family Phacodiscidae Haeckel, 1881

Subfamily Heliosestrinae Haeckel, 1887

Triactoma Rüst, 1885

Triactis Haeckel, 1881, Jena. Zeitsch., vol. 15: 457. *Type species: Triactoma tithonianum* Rüst, 1885, subsequent designation by Campbell in Moore, 1954: D81; not *Triactis* Klunzinger, 1877, Koralthiere rothen Meeres, vol. 1: 85.

Triactoma Rüst, 1885, Palaeontographica, vol. 31 (N.F., vol. 11): 289. *Type species: Triactoma tithonianum* Rüst, 1885, subsequent designation by Campbell in Moore, 1954: D81.

Triactiscus Haeckel, 1887, Rep. Voy. *Challenger* Exped., Zool., vol. 18, pt. 1: 421. *Type species: Triactiscus tripyramis* Haeckel, 1887, subsequent designation by Strelkov and Lipman in Rauser-Chernousova and Fursenko, 1959: 443.

The nomenclatural status of this genus has been confused. Campbell in Moore (1954: D81) recognized this genus as *Triactis* Haeckel, 1882 (sic), and cited *Triactoma titonianum* (sic) Rüst (correctly *Triactoma tithonianum*). Both *Triactoma* and *Triactiscus* were listed as objective synonyms, indicating that all three have the same type species. None of these three generic names was mentioned by Deflandre in Grassé (1953), but Strelkov and Lipman in Rauser-Chernousova and Fursenko (1959: 443) recognize *Triactiscus* with *T. tripyramis* Haeckel listed as type species. The generic name *Triactis* was proposed by Haeckel (1881: 457), without citation of species, hence any species could be later selected as type. However, the name was a homonym of *Triactis* Klunzinger, 1877.

Triactoma was used by Rüst, apparently as a substitute name for *Triactis* Haeckel, 1881, not Klunzinger, 1877, although the earlier name was not mentioned. Rüst stated (1885: 10) that he followed the classification, families and genera of Haeckel (1881) and that the latter was so detailed that only two new generic names were required for the

Jurassic forms, *Podocapsa* and *Salpingocapsa*. In the description of these two new genera by Rüst the new names were followed by the notation "n.g." and a generic diagnosis. *Triactoma* was merely given as a heading (as were the other generic names of Haeckel) before the descriptions of the species included therein. Furthermore, *Triactoma* is not mentioned by Neave, 1940, in Nomenclator Zoologicus, or in the supplement (1950). Rüst included and described three species in *Triactoma*—all new, *Triactoma tithonianum, T. pachyacantha* and *T. ilsedense*. The type species selected by Campbell in Moore was the first species described in Rüst's publication.

In 1887 Haeckel used the generic name *Triactiscus*, as a substitute name for *Triactis*. Although he did not mention the change in spelling, he cited the earlier paper and page where *Triactis* was described. No mention was made of Rüst's paper, and it is possible that the *Challenger* report was already in press before Rüst's paper had appeared. Haeckel described three species under *Triactiscus, T. tripyramis*, n. sp., *T. tricuspis*, n. sp., and *T. tripodiscus* Haeckel (including *Haliomma triactis* Ehrenberg, 1875, as a synonym, which has priority as a specific name over *T. tripodiscus*). As only three species were included by Haeckel, one of these must be cited as type. It cannot be an objective synonym of *Triactoma*, as stated by Campbell, as *Triactoma tithonianum* Rüst was not in the original list of species included in *Triactiscus*. The citation of *Triactiscus tripyramis* Haeckel as type, by Strelkov and Lipman in Rauser-Chernousova and Fursenko (1959: 443) is therefore valid—this being the first of the three species cited by Haeckel. Although both *Triactoma* and *Triactiscus* were apparently intended as new names for the homonym *Triactis* Haeckel, 1881, not Klunzinger, 1877, they nevertheless have different type species, as these were fixed by subsequent designation and must therefore in each case be one of the species included by the author of the genus.

The correct name for this genus is therefore *Triactoma* Rüst, 1885, as it has priority over *Triactiscus* Haeckel, 1887.

Subsuperfamily Ommatodiscilae Stöhr, 1880, name transferred

[Trematodiscida Haeckel, 1862; Ommatodiscidae Stöhr, 1880; Cyclodiscarea Haeckel, 1887; Euchitoniilae Campbell, 1954]

The oldest validly proposed family group name within this subsuperfamily is Trematodiscida Haeckel, 1862, based on *Trematodiscus* Haeckel, 1860, which is an objective synonym of *Flustrella* Ehrenberg, 1839. The oldest name based on a valid generic name is therefore the Ommatodiscida Stöhr, 1880, which should be used as a basis for the family group names referred by Campbell in Moore (1954) to the family Euchitoniidae Haeckel, 1887 [= Ommatodiscidae] and the subsuperfamily Euchitoniilae [= Ommatodiscilae].

Family Ommatodiscidae Stöhr, 1880

Subfamily Euchitoniinae Haeckel, 1887

Amphibrachella Haeckel, 1887

Type species: Amphibrachium diminutum Haeckel, 1887.

The name *Amphibrachella* Haeckel, 1887, was regarded as an objective synonym of *Amphibrachium* Haeckel, 1881, by Campbell in Moore (1954: D86). *Amphibrachium* was also recognized by Deflandre in Grassé (1953: 349), and by Strelkov and Lipman in Rauser-Chernousova and Fursenko (1959: 446). However, *Amphibrachium* Haeckel, 1881, Jena Zeitsch., vol. 15: 460 is a homonym of *Amphibrachium* Schulze, 1880, Trans. Roy. Soc. Edinburgh, vol. 29: 672, and the next valid name available is *Amphibrachella*. The subgenera of *Amphibrachium*, listed by Campbell in Moore (1954: D86) may thus be known as *Amphibrachella* (*Amphibrachella*), *A.* (*Amphibrachidium*), and *A.* (*Amphibrachura*), all of Haeckel, 1887.

Subfamily Flustrellinae Campbell, 1954

Flustrella Ehrenberg, 1839

Subgenus **Discospirella** Loeblich and Tappan, new name

Type species: Discospira helicoides Haeckel, 1862.

The new subgeneric name is proposed for *Discospira* Haeckel, 1862, which was regarded as a subgenus of *Flustrella* Ehrenberg, 1839, by Campbell in Moore (1954: D90). *Discospira* Haeckel, 1862, Die Radiolarien, vol. 1: 513, is a homonym of *Discospira* Mantell, 1850, Pict. Atlas: 142, Foraminifera, and of *Discospira* Semper, 1862, Arch. Ver. Freunde Naturgesch. Mecklenburg, vol. 15: 380, Moll.

Subgenus **Perispirella** Loeblich and Tappan, new name

Type species: Porodiscus perispira Haeckel, 1887.

Perispirella is proposed for *Perispira* Haeckel, 1881, regarded by Campbell in Moore (1954: D90) as a subgenus of *Flustrella* Ehrenberg, 1839. *Perispira* Haeckel, 1881, Jena Zeitschr., vol. 15: 459, is a homonym of *Perispira* Stein, 1859, Lotos, vol. 9, pt. 1: 60, Protozoa, Ciliata.

Superfamily LITHELIACEA Haeckel, 1862, name transferred

[Lithelida Haeckel, 1862; Litheliidae Campbell, 1954]

The family group name based on *Lithelius* Haeckel, 1862, has priority over the Laracarida Haeckel, 1887, which was elevated to superfamily rank by Campbell in Moore (1954: D95).

Family Pyloniidae Haeckel, 1881

Trizonium Haeckel, 1887

Type species: Echinosphaera datura Hertwig, 1879.

Echinosphaera Hertwig, 1879, was recognized for this taxon by Campbell in Moore (1954: D96) and *Trizonium* Haeckel, 1887, and *Trizonites*

Haeckel, 1887, regarded as objective synonyms. However, *Echinosphaera* Hertwig, 1879, Denkschr. Ges. Jena, vol. 2: 181, is a homonym of *Echinosphaera* Angelin, 1878, Iconog. Crin. Sil.: 28, Echin., and the next available name is *Trizonium* which is here regarded as the valid name.

Superfamily PLAGONIACEA Haeckel, 1881, name corrected

[Plagonida Haeckel, 1881; Plectida Haeckel, 1881; Plectoidea Haeckel, 1887; Plagoniicae Campbell, 1954]

Family Plectaniidae Haeckel, 1881

Subfamily Triplectinae Haeckel, 1881

Deflandrella Loeblich and Tappan, new name

Type species: Campylacantha cladophora Jörgensen, 1905.

The new name is proposed for *Campylacantha* Jörgensen, 1905, in Nordgaard and Jörgensen, Bergens Mus. Hydrogr. Invest.: 129, not *Campylacantha* Scudder, 1897, Proc. Amer. Acad., vol. 32, no. 9: 198, 204, Orth. The genus was recorded as *Campylacantha* Jörgensen by Deflandre in Grassé (1953: 405, 406), by Campbell in Moore (1954: D104) and by Strelkov and Lipman in Rauser-Chernousova and Fursenko (1959: 400). *Deflandrella* is named in honor of Professor G. Deflandre, in recognition of his work on the Protozoa.

Plectophorina Loeblich and Tappan, new name

Type species: Plectophora triomma Haeckel, 1887.

The new name is proposed for *Plectophora* Haeckel, 1881, Jena Zeitschr., vol. 15: 424, not *Plectophora* Gray, 1834, Ill. Indian Zool., vol. 2 (pts. 15, 16), pl. 42, Aves. The genus is discussed by Campbell in Moore (1954: D104).

Subfamily Tetraplectinae Haeckel, 1881

Talariscus Loeblich and Tappan, new name

Type species: Obeliscus pseudocuboides Popofsky, 1913.

The new name is proposed for *Obeliscus* Popofsky, 1913, Deutsch. Sudpolar Exped., vol. 14, no. 2: 279, not *Obeliscus* Beck, 1837, Index Moll. Mus. Ch. Fred., vol. 1: 61, moll. and not *Obeliscus* Agassiz, 1845, Nom. Zool. (Moll.): 60, Moll. The genus was described as *Obeliscus* by Campbell in Moore (1954: D104).

Superfamily ACANTHODESMIACEA Hertwig, 1879, name transferred

[Acanthodesmida Hertwig, 1879; Acanthodesmidae Campbell, 1954]

The family group name based on *Acanthodesmia* Müller, 1858, has priority over the Stephida Haeckel, 1881, and Stephanida Haeckel, 1887, and the superfamily Stephaniicae of Campbell in Moore (1954: D105) must be changed to Acanthodesmiacea.

Family Paratympanidae Haeckel, 1881

Subfamily Protympaniinae Haeckel, 1887

Toxarium Haeckel, 1887

Subgenus **Toxidiella** Loeblich and Tappan, new name

Type species: Toxidium cordatum Haeckel, 1887.

The new subgeneric name is proposed for *Toxarium* (*Toxidium*) as described by Campbell in Moore (1954: D109). *Toxidium* Haeckel, 1887, Rep. Voy. *Challenger* Exped., vol. 18, pt. 2: 996 is preoccupied by *Toxidium* Leconte, 1860, Proc. Acad. Nat. Sci. Philadelphia, 1860: 324, Col.

Superfamily ARCHIPILIACEA Haeckel, 1881, name corrected

[Archipilida Haeckel, 1881; Archipiliicae Campbell, 1954]

Family Sethophatnidae Haeckel, 1881, name corrected

[Sethophatnida Haeckel, 1881; Sethophaenida Haeckel, 1887, Sethophatninae Campbell, 1954]

The family group name Sethophormida Haeckel, 1881, is based on *Sethophormis* Haeckel, 1887, a synonym of *Tetraphormis* Haeckel, 1881, hence the oldest family group name based on a valid genus is Sethophatnida Haeckel, 1881. The family Sethophatnidae includes the genera and subfamilies included by Haeckel, 1887, in the Anthocyrtida, by Frizzell and Middour (1951: 8) in the Sethophormidae and by Campbell in Moore (1954: D124–128) in the family Sethophormididae.

Anthocyrtella Haeckel, 1887

Type species: Anthocyrtis mespilus Ehrenbreg, 1854.

Campbell in Moore (1954: D125) and Strelkov and Lipman in Rauser-Chernousova and Fursenko (1959: 455) refer to this genus as *Anthocyrtis* Ehrenberg, 1847. However, *Anthocyrtis* Ehrenberg, 1847, Monatsber. Akad. Wiss. Berlin, 1847: 54, is a homonym of *Anthocyrtis* Ehrenberg (January 1847), Bericht Verh. preuss. Akad. Wiss., 1846, tab. p. 385, pisces. *Anthocertella* Haeckel, 1887, Rep. Voy. *Challenger* Zool., vol. 18(2): 1269, was regarded as an objective synonym by Campbell but is the next valid name available. *Anthocyrtissa* Haeckel, 1887, and *Anthocyrtura* Haeckel, 1887, were placed as subgenera of *Anthocyrtis* by Campbell in Moore (1954: D126) and may now be considered as *Anthocyrtella* (*Anthocyrtissa*) and *Anthocyrtella* (*Anthocyrtura*) respectively.

Dictyoprora Haeckel, 1881

Type species: Sethamphora hexapleura Haeckel, 1887.

This genus includes the forms previously placed in the genus *Cryptocephalus* Haeckel, 1881, and the subgenera *Cryptocephalus* (*Cryptocephalus*) Haeckel, 1881, and *C.* (*Dictyoprora*) Haeckel, 1881, of Campbell in Moore (1954: D127). The generic name *Cryptocephalus* Haeckel, 1881, Jena Zeitschr., vol. 15: 430, is a homonym of *Cryptocephalus*

Geoffroy, 1762, Hist. Insect. Paris, vol. 1: 231, Col., and of *Cryptocephalus* van Beneden, 1849, Bull. Acad. Roy. Bruxelles, vol. 16, no. 1: 192, Verm. (Cest.). The objective synonym *Sethamphora* Haeckel, 1887, was recognized by Deflandre in Piveteau (1952: 310–311), by Deflandre in Grassé (1953: 426), and by Strelkov and Lipman in Rauser-Chernousova and Fursenko (1959: 455), but is preoccupied for the genus, s.l., by *Dictyoprora* Haeckel, 1881. The two subgenera thus become *Dictyoprora* (*Dictyoprora*) Haeckel, 1881, and *Dictyoprora* (*Sethamphora*) Haeckel, 1887.

Family Lophophaenidae Haeckel, 1881

Subfamily Lophophaeninae Haeckel, 1881

Dictyocryphalus Haeckel, 1887

Type species: Dictyocephalus obtusus Ehrenberg, 1861.

The generic name *Dictyocryphalus* Haeckel, 1887, was regarded by Campbell in Moore (1954: D128) as an objective synonym of *Dictyocephalus* Ehrenberg, 1861, and this genus was also referred to *Dictyocephalus* by Deflandre in Grassé (1953: 363), and to *Dictiocephalus* by Strelkov and Lipman in Rauser-Chernousova and Fursenko (1959: 456). *Dictyocephalus* Ehrenberg, 1861, Monatsber. Akad. Wiss. Berlin, 1860: 830, is a homonym of *Dictyocephalus* Leidy, 1857, Proc. Acad. Nat. Sci. Philadelphia, vol. 8: 256, Amph. The next available valid name is *Dictyocryphalus* Haeckel, 1887.

Family Theopiliidae Haeckel, 1881

Subfamily Theopiliinae Haeckel, 1881

Lipmanella Loeblich and Tappan, new name

Type species: Lithornithium dictyoceras Haeckel, 1860.

The new name is proposed for *Dictyoceras* Haeckel, 1862, Die Radiolarien, vol. 1: 333, not *Dictyoceras* Eichwald, 1860, Lethaea Ross., vol. 1: 1263, moll. It was recorded as *Dictyoceras* Haeckel by Campbell in Moore (1954: D130), and by Strelkov and Lipman in Rauser-Chernousova and Fursenko (1959: 402). The generic name is in honor of Professor R. K. Lipman, in recognition of his work on the radiolaria.

Subsuperfamily Stichoperilae Haeckel, 1881, name transferred

Family Stichoperidae Haeckel, 1881, name transferred

[Stichoperida Haeckel, 1881; Stichopilida Haeckel, 1881; Tetracyrtida Haeckel, 1881; Stichocyrtdia Haeckel, 1881; Podocampida Haeckel, 1887; Stichopiliidae Frizzell, 1951; Triacartilae Campbell, 1954; Triacartidae Campbell, 1954; Stichoperinae Campbell, 1954; Triacartinae Campbell, 1954]

Triacartus Haeckel, 1881, is regarded by Campbell in Moore (1954: D136) as including *Stichopilium* Haeckel, 1881, as an objective synonym, and the type is cited as *Stichopilium cortina* Haeckel, 1887. However, Frizzell in Frizzell and Middour (1951: 31–32) regards the two as objective synonyms but designated *Stichopilium bicorne* as type species of both. The family group names based on *Stichopilium* needed replacement and Campbell therefore proposed as new names the subfamily Triacartinae, family Triacartidae, and subsuperfamily Triacartilae. Only the first needed replacement, however, as the family name Triacartidae Campbell, 1954, is preoccupied by the family group name Stichoperida Haeckel, 1881 (= Stichoperinae Campbell, 1954). The subsuperfamily Triacartilae Campbell, 1954, is preoccupied by the Stichoperida Haeckel, 1881, Artophormida Haeckel, 1881 (= Artophormididae and Artophormidinae Campbell, 1954 = correctly Artophormidae), Stichophormida Haeckel, 1881, Stichophatnida Haeckel, 1881 (= Stichophatninae Campbell, 1954), Stichocorida Haeckel, 1881 (= Stichocoridae Frizzell, 1951; Stichocorythidae Campbell, 1954), Lithocampida Haeckel, 1887, Stichocapsida Haeckel, 1881 (= Stichocapsinae Campbell, 1954), and Artocapsida Haeckel, 1881. It is here recognized as subsuperfamily Stichoperilae.

Family Artophormidae Haeckel, 1881

[Artophormida Haeckel, 1881; Artophaenida Haeckel, 1881; Artophormididae Campbell, 1954]

Anthocorys Haeckel, 1881

Subgenus *Cyrtocorys* Haeckel, 1887

Type species: Phormocampe mitra Haeckel, 1887.

Cyrtocorys Haeckel, 1887, was originally an invalidly changed spelling of *Cyrtocoris* Haeckel, 1881, Jena Zeitschr., vol. 15: 438, and thus a junior objective synonym. However, as *Cyrtocoris* Haeckel, 1881, is a homonym of *Cyrtocoris* White, 1842, Trans. Ent. Soc. London, vol. 3, no. 2: 89, Hem., the name *Cyrtocorys* may be used for this taxon. It was referred to *Anthocorys* (*Cyrtocorys*) Haeckel, 1882, by Campbell in Moore (1954: D139), but the spelling as *Cyrtocorys* dates only from 1887.

Family Aulosphaeridae Haeckel, 1862

Subfamily **Campbellellinae** Loeblich and Tappan, substitute name

[Aulonida Haeckel, 1887; Auloniinae Campbell, 1954]

As the type genus of the subfamily Auloniinae is a homonym, here renamed as *Campbellella,* the subfamily name must be replaced by that based on the valid generic name.

Campbellella Loeblich and Tappan, new name

Type species: Aulonia hexagonia Haeckel, 1887.

The new name is proposed for *Aulonia* Haeckel, 1887, Rep. Voy. *Challenger,* Zool., vol. 18, no. 40: 1633, a homonym of *Aulonia* Koch, 1847, Die Arachniden, vol. 14, pt. 3: 97. It was described as *Aulonia* by Campbell in Moore (1954: D150). The generic name is in honor of Professor A. S. Campbell, in recognition of his work on the Radiolaria.

Superfamily CHALLENGERIACEA Murray, 1876, name corrected
[Challengerida Murray, 1876; Challengeriicae Campbell, 1954]
Family **Lirellidae** Loeblich and Tappan, substitute name

As the family Cadiidae Borgert, 1910, is based on *Cadium* Bailey, 1856, a homonym of *Cadium* Link, 1807, the family name must be changed to one based on a valid genus.

Lirella Ehrenberg, 1872

Cadium Bailey, 1856, Amer. Jour. Sci., ser. 2, vol. 22, p. 3. *Type species: Cadium marinum* Bailey, 1856. Fixed by original designation (monotypy); not *Cadium* Link, 1807, Beschr. Nat. Samml. Univ. Rostock, vol. 3, p. 113, Moll.

Difflugia (*Lirella*) Ehrenberg, 1872, Abh. K. Akad. Wiss. Berlin for 1871, p. 248. *Type species:* (here designated) *Lirella baileyi* Ehrenberg, 1872, new name for *Cadium marinum* Bailey, 1856 = *Difflugia* (*Lirella*) *marina* (Bailey) Ehrenberg, 1872, not *Difflugia marina* Bailey, 1856.

?*Eucadium* Ehrenberg, 1872, Abh. K. Akad. Wiss. Berlin for 1871, p. 248. *Type species:* (here designated) *Difflugia* (*Lirella*) *seriata* Ehrenberg, 1872.

Beroetta Cleve, 1899, K. Svenska Vetens. Akad. Handl., vol. 22, no. 3, p. 27. *Type species: Beroetta melo* Cleve, 1899, fixed by original designation (monotypy).

Cadiumella Strand, 1928, Arch. Naturgesch., vol. 92, A8 for 1926, p. 31, new name for *Cadium* Bailey, 1856, not *Cadium* Link, 1807. *Type species: Cadium marinum* Bailey, 1856, objective.

Cadimella Stand, Campbell in Moore, 1954, Treatise on Invert. Paleontology, Pt. D, Protista 3, p. D152. Misspelling of *Cadiumella* and Strand, placed in synonomy of *Cadium* Bailey.

Cadium was described by Bailey in 1856, but was a homonym of *Cadium* Link, 1807, a mollusk, and therefore renamed by Strand in 1928. The homonymy and subsequent renaming has been overlooked by the recent Treatises (Deflandre in Grassé, 1953: 377, and Campbell in Moore, 1954: D152) and the genus recognized as *Cadium.* Campbell even included *Cadiumella* Strand (although generic name and author were both misspelled) and *Beroetta* Cleve, 1899, in the synonomy of *Cadium.*

Although *Cadiumella* was proposed as a substitute name for the homonym *Cadium,* it is preoccupied by *Beroetta* Cleve, which has long been regarded as congeneric (Borgert, 1910, Ergebnisse Plankton-Exped., Humboldt Stiftung, Kiel and Leipzig, vol. 10: 384–414). Furthermore, in 1872 Ehrenberg discussed *Cadium marinum* Bailey in connection with numerous other protozoans, many of which he regarded as belonging to *Difflugia* although now placed in many different genera, families and orders. He described a number of subgenera of *Difflugia,* one of which

Difflugia (*Lirella*) included three species in the original list. One of these was *Lirella baileyi*, new name for *Cadium marinum* Bailey, 1856, because Ehrenberg considered this a homonymous species, as he placed *Difflugia marina* Bailey (possibly = *Paraquadrula*) and *Cadium marinum* Bailey in the same "genus." This congeneric status has not since been accepted by any later workers, because *Difflugia marina* Bailey belongs to the Rhizopodea (Arcellacea) whereas *Cadium marinum* Bailey is a Radiolarian. Thus there is no true homonymy and species *Lirella baileyi*, here designated as type species of *Lirella* Ehrenberg, is an objective synonym of *Cadium marinum*. The genus therefore should be referred to *Lirella*, and the type species *Lirella baileyi* Ehrenberg = *Cadium marinum* Bailey. *Eucadium* was also proposed by Ehrenberg, with two species originally included, of which *Difflugia* (*Lirella*) *seriata* Ehrenberg is here designated as type.

Subclass ACANTHARIA Haeckel, 1862

Superfamily ASTROLONCHACEA Haeckel, 1881, name corrected

Family Astrolonchidae Haeckel, 1881

Subfamily Astrolonchinae Haeckel, 1881

Dipelicophora Loeblich and Tappan, new name

Type species: Dicranophora buetschlii Schewiakoff, 1926.

New name proposed for *Dicranophora* Schewiakoff, 1926, Fauna e Flora Golfo di Napoli, vol. 37: 163; not *Dicranophora* Macquart, 1834, Roret's Suite à Buffon, Diptères, vol. 1: 255 (Diptera). For discussion see Deflandre in Grassé (1953: 304) and Campbell in Moore (1954: D34).

Superfamily Dorataspacea Haeckel, 1862, name corrected

Family Dorataspidae Haeckel, 1862, name corrected

[Dorataspida Haeckel, 1862; Dorataspididae Campbell, 1954]

Orophaspis Haeckel, 1881

Orophaspis Haeckel, 1881, Jena. Zeitschr., vol. 15: 468.

Stegaspis Haeckel, 1881, Jena. Zeitschr. vol. 15: 468; objective; not *Stegaspis* Germar, 1833—Hem.

Type species: Orophaspis diporaspis Haeckel, 1887.

Campbell (1954: D37) recognizes *Stegaspis* Haeckel, with *Orophaspis* regarded as an objective synonym. *Orophaspis* is the valid name, as it has priority and, because *Stegaspis* Haeckel is a homonym.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

NEW VENEZUELAN LEAFHOPPERS OF THE SUBFAMILIES XESTOCEPHALINAE AND NEOCOELIDIINAE (HOMOPTERA: CICADELLIDAE)

By James P. Kramer

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This paper adds three new species to the genus *Portanus* reviewed by Linnavuori (1959. Ann. Zool. Soc. 'Vanamo' 20(1): 45–51), and a new genus and species to the Neocoelidiinae reviewed by DeLong (1953. Lloydia 16(2): 93–131). All of the material treated in this paper will be deposited in the collection of the United States National Museum.

The new species described herein were collected by my friend and colleague, J. Maldonado Capriles of the University of Puerto Rico, College of Agriculture, Mayaguez, Puerto Rico. The collection, although small, contained some most interesting forms from several localities in Amazonas Territory, Venezuela, an area where the cicadellid fauna is almost unknown.

Xestocephalinae

Portanus linnavuorii, new species

Length: Male 5.2 mm.

Coloration: Color and markings indistinguishable from *P. boliviensis* (Baker) treated by Linnavuori (pp. 50–51).

Male genitalia: Connective elongated and Y-shaped; style slender with both apical lobes well developed (Fig. 13). Aedeagus (Fig. 14) similar to that of *boliviensis* (Linnavuori, Fig. 20B) but differing from it as follows: The aedeagal apex is entire, not trifid, and the finely toothed dorsal projection is large. Like *boliviensis,* the dorsal portion of the aedeagus is membranous.

Holotype: Male, Venezuela, Territory Amazonas, Upper Cunucunuma, Tapara, 20 April 1950, J. Maldonado Capriles. USNM type no. 64881. Female unknown.

Comparative note: This species is very close to *boliviensis,* but it is larger and differs in the characters of the aedeagus.

Portanus facetus, new species

Length: Male 5.7 mm.

Coloration: Venter and legs stramineous. Face stramineous with a brown stripe along each lateral margin of clypeus extending on to clypellus and fading out. Crown bright orange with exceedingly minute red dots. Two subtriangular dark brown spots partially surround the marginal red ocelli. These spots meet at midline of crown and extend caudad as a single stripe or two very narrow stripes meeting the dark coronal suture. Angle formed by margin of eye and posterior margin of crown, dark brown. Pronotal ground color brown, but with numerous small colorless oval or elongate-oval spots. Scutellum bright orange with anterior angles broadly dark brown, also with mesal broad dark brown stripe which fades before apex. Ground color of forewings brown hyaline with veins darker, especially in anterior costal area. Apex of forewings at times smoky brown. Claval commissure narrowly bright orange with obvious spot of same color before claval apex. Area of clavus next to the narrow bright orange commissure, dark brown. This dark brown area could be interpreted as a stripe running from each anterior angle of the scutellum on to the forewings and along the claval commissure being interrupted by a bright orange spot before attaining the claval apex.

Male genitalia: Pygofer with ventral margin greatly thickened (Fig. 8). Connective Y-shaped, clearly articulated to aedeagus, with forked distal flap (Fig. 7). Mesal lobe of style curved laterad, lateral lobe broad and blunt (Fig. 7). Aedeagus elongated with pair of long apical processes directed ventrally (Fig. 5). Gonopore opens ventrally near apex (Fig. 6).

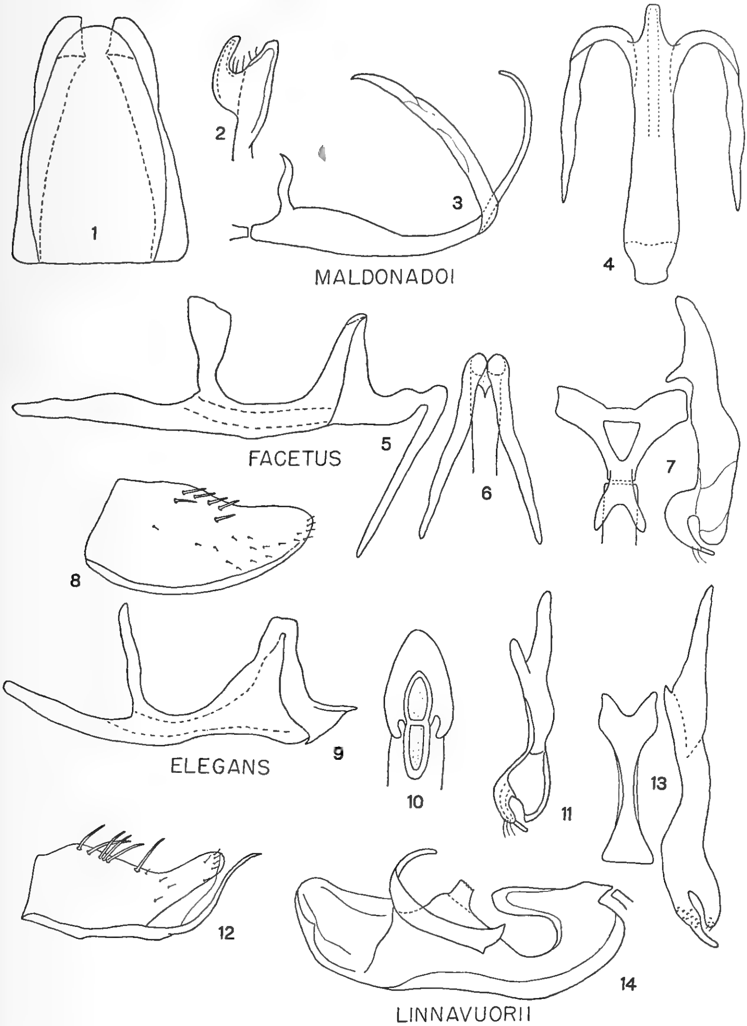
Holotype: Male, Venezuela, Territory Amazonas, Upper Cunucunuma, Tapara, 20 April 1950, J. Maldonado Capriles. USNM type no. 64880. Paratype male, some data except Juiian, 28 April 1950. Female unknown.

Comparative note: This species and *elegans* are the only members of the genus with bright orange markings. It is easily distinguished from *elegans* on the basis of markings. In *facetus* the pronotum lacks orange spots, the dark brown markings between the eyes consist of a pair of irregular triangles, and the clypeus lacks reticulated markings. The many differences in the male genitalia will separate the species as well.

Portanus elegans, new species

Length: Male 5.5–5.7 mm.

Coloration: Venter, legs, and face as in *facetus* except for additional weakly defined brown stripes on face extending on each side from antennal base along lorum to apex of each gena, and brown reticulated markings on upper half of clypeus. Crown bright orange with broad,



FIGS. 1–14. Figs. 1–4, *Deltocoelidia maldonadoi.* 1.—ventral view of genital capsule. 2.—apical portion of style ventrally. 3.—lateral view of aedeagus. 4.—ventral view of aedeagus. Figs. 5–8, *Portanus facetus.* 5.—lateral view of aedeagus. 6.—ventro-apical portion of aedeagus. 7.—dorsal view of connective and style. 8.—lateral view of pygofer. Figs. 9–12, *P. elegans.* 9.—lateral view of aedeagus. 10.—ventro-apical portion of aedeagus. 11.—dorsal view of style. 12.—lateral view of pygofer. Figs. 13–14, *P. linnavuorii.* 13.—ventral view of connective and style. 14.—lateral view of aedeagus. Note: Drawings made at various magnifications from holotypes.

dark brown, interrupted, transverse band between anterior margins of eyes, band touches marginal red ocelli but does not touch eyes. At the middle, the band projects caudally as a sharp marking meeting the coronal suture. Band broken medianly by narrow longitudinal orange area. Additional pair of narrow brown stripes originating from posterior margin of crown on either side of coronal suture. These stripes diverge anteriorly and reach almost to the transverse band. Pronotum as in *facetus* except for pair of elongate bright orange spots. Scutellum pale with a few brown markings and an orange spot at middle of each lateral margin. Forewings brown hyaline with veins mainly dark brown, and an irregular brown marking across base of anteapical cells. Clavi marked as in *facetus* except orange area slightly wider.

Male genitalia: Pygofer with long slender ventral process curved dorsally (Fig. 12). Connective as in *facetus*. Style similar to *facetus* but less robust and with comparative differences (Fig. 11). Aedeagus resembles that of *facetus* but shorter, and lacks long apical processes (Fig. 9). Gonopore opens ventrally (Fig. 10).

Holotype: Male, Venezuela, Territory Amazonas, Culebra N. Duida, 1–4 July 1950, J. Maldonado Capriles. USNM type no. 64879. Two paratype males: One, same data except Upper Cunucunuma, Julian, 28 April 1950; another, same data except Upper Cunucunuma, Tapara, 20 April 1950. Female unknown.

Comparative note: The only species with which elegans might be confused is *facetus*. It is easily distinguished from *facetus* by the orange spots on the pronotum, the dark brown band on the crown between the anterior margins of the eyes, and the brown reticulated markings on the upper half of the clypeus. The many differences in the male genitalia are distinctive also.

Neocoelidiinae

Deltocoelidia, new genus

Type species: Deltocoelidia maldonadoi new species

In DeLong's key to genera (pp. 94–95), this new genus would trace to *Stenocoelidia*. Like *Stenocoelidia, Deltocoelidia* lacks a carina between the face and crown; unlike *Stenocoelidia,* the pygofer lacks a ventral tooth, the aedeagus has paired lateral processes, and the valve and male plates are solidly fused and appear as a single plate on the venter of the genital capsule. The clypellus is slightly tumid, and the venation of the forewings is undiscernible except in the clavus and at the apex.

Deltocoelidia maldonadoi, new species

Length: Male 6 mm, female 6.5 mm.

Coloration: Venter, legs, and face stramineous. Crown, pronotum, and scutellum with ground color stramineous; wide cherry-red, median, longitudinal stripe running from apex of crown to base of pronotum. Stripe constricted at the middle of crown and widest at pronotal base, may extend on to scutellum where it fades out. Forewings stramineous hyaline marked as follows: clavus with moderately broad, red stripe running along scutellum and commissural margin, two dark brown spots flank stripe in clavus, third brown spot occurs just outside of claval apex with fourth spot directly behind it. These four spots in each wing are approximately linear in arrangement.

Male genitalia: Pygofer without processes or hooks. Valve and plates fused, appearing as single ventral covering for genital capsule (Fig. 1). Connective Y-shaped, largely membranous, and articulated with aedeagus. Styles long and slender with apical lobes well developed (Fig. 2). Aedeagus slender and recurved apically, a pair of moderately heavy lateral processes arising on distal portion of the shaft (Figs. 3–4).

Female genitalia: Pregenital sternite of female broadly and shallowly concave.

Holotype: Male, Venezuela, Territory Amazonas, Upper Cunucunuma, Juiian, 28 April 1950, J. Maldonado Capriles. USNM type no. 64882. Two female paratypes same data except Mount Marahuaca, northern slopes, Benitez Camp. 1–25 May 1950.

Comparative note: The male genitalia are unique and readily distinguish the species. The color pattern in the type is faded so that the red claval stripe is just discernible.

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PROCEEDINGS
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THE STATUS OF *HAGENOWELLA* CUSHMAN, 1933 AND A NEW GENUS *HAGENOWINA*

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The genus *Hagenowella* was originally described by Cushman (1933, p. 21) as having a trochoid spire, with vertical radial internal partitions projecting from the outer wall and partially subdividing the chambers. The genus was monotypic, and the type species designated as *Valvulina gibbosa* d'Orbigny, 1840. Marie (1941, p. 41) noted that this description had been based on misidentified material as it was not conspecific with the *V. gibbosa* of d'Orbigny.

The original specimens of *Valvulina gibbosa* d'Orbigny, from the Craie Blanche of Saint-Germain, France (designated as type species of *Hagenowella* by Cushman) were restudied in Paris by Marie. He stated that the type slide contained two specimens, a composite of these being the basis for d'Orbigny's type figures. The small globular specimen, which was drawn by d'Orbigny for the general form of the test was stated by Marie to be doubtful, but possibly an *Ataxogyroidina* [= *Ataxophragmium*] or a *Globigerina elevata* d'Orbigny, 1840 [a species Marie transferred to the genus *Hagenowella*]. The other larger specimen Marie stated to be an *Arenobulimina* with abnormal final chamber, apparently the basis for the representation of the aperture, although modified, in d'Orbigny's figures. Marie stated that the French specimens did not have an apertural tooth and did not have internal partitions, as did the specimens figured and described by Cushman. Marie then stated that *Valvulina gibbosa* should be rejected as type species and proposed that *Globigerina elevata* d'Orbigny, 1840 be made the type of *Hageno-*

wella. Unfortunately, the type species cannot be changed by later workers, hence the type must remain *Valvulina gibbosa.* On the basis of the original specimens of the type species, *Hagenowella* Cushman, 1933 becomes a synonym of *Arenobulimina* Cushman, 1927.

The specimens figured by Cushman as *Hagenowella gibbosa* (1933, Pl. 1, Figs. 1–3) were not identified as to exact locality, but specimens were stated (Cushman, 1933, p. 21) to have been obtained from "the Senonian of the Island of Rügen, in the Craie Blanche of the Paris Basin, and from the Chalk of England." In a later publication (Cushman, 1937, Pl. 21, Figs. 1, 2), the same illustrations were used, and then stated to be from the Cretaceous of France. An examination of the types in the Cushman Collection by the writers showed this last statement to be in error, as the figured specimens (Cushman Coll. 21213) are labelled from Upper Cretaceous (Senonian), Island of Rügen, Germany. These internally partitioned forms thus are not conspecific with *Valvulina gibbosa.* The French species with simple interior is correctly referred to *Arenobulimina,* and the German one should be referred to *Valvulina quadribullata* von Hagenow (a species described from Rügen and erroneously regarded by Cushman as a synonym of *V. gibbosa* d'Orbigny).

As *Hagenowella* is a junior synonym of *Arenobulimina,* the species with internal partitions requires a new generic name.

Family Ataxophragmiidae Schwager, 1877

Subfamily Ataxophragmiinae Schwager, 1877

Hagenowina Loeblich and Tappan, new genus

Hagenowella Cushman, 1933, Amer. Jour. Sci., ser. 5, v. 26, p. 21 (part, including *Hagenowella gibbosa* (d'Orbigny) of Cushman, not *Valvulina gibbosa* d'Orbigny).

Type species: Valvulina quadribullata von Hagenow, 1842.

Test trochospiral, with three or more chambers per whorl; interior of chambers subdivided by partial radial partitions projecting inward from the outer wall as in *Ataxophragmoides*; aperture an interiomarginal slit or loop with an indistinct tooth.

Range: Upper Cretaceous (U. Senonian or Maestrichtian).

Remarks: The present genus includes forms included by Cushman in *Hagenowella,* but does not include *Valvulina gibbosa* d'Orbigny, the type species of *Hagenowella,* which has been shown to have simple, nonsubdivided chambers. The specimens referred to *Hagenowella gibbosa* by Cushman (1933, Pl. 1, Figs. 1–3; 1937, Pl. 21, Figs. 1, 2) are in the U. S. National Museum (Cushman Coll. No. 21213) and are from the Upper Cretaceous (Upper Senonian), Island of Rügen, Germany. They should correctly be referred to *Valvulina quadribullata* von Hagenow = *Hagenowina quadribullata* (von Hagenow).

Summary

Hagenowella Cushman, 1933, was based on specimens misidentified as *Valvulina gibbosa* d'Orbigny, 1840. As *Valvulina gibbosa* has simple, nondivided chambers, *Hagenowella* is a junior synonym of *Arenobulimina*. *Valvulina quadribullata* von Hagenow includes the specimens with vertical internal partitions identified as *Valvulina gibbosa* by Cushman and is here made the type species for the new genus *Hagenowina*.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

A NEW SUBSPECIES OF WARBLER FROM CERRO DE LA NEBLINA, VENEZUELA, AND NOTES

By William H. Phelps and William H. Phelps, Jr.

Further research in our collection shows that our expedition of 1954 to the newly discovered Cerro de la Neblina in the extreme southwestern part of Venezuela, near where Brazil, Colombia and Venezuela meet, collected the following new subspecies of Parulidae.

The extension of range to Venezuela of the rare genus *Coturnicops* (Rallidae) is noted and a second record for South America of *Vermivora leucobronchialis,* hybrid, is listed. We wish to thank the Curator of Birds in the American Museum of Natural History for access to that collection.

Specimens listed are in the Phelps Collection, Caracas, unless otherwise indicated. Names of colors are capitalized when direct comparison has been made with Ridgway's "Color Standards and Color Nomenclature," 1912. Wing measurements are of the chord.

Coturnicops notata duncani (Chubb)

Ortygops notata duncani Chubb, Bds. Brit. Guiana, *1*, p. 74, Pl. 3, Fig. 2, 1916. (Abary River, British Guiana; type in British Museum.)

One female, "Mérida," collected by Gabaldón 24 June 1916. Specimen in the American Museum of Natural History.

This specimen constitutes an extension of range of the genus from British Guiana to Venezuela. The locality "Mérida" of Gabaldón would not necessarily indicate a Subtropical Zone locality.

This well-marked subspecies was hitherto known only by the type in the British Museum. Not only is *duncani* an excessively rare bird but Hellmayr and Conover (Bds. Americas, Pt. 1, No. 1, p. 389, 1942) give the range of the nominate race *notata* as Uruguay and Argentina and say "The Masked Rail is one of the rarest neotropical birds."

This Venezuelan specimen has not been compared with the type of *duncani* but it is similar to the colored plate of Chubb in the original description and quite different from *notata* in the American Museum of Natural History from Hamburgo Velho, Rio Grande do Sul, Brazil.

Vermivora chrysoptera × *Vermivora pinus*
= *Vermivora leucobronchialis* (Brewster). Hybrid.

Hellmayr (Bds. Americas, etc., 8, p. 336, 1935) records a specimen from Valle, Mérida, that presumably is the only record from South America up to date. We have a specimen collected at Río Chiquito, western Táchira, 20 February 1956, in a forest at 1,800 meters altitude.

Myioborus brunniceps maguirei, new subspecies

Type: From Cerro de la Neblina, Territorio Amazonas, Venezuela; 1,850 meters. No. 60274, Phelps Collection, Caracas. Adult male collected 20 January 1954 by Ramón Urbano. (Type on deposit at American Museum of Natural History.)

Diagnosis: Nearest to *M. brunniceps castaneocapillus* (Cabanis) of Mount Roraima and the other mountains of the Gran Sabana, Bolívar, from which it differs in having the gray of forehead less extensive, the breast more lemon yellow, without the orange tint; and the white eye-ring more prominent. Differs from *M. b. duidae* Chapman, of mounts Duida, Parú, and Huachamacari, by yellow instead of orange underparts.

Range: Known from Cerro de la Neblina, near the extreme southwestern part of Territorio Amazonas in low forest and bushes at altitudes between 1,800 and 1,850 meters.

Description of type: Crown, Sanford's Brown; forehead, lores and sides of head grayish black; orbital ring white; back and uropygium nearest to Citrine. Chin white; throat, breast, sides and abdomen Lemon Chrome; under tail-coverts white. Wings, Fuscous; bend of wing, under wing-coverts and axillaries mixed brownish and whitish. Tail, Fuscous, outermost rectrices white with Fuscous basally on inner webs; second ones with less white; third ones only apically with white; and the fourth ones only with white tips.

Bill (in life) "brownish-black"; feet "brown," under surface of toes yellowish; iris "brown." Wing, 64 mm; tail, 64; exposed culmen, 10; culmen from base, 13; tarsus, 20.

Remarks: Sexes alike in color, female with shorter wing. Size similar to *castaneocapillus.* Range of measurements: five adult males (inc. type)—wing, 64–66 (64.6) mm; tail, 63–67 (64.7); culmen from base, 13–14 (13.8); three adult females—wing, 60–63 (61); culmen from base, 14–14 (14). Measurements of *castaneocapillus*: five adult males—wing, 63–66 (64.2); tail, 58–62 (60.4); culmen from base, 13.5–14 (13.9); five adult females—wing, 60–62 (61.2); tail, 57–60 (59); culmen from base, 13–14 (13.8).

It gives us great pleasure to dedicate this new bird to Dr. Bassett Maguire, explorer extraordinary, Curator in the New York Botanical Garden, who, in his exploration of Cerro de la Neblina, facilitated our access to the upper reaches of the mountain where this bird has its habitat.

Specimens examined: M. b. castaneocapillus—VENEZUELA: Bolívar, in the Gran Sabana region, mounts: Roraima, 13 ♂, 11 ♀, 5 (?); Cuquenán, 9 ♂, 6 ♀, 5 (?); Ptari-tepui, 6 ♂, 3 ♀, 6 (?); Soropán-tepui, 1 ♀, 3 (?); Chimantá-tepui, 5 ♂, 7 ♀, 7 (?); Uaipán-tepui, 4 ♂, 5 ♀, 7 (?); Aprada-tepui, 8 ♂, 4 ♀, 3 (?); Acopán-tepui, 3 ♀, 4 (?); Uei-tepui, 8 ♂, 4 ♀, 4 (?); Arabopó, 1 (?). *M. b. duidae*—VENEZUELA: Terr. Amazonas, mounts: Duida, 2 ♂, 1 ♀; Parú, 11 ♂, 7 ♀, 4 (?); Huachamacari, 7 ♂, 4 ♀, 1 (?). *M. b. maguirei*—VENEZUELA: Terr. Amazonas, Cerro de la Neblina, 5 ♂ (inc. type), 3 ♀, 2 (?).

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PROCEEDINGS

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THE COLLARED LEMMING (*DICROSTONYX*) FROM THE PENNSYLVANIA PLEISTOCENE

By John E. Guilday and J. Kenneth Doutt
Carnegie Museum

Excavations at sinkhole no. 4, 1.5 miles northeast of New Paris, Bedford County, Pennsylvania (lat. 40° 7′ N, long. 78° 37′ W, alt. 1,500 feet) by Carnegie Museum/National Speleological Society field parties have added many new species to the poorly known late Pleistocene fauna of the state. These include *Pedioecetes phasianellus, Citellus tridecemlineatus, Synaptomys borealis, Phenacomys* cf. *ungava, Microtus xanthognathus,* and the extinct *Eptesicus grandis, Tamiasciurus tenuidens* and *Mylohyus pennsylvanicus.* A Carbon 14 date, from flakes of charcoal in the associated matrix, of 11,300 ± 1000 Before Present was obtained by Yale University, sample no. Y-727. The fauna post-dates the maximum extension of the Wisconsin glaciation.

Matrix from the 20-foot level excavated 21 October 1960 was washed and screened to recover bones and teeth of the smaller forms on 16 June 1961. A fragmentary maxilla bearing M^1 and M^2 and a right and left mandible with complete dentition (Carnegie Museum Section of Vertebrate Fossils Catalog Number 6258) were recovered from the same washing screen. They are probably parts of a single individual. We have identified them as *Dicrostonyx hudsonius* (Pallas). Dental distinctions as discussed by Miller (N. A. Fauna, 1896, no. 12, p. 39) and Hall & Kelson (Mamm. of N. A., 1959, pp. 765, 767), and direct comparison with specimens of *D. hudsonius* (Pallas) from Ungava and *D. groenlandicus* (Traill) from the Mackenzie River delta, N. W. T. in the collections of Carnegie Museum, make it apparent that the Pennsylvania specimens are indistinguishable from modern *D. hudsonius* in all characters of the dentition. They differ from *D. groendlandicus* in just those points that distinguish the latter from *D. hudsonius.* Cursory inspection of two mandibles of *D. torquatus* (Pallas) from the Pleistocene of Poland lead us to believe that *D. torquatus* and *D. groenlandicus* may be more closely related than either is to *D. hudsonius.* The discovery of what was ostensibly a form endemic to the tundra of northern Quebec and Labrador, 1,200 miles to the south during the late Pleistocene presents an interesting problem in speciation and Pleistocene zoogeography which we hope to pursue further in the near future. The excavation of sinkhole no. 4 is incomplete at the present writing. We have reason to believe that more *Dicrostonyx* material will be recovered as excavation proceeds deeper.

This is the first record of an unequivocal tundra rodent from the Pleistocene of the Appalachian Mountain region. *Dicrostonyx* is known from the Pleistocene of Europe but has not heretofore been recovered from the North American Pleistocene to our knowledge.

We wish to thank W. Galen Barton, Ralph C. Bossart, Mr. and Mrs. Harold Hamilton, John A. Leppla, Allen D. McCrady, and those members of the Pittsburgh Grotto, National Speleological Society, whose untiring work at the site made this discovery possible. We are also indebted to the A. W. Mellon Educational and Charitable Trust for financial assistance.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

AUSTROTYLA, A NEW MILLIPED GENUS (CHORDEUMIDEA: CONOTYLIDAE: CONOTYLINAE)

By Nell B. Causey

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Introduction: The genus *Austrotyla* is proposed for four species formerly included in the genus *Conotyla*: *coloradensis, humerosa, montivaga,* and *specus.*

Sixteen species have been assigned by various authors (Loomis, 1943; Chamberlin and Hoffman, 1958) to the genus *Conotyla.* The sternal regions of the gonopods of these species have rarely been described, and consequently forms with widely divergent generic characters have been brought together. As now conceived, *Conotyla,* with its junior synonym *Proconotyla* Verhoeff, 1932, is restricted to forms in which the sternum of the anterior gonopods is bandlike; the anterior gonopod is small, simple, inconspicuous, composed of one fused piece, free from its homologue in the coxal region, and it either clutches or entwines about some part of the posterior gonopod; the coxal endite of the posterior gonopod is larger and stouter than the anterior gonopod and sometimes complex on the caudal surface. The characters that quickly distinguish *Austrotyla* from *Conotyla* are the slightly smaller body and the anterior gonopods, which are larger and more conspicuous than the largely membranous coxites of the posterior gonopods. The ranges of these two genera overlap partially in the Middle Western States; species of *Austrotyla* tend to have a wider and more southern and western distribution than species of *Conotyla.* In each genus there are both epigean and troglobitic species.

The form of the sternum of the anterior gonopods of two very incompletely described conotylinid genera, *Cookella*

Chamberlin, 1941, and *Zygotela* Chamberlin, 1951, is not known. With but one exception, the alleged presence of a "small, broadly triangular promentum," the somatic characters of the type species of *Cookella, Cleidogona leibergi* Cook and Collins, 1895, closely resemble those of *Austrotyla.* I have not seen the female syntypes, and Chamberlin did not state that he had seen them when he proposed the genus *Cookella,* with the chief diagnostic character the presence of a promentum. I know of no conotylid with a promentum. The definitive characters of *Zygotela* are unknown, since the type species is based on a larval male.

Acknowledgments: I am grateful to Herbert W. Levi, who loaned the holotype of *Conotyla montivaga* and the large Colorado collection of conotylids made by him and Mrs. Levi; to H. F. Loomis, who called my attention to some of the discrepancies in the description of *Conotyla coloradensis*; and to each of the following, who also collected specimens that were studied in the preparation of this paper: T. C. Barr, Jr., Richard E. Graham, Oscar Hawksley, C. C. Hoff, and M. W. Sanderson.

This work was completed with the support of a National Science Foundation Research Grant, G-14486.

Austrotyla, new genus

Type species: Conotyla specus Loomis.

Distribution: Caves and epigean sites from the upper Mississippi Valley westward to Arizona and northeastern California (Fig. 1).

Diagnosis: Medium size, pigmented (unless troglobitic) conotylinids of 30 body segments in which L-shaped sternites form conspicuous lobes on the ectal margin of the anterior gonopods. Anterior gonopods stouter and more conspicuous than the coxal endites of the posterior gonopods. Nearest *Taiutyla* Chamberlin, 1952, in which the sternites of the anterior gonopods are oval and widely separated but are not ectal to the gonopods.

Description: Body 9 to 21 mm long, 0.9 to 1.7 mm wide, of even width from about segment 4 to segments 20 or 23. Typical body color of preserved specimens: medium to dark brown above and light tan below; metatergites darker than protergites, which often are gray; indistinct tan maculae on the shoulders and the prozonites; a thin middorsal, longitudinal tan suture extends from the middle of the collum through the penult segment; dorsum never with distinct longitudinal brown bands as in *Conotyla*; base of legs light tan; distal half of legs and antennae brown.

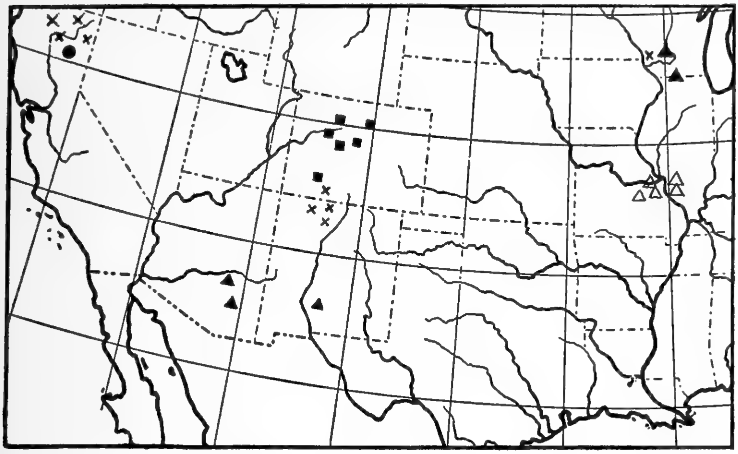


FIG. 1. Map showing the distribution of the species and subspecies of *Austrotyla* in the United States. Symbols: square, *A. coloradensis*; dot, *A. humerosa*; open triangle, *A. specus specus*; solid triangle, *A. specus montivaga*; ×, females and larvae of undetermined species.

No promentum; the small triangular space between the anterior margin of the mentum and the base of the lingual laminae is covered by a membrane that when wet resembles a sclerite. Ocelli dark brown or black; in *specus* and *coloradensis* there are from 20 to 25 dark brown or black, rarely contiguous ocelli on a brown background arranged in 4 or 5 straight or curved rows in a triangular or subtriangular area with slightly convex sides; one ocellus is out of line on the ectocaudal angle; in the *humerosa* group there are from 7 to 10 brown ocelli, mostly contiguous and arranged in two very irregular horizontal rows on a depigmented background. Antennae very slender and long to slightly clavate and shorter, article 3 longest, and article 4 slightly bent at the base.

Body surface shining; surface of metatergites minutely reticulated and margins minutely beaded; protergites more coarsely reticulated and crossed by one distinct and one indistinct transverse ridge; metapleurites minutely and obliquely striated; a single large submarginal stria crosses the metapleurites obliquely from the ventral margin to the posterior margin.

The width of the collum is slightly more than twice its length, except in *humerosa* where the ratio is 8/5; the anterior margin is semicircular and the posterior margin is either straight or very slightly concave; a weak stria is parallel with the anterior margin. Paranota are on segments 2 through 25 or 26; viewed from above, the ectocephalic margin of typical paranota is rounded and the caudal margin is nearly straight (Fig. 9). The paranota are either well below the dorsal body surface (*specus*, *coloradensis*) or even with it (*humerosa*). The segmental setae are acute and set on conspicuous nodules, which on typical segments are arranged as shown in Figure 9; length of longest setae approximately one-third the body width. Shape of caudal segment and arrangement of setae as in *Conotyla.*

Leg pairs 1 and 2, composed of 6 segments, are about two-thirds the length of the following legs; the ventral surface of the tarsal segments bears stiff, dense setae. The other legs are composed of 7 segments. In the male, leg pairs 3 through 7 are slightly shorter and thicker than the postgonopodal legs, and segment 4 of 2 or more of them bears conical or cylindrical lobes on the mesial surface; the size of the lobes is either constant or variable for a species but the arrangement is constant; the tarsal surface of leg pairs 3 through 7 or 11 is pulvillar; leg pair 10 has coxal glands that are seldom everted, and in one species, *specus,* there is an anteriorly directed, nipplelike coxal lobe; leg pair 11 has no coxal glands; segment 3 of leg pair 10 bears a lobe in *humerosa.*

The anterior gonopods curve back over the coxae of the tenth or eleventh legs and are contiguous in the midline, covering the coxal endites of the posterior gonopods. The gonopod is an elongated unsegmented piece smooth on the ventral surface and more or less complex on either the dorsal surface or the mesial margin. It is larger, more heavily sclerotized, and more conspicuous than the coxal endite of the posterior gonopod. At the base, it is separated by a distinct suture from its homologue. The two L-shaped sternites are attached to the ectocephalic angles of the gonopods; the vertical branches of the sternites, which appear as conspicuous lateral lobes that quickly distinguish this genus from any other, are attached either at one point on the ectal margin of the gonopod (*coloradensis*) or all along the basal half of the ectal margin (other species). The spiracle is lateral and difficult to see. The space anterior to the anterior gonopods is filled by a band of transversely striated surface chitin.

The sternum of the posterior gonopods is a weak transverse band; the sternal apodemes are about as long as the coxal endites. The joints between the sternum, coxa, and prefemur are sometimes difficult to see, and it is doubtful whether all of them are movable in any species. The coxosternal joint reaches either to or almost to the midline; a small pore opens on the mesioventral surface of the coxa. The coxal endite arises mainly from the caudal, mesial, and cephalic margins; it is somewhat cuplike and open cephalad or ventrad; it is either entirely membranous or it is partly membranous and partly sclerotized; the shape of the margin varies a little within a species. The second segment, the prefemur, is either markedly clavate (*humerosa*) or only slightly clavate distad (other species). The ovate third segment, the femur, is 2 to 4 times as long as it is thick; it has no terminal spine, but there is usually an irregular brown spot on the apex. The prefemur is either markedly shorter than or slightly longer than the femur.

Classification: Austrotyla is diphyletic. The somatic characters of the *humerosa* group are possibly different enough from the *specus-montivaga* group to warrant the establishment of a separate subgenus. The sternal region of the anterior gonopods is certainly too similar in the two groups to permit generic rank for each.

In addition to the marked specific differences in the anterior gonopods, there are specific differences in the shape of each segment of the posterior gonopods, the size of the body, the size and position of the paranota, the length and thickness of the antennae, the eyes, and the lobation of the legs.

Number of species: Three, of which one is represented by two subspecies; a key is given in the next paragraph. It is possible that *Scoterpes wyandotte* Bollman, 1888, will go in *Austrotyla* also. I have not seen this species, which is still known from only one female specimen (Crawford Co., Indiana, U. S. Nat. Mus., No. 440). The convex posterior margin of the collum and the short body are characters of *Austrotyla* rather than of *Conotyla,* the genus to which Cook and Collins (1895) assigned it. The report of *wyandotte* from Michigan by Johnson (1954, The millipeds of Michigan, Michigan Acad. of Sci., Arts, and Letters, 39: 241–252) needs confirmation.

Key to the Genus *Austrotyla* Based on the Male

1. Troglobitic; depigmented; length 17 to 21 mm; 7 to 10 ocelli in an irregular horizontal patch; paranota elevated to the level of the dorsum; lobes on segment 4 of leg pairs 5, 6, and 7. Anterior gonopod: apex attenuated, ending in a hook; with from 4 to many stiff, slender processes on the mesial margin. Posterior gonopod: prefemur clavate distad; length of prefemur and femur almost equal .... *humerosa* group

   Mostly epigean and pigmented; length 9 to 17 mm; 19 to 25 ocelli in a triangular patch; paranota placed well below the level of the dorsum; lobes on segment 4 of leg pairs 3 and 4. Anterior gonopod: apex either narrow or broad, rounded; dorsal surface with sclerotized or setose lobes. Posterior gonopod: prefemur very slightly clavate distad; femur markedly longer than prefemur 2

2. Without a lobe on segment 1 of leg pair 10. Anterior gonopod: sternite coalesced to only one point of the ectal margin of the gonopod. Posterior gonopod: coxal endite quadrate from a caudal view; ratio of length to thickness of femur 4/1 .. *coloradensis*

   With an anteriorly directed lobe on segment 1 of leg pair 10. Anterior gonopod: sternite coalesced to the proximal half of the ectal margin of the gonopod. Posterior gonopod: coxal endite triangular from a caudal view; ratio of length to thickness of femur 3/1 3

3. Troglobitic; white to pale brown; length 13 to 15 mm; ratio of the length of articles 3 and 4 of the antennae approximately 4/3 .... *specus specus*

Epigean; medium to dark brown; length 9 to 13 mm; ratio of the length of articles 3 and 4 of the antennae approximately 4/2 .... *specus montivaga*

Austrotyla coloradensis (Chamberlin, 1910), new combination
Figs. 2–4

Conotyla coloradensis Chamberlin, 1910, Ann. Ent. Soc. Amer., 3(4): 237, Pl. 32, Figs. 8, 9; Pl. 33, Figs. 1–3. Cockerell, 1911, Univ. Colorado Studies, 8: 249. Loomis, 1943, Bull. Mus. Comp. Zool. Harvard, 42(7): 382. Chamberlin and Hoffman, 1958, U. S. Nat. Mus. Bull., 212: 98.

Female holotype (present location unknown) originally stated to be from Colorado was later reported (Cockerell, 1911) as having been collected at Salina, Boulder County, Colorado. A male, collected 4 miles north of Allen's Park, Boulder County, 20 July 1959, by H. W. Levi, has been designated as the neotype (Museum of Comparative Zoology) and described here.

Range: The southern Rocky Mountains of Colorado, including the following counties: Boulder, Chaffee, Eagle, Gilpin (Cockerell, 1927), Gunnison, Hinsdale, and Pitkin.

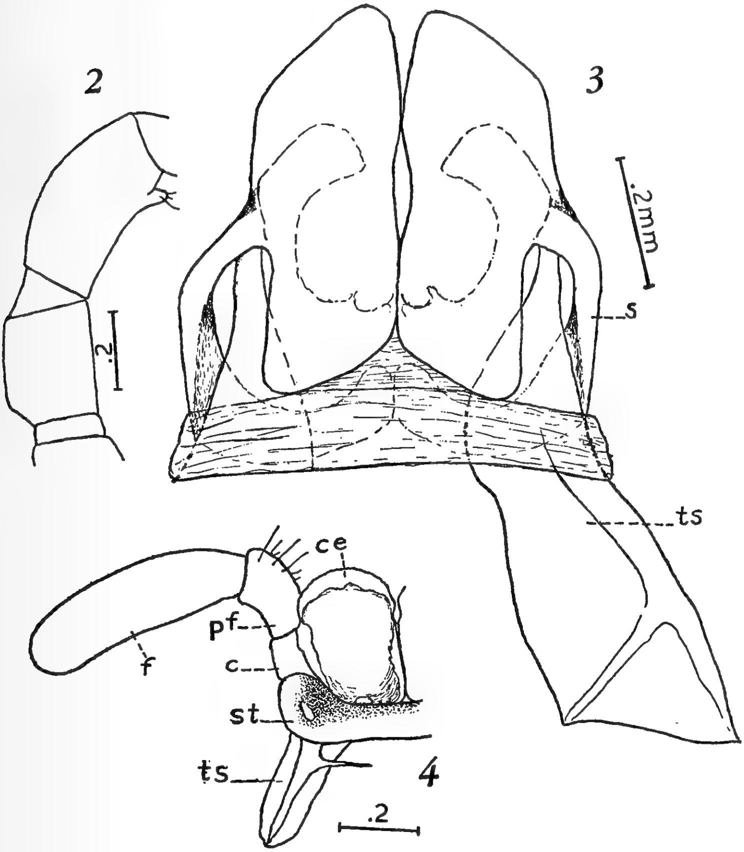
Diagnosis: Nearest *A. specus montivaga,* from which it is easily distinguished by its larger size, the absence of coxal lobes on leg pair 10, and the anterior gonopods, which have the sternites attached at only the middle of the ectal margin instead of all along the basal half of that margin.

Description of the male neotype: Body length about 15 mm, width 1.3 mm. Color and pattern typical of the genus. Ocelli 23; except for the single one on the ectocaudal angle, closely arranged in a triangle which has all sides slightly convex; in curved rows of 1, 7, 6, 5, 3, 1. Antennae slender, approximately 2.3 mm long, ratio of segments 1 through 7 as follows: 9:28:54:34:42:20:13. Gnathochilarium 0.5 mm wide. Segmental setae acute, the longest ones about 0.5 mm long.

Lobation of legs inconspicuous. Distomesial surface of segment 4 of leg pairs 3 and 4 with a small cylindrical lobe, the smallest in the genus. Ventral surface of tarsal segment of leg pairs 3 through 7 pulvillar.

In ventral view, the anterior gonopods are slightly contiguous along their mesial margin; they curve caudad at the base but straighten out distad; they reach back to the coxae of leg pair 10. From a caudal view, the coxal endites of the posterior gonopods appear as two membranous, quadrate, convex, closely contiguous pieces that cover the complex basal region of the dorsal surface of the anterior gonopods.

A transversely striated band of chitin crosses the ventral surface at the base of the anterior gonopods. The 2 L-shaped sternites together form an irregular, U-shaped support at the sides and across the dorsal surface at the base of the anterior gonopods. The end of the vertical arm of the sternite, carrying the tracheal pouch, is firmly coalesced



FIGS. 2–4. *Austrotyla coloradensis* (Elk Mts., Gunnison Co., Colorado). Fig. 2.—Segments 2 to 4 of third leg of male. Fig. 3.—Anterior gonopods, ventral view. Fig. 4.—Left posterior gonopod, anterior view. Abbreviations: c, coxa; ce, coxal endite; f, femur; pf, prefemur; s, sternite; st, sternum; ts, tracheal pouch.

to the middle of the ectal margin of the gonopod; the opening between the lateral sternal arm, the tracheal pouch, and the ectal margin of the gonopod easily distinguished this species from the others in which the gonopod and the vertical arm of the sternite are coalesced longitudinally. The horizontal arm of the sternite is coalesced to its homologue in the middorsal line. The anterior gonopods (Fig. 3) are smooth on the ventral surface and narrowly rounded at the apex; on the middle of their dorsal surface is a conspicuous, rounded, heavily chitinized lobe and at the base is a transverse shaggy region. I have not seen the spiracles.

The coxosternal joint of the posterior gonopods reaches to the midline of the sternum and is easily seen. From a caudal view, the coxa is about the length of the prefemur; from a cephalic view, the prefemur is longer. The membranous coxite is in the form of a large subquadrate shallow cup that opens cephalad; thin membranes of nearly equal length form the mesial, ventral, and ectal sides of the cup; the mesial margin is irregularly serrated and the ventral margin has one shallow emargination. The prefemur is very slightly clavate distad. The femur is the slenderest in the genus; the ratio of its length to its width is approximately 4/1. The ratio of the length of the prefemur and femur is approximately 2/5.

Figures 2 to 4 were drawn from a male from the Elk Mountains, below Queen Basin, Copper Creek Valley, Gunnison County, Colorado. It differs slightly from the neotype in the shape of the margin of the coxal endite.

Variations: The length varies between 14 and 17 mm. The number of ocelli varies between 23 and 19; the usual number is 22 or 23; when the number is reduced, the loss is in the shorter rows. The shape, position, and size of the lobes of the legs of the male have not been observed to vary significantly. The margins of the coxite of the posterior gonopod show some minute individual variations.

Remarks: The description of *Conotyla coloradensis* Chamberlin, 1910, was based on a female, now lost. Only one other Colorado conotylid has been reported (see the paragraph on *Austrotyla* spp.). My decision to identify this species as the problematical Chamberlin species was made with the full awareness that there are several discrepancies between it and the original description. I made the determination after learning: (1) that this is the most common conotylid in Colorado, and, therefore, the chances are great that it is the one that was described, and (2) that the original description contains errors. The discrepancies between the description of the holotype and my specimens are listed and discussed below:

1) Length of antennae. The only measurement of the holotype is of the antennae, which were stated to be "very long," 4.2 mm. The drawing of an antenna (Chamberlin, op. cit., Pl. 33, Fig. 2) does not suggest unusual length, however; the proportions are essentially what I have found, allowing for slight errors in copying and variations in specimens. In my specimens the antennae are between 2.2 and 2.4 mm long, about five times the width of the gnathochilarium.

The drawings of the gnathochilarium and an antenna of the holotype were stated to have been enlarged 39.5 and 87 times, respectively (Chamberlin, op. cit., p. 260 and Pl. 33, Figs. 1 and 2). If one reduces these drawings accordingly, then the gnathochilarium of the holotype is about 1 mm wide and the antennae about 1.2 mm long. Since such short antennae are not found on any conotylid with a gnathochilarium of that width, an error in the statement of the degree of enlargement is indicated. If it is assumed (1) that the scales of enlargement of these two drawings really refer to enlargement before publication and (2) that the figures were inadvertently interchanged, then the relative sizes of the gnathochilarium and the antennae of the holotype are approximately what I have reported.

The body length of the holotype was not recorded. Loomis (1943), who stated that the length is over 22 mm, reached this figure by deduction (personal letter to Nell B. Causey, 25 Nov. 1960), basing it on Chamberlin's statement that the antennae of the holotype were 4.2 mm long.

2) Gnathochilarium. The gnathochilarium of the holotype was represented (Chamberlin, op. cit., Pl. 33, Fig. 1) as having a minute promentum. The minute triangular space anterior to the mentum does not contain a sclerite.

3) Eyes. One eye of the holotype was drawn (Chamberlin, op. cit., Pl. 32, Fig. 9). The eyes of my specimens differ in that there is an additional ocellus on the ectocaudal angle. It is smaller than the ocelli in the caudal row and easily overlooked.

4) Position of segmental setae. The position of the internal segmental setae of the holotype was described as follows: "Innermost bristle about one-third the distance from median to the edge of the carina of the corresponding side. . . ." (op. cit., p. 237). In my specimens the internal setae of typical body segments are approximately two-thirds the distance from the median to the lateral edge of the body.

Distribution: The Herbert W. Levis made 28 collections of *A. coloradensis,* including 32 mature males and 21 mature females, in 5 Colorado counties between 1952 and 1960. Adults and larvae of both sexes were collected in each of the months of June, July, and August. The collection sites are at altitudes between 3,300 feet and 13,000 feet. Of the 22 collections with habitat data, 3 were made in meadows, 3 in talus, 2 in mixed forests, and 14 in coniferous forests. The specimens that were examined are in the Museum of Comparative Zoology; they are listed below:

BOULDER COUNTY: 4 miles N of Allen's Park, 1 ♂ (neotype). CHAFFEE COUNTY: Monarch Pass, 3 ♂, 2 ♀. EAGLE COUNTY: Gore Mts., 1 ♂. GUNNASON COUNTY: Gothic, 5 ♂, 1 ♀; N slope of Ohio Peak, 2 ♂; Castle Pass, 3 ♂, 2 ♀; Copper Creek Valley, 7 ♂, 5 ♀; 5 miles E of Wuanita Hot Springs, 1 ♂, 1 ♀; Fossil Ridge, 3 ♂, 1 ♀; Cumberland Pass, 1 ♂; Schofield Pass, 1 ♂, 2 ♀; Tincup, 1 ♀; Washington Gulch, 1 ♀. Gunnison-Pitkin County line: Conundrum Pass, 2 ♂, 2 ♀. HINSDALE COUNTY: Slumgullion Pass, 3 ♂, 2 ♀. PITKIN COUNTY: Buckskin Pass, 1 ♀.

With the exception of 2 specimens and the usual run of larvae (from all of the counties listed above and San Miguel County) unidentifiable as to species, all of the chordeumids collected at 30 sites in 7 Colorado counties by the Levis and C. C. Hoff are *C. coloradensis.* One of the exceptions is a female austrotylid from Conejos County. The other is a larva of uncertain generic position from Pitkin County. The Levis' collections from the following Colorado counties contain no chordeumids: El Paso, Montrose, Rio Grande, and Sauguache.

Austrotyla humerosa (Loomis), new combination

Conotyla humerosa Loomis, 1943, Bull. Mus. Comp. Zool. Harvard, 92(7): 384–385, Figs. 5a-d. Chamberlin and Hoffman, 1958, U. S. Nat. Mus. Bull., 212: 99.

Male holotype (U. S. Nat. Mus. No. 1443) collected in Sunnyside Mine, 3 miles southwest of Seneca, Plumas County, California, 22 Jan. 1923, by H. S. Barber.

Range: Known only from the type locality.

Diagnosis: Distinguished by the very high paranota, the reduced number of ocelli, the absence of body pigment, and the attenuated anterior gonopods with 4 or 5 unequal processes on the mesial margin.

The anterior view of the left anterior gonopod that was drawn by Loomis (op. cit., Fig. 5b) clearly shows the vertical lobe of the sternite ectal to the anterior gonopod and establishes the generic position of this species. From a ventral view, the anterior gonopods, broad at the base and narrowed distad, simulate the appearance of the anterior gonopods of trichopetalinids.

A correction of the original description must be made: there is no promentum.

Ecological status: The species is surely a troglobiont that has moved from cave passageways, of which there are many in this limestone area, into the connecting shafts of Sunnyside Mine.

Material examined: Larval male paratype (Museum of Comparative Zoology).

The *humerosa* Group

The *humerosa* group of this genus will be treated in a later paper. They occur in limestone and lava caves of northeastern California and are the only troglobitic conotylinids that have been collected west of the Rocky Mountains. They are much more highly modified by their cave life than the eastern conotylinids, *Austrotyla specus specus, Conotyla bollmani,* and *Conotyla vaga,* all of which have very close epigean relatives and are probably relatively recent cavernicoles.

Austrotyla specus (Loomis), new combination

Austrotyla specus, the most widely distributed species of the genus, is easily distinguished from the other species by the anteriorly directed coxal lobes of the tenth legs of the male. The form of both pairs of gonopods indicates that it is more closely related to *coloradensis* than to *humerosa.* Specimens of both sexes and later larval stages are readily distinguished from *Conotyla pectinata,* with which it is sympatric in the Middle West, by the longer segmental setae and the smaller body.

I recognized two subspecies of *specus.* Their relationship to two other closely related forms in northern New Mexico cannot be determined until more material is available. The nominate subspecies is probably an obligate cavernicole in eastern Missouri and western Illinois; *s. montivaga* is epigean, with a disjunct distribution that presents the greatest problem in this genus; I have identified it from several sites along the upper Mississippi River and Loomis identified it from three sites in the Southwest. The two subspecies have identical gonopods. The lobation of the legs shows a little variation in the size of the lobes, none in position; a conical or slender cylindrical lobe is on the mesial surface of segment 4 of leg pairs 3 and 4.

The differences between *s. specus* and *s. montivaga* are the unspectacular kinds of modifications produced in millipeds by cave life. In *s. specus* there is reduction of body pigment, a slight enlargement of the body, and a slight elongation of the antennae and legs. That *s. specus* is a relatively recent troglobite is indicated by the presence of almost as many ocelli as in *s. montivaga.*

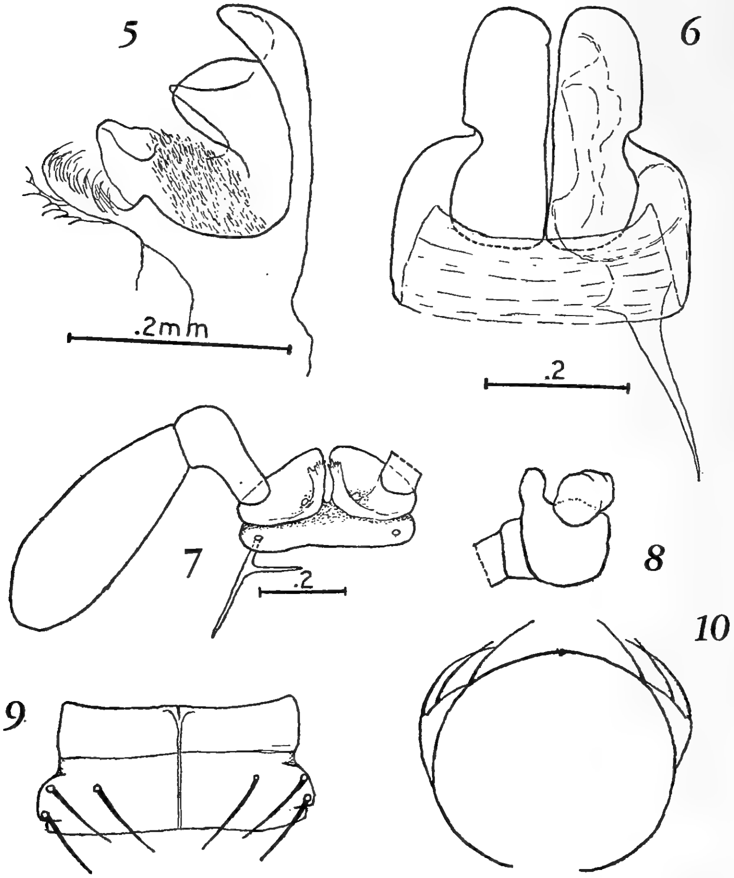
Austrotyla specus specus (Loomis), new combination
Figs. 5–10

Conotyla specus Loomis, 1939, Bull. Mus. Comp. Zool. Harvard, 86(4): 184, Fig. 11a-c; 1943, ibid., 92(7): 382. Hubricht, 1950, Nat. Speleological Soc. Bull., 12: 17. Chamberlin and Hoffman, 1958, U. S. Nat. Mus. Bull., 212: 99.

Nomenclatorial summary: The name *specus* was first applied (Loomis, 1939) to a form collected in two eastern Missouri caves. Later (Loomis, 1943; Hoffman *in* Hubricht, 1950) it was applied to collections from other caves in eastern Missouri and adjacent southwestern Illinois and to an epigean collection (Causey, 1952) from northern Illinois. The epigean form is recognized here as *s. montivaga.* The populations in the caves in the vicinity of the confluence of the Missouri and Mississippi rivers, *s. specus,* are unevenly modified by cave life. Of the specimens that I have seen, those from Meramec Caverns, Jefferson County, Missouri, show the greatest modification, and those from Eckert's Cave, Monroe County, Illinois, show the least; the latter, since they are smaller and more deeply pigmented, might be regarded as intergrades between *s. specus* and *s. montivaga*; the antennae are of the *s. specus* type. It is possible that some of the differences in color and size of the specimens in these cave collections are artifacts produced by the variations in strength and composition of the preservatives.

Male holotype (Museum of Comparative Zoology) collected in Rice's Cave, 3 miles northeast of Goldman, Jefferson County, Missouri, 16 October 1938, by Leslie Hubricht.

Range: Reported from caves in Franklin, Jefferson, and St. Louis counties, Missouri, and St. Clair and Monroe counties, Illinois. These records include possible intergrades with *s. montivaga* in southwestern Illinois.



FIGS. 5–10. *Austrotyla specus specus* (Meramec Caverns, Jefferson Co., Missouri). Fig. 5.—Right anterior gonopod, mesial view. Fig. 6.—Anterior gonopods, ventral view. Fig. 7.—Posterior gonopods, anterior view. Fig. 8.—Segments 1 and 2 of third leg of male. Fig. 9.—Outline of segment 10, dorsal view. Fig. 10.—Outline of segment 10, posterior view. Figs. 8–10 are drawn to the same scale.

Diagnosis: Differs from *s. montivaga* in the cave habitat, the reduction of body pigment, the larger body, and the difference in the length of the articles of the antennae, of which the ratio of articles 3 and 4 is approximately 4/3.

Description of a male from Meramec Caverns: Body length about 14 mm, width 1.3 mm, legs 1.7 mm long. In alcohol flesh colored; in life probably colorless. Ocelli arranged in a subtriangular area with the ocelli almost touching, the two caudal rows straight except for the single ocellus on the ectocaudal angle, and the other rows uneven; 21 ocelli in rows of 1, 7, 6, 5, 2; the outer halves of the ocelli in the shortest and longest rows are depigmented, giving the eyes a subtriangular appearance. Length of antennae 2.3 mm; the ratio of segments 1 through 7 as follows: 8:24:48:33:29:24:12. Segmental setae acute, conspicuous, and up to 0.5 mm long. Middle of mesial surface of segment 4 of leg pairs 3 and 4 with a slender, conical lobe; the lobes are slightly unequal, with the one on leg pair 4 larger. Ventral surface of tarsal segment of leg pairs 3 through 7 pulvillar. Coxal segment of leg pair 10 (Fig. 8) with the gland everted; on the distal margin of the coxa is an anteriorly directed lobe, slightly constricted at the base, that is contiguous with the mesial surface of the prefemur of the posterior gonopods.

From a ventral view, the anterior gonopods (Fig. 6) are as broad and rounded at the apex as at the base; there is a small concavity on the middle of the ectal margin at the apex of the sternites which are fused to the ectal margin. Dorsad, the sternites are connected by two narrow arcs that are contiguous in the mid-dorsal line at the base of the gonopods. The apodemes are about the length of the gonopods. The figure of the ventral surface of the anterior gonopods (Fig. 6) shows the right one as it appears after maceration, with the thicker elements on the dorsal surface showing through. The details of the dorsal surface (Fig. 5) are most easily seen from a mesial view. Proceeding from the apex to the base are the following elements: two contiguous flattened lobes, one rounded and the other angular, a rounded lobe covered with short setae, a larger membranous lobe, and a longer narrow lobe that is covered distad with long setae.

From a caudal view of the posterior gonopods, the coxal endites have the appearance of two convex, membranous, triangular pieces that are almost contiguous along their shorter margin. The coxae reach almost to the midline of the sternum, and the sutures between them and the sternum and the prefemurs are easily seen. The coxa, as measured along the ectal surface, is about one-fifth the length of the prefemur. A minute pore is on the mesioventral surface of the coxa adjacent to the mesial lobe of the coxal endite. The coxal endite consists of two lobes; the larger one is membranous, triangular, arises from the mesiocaudal margin of the coxa, the apex reaches to the middle of the length of the prefemur, and its even margins are turned cephalad; the smaller mesial lobe is stiffer and columnar, and distad it is expanded, striated, and contiguous with its homologue. The prefemur is slightly clavate distad. The femur is a little thicker than in *coloradensis*; the ratio of its width to its length is approximately 2/5. The ratio of the length of the prefemur to the length of the femur is also about 2/5.

Variations: Body length 12 to 15 mm. In alcohol colorless to pale brown. Ocelli 20 to 24. Length of antennae 1.8 to 2.3 mm.

Specimens examined: ILLINOIS: MONROE COUNTY: Eckert's Cave, near Burksville, 1 ♂, 24 January 1947. MISSOURI: FRANKLIN COUNTY:

Copper Hollow Sink Cave, 1 ♂, 1 ♀, 8 February 1958. Meramec Caverns, 1 ♂, 2 ♀, 20 December 1957. Fisher Cave, 1 ♀, 8 February 1958. Mushroom Cave, 1 ♂, 8 February 1958.

Austrotyla specus montivaga (Loomis), new status, new combination

Conotyla montivaga Loomis, 1943, Bull. Mus. Comp. Zool. Harvard, 92(7): 383–384, Fig. 4a-d. Chamberlin and Hoffman, 1958, U. S. Nat. Mus. Bull., 212: 99.

Conotyla specus Causey, 1952, Proc. Biol. Soc. Washington, 65: 113.

Male holotype (Museum of Comparative Zoology) collected at 7,500 feet elevation in the Santa Rita Mts., Pima County or Santa Cruz County, Arizona, 29 October 1927, by H. F. Loomis.

Range: Southern New Mexico, southern Arizona (Loomis, 1943), northern Illinois, and southern Wisconsin.

Diagnosis: Distinguished from *s. specus* by the epigean habitat, the smaller, more deeply pigmented body, and differences in the length of the articles of the antennae, of which the ratio of articles 3 and 4 is approximately 2/1.

Description (paraphrased from Loomis' description based on an unspecified number of specimens): Body length 9 to 13 mm; pigmentation weak; ocelli 21, in 4 or 5 series arranged in a subtriangular group, 3, 5, 6, 7 or 1, 3, 5, 6, 6; antennae rather short and stout; paranota not becoming apparent until the fourth or fifth segment and completely lacking from the last half dozen segments; males with a long slender lobe on the middle of the ventral surface of segment 4 of leg pairs 3 and 4; ventral surface of tarsal segment of leg pairs 3 to 7 granular; anterior surface of coxal segment of leg pair 10 with a knoblike lobe that projects under the gonopods; "both anterior and posterior gonopods show the close relationship to *specus* although they exhibit obvious differences."

I have made the following observations from the male holotype: body length about 9 mm, body thickness 1 mm; no promentum; length of antennae approximately 1.8 mm, the ratio of segments 1 through 7 as follows: 9:22:47:20:32:18:9; the ocelli were not recounted; small cylindrical lobes, approximately twice as long as they are thick, are on the middle of the mesial surface of leg pairs 3 and 4; the ventral surface of leg pairs 3 through 11 is pulvillar; the length of the longest segmental setae, most of which have been rubbed off, is 0.35 mm; the details of both pairs of gonopods, including the complex dorsal surface of the anterior pair, are as in *s. specus* (Figs. 5–7).

Variation: The length of the specimens that I have seen is between 9 and 10 mm. There are 23 or 24 ocelli in rows of 1, 7, 6, 5, 4(3), 1. The antennae are from 1.3 to 1.8 mm long. The lobes on segment 4 of leg pairs 3 and 4 are thick and conical in the Illinois specimens and slender and cylindrical in the Wisconsin specimens; no marked differences were observed between the size of the lobes on leg pairs 3 and 4 in any one male. The segmental setae are from 0.3 to 0.5 mm long. The shape of the margins of the lobes on the dorsal surface of the anterior gonopods varies minutely from *s. specus*; the variation is possibly of an individual or a clinal nature.

Specimens examined: ARIZONA: Santa Rita Mts., male holotype. ILLINOIS: CARROLL COUNTY: Smith Park, Mt. Carroll, 2 ♂, 1 ♀, 6 December 1945; Pallisades State Park, 1 ♂, 6 December 1945. WISCONSIN: SAUK COUNTY: Devil's Lake State Park, in pine litter on east bluff, 2 ♂, 13 October 1955. VERNON COUNTY: (tentative determinations) 1 mile east of Coon Valley, in oak litter, larvae, 2 September 1954; 5 miles north of Viola, in mixed hardwood litter, larvae, 2 September 1954.

Austrotyla spp.

Specimens undetermined as to species, all collected by C. C. Hoff, have been examined from the following sites: COLORADO: CONEJOS COUNTY: Cumbres Pass, 10,000 feet alt., 1 ♀, 3 September 1952. NEW MEXICO: SANDOVAL COUNTY: 12 miles E of Cuba, 8,800 feet alt., in deep, moist Gambel oak litter in yellow pine zone, 1 ♀, larvae, 26 August 1953. SANTA FE COUNTY: Baldy Mt., 11,400 feet alt., larvae, 11 August 1953. TAOS COUNTY: Mt. Wheeler trail, S of Red River Village, 10,300 feet alt., larvae, 8 September 1953.

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SIPHOGENERITA, NEW GENUS, AND A REVISION OF CALIFORNIA CRETACEOUS "*SIPHOGENERINOIDES*" (FORAMINIFERIDA)

By Max A. Furrer

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Topotype material of all California species and subspecies of *Siphogenerinoides* was recently obtained by our laboratory. A. R. Loeblich, Jr., called the attention of the writer to certain discrepancies between the type species, *Siphogenerinoides plummeri* Cushman and the California species. A subsequent study of topotypes of *S. plummeri* and a survey of the literature concerning *Siphogenerinoides* demonstrated the presence of these inconsistencies. In view of the importance of this genus to California biostratigraphy it was decided to restudy the internal morphology of the test, particularly the arrangement of the early chambers and the siphon in order to clarify the somewhat doubtful systematic position of the California species of *Siphogenerinoides*.

The writer gratefully acknowledges the help received from several persons. A. R. Loeblich, Jr., California Research Corporation, La Habra, California, provided some of the material and also suggested the present study. William Lewis, Standard Oil Company of California, Oildale, California, supplied type material from two localities in California. Helen Tappan Loeblich, University of California at Los Angeles, drew the text figure and two figures on the plate and critically read the manuscript. Other illustrations were prepared by Lawrence Isham, scientific illustrator, Washington, D. C.

The genus *Siphogenerinoides* was introduced by Cushman in 1927. As type species he selected *Siphogenerina plummeri* which he had first briefly mentioned in a paper on the genera *Siphogenerina* and *Pavonina* (1926a: 18). Comparing it to the Recent *Siphogenerina australiensis*

Cushman wrote: "There is a very slender species with numerous uniserial chambers and 10 to 12 costae, which occurs in the Navarro, Upper Cretaceous clays, one-half mile south of Kemp, Texas. This may be known as *Siphogenerina plummeri* Cushman, new species, and will be figured later."

Siphogenerina plummeri was described and figured later in the same year (Cushman, 1926b: 15) and a specimen was designated as holotype from the Upper Navarro, exposed along Walker Creek in Milam County, Texas. No mention was made as to the presence or absence of an internal tube. Without reference to any generation, the early stage was described as being biserial.

One year later Cushman published his outline of a reclassification of the foraminifera wherein he proposed the genus *Siphogenerinoides* with *Siphogenerina plummeri* as type species (Cushman, 1927: 63). At this time he positively stated the absence of siphons between the chambers and again mentioned the biserial initial stage.

The first adequate description of *Siphogenerinoides plummeri* was given by Plummer (1931: 183). Excepting some modifications concerning the internal tube, nothing can be added to her observations. Of great interest are Plummer's conclusions as to the generic affiliations: "The genotype of *Siphogenerinoides* is here placed in the family Buliminidae Cushman, of which the internal tube is a fundamental character. Whereas *Siphogenerina,* characterized by its triserial initial stage, has probably evolved from *Bulimina* through *Uvigerinella* with its collared aperture and *Uvigerina* with its aperture bounded by a neck and phialine lip, *Siphogenerinoides* has probably arisen through bolivine stock. The frequent twisting of the earliest biserial chambers of the microspheric test is possibly an inheritance from *Virgulina* and *Bolivina.* The basic characters that differentiate *Siphogenerinoides* from *Siphogenerina* are, therefore, the biserial arrangement of numerous early chambers of the microspheric form."

Galloway's manual (1933: 379) listed *Siphogenerinoides* as a synonym of *Siphogenerina.*

In his monographic treatment of *Siphogenerinoides,* Stone (1946) reached the conclusion that the two genera are to be separated because of the differences in their apertural features. He considerably emended Cushman's original definition of *Siphogenerinoides* and included the statement that the early chambers of the microspheric form of *S. plummeri* were triserial exhibiting an irregular configuration.

The last edition of Cushman's *Foraminifera, Their Classification and Economic Use* (1948: 260), again mentions biserial initial chambers for *Siphogenerinoides.*

In a careful analysis of the internal structure of *Siphogenerinoides plummeri* Montanaro Gallitelli (1957: 148) confirmed the biserial arrangement of the early stage. She maintains that, "a relationship of *Siphogenerinoides* with triserial genera must be excluded."

Recently, I was able to examine a large number of topotypes of

Siphogenerinoides plummeri. In order to obtain a better view of the initial chambers and the internal tube Troelsen's acid treatment (1954) was successfully utilized. With the chamber walls eroded in this manner all specimens examined showed an unquestionably biserial *Bolivina*-like arrangement just as described by Plummer and Montanaro Gallitelli.

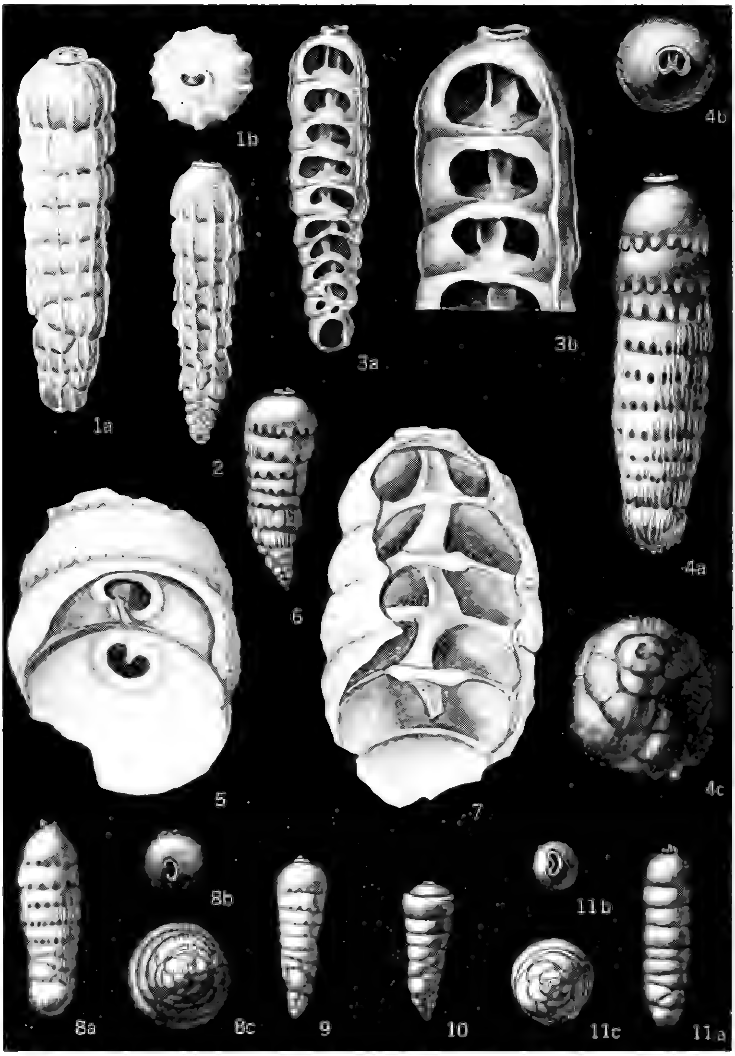
To date, two species and one variety of *Siphogenerinoides* have been reported from California, namely *Siphogenerinoides clarki* Cushman and Campbell, 1936 (see attached plate, Figs. 5, 6, 10a,b,c), *Siphogenerinoides clarki* Cushman and Campbell var. *costifera* Cushman and Goudkoff, 1944 (= Figs. 8a,b,c,g, herein) and *Siphogenerinoides whitei* Church, 1941 (see Figs. 4a,b,c, 6, herein). Examining the original descriptions one notes that in all three cases the early chambers of the microspheric generation are clearly stated to be triserial. For the present study large samples of topotype material were available and therefore hundreds of microspheric tests were treated with hydrochloric acid. Without exception, the neanic stages of the three species were found to be triserial. The internal siphon, however, appears to be formed in the same way as in *Siphogenerinoides plummeri* (Figs. 1a,b, 2, 3a,b, herein). As observed by Montanaro Gallitelli (1957) the internal "tube" is not a complete cylinder, but a spoutlike hemicylinder connecting the foramen on the upper and lower side of a chamber. But this spout does not extend through the openings as it seems to pierce the septal wall in a separate small circular hole in such a manner that the concave side of the spout faces the foramen (see text, Fig A). There is not a single continuous, twisted spout present throughout the whole length of the test because the spouts grow visibly out of each septal wall or rather out of the lip or weltlike structure surrounding the aperture. The position of attachment of the spout connecting two chambers is diametrically opposite because the position of successive openings is axially oriented at the rate of 120°–180°.

FIG. A. Portion of the columellar process and apertural rim in *Siphogenerita whitei.*

From this closer examination of the internal structure of the Californian species of "*Siphogenerinoides*" thus emerge two relationships:

1. With the genus *Siphogenerinoides*, because of the columellar process and apertural features, and also the general test morphology.

2. With *Siphogenerina*, because of similarity of test and the triserial neanic stage in the microspheric generation.



FIGS. 1–3. *Siphogenerinoides plummeri* (Cushman) topotypes (USNM P5453) from the Upper Cretaceous, Navarro group, in the bank of Walker Creek, 6 miles N 15° E of Cameron, 1 mile upstream from the intersection of Walker Creek and the Cameron-Clarkson road, Milam County, Texas. Collected by H. J. Plummer. Figs. 1a, 2—sideviews; 1b—top view (all ×73). Fig. 3a—sectioned topotype (USNM P5455), showing internal tube (×73). Fig. 3b—enlarged upper part of the same specimen (×143).

Since no biserial microspheric specimens have been found among the Californian species and on the other hand no triserial microspheric generation of *Siphogenerinoides plummeri* is known, dimorphism is to be ruled out. It appears then that in spite of their similarities to *Siphogenerina* and *Siphogenerinoides* the California species cannot be placed in either genus but must be allocated to a new genus for which the name *Siphogenerita* is proposed. Because of its triserial early chamber arrangement the new genus is here included in the family Uvigerinidae.

Order FORAMINIFERIDA Zborzewski, 1834
Superfamily BULIMINACEA Jones, 1875
Family Uvigerinidae Cushman, 1913
Genus **Siphogenerita** Furrer, new genus

Type species: Siphogenerinoides clarki Cushman and Campbell, 1936.

Test free, elongate, length up to 2.3 mm. Circular to subcircular in transverse section, megalospheric forms well rounded at both ends, microspheric forms rather distinctly tapering. Early stage in microspheric generation triserial, passing into a relatively short biserial stage, then uniserial. Megalospheric forms with large proloculum followed by biserial and uniserial stages. Chambers somewhat inflated, sutures distinct, depressed. Wall calcareous perforate, finely porous, frequently ornamented with longitudinal costae or striations. Columellar process consisting of spoutlike hemicylinders changing the position of their convex side at a rate of 120°–180° in each successive chamber. Spouts do not pass

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FIGS. 4–7. *Siphogenerita whitei* (Church) from top of cored interval 325–335 feet, Marca No. 3, near the center of Sec. 6, T. 15 S, R. 12 E, Mount Diablo Baseline and Meridian, Panoche Quadrangle, Fresno County, California. Fig. 4a—sideview of megalospheric test; 4b—apertural view; Fig. 6—side view of microspheric test; all ×20.5. Fig. 4c—view of early chamber arrangement in microspheric test, ×41. Figs. 5, 7—dissected tests showing alternating position of the semicylindrical spouts and the foramen in successive chambers (×48).

FIGS. 8–9. *Siphogenerita clarki* (Cushman and Campbell) var. *costifera* (Cushman and Goudkoff) from a core at interval 6971–80 feet in Jergins Oil Cheney Ranch No. 1 Well, in Sec. 29, T. 14 S, R. 13 E, Fresno County, California. Fig. 8a—sideview of megalospheric test; Fig. 8b—apertural view; Fig. 9—sideview of microspheric test; all ×20.5. Fig. 8c—view of microspheric early chamber arrangement (×41).

FIGS. 10–11. *Siphogenerita clarki* (Cushman and Campbell) from Marsh Creek at the bend just below mouth of Briones Creek, S ½, SW ¼, NW ¼, Sec. 35, T. 1 N, R. 2 E, Mount Diablo Baseline and Meridian, Byron Quadrangle, Contra Costa County, California. Fig. 10—sideview of microspheric test; Fig. 11a—sideview of megalospheric test; Fig. 11b—apertural view; all ×20.5. Fig. 11c—view of microspheric early chamber arrangement, ×41.

through foramen but grow out of the welt- or liplike structure surrounding the aperture, thus not forming an uninterrupted, continuous siphon. The concave side of the spout always faces the apertural opening. Aperture terminal, elliptical, or reniform with short neck and distinct lip. Terminal feature of columellar process is a small circular opening outside aperture and adjacent to its concave side.

Occurrence: Upper Cretaceous, Coniacian–Maestrichtian.

Remarks: Siphogenerita, new genus, differs from *Siphogenerinoides* in having a triserial initial chamber arrangement. The spoutlike hemicylinders forming a discontinuous siphon which does not pass through the foramen distinguish the new genus from *Siphogenerina.*

From a study of the literature and without having examined actual material it seems evident that most western hemisphere species of *Siphogenerinoides* must be placed with *Siphogenerita.* This applies in particular to the species from Peru erected by Stone (1946), Cushman's Venezuelan species (1929) and the forms described by Petters (1954) and Redmond (1955) from Colombia. *Siphogenerinoides cretacea* Cushman subsp. *idkyensis* Colom, 1948, first reported from the Upper Cretaceous of the Spanish Sahara undoubtedly belongs to *Siphogenerita.* In a recent paper (Chenouard, de Klasz and Meijer, 1960: 71) two new species, *Siphogenerinoides clavata* and *Siphogenerinoides dentata* were described from the Upper Cretaceous of West Africa. Diagnosis and illustrations clearly demonstrate them to be *Siphogenerita.*

Siphogenerinoides oveyi Nakkady and *S. oveyi* var. *compressa* Nakkady (1950) both found in the Upper Cretaceous of Egypt are apparently true *Siphogenerinoides.* This survey of the literature indicates that a number of synonyms occur among species of *Siphogenerinoides* and *Siphogenerita* respectively, but without an examination of the material no changes will be suggested at present.

We are facing here a somewhat similar situation to that which existed prior to 1945 for *Siphogenerina* which then included forms with biserial as well as triserial neanic chambers in microspheric tests. Mathews (1945: 588) separated these, leaving those with biserial neanic chambers as *Siphogenerina* and erecting for those with triserial early stage the new genus *Rectuvigerina* (which was divided into two subgenera *Rectuvigerina s. s.* and *Transversigerina,* on the basis of shape of the sutures). There is, however, a certain difference between the splitting of *Siphogenerina* and *Siphogenerinoides* because dimorphism undoubtedly occurs in the former. Bandy (1952: 17) reported both tri- and biserial tests among specimens of *Siphogenerina costata* from its type area in the south Pacific Ocean (Tahiti).

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ALLOMETRY AND SPECIATION IN *ECACANTHOTHRIPS* BAGNALL

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Hood (1935) suspected that synonymous names existed within the genus *Ecacanthothrips,* in view of the extreme variability of the forecoxae he found in the males of *E. priesneri* Hood. To quote Hood, "similar variability is to be expected among its congeners and as this character has been used as a prime one in the definition of species, there can be little doubt that synonymous names exist in the genus. Several species such as *inermis, bagnalli, crassiceps, inarmatus* and *coniger* appear to be thoroughly distinct, but the remainder of the genus centering about *sanguineus,* requires careful study of a large series of specimens." A study of different populations of *Ecacanthothrips* has confirmed several facts concerning the speciation of this genus. Several species are on record, mostly described from uniques or a few isolated specimens such as *E. bryanti* Bagnall, *E. coxalis* Bagnall, *E. steinskyi* Schmutz, *E. fletcheri* Ramakrishna, *E. ramakrishnai* Ananthakrishnan, *E. erythrinus* Ananthakrishnan, *E. flavipes* and *E. priesneri* Hood—all in the opinion of the author, only synonyms of *E. sanguineus* Bagnall. These species were erected because of insufficient knowledge of the enormous variations exhibited by *E. sanguineus,* so extensive as to be almost unbelievable. The individuals in a population fall into a finely graded series, so that the two opposite ends of the series, the gynaecoid and the oedymerous forms are strikingly different. This being the case, such characters adopted in the speciation by the protologists of the species, such as the color of the body, head length/width index, head length/tube length index, the structure of the forefemora and tibia, the coxal prolongation in the males, the number and position of the foretibia tubercles and *even the number of cones in the third antennal joint and the accessory setae of the forewings,* have been found to be very inconsistent in view of the enormous range of variation exhibited by the individuals *in a population from the same host.* The accompanying range of measurements and the figures provide ample data for confirming the invalidity of the species mentioned above and careful scrutiny will reveal that all these species fall within the range of variation exhibited by them.

It is my pleasant duty to thank the authorities of the British Museum of Natural History, London, for extending me all the facilities for studying their collection of Thysanoptera and also to Dr. H. Priesner of Linz (Austria) for having given me the privilege of examining his collection during my stay in Linz. My thanks are also due to K. S. Ananthasubramanian of this department for having helped me in the collection of several of the forms discussed below.

The present observations are based on the following material:

(1) 19 males and 12 females and numerous larvae from neem bark, Palghat, Kerala, S. India.

(2) 16 males and 12 females and numerous larvae in the decaying bark of *Moringa moringa,* Madras, along with several individuals of staphylinid beetles and the caterpillars of the moringa pest (*Eupterotes mollifera*). An interesting feature is that the females of *Ecacanthothrips* laid their eggs within the moulted skin of the caterpillar and eclosion and the coming out of the first instar larva were observed in the laboratory.

(3) 20 males and 15 females from within dried twigs of *Sesbania.* This seems to be an abode of this thrips; several clusters of 10–42 eggs were found within the crevices.

(4) 12 males and 10 females from the sheaths of the coconut palm, Madras.

(5) 8 males and 10 females from the sheaths of a palm, Madras.

That allometry exists in *Ecacanthothrips* was established by Hood even from the four males he had of *E. priesneri,* but he was unaware of the existence of the very many intergrading forms. As such, he described *E. priesneri* as a new species and also provided a tentative key for such species as *flavipes, bryanti, steinskyi, sanguineus, coxalis,* and *priesneri,* based on the color schemes of the forelegs and antennal joints 3–5, along with the proportionate lengths of joints 3–5. The present study has established beyond doubt that these are no longer tenable, being mere variations found within a population and while the majority of the individuals possess antennal joints 3, 4, and 5 brownish, some individuals have the basal half of 3, 4, and 5 yellow, the rest brown. Again, the proportionate lengths of the antennal joints 3–5 in *steinskyi* and *priesneri* have been mentioned as being 123, 132, 126 μ and 140, 147, 144 μ respectively, but measurements of all the males within a population have proved the range in each case to be, 98–168, 126–172, and 112–168 μ.

From the point of view of body coloration, every grade from dark,

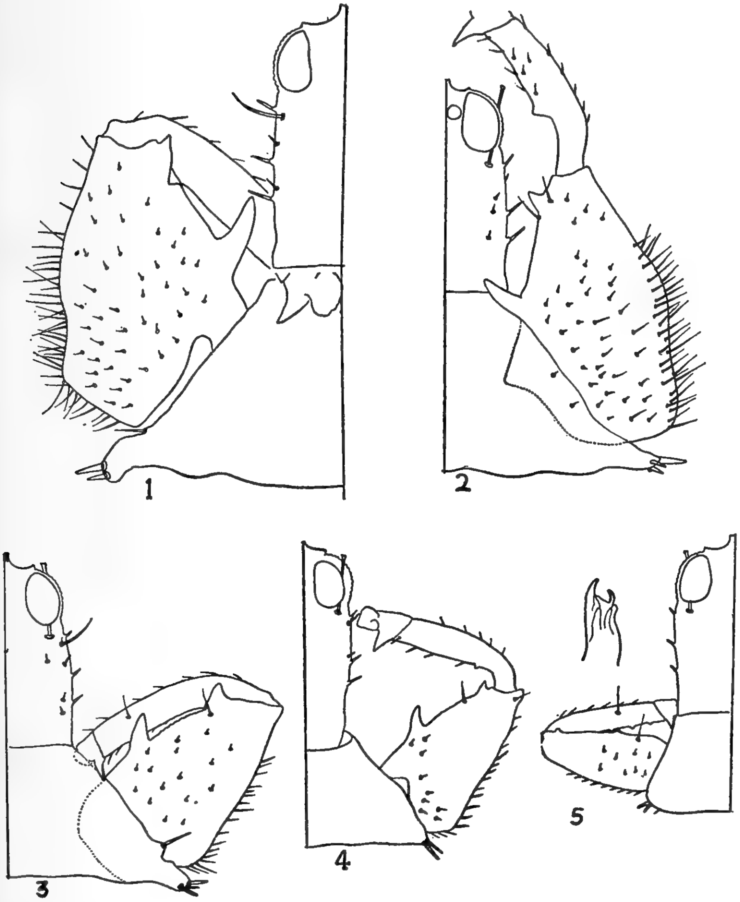

FIG. 1. *Ecacanthothrips sanguineus* Bagnall. 1.—Head, prothorax, and forelegs (on one side) of a maximum oedymerous male. 2–5.—The same, depicting the gradation in the reduction in the size of the forelegs. 5.—Gynaecoid male, with the side view of the apex of the pseudovirga. (All the setae on the forelegs are not shown.)

blackish brown without any trace of red pigmentation, through light brown with red pigmentation to almost entirely reddish individuals are met with. The number of cheek setae on raised prominences are constant for all the members in a population, three pairs being normally present. However, in all oedymerous forms and in those which show the tendency to be so, two or three pairs of smaller, accessory setae are present in between the three primary ones.

A significant feature is that the gynaecoid males, in general, appear so feebly developed as to lose all the typical male *Ecacanthothrips* characters, except for the genitalia. Practically all other morphological characters of the average male, not to speak of the oedymerous forms, are strongly suggestive of female traits: for example, a strong pronotum, strong forefemur and teeth, and particularly the absence of a coxal

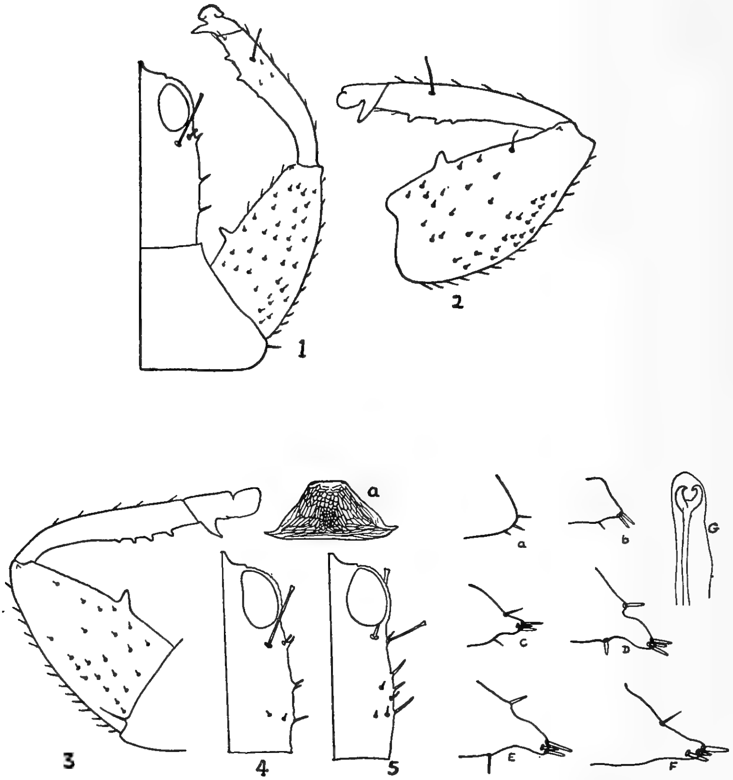

FIG. 2. *Ecacanthothrips sanguineus* Bagnall. 1.—Head and prothorax of female (one half). 2, 3.—Forelegs of female. 4.—Head of female (one half). 5.—Head of male (one half). a.—Pelta. a.–f.—Coxal prolongation. g.—Apex of pseudovirga.

prolongation. This is again confirmed by the fact that the gynaecoid males develop tibial tubercles beyond the middle region of the foretibia, a feature totally lacking in the normal and oedymerous males, but present only in the females. In the typical males, the proximal region of the foretibia is clearly concave and possesses one prominent tubercle while all the distal tubercles are not developed, or at most the inner margin of the foretibia is rugged. In the maximum oedymerous males, the outer margin of the forefemora at base tends to be clearly concave and is provided with a cluster of fine hairs. This concavity becomes progressively reduced along with the size and number of the fringing hairs as we proceed along the series, down to the gynaecoid individuals. Thus, in the gynaecoid males, the outer margin of the forefemora is normal, possessing a few weak setae and the proximal forefemoral tooth is very much reduced and the apical tooth hardly visible—features again suggestive of female traits. As such, speciation based on the forefemora possessing basally an excavated outer margin, provided with long, fringing hairs, becomes no longer tenable.

TABLE 1.—*Range of measurements in μ unless otherwise specified.*

	Males	Females
Total body length	2.240–4.228 mm	2.940–4.060 mm
Head, length	350–518	350–462
Head, width across eyes	210–280	224–280
width across cheeks	226–266	252–308
Postocular, length	112–172	112–154
Cheek spines, length: 1	14–28	14+
2	14–42	14–28
3	14–56	14–28
Antennal joints, length: 3	98–168	126–154
4	126–172	140–168
5	112–168	140–168
Antennal joints, width: 3	56–91	70–84
4	42–70	56
5	35–42	42–70
Prothoracic width at posterior margin (inclusive of coxae)	392–1022	420–700
Width of forefemora	126–378	126–280
Basal forefemoral tooth, length	28–140	14–56
Apical tooth, length	7–98	—
Number of accessory setae of forewings	12–25	15–19
Tube, length	168–280	172–266

(A very detailed account of the measurements of every individual in a population will be published elsewhere.)

Some males were also observed in the same population, with a body size range in between the gynaecoid and the oedymerous forms, but yet with poorly developed forefemora and coxae.

The range of variation shown by the number of accessory setae of the forewings and the number of sense cones on the third antennal joint ranging from 12–25 in either case, further confirm the invalidity of all the species.

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PROCEEDINGS

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PROCEEDINGS

The one meeting thus far during 1962 was held in Room 43 of the United States National Museum at 8:00 pm.

1033rd Meeting—7 June 1962

EIGHTY-THIRD ANNUAL MEETING

President Johnson in the chair; 32 members and guests present.

The reports of the Corresponding Secretary and Treasurer were presented.

New members elected: Mrs. Thomas Burch, Ermelinda Desmond, Jerry A. Powell, Joseph Rosewater.

The following officers and Members of the Council were elected: *President,* Albert C. Smith; *Vice Presidents,* Joseph P. E. Morrison, Louise M. Russell, Viola S. Schantz, Richard H. Manville; *Recording Secretary,* Richard S. Cowan; *Corresponding Secretary,* John L. Paradiso; *Treasurer,* John W. Armstrong; *Members of Council,* Daniel Cohen, Ralph E. Crabill, Jr., Charles O. Handley, Jr., Ernest A. Lachner, Henry W. Setzer.

Formal communication: Dr. James H. Wright, Veterinarian, National Zoological Park, presented a film entitled "Zambesi," depicting human and animal life in Rhodesia before and after the building of the Kariba dam.

The 1034th meeting will be held on 20 December 1962.

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PROCEEDINGS
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NATURAL HISTORY OF PLUMMERS ISLAND, MARYLAND[1]

XIII. Descriptions of New Wasps From Plummers Island, Maryland, (Hymenoptera : Aculeata)

By Karl V. Krombein

Entomology Research Division, Agricultural Research Service, U. S. Department of Agriculture, Washington, D. C.

The following new wasps are described at this time so that names will be available for two field projects that I have carried on at Plummers Island during the past 6 years. One of these projects is a study of the biology of solitary predaceous wasps, and bees that nest in borings in wood, and the other is the systematic collecting of both ground- and wood-nesting wasps to form the basis for an annotated list of the wasp fauna of Plummers Island.

I have named these ten new species in honor of some of the entomologists who are or were members of the Washington Biologists' Field Club. Most of them collected some of the specimens on which my annotated list of the wasps of Plummers Island will be based.

Family Bethylidae

Epyris vierecki,[2] new species

This species is known from a small series of ten males and one female from Plummers Island, most of which were swept from vegetation. All specimens were taken in the fall. Males may be distinguished from the known males of the other eastern species by a combination of the sculpture of the U-shaped propodeal area, color of antennae and legs, and relative proportions of head and antennae. The only other eastern species known to have a brachypterous female is *Epyris brachypterus* (Ashmead), which also occurs on Plummers Island. Females of *vierecki* may be dis-

[1] A list of the titles published previously in this series will be found in No. XII, Proc. Biol. Soc. Wash. 72: 101–102, 1959. Publication costs of this number have been defrayed by the Washington Biologists' Field Club to promote its primary objective of research on the fauna and flora of Plummers Island and adjacent areas.

[2] For Henry Lorenz Viereck (member 1911–1931), hymenopterist, and collector of many specimens on which my list of Plummers Island wasps will be based.

tinguished from those of *brachypterus* by the sculpture of the U-shaped area on the propodeum which in the latter has strong radiating rugulae.

Type ♂: Plummers Island, Md.; 27 September 1959, K. V. Krombein. U.S. National Museum, Type No. 65882.

Male: Length 3.5 mm, forewing 2.3 mm. Black; mandible reddish on apical half; tarsi light brown; antenna and fore tibia dark brown, the former a little lighter beneath. Vestiture on head and thorax, short, grayish, subdecumbent. Forewing slightly infumated, veins brown.

Head dull, moderately alutaceous, the length from apex of clypeus to occiput 1.1 times the greatest width including eyes; front with a feeble median groove extending one-fourth the distance to anterior ocellus, and with scattered, moderately large punctures; length of head behind eyes subequal to eye length; sides of head behind eyes parallel, rounded into occiput; flagellum moderately elongate, the ratio of lengths of first four flagellar segments as 3:4:4:5, the combined length of the third and fourth flagellar segments equal to least interocular distance.

Thorax dull, weakly alutaceous except propodeum; pronotal disk with greatest width two-thirds the length, surface with punctures of same size and density as front; scutum and scutellum with smaller, sparser punctures; mesopleuron impunctate; propodeal dorsum with broad U-shaped central area with a median carina on either side of which it is weakly and irregularly ruguloso-reticulate, the sculpture becoming weaker posteriorly; on either side of this area the dorsum with weak, close transverse carinae; lateral surface of propodeum strongly alutaceous; posterior surface with a complete median carina and very weakly alutaceous.

Abdomen shining and impunctate; second tergum posterolaterally and third to seventh terga and sterna with moderately long, decumbent vestiture.

Allotype ♀: Plummers Island, Md.; 1 October 1960, K. V. Krombein. U.S.N.M.

Female: Length 3.3 mm, forewing 1.1 mm. Black, the following light reddish brown—mandible, scape, pedicel, tegula, fore tibia and all tarsi; flagellum and remainder of legs castaneous. Brachypterous, the forewing extending only about half its length beyond apex of propodeum, the wings slightly infumated. Vestiture sparse, light grayish.

Head shining, very weakly alutaceous, the front and vertex with quite scattered, moderately large punctures, the length from apex of clypeus to occiput 1.1 times the greatest width; head behind eyes about as long as eye length.

Thorax shining except propodeum, the surface very weakly alutaceous; pronotum with large punctures a little more scattered than on head, the length of dorsum three-fourths its width at posterior lobes; scutum and scutellum impunctate; propodeum dull, the dorsum with a well-developed median carina, the U-shaped area strongly alutaceous and with a few radiating irregular carinules, the dorsal surface outside the U-shaped area with close transverse, very delicate striolation.

Abdomen shining, impunctate, sides of second and third, and most of fourth to sixth terga with very scattered, rather short, suberect setae.

Paratypes: 9♂♂; Plummers Island, Md.; 12 September 1909, J. C. Crawford, 1♂; 23 September 1960, H. E. Evans, 5 ♂♂; 4 October 1959, K. V. Krombein, 1♂; 5 October 1958, K. V. Krombein, 1♂, on *Solidago*; 17 October 1960, K. V. Krombein, 1♂. Paratypes are in the collections of the U.S. National Museum, Museum of Comparative Zoology, and the author. The paratypes are quite similar to the type in most details. The range in length is 2.4 to 4.2 mm. The sculpture of the U-shaped propodeal area in the smaller specimens is similar to that of the allotype, and in the largest specimens it is somewhat coarser than in the type.

Family Dryinidae

Mesodryinus crawfordi,[3] new species

M. crawfordi is readily distinguished from the other North American species, *M. americanus* (Ashmead) and *M. alatus* (Cresson), by the complete occipital carina, entirely black body, coarser sculpture, and more strongly banded wings.

Type ♀: Plummers Island, Md.; 11 July 1909, J. C. Crawford. U.S. National Museum, Type No. 65883.

Female: Length 4.2 mm, forewing 2.8 mm. Head and thorax black, abdomen castaneous except terminal segment lighter; scape, pedicel, first and last flagellar segments, and fore and mid legs beyond coxae, testaceous; mandibles and hind legs except coxae, light brown. Vestiture on head and thorax sparse, short, appressed, silvery. Wings clear except for infuscate bands across the forewing, one on distal two-thirds of basal cell and the other including stigma and proximal half of marginal cell; stigma and veins light brown.

Head dull, finely granular; clypeus shallowly and narrowly emarginate at apex; malar space with a median longitudinal carina on lower third; face with a complete median carina, a narrow strip along inner eye margin on lower two-thirds with a delicate network of fine carinules superimposed on the granular surface; ocellocular distance 1.5 times the postocellar distance; occipital carina complete; comparative lengths of scape, pedicel, and first three flagellar segments as 11:6:19:11:9, the combined lengths of the first three flagellar segments 0.9 times the head width including eyes.

Thorax dull, the basic sculpture finely alutaceous, except propodeum; pronotum about two-thirds as long as wide, with a weak marginal furrow anteriorly; scutum finely ruguloso-reticulate except for a median strip; postscutellum finely ruguloso-reticulate anteriorly; mesopleuron irregularly and finely ruguloso-reticulate; propodeum more coarsely ruguloso-reticulate, the dorsum longitudinally so.

Fore trochanter gradually clavate; fore femur strongly thickened, its

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[3] For J. C. Crawford (member 1909–1927), specialist in bees, and collector of the unique type of this new species.

length three times the greatest width; fore tibia half as wide as greatest width of femur, about four-fifths as long as fore tarsus; fore basitarsus cylindrical, about two-thirds as long as tibia, slightly hooked at apex; second tarsal segment transverse, a little hooked at apex; third tarsal segment twice as long as second and a little hooked at apex; fourth segment about two-thirds as long as first; chela of fifth segment extending back to apex of third segment, the lamellae extending almost to base of articulation; enlarged claw slightly curved, with a row of lamellae along curved edge.

Male: Unknown.

Gonatopus curriei,[4] new species

Of the described North American *Gonatopus* this appears to be closest to *ashmeadi* Kieffer with which it agrees in the light-red body color. It differs in having the abdomen also red instead of infuscated and in having the stalk of the mesonotum shining and unsculptured instead of dull and alutaceous.

Type ♀: Plummers Island, Md.; "3–8" (presumably 3 August), R. P. Currie. U.S. National Museum, Type No. 65884.

Female: Length 3.0 mm. Entirely light red except petiole of abdomen black, and the following testaceous—palpi, mandible, clypeus, lower face, antenna, and tarsi.

Head mostly shining, the anterior part of front very delicately alutaceous; upper horizontal part of front with a weak median carina extending to anterior ocellus; relative length of first three flagellar segments as 18:11:9, the combined length of these three segments subequal to head width including eyes.

Thorax shining; pronotal width three-fourths the length, the posterior margin narrowly emarginate in middle; lamellate side piece of pronotum with lower margin shallowly emarginate posteriorly; mesonotal stalk slender, polished, impunctate, about three-fifths as long as pronotum; propodeum in profile strongly rounded, the declivous posterior surface with about 15 delicate transverse carinae most of which extend onto the lateral surface.

Fore coxa elongate, about three times as long as lateral width; trochanter very slender and elongate, a little longer than fore coxa; fore tibia twice as long as coxa, thickened on basal half and slender apically; fore tibia slender, slightly curved, subequal to length of femur and also to length of tarsus exclusive of chela and claw; basitarsus slender, slightly hooked at apex; second tarsal segment transverse; third segment twice as long as second; fourth segment elongate, about equal to combined lengths of first three segments; chela extending to apex of second segment, a row of short lamellae beneath on apical half in addition to

[4] For R. P. Currie (member 1901–1930), entomologist, clergyman, and collector of the unique type specimen of this new species.

the usual concentration at apex; enlarged claw slender, almost as long as trochanter, without a subapical tooth.

Male: Unknown.

Paratype: 1♀, Dunn Loring, Virginia; 30 July 1949, K. V. Krombein.

Family Vespidae

Rygchium schwarzi,[5] new species

This species is deceptively similar to *R. megaera* (Lepeletier) in most details of the coloration and sculpture. It is separated at once from *megaera* by its somewhat smaller size, the lack of a carina or lateral angle on the superior margin of the propodeal concavity, by having the outer surface of the tibiae entirely white in the male and almost so in the female, and by the very much larger subapical lamella on the ventral surface of the aedeagus in the male. Occasionally, as in several specimens from Kill Devil Hills, N.C., the tibiae of male *megaera* may have some pale blotches. However, the tibiae of these individuals are never entirely white on the outer surface and the superior angles of the propodeal concavity are carinate.

Although both *megaera* and *schwarzi* are largely Lower Austral in distribution, it appears that they may be allopatric because they have never been taken in the same restricted locality.

Type ♂: Plummers Island, Md.; 6 June 1959, K. V. Krombein. U.S. National Museum Type No. 65885.

Male: Length 9.5 mm, forewing 8.0 mm. Black, the following white to ivory: Mandible except apex, clypeus, scape beneath, small circular spot above and between antennal sockets, tiny spot behind eye laterally on vertex, front half of dorsum of pronotum, narrow anterior band on postscutellum, very small round spot on mesopleuron beneath tegula, narrow apical margins of first two terga slightly narrowed anteriorly at midline, narrower band interrupted in middle posteriorly on second sternum, femora narrowly at apices, tibiae on outer surface, and middle segments of tarsi. Wings deeply infuscated.

Clypeus moderately closely punctate, the apex narrow and slightly emarginate; last flagellar segment stout, reaching base of ninth segment, the tip bluntly rounded, slightly concave beneath; interocellar area not tuberculate.

Humeral angles not prominent; postscutellum not serrate, and not produced behind into a shelf; propodeal concavity with a median ridge, weakly punctate and more closely so beneath than above, not margined by a carina above and without a lateral angle; lateral and posterior surfaces of propodeum not separated by a carina or series of serrations.

Legs unmodified.

First and second terga with moderately small, scattered punctures, separated from each other by one to two times the diameter of a puncture; third to fifth terga with coarser, subcontiguous punctures; apices

[5] For Eugene Amandus Schwarz (member 1903–1928), naturalist and coleopterist.

of terga not thickened or reflexed; aedeagus ventrally with the usual lateral tooth at middle, but the lamella at apical third very much larger than in *megaera.*

Allotype ♀: Same locality as type, 18 July 1956, K. V. Krombein; reared from nest H#29, cell 1. U.S.N.M.

Female: Length 11.0 mm, forewing 9.5 mm. Coloration similar to male type except as follows: Mandible black except a small subbasal spot, clypeus black except for basolateral band, interantennal spot a little larger, tegula with a tiny spot at base and apex, mesopleural spot larger, femora and tarsi all black, and tibiae outwardly narrowly black at apex and base. Sculpture generally similar to male but comparatively slightly coarser: Vertexal impression oval, as wide as ocellar triangle.

Paratypes: 4♂♂, 1♀, Plummers Island, Md., 4 June 1959 (♂), 4 June 1961 (♂), 17 July 1961 (♂), 18 July 1956 (♀), 30 August 1961 (♂), and 5♂♂, 15♀♀ reared from nests H#57 and H#59 (1956), nests P#3, P#4, P#63, P#123, and P#148 (1957), nests Y#141 and Y#144 (1959), and nests K#104 and K#201 (1961), all K. V. Krombein. 1♂, Glen Echo, Md., July 1930, J. C. Bridwell. 1♀, Roxborough, Pa., 19 June 1909, G. M. Greene. 1♀, Princeton, N.J., 1 July 1950, K. W. Cooper. 3♀♀, Washington, D. C.: 24 July 1915, 1♀, W. A. Donnell; 2♀♀, W. M. Mann. 2♂♂, Arlington, Va., 25 July 1948, K. V. Krombein. 1♀, Dunn Loring, Va., 30 August 1947, K. V. Krombein. 1♀, Boggy Creek, I.T. (i.e., Oklahoma), 6 September 1904, F. C. Bishopp. Paratypes are in the collections of the U. S. National Museum, University of California at Davis, and the author.

Male paratypes range in length from 8.5 to 11 mm. They are quite similar in punctation. Frequently the apical margin of clypeus is narrowly black. Occasionally there may be extremely narrow white bands on third and fourth terga which may be interrupted along midline, and a few specimens have very small posterolateral white spots on third to fourth or fifth sterna.

Female paratypes are 7.5 to 12.5 mm long. They are very similar to the allotype in most details. In a few specimens the tegula lacks pale spots, occasionally the clypeal band is divided into basolateral spots, and in one specimen there is a tiny spot on the scutellum.

Stenodynerus (Parancistrocerus) vogti,[6] new species

This species is known only from the unique female type which I reared from a nest built in a boring in a wooden block at Plummers Island in 1957. It runs to S. *histrio* (Lep.) in Bohart's key to the species of this subgenus (Proc. Ent. Soc. Wash. 54: 40–43, 1952), but differs in a number of details. Bohart's couplet 26 may be modified as follows to provide for this additional species:

26. As seen in dorsal view, postscutellum sharply separated from vertical surface of propodeum at middle by a rough horizontal area 26a

[6] For George B. Vogt (member 1950 to date), coleopterist.

As seen in dorsal view, postscutellum separated from vertical surface of propodeum at middle by at most a roughly rounded area 27

26a. Base of second sternum with 10–12, strong, well separated longitudinal rugae, median basal groove well developed; interocellar area not tuberculate; posterior margin of parategula incurved; wing membrane very dark; Va. to Fla., La. .... *histrio* (Lepeletier)

Base of second sternum with about 24 weaker, close longitudinal rugulae, median basal groove almost evanescent; interocellar area weakly tuberculate; posterior margin of parategula rounded out; wing membrane paler; Md. .... *vogti,* new species.

Type ♀: Plummers Island, Md.; emerged 23 May 1958 in laboratory from nest P#155 stored in late August, 1957, K. V. Krombein. U. S. National Museum, Type No. 65886.

Female: Length to apex of second tergum 5.5 mm, wings deformed. Black, the following light yellow—spot at base of mandible, small triangular spot above interantennal crest, small transverse spot on humeral angle, spot at base of tegula, parategula, short band on postscutellum, small round spot on mesopleuron below pronotal lobe, narrow oblique spot anterolaterally and a narrow apical band on first tergum, slightly wider apical band on second tergum, small triangular posterolateral spot on second sternum; tegula testaceous; femora castaneous; tibiae and tarsi reddish brown. Wings not properly expanded so colors probably not typical. Pubescence grayish, inconspicuous.

Clypeus shallowly incised at apex and about as wide there as interantennal distance; front moderately swollen; interocellar area with low tubercles, not bridged behind front ocellus.

Humeral angle moderately prominent; parategula with posterior margin rounded outward; propodeum with a short pitted horizontal section at base.

First tergum wider than long, almost as wide as second, rather weakly punctate, the summit irregular but with a weak carina, the apical margin not thickened; second tergum with apical margin transverse, the apex very slightly thickened; second sternum at extreme base with about 24 short, close, longitudinal rugulae, the segment weakly swollen in profile, with scattered moderate punctures, and with the median basal groove almost evanescent.

Male: Unknown.

Family Pompilidae

Dipogon subgenus **Winnemanella,**[7] new subgenus

This subgenus is known from the female only. It may be distinguished from the other subgenera, *Dipogon* Fox and *Deuteragenia* Sustera, by the ivory integumental spots on the clypeus, malar space and pronotum, the long malar space, the highly polished and very sparsely punctate

[7] From Winnemana, the local Indian name for beautiful island.

front and thoracic dorsum, the greatly reduced maxillary beard and the clear, non-fasciate forewing. In addition, the maxillary beard is pale as in typical *Dipogon*, but the second and third cubital cells are subequal in length as in *Deuteragenia*.

Type of subgenus: Dipogon (Winnemanella) fulleri, new species.

Very small, the single known species 4 mm long with forewing 3.5 mm long; clypeus, malar space and pronotum with ivory integumental maculations; malar space longer than in other subgenera, its length at anterior mandibular condyle as great as width of a flagellar segment; maxillary beard consisting of a long curved fascicle of pale golden hair arising from each cardo, the fascicle composed of only about six hairs; front and thoracic dorsum highly polished and with scattered, minute punctures; notaulices elongate as in typical *Dipogon*; second and third submarginal cells subequal in length.

Dipogon (Winnemanella) fulleri,[8] new species

This is the only known species of the subgenus *Winnemanella*, and may be readily distinguished from our other *Dipogon* by the characters noted in the subgeneric discussion.

I presume that *fulleri* nests in abandoned borings of other insects in sound dead wood. I collected the type specimen as it crawled a few inches above the ground on the trunk of a standing dead, barked tree containing many insect borings. This tree is on moderately densely shaded bottomland several feet above the mean summer level of the Potomac River. O. L. Cartwright captured the paratype female in South Carolina as it crawled over the ground dragging its prey, a paralyzed jumping spider *Icius hartii* Emerton, Salticidae (det. W. J. Gertsch).

Type ♀: Plummers Island, Md.; 18 August 1960, K. V. Krombein. U. S. National Museum, Type No. 65887.

Female: Length 4 mm, forewing 3.5 mm. Black, except the following ivory—clypeus except a median triangular black mark on basal third, malar space, small spot anteriorly on side of pronotum, and the following fulvous—palpi, last eight flagellar segments, apices of coxae and fore and mid femora, most of hind femur, all tibiae and tarsi; wings pale, the stigma and veins testaceous.

Clypeus slightly arched, anterior margin unmodified, highly polished with a few long submarginal setae; front highly polished, rounded outward between eyes, and with scattered minute punctures; thoracic dorsum highly polished and with a few scattered punctures; notaulices elongate; mesopleuron and propodeum delicately shagreened, subopaque; abdomen subshining, with small, well-separated punctures.

Male: Unknown.

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[8] For my dear friend, and companion during many pleasurable days at the Island, Henry S. Fuller, M.D. (member 1949 to date), whose claim to hymenopterological fame is the discovery of a female European hornet sitting at the bar in Winnemana Lodge, the only time that this species has been taken on the Island.

Paratype: 1♀, St. George, S. C.; 26 May 1961, O. L. Cartwright. U.S.N.M. This is very similar to the type in most details but has the basitarsi somewhat infuscated, and the thoracic dorsum and abdomen somewhat less polished because of very delicate shagreening.

Family Sphecidae

Trypoxylon (Trypoxylon) clarkei,[9] new species

As will be evident from the complicated synonymy discussed under the next specific heading, the present species requires description as a new species. *T. clarkei* may be distinguished from its closest relative *T. johnsoni* Fox by the key which follows the description. It is known from New York, New Jersey, Pennsylvania, Maryland, District of Columbia, Virginia, and North Carolina. Additional collecting will probably demonstrate its presence in some of the other southeastern states.

I have reared it from two nests from Plummers Island that were constructed in borings of 3.2 mm diameter in wooden blocks. These traps were attached to the side of a standing, dead, barked tree trunk in rather dense shade, the same tree on which the type of *Dipogon fulleri* was taken. The biology of *clarkei* will be discussed in a separate contribution treating the species reared from wooden trap nests.

Type ♂: Dunn Loring, Va.; 21 August 1949, K. V. Krombein; visiting honeydew secretions on tulip tree. U. S. National Museum, Type No. 65888, by transfer from author's collection.[10]

Male: Length 6.5 mm, forewing 4.8 mm. Black, the head dull, thorax and abdomen shining; the following light reddish—apex of mandible, apical margin of clypeus, fore and mid legs except tarsi, hind trochanter, hind femur except for some infuscation above, and hind tibia beneath; the following testaceous—palpi, scape and pedicel beneath, tegula, fore and mid tarsi, and hind tarsus entirely beneath and at apices of segments on upper side. Wings clear, stigma and veins brown. Vestiture silvery, short, appressed.

Clypeus with dense vestiture, the apical margin strongly and narrowly rounded out in middle and with a very weak blunt tooth on each side of the produced portion; front convex, strongly shagreened and with moderately large punctures separated from each other by about the diameter of a puncture; frontal keel extending one-third the distance from antennal foramina to anterior ocellus; front with a shallow median furrow from upper end of keel to anterior ocellus; ocellocular line about as long as diameter of a posterior ocellus, and half as long as postocellar line; flagellum moderately clubbed, the fourth segment excavated beneath almost to apex, the eighth excavated beneath on basal third, the terminal segment as long as the preceding three segments combined.

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9 For J. F. Gates Clarke (member 1955 to date), lepidopterist.

10 I am not selecting the type from Plummers Island because the single male from that locality is in poor condition.

Scutum shining, the punctures small, shallow, and separated from each other by about the diameter of a puncture; dorsal surface of propodeum with a shallow median furrow, on each side of which are some weak oblique rugulae which do not extend to the marginal carina; posterior surface with a deeper median furrow on upper two-thirds; carina separating lateral from dorsal and posterior surfaces very weak, evanescent over most of posterior slope.

First abdominal segment stout, its apical width about half its length, with a weak shallow groove on basal third; eighth sternum and genitalia as figured by Sandhouse (1940, Amer. Midland Nat. 24: 172, 174, figs. 21, 48, 49, 50).

Allotype ♀: Plummers Island, Md.; 27 July 1961, K. V. Krombein; reared from nest K#146. U.S.N.M.

Female: Length 6.2 mm, forewing 4.5 mm. Similar to male in coloration but second and third abdominal segments light reddish except for a black blotch on posterior two-thirds of terga in middle.

Head similar to male except antennae not modified, clypeal lobe somewhat more strongly produced; and ocellocular line only half as long as diameter of posterior ocellus, though it is still half as long as the postocellar line.

Scutum shining, but the small punctures denser than in male; propodeum as described for male.

Paratypes: 1♂, Plummers Island, Md., 24 July 1961, K. V. Krombein, reared from nest K#145; 1♂, "Va.," 24 August 1883 (illustrated by Sandhouse as *johnsoni*); 1♀, N. C.; 1♂, Washington, D. C. (labeled as U.S.N.M. Type No. 1873, *ornatipes*); 1♂, Hummelstown, Pa., J. N. Knull; 1♀, Marsh Run, York Co., Pa., 18 July 1909, P. R. Myers; 1♀, Delaware Water Gap, N.J., 12 July; 1♂, 1♀, Poughkeepsie, N. Y., 15 July 1936, H. K. Townes; 1♀, Six Mile Creek, Ithaca, N. Y., 17 July 1947, J. G. Franclemont; 1♂, 3♀♀, same locality as preceding but 20 and 21 July, and August 1939, P. P. Babiy. Paratypes are in the U. S. National Museum, Academy of Natural Sciences, Philadelphia, and the author's personal collection.

Male paratypes range from 6 to 7 mm in length. They exhibit very little variation in coloration, but in several the rugae are entirely lacking on the dorsal surface of the propodeum, one specimen lacks the small blunt tooth on each side of the clypeal lobe, and in several this tooth is better developed than in the type.

Female paratypes are 7 to 8 mm long. They agree well with the allotype in details of the sculpture, but in three specimens the black areas on second and third terga are somewhat less extensive.

The following key will separate the two closely allied species of Group Fabricator, and should be substituted for couplet 2 of Sandhouse's key.

Carina separating dorsal and lateral surfaces of propodeum strong, the dorsal surface usually with rather strong rugulae many of which extend to the lateral carina though they may be interrupted; scutum usually duller and with somewhat larger punctures; postocellar line about three times as long as ocellocular line. ♂♂: Paramere of genitalia narrower; clypeus with median lobe usually weakly produced and without a tooth on either side; last flagellar segment as long as preceding five joints combined. ♀♀: Clypeus with median lobe usually weakly produced, but always with apex slightly emarginate; light red areas on abdomen quite reduced. .... *johnsoni* Fox

Carina separating dorsal and lateral surfaces of propodeum weaker, the dorsal surface without rugulae or with very weak ones which do not extend to the lateral carina; scutum usually more shining and with smaller punctures; postocellar line not more than twice the ocellocular line. ♂♂: Paramere of genitalia broad; clypeus with median lobe usually more produced and strongly rounded, and with a weak rounded tooth on each side of median lobe; last flagellar segment as long as preceding three joints combined. ♀♀: Clypeus with median lobe strongly produced and rounded out; light-red markings on abdomen more extensive .... *clarkei*, n. sp.

Trypoxylon (*Trypoxylon*) *johnsoni* Fox

Trypoxylon Johnsoni Fox, 1891. Trans. Amer. Ent. Soc. 18: 147. ♀. (Type from Florida, in Academy of Natural Sciences).

Trypoxylon ornatipes Fox, 1891. Trans. Amer. Ent. Soc. 18: 148. ♂. (Type from District of Columbia in Academy of Natural Sciences; cotype (?) from D. C. in U. S. National Museum.)

Trypoxylon (*Trypoxylon*) *adelphiae* Sandhouse, 1940. Amer. Midland Nat. 24: 151. ♂, ♀. (Type from Tennessee in U. S. National Museum; allotype from Virginia in Museum of Comparative Zoology.) New Synonymy.

The synonymy proposed above is based on a recent critical study of the type series of these three species which are on deposit in the U. S. National Museum, Academy of Natural Sciences of Philadelphia, and Museum of Comparative Zoology. The three holotypes agree with the characters ascribed to *johnsoni* Fox in the key above except that it was not possible to dissect the genitalia from the type of *ornatipes*. However, the type of *ornatipes* agrees with the external characters listed for males of *johnsoni*, and I have no hesitancy in confirming its synonymy under *johnsoni* as proposed in Sandhouse's revision.

I think that the confusion which led to Sandhouse's description of *adelphiae* as a new species was caused in part by the mixed type series of *ornatipes*. The true type, a male, is in Philadelphia; it is the opposite sex of *johnsoni*. However, there is another male from D. C. in the National Museum which bears a red Museum type label. Fox does not state how many specimens he had in his series so this specimen may not even belong to the type series. However, it is a specimen of what I described above as *clarkei*. Sandhouse extracted the genitalia from the male from "Va.," listed above as a paratype of *clarkei*, and based her interpretation of *johnsoni* genitalia on that specimen. Hence, when she got a male of a closely related species from Tennessee with obviously different genitalia, she described it as a new species rather than recognizing it as true *johnsoni.* The allotype female of *adelphiae* from Virginia is also a specimen of *johnsoni.*

Spilomena barberi,[11] new species

S. barberi may be distinguished at once from the other species of *Spilomena* in the United States by the rather dense, appressed, short silvery vestiture on the front, scutum, and apices of the third to sixth terga which gives the species a somewhat griseous appearance. In addition, the combination of the following characters will serve to separate it from its eastern congeners, *pusilla* (Say), *alboclypeata* Bradley, and *ampliceps* Krombein: marginal cell of forewing with scattered minute setae; pronotum without a carina extending laterally onto the lobe; propodeal dorsum with a broad U-shaped area delimited by a strong carina; female with greatest width of temple a little less than that of eye; male with face immaculate above clypeus and the lower lateral spots; male flagellum with suberect short setae; and third and fourth sterna of male with dense, appressed, short setae.

Type ♂: Arlington, Va.; 22 May 1954, K. V. Krombein; on wooden wall of old cowshed at my home. U. S. National Museum, Type No. 65889, by transfer from author's personal collection.[12]

Male: Length 2.8 mm, forewing 2.0 mm. Black, without metallic reflections, the following creamy—mandible except apical teeth, clypeus, malar space, postmandibular triangle, and subrectangular spot along lower inner eye margin extending about one-third of distance to top of eye, and antennal scape; the following testaceous—mandibular teeth, pedicel, tegula, and legs except hind coxa and femur. Pubescence generally much denser than in other species, short, appressed and pale, rather dense on front, vertex, scutum, mesopleuron, across apical third of third to sixth terga, and on third to sixth sterna. Wings clear hyaline with iridescent reflections; stigma brown, veins testaceous.

Head subshining from delicate lineolation and the appressed vestiture; in frontal view subcircular; viewed from above the head behind the eyes a little shorter than dorsal eye length; viewed from the side the cheek not angulate at middle, about as wide as eye width; scape half as long as clypeal width at anterior mandibular condyles; postocellar distance 0.6 times the ocellocular distance and subequal to the ocelloccipital distance; front with a very weak median carina on lower half.

Thorax rather dull from appressed vestiture and moderately strong lineolation on scutum; pronotum dorsally with a complete carina which does not extend laterally onto lobe; notauli evanescent; mesopleuron delicately lineolate, the episternal suture very weakly foveolate; meta-

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[11] For Herbert S. Barber (member 1901–1950), peerless naturalist and coleopterist, who collected many specimens on which my Plummers Island wasp list will be based.

[12] The type is not selected from Plummers Island because of the short series and absence of males from that locality.

pleuron smooth; propodeum dull from strong lineolation, the lateral surface with a few oblique rugulae and a carina separating it from posterior surface; posterior surface with a strong median carina and some weak transverse rugulae; dorsal surface with a broad U-shaped area delimited by a sharp carina, the enclosed area with two strong longitudinal and several transverse carinae.

Second submarginal cell rectangular, 0.6 as high as wide; first recurrent vein received a little basad of first transverse cubital.

Abdomen without modification except for that noted under vestiture.

Allotype: ♀, with identical label data, U.S.N.M.

Female: Length 2.8 mm, forewing 2.0 mm. Black, without metallic reflections, the following testaceous—mandible, scape, pedicel, antenna beneath except at apex, tegula, and legs except hind coxa and femur. Vestiture similar to that of male except sterna with short appressed hair on apical third only. Wings as in male.

Head rather dull from fine lineolation, subcircular in frontal view, similar to male in sculpture and vestiture; proportions of head similar to male; clypeus with a narrow trigonal platform in middle, the apex slightly emarginate; upper part of clypeus with a weak median carina which continues upward on front, becoming evanescent about one-third the distance to anterior ocellus.

Thorax similar to male except mesopleuron shinier because of weaker lineolation and more scattered setae.

Venation as in male except first recurrent is slightly distad of first transverse cubital vein.

Legs and abdomen not modified except as described under vestiture.

Paratypes: 26♂♂, 70♀♀, same locality as type, with the following dates: 1951—June 9 (1♀), 12 (1♀), 16 (1♀), September 3 (2♀♀), 9 (2♀♀), 10 (1♀), 15 (1♀), 22 (4♀♀), 23 (1♀); 1952—May 14 (1♂, 1♀), June 6 (1♀), 9 (1♂, 1♀), 15 (1♂), 24 (1♀), July 4 (1♀), 5 (2♀♀), 6 (2♀♀), 12 (1♀), August 12 (1♀), 13 (1♀), 23 (1♀), September 6 (1♀); 1953—May 30 (1♂), June 3 (1♂), 4 (1♀), 8 (1♀), 9 (1♀), 18 (1♂), July 25 (2♀♀), 28 (5♀♀), August 8 (1♀), 12 (2♀♀), 22 (2♀♀), 30 (2♀♀), September 5 (1♀), 7 (1♀), 12 (2♀♀), 19 (1♂, 2♀♀), 26 (1♀), October 3 (1♀); 1954—May 1 (1♂), 2 (1♂), 22 (3♂♂), 23 (4♂♂), 26 (1♀), 28 (1♂, 1♀), 29 (1♀), 31 (2♂♂), June 5 (3♀♀), 6 (3♂♂, 1♀), 12 (1♀), 14 (1♂); 1955—May 21 (1♂), 22 (1♂, 1♀), June 12 (1♂, 1♀); 1956—June 9 (1♀); 1957—May 26 (2♀♀), August 24 (1♀), September 1 (1♀), 15 (1♀), 21 (1♀). 1♀, Glencarlyn, Arlington Co., Va., 4 September 1954, K. V. Krombein; visiting extrafloral nectaries of *Cassia nictitans.* 1♀, McLean, Va., 7 August 1954, K. V. Krombein. 1♀, 1♂, Falls Church, Va., 26 July 1917, S. A. Rohwer; Hopkins No. 1077a; visiting aphids, presumably for nectar. 1♀, Blacksburg, Va., W. J. Schoene; *ex Xyletinus peltatus.* 3♀♀, Plummers Island, Md., 31 July 1958, 28 May 1959, and 13 June 1961, K. V. Krombein; on beams in cabin roof. 3♀♀, 2♂♂, Washington, D. C. 29 May 1908, 1♂, J. C. Crawford; no other data: 1♀, 1♂, Ashmead coll.; 26 May 1914, 1♀, P. R. Myers; 8 September 1952, 1♀, R. Boettcher. 1♂, Wake Co., N. C., 19 May 1940, R. Barnes. 1♂, Raleigh, N. C., 20 September 1947, M. W. Wing; at light. 1♀, Athens, Ga., 15 June 1909, J. C. Bradley. 2♂♂, Cloudland Canyon State Park, Ga., 8 May 1952, O. Peck. 1♀, Gatlinburg, Tenn., 15 July 1947, R. H. Whittaker; swept in pine-oak forest, 1,500 ft elev. 1♀, Harriman, Tenn., 2 August 1933, H. G. Butler. 1♂, Presque Isle State Park, Pa., 28 June 1961, F. E. Kurczewski. 1♀, 1♂, N. J., Ashmead coll.; on same pin mount. 1♀, Moorestown, N. J., 6 August 1939, H. and M. Townes. 1♀, Millwood, N. Y., 20 June 1936, J. G. Franclemont. 4♀♀, Ithaca, N. Y., 23 June 1929, P. P. Babiy; 16 June 1935, Babiy; 7 August 1936, Babiy; 20 June 1953, A. Stone. 1♀, Medford, Mass., 11 July 1927, W. A. Baker. 2♀♀, 1♂, Ottawa, Can. 1♀, Toronto, Can., 17-7-7. 1♀, 1♂, Port Dalhousie, Can., 10 July 1939 (♂), 15 August 1940 (♀). 2♀♀, Sioux City, Iowa, May 1936, C. N. Ainslie. 1♀, Lawrence, Kans., 23 May 1941, H. K. Townes. 1♂, Fort Collins, Colo., 15 June 1896, C. F. Baker. 1♀, Santa Fe, N. Mex., August 1915, Cockerell. 1♀, Mesilla, N. Mex., 28 June 1897, A. P. Morse. 1♀, Rio Grande, Taos Co., N. Mex., 6 July 1953, W. W. Wirth. 1♂, Tucson, Ariz., 10 June 1897, R. E. Kunze. 1♀, Zion Canyon, Utah, 23 June 1950. 1♀, Riverside, Calif., 30 October 1925, P. H. Timberlake; on *Euphorbia albomarginata*. Paratypes are in the collections of the U. S. National Museum, Cornell University, Canadian National Collection, H. K. Townes, P. H. Timberlake, and the author.

Male paratypes range from 2.3 to 2.8 mm in length. They agree in all important details with the type except that eight have the upper third of the clypeus between the antennae dark, and several have the front and mesopleuron shinier because of weaker lineolations on those parts.

Female paratypes range from 2.5 to 2.8 mm in length. Most of them are very similar to the allotype, but some have the femora and tibiae somewhat infuscated, and in some the lineolations are weaker so that the head and thorax have a shinier appearance.

Twelve additional females and two males of S. *barberi* have been excluded from the type series because of poor condition. These are from Arlington, Va., Gatlinburg, Tenn., Utica, Miss., Wilawana, Pa., Ithaca, N. Y., Ottawa, Can., and Tucson, Ariz. Also, I have seen two females labeled Concepcion, Guatemala, 1,400 ft elev. (C. N. Ainslie) that appear to be *barberi*. I have not included them in the type series because of the possibility of an erroneous locality label.

Eleven females (71252A, 72553D, 72853H, 72853I, 91953B, 52854A, 6554A, 6554B, 6654A, 52657A, and 91557A) captured in Arlington were taken with prey. Each was caught near her burrow entrance in boards in the cowshed wall. Each was carrying a paralyzed, immature, pale-green thrips in her mandibles. The thrips ranged from 0.6 to 1.0 mm in length.

These females were bringing in prey as early as 0953 and as late as 1815 hours, and from May through September. Three of the thrips were identified as a first-instar nymph belonging to the Thripidae, a second-instar thripid nymph, either *Frankliniella* or *Thrips*, and a nymph of *Sericothrips* (all det. by K. O'Neill).

Spilomena barberi nests in old anobiid borings made by *Xyletinus peltatus* at my home in Arlington. These borings are about 2 mm in diameter. The wasp does not build a turret of beetle frass at the burrow entrance as does S. *pusilla* (Say).

Gorytes (Gorytes) mcateei[13] Krombein and Bohart, new species

This species is known from the female only. It is similar to most of our Eastern *Gorytes* in color pattern, and is perhaps closest to *deceptor* Krombein with which it agrees in the quite weakly sculptured propodeum and non-foveolate metapleural-propodeal suture. It may be readily distinguished from *deceptor* by the much narrower pygidium (30° at apex compared to 45°), the lack of scattered larger punctures on front, the lack of paired yellow spots on the propodeum, and the reduction of the yellow stripe at apex of fifth tergum to the middle half or two-thirds instead of being complete as in *deceptor*.

Type ♀: Plummers Island, Md.; 6 June 1959, K. V. Krombein. U. S. National Museum, Type No. 65890.

Female: Length 9 mm; forewing 7 mm. Black and shining, the following lemon yellow—palpi, labrum, clypeus except narrow apical margin, supraclypeal area, narrow stripe along inner eye margin extending from base of clypeus two-thirds of distance to anterior ocellus, antenna beneath, narrow transverse stripe on dorsum of pronotum, band on posterior two-thirds of scutellum, small spot on mesopleuron adjacent to tubercle, apical bands on first to fifth terga, that on first narrowly emarginate anteriorly in middle, that of second broadly and shallowly emarginate anteriorly, those of third and fourth narrower and narrowed laterally on anterior margin, that of fifth reduced to a transverse spot half as wide as segment, attenuate spot posterolaterally on second and third sterna, femora narrowly at apices, fore and mid tibiae except for some infuscation beneath, hind tibia beneath and on basal half of outer surface, and fore and mid tarsi. Wings clear except marginal cell moderately infuscated, and upper part of basal vein and second submarginal cell each with a vague infuscated area; stigma and veins brown.

Front with close minute punctures; least interocular distance 1.1 times the eye breadth; supraclypeal area about as broad as high; antennal insertion less than its diameter from inner eye margin; flagellum moderately clubbed toward apex; vertex and thorax except propodeum with

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13 For W. L. McAtee (member 1905 to date), specialist in Hemiptera who collected some wasps on the Island.

We are publishing this description in advance of a generic revision so that the name will be available for use in the senior author's annotated list of Plummers Island wasps.

minute well-separated punctures; metapleural-propodeal suture well-developed for its whole length, but not foveolate on any sector; propodeal enclosure delimited by foveolate grooves, with narrow central furrow on either side of which are about eight weak rugae that extend almost to apex; posterior surface of propodeum and area above hind coxa with some short vertical rugae extending about halfway to upper horizontal surface; pygidium triangular, very narrow, its apical angle about 30°, the basal width about half the length, the surface shining and with scattered small punctures.

Male: Unknown.

Paratypes: 1♀, topotypic, 3 June 1960, K. V. Krombein; 1♀, Washington, D. C., 17 June 1944, M. Vogel; 1♀, Dunn Loring, Va., 26 June 1949, K. V. Krombein; 1♀, Great Falls, Va., 23 June, N. Banks; 2♀♀, Chain Bridge, Va., 23 June, N. Banks; 2♀♀, Glencarlyn, Va., 2 July, N. Banks; 1♀, Castle Rock, Pa., 19 June 1910, G. M. Greene; 1♀, Poughkeepsie, N. Y., 18 July 1936, H. K. Townes. Paratypes are in the collections of the U. S. National Museum, University of California at Davis, Museum of Comparative Zoology, and the senior author. Paratypes vary in length from 9 to 11 mm. They are quite similar in coloration and sculpture except that in the single topotypic specimen the rugae of the propodeal enclosure extend only about half the distance to the apex.

Crossocerus (Crossocerus) spangleri,[14] new species

The male of this rare species is distinguished from any of our American species by the distorted fore basitarsus and the modified fore femur. The female is very similar in appearance to *C. lentus* (Fox) but is slightly larger, and has a better developed median tooth on the apical margin of the clypeus.

The dates of capture of the two males, 30 May and 18 July, suggest that the species is multivoltine. It is presumed to nest in the ground, as do most other members of the typical subgenus, because several females were captured on the ground. Three females were collected on coarse alluvial sand several feet above the mean summer level of the river and others were taken on soil near the cabin.

Type ♂: 18 July 1956, K. V. Krombein; collected in a boring of 3.2 mm diameter in a wooden block placed under firewood near outdoor fireplace. U. S. National Museum, Type No. 65891.

Male: Length 4.8 mm, forewing 3.5 mm. Black, the following yellow—palpi, mandible except apex which is reddish, apical half of clypeus, small area around base of mandible, scape beneath, pronotal tubercle, anterior face of mesopleuron and extreme base of lateral surface, fore and mid legs, hind coxa beneath, hind trochanter, hind tibia outwardly, hind tibia spurs and hind tarsus except apical segment. Wings clear, stigma dark brown, veins testaceous.

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[14] For Paul J. Spangler (member 1960 to date), coleopterist, who collected part of the type series, and who captured the only specimen of *Nysson opulentus* Gerst. recorded so far from the Island.

Clypeus with dense, short decumbent silvery vestiture, the apical margin very weakly tridentate; first five flagellar segments with a fringe of short erect setae beneath, the apical segment cylindrical in cross section, not curved or flattened; top of head shining with moderately scattered, fine punctures; supraorbital fovea not developed.

Thorax with short, decumbent silvery vestiture which is denser on sternum; pronotum with a weak, short, transverse carina at anterior angle, the posterior margin strongly impressed; scutum and scutellum slightly subopaque with fine punctures separated by several times the diameter of a puncture; mesopleuron glossy and punctured like scutum, without a tubercle before mid coxa; propodeum glossy, the enclosure margined by foveolae and bisected by a narrow, cuneate, foveolate channel; lateral and posterior surfaces finely, horizontally striate, separated by a strong vertical carina, posterior surface with a median furrow.

Fore femur somewhat expanded, slightly flattened beneath, with a strong acute tooth beneath along posterior margin, the tooth with a strong seta at tip; fore basitarsus as long as remainder of tarsus, anterior margin strongly rounded outward, somewhat concave and with a brush of dense short setae beneath, viewed from in front concave above; legs otherwise unmodified.

Allotype ♀: topotypic; 11 June 1957, K. V. Krombein. U.S.N.M.

Female: Length 4.8 mm, forewing 3.5 mm. Black, the following light yellow: Palpi, scape beneath, short line on pronotal dorsum not connected with spot on tubercle, transverse mark anteriorly on scutellum, fore and mid tibiae except latter beneath, hind tibia on basal third and a narrow stripe on outer surface reaching almost to apex; all tarsi except apical segment. Mandible light red except black at base and apex. Wings as in male.

Clypeus with apical margin strongly tridentate, the teeth rounded; punctation as in male though comparatively denser and larger. Thorax also sculptured similarly to that of male, but punctures comparatively larger and denser, striae of propodeum stronger, and pronotum not carinate at anterior angle.

Paratypes: All topotypic; 1♂, 30 May 1959, K. V. Krombein; 2♀♀, 21 June 1960, P. J. Spangler (on sand); 1♀, 25 June 1960, K. V. Krombein (on sand). The male paratype is similar to the type in all details but the yellow is slightly cyanided. The female paratypes agree in sculptural details with the allotype, but one has reduced yellow maculations as follows—pronotum black including tubercle except for a pair of tiny spots on dorsal surface, scutellum black, yellow on mid and posterior tibiae somewhat reduced, and tarsi infuscated.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

NATURAL HISTORY OF PLUMMERS ISLAND, MARYLAND[1]

XIV. Biological Notes and Description of the Larva and Pupa of *Copelatus glyphicus* (Say) (Coleoptera: Dytiscidae)

By Paul J. Spangler

Entomology Research Division, Agricultural Research Service, U. S. Department of Agriculture, Washington, D. C.

The genus *Copelatus* is primarily tropical or subtropical in distribution but in the Western Hemisphere a few species occur throughout much of the temperate region of the United States. One of these is *Copelatus glyphicus* (Say), commonly found in the Eastern United States. Adults of this species are collected frequently; however, the immature stages have not been described. The larva and pupa of this common species are described in this paper.

On 7 June 1961, numerous larvae and adults of *C. glyphicus* were collected from a water-filled pothole in an outcropping of rock on Plummers Island, Md. The pothole was exposed to direct sunlight most of the day and the water temperature reached 82° F at noon. The water was darkly colored from decomposing vegetation. Larvae dipped from the water temporarily feigned death but soon hastily burrowed into the debris in the net.

By rearing last instars to the adult stage, the immature stages were identified as those of *C. glyphicus*. The larva and pupa closely resemble those of *Copelatus parvulus* (Boisduval), a Hawaiian species, whose immature stages were described by Williams (1936).

By dissecting the gut of larvae and adults of *parvulus*,

[1] For the list of numbers I–XII of this series see Krombein, 1959, Proc. Biol. Soc. Washington 72: 101–102. For number XIII see the preceding paper by Krombein in this issue. Publication costs of this number have been defrayed by the Washington Biologists' Field Club to promote its primary objective of research on the flora and fauna of Plummers Island and adjacent areas.

Williams (1936) found that they fed on copepods and ostracods and that they possessed a trilobed proventriculus. My dissections of four *glyphicus* larvae showed that this species also has a trilobed proventriculus and eats copepods, ostracods, ceratopogonid larvae, and the collembolan *Podura aquatica* L.

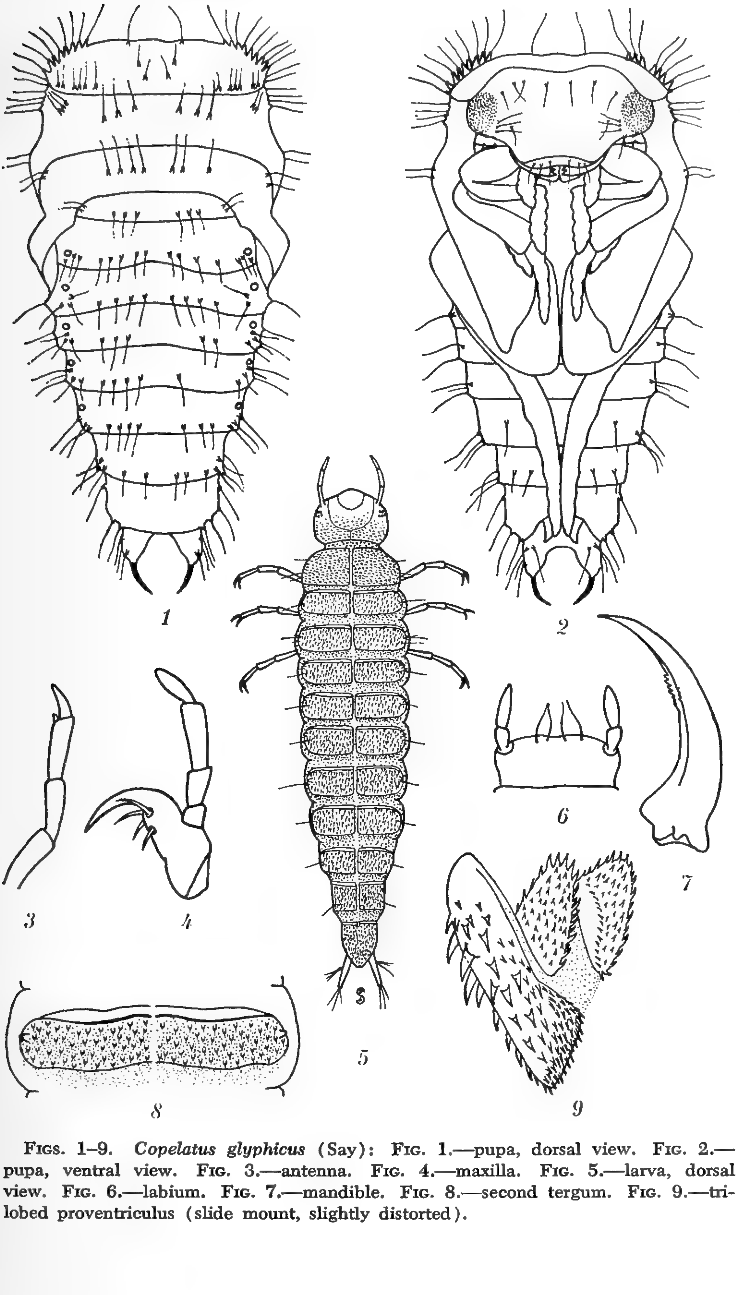
On 13 June, I examined the soil around the roots of moss growing alongside the pothole previously mentioned and found a pupa lying in the damp soil. A small depression in the soil indicated that a pupal chamber was present but this depression was disturbed when I separated the moss from the soil. When found, the pupa was entirely white; but when examined 7 hours later, the eyespots had become pink, which suggested that pupation had occurred earlier on the same day the pupa was collected. The pupa was kept for rearing and it eclosed 6 days after it was collected. Six larvae brought back to the laboratory pupated in the soil surrounding the roots of moss. The first pupa was preserved and used for descriptive purposes. Three of the five remaining pupae were preserved for the U. S. National Museum collection and the other two were allowed to eclose. Eclosion occurred on the fifth and sixth day, respectively, after pupation.

On 6 September, I again found *glyphicus* larvae in a pothole. At that time 12 larvae in different stages were collected and they have been deposited in the U. S. National Museum collection. Apparently this species breeds throughout most of the summer. Adults have been collected on the island as early as 4 March and as late as 11 October.

Description of Last Instar
(Figs. 3–9)

Length 7.5 mm; greatest width of pronotum 1.1 mm. Color of integument gray; terga grayish brown with yellowish brown maculae on mesonotum and metanotum; a median longitudinal stripe also is yellowish brown. Terga and integument behind terga asperate. Body subdepressed and elongate.

Head subquadrate. Labro-clypeus evenly arcuate, with a row of seta-bearing punctures along anterior margin; labro-clypeal suture present, distinct. Ecdysial cleavage line distinct at base of head, abruptly forked at basal third of head and frontal arms of cleavage line then diverge weakly and extend to anterior edge of labro-clypeus at base of mandibles. Ventral surface of head with a few long setae; posterior tentorial pits present. Ocular area with six ocelli arranged in an ellipse; anterior three



FIGS. 1–9. *Copelatus glyphicus* (Say): FIG. 1.—pupa, dorsal view. FIG. 2.—pupa, ventral view. FIG. 3.—antenna. FIG. 4.—maxilla. FIG. 5.—larva, dorsal view. FIG. 6.—labium. FIG. 7.—mandible. FIG. 8.—second tergum. FIG. 9.—trilobed proventriculus (slide mount, slightly distorted).

ocelli compact, adjacent; posterior three separated so that ventral ocellus is widely separated from remaining two dorsal ocelli. Antenna four-segmented, moderately long, cylindrical; first and penultimate segments equal; second shorter; ultimate segment shortest, about half length of penultimate. Both mandibles long, moderately stout, falciform; upper, inner edge distinctly serrate (7 teeth) in middle portion, lower inner edge with minute serrate area (4 teeth) (not present in all larvae examined). Maxillary stipe broad; galea very long; lacinia with four spine-like processes, two on dorsal side and two on ventral side at base of lacinia; palpus four-segmented, basal segment shortest, second segment slightly longer than basal, ultimate and penultimate segments longest and subequal. Labium without ligula; labial palpus two-segmented, second segment longer.

Pronotum with sides arcuate, widest posteriorly, lateral margins with a few (8–10) long setae. Mesonotum wider than pronotum but only slightly more than half as long as pronotum; with interspersed setae arising from spinous bases; with a pair of spiracles anterior to mesocoxae in pleural region. Metanotum slightly wider than mesonotum and subequal in length, setation similar to mesonotum.

Legs five-segmented; coxa long; trochanter about a third as long as coxa; femur longer than tibia; tarsus with two elongate, slender claws. No natatory hairs present on legs.

Abdomen with eight distinct segments. Each segment with setation similar to metanotum and with a well-developed antecostal suture which is briefly interrupted medially. Segments 1 to 7 each with a pair of spiracles, one on each side of segment; segment 8 with a pair of terminal spiracular openings above cerci. Segments 7 and 8 narrow rather abruptly and are sclerotized ventrally but less than dorsally. A pair of unsegmented cerci arise from ventral side of eighth segment. Each cercus with three setae arising at midlength and three from apex.

Description of Pupa
(Figs. 1–2)

Length 4.5 mm, greatest width 2.0 mm; color white except eyes reddish brown; glabrous except for styli described below.

Head with 22 styli arranged as follows: 4 styli between eye and vertex (only 3 on left side), 5 at lower anterior corner of eye (only 4 on right side), and 6 on clypeus.

Pronotum with 39 styli arranged as follows: 9 on right anterolateral angle, 8 on left anterolateral angle, 1 on each side of median line on anterior margin, 6 on each posterolateral angle, 2 on each lateral margin, and 2 on each side of median line on disc.

On the dorsum of several of the remaining segments, some groups of styli are unequal in number on opposite halves of the pupa; therefore, a numerical formula is used that gives the number of styli in each group from the left side of the segment to the right. First and last numbers thus refer to lateral groups and the middle numbers refer to groups on each side of the median line. When only two numbers are given, these refer to lateral groups. The arrangement of styli is as follows: Mesonotum, 3-3-3-2; metanotum, 2-4-3-2; first abdominal, 2-3-3-2; second abdominal, 3-5-4-3; third abdominal, 3-4-4-2; fourth abdominal, 3-3-2-3; fifth abdominal, 3-4-1-3; sixth abdominal, 3-4-3-3; seventh abdominal, 3-2-3-3; eighth abdominal, 2-4.

Segment 9 terminates in two cerci longer than length of eighth segment; each cercus with two dorsal and two ventral styli.

Abdominal segments, 2, 3, and 4 ventrally each with two styli, one on each side of segment; segments 5 and 6 each with four styli, one lateral and one each side of median line.

First to sixth and apparently seventh abdominal segments with a pair of spiracles.

Antennae and legs extend outward at right angles from body axis. Tibiae of first two pairs of legs folded against femora; tarsi turned backward parallel with body axis. Femur and tibia of each hind leg not folded against each other; femora directed obliquely away from midline; tibiae directed obliquely toward midline; tarsi almost parallel with body axis.

Variation: The four pupae showed a surprising amount of variation in the number of styli on the different parts of their bodies. When the numbers of styli were averaged, the normal complement appeared to be as follows: Head with 4 styli between eye and vertex, 5 below lower corner of eye, and 6 on clypeus (total on head 24); pronotum with 10 styli on each anterolateral angle of pronotum, 2 on anterior edge, 4 on disc, 2 on each lateral margin, and 6 on each posterolateral angle (total on pronotum 42); mesonotum, 3-3-3-3; metanotum, 2-4-4-2; dorsum of first abdominal segment, 2-3-3-2; second abdominal, 3-4-4-3; third abdominal, 3-4-4-3; fourth abdominal, 3-4-4-3; fifth abdominal, 3-4-4-3; sixth abdominal, 3-4-4-3; seventh abdominal, 3-3-3-3; eighth abdominal, 4-4.

Four pupae and 22 larvae have been deposited in the United States National Museum collections.

Reference

Williams, Francis X. 1936. Biological studies in Hawaiian water-loving insects, Part I, Coleoptera or beetles. Proc. Hawaiian Ent. Soc. 9(2): 235–273.

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PROCEEDINGS
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BOERLAGIODENDRON (ARALIACEAE) IN EASTERN MELANESIA[1]

By Benjamin C. Stone[2]
U. S. National Museum, Smithsonian Institution

The genus *Boerlagiodendron* Harms was actually first established by Zippel (ex Boerlage in Ann. Jard. Bot. Buitenz. 6: 112. 1887), but the name then given, *Eschweileria,* had to be replaced because of the earlier *Eschweilera* Martius (ex DC. Prodr. 3: 293. 1828) of the Lecythidaceae. The first extensive treatment of species was that of Beccari (in Malesia 1: 195–198. 1898), who described six species and discussed the peculiar floral dimorphism and its biological significance. He placed these species, however, in the genus *Osmoxylon* Blume, which is now regarded as amply distinct from *Boerlagiodendron.* Since 1900 a rather considerable number of species have been described. At present there are about fifty-five species known, including two proposed as new in the present paper. Of these, 22 are Philippine endemics; 13 are from New Guinea; and the remainder of the species are from Java, Borneo, Celebes, Formosa, Micronesia, and Melanesia.

The present treatment summarizes the known species from the Solomon Islands and the New Hebrides, here called Eastern Melanesia (though the term could well include Fiji). There are no records of the genus in Fiji, and it would appear probable that it will not be found. It is unknown in New Caledonia, which also has been rather extensively (but scarcely completely) explored, and does not occur anywhere in Polynesia. Thus the New Hebrides represent the easternmost extension of the genus, and but one species is presently known from the group. Two species had previously been recorded from the Solomon Islands; two more here described

[1] This report is the third in a series of studies of plants of the Solomon Islands and phytogeographically related areas. The first appeared in Bot. Not. 112: 372–376, 1959 (I. E. Lane, co-author); the second in Brittonia 13: 212–224, 1961.

[2] Present address: College of Guam, Agana, Guam.

as new have been discovered. The flora of the Solomon Islands is a rich one, and that of the New Hebrides, although attenuated in comparison, is still relatively dense in number of genera and species. Both island groups are, from a botanical standpoint, virtually *terrae incognitae,* and it is to be expected that there are several, perhaps many, as yet undiscovered species.

The systematic understanding of the genus in Melanesia rests primarily on the synopsis by Harms (in Bot. Jahrb. 56: 377. 1921), who describes several species from New Guinea. He lists also the species known from the Bismarck Archipelago, i.e., New Britain and New Ireland. This large (and botanically very imperfectly known) island group lies between New Guinea and the Solomon Islands. It appears to share botanical relations with areas both to the east and west, but at present seems to have more in common with continental New Guinea than with the Solomons (except perhaps for Bougainville). At any rate, the present limitation to the Solomons and New Hebrides appears as a reasonably natural one. From this region five species are now recorded.

Unfortunately I am unable to add to our understanding of the floral adaptations in the genus, except to state that the theories and observations of Beccari appear just as pertinent in relation to the Solomons species. The tripartite umbels, a characteristic of the genus, bear, on the central radiolus, flowers which enlarge and appear to be fruits. Often they lack stamens, and sometimes lack a corolla also. These "bacciform" or pseudofeminine flowers are sought by fruit-pigeons, which act unwittingly as pollinators by shaking the hermaphrodite flowers of the two lateral radioli, which attain anthesis at the time that the pseudofeminine flowers attain their fruit-like appearance. It is believed that the pigeons transport pollen from one plant to another in this manner; it seems just as possible, however, that there is a certain amount of self-pollination.

Boerlagiodendron Harms

Boerlagiodendron Harms in Pflanzenfam. 3, 8: 31. 1894.
Eschweileria Zipp. ex Boerl. in Ann. Jard. Bot. Buitenz. 6: 112. 1887; not *Eschweilera* Mart. ex D. C.

Unjala Reinw. ex Boerl. ibid. 116.
Osmoxylon Bl. sensu Becc. et auctt. pro parte.
Boerlagiodendron Burck fide Index Kew. Suppl. I. 162. 1901–6.

Key to the East Melanesian Species

Leaves palmately divided (the divisions petiolulate, the petiolules narrowly alate); leaf divisions pinnatifid with entire margins; stems and leaves glabrous; stamens 5–11, usually 9–11. Malaita, Solomon Islands. .... *B. puniceopolleniferum*

Leaves palmately lobed (sometimes subentire in juvenile stage); leaf divisions entire to lobulate and/or serrate; stems and leaves glabrous or puberulent and bristly-scaly; stamens 4–6 or (?) up to 14.

- Leaf divisions entire or nearly so, glabrous; stamens 4; ovary multilocular (but many cells abortive); San Cristoval Island, Solomon Islands. .... *B. tetrandrum*
- Leaf divisions lobulate to grossly serrate; leaves etc. glabrous to puberulent and bristly-scaly; stamens 4, 5, or 6 (or up to 14?); ovary 5–14 locular.
  - Leaves trilobate, glabrous; ovary 5-locular; stamens 4. Espiritu Santo, New Hebrides. .... *B. orientale*
  - Leaves 5–7-lobed, glabrous to puberulent; ovary 5–14-locular; stamens 5 or 6 (or more?).
    - Ovary 5–10-locular; stamens 5 or 6; petiolar crests pectinate, petioles and branchlets bristly-scaly, leaves puberulent beneath and bristly on the nerves; inflorescence bristly-puberulent. Malaita, Solomon Islands. .... *B. reburrum*
    - Ovary about 14-locular; stamens more than 6 (?); petiolar crests pectinate, but the plants otherwise not bristly-scaly except for the sparsely furfuraceous inflorescence. Russell Islands, Solomons. .... *B. russellensis*

Boerlagiodendron puniceopolleniferum B. C. Stone, sp. nov.
Fig. 1

Arbor parva pauciramosa c. 8 m alta glaberrima, ramis crassis adscendentibus, foliis confertis apicem ramorum versus petiolatis, petiolis crassis glabris subteretibus c. 15–25 cm longis basi ad 12 mm diam. cristulatis, cristulis c. 4–7 angustis sinuato-crispatis inter se 7–10 mm distantibus vaginis ut videtur brevibus ad 1 cm longis, laminis palmatisectis glabris ad 70 × 80 cm, lobis basi petiolulatis (petiolulis c. 3 cm longis anguste alatis) profunde 3–5-pinnatifidis (lobis centralibus longioribus usque ad 60–70 cm longis ad 17 cm latis) vel leviter paucilobulatis vel subintegris (lobis basalibus minoribus), apice obtusis, margine integris; inflorescentia terminalis amplissima composite umbellata, bracteis caducis (non visi), radiis numerosis dense confertis curvato-erectis sublevibus subteretibus ad 20 cm (vel ultra) longis, ad 6 mm diam. apice tripartitis, radiolo intermedio breviore ad 3.5 cm longo; flores pseudo-

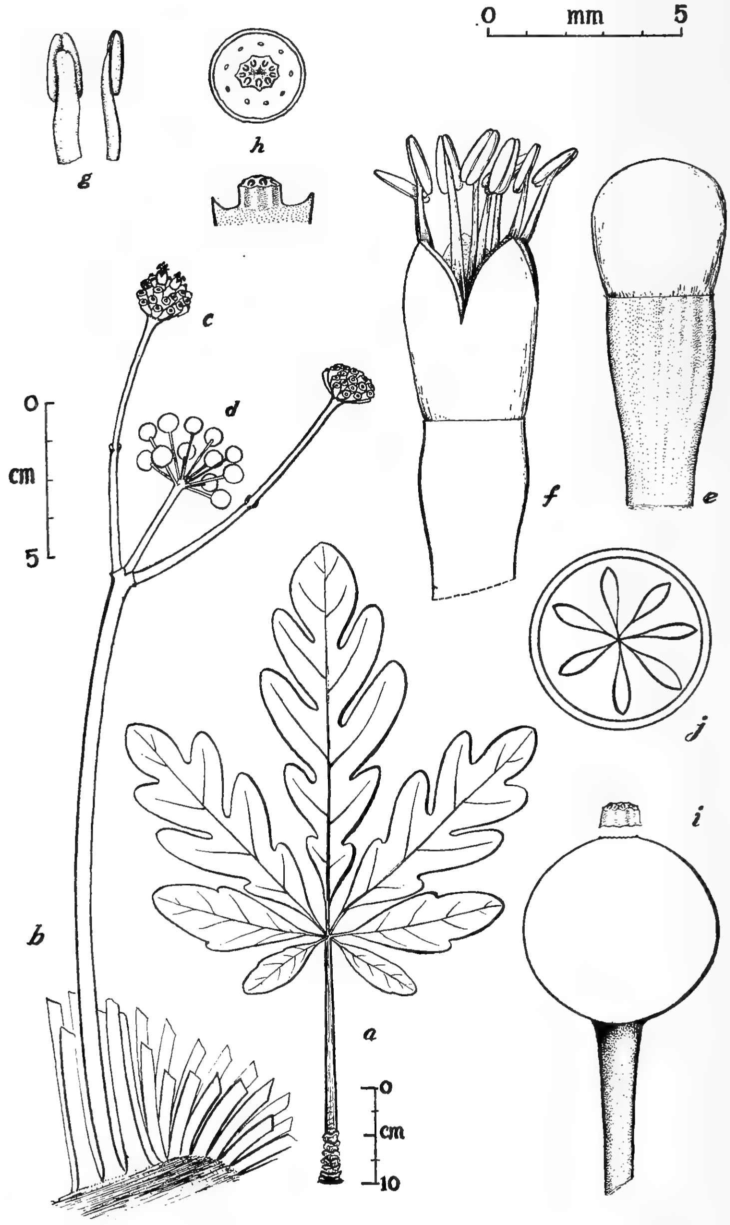

FIG. 1. (Legend on facing page.)

foemineos baccaeformes c. 12 globosos c. 5 mm diam. pedicellatos (pedicellis c. 15 mm longis) gerente; radiolis lateralibus medium vel supra medium bibracteolatis (bracteolis caducis non visi) quam radiolo intermedio duplo longioribus apice floriferis (capitulum similibus) floribus breve pedicellatis, pedicellis c. 3 mm longis cum calycis confluentibus, floribus c. 25–40 (basi probabiliter bracteolatis bracteolis caducis non visi) hermaphroditis (alabastris c. 9 mm longis) glabris arcte congestis; calycis tubo anguste tubuloso c. 4 mm longo, ore truncato c. 2.6 mm lato; corolla rubropunicea basi tubulosa (juventute apice globosa) ad 4.7 mm longa distaliter irregulariter in lobas 3 vel 4 demum scissa; stamina (5-)-9-11, filamentis c. 2.8 mm longis et 0.5 mm latis, antheris versatilibus obtusis c. 1.7 mm longis, polline jocunde puniceum (i.e. rubro-violaceum); ovarium (5-)-9-11-loculare, disco subplano, stigmatibus (5-)-9-11 sessilibus connatis turriculatis radiate dispositis minute hippocrepiformibus; fructus globosus atropurpureus.

Type: In the herbarium of the Bishop Museum (Honolulu), collected on the trail from Auki to Tantalau village (Kwara'ai District) on the island of Malaita, British Solomon Islands, 29 September 1957, by Benjamin C. Stone (No. 2450); isotypes in the U. S. National Herbarium, the herbarium of the Royal Gardens, Kew, and the herbarium of the Arnold Arboretum.

Remarks: This new species (named with reference to the brilliant magenta pollen) is a glabrous, single-trunked tree ("Schopfbaum") of the section *Pedicellata* (of Harms' treatment of the genus). The hermaphrodite flowers are dark maroon; the fruits and pseudofruits are similar or purplish. The nearest relative in the region may be *B. tetrandrum*, but that species differs in various major characters as pointed out in the key and description. Elsewhere, the closer relatives appear to be *B. novoguineense* or *B. Lauterbachii.*

Boerlagiodendron tetrandrum C. T. White

Boerlagiodendron tetrandrum C. T. White in Journ. Arn. Arb. 31: 102. 1950; ex F. S. Walker, Forests of Brit. Sol. Is. Protect. 98. 1948 (nomen et descriptio anglice).

SOLOMON ISLANDS: San Cristoval: Makira Island, Anganiwai, Walker B.S.I.P. 260 (type).

Known only from the type collection.

White distinguished the species from *B. barbatum* (Becc.) Harms of the Kei Islands (southwest of New Guinea), which has deeply 5–7-lobed leaves, the petioles basally manicate-cristate, and the flowers with 7 or rarely 5 stamens. It is relatively remote from the other East Melanesian

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FIG. 1. *Boerlagiodendron puniceopolleniferum.* a.—leaf; b.—portion of inflorescence, showing one of the tripartite umbels; c.—umbellule of hermaphrodite flowers; d.—umbellule of pseudofemale flowers; e.—hermaphrodite flower in bud; f.—the same at anthesis; g.—anthers; h.—top and lateral views of apex of ovary and stigmas; i.—pseudofemale flower in lateral view, and showing the caducous stylopodium; j.—the same in cross section.

species considered herein, in its entire or subentire leaf divisions, and from all except *B. orientale* in its 4-stamened flowers.

Boerlagiodendron orientale Guillaumin

Boerlagiodendron orientale Guillaumin in Journ. Linn. Soc. Bot. 51: 554. 1938.

NEW HEBRIDES: Espiritu Santo, Hog Harbor, I. & Z. Baker (Oxford Univ. Exped.) 258 (type).

Known only from the type collection. The collectors report the vernacular name "varaku."

Guillaumin relates this species to *B. novoguineense* (Scheff.) Harms. From the other Melanesian species it is amply distinct in its trilobate leaves, flowers with but 4 stamens, and 5-celled ovaries.

Boerlagiodendron reburrum B. C. Stone, sp. nov.

Fig. 2

Arbor parva ad 8 m alta (vel ultra) pauciramosa, ramis adscendentibus, foliis apicem ramorum versus confertis longe petiolatis, petiolis c. 30–45 cm longis dense fimbriato-paleatis (paleis saepe furcatis denticulatisque pallide rufis vel pallide fuscis) basi ad 16 mm diam. cristulatis, cristulis latis petiolum c. ¾ cinctis dense pectinatis (paleis gracilis subrectis ad 10–15 mm longis), laminis profunde palmatifidis, lobis 5, 6, vel 7, centralibus majoribus (lobis omnibus apice abtusis) ad 60 $\times$ 15 cm, basi sinibus latiusculis rotundatis sejunctis, grosse pauciserratis sublobulatis, margine in sinebus exceptis dentatis vel denticulatis, facie superiore glabris, inferiore dense minute puberulentibus, et nerviis costisque puberulentibus trichomis diversis: minoribus simplicibus c. 0.1–0.3 mm longis majoribus bicellularibus ad 1–3 mm longis ad medium articulatis cellula apicali anguste cornuta quam cellula basali pallidiore saepe longiore; inflorescentia terminalis composite umbellata contracta confertiflora, paleis fimbriatulis furfuraceis obtecta; umbellis tripartitibus subimmaturitate c. 3 cm longis, radiolo intermedio brevissimo ad 18 mm longo, pedunculis c. 6 mm longis dense furfuraceo-puberulentibus, umbellulam florum bacciformium subglobosorum ad 5 mm diam. pedicellis teneribus longiusculis ad 6–7 mm longis gerente; radiolis lateralibus ut videtur brevioribus sed immaturis basi bracteis lanceolatis dense paleato-puberulentibus suffultis ad 1 cm longis apice capitulum florum subsessilium parvorum gerentibus; flores pseudofoeminei parvi ad 9 mm longi, calyce c. 4.5 mm longo compresso ore dense ciliato-paleato tubo puberulento; corolla punicea angusta tubulosa c. 4.5 mm longa; stamina 5 vel 6 c. 4 mm longa, filamentis c. 2 mm longis, antheris versatilibus oblongis obtusis c. 2.3 mm longis; ovarium 9-vel 10-loculare, disco plano, stigmatibus in turriculam dispositis, apice subtruncatis minute hippocrepiformibus, 5–6 (vel ultra ad 10?); fructus maturus non visus.

Type: In the herbarium of the Bishop Museum (Honolulu), collected between Tantalau Village and the Fiu River in the Kwara'ai District,

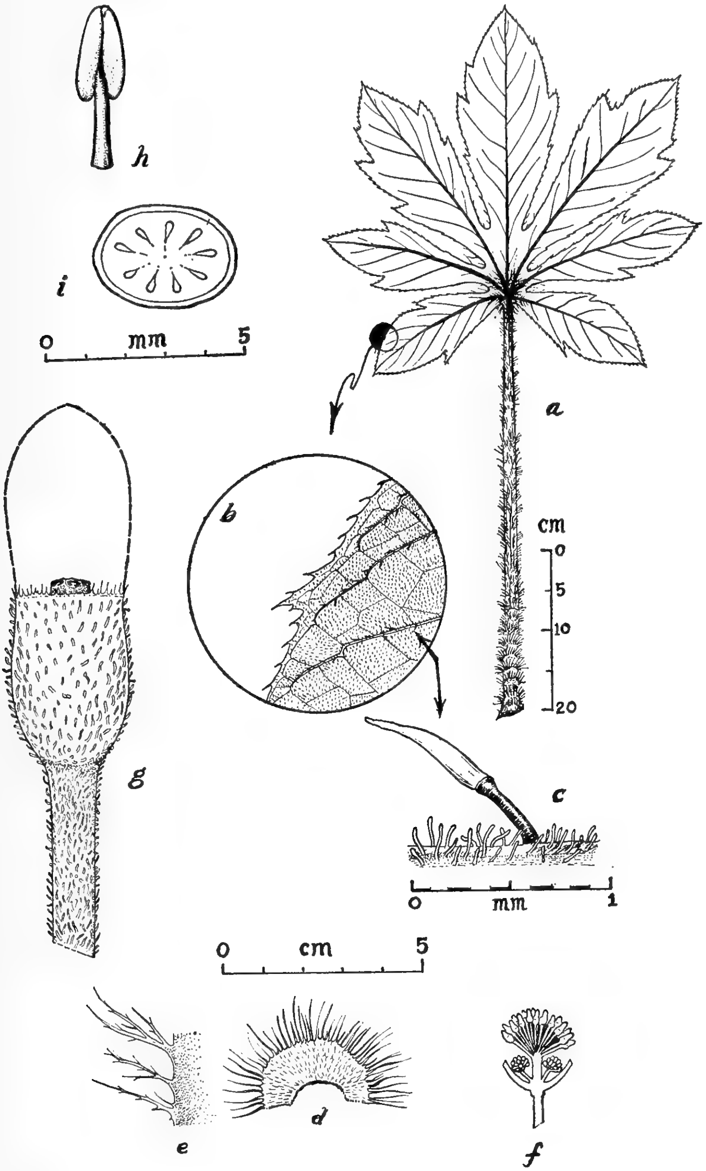

FIG. 2. *Boerlagiodendron reburrum.* a.—leaf; b.—portion of leaf margin, showing the undersurface enlarged; c.—greatly enlarged view of small part of a vein in lateral view, showing two types of trichomes; d.—crest from base of petiole; e.—fimbriate hairs from petiole; f.—one of the tripartite umbels from the inflorescence; g.—a flower from the center radiolus; h.—anther; i.—ovary in cross section.

Island of Malaita, British Solomon Islands, 25 September 1957, by Benjamin C. Stone (No. 2397); isotype in the U. S. National Herbarium.

Remarks: Boerlagiodendron reburrum appears related to *B. russellensis,* but differs in numerous respects: ovary locules 9–10, not 14; inflorescence densely puberulent and bristly-scaly, not merely sparsely furfuraceous; flowers up to 14 (or more?) per umbellule, not 7; leaves 7-lobed (not 5); petioles and branches covered with stiff bristly fimbriant scales; petiolar crests pectinate and puberulent; and umbels smaller.

The central radiolus of each umbel bears flowers which have a corolla (though it is very narrow) and also have stamens; the flowers of the lateral radioli are quite immature. It is probable that the central flowers are pseudofeminine, as in other species, but it is not entirely certain that this is true. The flowers are dark maroon in color; the hairs of the petiole, etc., are in life greenish, becoming brownish after drying. The specific epithet means "bristling with hair."

Boerlagiodendron russellensis Philipson

Boerlagiodendron russellensis Philipson in Bull. Brit. Mus. (Nat. Hist.) Bot. 1(1): 12. 1951.

SOLOMON ISLANDS: Russell Islands; in deep jungle, R. T. Brice 18 (type in Arnold Arboretum).

This species, known so far only from the type collection, is related to *B. pfeilii* (Warb.) Harms, from which Philipson distinguished it, and to the newly described *B. reburrum.* It differs from the latter as indicated in the key, and from the former in its pectinate petiolar crests and regularly serrate leaf-division margins, and in the much shorter primary rays and fruits which are broader than long. When fresh the fruits are said to be white with red stigmas and corolla scar.

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PROCEEDINGS
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NEW SPECIES OF BLACK TACHYSPHEX FROM NORTH AMERICA (HYMENOPTERA, SPHECIDAE)

By R. M. Bohart
University of California, Davis

The large genus *Tachysphex* is composed mostly of medium-sized wasps with black head and thorax, and red abdomen. A few species have occasional dark forms, and perhaps twenty in our fauna are customarily all dark or have red only toward the apex of the abdomen. Five of the dark species appear to be new and are herein described.

Important specific characters are the punctation of the head and thorax, shape of the frons and clypeus, relative lengths of flagellar segments (flagellomeres), striation of the propodeum, and number of silvery hair bands on the abdominal tergites. Male genitalia are practically diagnostic, and other secondary sexual characters of value are the extent of the tarsal comb in the male and the nature of the pygidium in the female. For comparative purposes the measurements of flagellomeres and the breadth of the frons and clypeus are given in a ratio in which 86 equals one millimeter.

Holotypes will be deposited in the California Academy of Sciences, and paratypes will be distributed to the U. S. National Museum and to other institutions insofar as possible.

Tachysphex hurdi R. Bohart, new species
Figs. 13–15

Male: Length 8.5 mm. Black, tarsi reddish distally; wings smoky. Face moderately silvery, tergites I–III with silvery apical bands; wing cells densely covered with dark microsetae. Frons and clypeus closely punctate except for low, shiny, well-defined, crescentic clypeal bevel which is separated by an impressed line from a short, smooth lip; punctures of frons overlaid with shagreening; on vertex separated by about one puncture diameter of light shagreening; on scutum mostly about one diameter apart, on scutellum slightly more widely spaced, on mesopleuron a little more closely and the area slightly shagreened. Propodeum laterally with coarse longitudinal striation, dorsally subreticulate and with short striae behind postscutellum; abdominal tergites with coarse shagreening. Flagellomeres I–III, least interocular distance, and clypeal breadth with the length relationships 23:28:28:68:148 respectively; front tarsus without a comb, setae of basal tarsomere about one-fifth its length. Genitalia as in Figs. 13–15; bristles of volsella and gonostyle relatively few, very stout; serrated crest of volsella produced slightly anteriorly, flat-topped, abrupt posteriorly; aedeagal teeth moderate in size and spacing.

Female: Length about 10 mm. Clypeal lip obtusely angled out, slightly trilobed, without a lateral notch; flagellomeres I–III, least interocular distance and clypeal breadth with the length relationships of 34:41:42:72:174 respectively. Tarsal comb about as long as basal tarsomere; pygidium mostly polished, sparsely and finely punctate, angled at about 33 degrees, not depressed.

Material: Holotype male, Hungry Valley, 5 miles south of Gorman, Ventura County, California, 4 May 1959 (P. D. Hurd). Paratypes, 49 males and 26 females from the following California localities during April through July: Shasta County: Cassel (R. M. Bohart), Hat Creek P. O. (J. W. MacSwain); Mono County: Topaz Lake (J. W. MacSwain); Alameda County: Arroyo Mocho (D. J. Burdick); Santa Clara County: San Antonio Ranger Station (C. D. MacNeill); Alpine County: Silver Creek (R. M. Bohart); Inyo County: Big Pine (R. M. Bohart); Tulare County: California Hot Springs (E. C. VanDyke), Three Rivers (H. R. Moffitt); Madera County: Madera (A. J. Kalz); Monterey County: Arroyo Seco Camp (D. J. Burdick); San Benito County: Idria (D. J. Burdick); Kern County: Mill Potrero (R. M. Bohart); Ventura County: near Gorman (P. D. Hurd, et al.), Quatal Canyon (J. Powell); Los Angeles County: Tanbark Flat (P. D. Hurd, et al.); San Bernardino County: Camp Baldy (R. M. Bohart); Riverside County: Riverside (R. C. Bechtel); Corona; Anza (R. M. Bohart), Banning (E. C. VanDyke); San Diego County: Warner Springs (R. M. Bohart), Alpine (R. M. Bohart). Also, one male metatype, Dufur, Oregon (K. Gray, J. Schuh), and one female metatype, Descanso, Baja California, Mexico (R. M. Bohart).

Remarks: The range of *hurdi* seems to be the Pacific Coast in the Upper Sonoran and Transition life zones. Characteristic among the all-black species are the moderate size, silver hair bands on basal three tergites, moderately broad least interocular distance, laterally striate propodeum, well separated punctures of scutum and mesopleuron, sharply defined clypeal bevel, and in the male the absence of a tarsal comb. The male genitalia are quite distinctive, also. A related species is *schlingeri* which has the smooth area of the clypeus not beveled sharply, more finely punctate vertex, and a weak tarsal comb in the male.

The species is named for P. D. Hurd, Jr., who collected the holotype as well as much of the type series.

Tachysphex linsleyi R. Bohart, new species
Figs. 7–9

Male: Length 6.5 mm. Black, tergites V to VII red, wings with membrane clear, veins dark brown. Face densely silvered nearly to ocelli, tergites with relatively coarse silvery pubescent bands on I–V. Frons shiny with fairly close coarse punctures, clypeal punctation finer, weak clypeal bevel and lip nearly smooth, punctures of vertex, scutum and scutellum moderate, spaced irregularly from one to four diameters apart, especially wide-spaced over most of scutellum, those of mesopleuron about one diameter apart, tergites, finely shagreened, polished apically; propodeum very coarsely granulose above, laterally with strong oblique striae. Flagellomeres I–III, least interocular distance, and clypeal breadth with the length relationship of 18:18:20:67:100 respectively; front tarsus with a definite comb, setae of basal tarsomere three-fifths its length. Genitalia as in Figs. 7–9; bristles of volsella small and numerous, those of blade-like gonostyle inconspicuous; serrated crest of volsella high, semi-conical, somewhat inclined anteriorly, arising gradually posteriorly; aedeagal teeth very small, well spaced.

Female: Length about 8.0 mm. Clypeal lip obtusely angled out, without a lateral notch; flagellomeres I–III, least interocular distance, and clypeal breadth with length relationships of 25:27:28:70:116 respectively. Face extensively silvery, tergites III to VI red. Tarsal comb about nine-tenths as long as basal tarsomere; pygidium mostly polished with sparse fine punctures, angled at about 30 degrees.

Material: Holotype male, Eastgate, 1 mile W, Churchill County, Nevada, August 11, 1958, from honeydew on *Chrysothamnis* (E. G. Linsley). Paratypes, 5 males, 33 females, same data as holotype. Other paratypes from California: 5 males, Paradise Camp, Mono County (A. E. Menke, F. D. Parker); 1 male, 2 females, Antelope Springs, Inyo County (H. K. Court); 2 males, 1 female, Deep Springs, Inyo County (E. I. Schlinger); 2 males, 1 female, Borrego Valley, San Diego County (J. C. Hall, W. F. Barr, L. G. Rozen). Also Willcox, Arizona (R. M. Bohart); Rodeo, New Mexico (R. H. James, R. M. Bohart); Albuquerque, New Mexico (R. and K. Dreisbach); and Powder River, Wyoming (R. Dreisbach and R. Schwab).

Remarks: This species is related to *terminatus* Smith and *fusus* Fox, agreeing with these species in the broad least interocular area, the rather coarse and well separated vertex punctures, and the red abdominal apex of the female and many males. The male of *linsleyi* has a distinctive blade-like gonostyle. In addition the narrower clypeus and clear wings differentiate it from *terminatus,* the definite tarsal comb from *fusus.* The female has clear wings and a shinier frons than that of *terminatus,* and a much broader clypeus than in *fusus.*

Tachysphex powelli R. Bohart, new species
Figs. 1–3

Male: Length 9.0 mm. Black, apices of tarsi brown; wings brown. Face weakly silvered, tergites without silvery bands; wing cells densely covered with dark microsetae. Frons coarsely granulose, clypeus closely punctate except for a mostly smooth distal crescent and lip; punctures of vertex, scutum, and scutellum less than a diameter apart; those of mesopleuron contiguous; propodeum coarsely granulose, slightly carinulate anteriorly above; abdominal tergites finely shagreened. Flagellomeres I–III, least interocular distance, and clypeal breadth with the length relationships of 22:32:34:65:132 respectively; clypeus convex, not beveled, lip narrow and broadly curved; front tarsus with comb present, setae of basal tarsomere about one-half its length. Genitalia as in Figs. 1–3; bristles of volsella and gonostyle moderate, in a single row and numerous; serrated crest of volsella produced strongly backward; aedeagal teeth moderate, nine in number (varies slightly in paratypes).

Female: Length about 11.5 mm. Clypeal lip slightly undulate, notched laterally, a little concave medially; flagellomeres I–III, least interocular distance, and clypeal breadth with length relationships of 46:52:52:73:198 respectively. Tarsal comb about 0.7 times as long as basal tarsomere; pygidium mostly polished with sparse fine punctures, a little shagreened at extreme base, angled at about 28 degrees, not depressed.

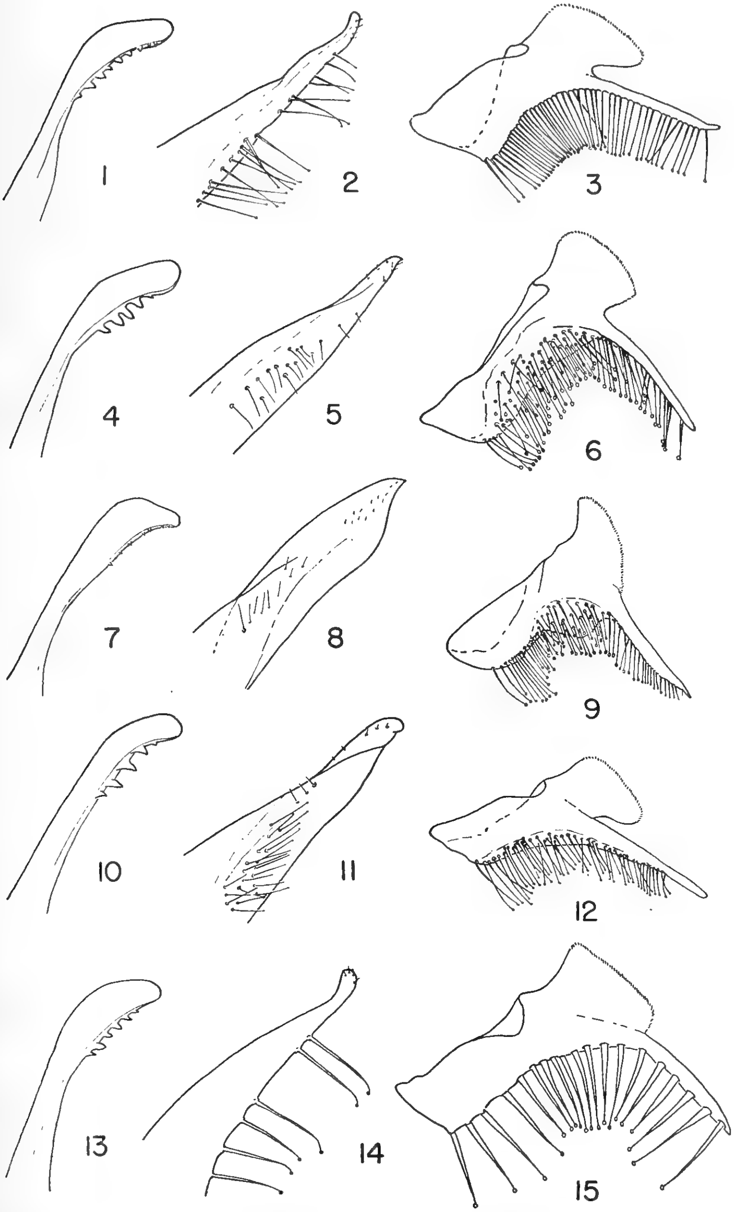
Material: Holotype male, Winnemucca Lake, Alpine County, California, 7 July 1949 (R. M. Bohart). Paratypes (all from California), 17 males, 13 females, Mono Pass, Inyo County (J. Powell, D. D. Linsdale); Ruby Lake, Inyo County (J. Powell); Sonora Pass, Mono County (J. Powell, J. M. Burns, J. W. MacSwain, A. T. McClay, A. S. Menke); Strawberry Lake, El Dorado County (E. C. VanDyke); Winnemucca Lake, Alpine County (R. M. Bohart, P. M. Marsh); Sonora Peak, Tuolumne County (J. Powell, C. D. MacNeill); Nellie Lake, Fresno County (E. P. VanDuzee); Heart Lake, Fresno County (E. I. Schlinger). Recorded altitudes: 9,000 to 11,000 feet; recorded dates: 10 July to 1 September.

Remarks: This species is clearly a creature of tree-line in the Hudsonian life zone. It is distinguished from other black species by its moderate size, all dark tergal pubescence, propodeum granulose laterally, least interocular distance moderately narrow, in the male the second flagellomere less than twice its breadth, and in the female the pygidium narrow and polished. Its nearest relative is *T. aethiops* Cresson which, however, has the male second flagellomere about twice as long as broad, and the female pygidium wrinkled.

The species is named for Jerry Powell, who collected much of the type series.

Tachysphex schlingeri R. Bohart, new species
Figs. 4–6

Male: Length 8.3 mm. Black, apices of tarsi brown; wings nearly clear. Face moderately silvery, tergites I–III with silvery apical bands; wing cells densely covered with dark microsetae. Frons and clypeus closely punctate except for a small, sparsely punctate clypeal lobe separated by an impressed line from smooth lip; frons granulose and



FIGS. 1–15. Aedeagus, gonostyle, and volsella, respectively, of new species of *Tachysphex*: FIGS. 1–3.—*T. powelli*. FIGS. 4–6.—*T. schlingeri*. FIGS. 7–9.—*T. linsleyi*. FIGS. 10–12.—*T. williamsi*. FIGS. 13–15.—*T. hurdi*. All illustrations are from holotypes, based on camera lucida drawings from dissected mounts.

shagreened; vertex polished, punctures fine and 1 to 2 diameters apart; those of scutum and scutellum moderate, spaced irregularly but averaging about 1 diameter apart; those of mesopleuron coarse and separated by about 1 diameter of shagreening; propodeum granulose and obliquely striate laterally, enclosure granulose, becoming subreticulate anteriorly; abdominal tergites slightly shagreened. Flagellomeres I–III, least interocular distance, and clypeal breadth with length relationships of 16:20:24:56:120 respectively; clypeus convex, not beveled, lip narrow and angular. Front tarsus with comb broadly developed, setae of basal tarsomere about one-third its length. Genitalia as in Figs. 4–6; bristles of gonostyle relatively small, those of volsella numerous and with large terminal spheres; serrated crest of volsella high, abrupt posteriorly; aedeagal teeth rather large and closely grouped.

Female: Length 11.5 mm. Clypeal lip slightly angled, without a lateral notch; flagellomeres I–III, least interocular distance, and clypeal breadth with length relationships of 38:44:46:58:150 respectively. Tarsal comb about two-thirds as long as basal tarsomere; pygidium polished, sparsely punctate, angled at about 43 degrees, somewhat depressed subapically.

Material: Holotype male, Sierraville, Sierra County, California, 20 August 1953 (E. I. Schlinger). Paratypes, one male each from the following localities in California: Independence Lake, Sierra County, 20 July 1954 (R. M. Bohart); Sardine Creek, Mono County, 12 July 1951 (E. I. Schlinger); Lake Fontanillis, El Dorado County, 21 August 1955 (E. I. Schlinger); Hope Valley, Alpine County, 18 July 1948 (P. D. Hurd); Dodge Ridge, Tuolumne County, 7 August 1960 (A. S. Menke). Also Sky Ranch, near Reno, Nevada, 4 July 1952 (E. I. Schlinger). Also, 1 female, Montepelier, Idaho, 6 July 1920. 1 female, Green River, Wyoming, 2 July 1920 (American Museum of Natural History).

Remarks: Essentially a species of the Transition and Canadian life zones, *schlingeri* is characterized by its medium size, faintly indicated silvery pubescence on tergites I–III, laterally striate propodeum, moderate least interocular distance, and absence of a sharply defined clypeal bevel. This last feature, as well as the male genitalia, distinguish it readily from its relative, *hurdi.*

The species is named for Evert Schlinger, who collected much of the type series.

Tachysphex williamsi R. Bohart, new species
Figs. 10–12

Male: Length 7.5 mm. Black, wings lightly stained. Face moderately silvered, tergites with silvery bands on I–IV. Frons granulose; clypeus closely punctate except for very weak, sparsely punctate bevel, and smooth, evenly rounded lip; vertex punctures small and separated by one diameter or less of shagreening; scutum, scutellum, and mesopleuron closely punctate; propodeum granulose above with a partial median carina, laterally evenly granulose; tergites lightly shagreened; trochanters punctate, not especially polished. Flagellomeres I–III, least interocular distance, and clypeal breadth with the length relationship of 22:26:26: 47:102 respectively; front tarsus without a comb, setae of basal tarsomere about one-fifth its length. Genitalia as in Figs. 10–12; bristles of volsella and gonostyle small, placed irregularly, numerous on volsella; serrated crest of volsella produced strongly backward; aedeagal teeth few and irregular.

Female: Length about 10 mm. Clypeal lip slightly indented medially, notched laterally, clypeal bevel fairly distinct; flagellomeres I–III, least interocular distance, and clypeal breadth with the length relationships of 35:45:45:51:148 respectively. Face weakly silvered, tergites I–III with silvery bands, IV–V with tarnished pubescence. Tarsal comb about four-fifths as long as basal tarsomere; pygidium lightly shagreened, with moderate scattered punctures, angled at about 38 degrees.

Material: Holotype male, Lone Mt., San Francisco County, California, 6 July 1920 (F. X. Williams). Paratypes, all from San Francisco County, California: 21 males, 34 females from Lone Mt. (F. X. Williams), Land's End (F. X. Williams), Lake Merced (T. R. Haig), Ingleside (F. X. Williams), San Francisco (E. P. VanDuzee).

Remarks: In most respects this species is similar to *tarsatus* Say. Ordinarily the all-black color of *williamsi* is sufficient for separation; but very rarely *tarsatus* may be all dark. I have seen such specimens from Kill Devil Hills, North Carolina (K. V. Krombein) and from Fraser River, British Columbia (E. I. Schlinger). In such cases the most reliable characters are found in the male genitalia. In *williamsi* the gonostyles have weak bristles and those of the volsellae are short. In *tarsatus* these structures are unusually bristly. Among the black species, *williamsi* is distinctive by its combination of moderate size, rather narrow least interocular distance, granulose propodeum laterally, silvery bands on first four tergites of male and three in female, and the laterally notched female clypeus.

The species is known only from the San Francisco area where most of the type series was collected by its namesake, F. X. Williams.

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A NEW CRAYFISH OF THE GENUS CAMBARUS FROM GEORGIA (DECAPODA, ASTACIDAE)

By Horton H. Hobbs, Jr., and H. H. Hobbs, III
Department of Biology, University of Virginia

From a small cascading, but sluggish, tributary of the Conasauga River flowing through a deep wooded ravine two miles east of Chatsworth, Georgia, a small collection of crayfishes was obtained by turning the large stones in the stream bed. In April 1958, when Thomas L. Johnson and the senior author were there, little water was flowing over the rocky bottom, and crayfishes were difficult to find. Only two species were collected—four specimens of the one described below and two juvenile females of *Cambarus striatus* Hay.

The new crayfish is a member of the Asperimanus Group and has its closest affinities with *Cambarus asperimanus* Faxon (1914: 391).

Cambarus conasaugaensis, new species

Diagnosis: Rostrum short with thickened convergent margins, upper surface with scattered punctations; acumen indistinctly delimited at base; postorbital ridges terminate cephalically in small corneous tubercles; suborbital angle absent; areola broad and moderately long, four to five times longer than broad with three or four punctations in narrowest part, and constituting from 35 to 37.5 per cent of length of carapace; lateral spines or tubercles absent from sides of carapace immediately caudal to cervical groove; cephalolateral portion of carapace with a few tubercles, remainder of carapace, except for dorsal gastric region which is polished, punctate; hooks on ischiopodites of third pereiopods in male. First pleopod of first form male terminating in two parts: central projection corneous, curved throughout its length with apex directed proximally; mesial process bulbous but tapering distally and extending caudolaterad, the apex extending caudad of tip of central projection. Annulus ventralis as figured.

Holotypic Male, Form I: Body subovate, slightly depressed. Abdomen narrower than thorax (13.1 and 14.9 mm in widest parts respectively). Width of carapace greater than depth in region of caudodorsal margin of cervical groove (14.9 and 11.7 mm). Greatest width of carapace near midlength of areola.

Areola broad (four times longer than wide) with three or four punctations across narrowest part; cephalic section of carapace 1.2 times longer than areola; length of areola 37.2 per cent of entire length of carapace.

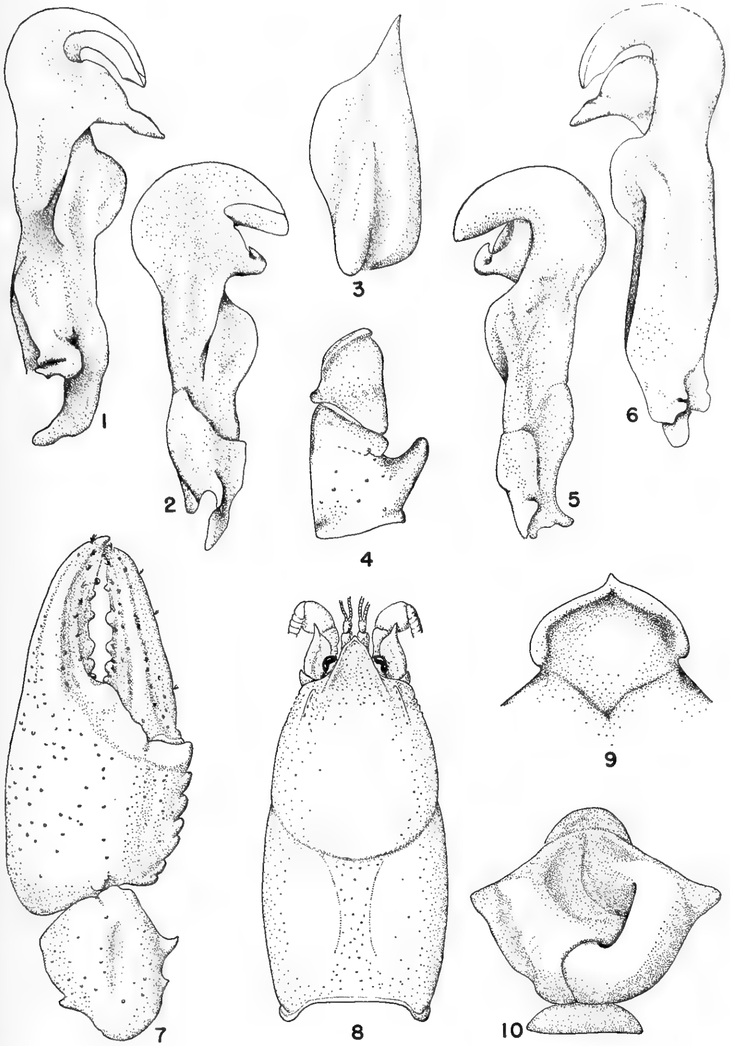
Rostrum with thickened convergent margins which lack marginal spines or tubercles; upper surface concave and punctate; acumen not distinctly delimited at base although rostral margins are somewhat suddenly contracted at its base; apex extending almost to distal extremity of penultimate segment of peduncle of antennule. Subrostral ridges weakly developed and evident in dorsal aspect for only a short distance at base of rostrum.

Postorbital ridges of moderate length, depressed, pitted by punctations (some coalescing) dorsolaterally, and terminating cephalically in very weak tubercles. Suborbital angle lacking. Branchiostegal spine small but acute and corneous. Surface of carapace mostly punctate except for polished dorsal gastric area and a few tubercles on lateral gastric area. Lateral spines or tubercles lacking immediately caudal to cervical groove.

Abdomen shorter than carapace (26.7 and 28.2 mm). Cephalic section of telson with two spines in each caudolateral corner.

Epistome (Fig. 9) subplane with elevated (ventrally) and somewhat thickened margins gently curving from broad base to short cephalomedian projection. Antennules of the usual form with a prominent corneous spine at base of distal third on ventral surface of basal segment. Antennae extend caudad to second abdominal tergum. Antennal scale (Fig. 3) with a heavy lateral portion bearing a prominent distal spine and a comparatively narrow lamellar portion.

Left chela (Fig. 7) subovate in cross section with palm inflated (right chela probably regenerated); all surfaces punctate except inner margin of palm and opposable margins of fingers. Inner margin of palm with a single row of six tubercles. Fingers slightly gaping and both with a prominent submedian longitudinal elevation and a less conspicuous and shorter one near opposable surfaces. Opposable margin of dactyl with five rounded tubercles along proximal three-fourths of finger, the second and third from base largest. Opposable margin of immovable finger also with a row of rounded tubercles opposing, except the distalmost, the corresponding tubercles on dactyl; distal tubercle situated slightly proximad of corresponding one on dactyl; in addition, a single tubercle present at a level below members of above-mentioned row just distal to distalmost tubercle in the row; minute denticles between and distal to fourth and fifth tubercles. Lateral margin of immovable finger slightly costate. Carpus longer than broad with a shallow, slightly oblique furrow above; dorsal and lateral surfaces punctate; mesial surface with a prominent spike-like tubercle and a smaller one proximal to it; lower distal margin with a prominent tubercle and a smaller one proximomesial to it. Merus with upper distal extremity emarginate; one tubercle present proximad of emargination and a few punctations flanking it, and others scattered on upper mesial and lateral surfaces; lower surface with a lateral row of two spike-like tubercles and a mesial row of six (corresponding rows on right cheliped consist of three and nine, respectively).



FIGS. 1–10. *Cambarus conasaugaensis,* new species. FIG. 1.—Mesial view of first pleopod of male, form I. FIG. 2.—Mesial view of first pleopod of male, form II. FIG. 3.—Antennal scale. FIG. 4.—Basipodite and ischiopodite of third pereiopod of male, form I. FIG. 5.—Lateral view of first pleopod of male, form II. FIG. 6.—Lateral view of first pleopod of male, form I. FIG. 7.—Distal podomeres of cheliped of male, form I. FIG. 8.—Dorsal view of carapace of male, form I. FIG. 9.—Epistome. FIG. 10.—Annulus ventralis.

Lower margin of ischiopodite with a single well defined small tubercle.

Hooks on ischiopodites (Fig. 4) of third pereiopods only; hooks strong and simple. Coxa of fourth pereiopod with a prominent caudomesial projection.

First pleopod (Figs. 1 and 6) extends cephalad to coxopodite of third pereiopod when abdomen is flexed. Tip terminating in two parts (see diagnosis).

Allotypic Female: Differs from the holotype in only a few details—inner margin of palm of chela with a row of seven tubercles; opposable margin of dactyl with a row of six tubercles which do not oppose corresponding tubercles on immovable finger. Merus with spike-like tubercles corresponding to those on right cheliped of holotype.

Annulus ventralis (Fig. 10) with a prominent U-shaped, elevated, caudal wall; cephalomedian area depressed with a shallow trough extending from cephalic margin curving gently sinistrocaudally, following contour of dextral tongue; sinus in the form of an oblique, inverted U, crossing caudal wall; fossa situated on sinistral side of median line between tongue and elevated caudal wall.

Morphotypic Male, Form II: Differs from the holotype in the following respects: rostrum extends cephalically almost to distal end of peduncle of antennule; antenna extends caudad to third abdominal tergum; opposable margin of dactyl of left chela with a row of six tubercles, and that of immovable finger with a row of four; opposable margins of both fingers of both chelae with minute denticles distal to third tubercle from base; right merus with lower surface bearing an inner row of 10 tubercles and an outer one of three, those on left consisting of eight and two, respectively; lower margin of right carpus with two tubercles.

First pleopod (Figs. 2 and 5) with neither terminal corneous; mesial process apparently shrunken in preservation; shaft with a distinct juvenile oblique suture.

Measurements: As follows (in millimeters):

	Holotype	Morphotype	Allotype[1]
Carapace—			
Height	11.7	10.2	—
Width	14.9	12.9	—
Length	28.2	26.7	27.0
Areola—			
Width	2.6	1.9	—
Length	10.5	9.4	—
Rostrum—			
Width	4.6	4.5	4.4
Length	4.7	4.8	4.8
Chela—			
Length of inner margin of palm	8.2	7.4	7.0
Width of palm	10.3	8.4	8.7
Length of outer margin of hand	21.9	19.6	19.3
Length of dactyl	12.3	10.0	10.4

[1] Carapace of allotype partially crushed.

Type Locality: A small tributary of the Conasauga River, two miles east of Chatsworth, Murray County, Georgia on U. S. Rte. 76. See introductory paragraph.

Disposition of Types: In the United States National Museum are the holotypic male, form I (107156), morphotypic male, form II (107158), and allotypic female (107157). A second form male paratype is retained in the personal collection of the senior author. Only the four specimens of this species are available.

Relationships: Cambarus conasaugaensis has its closest affinities with *Cambarus asperimanus.* The similarities may be seen in the conformation of the carapace, chelae, and first pleopods of the first form male. They may be distinguished easily by the absence of long and conspicuous setae on the chelae of the former and slight differences in the first pleopods of the first form males and annuli ventrales of the females.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

TWO UNUSUAL CENTRAL AMERICAN SPIROSTREPTID MILLIPED SPECIES

By H. F. Loomis
Miami, Florida

In recent months two unusual spirostreptids have been given me for study. One is believed to be the first truly troglobitic milliped in the family and was found two years ago in Yucatan by Stanley Kiem. Beside the fact that it was discovered deep in a cave it exhibits many of the characters associated with troglobitic forms, not only of millipeds but of other arthropods as well; pigmentation is greatly reduced; the body wall is less strongly chitinized than in surface species; the legs and antennae are elongated, and the ocelli are unusually low in number, lacking in pigment and seem poorly developed. That they were somewhat functional, however, probably is indicated in a note by Kiem: "The milliped was almost white and when a flashlight was pointed directly at it, it squirmed and twisted but became calm when the beam was turned away."

Over a half dozen spirostreptids have been taken in Mexican and Central American caves, some being recognized as established surface species and of the others, described as new, five were from various localities in Yucatan but none had characters indicating adaptation to cave life and most were suspected of being casual visitants from aboveground.[1]

In general it is difficult and often impossible to identify or describe satisfactorily female specimens in this family, except in association with males, because they show few distinctive characters, the others integrating with those of one or more related species. In this cave species, however, so many outstanding peculiarities are shown that identity of future specimens should never be in doubt and its description seems

[1] Chamberlin, R. V. Diplopods from Yucatan. Carnegie Inst. Washington, No. 491, pp. 165–182, illus., 1938.

justified, especially as it places the very restricted type locality on record for collectors in the hope that males may be procured and the correctness of generic designation established.

The second unusual milliped to be dealt with was found in the lowlands of Guatemala by Dr. Hugh Popenoe who sent me three females that had a curiously produced last segment, a character previously unknown in the family, suggesting the possibility that they might typify a new genus. Fortunately, a request for additional specimens resulted in a second collection in which males were represented. While examination of the gonopods reveals that the species is a member of the genus *Orthoporus*, the peculiar caudal segment and several other structural characters indicate a rather wide separation in relationship with any other known member of the genus.

Orthoporus kiemi, new species

Type specimen: Female holotype, U. S. National Museum 2778.

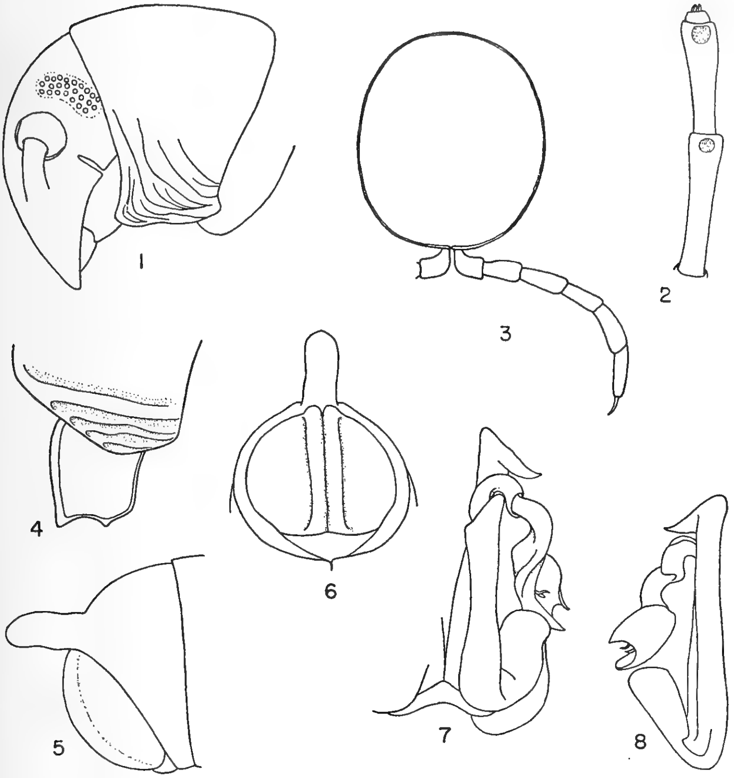
Type locality: Gravid female found in total darkness about 150 feet below surface and about a quarter mile from mouth of cave on Hacienda San Bernardo, five miles from station of same name on railroad between Merida and Maxcanu, Yucatan, 20 March 1959, by Stanley Kiem, Kendall, Florida.

Diagnosis: A smaller species than *O. luchicolens* Chamberlin to which it seems more closely related than to any of the other Yucatan species but distinguished by the light color, reduced number of ocelli, form of segment 1, and location of the pores.

Description: Body with 61 segments, 76 mm long, 4.5 mm wide, and 5 mm high, being laterally compressed throughout and strongly constricted from posterior portion of segment 1 to segments 5 and 6 after which it gradually widens; body wall less chitinized than in surface species; color throughout nearly white, the only exception being an internal dark spot beneath each pore, doubtless the repugnatorial gland.

Head smooth and shining, a median furrow extending forward from segment 1 to a broad shallow depression a little above the upper limits of the antennal sockets. Clypeus with four fovea on one side, a median fovea and two on opposite side. Eyes small, reniform, as shown in Fig. 1, separated by nearly twice their width; composed of small, low, flat, unpigmented ocelli in three rows, ocelli distributed 7-8-9 on one side, 8-8-9 opposite, counting from in front. Antennae 9 mm long, reaching back behind segment 7; joints 2 to 6 slender and of about equal diameter at distal end, joints 2 and 3 subequal in length, longer than subequal joints 4 and 5, joint 6 a little shorter than joint 5, joints 5–7 shown in Fig. 2.

Segment 1 with sides scarcely inflexed, almost vertical, with striae numerous as shown in Fig. 3; anterior corner produced forward, the



FIGS. 1–3. *Orthoporus kiemi.* FIG. 1.—Head and segment 1, lateral view; FIG. 2.—Three terminal joints of antenna from outer side; FIG. 3.—Segment from middle of body with typical long leg, posterior view.

FIGS. 4–8. *Orthoporus paxillicauda.* FIG. 4.—Lower side of segment 1 and mandibulary cardo of holotype; FIG. 5.—Last segment, valve and scale of holotype, lateral view; FIG. 6.—Last segment, valves and scale of paratype female, ventral view; FIG. 7.—Right gonopod of holotype, anterior view; FIG. 8.—Same gonopod, posterior view.

posterior one produced backward somewhat less, intervening margin long, biarcuate. Ensuing segments shining, the prozonites encircled by 6 to 8–9 fine striae, the posterior ones more widely separated and behind the last one the broad median constriction descends abruptly and contains fine, short, longitudinal striae throughout; metazonites noticeably convex with a few tiny faint punctations and with shallow, indefinite, lengthwise channels, more numerous on posterior portion, causing an inconspicuous unevenness of the surface; lateral striae extending to the pores on the anterior segments but receding toward the base of the legs further back. Pores beginning on segment 6, located slightly in front of middle of metazonites. Last segment considerably exceeded by anal valves, its apex only a little produced; valves smooth, strongly shining, margins thick and strongly elevated; preanal scale over three times as broad as long, its apex more rounded than angular. Legs very long and slender as seen in Fig. 3, a fully extended pair at midbody measuring 13 mm from tip to tip.

Orthoporus paxillicauda, new species

Type specimen: Male holotype, U. S. National Museum 2779.

Type locality: Three females, January 1961, and 3 males, 2 females, 11 February 1961, Zapotillo, Lake Izabal, Guatemala, collected by Hugh Popenoe, University of Florida, Gainesville, Florida.

Diagnosis: This disjunct species may be most closely related to *O. cobanus* Chamberlin, as indicated by the gonopods, but is outwardly distinguished by the smaller, more widely separated eyes, proximity of pores to the transverse constrictions, as well as the extended last segment which has no counterpart elsewhere in the family.

Description: Body cylindrical, ranging from 40 mm long, 2.2 mm wide, 66 segments (female) to 60 mm long, 3 mm wide, 63 segments (holotype); color of metazonites after brief preservation, light fawn brown, the prozonites still lighter; ocelli colorless to light brown.

Head with vertex smooth and shining, a very fine faint median sulcus posteriorly; clypeus with four anterior punctations; eyes small, separated by about four times their transverse length, arranged in four or five longitudinal rows, 3-4-6-5, 1-3-5-6-3, 1-3-5-6-4, counting upward, forming a scalene triangle with anterior side longest, posterior next, and ventral side shortest; antennae short and stout, joint 2 longest, joint 5 next, joint 4 widest; cardo of male mandible shown in Fig. 4.

Segment 1 (above Fig.) strongly shining with almost no tiny punctations such as are more numerous but still sparse on ensuing metazonites to end of body, slightly reducing the gloss of the surface as compared to that of the smooth and brilliantly shining prozonites; lower sides of segment 1 with a broad evenly convex longitudinal ridge and three smaller lower ridges, all set off by rather broad concave channels instead of sharply impressed striae.

Metazonites slightly convex, separated from the flatter prozonites by a fine but strong encircling constriction crossed by small, adjacent ridges, the intervening spaces pit-like and continuous across dorsum; pores very small, beginning on segment 6 where they are about their own diameter behind the constriction but thereafter are removed 2–4 times as far; lower sides of metazonites with striae reaching to line of pores on segment 5 but gradually restricted to lower sides thereafter.

Last segment with dorsum strongly convex, more abundantly punctate than preceding metazonites, the punctate apex abruptly produced into a long cylindrical, apically bluntly rounded, peg-like process greatly exceeding the anal valves as shown in Fig. 5; females with a similar process as seen in Fig. 6 which also shows the preanal scale and the thickly margined valves, their lateral surface and lower side of margins being punctate like last segment but the margins elsewhere smooth and shining.

Gonopods as shown in Figs. 7 and 8.

Anterior male legs 3–7 with a conic process at disto-ventral end of joint 5; similar processes on joint 4 of legs 6 and 7.

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PROCEEDINGS
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MILLIPEDS FROM THE NEVADA TEST AREA

By Ralph V. Chamberlin

Representatives of the species of millipeds herein considered were taken by field agents operating on a project entitled "Comparative Ecological Studies of Animals at the Nevada Test Site" conducted under contract between the Brigham Young University and the U. S. Atomic Energy Commission. These millipeds, which were referred to me for identification through the courtesy of Dr. D. Elden Beck, Associate Director of the project, were collected during the 1960–61 season between October and February when all seem to have attained sexual maturity.

Order SPIROBOLIDA
Family Atopetholidae
Arinolus sequens, new species

Description: General color of body in preserved specimens gray or brownish gray with a narrow black annulus on the prozonite of the segments and with the caudal border of the metazonites more or less darkened. Body cylindrical between the narrowing portion in front of the sixth segment and the several most caudal segments.

Eye patch or "ocellarium" forming an oblong area above base of antenna. Antennae of moderate length, slender, widening a little distad.

The acutely narrowed lower end of the collum straight, not at all bent caudad, its apex narrowly rounded and not extending below level of second tergite.

Ordinary somites with the median sulcus not very strongly impressed, lying in a shallow furrow. Ozopore on the metazonite. Segments longitudinally striate below.

In the male the sixth and seventh segments somewhat enlarged. The first three pairs of legs crassate with the claws not especially enlarged. Third legs lacking conspicuous coxal processes. Coxae of fourth and immediately following legs ventrally in the antero-posterior direction. In the gonopods the terminal process of the anterior pair extending well beyond that of the coxite (cf. Fig. 5). Distal expansion of the posterior gonopods proportionately large, broadly elliptical in outline with the margin smooth.

Number of segments, 48–49.

Width, 2 mm.

Locality: NEVADA: vicinity of Mercury. The male type taken in November 1960.

Remarks: An exceptionally small form in which the anterior gonopods resemble those of *A. citrinus* Hoffman but the posterior pair differ especially in the much larger and differently formed distal expansion.

Arinolus nevadae, new species

Description: Antennae of moderate length. Clypeal foveolae and setae mostly 3–3. Ocellarium in outline roughly subcircular, typically somewhat truncate below, with the ocelli typically in 6 or 7 series.

Collum with lower end straight, not bent caudad as it is in *A. michelbacheri* Verhoeff, the tip slightly exceeded by the second tergite (cf. Fig. 3).

Ordinary tergites with a distinct encircling median furrow in which lies the segmental sulcus, the furrow most distinct beneath. Ozopore contiguous with the furrow on its caudal side.

Telopodite of anterior gonopods of male characteristically bent abruptly ectad as shown in Fig. 1, exceeding the process of the coxite. Posterior gonopod of form shown in Fig. 2.

Number of segments, 43–44.

Width, 3 mm.

Locality: NEVADA: Mercury and adjacent area. Many specimens taken mostly in October, November, and December 1960, when the males are apparently all mature, no larval forms appearing in the collection.

Remarks: This and the species of *Orthichelus* listed below seem to be by far the commonest millipeds of the area.

Orthichelus michelbacheri (Verhoeff)

Onychelus michelbacheri Verhoeff, 1938, Zool. Anz., 122, p. 276, Figs. 1–3.

Onychelus phanus Chamberlin, 1941, Bull. Univ. Utah Biol. Serv., 6, No. 5, p. 6, Figs. 6, 7.

Orthichelus phanus Chamberlin and Hoffman, 1950, Chicago Acad. Sci., Nat. Hist. Misc., No. 71, p. 7.

Atopetholus michelbacheri Hoffman, 1960, Proc. U. S. Nat. Mus., 111, p. 138.

Heretofore known only from two specimens, one recorded by Verhoeff and one by myself (cf. citations above), both from the vicinity of Walker Pass in southern California, this species is represented by numerous specimens in the Nevada collection.

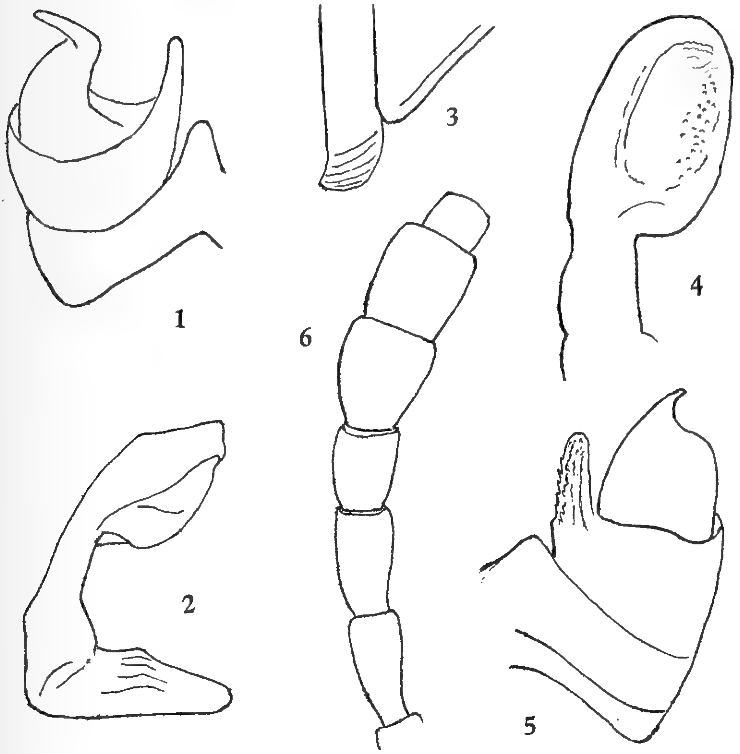
Order CAMBALIDA

Family LEIODERIDAE

Titsona tida, new species

Description: Body light brown with the two longitudinal series of black spots over the repugnatorial glands very conspicuous. Body slender and cylindrical.

Segments constricted as in the type species by deep encircling furrows.



FIGS. 1–3. *Arinolus nevadae,* new species. FIG. 1.—Left anterior gonopod of male, cephalic aspect. FIG. 2.—Posterior gonopod. FIG. 3.—Lower end of collum and second tergite.

FIGS. 4–5. *Arinolus sequens,* new species. FIG. 4.—Posterior gonopod. FIG. 5.—Right anterior gonopod, cephalic aspect.

FIG. 6. *Titsona tida,* new species. Antenna, with setae omitted.

The segments between the second and fifth narrowed and thus forming a "neck."

Ocelli in a single series as in the generotype, five in number but the terminal one at each end much reduced in size. Antennae distally strongly clavate, the fifth and sixth articles abruptly much thicker than the others; the sixth article cylindrical, the fifth clavately widening from base.

The tergite of the first segment appears not to extend down the sides so far as in *T. sima.*

Length, c. 7–8 mm; width, 0.62 mm.

Locality: NEVADA: Nevada test area, vicinity of Mercury. Two specimens taken in March 1960.

Remarks: This is a much smaller form than *T. sima* Chamberlin, the generotype, and differs in the form and proportions of the enlarged articles of the antennae.

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PROCEEDINGS
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A NEW SUBSPECIES OF IVORY-BILLED WOODHEWER FROM MEXICO

By Alexander Wetmore and Kenneth C. Parkes
Smithsonian Institution and Carnegie Museum

The name *Xiphorhynchus flavigaster eburneirostris* (Des Murs) has been current for the Ivory-billed Woodhewers from southern Veracruz to northwestern Costa Rica since van Rossem (1939: 15) showed that the type specimen of *flavigaster*, the name previously used for the Central American race, was an example of the Guerrero-Oaxaca population named *megarhynchus* by Nelson (1900: 265). Examination of the series of "*eburneirostris*" in our two museums indicates that two well-defined subspecies exist within the area currently covered by this designation. The type locality of *eburneirostris* Des Murs 1847 is Realejo, Nicaragua, which therefore leaves the distinctive population from the northern region of this composite range to be named. Any bird of this family commonly is known to local Spanish-speaking inhabitants as "sube palo," one that climbs up trees, or as "trepador," a climber, so a Latin equivalent seems an appropriate subspecific name, as follows:

Xiphorhynchus flavigaster ascensor, new subspecies

Type: Carnegie Museum No. 136,043, adult ♂, Coyame (7 air miles east of Catemaco), 1,900 feet elevation, Veracruz, México, in rain forest, collected 10 July 1954, by Ernest P. Edwards (original No. 1792).

Characters: Dorsally, darkest of the races of *Xiphorhynchus flavigaster*, particularly with respect to the deep chestnut of wings and tail; all dorsal browns richer and darker than those of the adjacent race *eburneirostris*, approached but not equaled in this respect by *ultimus* of the Nicoya Peninsula, Costa Rica; pale marks of crown narrower than in *eburneirostris* or *ultimus*, giving a streaked rather than spotted appearance; pale streaks of back longer, broader, and more widely margined with black than in either *ultimus* or *eburneirostris*, which differ little or not all from one another in this respect (in spite of the mention of "narrower and more restricted" streaks in the original description of *ultimus* by Bangs and Griscom, 1932: 48); shape of these dorsal marks similar to those of *saltuarius* of northeastern México, but with wider black edges; buff ground color of underparts slightly paler than in *ultimus*, about as in *eburneirostris*, but broad, distinct streaks extending farther caudad, and more heavily outlined in black. In size *ascensor* is smaller than the five specimens seen of *ultimus*.

Measurements: Males (15 specimens), wing (chord) 106.0–116.0 (111.7), tail 91.0–102.0 (95.7), culmen from base 37.5–41.6 (39.7), tarsus 22.4–24.5 (23.4) mm. Females (15 specimens), wing (chord) 97.0–108.0 (103.3), tail 82.0–92.5 (86.1), culmen from base 38.2–42.0 (39.8, average of 14), tarsus 21.0–25.5 (22.3) mm.

Range: Southern México from near Vera Cruz City to Tabasco, ranging west on the Gulf slope into Oaxaca: probably extends through northern Chiapas into Petén, as two skins in the U. S. National Museum from Remate and Flores agree with specimens from southern Veracruz: Intergrades with *saltuarius* in west-central Veracruz; probably intergrades with *eburneirostris* in Oaxaca and Chiapas.

Remarks: The new subspecies does not require direct comparison with *tardus* Bangs and Peters of southern Sonora and northern Sinaloa, *mentalis* (Lawrence) of the Pacific slope from southern Sinaloa to Michoacán, or *flavigaster* Swainson of Guerrero and western Oaxaca, since all of these are pale races. Griscom (in Miller et al., 1957: 49) remarked that *saltuarius* Wetmore of northeastern México "requires comparison with *yucatanensis* Ridgway," but these two races are clearly distinct, as well as geographically separated. The dorsal streaks of *saltuarius* are decidedly broader than those of *yucatanensis*, and the buff of throat and upper foreneck also is richer in the northern race. In addition, *yucatanensis* is colder, grayer in color on the posterior underparts.

Peters (1951: 45) included British Honduras within the range of *X. f. eburneirostris*. An excellent series from that country in Carnegie Museum shows that this population, as might be excepted on geographic grounds, is intermediate between *eburneirostris* and *yucatanensis*.

The subspecies *X. f. ultimus* is an excellent one, but in typical form has a restricted range, being known only from the lowlands of the Nicoya Peninsula, Costa Rica. The few birds that we have seen from the higher elevations and foothills of the northern border of Guanacaste Province, Costa Rica, are large like *ultimus*, but as a series are closer to *eburneirostris* in color.

Specimens Examined

X. f. mentalis: Sinaloa: Culicán, 1; near Mazatlán, 13; Plomosas, 2; Escuinapa, 1. Durango: Chacala, 3. Nayarit: Santiago, 1; San Diego, 1 (U.S.N.M.); Río Quimeche, 4 (C.M.). Jalisco: Las Palmas, 3; San Sebastián, 3. Colima: Manzanillo, 7. Michoacán: Cayaco, 1 (U.S.N.M.).

X. f. flavigaster: Jalisco: Barranca Ibarra, 1. Guerrero: El Naranjo, 1; La Unión, 1; Zihuantenejo, 1; Papayo, 1; Acahuizotla, 1; Tres Palos, 1. Oaxaca: Puerto Ángel, 2; Tapana, 1 (U.S.N.M.).

X. f. saltuarius: TAMAULIPAS: Gómez Farías, 3 (C.M.); Alta Mira, 12 (U.S.N.M.). SAN LUIS POTOSÍ: Palitla, 2 (C.M.); Valles, 3 (C.M., U.S.N.M.). VERACRUZ: Rivera, 1; Mirador, 1; Orizaba, 2; Córdoba, 1; Motzorongo, 2. PUEBLA: Metlatoyuca, 5 (U.S.N.M.).

X. f. ascensor: VERACRUZ: Carrizal, 2; Buena Vista, 1; Paso Nuevo, 1; Tres Zapotes, 15; Cerro Tuxtla, 3; Santa Lucrecia, 1 (U.S.N.M.); Coyame, 5 (C.M.). OAXACA: Guichicovi, 1; Santo Domingo, 2. TABASCO: La Venta, 10; Teapa, 3; Frontera, 1 (U.S.N.M.).

X. f. yucatanensis: CAMPECHE: Matamoros, 1; Pacaitún, 1 (C.M.); Apazote, 1; Yohaltún, 1; Canasayab, 1 (U.S.N.M.). YUCATÁN: Mérida, 1 (U.S.N.M.); Chichén Itzá, 3 (U.S.N.M.), 1 (C.M.); Temax, 1 (U.S.N.M.). QUINTANA ROO: La Vega, 6; Puerto Morelos, 2 (U.S.N.M.).

X. f. yucatanensis × *eburneirostris*: BRITISH HONDURAS: Various localities, 30 (C.M.).

X. f. eburneirostris: OAXACA: Santa Efigenia, 4. GUATEMALA: Telemán, 1; Sabana Grande, 1 (U.S.N.M.). HONDURAS: Lago de Yohoa, 5; La Ceiba, 6 (C.M.), 3 (U.S.N.M.); Trujillo, 4 (C.M., U.S.N.M.); Planes, 3; San Esteban, 1 (C.M.); Santa Ana, 1 (U.S.N.M.). EL SALVADOR: Acajutla, 1; La Libertad, 1 (U.S.N.M.). NICARAGUA: San Juan del Sur, 1; Sucuyá, 2; Managua, 1 (U.S.N.M.).

X. f. eburneirostris × *ultimus*: COSTA RICA: Cerro Santa María (C.M.); Volcán Rincón de la Vieja, 1 (U.S.N.M.); 15 mi N of Liberia, 2 (U.C.L.A.); Miravalles, 1 (A.M.N.H.).

X. f. ultimus: COSTA RICA: NICOYA: Tambor, 5 (L.A.Co.M.); Ojo Ancho, 2; Paquera, 1 (M.C.Z.).

Acknowledgments: Specimens to supplement series in our own institutions were kindly loaned by the following: Dr. Kenneth Stager of the Los Angeles County Museum, Dr. Raymond A. Paynter of the Museum of Comparative Zoölogy, Dr. Thomas R. Howell of the University of California at Los Angeles, and Dr. Paul Slud of the American Museum of Natural History. Dr. Slud also gave us the benefit of his notes on the distribution of this species in Costa Rica.

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Vol. 75, pp. 61–66 30 March 1962

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

NOTES ON SPECIES OF *LETHOCERUS* MAYR AND *HYDROCYRIUS* SPINOLA DESCRIBED BY GUERIN-MENEVILLE, L. DUFOUR, A. L. MONTANDON, AND G. A. W. HERRICH-SCHÄFFER (BELOSTOMATIDAE; HEMIPTERA)

By Arnold S. Menke
University of California, Davis

During my work on a revision of the Western Hemisphere *Lethocerus* the identity of several species, hitherto poorly known, has been ascertained. Since it will be sometime before my revision is finished it is desirable to make this data available now.

My sincere thanks are given to Dr. R. M. Bohart, University of California, Davis, for making comparisons and notes on the Guerin types in Naples. Dr. Max Beier, Naturhistorisches Museum, Wien, has lent the types of several species described by Dufour and Montandon, and I would like to express my appreciation for his generosity.

Guerin-Meneville, 1856

In 1856 Guerin listed five species of Belostomatidae from Cuba, four of which he described as new: *Belostoma medium, curtum, capitatum,* and *angustatum.* His fifth species was "*Belostoma grande* Linnaeus" which undoubtedly referred to the species now known as *Lethocerus colossicus* (Stal).

The first author to consider Guerin's species was Mayr (1865) who synonymized *B. capitatum* with *Hydrocyrius columbiae* Spinola. In 1910 Montandon (see Hussey, 1952) saw Guerin's types and verified that *capitatum* was a *Hydrocyrius.* De Carlo (1938) considered *capitatum* synonymous with *Lethocerus annulipes* (Herrich-Schäffer) probably on the basis of Guerin's original description which states that *capitatum* has two dark longitudinal lines on the abdominal venter. It is true that *L. annulipes* has this character but *H. columbiae* does also, and had De Carlo been aware of Montandon's paper he probably would not have made the above synonymy. In his description, Guerin emphasized that the head of *capitatum* was very broad and the eyes large and oblique. These characters fit *Hydrocyrius* much better than *Lethocerus.*

According to Bohart's notes, the type of *capitatum* is a female and bears a green Guerin type label, and another label "Cuba?," the latter indicating that Guerin himself was not sure of the origin of the specimen. It is interesting to note that Spinola described *Hydrocyrius* from Colombia. All species of this genus are African.

Guerin's *Belostoma angustatum* was tentatively placed in synonymy with *L.* (*Benacus*) *griseus* (Say) by Mayr in 1871. Montandon after seeing the type in Naples verified Mayr's assumption. Bohart's notes leave little doubt that both Mayr and Montandon were correct. The type lacks grooves on the profemur and *L. griseus* is the only known species with this feature. The type is a female and bears one of Guerin's green type labels, "Cuba, No. 260," and a 1908 Montandon determination label, "Benacus griseus Say."

Belostoma medium was synonymized with *L. annulipes* by Montandon in 1910 (see Hussey, 1952). Hussey suggested that Montandon's *annulipes* should be considered the same as *delpontei* De Carlo, not *annulipes* (Herrich-Schäffer). What Hussey did not realize however, when he made this statement, is that *delpontei* is strictly a South American species, and the entity in North and Central America that has been masquerading under De Carlo's name is a different species. Bohart's notes on the type of *B. medium* prove that Guerin's name should be applied to this undetected species. Although the type has lost both middle and hind pairs of legs it compares very favorably with Cuban specimens that I gave Bohart. The details of the head as well as the typical reddish color of the abdominal venter agree with my Cuban material. The abdomen of the type is badly eaten by pests but the genital plate is intact and the specimen is a male. It has a green Guerin type label, "Cuba," and a 1908 Montandon determination label "Lethocerus annulipes H. S." *L. medius* and *delpontei* are very similar externally but the male genitalia are strikingly different. In *medius* the ventral diverticulum of the phallus bears a median, ventral semicircular flange, apically. This flange is very prominent in a lateral view of the phallus. In *delpontei* the flange is weakly developed and not visible in lateral view, the lateral margins of the diverticulum extending below it.

Dr. Bohart could not find any specimens at Naples labeled *Belostoma curtum.* Montandon (1910, see Hussey, 1952) mentions a specimen at Naples labeled by Guerin "latum, type," and states that it probably is a lapsus, inferring that the specimen is the type of *B. curtum.* Bohart saw the specimen referred to and found it to be identical with *L. medius* Guerin. It is a male and bears a green Guerin type label, and another, "Cuba." I agree with Montandon's theory and place *curtus* in synonymy with *medius.*

Leon Dufour, 1863

Leon Dufour described several New World species of *Lethocerus* under the name *Belostoma*: *ruficeps, signoreti, distinctum, litigiosum,* and *obscurum.* I have not seen the types of the last three.

The type of *ruficeps* is a female and bears the following labels:

"Brasilien, Coll. Signoret;" "ruficeps," det. Dufour; "annulipes," det. Mayr; "annulipes," det. Montandon. The specimen agrees with Dufour's meager description except for the length. He gave the length as 35 mm but the type is 64.5 mm long. Dufour's measurement must be a lapsus since no species of *Lethocerus* are that small. *B. ruficeps* should be synonymized with *L. annulipes* (Herrich-Schäffer). The longitudinal black lines on the abdominal venter characterize *annulipes* and are present in *ruficeps.*

There are four specimens in the Vienna Museum labeled by Dufour as *Belostoma signoreti,* but he cited only one example in the original description. Dufour gave the length of the type as 64 mm and one of the four specimens before me, a female, comes close to this, being 66 mm long. I consider this as the holotype. It bears the following labels: "Amer. Merid., Coll. Signoret;" "signoreti," det. Dufour; "annulipes." det. Mayr; "annulipes," det. Montandon. All four specimens have the black abdominal stripes and are *annulipes* (Herrich-Schäffer). The specimen that Dufour described as a variety of *signoreti* is a male *L. medius.* It bears the following labels: "Laguaira, Coll. Signoret;" "signoreti," det. Dufour; "annulipes," det. Mayr; and "annulipes," det. Montandon.

A. L. Montandon, 1896

The type of *Belostoma mayri* Montandon is a female of *Lethocerus annulipes.* The specimen bears the following labels: "Brasil, 12;" "annulipes," det. Mayr; and "mayri," det. Montandon.

G. A. W. Herrich-Schäffer, 1848

Most authors consider that the common South American species of *Lethocerus* with two black lines on the abdominal venter is the same as that described by Herrich-Schäffer as *Belostoma annulipes.* So far the type has not been located and may be destroyed. The only characters given in the original description are "die vier hinteren Schenkel und Schienen haben unten drei braune Querbinden, aus Sudamerika." This statement would apply to all South American *Lethocerus.* The dorsum (Fig. 803) and the venter (Fig. 804) of this insect are depicted by fairly good illustrations on plate 258 of Herrich-Schäffer's work. The ventral view plainly shows the 3 rings on the femora and tibiae referred to in the description, but there are no solid black lines on the abdomen. The illustrator used a type of stipple shading along both sides of the suture dividing the median and parasternites, but considering the overall accuracy of the drawing, it would seem that if Herrich-Schäffer's type had possessed solid stripes they would have been indicated. Herrich-Schäffer's name would appear to be more appropriately applied to a non-vittate species such as the common South American *delpontei* De Carlo. Mayr (1871), acting as first revisor, synonymized *ruficeps* and *signoreti* Dufour with *annulipes.* Dufour's species have the black lines on the venter and Mayr's action indirectly fixed this character with *annulipes.* It is well known that both Mayr and Montandon confused several distinct species under Herrich-Schäffer's name. No apparent significance was attached to the black lines, and specimens were called *annulipes* with or without them. In 1865 Mayr noted one specimen of *annulipes* differing from the rest in possessing two black lines on the abdomen! Mayr apparently never used the black lines as a specific character for *annulipes*, even in his 1871 revision. However, under the circumstance of common usage, and by Mayr's authority as first revisor, it seems best to retain *annulipes* for the vittate species of *Lethocerus* at least for the present, rather than create needless new synonymy by changing the placement of *annulipes* to a non-vittate species. In so doing, it must be assumed that the lack of definite black lines in the illustration mentioned previously is an illustrator's lapsus.

Synonymical Summary

The proper placement of the species discussed is shown below. The known distribution of each is given in brackets.

Lethocerus medius (Guerin-Meneville), 1856 [Greater Antilles, Central America, southwestern United States.]
- *Belostoma medium* Guerin-Meneville.
- *Belostoma curtum* Guerin-Meneville, 1856.
- *Belostoma signoreti* (variety) Dufour, 1863.
- *Lethocerus delpontei* Auct., nec De Carlo.
- *Lethocerus annulipes* Auct., nec Herrich-Schäffer.

Lethocerus annulipes (Herrich-Schäffer), 1848 [South America, Lesser Antilles.]
- *Belostoma annulipes* Herrich-Schäffer.
- *Belostoma ruficeps* Dufour, 1863.
- *Belostoma signoreti* Dufour, 1863.
- *Belostoma mayri* Montandon, 1896.

Lethocerus (*Benacus*) *griseus* (Say), 1832 [Eastern United States, east coast of Mexico, Greater Antilles.]
- *Belostoma angustatum* Guerin-Meneville, 1856.

Hydrocyrius columbiae Spinola, 1850 [Africa.]
- *Belostoma capitatum* Guerin-Meneville, 1856.

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PROCEEDINGS

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A NEW LIZARD OF THE GENUS *GEKKO* FROM THE PHILIPPINE ISLANDS

BY WALTER C. BROWN AND ANGEL C. ALCALA

Menlo College, Menlo Park, California and Natural History Museum, Stanford University, California; Silliman University, Philippine Islands

Three examples of an undescribed species of *Gekko* were collected in dipterocarp forest on Palawan Island by members of the Stanford-Silliman Expedition to that Island during March and April 1961. The population appears to have its closest affinities with *Gekko pumilus,* Boulenger (1885: 473) which is known from New Guinea and Murray Island. These species are alike in that the digits are moderately webbed and in that enlarged tubercles among the small, granule-like scales on the dorsal and lateral surfaces are lacking. The present species is readily distinguished from *pumilus* by the continuous series and reduced number of preanal and femoral pores, the greater number of subdigital lamellae, and the greater number of labials (see Table 1).

The Stanford-Silliman Expedition to Palawan Island was supported by a grant from the National Science Foundation. Illustrations were prepared by Mr. Walter Zawoski, Stanford Research Institute.

Gekko athymus, new species

Holotype: Stanford University Reptile Register No. 23119, a male, collected in dipterocarp forest about 8 to 9 kilometers south of Balico,

TABLE 1. Pore, labial and lamellar counts for *Gekko pumilus* and *Gekko athymus*

SPECIES	PREANAL PORES	FEMORAL PORES	UPPER LABIALS	LOWER LABIALS	THIRD TOE LAMELLAE
Gekko pumilus	11	12-12	11-12	10	10-12
Gekko athymus	23		13-15	12	18-20

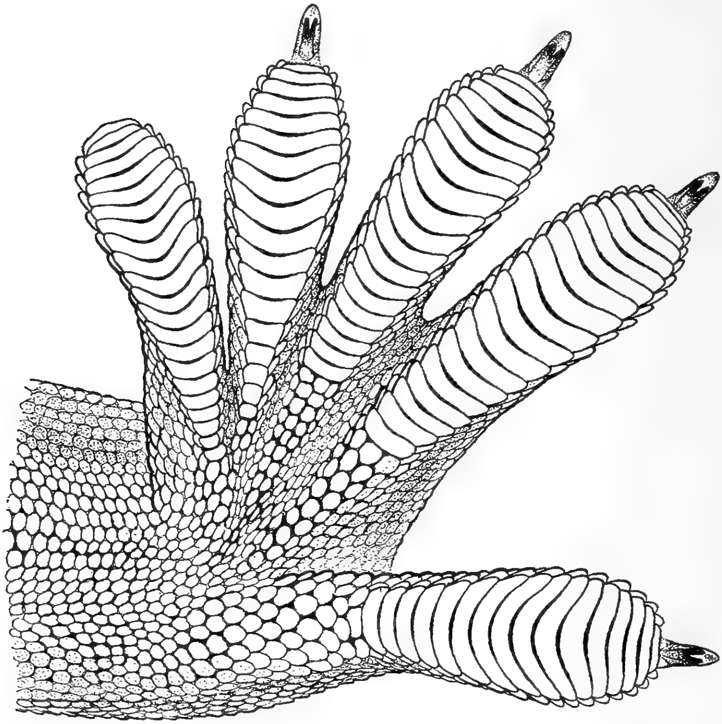

FIG. 1. *Gekko athymus,* new species. Under surface of hind foot.

Palawan Island near north end of Village Range; elevation about 75 meters, April 1961.

Paratypes: S.U. 23121, a female, collected in dipterocarp forest at an elevation of about 100 meters on the northeast side of Central Peak, (Malabo Peak) about 8 kilometers southwest of Iwahig, Palawan Island; and S.U. 23120, a juvenile, collected in the upper edge of the dipterocarp forest at about 600 meters on the southeast slope of Thumb Peak, about 5 kilometers west-northwest of Iwahig, Palawan Island.

Diagnosis: A *Gekko* covered dorsally by small, relatively uniform granules, without enlarged tubercles of any kind; nostril in contact with rostral; toes about one-third webbed except between the first and second toes of the hind foot where the web is lacking; preanal pores in a moderately long series, narrowly separated from the short series of femoral pores; toes moderately dilated throughout their length; 19 to 20 lamellae beneath the fourth toe of the hind foot.

Description: A *Gekko* of moderate size, an adult female measures 109 mm from snout to vent, and the adult male measures 101 mm from snout to vent; relatively slender, head about 1⅓ times as long as broad;

snout rounded, its length about 1½ times the diameter of the orbit; the latter measurement being between ¼ and ⅓ the length of the head; ear small, its diameter about ⅓ that of the orbit; nostril in contact with the rostral; upper labials 13–15; lower labials 12; nostril bordering the rostral; rostral much broader than long; internasals large, separated by a single scale; granules of head largest on snout, gradually being reduced posteriorly until mergence with the small, relatively uniform granules on the dorsal surfaces of the body, the latter become enlarged on the lateral surfaces and gradually merge with the imbricate ventral scales; no enlarged or raised tubercles; ventral scales in 34 to 36 longitudinal rows at the middle of the body; middle pair of chin shields elongated; female without pores; the type with 23 preanal and femoral pores in a continuous arched series; tail subcylindrical except at base where it is much broader than deep; subcaudal scales about twice as broad as adjacent scales; toes long, moderately dilated, about one-third webbed except between the 1st and 2nd toes of the hind foot, where the web is lacking; 19 to 20 undivided lamellae beneath the 4th toe of the hind foot; inner toe clawless (Fig. 1).

Color: Dark grayish brown to reddish brown on the dorsal surfaces, indistinctly marked with darker, broad, undulating transverse bands which are most heavily pigmented at the posterior border; upper labials cream, heavily flecked with brown and dark edge; lower labials more lightly flecked with brown; venter whitish or with scattered brown flecks most numerous beneath the head and laterally on the body.

Measurements of the holotype (in mm): Snout-vent length 101; snout to ear 25½; breadth of head 18½; snout 11; eye 7; ear 2½; hind limb 46.

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PROCEEDINGS
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A NEW PLETHODONTID SALAMANDER (GENUS *MAGNADIGITA*) FROM THE CORDILLERA OCCIDENTAL OF COLOMBIA

By Arden H. Brame, Jr. and David B. Wake
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The presence in collections of representatives of several undescribed species has been revealed during the preparation of a review of South American salamanders (family Plethodontidae). Although the study is still in progress, it seems advisable to describe at this time a species that is apparently the lone representative of the genus *Magnadigita* on the South American continent. The new species is of obvious northern affinities and has no close relatives among South American forms. The species is known only from a high elevation on Páramo Frontino, a highland plateau in the Cordillera Occidental of Colombia. In allusion to the fact that it occurs at a higher elevation than any other member of the genus, and at an altitude exceeded by only one or two other plethodontid salamanders, it may be known as:

Magnadigita hypacra, new species

Holotype: United States National Museum 131481; an adult female from Páramo Frontino, 11,850 feet (3,610 meters), Departmento de Antioquia, Colombia, collected 18 August 1951, by M. A. Carriker, Jr. The species is known from the unique holotype.

Diagnosis: A plethodontid salamander referred to the genus *Magnadigita* on the basis of absence of a sublingual fold, presence of subdigital pads on the tips of truncate unflattened phalanges, and the incomplete webbing of hands and feet. A medium-sized species (62.0 mm snout-vent length); head of moderate length and width; eyes and upper eyelids moderate; moderate number of maxillary, large number of dentary, and small number of vomerine teeth; tail length moderate, shorter than body; hands and feet narrow, webbing reduced, with corresponding great freedom of digits. Coarse dorsal speckling of yellow-buff on dark brown ground color; large yellow spots scattered sparsely over lateral surfaces of body and ventral surfaces of tail and body.

Magnadigita hypacra is distinguished from all other South American salamanders by the near absence of webbing of hands and feet; from the *Magnadigita subpalmata* group (including *pesrubra* and *torresi*) of Costa Rica, in having larger adult size, fewer maxillary and vomerine teeth, and larger eyelids; from *Magnadigita cerroensis* of Costa Rica, in having a different color pattern, more maxillary and dentary teeth, and smaller hands and feet; from the recently described *Magnadigita marmorea* from el Volcán de Chiriquí (Volcán Baru), Panamá (Tanner and Brame, 1961), in having a different color pattern, fewer vomerine teeth, shorter hind limbs, smaller hands and feet, and a smaller head.

Description of Holotype: Adult female, vent walls folded, hedonic glands absent. Snout truncate in dorsal and lateral view; nostril small, labial protuberances moderate for female; canthus moderately rounded, not well developed. Snout-vent length 7.0 times head width; snout-vent length 4.7 times snout-gular length. Horizontal groove extends posteriorly from eye 2.6 mm, then proceeds ventrally to mandible, becomes shallow and less obvious, extends across gular area parallel to gular fold at point 6.2 mm anterior to fold. Gular fold continuous across gular area, extending dorsally as groove, then proceeding anteriorly and mesially to dorsal midline. Small gular grooves paralleling the mandibular rami faintly indicated. No sublingual fold, tongue boletoid. Vomerine teeth 10 on left, 9 on right side, extending slightly more than one choanal diameter from lateral choanal border toward maxilla. Maxillary teeth 26 on left, 22 on right side, extending posteriorly to level of center of eyeball. Four premaxillary teeth, none piercing lip ridge. Dentary teeth (both sides) 74. Well defined costal grooves, 13 on each side including one each in axilla and groin; caudal grooves 26. Tail 0.85 times snout-vent length; moderately constricted at base with moderate lateral compression throughout. Post-iliac gland not evident. Limbs of moderate length; when appressed to sides of trunk two costal folds remain uncovered; snout-vent length 4.7 times right fore limb; snout-vent length 4.4 times right hind limb. Webbing of hand slight; first finger completely in web; finger two, with one and one-half phalanges free of web; finger three, with two and one-quarter phalanges free of web; finger four, with one phalanx free of web. Webbing of foot slight; toe one completely in web; toe two, with one and one-half phalanges free of web; toe three, with slightly over two phalanges free of web; toe four, with two phalanges free of web; and toe five, with one phalanx free of web. Well developed finger and toe pads at tips. Fingers in order of decreasing length: 3,2,4,1; toes in order of decreasing length: 3,4,2,5,1.

Measurements (in mm): Head width 8.7; snout-gular fold 13.0; head depth at posterior angle of jaw 4.6; eyelid length 4.0; eyelid width 1.9; anterior rim of orbit to snout 3.1; horizontal orbital diameter 3.0; interorbital distance 3.0; distance between vomerine teeth and parasphenoid tooth patch 0.8; snout to fore limb 16.9; distance separating internal choanae 2.1; internarial distance 2.9; snout projection beyond mandible 0.8; snout-posterior angle of vent 62.0; snout-anterior angle of vent 59.0; axilla-groin length 34.0; tail length 51.5; tail width at base

3.5; tail depth at base 4.4; fore limb length 13.3; hind limb length 14.0; width of right hand 5.1; width of right foot 6.2.

Coloration: Over-all dorsal coloration dark; dorsal ground color very dark brown with coarse speckling of yellow, yellow-buff, to yellow-orange; speckling effect may be due to absence of pigment; light coloration lends vermiculated appearance to head and portions of dorsum and tail; large yellow spots on lateral surfaces, but are sparse and scattered; a few large yellow spots extend onto venter; tail sparsely spotted with yellow laterally and ventrally; gular region spotted with yellow. Lateral and ventral yellow spotting apparently due to presence of yellow pigment. Limbs mottled with yellow spots, but ground color dark. Venter lighter than dorsum, over-all appearance gray-brown with exception of tan gular region; ventral melanophore pattern reticulate under magnification.

Relationships: The closest allies of *Magnadigita hypacra* are found among the *Magnadigita* of Panamá and Costa Rica, rather than with any South American plethodontid salamander. The new form resembles the recently described *M. marmorea* (Tanner and Brame, 1961) from el Volcán de Chiriquí, Panamá, in general body proportions and numbers of maxillary and dentary teeth. The color pattern, the low number of vomerine teeth, the shorter limbs, the smaller head, and the size and shape of the hands and feet readily distinguish *M. hypacra* from *M. marmorea*. Similarities between *M. hypacra* and the *M. subpalmata* group are evident in head-body proportions, size and dimensions of hands and feet, and limb length. *M. hypacra* has fewer teeth, proportionately larger eyes, and apparently is a larger species than either *M. subpalmata* or its close relatives, *M. pesrubra* and *M. torresi.* Although *M. hypacra* and *M. cerroensis* share similar adult size and numbers of vomerine teeth, the new form has more maxillary and dentary teeth, shorter hind limbs, different head proportions, different shape of hands and feet, and a different color pattern than *M. cerroensis.* There is little or no indication of relationship to *M. nigrescens,* a small form known only from the unique holotype, or to *M. robusta,* a very large and distinctive form.

Magnadigita hypacra appears to be more closely related to *M. subpalmata* and *M. marmorea* than to any other known forms. The possibility of a relationship to *M. cerroensis* is also indicated by the presence of several common characters in the two species.

Remarks: The genus *Magnadigita* is represented in southern Central America and South America by eight nominal species: *M. nigrescens,* known only from the type locality in Costa Rica; *M. robusta,* known from Costa Rica and Panamá; *M. cerroensis,* known from Costa Rica; *M. subpalmata,* known from Costa Rica and Panamá; *M. pesrubra* and *M. torresi,* known from southern Costa Rica; *M. marmorea,* known only from el Volcán de Chiriquí, Panamá; and *M. hypacra,* known only from Páramo Frontino, Colombia. These species are separated geographically from the *Magnadigita* to the north, since no *Magnadigita* are known from Nicaragua. With the exception of *Magnadigita hypacra* and the

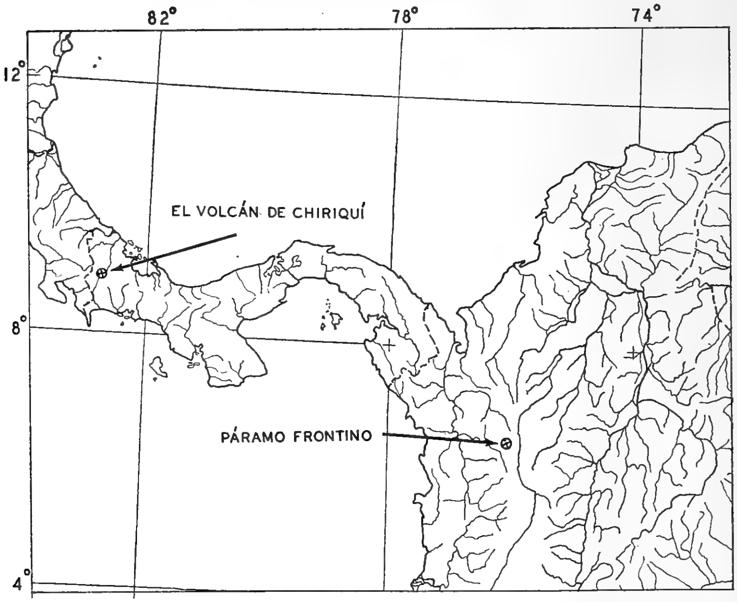

Fig. 1. Map of northern South America and southern Central America indicating locations of highlands species of *Magnadigita* on el Volcán de Chiriquí, Panamá (*M. marmorea*), and Páramo Frontino, Colombia (*M. hypacra*).

Oedipina of Ecuador and Colombia, it appears that all known South American salamanders are assignable to the genus *Bolitoglossa.*

In contrast to *Bolitoglossa,* which occurs from sea level to great elevations, the southern species of *Magnadigita* exist only at moderate to great elevations. The geographic location of the southern highland populations of *Magnadigita* is indicated on the accompanying map (Fig. 1).

Nothing is known of the habitat of *M. hypacra,* but it presumably was collected in the páramo (alpine grassland) zone. It seems likely that the species occurs under rock rubble in moist situations in regions of dwarf vegetation. Other southern *Magnadigita* are found in similar situations at high elevations. Reduced webbing in *Magnadigita* appears to be correlated with a more terrestrial existence than for the almost fully webbed species of *Bolitoglossa.*

The name *hypacra* is derived from the Greek, *hypo* (less than, almost) and *akros* (highest).

Acknowledgments: We are indebted to Jay M. Savage for his encouragement and critical review of the manuscript, and to Doris M. Cochran of the United States National Museum for the loan of the typical specimen. Comparative material of *Magnadigita marmorea* was made available through the courtesy of Alan E. Leviton of the California Academy of Sciences and Charles M. Bogert of the American Museum of Natural History. Additional comparative material of other species was collected by the senior author in 1959 while a member of a University of Southern California field party studying in Costa Rica under the sponsorship of the National Science Foundation (G-6089). The junior author gratefully acknowledges support received from the National Science Foundation in the form of a Cooperative Graduate Fellowship.

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PROCEEDINGS
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NEW SPECIES OF POLYCHAETE WORMS (SPIONIDAE: *SPIOPHANES*) FROM THE EAST AND WEST COAST OF NORTH AMERICA

By Marian H. Pettibone
University of New Hampshire

The two new species of *Spiophanes* described herein were obtained from two sources:

1. One species was collected by Roland L. Wigley and others off Massachusetts and found in the collections of polychaetes at the U. S. Fish and Wildlife Station at Woods Hole, Massachusetts, where I worked during the summer of 1960.
2. One species was collected by Edith and Cyril Berkeley in British Columbia, Canada, and confused with *Spiophanes cirrata* Sars.

This study was carried out at the United States National Museum and aided by a grant from the National Science Foundation (NSF G-4833).

Family Spionidae
Genus *Spiophanes* Grube, 1860

Type species: S. *kroyeri* Grube, 1860; by monotypy.

Diagnosis: Spionids without branchiae. With hooked seta in neuropodium of first setiger and longer curved lower neuroseta in most segments of body. With capillary notosetae only, without notopodial hooks. Body divided into 3 more or less distinct regions: (1) anterior region (setigers 1–4) with well developed notopodial and neuropodial postsetal lamellae (notopodial lamellae may be more dorsal in position and simulate branchiae); (2) middle region (setigers 5–14) with interramal parapodial thread glands, with short limbate neurosetae and poorly developed neuropodial lamellae; (3) posterior region (beginning on setiger 15) with bidentate or tridentate neuropodial hooks, with poorly developed neuropodial lamellae. Proboscis saclike. With anal cirri. Tubes elongate, slender, collapsible, sandy or muddy.

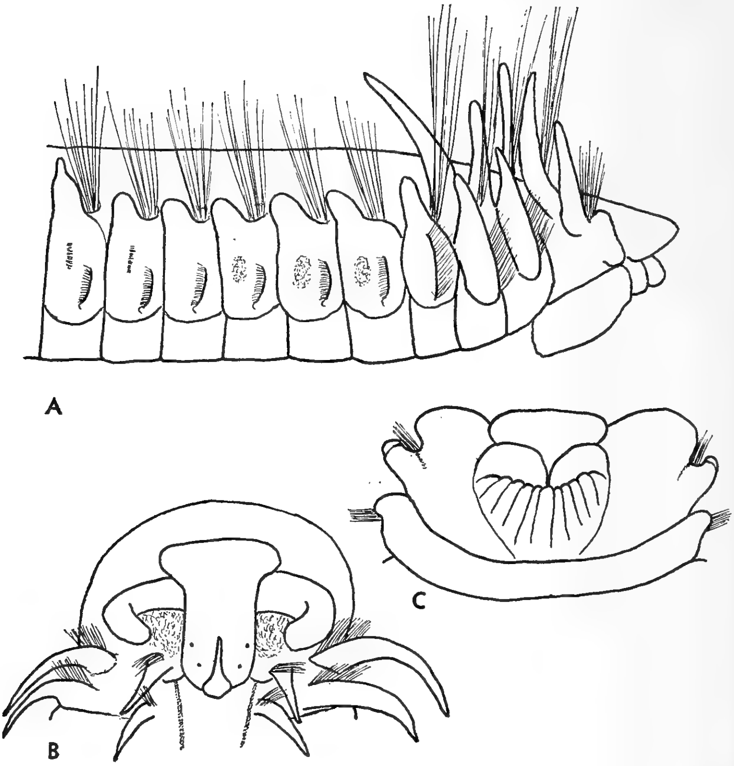

FIG. 1. *Spiophanes berkeleyorum,* new species: a.—Lateral view anterior end, tentacular palps missing, proboscis extended. b.—Same, dorsal view. c.—Same, ventral view.

Spiophanes berkeleyorum, new species
Figs. 1–4

Spiophanes cirrata Berkeley, 1927, p. 416.—Berkeley and Berkeley, 1936, p. 475, Fig.; 1952, p. 24, Figs. 44–46; 1960, p. 791. Not Sars, 1871, p. 410.

The type and 6 paratypes were collected in Departure Bay, east coast Vancouver Island, British Columbia, 25 April 1936, by Edith and Cyril Berkeley. They report the species as fairly common on clean sand banks and in mud at the head of Departure Bay and at Nanoose Bay in British Columbia and at Friday Harbor, Washington, at low tide and dredged up to 250 fathoms. I obtained a single specimen in the head of Carr Inlet, Puget Sound, Washington, in mud, 10 fathoms, 2 August 1938. The types (USNM Cat. No. 30399, holotype, and 30400) are deposited in the United States National Museum. It is named for

FIG. 2. *Spiophanes berkeleyorum*, new species: a.—Right parapodium from setiger 1, anterior view. b.—Same, from setiger 2. c.—Same, from setiger 4.

Mr. and Mrs. Cyril Berkeley, who kindly sent me the specimens at my request.

Description: Length up to 35 mm, width up to 2 mm, segments up to 100. Body flattened dorsoventrally anteriorly, tapered gradually posteriorly. Prostomium (Fig. 1, a–c) bell-shaped, widest anteriorly, the anterior angles rounded, extending posteriorly on first setiger, with 4 small deep-set inconspicuous eyes, with prominent median occipital antenna at the level of the notopodial lobes of the first setiger.

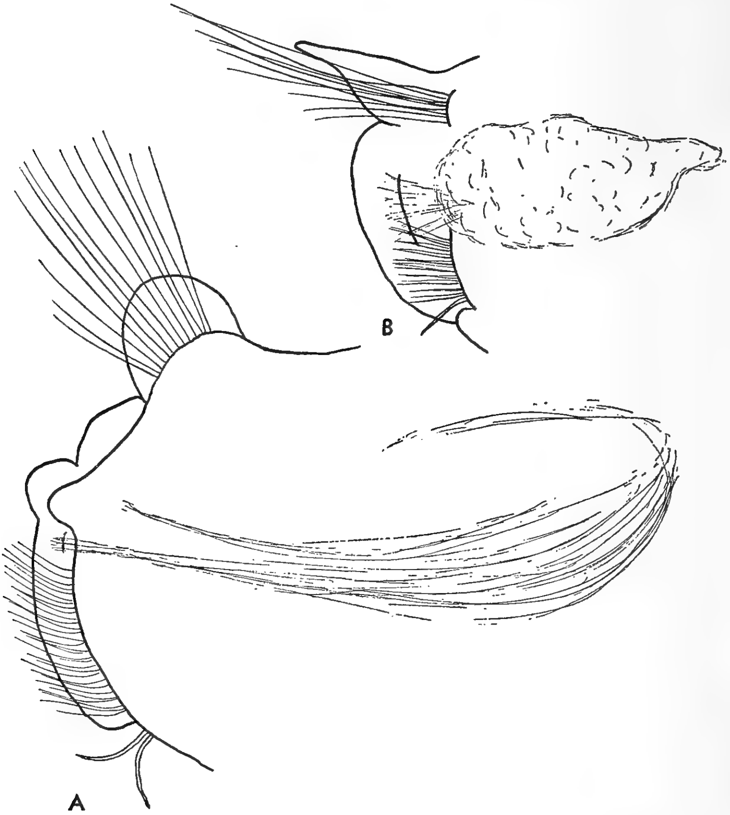

FIG. 3. *Spiophanes berkeleyorum,* new species: a.—Right parapodium from setiger 5. b.—Same, from setiger 10.

Peristomial segment achaetous, enlarged, lateral and ventral to prostomium, with a raised fold lateral to tentacular palps. Tentacular palps with scalloped borders along the ciliated grooves. Dorsal sensory grooves parallel, extend to about setiger 14. Proboscis (Fig. 1, a, b) saclike.

Anterior region (first four setigers) with well developed subulate notopodial and neuropodial postsetal lamellae, with long slender capillary notosetae and shorter limbate neurosetae tapering to fine tips. First setiger (Fig. 2, a) with subulate postsetal lobes, the notopodial shorter and more slender than the neuropodial, with long smooth slender capillary notosetae and shorter tapering neurosetae, with a single stout hooked neuroseta. Second and third setigers (Fig. 2, b) with neuropodial lamellae wider basally, with tapering neurosetae only. Beginning on setiger 4 (Fig. 2, c) and continuing along body, with 1–2 stout curved darker lower neurosetae.

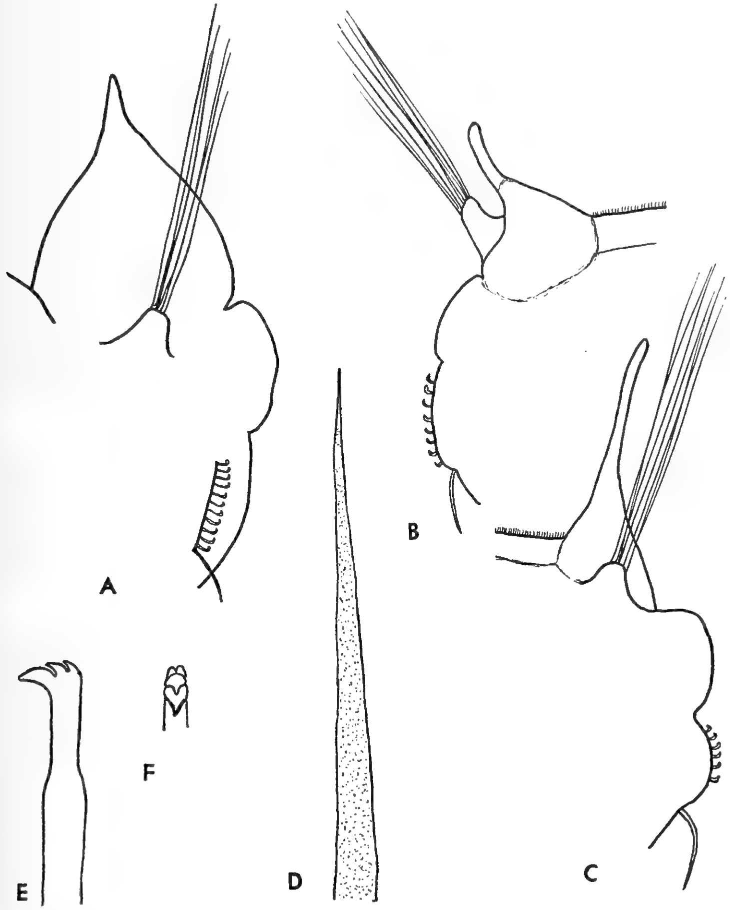

FIG. 4. *Spiophanes berkeleyorum*, new species: a.—Left parapodium from setiger 20, anterior view. b.—Same, from middle of body, posterior view. c.—Same, from posterior end of body, anterior view. d.—Lower neuropodial acicular seta. e.—Neuropodial hook, lateral view. f.—Tip of same, frontal view.

Middle region (setigers 5–14, Figs. 1, a; 3, a, b) with parapodial thread glands furnished with bundles of straight threads or fibers which may emerge posterior to the upper neurosetae. Notopodial lamellae of setigers 5–9 (Fig. 3, a) low, rounded, becoming longer and tapering to digitiform tips in more posterior setigers (Fig. 3, b); neuropodial lamellae wide, low; neurosetae short, limbate, with short fine tips.

Posterior region (beginning on setiger 15) with large, cordiform postsetal notopodial lamellae (Fig. 4, a), becoming more slender posteriorly, with long digitiform tips (Fig. 4, b, c). With rounded interramal

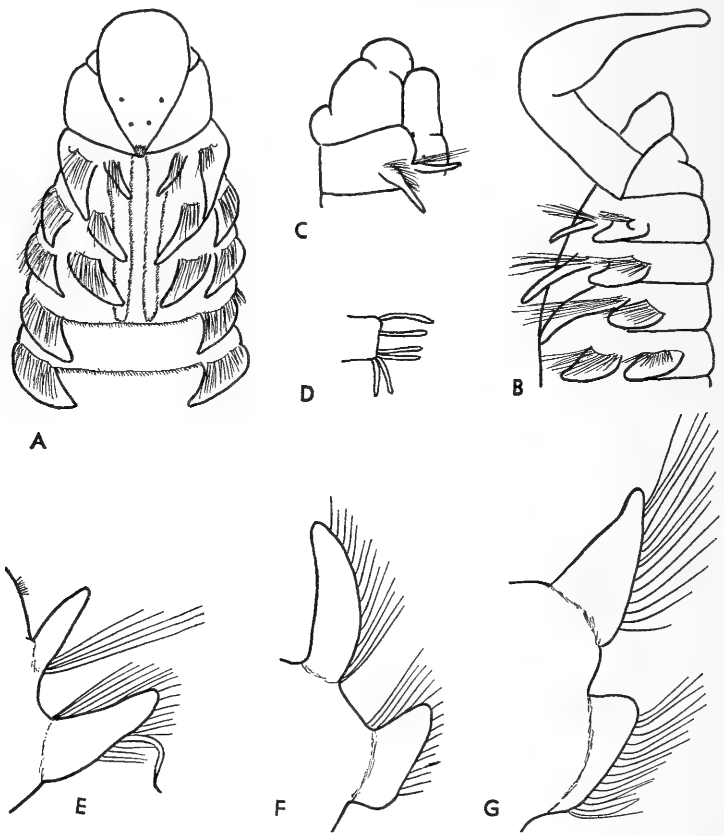

FIG. 5. *Spiophanes wigleyi,* new species: a.—Dorsal view anterior end, tentacular palps missing. b.—Lateral view anterior end. c.—Lateral view anterior end with proboscis everted. d.—Lateral view posterior end. e.—Right parapodium from setiger 1, posterior view. f.—Same, from setiger 2. g.—Same, from setiger 4.

glandular lobe and low neuropodial lobe with row of hooks and 1–2 lower stout curved acicular setae (Fig. 4, d). Neuropodial hooks bare (without hood), tridentate as viewed laterally (Fig. 4, e), quadridentate as viewed frontally (Fig. 4, f), the upper tooth being bifid, 11 (anteriorly) to 6 (posteriorly) hooks per row. Transverse ciliated ridges begin on about setiger 17, low at first, becoming well marked posteriorly, fused to inner basal borders of notopodial lamellae (Fig. 4, b, c). Without interramal genital pockets (as in *S. kroyeri*).

Anal end cylindrical with fringe of 8–12 delicate anal cirri. Color (in life): Orange. Tube: Tough transparent base encrusted with fine sand or mud, fitting the occupant closely. Eggs in body irregular in shape, with several egg vesicles and thick finely striated shell.

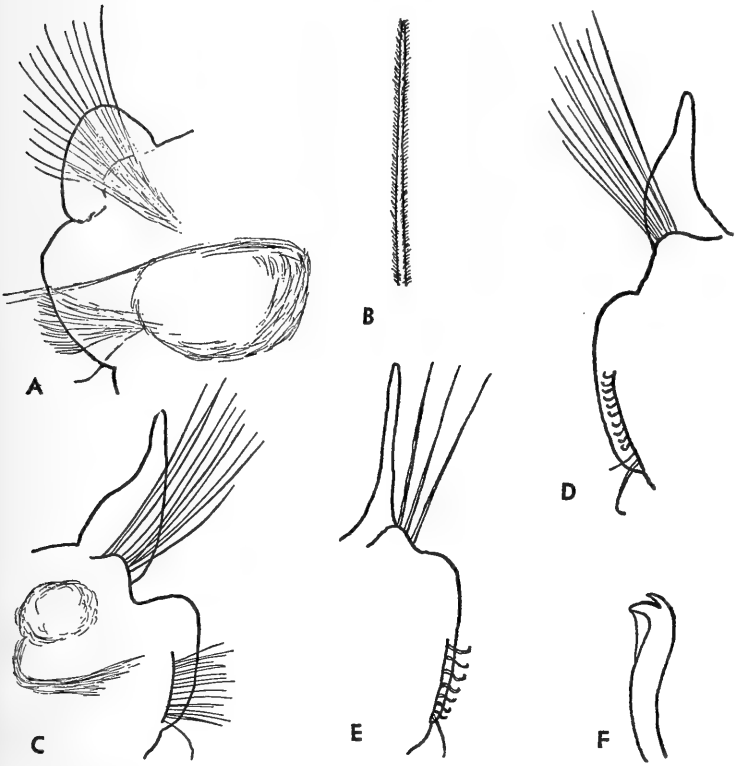

FIG. 6. *Spiophanes wigleyi,* new species: a.—Left parapodium from setiger 7, posterior view. b.—Tip of one of projecting interpodial frayed setae. c.—Left parapodium from setiger 10, anterior view. d.—Right parapodium from setiger 16, anterior view. e.—Left parapodium from far posterior region, anterior view. f.—Neuropodial hook.

Distribution: Western Canada (British Columbia), Washington (San Juan Archipelago, Puget Sound), low water to 250 fathoms.

Remarks: Spiophanes berkeleyorum resembles *S. kroyeri* Grube and *S. longicirris* Caullery. The differences are indicated in the Key on page 85.

Spiophanes wigleyi, new species

Figs. 5–6

The species is represented by 20 specimens which were dredged by *Albatross III* in the Georges Bank area off Massachusetts, 40° to 41° N, 66° 46′ to 69° W, 39 to 74 fathoms, on bottoms of very fine to coarse sand and gravel, 1955 and 1957. The types (USNM Cat. No. 30401, holotype, and 30402) are deposited in the U. S. National Museum, Cruise

101, 40° 09′ N, 68° 58′ W, 74 fathoms, 22 August 1957. The species is named for Roland L. Wigley, who collected the specimens.

Description: Length up to 15 mm, width up to 1 mm, segments up to 62. Body flattened dorsoventrally anteriorly, tapered gradually posteriorly. Prostomium (Fig. 5, a–c) rounded anteriorly, tapered posteriorly to a raised triangular area, with 4 deep-set eyes and dark pigment on the posterior tip.

Peristomial segment achaetous, enlarged, lateral and ventral to the prostomium. Tentacular palps thick basally, tapering distally. Dorsal sensory grooves in form of elongated, parallel W-shaped ciliated epaulettes on first 4 setigers (Fig. 5, a). Proboscis eversible, disclike (Fig. 5, c).

Anterior region (first 4 setigers) with well developed subulate notopodial and neuropodial postsetal lamellae, with long slender capillary notosetae and shorter limbate neurosetae tapering to fine tips. The first 3 setigers with parapodia more dorsal in position than in the following setigers. First setiger (Fig. 5, e) with digitiform postsetal lobes, the notopodial shorter and more slender than the neuropodial, with long smooth slender capillary notosetae and shorter tapering neurosetae, with a single stout hooked neuroseta. Second and third setigers (Fig. 5, f) with longer digitiform notopodial lamellae and shorter, wider, subulate neuropodial lamellae, with tapering neurosetae only. Fourth setiger similar except for the more lateral position of the parapodia (Fig. 5, g).

Middle region (setigers 5–14) with parapodial thread glands furnished with bundles of threads or fibers and (in some parapodia) with rather stout frayed setae emerging posterior to the upper neurosetae (Fig. 6, a, b). Notopodial lamellae of setigers 5–8 short rounded (Fig. 6, a), becoming conical and subulate more posteriorly (Fig. 6, c); notopodial lamellae of setigers 9–15 usually reddish or brownish. Neuropodial lamellae wide, low; neurosetae short, limbate, with short fine tips. Lower neuroseta curved downward, beginning on setiger 9 and continuing posteriorly (not stouter or darker than other neurosetae).

Posterior region (beginning on setiger 15) with subulate postsetal notopodial lamellae (Fig. 6, d), becoming more slender, digitiform posteriorly (Fig. 6, e); notosetae vary from numerous slender ones more anteriorly to few stout ones posteriorly. Neuropodial lobes low, thick, on the lower part with row of hooks and 1–2 lower setae which are curved downward. Neuropodial hooks hooded, bidentate, 10 (anteriorly) to 7 (posteriorly) hooks per row (Fig. 6, d–f). Transverse ciliated ridges begin on setiger 15, low at first, becoming more prominent on setigers 17–30 and low or absent more posteriorly. Without interramal genital pouches (as in S. *kroyeri*).

Anal ring with fringe of 4–6 delicate anal cirri (Fig. 5, d). Tube: Rather soft base (collapsed when unoccupied) encrusted with sand and debris, fitting the occupant closely.

Distribution: Known only from the type locality.

Remarks: Spiophanes wigleyi falls in the S. *bombyx* group in lacking an occipital antenna and having bidentate hooded hooks. The differences are indicated in the Key beginning on this page.

REVIEW OF THE SPECIES OF *SPIOPHANES* GRUBE, 1860

Seventeen species, including the two new species described herein, have been referred to *Spiophanes* Grube, 1860. The following species may be distinguished as indicated in the Key beginning on this page.

1. S. *kroyeri* Grube, 1860 (Greenland and cosmopolitan, low water and dredged) (Includes S. *cirrata* Sars, 1871, Norway; S. *malayensis* Caullery, 1915, Malay Archipelago; S. *fimbriata* Moore, 1923, California)
2. S. *bombyx* (Claparède, 1870) (France and cosmopolitan, low water and dredged) (Includes S. *verrilli* Webster and Benedict, 1884, Massachusetts)
3. S. *longicirris* Caullery, 1915 (Malay Archipelago, dredged)
4. S. *missionensis* Hartman, 1941 (California, low water and dredged)
5. S. *anoculata* Hartman, 1960 (California, deep water)
6. S. *berkeleyorum*, new species (British Columbia and Washington, low water and dredged) (Includes S. *cirrata* Berkeley and Berkeley, 1952; not Sars, 1871)
7. S. *wigleyi*, new species (Massachusetts, dredged)

The following species of *Spiophanes* are insufficiently characterized:

1. S. *uschakovi* Zachs, 1933 (North Japan Sea)
2. S. *tcherniai* Fauvel, 1950 (Antarctic)
3. S. *soderstromi* Hartman, 1953 (Antarctic)

The following species do not agree completely with *Spiophanes* and should be referred elsewhere:

1. S. *tenuis* Verrill, 1879 (Massachusetts) (= *Prionospio*)
2. S. *pigmentata* Reish, 1959 (California) (= *Microspio*?)
3. S. *pallidus* Hartman, 1960 (California) (= *Prionospio*?)

KEY TO SOME SPECIES OF *SPIOPHANES*

1. Prostomium without occipital antenna. Without interramal genital pockets 2
   Prostomium with occipital antenna. Neuropodial hooks tridentate, without hood 5
2. Prostomium with distinct lateral horns 3
   Prostomium without distinct lateral horns 4
3. First 4 notopodia slightly more dorsal than following, with postsetal lobes elongate, pointed. Neuropodial hooks bidentate, hooded. S. *bombyx* (Claparède)
   First 5 setigers with foliaceous postsetal lobes; first notopodial reduced to slender papillar lobe. Neuropodial hooks (?). S. *anoculata* Hartman

4. Notopodia first 3 setigers more dorsal in position; first slender, digitiform. Neuropodial hooks bidentate, hooded. Anal cirri 4–6. *S. wigleyi*, new species

   Notopodia first 2 setigers more dorsal in position. Neuropodial hooks tridentate, without hood. Anal cirri 2 plus ventral papilla. *S. missionensis* Hartman

5. First 4 notopodial postsetal lobes very long, filiform, greenish. Neuropodial postsetal lobes subulate, pointed. Neuropodial hooks about 5 per row. *S. longicirris* Caullery

   Both notopodial and neuropodial postsetal lobes of first 4 setigers enlarged, subulate 6

6. Notopodial lobes of posterior region (begin on setiger 15) large, flat, whitish. Neuropodial hooks 6–11 per row. Without interramal genital pockets. *S. berkeleyorum*, new species

   Notopodial lobes of posterior region digitiform. Neuropodial hooks 6–7 per row. Interramal genital pouches present, begin about setigers 14–17. *S. kroyeri* Grube

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PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

REASONS IN FAVOR OF RETAINING THE GENERIC NAME *CARCHARHINUS* BLAINVILLE, AND A PROPOSAL FOR IDENTIFYING ITS TYPE SPECIES AS THE INDO-PACIFIC BLACK-TIPPED SHARK, *C. MELANOPTERUS*[1]

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This paper has two objects. The first of these is to review briefly the perilous generic status of *Carcharhinus* Blainville, 1816, and to advance reasons why this generic name should be retained. The second is a proposal that *C. commersonii*, selected as type species of *Carcharhinus* by Jordan and Gilbert, can be identified as a junior synonym of *C. melanopterus* Quoy and Gaimard.

In a thorough account, Boeseman (1960: 81) has shown that the well known and widely used generic name *Carcharhinus* Blainville, 1816, pertaining to the largest group of living sharks, is not available. More recently White, Tucker, and Marshall (1961: 276) have affirmed, independently, Boeseman's view of the unavailability of the name *Carcharhinus*, and have proposed to the International Commission on Zoological Nomenclature a means for stabilizing the name in its accustomed sense. Their proposal includes the arbitrary designation of *Carcharias milberti* Müller and Henle, 1841 as type species of *Carcharhinus*. In the account below evidence is given that *Carcharias melanopterus* Quoy and Gaimard, 1824 is a more logical choice as type species of *Carcharhinus*. White, Tucker, and Marshall have also shown that contrary to the general view Bosc's (1816: 277) selection of *Squalus carcharias* (presumably of Linnaeus, 1758) as type species of *Carcharhinus* Blainville, 1816 can be interpreted as valid even though the specific name *carcharias* was not listed by Blain-

[1] This research was partially supported by the Atomic Energy Commission contract AT (30-1) 2409 with the Smithsonian Institution.

ville when he proposed the genus. Their interpretation depends on recognizing *C. lamia* (presumably of Rafinesque, 1810) on Blainville's list as a junior objective synonym of *S. carcharias*. If this interpretation is correct, Bosc's selection of a type species is the first valid one for *Carcharhinus*, and makes *Carcharhinus* a senior objective synonym of *Carcharodon* A. Smith, 1838. It is unlikely that there will be any dissenters to White, Tucker, and Marshall's view (1961: 276) that ". . . it is clear that Bosc's valid type-designation must be set aside," for otherwise the well established usage of *Carcharodon* for the White Shark, as well as that of *Carcharhinus* for the Gray Sharks, would be lost. The account below is given on the assumption that Bosc's selection will not be followed, and therefore deals only with subsequent selections of type species for *Carcharhinus*.

The unavailability of the generic name *Carcharhinus* hinges on the fact that Jordan and Gilbert, who first designated a type species for *Carcharhinus* from the fourteen specific names listed by Blainville under his original generic diagnosis, selected *C. commersonii* which was a *nomen nudum* when Blainville introduced it (1816a: 121, 1816b: 264). Blainville validated *C. commersonii* in a later account (1825: 90) by indicating that it was based on a shark figured in Lacepède (1798: 169, pl. 8, Fig. 1), but that action did not make it available for selection as type species. Consequently, the first acceptable designation of a type species for *Carcharhinus* is that of *C. vulpes* by Fowler (1908: 62). Fowler's designation makes *Carcharhinus* Blainville, 1816 a synonym of *Alopias* Rafinesque, 1810, the genus of thresher sharks.

Fowler's procedure, although correct, has not been accepted by most workers, who with few exceptions (see Boeseman, 1960: 81) have retained the name *Carcharhinus*, and recognized *C. commersonii* as type species. Arguments favoring their action include the view that Jordan and Gilbert's selection of *C. commersonii* as type species was reasonable and legitimate at the time it was made, and should not be upset by nomenclatural procedures and regulations formulated at a later date. Excluding here the questions of legality, the chief disadvantage in recognizing *C. commersonii* as type species is that it has not been possible to identify *C. commersonii* with any certainty. However, a rather similar disadvantage applies to the type species of the two genera with most claim as substitutes for *Carcharhinus*. Thus *Glyphis* Agassiz, 1843 (p. 243, pl. 36, Figs. 10–13) has as its type species *G. hastalis* Agassiz, 1843, which is based only on two fossil teeth; these teeth resemble the lower teeth of *Carcharias* (*Prionodon*) *glyphis* Müller and Henle, 1841, which falls into *Carcharhinus* as currently recognized. The resemblance, though good, can scarcely be regarded as definitive evidence of congeneric relationship. Likewise, *Galeolamna* Owen, 1853 (p. 96, No. 427) with type species *G. greyi* Owen, 1853, was based only on a pair of jaws held in the museum of the Royal College of Surgeons, London, and these are now lost as a result of bombing damage during World War II. The jaws were from a shark taken in South Australia and were not figured or described by Owen though he gave a brief comparison of the teeth with those of *Galeus, Lamna,* and *Carcharias.* The species is not identifiable from this comparison. Owen's species seems to have been overlooked until resurrected by Whitley (1932: 324). Subsequently Whitley discussed the species or referred specimens to it in four different accounts. These accounts introduce a great deal of confusion. Not only did Whitley change his opinion several times in identifying *G. greyi,* but it is also clearly evident that at least three and possibly four distinct species were referred by him to *G. greyi.* Thus in his first account (op. cit.) when he was relying only on Owen's meager comparison he stated that *G. greyi* "apparently refers to the South Australian Whaler Shark, a species which has been figured by Waite as *Carcharhinus brachyurus.*" Two years later when he had still not seen type material he proposed (1934: 185) that "the status of Owen's name (*G. greyi*) is at present indeterminable, ..." Following this he was able to examine the type of *G. greyi* in the Royal College of Surgeons, and published (1939: 231) a brief description of the teeth together with the statement that "the specimen is a South Australian Cocktail or Whaler Shark," i.e., the *C. brachyurus* of Waite. A year later (1940: 100, Fig. 88) his view was not as definite—"This is probably the Cocktail Shark . . ."—while in an appendix to the same work (op. cit. appendix C, p. 273, Fig. 303) he described and figured a Swan River Shark "which appears to be *Galeolamna greyi,* . . ." The Swan River Shark bears a strong resemblance to the Atlantic *C. leucas* and differs strikingly from Waite's *C. brachyurus,* particularly in the much more anterior position of its first dorsal origin, and the shape and size of its dorsal and anal fins. Lastly, in 1945 (pp. 1–4, Figs. 1–2) Whitley described three subspecies of *G. greyi* from Western Australia. His *G. g. greyi* from Esperance is a much longer-snouted shark than either the Swan River Shark or Waite's *C. brachyurus* and is clearly a different species. Similarly his *G. g. cauta,* though short-snouted, has very different teeth and a more rearwardly placed first dorsal than the Swan River Shark, while at the same time it does not fit closely with Waite's *C. brachyurus.* The Swan River Shark is recorded in the account as *G. g. mckaili.*

From the above brief review it is obvious that several interpretations are possible in recognizing the type species of *Galeolamna* from the three or four species which Whitley lumps under *G. greyi.* Thus choice of *Galeolamna,* or for that matter *Glyphis* also, as generic names to replace *Carcharhinus* would not bring about clarity, though it would conform to the rules of nomenclature. The disadvantage, on the other hand, is that by discarding the name *Carcharhinus,* we do so at the expense of established usage in a group where there has already been much confusion, and where the nomenclature has taken a long period to become more or less stabilized.

It is the intention of the writer to appeal to the International Commission on Zoological Nomenclature to conserve *Carcharhinus* Blainville, 1816. The appeal will therefore support in principle that of White, Tucker, and Marshall (1961: 273), but will not support their arbitrary choice of *Carcharias milberti* Müller and Henle, 1841 as type species of *Carcharhinus*. Instead the appeal will include the request that *Carcharias melanopterus* Quoy and Gaimard, 1824 (Zool. p. 194), the widely distributed Indo-Pacific black-tipped shark, be designated as type species of *Carcharhinus*. This designation follows from the proposal that *C. melanopterus* is a senior synonym of *C. commersonii* which is generally recognized as type species of *Carcharhinus* even though it is not available. Evidence for regarding *C. melanopterus* and *C. commersonii* as conspecific is given below.

Blainville never described *C. commersonii*, but indicated that it was the shark figured in Lacepède (1798: 169, Pl. 8, Fig. 1) as "Le Squale Requin." The introduction to Lacepède's account on page 7 of Volume 1, includes the statement that Plate 8, Figure 1 (among others) was copied either from an original drawing by Commerson, or from one made under Commerson's supervision. The textual account of "Le Squale Requin" likewise includes citations from Commerson's manuscript. "Le Squale Requin" is based therefore, at least in part, on material described in manuscript by Commerson, and published in Lacepède. However, the textual account of "Le Squale Requin" in Lacepède is obviously heterogeneous (as the author intended), the synonymy including *Carcharodon carcharias* as well as *Carcharhinus* species. This introduces confusion in the text, because until recently it has not been possible to select the information relevant to *Carcharhinus commersonii*. As a consequence, the text has been mostly disregarded by authors endeavoring to identify *C. commersonii*, and only the figure of "Le Squale Requin" has stood as its basis.

Boeseman (1960, Pls. 7–8), has shed light on the above by publishing a photostatic copy of the morphological part of Commerson's original manuscript, and a drawing of a shark made from the figure in Commerson's manuscript. There is no doubt as to the validity of the manuscript which was located in the Museum National d'Histoire, Paris. It is therefore now possible to identify those parts of Lecepède's text referring to Commerson's shark, including a description and measurements. As Boeseman (1960: 94) pointed out, the measurements have limited value because we do not know how they were taken, and because in several instances they do not agree with either the description or the figure. In terms of *Carcharhinus* species, the description is not definitive, but at least it provides information on some features which may be of value, viz., the color is grey above, white below; the head is depressed, the snout narrower but almost semicircular from eye-to-eye; the nostrils are slightly nearer the eyes than the tip of snout; the upper teeth are triangular, serrated on both margins, and in about 24 rows, while the lowers are narrower but also serrated; the first dorsal fin apex is blunt; the second dorsal fin is smaller than the anal, with a slender posterior tip; and the anal fin has a notched distal margin, and a tip reaching almost to the origin of the caudal fin.

Commerson's manuscript figure, reproduced in Boeseman (1960, Fig. 1, upper figure) was evidently carefully drawn. It agrees reasonably well with the description, though the nostrils are shown nearer the tip of the snout than the eyes (vice versa in the description). The salient features of the figure for purposes of identification are: the posterior tips of the second dorsal and anal fins reach back almost to the upper precaudal pit and the lower caudal origin respectively, and are subequal to the heights of these fins; the anal axil is noticeably behind the second dorsal axil; the first dorsal fin apex is rounded, and the fin itself falcate; the pectoral fin tip is narrow, almost pointed; and the anterior margin of the eye is anterior to a vertical from the point of the mouth. The specimen figured was a male, mature or near mature judging by the clasper size. The accompanying scale shows that the specimen was six feet long.

Attempts within the last fifty years to identify *C. commersonii* appear to have been made with the assumption that the species is an Atlantic or Mediterranean form. This assumption is incorrect, for as Boeseman (1960: 90) shows, the introduction to Lacepède (1798: p. ix, x) provides clear evidence that Commerson's figure was made from an Indo-Pacific specimen. The exact locality is unknown, but the figure must have been drawn either from an Indo-Pacific specimen taken when Commerson accompanied Bougainville on his voyage around the world in 1766 to 1769, or from one collected while Commerson lived on Mauritius.

Recent identifications of *C. commersonii,* dating from Garman (1913: 140), have been as *C. leucas* or *C. longimanus,* and are not supported by comparisons with Commerson's figure and text. *C. longimanus,* now known from the Pacific as well as from the Atlantic, has a characteristically longer and obtuse-tipped pectoral fin, a much broader based first dorsal fin, and a higher tooth count (29–31 teeth in upper jaws) than Commerson's shark. *C. leucas,* represented at least by the cognates *C. azureus, C. gangeticus, C. zambezensis,* and the Swan River *C. greyi* in the Indo-Pacific, agrees better with Commerson's account but does not have its second dorsal and anal fin tips reaching as far back as in Commerson's figure, while its first dorsal fin is broader based, less falcate, and with sharper pointed apex, to mention but a few of the obvious differences. Identification of Commerson's species as *C. leucas* would be very speculative.

Much the same can be said in comparing Commerson's account with specimens and/or literature of all other *Carcharhinus* species known from the Indo-Pacific and Atlantic. Although many species show agreement in some features, none show agreement in all. The absence of any reference to black-tipped or white-tipped fins in Commerson's description of the color of his specimen excludes many species where such a pattern is conspicuous. The posterior position of the second dorsal and anal fin tips, which seems the most striking character in Commerson's figure, is matched in *C. falciformis, C. floridanus,* and *C. malpeloensis* among the more or less immaculate sharks. However, in these three species the second dorsal and anal fins are much lower and more slender than those in Commerson's shark, their heights only about half the lengths of their posterior tips, rather than equal to them.

Failure to identify the shark described and figured in Commerson's manuscript does not mean that *C. commersonii* cannot be plausibly identified. This apparent paradox results from the fact that Lacepède's figure of "Le Squale Requin," which Blainville referred to *C. commersonii,* differs sufficiently from Commerson's manuscript figure and account to suggest another species. Because we have no reason to believe that Blainville ever saw Commerson's manuscript, it is reasonable to assume that Blainville based *C. commersonii* only on Lacepède's figure.

Comparison of Lacepède's figure (1798: Pl. 8, Fig. 1) with Commerson's figure shows general agreement in over-all longitudinal dimensions, in being of a mature or near mature male, and in the placing of the fins, notably in the posterior position of the anal axil relative to the second dorsal axil. Beyond this there is little resemblance between the two figures, particularly in the fin shapes. The most striking difference, however, is the color pattern, Lacepède's figure showing a shark with prominently dark-tipped fins. Commerson's figure does not indicate color, and his color description refers to his specimen only as grey above and white below. In Lacepède's figure the first dorsal and pectoral fins and the dorsal and ventral lobes of the caudal fin are obviously dark-tipped. It is possible that the artist intended the distal margins of the second dorsal, and anal, and the pelvic fins to have a narrow dark edging, but this is not certain.

The presence of a color pattern (i.e., dark-tipped fins) in Lacepède's figure provides strong clues to the identity of *C. commersonii,* for although less than half the known species of *Carcharhinus* have more or less black-tipped fins at some stage of growth, only one species is regularly and as noticeably dark-tipped when mature. The obvious species is *C. melanopterus* (Quoy and Gaimard, 1824), described from "l'ile Vaigiou" at the western extremity of New Guinea, and now known as a conspicuous and common shallow-water, reef-inhabiting species in the tropical and subtropical Indo-Pacific. It has also been reported from the Mediterranean.

Dark-tipped sharks, other than *C. melanopterus,* which may resemble the figure of *C. commersonii* in the disposition of their fin markings include *C. limbatus* (Müller and Henle, 1841), *C. leucas* (Müller and Henle, 1841), *C. sorrah* (Müller and Henle, 1841), *C. pleurotaenia* (Bleeker, 1852), *C. longimanus* (Poey, 1861), *C. maculipinnis* (Poey, 1865), and others. But in all these species the first dorsal fin is plain or at most only faintly dusky in the adult stage, though it may be more definitely dark-tipped in embryos and juveniles. This contrasts with *C. melanopterus* in which the first dorsal fin is strikingly dark-tipped in the adult stage—as is also the figure of *C. commersonii* in Lacepède which is obviously adult as evidenced by the clasper size. Agreement between *C. commersonii* and *C. melanopterus* in other features, viz., proportions, fin shapes and sizes, breadth and length of snout, etc., is to say the least, tolerably good. It follows that recognizing *C. commersonii* as conspecific with *C. melanopterus* is plausible, and in fact, not without precedent. Quoy and Gaimard (1824: 194), when first describing *C. melanopterus,* regarded Lacepède's figure of "Le Squale Requin" as being of their species, and this view was shared later by Müller and Henle (1841: 43), Gray (1851: 46), and Dumeril (1865: 365).

The question of how Lacepède's artist came to change Commerson's manuscript figure into a very reasonable illustration of *C. melanopterus* is likely to remain unanswered. Possibly, the artist was dissatisfied with the bare outline drawing from Commerson's manuscript which he was expected to copy, and looked around for material to dress it up. If this was so, Boeseman (personal communication) has not been able to find in the Paris Museum any specimen of *C. melanopterus* which might definitely have been available for Lacepède's artist to use. However, whatever the source, the illustration is a reasonable representation of *C. melanopterus,* and must stand firstly, as the basis of *C. commersonii* as understood by Blainville, and secondly, as the generally recognized but unavailable type species of *Carcharhinus.* Acceptance of it as a junior synonym of *C. melanopterus,* and validation of the latter as type species of *Carcharhinus* would be a considerable contribution to the stability of selachian nomenclature.

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Vol. 75, pp. 97–100 30 March 1962

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

A NEW SPECIES OF THE GENUS *OOSTERNUM* AND A KEY TO THE U. S. SPECIES (COLEOPTERA: HYDROPHILIDAE)

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The hydrophilid genus *Oosternum* (Sharp, 1882, p. 112) is a rather poorly known group of minute beetles that are more abundant in tropical or subtropical regions. Of the nine species presently in the genus, only two, *O. pubescens* LeC. and *O. costatum* Shp., have been reported as occurring in the United States. Recently, John C. Moser of the U. S. Department of Agriculture, Division of Forest Insect Research, Southern Forest Experiment Station, submitted a series of *Oosternum* from Louisiana for identification. These undescribed specimens were collected from detritus cavities 2–8 feet underground in nests of the Texas leaf-cutting ant, *Atta texana* (Buck.). They were most common in moist, fresh detritus actively being broken down by inquilines but some were also found in dry detritus previously broken down. Additional specimens of this new species were also collected from detritus from a nest of the Mexican leaf-cutting ant, *Atta mexicana* (F. Sm.) in El Salvador. According to O. L. Cartwright, collector of this series, the entrance to the nest was located on top of a cliff, 15–20 feet above the valley floor. However, the beetles were collected at the base of the cliff in a pile (2–3 bushels) of moist detritus dropped there by the ants from an opening in the side of the cliff. Dr. Moser (in litt.) informs me that *A. texana* ordinarily buries detritus in special cavities inside the nest and only in rare instances deposits it outside the nest. However, many other species of *Atta* regularly deposit part of the detritus outside the nests. Other species of *Oosternum* have been collected from ants' nests, suggesting that at least some species are myrmecophiles. The biology and immature stages are unknown. This new species is described to make its name available for use in papers dealing with its biological or ecological relationships.

Oosternum attacomis, new species

Holotype male: Castaneous dorsally and ventrally. Head microreticulate; with moderately coarse, widely spaced, setigerous punctures. Clypeus more densely punctate and finely margined; feebly emarginate medially. Labrum almost membranous, small, and partially hidden by clypeus. Maxillary palpi slightly shorter than antennae; penultimate segment shortest, ultimate segment equal in length to broad pseudobasal segment. Labial palpi very small. Mentum microreticulate and depressed antero-medially. Antennae with 6 antennal segments before a 4-segmented club.

Prothorax forming a continuous arch with elytra; microreticulate and punctate similar to head; distinctly margined laterally. Inflexed portion of pronotum with oblique carina extending from coxal cavity toward lateral margin of prosternum then turning anteriorly, terminating on anterior edge of prosternum. Middle of prosternum raised abruptly to same plane as mesosternal process; with longitudinal median carina. Mesosternal process broadly oval, strongly concave medially. Metasternal area pentagonal; with coarse, setigerous punctures; feebly concave medially. Scutellum microreticulate and with few indistinct punctures.

Elytra with 10 distinct costae of equal height; costae each surmounted with a series of coarse, setigerous punctures; intervals with a series of coarse punctures.

First abdominal segment with distinct, longitudinal, median carina extending entire length of segment.

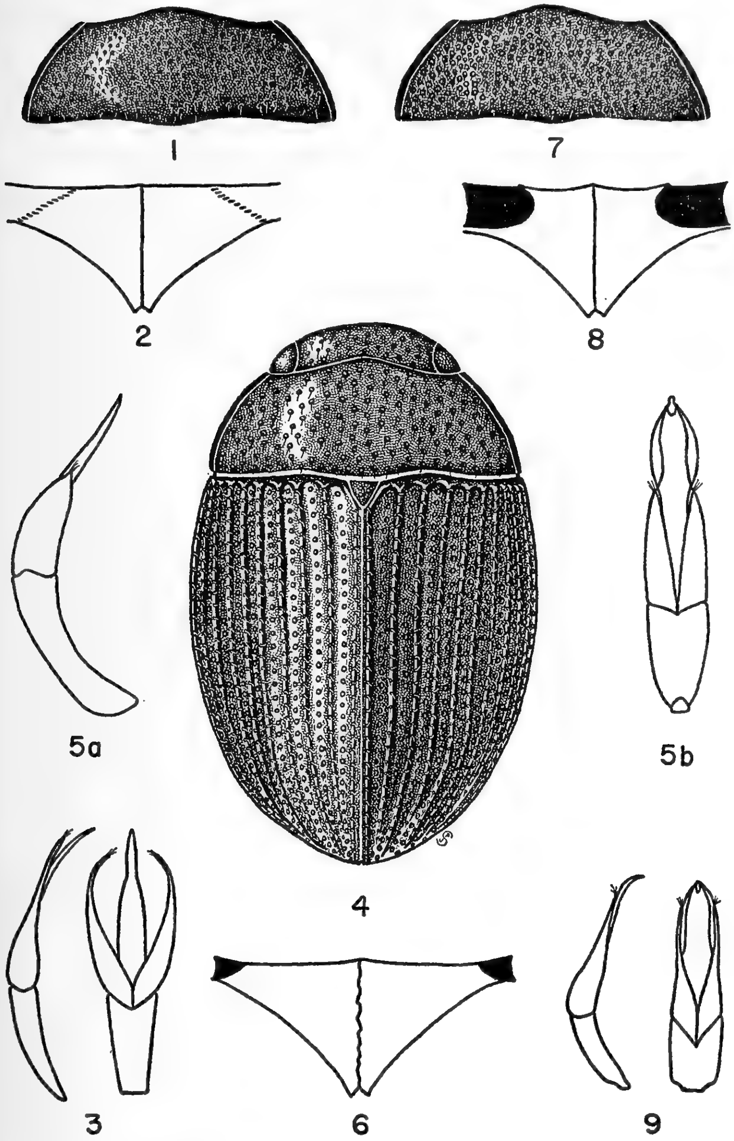
Length 1.3 mm; greatest body width 0.8 mm.

Allotype female: Similar to male except the metasternal area is not concave.

Distribution: Holotype male and allotype from Louisiana, 1½ miles south of Melder, T1NR3WS11, 18 January 1960, in detritus cavity of *Atta texana*, 8 ft beneath surface, J. C. Moser. Type No. 65672 in the U. S. National Museum. Paratypes: same data as holotype, 58 ♂♂, 21 ♀♀; same locality and collector, 24 March 1960, 1 ♂, 2 ♀♀; same locality and collector, 16 May 1960, 7 ♂♂, 2 ♀♀; Rapides Parish, La., 10 mi SE Flatwoods, 6 February 1959, in detritus cavity of *A. texana*, J. C. Moser, 1 ♀. El Salvador: San Salvador, 2 June 1959, in detritus ex nest of *A. mexicana*, O. L. Cartwright, 18 ♂♂, 14 ♀♀.

Paratypes will be distributed to the following museums: British Museum (Natural History); California Academy of Sciences; Institut royal des Sciences naturelles de Belgique; and also the collections of the State Plant Board of Florida and Louisiana State University.

This species is similar to *O. pubescens* LeC. and *O. costatum* Shp. but may be distinguished from both by the following key:



Figs. 1–3. *Oosternum pubescens* LeC.: 1.—Pronotum. 2.—Prosternum. 3.—Aedeagus, lateral and ventral view. Figs. 4–6. *Oosternum attacomis*, new species: 4.—Dorsal view. 5a.—Aedeagus, lateral view. 5b.—Aedeagus, ventral view. 6.—Prosternum. Figs. 7–9. *Oosternum costatum* Shp.: 7.—Pronotum. 8.—Prosternum. 9.—Aedeagus, lateral and ventral views.

1. Middle of prosternum raised abruptly to same plane as mesosternum (Figs. 6, 8); pronotum coarsely and densely or sparsely punctate; median lobe of aedeagus broad for entire length (Figs. 5b, 9) 2

   Middle of prosternum gradually raised to same plane as mesosternum (Fig. 2); pronotum finely, densely punctate; median lobe of aedeagus broad at base but acicular in apical third (Fig. 3) .... *pubescens* LeC.

2. Elytral costae all of equal height; pronotal punctation sparse, moderately coarse (Fig. 4); apex of median lobe of aedeagus slightly turned up in lateral view (Fig. 5a) .... *attacomis* sp. nov.

   Alternate elytral costae (1, 3, 5, 7, 9) distinctly higher than intervening ones; pronotal punctation very dense, coarse (Fig. 7); apex of median lobe of aedeagus turned down in lateral view (Fig. 9) .... *costatum* Shp.

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PROCEEDINGS
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A SYNOPSIS OF BIZA AND A NEW ALLIED GENUS (HOMOPTERA: CICADELLIDAE: NEOCOELIDIINAE)

By James P. Kramer

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During July of 1960, I had the opportunity to study some of Francis Walker's leafhopper types in the British Museum (Natural History), London. Among the types studied was *Biza crocea* Walker, a species unknown since its description. In this paper Walker's species is redescribed, and two new species are added to the genus together with a key to males. A new genus and species of the Neocoelidiinae is included.

Biza Walker 1858

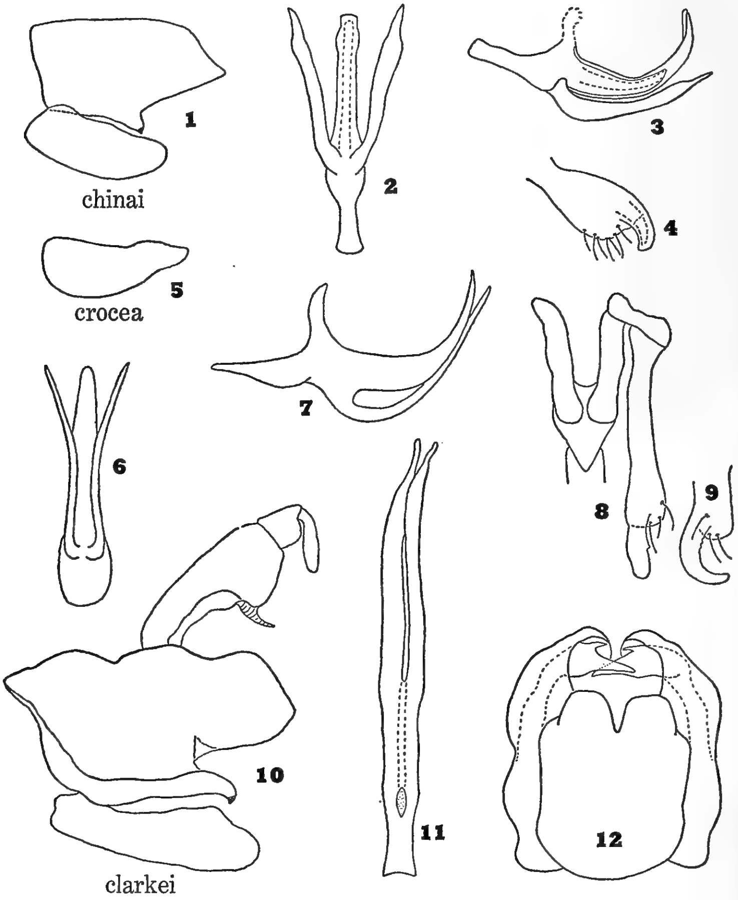
Type of genus: Biza crocea Walker.

Head, including eyes, about three-fourths as wide as pronotum. Antennae at least half of body length. Crown subquadrate, much wider than long and produced beyond eyes, flat with posterior and sinuated lateral margins carinated, a very distinct carina separating face and crown. Ocelli small, marginal, one near each eye. Lateral margins of pronotum strongly carinated, posterior margin broadly but shallowly indented. Venation of forewing distinct with four apical and three subapical cells.

Male genitalia: Pygofer unarmed except for ventral teeth. Male plates moderately deep, valve lacking. Connective Y-shaped, clearly articulated to aedeagus. Style with one well-developed apical lobe. Aedeagus a simple recurved shaft with or without paired basal appendages.

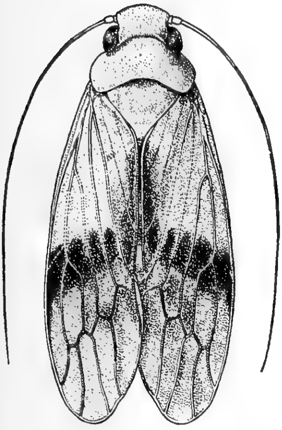
Coloration in known species yellow to orange with brown or fuscous marking on the forewings.

Species appear broad and somewhat flattened with a cercopid-like habitus (Fig. 13). On the basis of male genitalia, *Biza* Walker (1858: 231) and *Megacoelidia* Kramer and Linnavuori (1959, Proc. Biol. Soc. Wash. 72: 55–58) appear to be related, although they are distinct genera. Both lack a valve and have but one well-defined apical lobe of the style, the basal portion of the aedeagus prolonged, and the male plates fused at their bases. They differ considerably in length of body:



FIGS. 1–4. *Biza chinai*: 1.—Lateral view of pygofer and male plate. 2.—Ventral view of aedeagus. 3.—Lateral view of aedeagus. 4.—Distal portion of style in lateral view. FIGS. 5–7. *Biza crocea*: 5.—Lateral view of male plate. 6.—Ventral view of aedeagus. 7.—Lateral view of aedeagus FIGS. 8–12. *Tichocoelidia clarkei*: 8.—Dorsal view of connective and style. 9.—Distal portion of style in lateral view. 10.—Lateral view of entire genital capsule. 11.—Dorsal view of aedeagus. 12.—Ventral view of genital capsule.

Biza is 7–8 mm, whereas *Megacoelidia* is 13 mm. The crown is flat in *Biza* and distinctly concave in *Megacoelidia.* All-over size and the condition of the crown will readily separate the two genera.



Biza craspa

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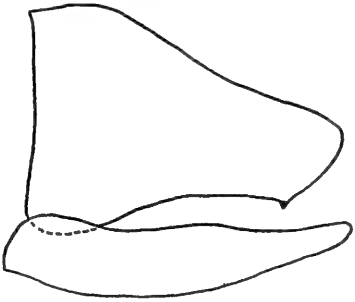

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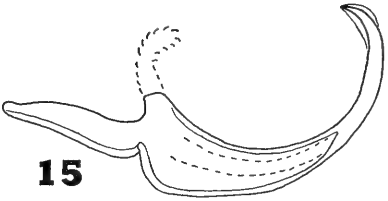

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Figs. 13–15. ***Biza craspa*: 13.—Habitus shown dorsally. 14.—Lateral view of pygofer and male plate. 15.—Lateral view of aedeagus. (All drawings made from types.)**

Biza: Key to Males

1. Aedeagus with paired basal processes (Fig. 3), pygofer in lateral view pointed apically (Fig. 1) 2
   Aedeagus without paired basal processes (Fig. 15), pygofer in lateral view rounded apically (Fig. 14) .... *craspa,* new species
2. Aedeagal processes uniformly slender (Fig. 6), curvature approximately that of the aedeagus (Fig. 7) .... *crocea* Walker
   Aedeagal processes moderately stout (Fig. 2), curvature not like that of the aedeagus (Fig. 3) .... *chinai,* new species

Biza crocea Walker

Biza crocea Walker 1858. Supplement. List of specimens of homopterous insects in the collection of the British Museum 1858: 253.

Length: 7–8 mm.

Coloration: Ground color pale yellow to yellow. Venter, legs, face, crown, pronotum, and scutellum unmarked. Each forewing marked as follows: Brown spot in center of clavus; spot variable in size, may reach claval commissure; distal portion of wing smoky brown, darker brown transverse band across anteapical cells separating distal smoky brown apex from basal yellow portion; combined widths of smoky brown apical coloration and of transverse brown band variable, sometimes occupying half of wing.

Male genitalia: Pygofer in lateral view pointed apically with a large tooth at about middle of ventral margin, plates shorter than pygofer and somewhat narrowed distally (Fig. 5). Aedeagus with a pair of slender, recurved basal appendages (Figs. 6–7).

Specimens: This species is known from three syntypes, one male and two females, in the British Museum. The male specimen with data Villa Nova, Pará, Brazil, is hereby selected as the lectotype. The illustrations of the male genitalia were prepared from sketches made by Dr. W. E. China of the British Museum (Nat. Hist.). One of the females bears the same data as the lectotype male, whereas the second female is labeled Tapayos, Pará, Brazil.

Biza chinai, new species

Length: 8 mm.

Coloration: Indistinguishable from *crocea.*

Male genitalia: Pygofer as in *crocea,* male plates short and stout (Fig. 1). Aedeagus with a pair of moderately stout basal appendages which are slightly expanded preapically (Figs. 2 and 3).

Specimens: Holotype male, Pará, Brazil, U. S. National Museum type No. 65693. Female unknown. This species is named for W. E. China, who has been most helpful in this and other leafhopper studies.

Biza craspa, new species

Length: 7.25–8 mm.

Coloration: Ground color pale yellow to orange; venter, legs, face, crown, pronotum, and scutellum unmarked. Forewings marked as in *crocea* except as follows: no brown spot in clavus, but claval commissure lightly brown or pale yellow to orange. Like *crocea* the smoky brown apical coloration and transverse brown band are highly variable. In one of the specimens at hand the brown area covers eighty per cent of the forewing including all of the clavus.

Male genitalia: Pygofer in lateral view rounded apically with a small tooth on the distal portion of the ventral margin, plates as long as pygofer and slender (Fig. 14). Aedeagus a simple recurved shaft without appendages (Fig. 15).

Specimens: Holotype male, Costa Rica, Pablo Schild. U. S. National Museum type No. 65666. Paratypes, three males; one, same data as type; one Teapa, Tabasco, Mexico; and one Volcán de Chiriquí, Panama. Female unknown.

Tichocoelidia, new genus

Type of genus: Tichocoelidia clarkei, new species.

This new genus will trace to *Coelidiana* in DeLong's key to genera (1953. *Lloydia* 16 (2): 94–95). It may be distinguished from *Coelidiana* on the basis of the asymmetrical aedeagus and the crossed paired processes within the male genital capsule.

Head, including eyes, slightly less than four-fifths as wide as pronotum. Crown pentagonal, produced beyond eyes. Antennae more than half body length. Crown concave with all margins strongly carinated. Ocelli small, marginal, one near each eye. Lateral margin of pronotum carinated, posterior margin mesally indented. Venation of forewings distinct, with four apical and three subapical cells.

Male genitalia: Pygofer with hooked ventral process. Anal tube with hooks. Male plates solidly fused basally with valve lacking. Crossed paired processes within genital capsule. Aedeagus asymmetrical.

Tichocoelidia clarkei, new species

Length: 7.5–8 mm.

Coloration: Ground color tan. Marked as follows: venter of thorax between prothoracic and mesothoracic legs brown, with a weakly defined mesal ivory stripe; sides of thorax largely ivory; anterior carina of crown brown, with a distinct black spot at middle; scutellum with three broad, weakly defined longitudinal brown stripes, lateral margins marked with ivory basally. Forewings tan hyaline with veins brown in clavus and at apex.

Male genitalia: Genital capsule in lateral view (Fig. 10), anal tube with a pair of small but distinct ventral hooks (only one visible laterally), pygofer with dorsal margin irregular and hooked process on ventral margin, male plate shorter than pygofer. Genital capsule in ventral view (Fig. 12), male plates fused for most of their length, valve lacking, with a pair of internal twice-pointed crossed processes distally. Connective approximately Y-shaped, style long and slender with one apical lobe (Fig. 8). Aedeagus long slender and asymmetrical in both lateral and dorsal views, cleft for over one-half its length, gonopore opening at base of cleft (Fig. 11). Aedeagus and connective fused but the joint is flexible.

Specimens: Holotype, male, Colombia, Cundinamarca, Rio Sumapaz Gorge, East of Melgar, 5 January 1959, J. F. G. Clarke. U. S. National Museum type No. 65673. One paratype male with same data. Female unknown.

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PROCEEDINGS
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SIX NEW GENERIC NAMES IN THE MYCETOZOIDA (TRICHIIDAE) AND FORAMINIFERIDA (FISCHERINIDAE, BULIMINIDAE, CAUCASINIDAE, AND PLEUROSTOMELLIDAE), AND A REDESCRIPTION OF *LOXOSTOMUM* (LOXOSTOMIDAE, NEW FAMILY).

BY ALFRED R. LOEBLICH, JR., AND HELEN TAPPAN
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A restudy of foraminiferal genera, based on their type species, for the "Treatise on Invertebrate Paleontology," has shown that certain species require new generic taxons for their placement as they can no longer be retained in the genera to which previously they had been assigned. As no new generic names are to be included in the "Treatise," the four new genera are here briefly described. All are based on previously described species. In addition, one genus is redefined, a new family, Loxostomidae, proposed and one generic homonym in the Foraminiferida is renamed, as is a generic homonym in the Mycetozoida.

Subphylum SARCODINA Schmarda, 1871
Class RHIZOPODEA von Siebold, 1845
Subclass LOBOSIA Carpenter, 1861
Order MYCETOZOIDA de Bary, 1859
Suborder EUMYCETOZOINA Poche, 1913
Superfamily TRICHIACEA Fries, 1821
Family Trichiidae Fries, 1821
Subfamily Prototrichiinae MacBride, 1899, nom. transl.

Prototrichiinae Loeblich and Tappan, *nom. transl.,* herein, *ex* family Prototrichieae MacBride, 1899, North American Slime Moulds: 179, 199.

Dianemininae Loeblich and Tappan, 1961, Jour. Paleontol., 35 (2): 266, *nom. subst.* and *nom. transl. ex* family Dianemeae MacBride, 1899, Ibid.: 179, 180.

In the suprageneric classification of the Rhizopodea (Loeblich and Tappan, 1961) in which were listed all family group names and synonomies, the family group taxon containing the four genera *Margarita* Lister, 1894, *Dianema* Rex, 1891, *Prototricha* Rostafinski, 1876, and *Listerella* E. Jahn, 1906, was regarded as of subfamily status. Each of these four genera has been made the basis for a family name (Dianemeae MacBride, 1899; Prototrichieae MacBride, 1899; Margaritidae Doflein, 1909; and Listerellaceae E. Jahn, 1928). Because *Dianema* Rex, 1891, was shown to be a homonym of *Dianema* Cope, 1871, and renamed as *Dianemina* Loeblich and Tappan, 1961, a substitute subfamily name Dianemininae was proposed. However, the above-mentioned family group names based on the remaining included genera have priority over this and the family group name Prototrichieae is here corrected and transferred to subfamily status. Of the remaining genera, *Margarita* Lister, 1899, is also a homonym and is renamed below. *Listerella* E. Jahn, 1906, is a valid senior homonym of *Listerella* Cushman, 1933 (which was renamed *Schenckiella* by Thalmann, 1942).

Margaritellina Loeblich and Tappan, new name

Margaritellina is proposed for *Margarita* Lister, 1894, Monogr. Mycetoza: 202 (*non Margarita* Leach, 1814; *non Margarita* Leach, 1819; *non Margarita* Lea, 1836 and *non Margarita* Lea, 1838). The type species is *Physarum metallicum* Berkeley, 1837 [= *Margarita metallica* Lister, 1894], Mag. Zool. and Bot., 1:49.

Class Reticularea Lankester, 1885
Subclass Granuloreticulosia de Saedeleer, 1934
Order Foraminiferida Zborzewski, 1834
Suborder Miliolina Delage and Hérouard, 1896
Superfamily Miliolacea Ehrenberg, 1839
Family Fischerinidae Millett, 1898
Subfamily Fischerininae Millett, 1898
Fischerinella Loeblich and Tappan, new genus.

Type species: Fischerina helix Heron-Allen and Earland, 1915, Zool. Soc. London, Trans., 20 (17): 591.

Test free, trochospirally coiled; proloculus large and globular, followed by long tubular chamber of almost a complete volution, later chambers gradually shortening to 3 or 4 per volution, chambers low and broad as seen from the spiral side, extending to the umbilicus on the opposite side; spiral suture slightly depressed, intercameral sutures flush; wall very thin, delicate and fragile, surface may be ornamented by radial striae; aperture rounded at the open end of the final chamber.

Remarks: The type species was originally placed in *Fischerina* Terquem, and the later descriptions of *Fischerina* have been based to some extent upon this species. Thus the genus and the subfamily and family based on it were regarded as trochospiral. A restudy by the writers of the type species of *Fischerina* (*F. rhodiensis* Terquem), as based on the holotype in the Muséum National d'Histoire Naturelle, Paris, has shown it to be planispiral and evolute on both sides, with a symmetrical equatorial aperture. *Fischerina* is therefore restricted to include only these planispiral species, and the new genus *Fischerinella* is proposed for the trochospiral forms such as *Fischerina helix.* The new genus is placed in the subfamily Fischerininae and bears the same morphologic relationship to *Fischerina* as the perforate calcareous *Conicospirillina* bears to *Spirillina.*

Occurrence: Recent, Kerimba Archipelago and New Zealand.

Zoyaella Loeblich and Tappan, new name

Ceratina Goës, 1894, K. Sven, Vet.-Akad. Handl., Stockholm, n.f., 25 (9): 122 (1892) (*non Ceratina* Latreille, 1802 and *non Ceratina* Menge, 1868).

Type species: Ceratina trochamminoides Goës, 1894, Ibid.: 122.

Test free, discoidal, proloculus followed by tubular second chamber, later streptospirally enrolled as in *Glomulina* Rhumbler and finally becoming planispiral and evolute, with numerous chambers per whorl; sutures depressed, radiate; wall calcareous, porcellanous; aperture a high arch at the open end of the final chamber.

Remarks: Ceratina was regarded by Galloway (1933: 111) as a synonym of *Fischerina* Terquem, 1878. Restudy by the writers of the type specimen of *Fischerina rhodiensis* showed that the genus should be restricted to forms which are planispiral throughout, and the early glomospirine or streptospiral coiling of *Ceratina trochamminoides* shows its closer relationship to *Glomulina.* The later planispiral development separates it from *Glomulina.* As *Ceratina* Goës, 1894 is a homonym of *Ceratina* Latreille, 1802 and *Ceratina* Menge, 1868, the new name *Zoyaella* is here proposed.

The genus is named in honor of Professor Zoya Z. Stschedrina of the Zoological Institute, Academy of Science U.S.S.R., Leningrad, in recognition of her contributions to the knowledge of Recent Arctic and Antarctic foraminifera.

Occurrence: Recent, Azores at 540 meters.

Suborder ROTALIINA Delage and Hérouard, 1896
Superfamily BULIMINACEA Jones, 1875
Family Buliminidae Jones, 1875
Subfamily Pavonininae Eimer and Fickert, 1899
Fijiella Loeblich and Tappan, new genus

Type species: Trimosina simplex Cushman, 1929, Washington Acad. Sci., Jour., 19 (8): 158.

Test free, pyramidal and triangular in section; chambers broad and low, triserially arranged throughout; wall calcareous, coarsely perforate, surface smooth, lateral margins carinate and may be spinose; primary aperture a narrow, elongate basal slit, terminal face with a supplementary cribrate aperture.

Remarks: Fijiella, n. gen. differs from *Reussella* in the presence of the supplementary cribrate aperture, from *Trimosina* in having a basal primary aperture and supplementary cribate aperture rather than a single areal slit, and from *Chrysalidinella* in retaining the primary aperture and in lacking a uniserial development. In addition to the type species, *Trimosina perforata* Cushman, 1924 also belongs to the present genus.

Occurrence: Recent, Fiji, Tropical Pacific, at 40–50 fathoms.

Superfamily CASSIDULINACEA d'Orbigny, 1839

Family **LOXOSTOMIDAE** Loeblich and Tappan, new family

Test biserial or may become uniserial in the later stage; wall calcareous, perforate-granular in structure; aperture primitively basal, or may become terminal, without a toothplate or internal siphon.

Remarks: A few genera previously placed in the Buliminacea have been shown not to possess the internal toothplates characteristic of that superfamily. Their wall structure also differs and has been reported to be composed of agglutinated calcareous grains. Examination in polarized light shows the type species of *Loxostomum* to have a perforate-granular calcareous wall. The present family includes *Loxostomum* and *Aragonia.*

Loxostomum Ehrenberg, 1854

Loxostomum Ehrenberg, 1854, Mikrogeologie: 22. *Type species: L. subrostratum* Ehrenberg, 1854. Fixed by subsequent designation by Cushman, 1927: 490.

Loxostoma Howe, 1930, Jour. Paleontol., 4: 329 (*nomen vanum*).

Bolivinitella Marie, 1941, Mém. Muséum Natl. Hist. Nat. n. ser., 12 (1): 189. *Type species: Bolivinita eleyi* Cushman, 1927 = ? *Loxostomum subrostratum.* Fixed by original designation.

Test elongate, compressed, quadrate in section, with flat or concave sides; chambers biserially arranged throughout, strongly overlapping and arched in the adult with a tendency to become uniserial; sutures limbate, arched, the sutural thickening merging laterally into the longitudinal carinae at the four margins; wall calcareous, finely perforate; aperture terminal, slit-like to ovate, commonly with a lip which may be very finely tuberculate, but lacking any internal toothplate.

Remarks: The synonymy of *Bolivinitella* with *Loxostomum* was noted previously by Hofker (1951: 44), who suppressed *Bolivinitella,* but also regarded *Loxostomum* as a synonym of *Bolivina.* Some of the former species of *Loxostomum* should be referred to the new genus *Coryphostoma,* and *Loxostomum* is here restricted to include only those species previously placed in *Bolivinitella,* with perforate granular wall structure.

Loxostomum subrostratum Ehrenberg, the type species, was originally described from the Cretaceous chalk of Meudon, figured from a specimen mounted in balsam and viewed by transmitted light. The original figures as shown by Cushman (1937, Pl. 22, Fig. 22) are almost identical in appearance to *Bolivinita eleyi* Cushman, and in fact specimens found at Meudon were referred to *Bolivinitella eleyi* forma *typica* by Marie (1941) in describing the genus *Bolivinitella*. The specimens illustrated as *B. eleyi* by Marie (1941, Pl. 29, Figs. 282 a–c) are typical of *L. subrostratum* and the two "species" are not only congeneric, but almost certainly conspecific.

Not only has *Loxostomum* been generally misidentified, but most of the species previously placed therein (except by Ehrenberg) contain apertural toothplates, such as are found in the Bolivinitidae, whereas *L. subrostratum* does not have such apertural features and thus must be removed.

Family Caucasinidae N. K. Bykova, 1959
Subfamily Fursenkoininae Loeblich and Tappan, 1961
Coryphostoma Loeblich and Tappan, new genus

Loxostomum (part) of authors, not of Ehrenberg, 1854.

Type species: Bolivina plaita Carsey, 1926, Univ. Texas Bull., 2612: 26.

Test free, elongate, narrow, early chambers biserially arranged, later chambers becoming cuneiform with a tendency to become uniserial; wall calcareous, finely perforate, granular in structure; aperture loop-shaped in the early stage, extending from the base of the final chamber, becoming terminal in the adult, with internal toothplate.

Remarks: Because of the revision of *Loxostomum*, based on the type species, many species previously there referred were left nameless and the present generic name is proposed for them. *Coryphostoma* differs from *Loxostomum* in having an internal toothplate, being rounded in section, and in the absence of sharply keeled margins. It differs from *Rectobolivina* in having a granular rather than radially built wall, and in the later chambers being cuneate, without an elongate uniserial and rectilinear stage. *Loxostomoides* Reiss, 1957, differs in having a radially built wall, and retral processes with re-entrants and lobes or crenulations of the chamber margins along the sutures. The name is derived from *Koryphe*, Gr., top, crown, head + *stoma*, Gr., mouth, and refers to the terminal aperture.

Geologic range: Upper Cretaceous (Campanian), Recent.

Family Pleurostomellidae Reuss, 1860
Subfamily Wheelerellinae Petters, 1954
Bandyella Loeblich and Tappan, new genus

Type species: Pleurostomella greatvalleyensis Trujillo, 1960, Jour. Paleontol., 34 (2): 345.

Test free, short, robust; chambers triserially arranged in the early stage, later biserial, and final chambers cuneate and uniserial; wall calcareous, perforate granular in structure; aperture subterminal, slightly excentric, with a T-shaped opening consisting of a crescentic slit just below the hooded terminus, with a short perpendicular slit extending down the face.

Remarks: Bandyella resembles *Wheelerella* Petters in being triserial in the early stage, but differs in having a T-shaped excentric or hooded aperture instead of a straight terminal slit-like aperture. *Ellipsopolymorphina* Silvestri resembles the present genus in the apertural form, but has only a biserial early stage before the uniserial later development.

The generic name is in honor of Dr. Orville Bandy, University of Southern California, in recognition of his work on Californian foraminifera.

Geologic range: Upper Cretaceous (Coniacian-Campanian), California.

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PROCEEDINGS
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SYNONYMIC DATA AND TWO NEW GENERA OF SHORE-BUGS (HEMIPTERA: SALDIDAE)

By Carl J. Drake
Smithsonian Institution

The present paper erects two new genera of the family Saldidae to hold several species of shore-bugs described from the Patagonian and Andean regions of South America; describes a pair of scent glands of the seventh abdominal sternum not heretofore recorded in the literature; and makes new synonymic and other taxonomic changes. The illustrations were made by Arthur Smith, of the British Museum (Natural History), and by Patricia J. Hogue, of Arlington, Virginia.

Several years ago, while mounting saldids that had been killed and preserved in alcohol as netted in the field, I found occasionally a specimen with a pair (1 + 1) of digitiform structures protruded outward from the intersegmental suture of the seventh and eighth abdominal sterna and fully exposed (Fig. 1). Further study showed these structures to be scent glands situated in the seventh abdominal segment of both male and female specimens. In checking mounted material in my collection, I found now and then a specimen with these glands fully protruded and in plain view (Fig. 1, a).

In fresh specimens from the field and also in material preserved in alcohol, these glands can be readily thrust out by placing the saldid on its back and then pressing gently up and down on the abdomen with the tip of a pair of tweezers or the point of a lead pencil. The glands are fairly large, protrusile and retractile, and vary from creamy white to pinkish or reddish in color.

These paired scent glands have been found in species of the following genera: *Ioscytus, Saldoida, Teoleuca, Salda, Lampracanthia, Micranthia, Pentacora, Saldula,* and the two new genera, *Oreocora* and *Pelachoris,* described below. The

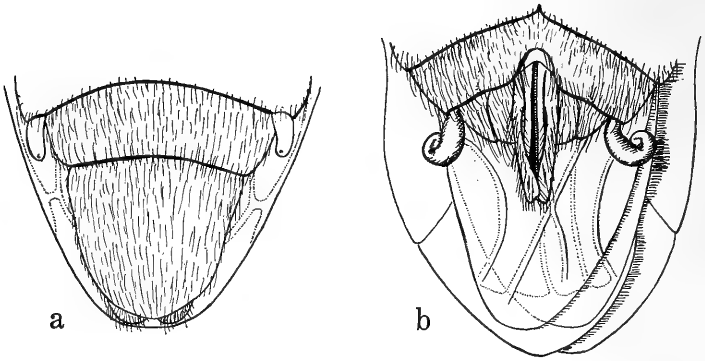

FIG. 1. Scent glands of 7th abdominal segment, protruded: a.—♂ *Ioscytus nasti* Drake and Hottes; b.—♀ *Pelachoris leucographa* (Rimes).

other genera of saldids were not examined for these structures. In the case of the genus *Saldula,* the glands have been found in more than 50 different species distributed among all of the faunal regions of the world. The ventral aspect of a male of *Ioscytus nasti* Drake and Hottes (Fig. 1, a) and a female of *Pelachoris leucographa* (Rimes) (Fig. 1, b) are illustrated to show the size and position of the fully protruded scent glands. Illustrations (Figs. 2 and 3) are also included to portray the dorsal aspect of these two saldids.

Saldula pexa Drake (Stat. nov.)

Saldula hirsuta pexa Drake, 1950, Bull. Brooklyn Ent. Soc., Vol. 45, p. 5.

Numerous specimens from western United States and Mexico show that *pexa* is a valid species and not a variety of the European *hirsuta* (Reuter). I have numerous specimens from California, Arizona, and Mexico.

Saldula palustris (Douglas)

Salda palustris Douglas, 1874, Ent. Monthl. Mag., Vol. 9, p. 10.
Saldula fernaldi Drake, 1949, Psyche, Vol. 56, p. 191. (Syn. nov.)

More specimens of the European *palustris* (Scott) make it necessary to suppress *fernaldi* Drake as a synonym. In addition to European specimens, I have many specimens of *palustris* from Canada, Alaska, and several states of the Rocky Mountain area and Pacific Coast.

Pelachoris, gen. nov.

Rather small, oblong. Head with three pairs of trichobothria, feebly convex; eyes very large, slightly converging anteriorly, with a few, tiny, inconspicuous hairs; ocelli small, feebly elevated, separated from each

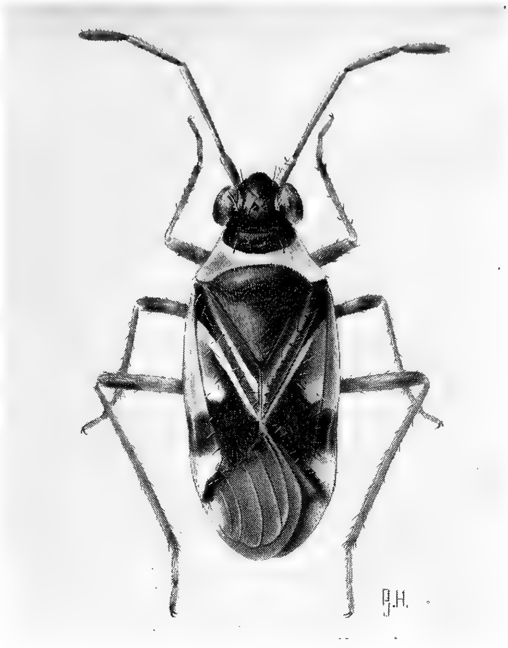

Fig. 2. *Pelachoris leucographa* (Rimes), ♂.

other by about the width of an ocellus, each from an eye by scarcely more than twice the diameter of an ocellus, placed just above a line connecting the antero-angles of ocular notches. Beak long, extending on second abdominal sternum. Antenna with segment I short and stout, II longest and slenderest; III and IV slightly swollen, subequal in length.

Pronotum trapezoidal, sharply narrowed anteriorly, with outer margins each forming straight lines, hind margin shallowly broadly excavated; callus strongly convex, transverse, short, extending sidewise almost to outer margins of pronotum, occupying about two-thirds of entire pronotum, with large discal fovea; hind lobe very short, finely punctate; explanate margins very narrow, feebly ridged on exterior margins. Scutellum large, triangular, transversely impressed near middle, basal width and median length nearly subequal to each other.

Hemelytra (macropterous) longer than abdomen, distinctly constricted on outer sides just in front of membrane; clavus sharply defined; corium with unbranched, median vein distinctly, subbasally notched on inferior side; embolium narrow, not separated from cuneus. Scutellum large, basal width and median length nearly subequal. Third connexival segments (on each side of abdomen of male) provided on anterior end with a row of four to six, short pegs followed by 15–20 fairly long, stiff hairs. Male parameres long, slender, arcuate, with a patch of hairs

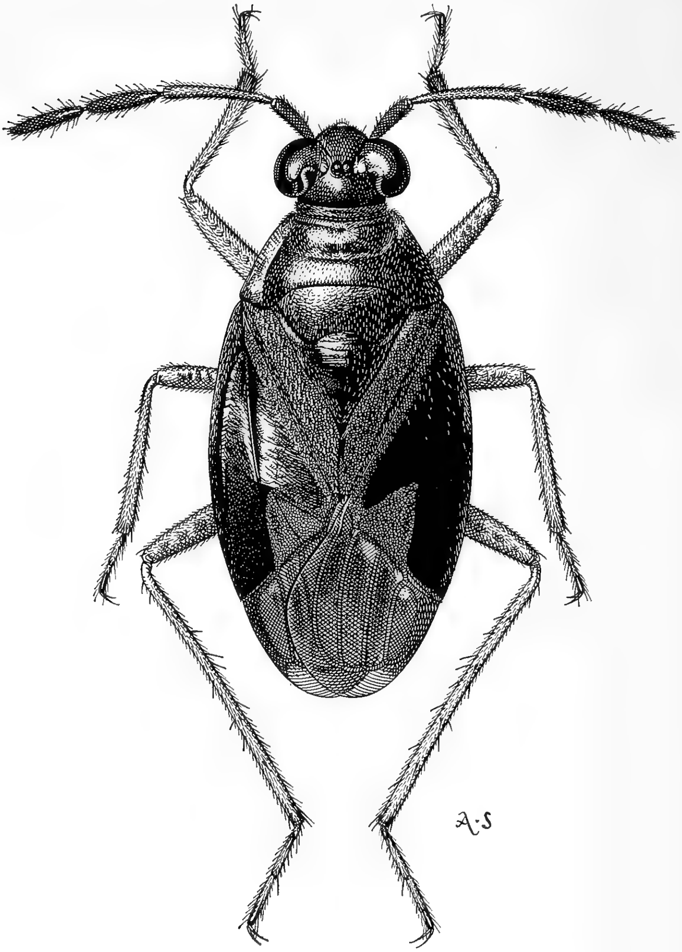

Fig. 3. *Ioscytus nasti* Drake and Hottes, ♀.

near middle. Penis-thread coiled with one and a half rings. Female with hind margin of seventh abdominal sternum distinctly notched at middle. Legs long, slender, saltatorial, hind coxae very large.

Type species: Pentacora leucographa Rimes (Fig. 2), Australian Region.

This genus belongs to the group of genera that have the membrane of the macropterous form divided into five long cells. The brachypterous form is unknown.

Pelachoris, new genus, can be separated from *Pentacora* Reuter by the general habitus, callus (transverse and extending sideways almost to outer margins of pronotum), shallowly excavated hind margin of pronotum, deeply notched hind margin of seventh abdominal sternum in female (Fig. 1, a), and other structures mentioned in the generic description. Rimes (1951, Fig. 1, k) published a good figure of the male paramere. Attention is also called here to the fact that *P. salina* (Bergroth) is a typical species of the genus *Pentacora* and related to the American *P. sphacelata* (Uhler).

Pentacora sphacelata (Uhler)

Salda sphacelata Uhler, 1877, Bull. U. S. Geol. Surv., Vol. 3, p. 343.
Salda rubromaculata Heidemann, 1901, Proc. Washington Acad. Sci., Vol. 3, p. 368. (Syn. nov.).
Saldula sphacelata: Van Duzee, 1917, Univ. California Pub., Tech. Bull., Vol. 2, p. 44. (Catalog).
Pentacora rubromaculata: Drake and Hoberlandt, 1951, Acta Ent. Mus. Nat. Pragae, Vol. 26, p. 5.
Pentacora sphacelata: Drake and Hoberlandt, 1951, Acta Ent. Mus. Nat. Pragae, Vol. 26, p. 5. (Catalog).

The holotype (macropterous male, USNM type No. 483) is in fair state of preservation. It belongs to the genus *Pentacora* Reuter and the trivial names of *sphacelata* Uhler and *rubromaculata* Heidemann apply to the same species, the former having priority (syn. nov.). This is the farthest southern record of *sphacelata* in the Americas. The other South American species described as, or transferred to, *Pentacora* are being transferred to a new genus described below.

Oreokora, gen. nov.

Small to moderately large, oblong or ovate, dorsal surfaces of pronotum and hemelytra clothed with short pubescence, which is often extremely short, grayish or golden in color. Vertex wide (as wide or slightly wider than an eye); ocelli small, approximate or separated from each other by width of an ocellus, placed scarcely above an imaginary line connecting anterior angles of inner excavations of eyes; with usual three pairs of trichobothria. Pronotum wide, explanate margins moderately wide; callus large, swollen, not extending sidewise on explanate margins of pronotum, with large discal fovea; hind margin broadly excavated; scutellum large, median length and basal width about equal to each other, with a median, transverse impression. Rostrum extending on or a little beyond metasternum. Hemelytron with the usual subbasal notch on inferior side of median vein of corium.

Male: Abdomen with upper, front margin of third connexival segment (one on each side) furnished with a long row of small, rounded pegs (9–11 in *andensis*) followed within with a few short, stiff hairs. Penis-thread slender, coiled two to three times. Parandria with the usual, paired, upright arms.

FIG. 4. *Oreocora regilla* (Drake), ♀.

Female: Seventh abdominal sternum obtusely prolonged behind, without a median notch.

Type species: Acanthia chilensis Blanchard.

This new genus is composed of species described as members of the genera *Salda, Saldula,* and *Pentacora.* Although the membrane of the macropterous form is usually divided into five cells, individual specimens are occasionally found with four cells in one wing and five in the other, rarely with only four in both wings (cell number 5 absent). In the type series of *O. regilla* (Drake) (Fig. 4) one specimen has five cells in each membrane and the other two only four each, and the abbreviated membrane of the brachypterous form has only three or four cells distinguishable, rarely five.

Oreokora chilensis (Blanchard)

Acanthia chilensis Blanchard, 1852 *in* Gay, Hist. Chile Zool., Vol. 7, Pl. 11, Fig. 15 (color). (Comb. nov.)
Salda chilensis: Reed, 1901, Rev. Chilena Hist. Nat., Vol. 5, p. 186, (Sep. p. 93).
Acanthia chilensis: Kirkaldy and Bueno, 1909, Proc. Ent. Soc. Washington, Vol. 10, p. 175. (List of American spp.)
Acanthia araucanica Kirkaldy, 1889, Rev. Ent. France, Vol. 18, p. 93.

A comparison of the types of *Acanthia chilensis* Blanchard (holotype, macropterous male, in Muséum National Historie Naturelle, Paris) and of *A. araucanica* Kirkaldy (macropterous type), collected by E. C. Reed, British Museum (Natural History), from Chile shows that these two species are inseparable from each other and thus synonyms, the former name having priority. I also have a few specimens of this species (Reed collection) taken with the type of *araucanica*. The membrane of the macropterous form is divided into five cells; brachypterous form is unknown.

Oreocora andensis (Distant) (Comb. nov.)

Acanthia andensis Distant, 1893, Trans. Ent. Soc. London, p. 93.
Pentacora bruesi Drake, 1949, Psyche, Vol. 56, p. 187, Pl. 14. (Syn. nov.)

A study of the type of *Acanthia andensis* Distant in the British Museum (Nat. Hist.) and that of *Pentacora bruesi* Drake in the Museum of Comparative Zoology (Harvard) show that these two trivial names apply to the same species, *andensis* having priority by many years. Other specimens of this species have also been seen from Peru.

Oreokora bergi (Haglund) (Comb. nov.)

Salda bergi Haglund, 1899 (Hem. part) *in* Svenska Magellanslanderna, 1907, Vol. 2 (9), pp. 173, 176, 179.
Salda argentina: Bergroth (not Berg, 1879), 1906, Wiener ent., zeit., Vol. 25, p. 7 (Error in identification).
Saldula lynchi (Drake and Carvalho), 1948, Rev. d'Entomologia, Brasil, Vol. 19, p. 476. (Syn. nov.).

Through the cooperation of Dr. E. Kjellander, Stockholm, I have been able to study the type specimen of *Salda bergi* from Patagonia. This species was described from a single, brachypterous female (thus, the holotype) which bears labels as follows: (1) "Gente Grande Bay," (2) "Tierre del Fuego," (3) "O. Nordenskiold," (4) "*Salda bergi* Hagl., type." The latter label is written in the handwriting of Haglund. The information on all labels is in accord with the data published in the original description. The following notes are based upon the holotype:

Brachypterous female: Color and markings as stated by Haglund in his description. Length 4.00 mm, width (transocular) 1.10 mm (across apex triangular process of pronotum) 2.25 mm, vertex (across ocelli) 0.50 mm.

Head with three pairs of long, erect, dark-fuscous trichobothria; vertex across ocelli and length of third antennal segment subequal to each other; vertex with a moderately large, transverse, tumid area at the base (just in front of collar); apex of front without transverse callosities. Rostrum very long, shiny, fuscous, extending between hind coxae. Antennae testaceous, clothed with short, setal-like hairs interspersed with a few very long hairs on each of last three segments. Segmental measurements: I, 26; II, 56; III, 42; IV, 44.

Pronotum broad, basal width three times median length with outer margins convexly narrowed anteriorly, hind margin widely excavated, basal width three times the median length; explanate margins wide, flavus; callus large, strongly swollen, not extending laterally on explanate margins, with the large discal fovea opened behind with a prominent sulcus, a small fovea on each lateral side of discal fovea; hind pronotal lobe narrow, slightly transversely rugulose, about one-third as long as collum.

Hemelytra wide, scarcely longer than abdomen, clavus distinct, corial veins not prominent; membrane abbreviated, composed of five, long cells. Male and macropterous form unknown.

For 80 years (Bergroth, 1879), *Salda bergi* Haglund has been erroneously treated as a synonym of S. *argentina* Berg (syn. of S. *coxalis* Stål). An examination of the type and three specimens of S. *lynchi* Drake from Punta Arenas (south Chile) shows that this species is inseparable from *lynchi* (new synonymy).

New Combinations

In addition to the taxonomic changes made in the above paragraphs, the following new combinations also are consummated: *Acanthia rogeri* Kirkaldy, *Saldula sola* Drake and Corvalho, S. *doeringi* Drake and Carvalho, *Pentacora angusta* Drake and Carvalho, *P. bacayana* Drake, *P. perula* Drake, *P. amazona* Drake, and *P. regilla* Drake to the new genus *Oreokora* Drake.

List of Species of *Oreokora*

1. *amazona* (Drake), 1955 .... Peru
2. *andensis* (Distant), 1893 .... Ecuador, Peru
   = *bruesi* (Drake), 1949, (syn. nov.)
3. *angusta* (Drake and Carvalho), 1948 .... Argentina, Chile
4. *bergi* (Haglund), 1899 .... Argentina, Chile
   = *argentina* (Bergroth), 1897, (not Berg, 1879)
   = *lynchi* (Drake and Carvalho), 1948, (syn. nov.)
5. *bacayana* (Drake), 1955 .... Equador
6. *chilensis* (Blanchard), 1852 .... Argentina, Chile
   = *araucanica* (Kirkaldy), 1899, (syn. nov.)

7. *doeringi* (Drake and Carvalho), 1948 .... Argentina
8. *perula* (Drake), 1955 .... Chile
9. *pillaona* (Drake), 1955 .... Chile
10. *regilla* (Drake), 1955 .... Chile
11. *rogeri* (Kirkaldy), 1899 .... Chile
12. *sola* (Drake and Carvalho), 1948, (comb. nov.) .... Argentina

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TISBE MONOZOTA, A NEW HARPACTICOID COPEPOD FROM FLORIDA

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Smithsonian Institution, Washington, D. C.

The new species of *Tisbe* described herein was obtained during February–May 1961 from a salt water aquarium in the Division of Marine Invertebrates, Smithsonian Institution. The aquarium contained sea water collected 5 October 1960, by F. M. Bayer in Bear Cut, between Virginia Key and Biscayne Key, Biscayne Bay, Dade County, Florida. A few rocks, collected at the same locality, were placed in the aquarium, and it is not known whether the specimens of *Tisbe* were introduced with the water or with the rocks.

Tisbe monozota, new species
Figs. 1–23

Female: Body colorless with red eye. Length, excluding caudal setae, 0.83–0.94 mm. Prosome about 1.7 times as long as broad, about 2.2 times as long as urosome. Genital segment divided by minutely serrate dorsal suture which becomes smooth and continues laterad for about half the depth of the segment, turns anteriad and runs nearly to anterior margin of segment, then turns dorsad and ends. Posterior lateral margins of prosomal, genital, and third urosomal segments each bearing a minute slender seta; cephalothorax with additional pair of lateral setae at level of leg 1. Rostum broadly rounded, with 2 sensory filaments. Posterior margins (dorsal, ventral, and lateral) of all urosomal segments except fifth pedigerous segment minutely serrate. Anal operculum with smooth margin.

Caudal ramus a little shorter than width at base, distolateral corner produced into truncate lobe bearing outermost of 4 terminal setae. Next-to-innermost terminal seta much the longest and heaviest, about 0.9 as long as body, proximal 0.25 with smooth margins, next 0.30 armed with barbs gradually decreasing in size distally, distal 0.45 unarmed. Next-to-outermost terminal seta about 0.5 as long as next-to-innermost seta, proximal 0.27 with smooth margins, next 0.31 armed with barbs gradually decreasing in size distally, distal 0.41 unarmed. Either of 2 large terminal setae may have "telescoped" joint on basal unarmed section

(Figs. 6–7); when present, this joint occurs on corresponding setae of both right and left rami. Outer and inner terminal setae subequal; outer seta with bend near base. Dorsal and ventral setae somewhat variable. Dorsal setae comprise 2 long slender setae, one proximal to distolateral lobe of ramus, its origin varying from medial to lobe to almost on lateral margin of ramus; the other proximal to interval between bases of 2 long terminal setae; and 1–3 short spiniform setae in a row medial to medial long dorsal seta. One ventral seta inserted near lateral margin in distal half of ramus. Lateral seta inserted at about middle of lateral margin, sometimes absent. All setae naked except 2 large terminal setae.

Antenna 1 (Fig. 10) 8-segmented; segment 1 a little more than half as long as segment 2, segments 3 and 4 subequal, about 0.8 as long as segment 2; anterior margin of segment 1 armed with numerous short fine setae; aesthetask on segment 4 about 0.75 as long as entire appendage; segment 6 bearing a spiniform seta. Antenna 2 (Fig. 12) of usual form for genus; basipod with several surface spinules. Gnathal lobe of mandible with 6 teeth. Maxilla 1 (Fig. 9) and 2 (Fig. 14) of usual form for genus. Maxilliped (Fig. 15) with row of spines along inner margin of segment 3.

Exopod of leg 1 shorter than endopod, segment 2 about as long as segment 1. Segment 3 about a third as long as segment 2. Lateral seta of segment 2, and 4 proximal setae of segment 3 without the usual tuft-like comb of setules at the apex, but with a single prominent setule (Figs. 17–18). Segment 2 of endopod longer than segment 1.

Legs 2–4 (Figs. 19–22) typical for genus. Armature of setae and spines identical with summaries given by Lang (1948: 364, Table 7) and by Humes (1954: Table 4).

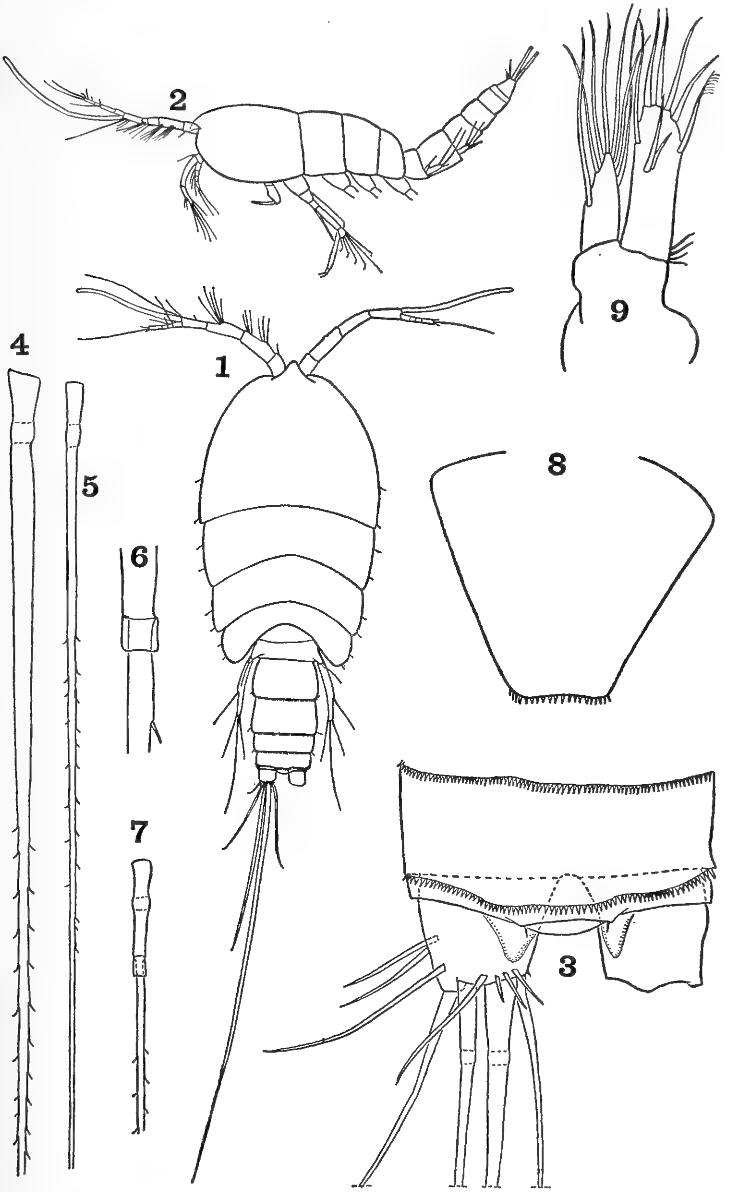
Leg 5 (Fig. 23) reaching nearly to posterior margin of genital segment. Inner lobe of proximal segment bearing 3 setae, middle one longest; outer lobe with 1 seta. Distal segment about 6 times as long as wide; next-to-innermost of 4 terminal setae the longest, most lateral terminal seta very short; lateral seta well removed (about one-third length of segment) from distal end; margins of segment rather sparsely armed with setules; anterior surface with scattered setules. Leg 6 absent.

Male: Color and body form similar to that of female, but prosome narrower, about twice as long as broad, about 1.5 times as long as urosome. Body length 0.70–0.76 mm. Posterior margins of urosome segments minutely serrate as in female. Caudal ramus as in female.

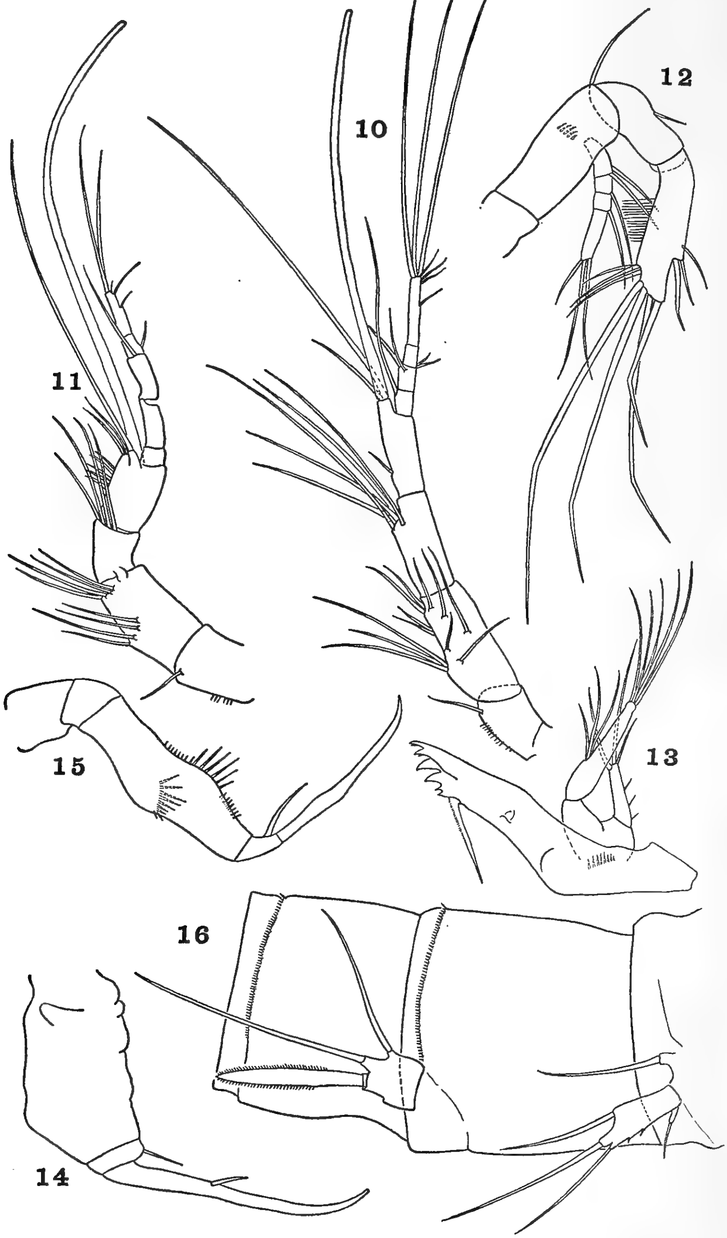
Antenna 1 (Fig. 11) prehensile, 8-segmented, "knee" between segments 6 and 7; terminal segment sometimes having additional faint suture; aesthetask on segment 4 about as long as entire appendage. Mouthparts as in female.

Legs 1–4 as in female, except that inner seta of segment 1 of endopod of leg 2 is modified into strong spine (Fig. 20).

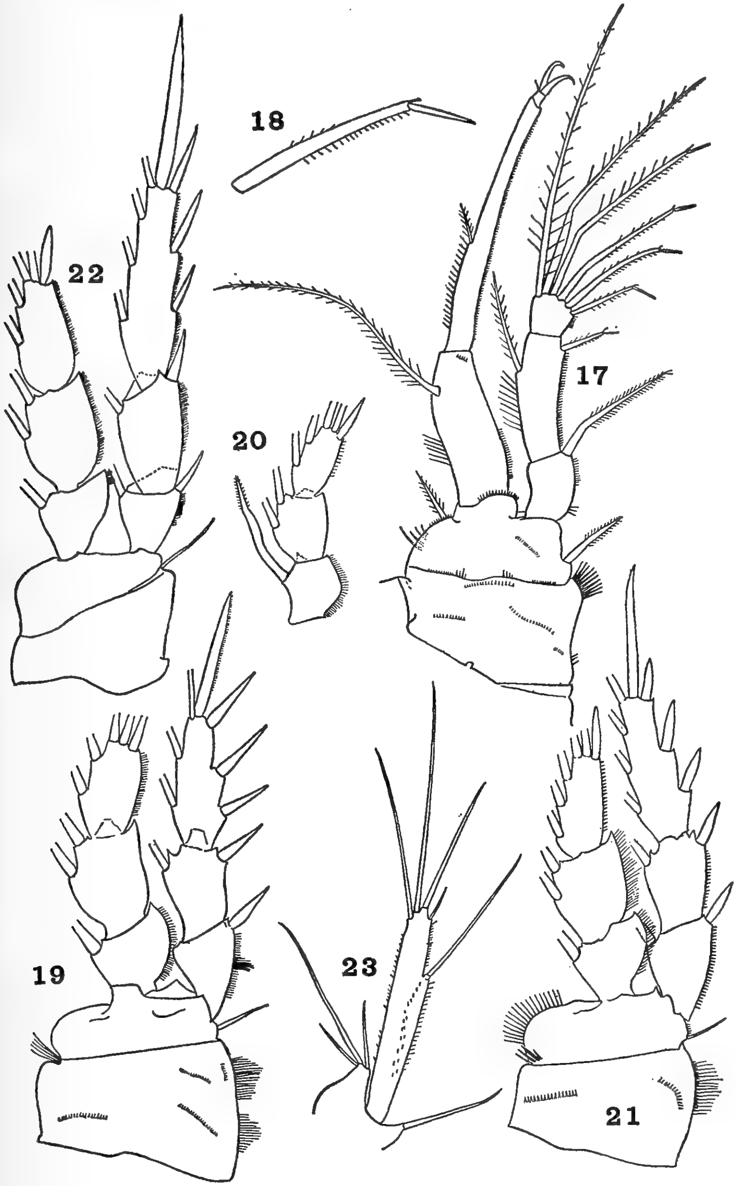
Leg 5 (Fig. 16) shorter than in female. Proximal segment with 1 seta on inner lobe and 1 on outer lobe. Distal segment about 0.25 as



FIGS. 1–9. *Tisbe monozota*, new species. 1.—Female, dorsal. 2.—Male, lateral. 3–9.—Female. 3.—Last urosome segment and caudal rami. 4.—Next-to-innermost caudal seta. 5.—Next-to-outermost caudal seta. 6–7.—Next-to-outermost caudal setae from two other females, showing telescoped joints. 8.—Labrum. 9.—Maxilla 1.



FIGS. 10–16. *Tisbe monozota,* new species. 10.—Antenna 1, ♀. 11.—Antenna 1, ♂. 12.—Antenna 2, ♀. 13.—Mandible, ♀. 14.—Maxilla 2, ♀. 15.—Maxilliped, ♀. 16.—First 3 segments of abdomen, ♂, showing legs 5–6.



FIGS. 17–23. *Tisbe monozota,* new species. 17.—Leg 1, ♀. 18.—Proximal outer seta of exopod segment 3, leg 1, ♀. 19.—Leg 2, ♀. 20.—Leg 2, endopod, ♂. 21.—Leg 3, ♀. 22.—Leg 4, ♀. 23.—Leg 5, ♀.

long as that of female, about 5 times as long as broad; medial of 2 terminal setae the longer; lateral margin with long seta well removed (about 0.25 length of segment) from distal end; medial margin with 2 spinules.

Leg 6 unisegmental, about as long as width at base. Inner terminal seta broad, spinose; outer terminal seta slender, naked, about a third longer. Lateral margin with 1 slender seta.

Types: Male holotype, USNM 107152; female allotype, USNM 107153; and 37♀, 29♂, 136 copepodid paratypes, from aquarium water collected in Bear Cut, Biscayne Bay, Florida.

The specific name, "monozota," derived from the Greek "mono," single, and "ozotos," branched, refers to the single apical setule on the setae of exopod segment 3 of leg 1.

Remarks: (Full references to all species cited in the following discussion are given by Lang (1948), except for 2 species described by Humes (1957). References to original descriptions are therefore omitted from the bibliography). Three characters distinguish *T. monozota* from all other species of *Tisbe*:

1. Only in *T. monozota* is there a single setule at the distal end of the setae of exopod segment 3 of leg 1. In other species of *Tisbe* these setae bear a group of setules. The setules of this group may be compact and tuftlike as in *T. furcata* (Baird), well spaced as in *T. gurneyi* (Lang), or absent as in *T. racovitzai* (Giesbrecht). According to Johnson and Olson (1948), the characteristic arrangement of setules is present in all copepodid stages of *T. furcata*; the same is true of the distinguishing single setule in *T. monozota.*

2. Sexual dimorphism in leg 2 has been reported in only 3 species: *T. gracilis* (T. Scott), *T. holothuriae* Humes (1957), and *T. cucumariae* Humes (1957). In these species, as in *T. monozota,* the seta of endopod segment 1 is transformed into a strong spine, differing in structure in the 4 species. In *T. gracilis* it is bifurcate at the apex and plumose in the distal 0.6. In *T. holothuriae* it is plumose throughout its length, slightly truncate apically, and with peculiar surface striations on the distal half. In *T. cucumariae* the spine is slightly sinuate, pointed and recurved apically, and plumose throughout its length. The spine in *T. monozota* is slightly sinuate, pointed apically, and has short marginal setules in the distal 0.3.

Unfortunately the male has been described in only a few species of *Tisbe,* and in at least one of these species, *T. wilsoni* Seiwell (1928), the sexual dimorphism in leg 2 has been overlooked. Leg 2 of the male holotype of *T. wilsoni,* which I have examined, closely resembles that of the male *T. gracilis.*

3. In the distal segment of female leg 5, the length to breadth ratio and position of the lateral seta are distinctive. Of the species having a length to breadth ratio of about 5:1 or more, only in *T. elegantula* (Sars) and *T. gurneyi* (Lang) is the lateral seta as much as 0.25 the length of the segment from the distal end. The latter two species can

easily be distinguished from *T. monozota* by the comparative lengths of segments 1–4 of antenna 1 and by the tufted setae of the third exopodal segment of leg 1.

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PROCEEDINGS

OF THE

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A NEW *CRUZOBIUS* FROM MEXICO (CHILOPODA: LITHOBIOMORPHA: WATOBIIDAE)[1]

BY RALPH E. CRABILL, JR.
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To date three species have been referred to the watobiid genus *Cruzobius*. These are: *verus* Chamberlin, 1942; *atoyacus* Chamberlin, 1942; *viganus* Chamberlin, 1944. All are native to the Mexican State of Vera Cruz. To these is now added a new species, *pococki*,[2] which is similarly Mexican.

All of the members of the genus are very small in size, have a low antennal articular number (24 or less), lack tergital productions, and have in the males striking fungiform lobes distodorsally on the 15th tibiae. The new species differs from its congeners, and indeed from nearly all other watobiids,[3] most notably in its possession of dorsal prefemoral spurs on legs 14 and 15. On the basis of the published descriptions of the other three species, it is not possible to know which of them is most similar to *pococki*: the descriptions of *atoyacus* and *viganus* are particularly wanting in critical details. The new species differs from the type species, *verus*, however, at least as follows. *C. pococki*: (1) 2 ocellar series present. (2) Last 3 pairs of legs lack anterior pretarsal accessory claws (anterior parungues). (3) Legs 14 and 15 with spurs DPM and DPP. *C. verus*: (1) 1 ocellar series present. (2) All legs with anterior and posterior parungues. (3) Spurs DPM and DPP absent on all legs. The third character, which is critical in watobiids, distinguishes *pococki* from all of its congeners.

[1] This research has been carried out with the assistance of a grant from the National Science Foundation.

[2] Named in honor of R. I. Pocock, late of the British Museum, whose versatile and prolific pen contributed greatly to our understanding of the Mexican and Central American Myriapoda.

[3] In 1943, p. 40 (in the description of *Malbius*, n.g.), Chamberlin wrote: "Readily distinguished from *Tropobius and all other genera* (my italics) of the group (i.e. family) in the possession on the posterior legs of spines (i.e. spurs) on articles other than the tibiae. . . ."

Cruzobius pococki, new species

Holotype ♂: MEXICO: CAMPECHE; intercepted by U. S. quarantine officials at Brownsville, Texas; 1 August 1960; on bromeliads. U.S.N.M.: 2777; C-167.

Description: GENERAL: Length, 11 mm. Color: body dark red-brown; antennae and legs lighter, shading to fulvous. Vestiture: sparse; in general the setae are short, straight, stiff. ANTENNAE: Length: 2.25 mm. Articular number: right, 24; left, 22. Setae: from article 2 through 14 not increasing notably in number but decreasing gradually in length; articles 3 through penult each with 2 rows of setae, last article with 4 regular rows beyond which there are scattered irregular setae. CEPHALIC PLATE: Dimensions: length, 0.67 mm; greatest width, 0.63 mm. Dorsally distinctly domed, not flat. Limbus (lateral margin): well-developed, extending anteriorly to level of major ocellus; at half its lateral length minutely but distinctly disjunct. Surface is smooth and weakly areolate; frontal and antennocellar sutures deeply impressed and distinctly connecting. Ocelli: in two series, i.e., 1–4, 4; major ocellus well-separated from minor ocelli; organ of Tömösvary relatively large (as large as nearest ocellus), deep, circular. PREHENSORIAL SEGMENT: Prosternal dentition: 2–2, apices recurved; diastema narrowly U-shaped; porodonts setiform, much shorter and less robust than adjacent teeth but only slightly shorter than adjacent setae. Calyx of each poison gland located in the tibial article. TERGITES: No tergite with posterior productions; all corners rectangular. Surface smooth, not rugose, faintly areolate. CURSIPEDS (legs 1–13): Tarsi: 1–12 without trace of ventral division, without dorsal condyles; 13 with weak ventral division but without dorsal condyle; pectines lacking on all. Pretarsi: 1–13 with large falciform posterior parungues; 1–12 with small straight anterior parungues, these lacking on 13. Cribellate surfaces: large aggregated pores absent except on inner and under surfaces of 12 and 13 (on femora, tibiae, tarsi). Secondary sexual modifications absent. TENACIPEDS (legs 14 and 15): Both slightly inflated. Length: 14th, 1.94 mm; 15th, 2.07 mm. Sexual modifications: absent on 14; tibia of 15th dorsodistally with a large fungiform lobe that is basally constricted, dorsally expanded and there bearing 8 short stiff alveolate aetae.[4] Tarsi: without pectines; each completely divided; each with a prominent dorsal condyle; posterior parungues present on both, anterior parungues absent on both. Cribriform surfaces: large massed pores present on ventral and inner surfaces of femora, tibiae, and both tarsal articles. COXAL PORES: Number: left, 2232; right, 2332. Each pore round; disposed unseriately; not sunk in deep depressions (scrobes). PLECTROTAXY: Quantitative dorsally: legs 1 through 10 = 00001; 11 through 13 = 00000; 14 and 15 = 00200. Quantitative ventrally: Legs 1 through 12 = 00000; 13 through

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[4] This lobe is nearly identical in form and relative size to the *14th* leg lobe seen in the males of the lithobiid genus *Nampabius* whose species occur commonly in the cooler parts of the United States. See Crabill, 1952, pp. 203–206.

15 = 00100. Qualitative: DPM = 14–15; DPP = 14–15; DTiP = 1–10; VPA = 15; VPP = 13–14. No coxa is laterally armed. Postpedal Segments: Gonopods: uniarticulate; very low and barely visible. Anal pores absent.

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PROCEEDINGS
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MISCELLANEA MEGADRILOGICA. V–VI[1]

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V. On Some Instances of Supposed Variation in the Night Crawler, *Lumbricus terrestris* L.

Segment number in 817 specimens (hereinafter referred to as the B series), obtained from biological supply houses (Bragg, 1955), was 114–204. The clitellum in 640 of the worms comprised 4–8 segments and began with xxvii (1 specimen), xxviii (1), xxix (2), xxx (11), xxxi (161), xxxii (409), xxxiii (49), xxxiv (4), xxxvi (1), xxxvii (1).

Species of *Lumbricus* are distinguishable from each other almost only by location of the clitellum and of the tubercula pubertatis though number of segments (Evans, 1946) and soma size supposedly have some taxonomic value. *L. terrestris,* as usually defined (*cf.* Smith, 1917, p. 179 or Cernosvitov and Evans, 1947, p. 29), has a clitellum of six or seven segments on xxxi or xxxii–xxxvii. Moreover, the clitellum in other American species of *Lumbricus,* as hitherto diagnosed, extends only through six or seven segments. The data for the B series accordingly are so inconsistent with lumbricid taxonomy as to require confirmation or correction. A letter (18 January 1956) to the author and a note (16 April 1956) to the editor of the trade journal published by the major supplier explained the situation and mentioned the desirability of further investigation of the supposedly divergent worms or study of others of a similar sort. Unfortunately, the original worms had been discarded and, so far as is known, no effort was made to secure further information or material.

Meanwhile, the literature has been reviewed by the present author and segments of juvenile and adult night crawlers from various parts of the country have been counted. Further con-

[1] From research supported by the National Science Foundation.

sideration of segment number in the species is left for a future communication but no good reasons have been found for believing that "normal" specimens of *L. terrestris* have more than 164 segments or that the clitellum of "normal" individuals varies markedly from the commonly accepted norms for the species. Although "Any specimens with lost segments or regenerating segments were discarded" (Bragg, 1955) it is likely that night crawlers with fewer than 125 segments (*cf.* Evans, 1946) really were amputees.

Intercalation of one to several extra segments in an anterior portion of the body (Gates, 1956–1958) is not uncommon in lumbricids. Occasionally the insertions are numerous and more extensively distributed through the body. One night crawler with 175 metameres on the right side and 196 on the left side recently (Gates, 1956) was described. The aberrant nature of all such worms that have been studied was shown by wrong locations of fixed-position organs such as the obvious male tumescences) and/or by abnormalities in metamerism. Although abnormality in the B series usually would be suspected Bragg stated (*in litt.* 9 February 1956) that he "was careful to reject from the data any counts on worms which were in any way abnormal as to somites." The splitting of somites during embryogenesis that is responsible for the above-mentioned abnormalities presumably could be confined to the region behind xviii where fixed-position organs are lacking. Regularization, after somite fission, presumably could be so perfect that no evidence for the developmental aberrations would be recognizable in the adults but such eventualities are unlikely even in a single individual (*cf.* Gates, 1956–1958) and seem incredible for a much larger number of worms.

In the B series, 570 specimens now seem likely to have been night crawlers and normal insofar as the clitellum is concerned. If abnormality of embryonic origin, amputation and regeneration are to be excluded from consideration, seventy worms or more than one-ninth of the series now must be assumed to have belonged to taxa other than *L. terrestris* in spite of the fact that Bragg (1955) "never found reason to question the identification of the animals."

Four species of *Lumbricus* are known from North America. The clitellum of *L. castaneus* and *rubellus* does begin with xxvi, xxvii, or xxviii but each of those species is so much smaller than *L. terrestris* as to be unlikely to be given to American students for dissection[2] or to be mistaken for the night crawler. *L. festivus* does have a clitellum beginning with xxxiii or xxxiv as in 53 of the B series. That species was reported from North America (eastern provinces of Canada) in 1902 (Stafford) but the record has not been confirmed. Though larger than *L. castaneus* and *rubellus, L. festivus* is not known to reach night crawler size. Other American lumbricids belong to five genera three of which hardly seem to need mention in the present connection. The clitellum of *Allolobophora turgida* occasionally begins with xxix but this species is small, unpigmented and unlikely to be mistaken for *L. terrestris.* The clitellum always begins with xxix in *Octolasium cyaneum,* as it does in two specimens of the B series, and with xxx in *O. lacteum,* as in 11 of the B series, but these species are smaller than *L. terrestris* and readily distinguished by the lack of pigment as well as by the prostomium. Only two of the exotic lumbricids, both pigmented, now seem at all likely to be confused with *L. terrestris.* The smaller of these, *Allolobophora trapezoides,* has a clitellum of 7–8 segments that may extend anteriorly into xxvi. A markedly aberrant specimen, originally referred to *A. caliginosa* (Gates, 1956a), has 210 (+ ?) segments though the maximum for normal individuals in the United States seems to be 170. The larger species, *A. longa,* may have as many as 220 segments and has a clitellum of 8–9 segments beginning, as in two of the B series, with xxvii or xxviii. Both species easily are distinguishable from *L. terrestris* by the color and by the prostomium. The anterior end of the clitellum in all endemic lumbricids is in front of xxxi. Such data as were provided for the B series are insufficient to warrant further comment on specific identity of the seventy divergent earthworms.

No normal earthworm of any family in North America is

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[2] The writer was recently requested to advise on the possibility of providing giant earthworms for dissection by students in this country. My reply mentioned the fact that beginning students in other countries seem to have no difficulty with dissection of earthworms that are smaller than the night crawler.

known to have a clitellum beginning with or behind xxxv, as in two of the B series. For those specimens, the only alternative explanations now remaining would seem to be mistakes in segment counting (even though counts were checked for accuracy and questionable counts were eliminated) or presence of unknown species.

Whether abnormality, amputation, misidentification or unknown species were involved in the B series, information as to various unrecorded characteristics of the divergent specimens would have been of considerable interest and worthy of publication. Accordingly, there is no disagreement with Bragg's conclusion as to possibilities of research on animals used in teaching.

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VI. Reproduction in a Tropical Earthworm.

The glossoscolecid *Pontoscolex corethrurus* (Müller, 1856), originally from tropical America and now domiciled in the United States (Gates, 1954, p. 222), may prove to be the most widely established of all the earthworms that have been transported around the world by man. Possibly no other megadrile has occasioned so much disagreement as to its morphology and reproduction. Some of the confusion with regard to structure, due to misinterpretation of divergence from normal megadrile organization, has been resolved (Gates, 1943) though some anatomical relationships still need accurate characterization. Basically involved in other contradictions is an assumption that reproduction is sexual and biparental as was long thought to be characteristic of all megadriles.

Sperm usually have been lacking on male funnels and in spermathecae of most breeding (indicated by clitellar tumescence) individuals that were collected by or for the author in different seasons of the year and from many widely separated regions. Tabulated data will be presented, circumstances permitting, in a subsequent communication. Spermatophores never were seen on many thousand specimens identified during the last thirty years and are not mentioned in the literature. Absence of spermathecal and spermatophoral sperm in breeding worms shows that copulation either was ineffective or had not taken place. In such circumstances, fertilization is possible only if a worm matures its own sperm. Testes, however, often remain juvenile or even rudimentary, sometimes so much so as to be unrecognizable in dissection. If, then, cross fertilization is impossible because sperm are not received in copulation and self fertilization is impossible because of male sterility, reproduction must be parthenogenetic. Further evidence in support of that method of reproduction is provided by the small size, rudimentary state or even absence of seminal vesicles (especially significant in a genus where by definition those organs are required to be unusually long and to extend through a number of segments), the small size of the male funnels or the translucence of larger but abnormally delicate funnels, retention of spermathecae in a juvenile condition throughout the entire breeding season, occasional presence of ova in gonads that should be testes, attenuated male gonoducts (without functional male pores). Such conditions have been found during the breeding season in taxa that have been proven by cytological studies to be male sterile. Elsewhere, similar conditions are known, in the breeding season, only from individuals or taxa in which male sterility or parthenogenesis is anticipated or suspected.

Very rarely in *P. corethrurus* sparse maturation of sperm has been demonstrated by flecks or spots of iridescence on male funnels possibly of nearly normal size. Such worms, however, usually do not copulate as can be deduced from the almost uniform emptiness of spermathecae during the breeding period. Only in four (of the six) spermathecae of a single individual was coagulum with spermatozoal iridescence found. Even there the coagulum was so little as to occupy only a small portion of the space available in the ampullae. Maturation of sperm is not incompatible with parthenogenesis which may be optional as in *Dendrobaena rubida* or obligatory as in the anarsenosomphic morph of *Pheretima anomala* because the sperm, even if normal, are unable (Gates, 1956) to pass out of a closed system (comprising testis sacs and male gonoducts) without openings to the exterior.

Furthermore, examination of many specimens of *P. corethrurus* has provided evidence for a belief, even though normally sexual morphs have not been seen, that tubercula pubertatis, genital setae, supraparietal TP and GS glands are disappearing or already have disappeared in various strains just as in parthenogenetic morphs of certain lumbricids. Male gonoducts of *P. corethrurus* sometimes attenuate or otherwise terminate without acquiring functional openings to the exterior, again just as happens in parthenogenetic morphs of lumbricids and of the megascolecid genus *Pheretima*.

The protandry, consecutive hermaphroditism, dioecism, masculine and feminine phases postulated by previous authors to explain conditions in their material of *P. corethrurus* are absent, at least in later stages of its postparthenogenetic evolution of polymorphism. As in other megadrile species for which separate sexes were reported, the supposed females are parthenogenetic and there is no male sex. Megadrile oligochaetes certainly seem to be characterized by an inherent inability to become dioecious.

Possibility or probability of parthenogenesis now can be recognized in favorable circumstances and when only pickled specimens too poorly preserved for cytological studies are available. This is especially important in oligochaete taxonomy as ignorance of the morphological changes appearing after establishment of that method of reproduction has been responsible for needless erection of species and perhaps occasionally even of genera. Some of those morphological changes are considered in recent contributions (Gates, 1954–1958). Other postparthenogenetic modifications of anatomy are to be considered in subsequent publications.

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A REMARKABLE NEW FAMILY OF SPINED POLYDESMOID DIPLOPODA, INCLUDING A SPECIES LACKING GONOPODS IN THE MALE SEX[1]

BY H. F. LOOMIS AND RICHARD L. HOFFMAN

Collecting in Alta Verapaz, Guatemala, during the course of agricultural investigations in 1904, the late O. F. Cook obtained specimens of two species of polydesmoid millipeds which in general appearance are quite unlike any species previously known from the western Hemisphere. Bearing a considerable resemblance to the strongylosomatid genus *Hylomus* of southeast Asia, these animals with curiously elevated and spined paranota appear to warrant the erection of a new family for their reception.

In publishing the names and descriptions of these millipeds, more than 50 years after their collection, we not only establish a new family, but more importantly, record one of the most astonishing and basic departures in the morphology of known Diplopoda. In one of the new species, there are no gonopods, segment 7 of males having instead two pairs of perfectly normal ambulatory legs. This condition is certainly unique insofar as helminthomorph diplopods are concerned, and one which might have been, *a priori,* considered impossible since gonopods are of the utmost importance in perpetuation of these animals. That it is normal for the species—and not a teratological situation—is attested by the great enlargement of the second pair of legs of males into clavate appendages which presumably substitute in some way for gonopods in the process of sperm transfer.

It is a curious circumstance that among all the millipeds discovered by Dr. Cook during his many years of collecting he should have failed to recognize what certainly was his

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most unusual species. Intent as always on preserving both sexes of the millipeds he collected, Dr. Cook probably mistook the gonopodless males to be females and so overlooked their significance. Otherwise, the unusual morphological and evolutionary aspects involved unquestionably would have fascinated him and led to the publication of these peculiarities.

We commence our discussion with formal diagnoses and descriptive notes of the new family and its included genera and species, following which some remarks upon the systematic position and evolutionary significance of the group are given.

TRIDONTOMIDAE, new family

Body composed of 20 segments in both sexes; exoskeleton rather thin, not well sclerotized.

Antennae and legs unusually long and slender.

Paranota of collum wide and much exceeding sides of head, greatly resembling those of following segments.

Prozonites of midbody segments well exposed, separated from metazonites by a broad, pronounced interzonal constriction. Metazonites with a broad middorsal concavity, but with no well defined transverse sulcus; paranota wide, moderately to greatly elevated, and produced into large acuminate, spine-like lobes; paranota of midbody segments occupy from two-thirds to five-sixths of the posterior sides of the metazonites. Ozopores very small, located in a rounded swelling on ventral side of the paranota of segments 5, 7, 9, 10, 12, 13, 15–19.

Males with or without gonopods. Coxae of second pair of legs each with a long, tubular seminal process, more or less setose at apex.

In the species with gonopods, these appendages of moderate size, the coxae completely independent from each other, and without trace of solenite. Telopodite consisting of a single article, without basal cavity or a seminal groove. Sternal aperture of segment 7 virtually divided by a long lobe from the posterior margin which nearly touches a smaller corresponding lobe from the anterior margin. In the species without gonopods the seventh segment has two pairs of normal legs, but the legs of the third segment are greatly enlarged and clavate.

Tridontomus, new genus

Type species: Tridontomus procerus, new species.

Diagnosis: Differing from *Aenigmopus* in the presence of gonopods in the male sex and by the normal configuration of the second pair of legs. The collum is distinctly broader and more acutely spiniform, and the caudal edge of each metazonite distinctly elevated. Other differences in body form are noted in the following paragraphs.

Description: Body of moderate size, the exoskeleton not strongly sclerotized and segments and appendages are capable of being indented or bent without breaking.

Head with a deep vertigial sulcus; labrum long and thin; antennae very long and slender, longer in males than in females, with a sensory area at apex of 5th and 6th articles.

Paranota of collum greatly exceeding sides of head and quite similar in shape to those of following segments.

Prozonites of most body segments largely exposed, separated from metazonites by a strong interzonal constriction. Metazonites shallowly depressed middorsally, lacking a distinct transverse sulcus, but with two anteriorly placed setiferous tubercules and a row of four to six larger tubercules near the caudal margin. Paranota of anterior and posterior segments occupying full length of metazonites, but those of midbody segments restricted to posterior two-thirds of length in males and four-fifths in females. Paranota rather thin, very wide, moderately to strongly elevated and consisting of three prominent, acuminate, outwardly directed lobes of which the middle is longest, the posterior shortest; paranota of segment 18 with first and last lobes greatly reduced in size and on segment 19 these lobes are not represented, the middle lobe occurring as a strong lateral ridge which extends beyond the posterior margin of the segment. Ozopores small, opening in low rounded swellings on ventral side of paranota of the usual poriferous segments.

Anal segment narrowed apically and exceeding the paraprocts, its tip truncated and narrowly oval.

Segment 7 of males with the sternal aperture small, almost divided medially between the gonopods by a high, produced lobe of the posterior margin, which extends cephalad and almost contacts a similar but much smaller lobe of the anterior margin. Gonopods moderately large, parallel *in situ,* extending cephalad between the legs of the 6th segment. No trace of sternal vestige or other form of connection between the gonopods aside from the usual intercoxal muscle. Coxae small, merging proximally into small but curiously formed apodemes; no trace of solenite evident. Telopodite fairly long and slender, unsegmented, set against the coxa at a right angle, the prefemoral portion without any basal concavity or groove, and no seminal groove visible along the length of the telopodite. A slender apically twisted prefemoral process occurs on the dorsal side, and a long acuminate retorse projection of the distal third extends somewhat caudolaterad.

Legs in both sexes very long and slender, setose, extending laterally beyond edges of paranota by several distal joints; legs of males with the coxae and prefemora noticeably enlarged, the others only slightly stouter than those of females. Anterior legs of males not specially modified except for the elongated, tubular, and distally laciniate seminal process on the coxae of the second pair of legs.

In females, ventral surface of third segment broadly elevated into a high cup-like or trough-like epigynal structure behind second pair of legs and hiding much of the basalmost joints.

Tridontomus procerus, new species

Figs. 1–13, 22

Type specimens: Male holotype, three female and six immature paratypes, U. S. Nat. Mus. Diplopod Type No. 2823, from Sepacuite, Dept. Alta Verapaz, GUATEMALA, collected in May, 1904, by O. F. Cook.

Diagnosis: With the characters of the genus; specific characters undoubtedly reside in the formation of the gonopods.

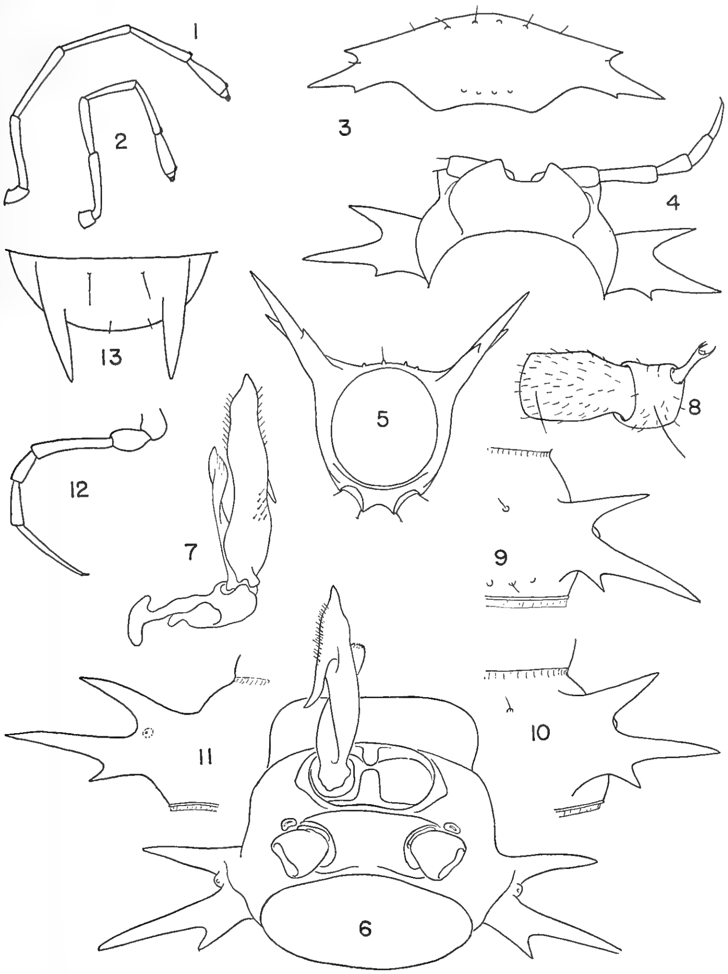
Description of holotype: Length, 33.0 mm, width across paranota, 6.0 mm. Color uniformly pale grayish, possibly faded from long preservation.

Head with deep median longitudinal sulcus on vertex, divided in front opposite top of antennal sockets and extending cephalolaterad on each side as a somewhat shallower, less definite depression to anterior margin of the socket; surface of vertex dull, with tiny scattered granules and a few short setae; a single long vertigial seta on each side of the sulcus. Front smooth and polished, but with numerous scattered setae of varying length. Labrum thin and projecting, crossed by a median series of 16 long setae, these stouter than those on the front, curving forward and ventrad half again their length beyond ventral edge of labrum. Antennae (Fig. 1) very long and slender, extending to caudal margin of segment 6 when appressed to body, articles 5 and 6 each with a tiny sensory area at the apex on outer side.

Collum of the form as shown in Fig. 3, its paranota greatly exceeding sides of head and slightly elevated, a short seta in the sinus between first and second lateral projection and another on front margin on each side near its junction with discal part of collum. A subtransverse series of four small setiferous tubercules just behind the anterior margin, and a similar row of smaller tubercules adjacent to the posterior margin. Central part of collum somewhat depressed, its surface, as well as that of the following metatergites, very finely and densely granular, the granules extending onto basal part of paranota but not onto their outer portions which are polished and faintly reticulated like the surface of the prozonites. Surface of metazonites most distinctly granular adjacent to posterior row of tubercules.

Body cavity higher than wide; prozonites considerably exposed, separated from metazonites by a broad, deep interzonal constriction, in which the transverse interzonal suture is represented by a slight declivity forming a distinct line. Metazonites with a raised rim along the posterior margin, this followed by a long, thin, unmodified supplementary border ("Franzensaum").

Metatergites posterior to the collum with two tiny, widely separated setiferous tubercules near the anterior margin; on segments 2 to 4 also four larger setiferous tubercules adjacent to the posterior margin, in-



FIGS. 1–13. *Tridontomus procerus,* new species. 1.—Antenna of male. 2.—Antenna of female. 3.—Collum of male. 4.—Segment 2 of female, anterior aspect, showing epigynal development. 5.—Segment 4 of male, caudal aspect, to show degree of elevation of paranota. 6.—Segment 7 of holotype, ventral aspect, with the left gonopod removed, the right gonopod in situ. 7.—Left gonopod of holotype, mesial aspect. 8.—Coxa and prefemur of second leg of male, to show form of seminal process. 9.—Right half of segment 10 of male, dorsal aspect, the paranotum considerably foreshortened. 10.—Right half of segment 10 of female, dorsal aspect. 11.—Segment 10 of female, right paranotum in ventral aspect, showing full length, also location of ozopore. 12.—Leg from midbody segment of male. 13.—Segment 19 of male, dorsal aspect. (All figures to same scale except 6 and 7 which are slightly enlarged.)

creasing to six on segments 5 to 17. These tubercules form a transverse row, in which the inner four are narrowly conical, the median pair largest. Segments 18 and 19 without tubercules but apparently normally with setae in the corresponding positions (some are lost).

Tergites with a broad concave middorsal depression but without a distinct transverse sulcus. Beginning with segment 2 the paranota became more distinctly trilobed and are completely so formed back through segment 17; the first and third lobes greatly reduced on segment 18 and lacking from segment 19. Paranota abruptly elevated from segment 2, the maximum angle achieved at segment 4 (Fig. 5) and approximated again from segments 16 to 18, elevation of the intervening segments not so pronounced. Paranota of segments 2 to 5 as long as the metazonites, but for several succeeding segments they gradually occupy less of the sides of the metazonites until only the posterior two-thirds of the length is occupied by paranota (Fig. 9) and this condition extends to segment 17. On segment 18 the paranota occupy more of the metazonital length, and on segment 19 the entire side of the posterior subsegment is covered with the small narrow paranotum which is also produced beyond the posterior margin of the segment as a slender conic process (Fig. 13). Ozopores small, in normal sequence on segments 5, 7, 9, 10, 12, 13, 15–19, opening in a low rounded swelling on ventral side of paranota just mesad of the sinus between lobe 1 and 2 (Fig. 11), largest swelling on segment 18, but none on segment 19 where pore opens ventrad of the ridge-like paranotum near middle of metazonite.

Anal segment with an anterior row of eight setae, the outer two on each side occurring adjacent to caudal margin of the segment, a subapical row of four setae, and a terminal cluster of four setae. Epiproct elongate, narrowly oval, moderately exceeding paraprocts. Latter somewhat inflated, the margins broad, high, and distinctly polished in contrast to the dull surface elsewhere, each paraproct with two long, widely separated setae located near the elevated mesal margin. Hypoproct subtriangular, more than twice as wide as long, the apex broadly rounded, with two long paramedian marginal setae but no distinct tubercules.

First pair of legs small, scarcely exceeding ends of collum, second and ensuing pairs of legs very slender, rapidly increasing in length for several pairs to their considerable maximum length; the three distalmost podomeres extending laterally beyond the ends of the paranota. Coxae and prefemora somewhat thickened, each with a long seta near the apex on ventral side, otherwise glabrous but with a finely granular texture, remaining podomeres entirely smooth. Legs set on distinctly elevated podosterna which are impressed by a deep transverse depression and a less distinct longitudinal groove; surface of podosterna somewhat more distinctly granular than the coxae.

Segment 7 in ventral aspect as shown in Fig. 6. Gonopodal aperture nearly closed medially by an elevated projection of the posterior margin which nearly touches a similar but shorter lobe from the anterior margin.

Gonopods of the form shown in Figs. 6 and 7, and with the general structure as itemized in the generic diagnosis.

Seminal process of the second pair of legs long, slender, and tubular in appearance, its apex with 2 or 3 short setae (Fig. 8).

Description of paratypes: Females, of about the same length as the male, the width across paranota also approximate, but the body cylinder is wider, the cavity circular, the paranota farther apart dorsally but narrower and not so prominently elevated as in the male, reaching the maximum elevation on segment 17. Paranota of segment 18 simpler than in male, anterior and posterior spiniform lobes reduced to knobs or slight undulations on the median lobe.

Labrum thin as in the male but not as long; the antennae also shorter, extending caudally only to posterior margin of segment 4; segmental granulation more uniform in that the texture does not become rougher adjacent to the posterior row of tubercules; pore swellings not more conspicuous near caudal end of body; legs slightly more slender than in male, the basalmost podomeres not enlarged and lacking the granular texture.

Segment 3 with ventral surface behind the legs developed into a high, anteriorly open trough-like epigynal structure, deeply emarginate medially as seen in oral aspect (Fig. 4).

Aenigmopus, new genus

Type species: Aenigmopus alatus, new species.

Diagnosis: Very similar in general appearance to *Tridontomus* but differing from it and from all other helminthomorph Diplopoda by the complete lack of gonopods, segment 7 of males having two pairs of normal walking legs; second pair of legs of males strongly crassate, with unusually stout pretarsi.

Description: Body rather small and slender, about seven times as long as broad, very poorly sclerotized; prozonites considerably exposed, separated from metazonites by a wide deep constriction. Metazonites with transverse rows of setiferous tubercules as in *Tridontomus* but lacking granulation, middorsal surface distinctly depressed; posterior margin of segments without raised rim, supplementary margin short. Paranota resembling those of *Tridontomus,* occupying only part of sides of metazonites except on several terminal segments, shorter at base in males than in females.

Head deeply sulcate on vertex; labrum short, with anterior edge a little thickened; antennae long and slender, those of male slightly longer than of female, with a small sensory area at distal end of articles 5 and 6.

Collum much wider than head, its lateral ends slightly elevated, each end consisting of a single acute ectal projection with a small sharp dentation on both front and back margins.

Segment 2 with the paranota bilobed, a third small lobe occasionally present behind largest one; paranota of segments 3 to 17 with three strong spiniform lobes as in *Tridontomus* but generally narrower although equally strongly elevated. Paranota of segment 18 not as large as preceding, consisting of a single, high acute lobe; those of segment 19 each reduced to a small lateral ridge extended beyond caudal margin of the segment as a short, acute point. Last segment in outline as in *Tridontomus,* but truncated apex circular rather than oval; paraprocts with thin, elevated margins; hypoproct triangular, its apex acute.

Males lacking gonopods; segment 7 with two pairs of legs no different from those on adjacent segments. Second pair of legs large, strongly crassate and uncate; each basal joint with a long tubular, apically setose seminal process; pretarsus of these legs unusually large and heavy. All other legs very long and slender, similar in the two sexes.

Females with ventral surface of segment 3 raised into a high, thin, epigynal crest behind the second pair of legs.

Aenigmopus alatus, new species
Figs. 14–21

Type specimens: Male holotype, two male and two female paratypes, U. S. Nat. Mus. Diplopod Type No. 2824, from Scamay, GUATEMALA, collected in June 1904, by O. F. Cook.

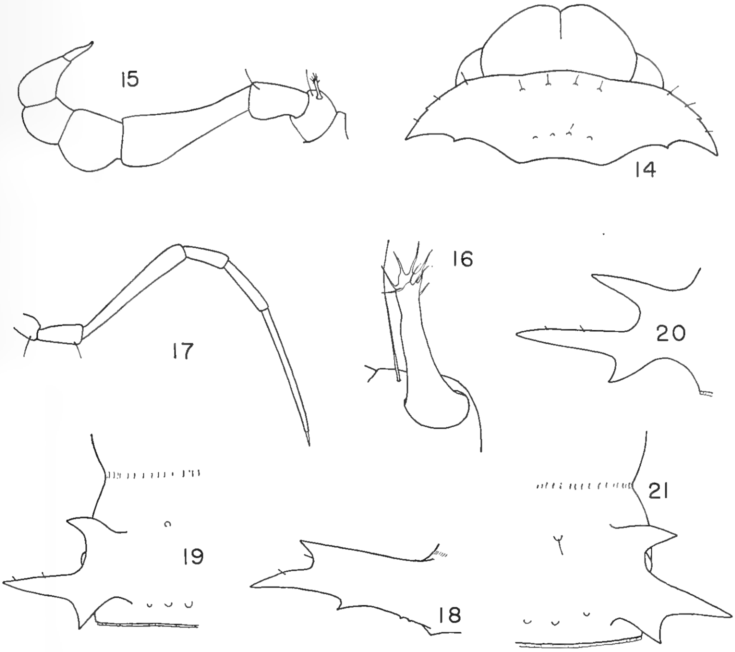
Diagnosis: With the characters of the genus.

Description of holotype: Adult male, length 22.0 mm, width across paranota, 3.0 mm. Color uniformly grayish.

Head with pronounced sulcus on vertex, deepest anteriorly, a broad shallow depression extending cephalolaterad on each side from lower end of vertigial sulcus to front margin of antennal socket; surface of vertex dull, reticulated, lacking granulations, sparsely beset with setae of moderate to considerable length; frons smooth and polished, the setae similar to those of vertex but more abundant. Labrum short, not especially thin as in *Tridontomus,* slightly depressed behind, with a transverse series of 16 to 20 setae, the tips of which do not much exceed labral margin; median setae of the series shortest. Antennae very long and slender, those of males capable of reaching caudal edge of segment 5 when appressed, those of females attaining caudal edge of segment 4. Articles 5 and 6 with a small sensory area near apex on the outer side.

Collum (Fig. 14) subcrescentic in outline, very broad, much exceeding sides of head, the lateral ends produced as a broadly acuminate lobe with a small sharp tooth on either margin near base; paranotal area of collum slightly elevated; dorsal surface and margins with setae as shown in the figure.

Prozonites and metazonites of body segments separated by a rather strong interzonal constriction, which, however, is not marked by a distinct suture line as in *Tridontomus.* Metazonites with an indefinite shallow middorsal depression, the dorsal surface dull, not granular but reticulated across dorsum and onto bases of paranota, latter distally smooth and polished. Anterior portion of metatergites with two widely separated, small setiferous tubercules; segments 2 to 4 (or 5) with four small setiferous tubercules in a row near the posterior margin, on more



Figs. 14–21. *Aenigmopus alatus,* new species. 14.—Collum and top of head of male. 15.—Right leg of second pair of male. 16.—Seminal process from coxa of second leg, enlarged. 17.—Leg from a midbody segment of male. 18.—Left paranotum of segment 2, male. 19.—Left paranotum of segment 9, dorsal aspect, the paranotum very foreshortened. 20.—Left paranotum of segment 9, perpendicular aspect to show full length and correct proportions. 21.—Right paranotum of segment 9, female, dorsal aspect.

posterior segments this number increases to six. Posterior margin of metazonites without a raised rim, the supplementary margin short. Paranota not fully occupying sides of metazonites except on one or two terminal segments, those of males occupying less of sides than those of females. Paranota of segment 2 (Fig. 18), with first and third marginal lobes small; on subsequent segments these lobes are larger (Figs. 19, 20) and are present through segment 17. Paranota of segment 18 smaller than on 17, each consisting of a simple, elevated, rather slender, caudally directed acute process; those of segment 19 small, each a low ridge terminating as a short conic projection which slightly exceeds caudal margin of the segment. All paranota elevated, the maximum angle attained at segments 4 and 5, but some caudal segments nearly as high, those of intervening segments less elevated.

Anal segment shaped as in *Tridontomus* but the truncated apex round; dorsal setae arranged as in that genus but the median four setae of the anterior row borne on distinct small tubercules; paraprocts slightly

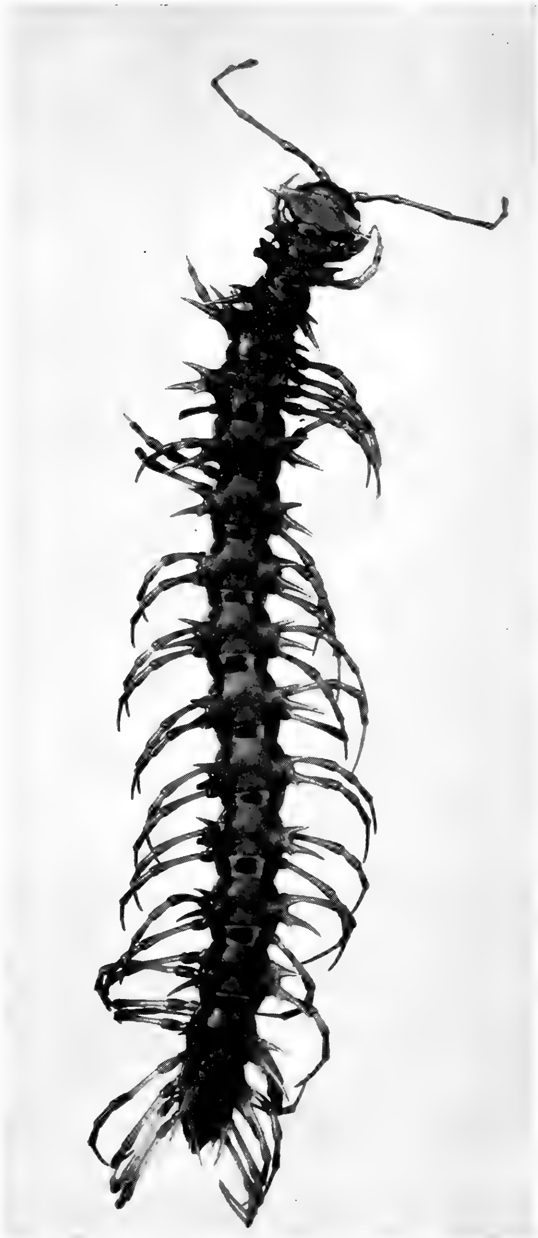


FIG. 22. *Tridontomus procerus*, male paratype, dorsal aspect.

inflated, the margins thin and high, with a pair of widely separated setae adjacent to each margin; hypoproct large, triangular, apically acute, with a long paramedian marginal seta on each side at the caudal fourth of the length.

Legs, except second pair of male, similar in both sexes; very long and slender (Fig. 17), exceeding outer limits of paranotal lobes by considerably more than their distal three podomeres. Podosterna moderately elevated, each with a broad, shallow longitudinal groove and a similar but deeper transverse groove; the surface of each podosternum thus with a cruciform impression.

Segment 7 with two pairs of normal walking legs. Second pair of legs large, crassate, and uncate in appearance (Fig. 15), podomeres smooth and polished; coxae with a long, tubular, apically setose seminal process (Fig. 16); pretarsus unusually large and heavy.

Description of paratype female: Largest female, 22 mm long and 3.2 mm in greatest width, essentially similar to male in most structural respects except that the paranota are narrower and the body cavity diameter relatively greater than in males. As in *Tridontomus procerus,* paranota occupy considerably more of the sides of the metazonites than in males.

Ventral surface of segment 3 elevated into a thin, high, rounded transverse crest behind the second pair of legs.

Systematic Position of the Tridontomidae

Among the ranks of known polydesmoid millipeds, there are only a few species which even superficially bear a resemblance to those which we have just described. These belong to the Asiatic genera *Hylomus, Centrodesmus,* and *Pratinus* of the family Strongylosomatidae. Indeed, if only females of the Tridontomidae were known, we would probably have considered them to be related to *Hylomus.*

The resemblance, however, is due entirely to independent and parallel development. The gonopod structure of *Tridontomus procerus* indicates that the genus is related to the large and extremely heterogeneous assemblage of diverse forms traditionally referred to the "family" Rhachodesmidae. No doubt when this group has been carefully studied it will be rendered into several natural and distinct family groups (which may require subordinal status), but it now seems that none of them will affect the status of the Tridontomidae, a family signalized by a whole galaxy of unusual characters. The gonopod of *T. procerus* is similar to the general rhachodesmoid type, and the curious modification of the gonopod aperture is repeated in the rhachodesmoid genus *Holistophallus* Silvestri.

Rhachodesmoids collectively are members of a group notable for great variability and the development of bizarre features. Among their ranks we find millipeds which are bright blue, green, orange, and even pure white as adults; here the gonopod structure ranges from the normal polydesmoid appearance down to monoarticular fused remnants.

Body form varies from a slender juliform shape to broad, flat, limaciform contour. Within the limits of this so-called single family occurs more variation than in all of the remaining polydesmoids.

The discovery of the Tridontomidae adds still another facet to the heterogeneity of this complex; a facet that we feel is extreme enough to warrant familial designation even before the entire group has been studied.

The occurrence of the tridontomid genera in Central America is, of course, additional presumptive evidence of relationship, since all other true rhachodesmoids are restricted to Middle America (such aberrant genera as *Atopogonus* of New Caledonia and *Telonychopus* of Brasil are probably not rhachodesmoids or even closely related to them).

The Evolutionary Significance of *Aenigmopus*

Aenigmopus alatus, as previously remarked, is one of the most unusual milliped species so far discovered, owing to its loss of gonopods and, presumably, the development of some other method of sperm transfer from male to female.

The class Diplopoda may be divided into three very distinct and more or less equivalent groups on the basis of over-all structural attributes. The smallest of these includes pselaphognath or polyxenoid species, very small and highly specialized animals which have no external genitalic structures and in which the exact details of insemination are unknown. The next largest group contains the glomeroid, glomeridesmoid, and zephronioid forms, the so-called "opisthandrous" millipeds. In these short and compact animals, many modified for rolling into a sphere, no gonopods are developed, and spermatophores are transferred to the external female genitalia by the mouth of the male. These two groups are quite small, and together comprise only a few hundred species.

Finally, in the great majority of diplopods—making up the third group, called Helminthomorpha by Pocock and Proterandria by Verhoeff—one or both pairs of legs of the 7th body segment in males are modified into characteristic and remarkable sperm transfer devices called gonopods. In the species of this group, males deposit seminal material (usually spermatophores) directly from the vasa deferentia upon one or both gonopods, and these are at some later time brought into close contact with the receptacular outer ends of the oviducts. The presence and preservation of functional gonopods have thus been considered an outstanding necessity for the continuity of helminthomorph species.

Various abnormal male sexual conditions are known, involving duplication of the 7th segment to form twice the usual number of gonopods; occasional incomplete genetic control (e.g., a gonopod on one side and a normal leg on the other); and even occasional failure of the gonopods to appear. Such conditions are unquestionably the result of homoeotic mutations, affecting individual animals and doubtless preventing their reproduction. It is obvious that any mutation involving loss or impairment of gonopods can be only disadvantageous unless some other, associated mutation, produces an efficient alternative sperm transfer sequence.

Aenigmopus alatus represents an entirely new state of affairs. Here the loss of gonopods has been compensated by the development of a presumably effective alternative copulatory device, and these two events obviously must have been simultaneous, otherwise immediate extinction of the species would have occurred.

How could the loss of gonopods have been accomplished? From existing species in structurally primitive orders of Diplopoda, we can postulate their original mode of formation from normal walking legs, which have become progressively less leg-like. There is no evidence, nor any reason to believe, that this general evolutionary tendency has at any time been reversed, and it seems particularly unlikely that such a tendency would produce only a single existing species of milliped which is otherwise very similar to another species with fairly normal gonopod structure.

The conclusion to which we are now led is that *Aenigmopus alatus* is the result of a single-step evolutionary change, presumably some kind of macromutation or "saltation." This is a possibility having more than casual interest in the light of a recent statement by Simpson (1953: 104) that there are no known examples—either fossil or recent—of any animal group which *must* have arisen by saltation (by group we infer the meaning of a taxon of generic or higher rank). *Aenigmopus* seems to us to be a generic-level unit which could scarcely have arisen by any other means.

This form of morphological departure from the normal is of course of considerable systematic importance. If the otherwise closely related *Tridontomus* was not known, probably any student of the Diplopoda would have erected a separate suborder of the Polydesmida for *Aenigmopus*. As it is, we feel that the totality of structural features compels inclusion of the two genera in a single family, although there is no doubt about the validity of the two genera. Even females can be readily separated by a number of significant features, a good generic criterion within this class of arthropods!

Since our knowledge of this mutative change is derived entirely from preserved specimens belonging to a group which is still very poorly known from a taxonomic standpoint, we do not care to take a more positive position than to state the facts as we know them, and to indicate the explanation which to us seems most feasible. Obviously the matter is far from being closed; we recognize in particular the need for additional field work to determine if *Aenigmopus* still exists in Guatemala (although it seems totally improbable that Cook discovered examples of a "species" which became extinct in its first generation). Studies on the mating behavior of both species should be of the utmost interest, particularly as regards *A. alatus,* to determine if the enlarged 2nd legs are sperm transfer organs or if seminal material is introduced directly into the cyphopods from the prolonged coxal process of the males and the enlarged distal articles serve merely as claspers.

Another novel character of the family Tridontomidae is the location of the ozopores on the lower surface of the paranota instead of the upper surface as almost invariably is the case in polydesmoids. Since this ventral position is found in both species of the family, the transfer could have taken place either gradually or as a sharp mutative shift in a common ancestor of the two, rather than concurrently connected with the major mutation involving loss of gonopods in *Aenigmopus,* as might have been thought possible had not *Tridontomus* been available for comparison.

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CHORISTISTIUM EUKRINES, A NEW SERRANID FISH FROM FLORIDA, WITH NOTES ON RELATED SPECIES[1]

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A distinctive new species of the serranid genus *Chorististium* was recently collected in the Florida Keys. New material of *Chorististium rubre* (Poey) and *C. mowbrayi* (Woods and Kanazawa) permit extensions of known range and additions to previous descriptions. These data, including the description of the new species, are here reported.

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Chorististium eukrines, new species
Figs. 1a–b, Tables 1 and 2

Holotype: ANSP 94357, 41.6 mm standard length, collected 2½ miles SSW of Alligator Reef lighthouse, Monroe County, Florida, in 150 feet, 22 May 1960, by Walter A. Starck, II, and Henry A. Feddern (CRR-F-229).

Diagnosis: A distinctive species of *Chorististium* characterized by a single, dark, median-lateral stripe from the snout tip almost to the posterior edge of the caudal fin. Fin-ray formula: dorsal fin—VI-I-I, 12 (last ray composite); anal fin—III, 8 (last ray composite); pectoral fin—13-13; branched caudal rays—15.

Description: The cream-colored body is distinctly marked with a dark brown to black lateral stripe (see Fig. 1a). In life the stripe is deep red brown becoming black on the posterior part of the caudal fin. Above the dark stripe on the body is a white stripe, becoming lemon yellow

[1] Contribution No. 344 from The Marine Laboratory, University of Miami.

dorsally. The dorsal surface of the body and the spinous dorsal fin is yellowish tan. Below the median stripe is a pink line, followed by a lemon-yellow area merging into salmon pink on the ventral surface of the body including the anal fin. These stripes are not continuous onto the caudal fin or head.

The dorsal surface of the head and tip of the snout are salmon pink while the side of the head is yellow. Ventrally the underside of the jaws, isthmus and branchial area are white.

Both pectoral and pelvic fins are transparent and tinged with pink. The caudal fin is yellow above and below the stripe and the tips of the principal rays are white producing a noticeable terminal band.

Figure 1a shows the general body form. The body is compressed, moderately so anteriorly, more so posteriorly. Numerous small teeth occur on the posterior margin of the body scales. The lateral line is arched anteriorly becoming median at a point opposite the posterior end of the base of the anal fin.

The head, except for the lips, is scaled. The narial tubes are widely separated, the anterior ones being tubular and adjacent to the lip and the posterior pair are simple holes just anterior to the eyes. The maxillary extends beyond a point below the posterior margin of the pupil but not beyond the posterior margin of the eye. The free margin of the preopercle is not serrated.

Villiform teeth are present on the jaws, vomer, and palatines. Vomerine and palatine teeth are somewhat enlarged and depressible as are those of the inner series of the jaws. The tongue is long, free, and pointed.

The dorsal fins are separated by a ridge formed by the posterior dorsal spines, scaled over except for the tips. Of the eight dorsal spines the first is short and closely applied to the second while the third spine is the longest, the fourth, fifth, and sixth being progressively shorter. Twelve dorsal rays are present. Eleven elements are included in the anal fin, three spines, and eight rays. Of the three spines the first is short (half the length of the second) and the second and third are of approximately equal length, the second spine being the strongest. The pectoral fins contain 13 rays while the pelvic fins have a count of one spine and five rays.

The soft dorsal and anal fins are rather high and pointed, the proximal third of the anterior membranes being scaled, squamation decreasing posteriorly with the membrane between the last rays scaled only at the base. The basal two-thirds of the caudal and the proximal third of the pelvic fins are scaled.

Lengths of body parts expressed as per cent standard length (41.6 mm) are: head length—41; greatest depth of body (at origin of dorsal fin)—29; snout length—10; fleshy interorbital space—5.3; diameter of eye—8.2; postorbital head length—23; length of upper jaw—18; predorsal distance—47; preanal-fin distance—69; least depth of caudal peduncle—16; distance from base of last anal ray to midbase of caudal fin—19; length of longest (third) dorsal spine—12; length of longest (third) anal spine—7; length of longest soft-dorsal ray—18; length of longest soft-anal ray—22; longest pectoral ray—25; longest pelvic ray—20; longest caudal ray—23.

Additional meristic data are: branchiostegal rays—7; opercular spines —3; gill rakers on first arch—17 (last four or five rakers rudimentary); segmented caudal rays—19; principle caudal rays—17; pores in lateral line from upper edge of the opercle to the caudal base—44; vertebrae—$10 + 14 = 24$. A radiograph of this specimen is shown in Fig. 1b.

The name *eukrines* is from the Greek for distinct, well separated.

Habitat: The area in which this fish was collected is characterized by a number of small, low patches of rock, similar in appearance to the jagged Key limestone ("cay-rock") encountered along the shores of many islands in the West Indian region. These patches form a band, several hundred yards long by fifty yards wide, parallel to the main reef but nearly a mile farther out. This places the area within the usual boundaries of the Florida Current. Depth varies from 150 to 155 feet on a very gently sloping bottom composed of silty sand mixed with numerous shell particles.

There is little vegetation in this area. However, loggerhead sponges, *Spheciospongia vesparia,* are common as is the large hydroid *Aglaophenia robusta.* One stony coral, *Mussa angulosa,* is frequently encountered and a few others such as *Meandrina danae* and *Manacina mayori* also occur here. A bivalve, *Spondylus americanus,* occurs on nearly every rock patch, and several small gastropods frequent the sandy areas. Other conspicuous invertebrates are ophiuroid brittle stars, several species of hermit crabs and a caridean shrimp, *Hippolysmata grabhami,* reported by Randall (1958: 334) to be a parasite picker.

A number of fishes common to the shallower reefs are found in this deeper area as well as are several species which apparently do not venture into much shallower waters. Among the latter group are *Serranus tortugarum, S. annularis, Epinephelus niveatus, Lutjanus buccanella, L. aya, Holocentrus bullisi,* and *Scorpaena dispar.*

The holotype of *Chorististium eukrines* was collected in one of the larger rock patches with a small hand net. Another individual of the same species was seen by Henry A. Feddern during the same dive.

Chorististium rubre (Poey)

Fig. 1c, Tables 1 and 2

Liopropoma ? *rubre* Poey, 1861: 418 (type locality: Cuba).

Material examined: UMML 4140 (1, 64.9), about ½ mile SW of Alligator Reef lighthouse, Monroe County, Florida, in 20 feet, 16 August 1958, Walter A. Starck, II, and Dennis R. Paulson, CRR-F-156. UMML 4232 (1, 58.7), one mile SW of Alligator Reef lighthouse, Monroe County, Florida, in 40 feet, 22 September 1958, Walter A. Starck, II, CRR-F-181. UMML 5307 (1, 32.0), one mile SW of Alligator Reef lighthouse, Monroe County, Florida, in 50 feet, 25 October 1958, Walter A. Starck, II, and Walter Charm, CRR-F-201. UMML 6198

TABLE 1. Frequency distribution of scale and gill-raker counts in three species of *Chorististium*

	Pored lateral-line scales				Caudal peduncle scales					Total gill rakers			
	44	45	46	47	34	35	36	37	38	15	16	17	18
C. rubrum	–	2	1	1	4	–	–	–	–	1	1	–	2
C. eukrines	1	–	–	–	–	–	1	–	–	–	–	1	–
C. mowbrayi	–	–	–	1	–	–	–	–	1	–	1	–	–

(1, 29.8), ¼ mile N of St. Marc, St. Marc Bay, Haiti, in 10 to 30 feet, 22 December 1959, John E. Randall, CRR-Car-2.

Description: This species has been well characterized by Böhlke (1956). General body form and color pattern are shown in Fig. 1c. Counts of our specimens are given in Table 1 and morphometric data are provided in Table 2.

Habitat: The Florida specimens were collected in a coral reef habitat by means of rotenone and were not observed in life.

The above specimens constitute new records from their respective areas. Future collecting by means of rotenone and diving gear will probably extend the known range of this species throughout the West Indian area.

Chorististium mowbrayi (Woods and Kanazawa)
Fig. 1d, Tables 1 and 2

Liopropoma mowbrayi Woods and Kanazawa, 1951: 633–636, Fig. 134 (type locality: Bermuda).

Material examined: CNHM 48544 (1, 66.8), S shore of Bermuda, on beach after a storm, 20 August 1933, Louis L. Mowbray; holotype. UMML 7621 (1, 36.6), N of E end of Salt Cay, off Nassau, Bahamas, in 100 feet, 11 November 1960, John E. Randall, Henry A. Feddern, Carleton Ray. UMML 5537 (1, 17.5), ⅓ mile N of W end of Salt Cay, New Providence, Bahamas, in 170 feet, 28 June 1959, John E. Randall, Walter A. Starck, II, CRR-BWI-26.

TABLE. 2. Measurements of three species of *Chorististium* expressed as per cent of standard length

	C. rubre				*C. eukrines*	*C. mowbrayi*
	UMML 5307	UMML 6148	UMML 4232	UMML 4140	ANSP 94357	UMML 7621
predorsal distance	47	48	46	46	47	47
preanal-fin distance	68	66	65	70	69	70
greatest body depth	30	30	31	32	29	26
head length	43	40	37	39	41	39
snout length	10	9	10	10	10	10
length of upper jaw*	19	19	17	18	18	18
eye diameter	10	10	9	8	8	10

* Anteriormost tip of premaxillary to posteriormost point of maxillary.

FIG. 1, a–d. *Chorististium eukrines,* new species. a.—Holotype, ANSP 94357; standard length 41.6 mm. b.—Radiograph of holotype. c.—*Chorististium rubre* (Poey), UMML 4140; standard length 64.9 mm. d.—*Chorististium mowbrayi* (Woods & Kanazawa), UMML 7621; standard length 36.6 mm.

Description: In addition to the description given by Woods and Kanazawa (1951) it can be added that the snout (except for the lips) and the maxillaries are scaled. The general body form is shown in Fig. 1d. Counts of Bahamian specimens are given in Table 1 and morphometric data are provided in Table 2. Pored lateral-line scale counts and number of gill rakers of the 17.5 mm standard length specimen are only approximate and are not included in Table 1. They are: pored lateral-line scales—44; total gill rakers—17.

The following life colors are from a Kodachrome transparency of UMML 7621 for which we are indebted to John E. Randall. The body is pale orange from the snout tip to the area of the black band at the posterior end of the caudal fin (see Fig. 1d). Fin spines are chalky except those of the dorsal fin which are slightly tinted with orange. Scaled areas at the bases of the soft-dorsal and anal fins are pale orange. The fin membranes are colorless. The dark markings on the caudal and dorsal fins are black. The iris of the eye is golden.

Woods and Kanazawa (1951: 635) refer to a note by Louis L. Mowbray "on a fresh specimen" which states: "color as in *Gonioplectrus hispanus* (Poey). Red and yellow longitudinal stripes. Soft dorsal, anal and caudal tipped with jet black." These are not the life colors of this fish but are typical of those of *Chorististium rubre* which, apparently, Mowbray mistakenly identified with this species.

Habitat: Both Bahamian specimens were collected in a coral reef habitat in rather deep water adjacent to the dropoff along the northern edge of the Great Bahama Bank. The smaller specimen was taken along the steeply sloping face of the dropoff itself. The larger specimen was collected a short distance from the dropoff. Both specimens were taken with rotenone and were not observed in life. *C. mowbrayi* is here recorded for the first time from the Bahamas.

Chorististium mowbrayi was known previously only from the type. The holotype was washed ashore following a storm. The Bahamian specimens were taken in 100 to 170 feet. The scarcity of specimens probably reflects the deepwater habits of the species. Future collecting by means of diving gear may extend the known range of *mowbrayi* into the West Indian area and possibly Florida.

Discussion: All specimens examined of the three species of *Chorististium* had 8 dorsal spines, 12 dorsal rays, 3 anal spines, 8 anal rays, and 13 pectoral rays. One specimen of each species was X-rayed and each had 10 precaudal and 14 caudal vertebrae.

The relationships of the genera *Pikea* Steindachner, 1875 (type species: *Pikea lunulata* = *Grystes lunulatus* Guichenot, 1863), *Chorististium* Gill, 1862 (type species: *Liopropoma rubre* Poey, 1861) and *Liopropoma* Gill, 1861 (type species: *Perca aberrans* Poey, 1861) are uncertain. We find no reference to anyone's having examined the types of *lunulata* or *aberrans*. Attempts to locate the type of the latter species have failed and we doubt its existence. Apparently studies of *Pikea* and *Liopropoma* have been based on the literature.

Following the generic description of *Pikea*, Steindachner (1875) describes two specimens from Mauritius which he identifies with *lunulata*. However, his specimens had a dorsal-ray count of eight spines and twelve soft rays and Guichenot (1863) cites ten spines and eleven rays in the description of *lunulata*. Steindachner states that Guichenot was probably in error. He further describes a shallowly notched spinous-dorsal fin whereas Guichenot states for *lunulata* "la partie épineuse de la dorsale est séparée de la molle par une échanerure profonde." In a later paper Steindachner and Döderlein (1883: Pl. 6, Fig. 2) illustrate *lunulata* but no mention of it is made in the text. The only explanation is the legend for the figure (p. 242) which states "*Pikea lunulata* Steind. (sp. Guichen?), siehe Steind. . . . (1874)." Evidently this is a figure of one of the Mauritius specimens, the identity of which Steindachner questions. Examination of the type of *lunulata* Guichenot (presumably in the Paris Museum) can clarify the position of *Pikea*.

Liopropoma can be separated from *Chorististium* or *Pikea* only on the basis of its having nine dorsal spines. This may be incorrect and if correct would probably not warrant separate generic ranking unless other differentiating characters could be found.

Schultz (1958) distinguishes *Chorististium* by the presence of eight dorsal spines and a separation of the spinous- and soft-dorsal fins by several rows of scales whereas *Pikea* is characterized by eight dorsal spines and the spinous- and soft-dorsal fins being continuous by a ridge of scales along the sides of the connecting dorsal spines. He retains *Liopropoma* on the basis of nine dorsal spines (*aberrans* Poey, 1861 and *roseus* Gunther, 1880). As these genera are not clearly defined at present we are tentatively placing *eukrines* and *Liopropoma mowbrayi* in the genus *Chorististium*, both species differing from *C. rubre* primarily in the separation of the dorsal fins and in color pattern.

The dorsal fins of *Chorististium mowbrayi* and *C. eukrines* are separated by a raised ridge formed by scales over the posterior dorsal spines except at their tips. When the spines are lifted the scales may separate slightly to give the appearance of a groove. The differences between a condition in which the scales meet dorsally to one in which they overlap and continue smoothly across the back are slight. This may be due to the fullness of the body at that point. Both *eukrines* and *mowbrayi* are moderately compressed in that area and, therefore, the scales of each side meet at a more acute angle dorsally than in *rubre*, which is a more robust form. We do not believe that such a slight difference merits separate generic ranking.

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ADDENDUM

Since this paper was submitted three additional specimens of *C. eukrines* have been brought to our attention. From the U.S. Fish and Wildlife Service Laboratory at Brunswick, Ga., we received two specimens, the larger one (84.3 mm in standard length) from Lat. 29°19′N, Long. 80°13′W, in 38 to 39 fathoms, 24 September 1961, SILVER BAY sta. 3431, and the other (65.1 mm in standard length) from Lat. 27°40′N, Long. 79°58′W, in 50 fathoms, 1 February 1961, SILVER BAY sta. 2721. The third specimen (66 mm in standard length), from the Florida State Board of Conservation Marine Laboratory, St. Petersburg, Fla., was taken in the Gulf of Mexico, offshore from St. Petersburg, from a grouper stomach, 19 August 1961, by B. Forsmark. All three specimens have 8 dorsal spines and 12 soft dorsal rays, 3 anal spines and 8 soft anal rays, 17 principal and 19 striated caudal rays, 1 pelvic spine, 5 pelvic rays and 7 branchiostegals.

The specimen from SILVER BAY 3431 has 14 pectoral rays, 16 gill rakers, 46 lateral-line scales (damaged) and 34 caudal peduncle scales (damaged) while the fish from SILVER BAY

2721 has 14 pectoral rays, 18 gill rakers, 46 lateral-line scales (damaged). Scales are missing in the caudal peduncle region.

The St. Petersburg specimen has 13 pectoral rays and 17 gill rakers. Scales are mostly missing on this fish.

Measurements expressed in percentages of standard length

	Silver Bay 3431	Silver Bay 2721	St. Petersburg Specimen
predorsal distance	43	48	43
preanal-fin distance	69	71	73
greatest body depth	25	25	22
head length	39	36	35
snout length	11	10	9
length of upper jaw	17	16	16
eye diameter	8	8	8

We designate these specimens as paratypes.

An additional specimen of *C. rubre,* UMML 9655, 56.5 mm in standard length, was collected on Banco Chinchorro around Cayo Norte, Yucatan, 23 June 1961, by Walter A. Starck, II, WAS-Carib-8. This extends the known range of *rubre* to the western Caribbean.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

SIX NEW SPECIES AND TWO NEW SUBSPECIES OF CEPHALOPODS FROM THE PHILIPPINE ISLANDS[1]

By Gilbert L. Voss
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During the course of the study of the cephalopods collected by the U. S. Bureau of Fisheries steamer "Albatross" in the Philippine Islands during the years 1907–1909 a number of new species and subspecies were found. A full and detailed report of the collections has been submitted to the United States National Museum for publication in the Bulletin of that institution. This includes detailed descriptions and illustrations of the fifty-four species now known to occur in those islands. However, since a considerable delay has occurred in the publication of this work, brief descriptions of the new species and subspecies are here given in order to make them available to other students of this group of mollusks.

This work was supported by a two year grant from the National Science Foundation (G-2901) which the author gratefully acknowledges.

Family Sepiidae

Sepia prionota, new species

Holotype: Female, mantle length 61.0 mm, "Albatross" Sta. D5151, from off Sirun Island, Sulu Archipelago, Tawi Tawi group, in 44 meters, coral sand and shell, 18 February 1908. USNM 575326.

Paratypes: Three females, mantle length 26.0–36.2 mm, from "Albatross" Sta. D5151, from off Sirun Island, Sulu Archipelago, Tawi Tawi group, in 44 meters, coral sand and shell, 18 February 1908. USNM 575327.

Description: The mantle is slender, about ½ as wide as long, with long narrow marginal fins which originate at the anterior mantle margin and terminate posteriorly in free lobes. The funnel is large and reaches almost to the base of the arms.

The head is large. The buccal membrane is seven lobed, without

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suckers. The arms are in the order, $4.1 = 2 = 3$, the ventral arms about 34–40 per cent of the mantle length. All of the arms are strongly compressed, thick at the base and tapering to sharp points. The suckers are in four rows on all of the arms and are equipped on their horny rings with very numerous square tipped teeth on the entire margin, those on the dorsal margin long and slender.

The tentacles are stout, moderately long, and compressed. The clubs are small, expanded, the floor of the hand lying free posteriorly. The suckers are in six rows of which about four of the second dorsal row are greatly enlarged. The horny rings bear long narrow square tipped teeth which are greatly crowded and larger on the distal half.

The sculpture consists of a keel on all but the ventral arms, consisting of a series of about 6–8 high rounded lappets originating at the base of the arms and extending to near the tip. There are scattered rugae and papillae along the dorsum of the mantle, the base of the fins, and the sides of the ventral surface of the mantle, and a patch of papillae below and in front of each eye.

The shell is narrow, rounded both anteriorly and posteriorly and with a short stout spine. The ventral surface is concave throughout.

Remarks: The specific name is derived from the Greek *prionotus,* jagged or saw-toothed, in reference to the saw-like keels on the arms. This character alone seems sufficient to separate this species from all others presently known from the Indo-Pacific region.

Family Sepiadariidae

Sepiadarium gracilis, new species

Holotype: Female, mantle length 16.0 mm, "Albatross" Sta. D5290, from Varadero Harbor, Verde Island, southern Luzon, 22 July 1908, at ship's side with electric light, 11:30 PM to 12:30 AM USNM 575325.

Description: The animal is small, with a saccular mantle which is about twice as long as wide and is joined to the head in the neck region by a narrow commissure. Laterally the mantle margins project forward as broad lappets shielding the eyes. The fins are small, less than half the mantle length, and longitudinally oval.

The funnel is long, extending beyond the eyes, and is fused with the mantle on each side. The head is large, wider than the mantle, and has large eyes with distinct ventral lids.

The arms are in the order 3.1.2.4, fat and muscular and united at their bases by a deep web which forms in sector D a deep sheath for the tentacles. The arm suckers are in two rows throughout and are borne on short pedicels. The horny rings appear smooth, bordered by a narrow papillate area.

The tentacles are short, stout, and nearly as large as the arms. The clubs are short and slightly expanded. The suckers are in six distinct rows and are very small with round apertures.

There is no gladius.

Remarks: This species may be separated from all other species of the genus by the narrow mantle, small fins, arm suckers in only two rows and the tentacular suckers in six rows.

The specific name *gracilis* is from the Latin meaning slender, in reference to the much narrower body in this species.

Family Sepiolidae

Euprymna phenax, new species

Holotype: Male, mantle length 11.0 mm, taken at ship's side by electric light, Nogas Point, Panay, 3 February 1908. USNM 575328.

Description: The mantle is saccular, rounded posteriorly and connected to the head by a broad nuchal commissure. The fins are small, about 43 per cent of the mantle length and circular in outline.

The head is large, with large eyes which have distinct lower lids. The funnel is long, free for half its length and extends beyond the eyes.

The arms are in the order 3 = 2.4.1. They have no protective membranes. The suckers are biserial, obliquely inserted and have small, smooth apertures. The suckers are mostly missing but there is no evidence of especially enlarged ones.

The left dorsal arm is hectocotylized. Basally there are about ten pairs of normal suckers covering about ⅔ of the arm of which the third sucker from the base in the ventral row is modified into a large fleshy papilla. The distal third of the arm bears about 10 pairs of suckers closely crowded, their bases forming a palisade on either side of the arm with the suckers of each row facing outward.

The tentacles are long and slender and bear short, strongly curled clubs which possess about 12–14 rows of small suckers. There is a broad membrane dorsally originating at the carpal section and extending to the tip.

There is no gladius.

There is a well developed saddle-shaped luminous organ on the ink sac.

Remarks: This species may be separated from the other species of the genus by the presence of biserial suckers, the more simplified hectocotylus and the apparent lack of any enlarged suckers on the arms.

The specific name is derived from the Greek *phenax* meaning impostor, in reference to the biserial suckers known only in this species.

Euprymna albatrossae, new species

Holotype: Male, mantle length 24.0 mm, from Cubagao Anchorage, Catanduanes Island off southeastern Luzon, 9 June 1909. Electric light. USNM 575331.

Paratypes: Two males, mantle length 22.0–20.5 mm and three females, mantle length 20.0–15.0 mm, from Cubagao Anchorage, Catanduanes Island, off southeastern Luzon, 9 June 1909, electric light. USNM 575332.

Description: The mantle is saccular, bluntly rounded and united to the head by a broad nuchal commissure. The fins are large, nearly ⅔ the length of the mantle, and inserted a little anterior to the mantle midpoint. The funnel is stout, tubular, and free for over half of its length.

The head is large, as wide as the mantle width, with prominent eyes which have small eyelids. There is a large pore posterior to and slightly ventrad of the pupil.

The arms are in the order 2.3.4.1 or 2.3.4 = 1 and stout, strongly keeled for most of their length. The suckers are quadriserial and in the females there is no disparity in size. In the males on the dorsal arms about eight suckers of the middle section of the outer rows are greatly enlarged, the suckers of the median rows all small. On the dorso-lateral arms about 14 of the suckers in both the dorsal and ventral rows are enlarged, the medians small. On the latero-ventral arms the suckers are all small, those of the outer rows only slightly larger throughout than the medians. On the ventral arms the suckers of the two inner rows are nearly minute but the outer rows have about eight median suckers which are about 3–4 times the size of those of the median rows.

In the males the left ventral arm is hectocotylized. Basally one or two suckers form fleshy papillae but distad the suckers are in four rows, the apertures slit-like, on fleshy papillae, which form two pairs of rows facing outwards, palisaded at their bases.

The tentacles are short and stout, with small, only slightly expanded clubs bearing about 20 rows of very minute suckers.

The spermatophores somewhat resemble those of *E. berryi* except in the structure of the mid-portion where there is a distinct round posterior section.

Remarks: This species may be distinguished from other members of the genus by the order of the enlarged suckers on the arms and the prominent keels on the first three arm pairs. This species is named in honor of the steamer "Albatross" from which the specimens were collected.

Sepiola trirostrata, new species

Holotype: Male, mantle length 12.0 mm, taken by electric light at ship's side, Nogas Point, Panay, 3 February 1908. USNM 575329.

Paratypes: Two males, mantle length 10.0–11.5 mm, two females, mantle length 11.0–12.3 mm, taken by electric light at ship's side, Nogas Point, Panay, 3 February 1908. USNM 575330.

Description: The mantle is short and saccular, broadest anteriorly, and in the males tapering in a cone to a sharp posterior end. The mantle is connected with the head by a broad nuchal commissure. The fins are small, semicircular with a deep, free anterior lobe. The funnel is long, slender and tubular.

The head is large, with enormous eyes with distinct ventral lids. There is a small round olfactory pore just posterior to and ventral of the eyelid.

The arms vary between the sexes but in general have a formula of 2.3.4.1. In both sexes the third arms are stouter than the others and strongly turned inward. In the males, the third arms are enormously stout, over twice as broad as the other arms.

In the females the suckers are biserial throughout and normal, but on the third arms the suckers are very small basally for three to four pairs after which they are abruptly larger. In the males the ventral suckers of the first and second arms are ⅓ larger than those of the dorsal row. In the third arms, there are about four pairs of minute suckers after which those of the ventral rows only become greatly enlarged.

In the males the left dorsal arm is hectocotylized. Basally there are two pairs of normal suckers equal in size. Distad of these in the ventral row is a large swollen papilla turned downward and outward. On the outer side of the arm beneath this swollen papilla are two smaller ones, long and slender. Distad the arm is twisted through 45° to the right. At the point of twist, there is a small papilla on the oral surface followed by a ridge which extends to the end of the arm. Dorsally, two rows of palisaded suckers extend to near the tip of the arm, which is tightly coiled.

The tentacles are long and slender, with short expanded clubs bearing four rows of small suckers.

The ink sac is a double kidney shape with an ill defined photophore in each lobe.

Remarks: The peculiar structure of the hectocotylized arm serves to separate this form from both of the Indo-Pacific species. The name *trirostrata* is given because of the three papillae on the hectocotylized arm instead of two in its closest ally S. *birostrata.*

Family Loliginidae

Doryteuthis reesi, new species

Holotype: Male, mantle length 70.0 mm, from off Port Maricaban, southern Luzon, 20 July 1908, electric light. USNM 575323.

Paratypes: Forty-three males, mantle length 43.0–66.0 mm, thirteen females, mantle length 51.5–62.0 mm, from Port Maricaban, southern Luzon, 20 July 1908, electric light. USNM 575324.

Description: The mantle is long and slender, about ⅕ as wide as long, with a small lappet on the dorso-anterior margin and a shallow excavation beneath the funnel with sharp lateral angles on either side. In the males there is a ventro-median ridge on the anterior ¾ of the mantle. The funnel is small, stout, nearly covered by the mantle. The fins are small, about 50 per cent of the mantle length in the males, less in the females. The head is small, slightly wider than the mantle.

The arms are short, about 25 per cent of the mantle length, in the order 3.4.2.1 although in the males the left ventral arm may be the longest. The suckers are biserial and in both sexes the horny ring is smooth proximally but armed with about seven long square-tipped teeth on the distal margin.

In the males both ventral arms are hectocotylized. The left arm has about 19 normal suckers basally, becoming smaller distally; beyond this for over half the length of the arm there are about 22 pairs of long, round papillae or pedicels each terminating in a minute, ringless sucker.

Pairs two to seven of these are much longer than the others. Beyond the terminal papilla the tip of the arm is round and smooth, cone-shaped. The right ventral arm is shorter than its fellow with normal suckers basally. After the seventh pair they diminish rapidly in size until the fifteenth pair when the suckers disappear and only a double row of minute suckerless pedicels remain. There are about 17 pedicels barely discernible, after which the end of the arm is long, slender and smooth.

The tentacles are short, only a little longer than the arms. The club is large, expanded, with quadriserial suckers which are equal in size. The largest hand suckers bear 11–12 sharp slender teeth on the rings of which three to four on the distal side are much longer.

The buccal membrane has seven points, each of which may bear from one to six small suckers.

The gladius is slender, with a narrow, straightsided vane with thickened and more heavily colored lateral margins.

Remarks: This is the third species of small *Doryteuthis* described from the Indo-Malayan region. It may easily be distinguished by the hectocotylization of both ventral arms.

The name *reesi* is given in recognition of the contributions made by W. J. Rees, formerly of the mollusk division of the British Museum, to the field of teuthology.

Family Histioteuthidae

Calliteuthis celateria pacifica, new subspecies

Holotype: Female, mantle length 74.0 mm, "Albatross" Sta. D5564, Dammi Island, between Jolo and Tawi Tawi, 432 meters, 21 September 1909. USNM 575453.

Paratypes: Two females, mantle length 33.0–52.0 mm, "Albatross" Sta. D5589, Mabul Island, Borneo, 494 meters, 29 September 1901. USNM 575457. One female, mantle length 51.0 mm, "Albatross" Sta. D5118, Sombrero Island, 292 meters, dark green mud, 21 January 1908. USNM 575454. One female, mantle length 58.0 mm, "Albatross" Sta. D5221, San Andreas Island, between Marinduque and Luzon, 354 meters, green sand, 24 April 1908.

One female, mantle length 28.0 mm, Albatross Sta. D5268, Matacot Point, Verde Island Passage, 310 meters, sand and pebbles, 8 June 1908. USNM 575455.

Description: This subspecies conforms in almost every detail with the description of *Calliteuthis celetaria* Voss, 1960 from off Bermuda (Voss, 1960, p. 424) so that a description would be repetitious. It differs from *C. celetaria celetaria* in the following respects.

C. celetaria celetaria

1. Swimming membrane of third arm originates near base of arm and is less than ½ the arm length.
2. Tentacular suckers toothed only on distal margin.
3. Seven large, four small light organs around left eye.

C. celetaria pacifica

1. Swimming membrane of third arm originates at proximal ¼ arm length and extends to tip of arm.
2. Tentacular suckers toothed on entire margin.
3. Seven large, 8–9 small light organs around left eye.

Besides these differences, the carpal arrangement of suckers and pads is different in a slight degree. The Philippine specimens lacked pigmentation, but the Atlantic subspecies is a vinous red.

Remarks: The subspecific name *pacifica* is given to distinguish this group from its Atlantic counterpart. Since the species of *Calliteuthis* are all widespread bathypelagic forms, *pacifica* will probably be found to occur throughout the Indo-Pacific region.

Family Ommastrephidae

Nototodarus sloani philippinensis, new subspecies

Holotype: Female, mantle length 180.0 mm, "Albatross" Sta. D5444, off Atalaya Point, Batag Island, east coast of Luzon, 565 meters, 3 June 1909. USNM 575451.

Paratype: Female, mantle length 101 mm, "Albatross" Sta. 5135, 11 miles of Jolo Light, Jolo Island, 299 meters, 7 February 1908, USNM 575452.

Description: This subspecies shows the general characters of the other subspecies of *Nototodarus sloani* except in the features of the arm and tentacular suckers.

Two types of arm suckers are present, based upon their dentition. The first, characterized by a single large median tooth on the outer or distal margin which is long, sharp and often upturned, is found on the basal 7–8 pairs of suckers. On either side of the giant median tooth are noticeably smaller teeth graduating downward in size but continuing entirely around the sucker ring in those of the fourth to the eighth pair, about 20 teeth in all. The first few pairs have smooth rings. The fourth to the eighth pairs have broad, shallow to triangular teeth on the proximal border. Beyond the basal eight pairs the suckers are distinctly changed, the proximal border flattened, entirely smooth.

The distal border has 6–7 long slender teeth. The first few suckers have the median tooth much longer than the others but within two to three pairs they become equal and continue to the end of the arms. In none of the series are there any intermediate smaller teeth.

The tentacular club has four rows of suckers on the hand, of which the suckers of the median rows are about 3–4 times the size of the marginal ones. The largest suckers of the hand have about 14–18 long sharp teeth, the outer one the largest, alternating with broadly triangular or rounded teeth which are much smaller. Distally the smaller suckers have numerous sharp slender teeth separated by smaller ones in between.

Remarks: This subspecies lies intermediate between *Nototodarus sloani gouldi* of Australia and *N. sloani hawaiiensis* of the Hawaiian group. It may be separated from both by the dentition of the suckers described above. Its subspecific name refers to the only area from which it is presently known.

Literature Cited

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A NEW ALOHINE DELPHACID FROM SAN AMBROSIO I. (HOMOPTERA: FULGOROIDEA)

By R. G. Fennah
Commonwealth Institute of Entomology, London

Among a collection of insects taken by Fr. G. Kuschel on the island of San Ambrosio (80° W 26°15′ S), and forwarded to the British Museum for study, a series of an alohine Delphacid has proved to represent a new genus and species. These are described below.

Nesorthia, new genus

Head, pronotum, and mesonotum with supernumerary carinae; antennae with basal segment not longer than broad, second segment longer than first; legs relatively short and stout. Tegmina brachypterous. Wings absent.

Type species: Nesorthia paronychiae, new species.

Nesorthia paronychiae, new species

Vertex longer than broad in middle line (1.2: 1), in profile meeting frons acutely, disc triangular, posterior margin transverse, lateral margins strongly elevated, almost straight, converging distad and meeting subacutely at apex, median carina and Y-shaped carina distinct; frons longer in middle line than broad (1.9: 1) widest between eyes, lateral margins sinuate, concave in basal quarter, shallowly convex in distal three-quarters, disc transversely angulately convex, more strongly so near base, median carina simple throughout, prominent; clypeus much shorter than frons, slightly recessed below level of frontoclypeal suture, convex transversely and axially, lateral margins carinate, median carina absent; rostrum attaining post-trochanters, subapical segment slightly longer than apical; genae rather narrow, ocelli absent, antennae reaching to level of frontoclypeal suture, basal segment about as long as broad, second segment twice as long as first, sides of head above eyes each with a supernumerary carina parallel to lateral margin of frons and attaining margin of vertex. Pronotum with disc produced between eyes, twice as broad at base as long in middle line, lateral carinae of disc prominent, shallowly convex, moderately diverging caudad, rather abruptly incurved basally, attaining hind margin, median carina prominent, a carina laterally between eye and base of tegmen, a supernumerary carina on each ventrolateral lobe, and an incomplete

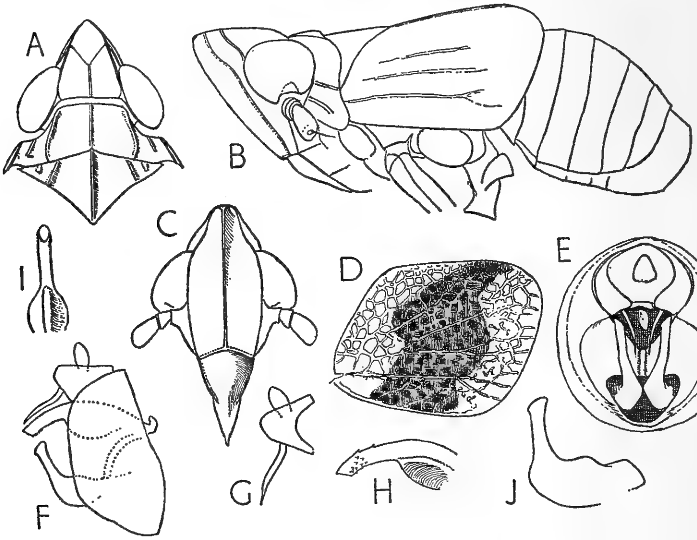

FIG. 1. *Nesorthia paronychiae*, new genus and new species: A.—Vertex, pronotum and mesonotum. B.—Head, thorax, and abdomen, left side. C.—Frons and clypeus. D.—Tegmen. E.—Male genitalia, posterior view. F.—Male genitalia, right side, with appendages extruded. G.—Anal segment of male, right side. H.—Aedeagus, right side. I.—Aedeagus, ventral view. J.—Genital style, side view.

carina on each side laterad of discal area, posterior margin obtusely angulately excavate; mesonotum twice as broad as long in middle, median carina percurrent to apex of scutellum, lateral carinae straight, each scarcely half as long as median carina, rather strongly diverging caudad, an obscure short supernumerary carina on each side anteriorly, laterad of discal area; tegulae absent; legs relatively short and stout, minutely and rather densely setose, post-tibiae laterally unarmed, with five teeth apically, post-tibial spur short, thick, with seven teeth, basal metatarsal segment with eight teeth, second metatarsal segment with four; abdomen laterally compressed. Tegmina brachypterous, not covering second visible abdominal segment, subquadrate, rather coriaceous, costal margin almost straight, weakly convex, apical margin shallowly convex, oblique, sutural margin straight, apical and anal angles rounded, venation reticulate, Sc + R indicated, remaining venation obscure. Wings absent.

Sordid yellowish-fuscous, minutely sprinkled fuscous near carinae on head, pronotum, and mesonotum; clypeus fuscous except at lateral margins and irregularly along middle line, where it is ochraceous; antennae fuscous, distally darker; carinae of pronotum and of mesonotum, and irregular dendroid expansions from the former, sordid white or stramineous; dorsal surface of thorax more or less regularly sprinkled with minute pallid spots. Legs suffused fuscous, paler at margins, tarsi fuscous. Abdomen fuscous-piceous, dorsolaterally sprinkled with minute testaceous spots, often obscure. Pygofer fuscous-piceous, stramineous ventrally and above laterodorsal angles; anal segment pallid; genital styles fuscous-piceous basally, testaceous or light castaneous distally.

Anal segment of male short, ring-like, apical margin incised medially, a pair of rather long, sinuate spinose processes arising ventrolaterally a little distance basad of apical margin, directed ventrad. Pygofer with posterior opening longer dorsoventrally than broad, laterodorsal angles obtuse, not or only very feebly produced caudad; diaphragm with dorsal margin deeply concave, thickly sclerotized at middle in a vertical ridge. Aedeagus tubular, slightly laterally compressed, shallowly and evenly decurved distad, produced ventrad and laterad on both sides in basal half in a shallowly rounded lobe, two minute spines dorsally in apical third, and five obliquely on left side and four near lower margin on right; orifice terminal, ovate. Genital styles moderately long, in side view broad and horizontal in basal half, abruptly bent dorsad at middle, narrowed and gradually tapering to a subcapitate apex.

Male: length, 2.4 mm.

Holotype male and eight males, San Ambrosio Island, Plano Tijeretes, 420 m. Fr. G. Kuschel, 23rd. November 1960, on *Paronychia manicata* Skottsberg. Type in collection of University of Chile; 1 paratype in British Museum (Nat. Hist.).

In Muir's key to the genera of Alohini (Canadian Entomologist 47: 269–270) this species runs to *Nesothoë,* but differs in general facies, and in the brachypterous tegmina. In the writer's key to south-eastern Polynesian genera (Trans. R. ent. Soc. Lond. 110: 159) it runs to *Nesodryas,* but differs in general facies and in male genitalic pattern, which in *Nesodryas* appears to be characteristic. *Nesorthia paronychiae* is the only species which at present can be referred to the genus. *Nesodryas laocoon* Fenn., from the Marquesas Is., agrees in antennal and tegminal characters, but differs in the absence of supernumerary carinae on the head and thorax.

The present collection adds one more group of islands in the eastern Pacific to those that have been colonized by members of the Alohini.

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A NEW GENUS AND SPECIES IN THE DIPLOPOD FAMILY XYSTODESMIDAE (POLYDESMIDA)

By Richard L. Hoffman

In recent years I have received three small collections of a very striking and unusual xystodesmid milliped from the Blue Ridge region of north Georgia. The novelty of this creature was recognized as long ago as 1953, but description has been deferred in the hope of securing living or freshly preserved specimens with the color pattern intact.

Thanks to the interest of my friend Robert E. Gordon, I was privileged at last to examine a living specimen of the species, and I now take the occasion to publish a name and description. Ordinarily the erection of monotypic genera in the Xystodesmidae is perhaps a rather hazardous undertaking, owing particularly to the large number of undescribed and often annectant species which continue to turn up in almost every collection from southeastern United States. I feel, however, that the animal under discussion is so singular in all important characters that its claim to generic status will probably not be seriously jeopardized by further discoveries.

For their thoughtfulness and kind help, I am most indebted to Dr. Gordon and to Mr. Leslie Hubricht, who secured the first specimens of the new form almost a decade ago.

Family Xystodesmidae Cook
Tribe Rhysodesmini Hoffman
Genus **Erdelyia,** new genus

Type species: Erdelyia saucra, new species.

Diagnosis: A rhysodesmine genus with the following diagnostic characters: Head smooth and polished, epicranial suture distinct and punctate, ventrally bifurcate into two conspicuous inter-antennal sutures. Facial setae as follows: vertigial 2–2; subantennal 1–1; frontal, 2–2; no trace of interantennals. Genae almost flat, without distinct median impression. Antennae with four terminal sensory cones.

Body moderate in size, width/length ratio about 22 per cent. Paranota moderate, depressed, anterior corners of paranota 2–4 acutely produced cephaloventrad; posterior corners of these and most other paranota broadly rounded, the posterior edges not margined. Ozopores in normal sequence, small, opening dorsally on small, poorly defined peritremata. Scapulorae distinct, sharp, submarginal. Tergites essentially smooth and polished, interzonal furrow not visible across dorsum of segments.

Sterna smooth and moderately convex between the legs, not produced into subcoxal spines nor divided by cruciform impressions. Sides of body smooth except for the vertically striate surface of the interzonal furrow. Stigmata moderate in size, not auriculate, similar in size, shape, and position. Sternum of 5th segment produced into two small setiferous paramedian knobs between the fourth pair of legs.

Coxae of legs provided with long, slender acute spines which arise at the distal end and are abruptly recurved, the tips extending back mesiad to the proximal end of the podomere.

Gonopod aperture large, oval, the anterior edge flush with segmental surface, the posterior edge elevated into a high flange, vertical to the flat sternal area of the 7th segment. Gonopods of the typical rhysodesmine type: coxae elongate and somewhat flattened, attached by a small sternal remnant, the solenite basally rather thick but distally very attenuated; telopodites long, nearly straight, and parallel, the setose prefemoral region scarcely thickened, with an acicular prefemoral process. Tibiotarsus of gonopods flattened, laminate, slightly curved dorsad over coxa, with a large, subterminal tibial branch. See Figs. 5 and 6.

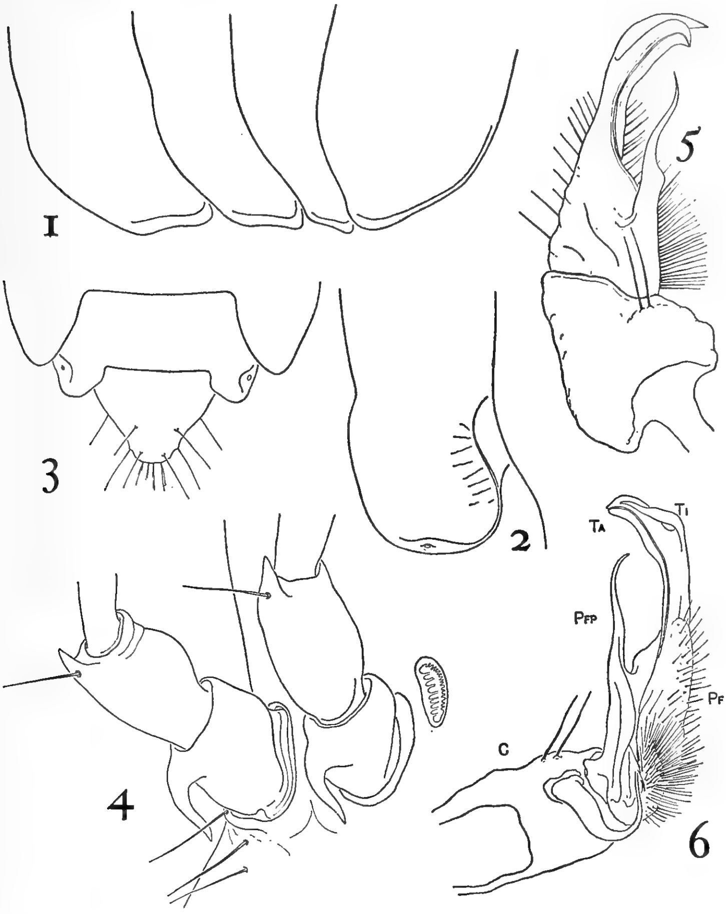
Characters of the female sex unknown.

Classification: The tribe Rhysodesmini is a group of xystodesmid genera characterized in part by gonopod structure, and in part by the intrageneric conservatism of gonopod form in contrast to specific diversification in body facies. As originally conceived, the group included the nominal genera:

Rhysodesmus Cook, 1895
Cruzodesmus Chamberlin, 1943
Acentronus Chamberlin, 1943
Boraria Chamberlin, 1943
Howellaria Hoffman, 1950
Cherokia Chamberlin, 1949
Pleuroloma Rafinesque, 1820

Of these genera, *Erdelyia* is perhaps closest to *Cherokia* in over-all form of the gonopods, but *E. saucra* differs from *C. georgiana* in nearly all other important characters. The only other genus with a tibial process —*Pleuroloma*—has a few species with the size, tergal texture, and convexity of *saucra,* but all forms of *Pleuroloma* differ otherwise in the form of both sterna and paranota.

The presence or absence of coxal spines in xystodesmids is not, per se, necessarily a generic character, but the remarkable form of these spines in *E. saucra* is not duplicated elsewhere in the Diplopoda, and must be accounted as strong supplementary evidence for the considerable systematic isolation of this genus. The shape and position of the coxal



FIGS. 1–6. *Erdelyia saucra,* new species: FIG. 1.—Lateral end of collum and paranota of segments 2–4, dorsolateral aspect, to show acutely angular anterior corners of paranota. FIG. 2.—Paranotum of segment 10, dorsolateral aspect. FIG. 3.—Segments 19–20, dorsal aspect, to show shape of epiproct and of paranota of segment 19. FIG. 4.—Bases of legs of segment 15, right side of body, ventrolateral aspect to show shape and armature of coxae and prefemora, also the anterior stigma of the segment. FIG. 5.—Left gonopod of holotype, dorsal aspect. FIG. 6.—Left gonopod of holotype, mesial aspect. Abbreviations: C, coxa; PF, prefemur; PFP, prefemoral process; TA, tarsus; TI, tibial process.

spines constitutes a ready recognition character for field identification. Presumably merely by flexing the legs slightly ventrad, the living animal is able to hang securely upside-down on such a smooth surface as the palm of a hand!

Erdelyia saucra, new species
Figs. 1–6

Holotype: Adult male, U. S. Nat. Mus. No. D-620, from a wooded area along Georgia Highway 180, about 0.5 mile west of the road up Brasstown Bald, in Union County, Georgia. Collected 19 July 1961, by Robert E. Gordon and James A. MacMahon (Gordon's field No. 579).

Diagnosis: With the characters of the genus. Easily recognized by the smooth tergites, depressed and rounded paranota, retrorse coxal spines, shape of the gonopods, and the distinctive color pattern.

Description of holotype: Length about 38 mm, greatest width 8.2 mm; width/length ratio about 22 per cent. Paranota depressed, creating a high height/width ratio of 69 per cent at midbody. Body essentially parallel-sided between segments 6 and 13, narrowing gradually at both ends as indicated by the following width values for selected segments:

Collum	5.7 mm
2nd	6.6
3rd	7.0
4th	7.5
5th	7.8
6th–8th	8.1
9th–11th	8.2
14th	7.7
16th	7.3
18th	4.8

Color of living specimen bright and distinctive, with dorsal side of prozonites and anterior half of metazonites, frons and vertex, and base and center of epiproct dark reddish-brown or mahogany. Caudolateral halves of paranota and margins of epiproct light creamy yellow. Each metatergite with a broad transverse dark red stripe between the paranotal spots. Basal antennal articles, clypeus and labrum, ventral surfaces of body, and bases of legs whitish; legs becoming more reddish distally. Distal antennal articles light brown.

Head capsule normal in appearance, oval, convex, smooth and polished; width across genal apices 4.6 mm. Epicranial suture (see appended note 1) prominent, its ventral half with a single series of small punctations, bifurcated into distinct interantennal sutures. Interantennal isthmus broad (1.5 mm) and smooth. Genae not margined laterally, slightly convex and with only a trace of median impression, the ends broadly rounded and slightly extending laterad beyond adjacent margins of the cranium.

Facial setae as follows: *vertigial* 2–2, forming a somewhat procurved row with the innermost seta of each pair set lower on the vertex than the outer, the space between the pairs greater than the distance between the setae of each pair; *subantennal* 1–1, each located near the lower, inner arc of the antennal socket; *frontal* 2–2, the outermost of each pair located in a slight depression at the lower end of the genal region, just mesiad to a short submarginal series of about 3 or 4 genal setae; *clypeal* about 8–8, slightly irregular in spacing; *labral* about 12–12, the outermost members of this series merging with the lower genal setae.

Antennae long (8.0 mm) and slender, reaching back to the middle of paranota of 5th segment. Article 1 broadest, short, globose, subglabrous. Articles 2–6 approximately equal in length and similar in shape except that 6 is less clavate distally than the others. Article 7 small, longer than broad, cylindrical, apically truncate, its distal edge not inturned between the four small, widely separated sensory cones. Antennae nearly glabrous proximally, becoming more densely invested distally, the setae of article 6 very numerous, dense and procumbent, those of article 7 apically forming a long, fine fringe around the sensory cones.

Collum broad, smooth, polished, almost exactly hexagonal in shape in that both anterior and posterior edges converge evenly laterad, producing a symmetrical, apically rounded lateral end; anterior edge with a deep, distinct, submarginal groove which isolates the lateral end of the collum but does not attain the caudal edge (*cf.* Fig. 1).

Tergites of body segments medially smooth and polished, becoming slightly coriaceus on the paranota. Latter moderate in size, strongly depressed on most segments and continuing slope of the middorsum. Peritremata and lateral margins not strongly set off and nearly flat, the submarginal depression not reaching caudal edge of paranota, latter not margined or otherwise set off. Prozonites and metazonites continuous dorsally, only a fine suture between them visible, their textures essentially the same. A faint, shallow, interzonal furrow begins to form in front of the paranotal bases.

Segments 2–4 subsimilar in appearance (Fig. 1), the paranota depressed and projecting cephalad, their anterior corners forming acute angles, the posterior broadly rounded. Paranota of segment 5 more nearly transverse, but of the same general shape; the ozopore located dorsally in a small and poorly defined peritreme, in the anterior half of the paranotal length.

Segments 6–12 similar, the paranota transverse, both corners broadly rounded; lateral and caudal edges convex, the latter bowed caudad beyond caudal edge of metatergites. Scapulorae distinct, sharply defined on the anterior paranotal arc, but becoming increasingly submarginal toward the body and exposing much of front surface of paranota as seen in dorsal aspect (see Fig. 2). Segments 13–19 decreasing in width gradually, the paranota becoming somewhat more horizontal and their corners increasingly produced caudad, and the ozopores likewise becoming increasingly posterior in their location on the margin. Paranota of segment 19 small, short, not evenly rounded but with the inner edge tending to be distinctly oblique (Fig. 3). Metatergites of segments 17–19 with about three irregular transverse rows of very small granules, about 20 in each row.

Epiproct (Fig. 3) evenly conical in dorsal appearance, its surface smooth and minutely granular. Ventrolateral corners of paraprocts slightly obliquely striated, the remainder of these structures smooth and almost flat except for the single paramedian setiferous knob near the center of each. Free edges of paraprocts expanded into pronounced marginal swellings, becoming thicker upward, the marginal seta located at the widest point. Hypoproct a broadly oval plate, its surface smooth and unmodified except for a slight transverse basal thickening; paramedian subapical setae widely separated from each other and slightly removed from edge of plate, the median apical projection large and distinct (note 2).

Pleural areas (note 3) unmodified, smooth; caudal edge of each metazonite with a distinct raised rim preceded by a submarginal depression running from underside of paranota to top of coxal sockets. Interzonal furrow becoming distinct and broad down sides, rather shallow but with the anterior edge elevated and sharply defined, particularly in front of stigmata; furrow distinctly and finely striated vertically, the resulting texture contrasting sharply with the adjacent smooth segmental surface. Stigmata elongate-oval (Fig. 4), similar in size and shape except that anterior stigmata are broadest dorsally, the posterior broadest ventrally. No elevated stigmal margins, each opening is slightly but distinctly separated from both the coxal socket and coxal condyle, the latter small and obscure.

Sternal areas slightly elevated medially between the legs, sloping off both toward the caudal edge of segment and the interzonal furrow. No subcoxal spines are formed, but the sterna are produced at base of each leg into a low but distinct subcoxal "sleeve" which slightly elevates the coxal bases from adjacent sternal surface. Anterior legs of each segment set farther apart than the posterior. Sterna glabrous except for two pairs of large macrosetae forming a transverse row between the anterior legs, and three pairs between the posterior legs of each segment. Interzonal furrow sharply defined across venter. Sternum of 5th segment produced into two low, setiferous, paramedian knobs between legs of the 4th pair. Sternum of 6th segment distinctly concave between 7th pair of legs to accommodate tips of the gonopods.

Legs long, distal half of femora visible from above when the legs are extended laterad. Podomeres in decreasing order of length: 3-6-2-1-4-5, all are only sparsely setose except tarsus which is covered with numerous long setae particularly near the distal end. Femora somewhat more clavate than usual for the family. Coxae with very long slender spines which arise near the distal end, then abruptly recurved mesiad, the tips reaching back to bases of coxae (Fig. 4). Prefemora with the usual acute, slightly curved, distal spine. Pretarsus long and evenly curved on all legs, somewhat compressed and ellipsoidal in cross-section, but not distinctly carinate on the dorsal side.

Prozonite of 7th segment reduced to a very thin transverse strip by the large, symmetrically oval gonopod aperture. Front edge of latter flush with segmental surface; back edge strongly elevated into a high flange in front of and between coxae of 8th pair of legs, the intervening sternal area depressed and flat. Gonopods of moderate size, the coxae retracted within the body; the elongate, nearly straight telopodites completely exposed, parallel, and directed cephalad between legs of the 6th segment. Telopodite continuous, e.g., no cingulum at the end of the slender, setose, prefemoral region. Latter with a long, slender, aricular prefemoral process on the coxal side. Telopodite narrowed distally, with a long, slender, subterminal tibial process (Fig. 6, TI), extending distad beside the major terminal branch, but the two are somewhat divergent distally. Tarsal branch (TA) flat, laminate, slightly curved, without modifications.

Distribution: The Blue Ridge range in northern Georgia, in the vicinity of Brasstown Bald. Aside from the type locality, specimens (all paratypes, retained for the present in my personal collection) are at hand from:

GEORGIA: Towns County: Enota Glade Picnic Area, east of Brasstown Bald, 3♂♂, 7 June 1953, Leslie Hubricht. White County: wooded hillside, 4.5 miles northeast of Cleveland, 2♂♂, 12 March 1961, Leslie Hubricht.

Almost certainly the species will be found to occur in nearby counties in north Georgia, such as Rabun, Habersham, Lumpkin, and Fannin.

NOTES

Note 1. Epicranial suture. This term from insect morphology seems applicable to the diplopod feature heretofore referred to as the vertigial sulcus. In most species this suture is a simple shallow median groove, in others—particularly species in the Rhysodesmini—the suture is bifurcated at its lower end with the two forks running lateral toward the antennal sockets.

Note 2. The terms epiproct, paraproct, and hypoproct are much to be preferred in favor of such earlier designations as telson, anal valves, and preanal scale. Their classical derivation is more universal, and the words themselves are less misleading, as they allude to the *location* of the structures and not to their supposed morphological identities.

Note 3. Pleural areas. By this term I mean to imply the sides of the segment between the paranota and the coxal sockets, and not that I consider this region morphologically homologous with the true pleurites of other diplopod orders. My usage is thus one of topography, and not morphology.

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ON THE NAME OF THE MIGRATORY GRASSHOPPER OF THE UNITED STATES AND CANADA, *MELANOPLUS SANGUINIPES* (F.) (ORTHOPTERA, ACRIDIDAE)

By Ashley B. Gurney

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Regretfully, I offer this note to explain another change in the scientific name of the migratory grasshopper, which for many years was known as *Melanoplus atlanis* (Riley), then from about 1917 to 1958 mainly as *M. mexicanus* (Sauss.), and since 1958 as *M. bilituratus* (Walker). *M. atlanis* is a synonym of *sanguinipes,* but *M. mexicanus* is a distinct species occurring chiefly in temperate Mexico; it is known in the United States only from two localities in western Texas. *M. bilituratus,* which dates from 1870, falls as a synonym of *Melanoplus sanguinipes* (Fabricius) 1798 (Supplementum Entomologiae Systematicae, p. 195). The name *M. bilituratus* had occasional use in American literature during the past 50 years, but not general use until adopted by Brooks 1958 (Can. Ent. 90, suppl. 9, p. 20), and later by Gurney and Brooks 1959 (Proc. U. S. Nat. Mus. 110, pp. 1–93) in their revision of the Mexicanus Group of *Melanoplus.* Due to the synonymy of *bilituratus,* the subspecies of this grasshopper recognized in the 1959 revision now are: *Melanoplus sanguinipes sanguinipes* (F.), widespread across Canada and the Northern States; *M. sanguinipes vulturnus* G. and B., in the southeastern part of the United States; and *M. sanguinipes defectus* Scudd., of the Southwest. Deep appreciation is expressed to Dr. T. H. Hubbell, of the University of Michigan, who informed me that he saw a Fabrician type of the Mexicanus Group at Copenhagen during a 1960 European visit. Dr. S. L. Tuxen, of the Zoologisk Museum, Copenhagen, graciously allowed me to borrow the type and to relax and study the concealed genitalia, and he also gave background information on this specimen following painstaking efforts to trace its source.

The original description of *Gryllus sanguinipes* F. was brief and insufficient for determining which modern genus it represents, as well as quite inadequate for the recognition of a species. The only other mention of that name which has come to my attention was its listing, with species misspelled *sanguineipes,* by Scudder 1901 (Alphabetical Index to North American Orthoptera, p. 128). Thus, the obscurity surrounding the Fabrician name has been almost complete. This name should not be confused with the manuscript name *Pezotettix sanguinipes* Bruner (Publ. Nebr. Acad. Sci. 3, p. 27, 1893), which Scudder 1897 (Revision of . . . Melanopli . . . , Proc. U. S. Nat. Mus. 20, p. 236) considered applicable to *Melanoplus altitudinum* (Scudd.), but instead applies to *M. dodgei* (Thos.).

The type specimen of *M. sanguinipes* (F.), which I examined in June 1961, is in comparatively good condition. Except for the left hind leg which is gone, and the right hind leg and part of an antenna mounted on an attached card, appendages are present on the specimen. The colors of the hind leg seem well-preserved; the tibia is orange, and dark transverse bars show on the femur. The aedeagus, extracted and now attached to the abdomen in a dry condition, is typical of *M. bilituratus bilituratus* as figured and described by Gurney and Brooks (loc. cit.). The aedeagus has no carina on the lateral surface of the dorsal valve such as occurs in *M. bilituratus vulturnus,* and the specimen agrees well with those from New England and nearby.

The pin bearing the type specimen has three labels: 1. A tiny pale green square; 2. A red label "Type" in longhand; 3. A white, narrowly black-bordered label in longhand

"Am. sept.
Rohr
Mus. S. & T. L.
Gr. sangui-
nipes F."

The third line indicates that the specimen was in the collection of Sehestedt and Tønder Lund. They were pupils of Fabricius, who stated in his autobiography (translated into English by Hope [Trans. Ent. Soc. London 4, pp. i–xvi, 1845], but also consulted in the original for me by Dr. Tuxen) that he often visited Copenhagen (from Kiel) to study the specimens of Sehestedt and Lund. The report on numerous specimens from Sehestedt and Lund in the 1787 "Mantissa Insectorum" shows that he had access to their material at least from this time. Dr. Tuxen has written me that there may have been a specimen in Fabricius' own collection, but there is none now. He regards the specimen here discussed as having been seen by Fabricius and to be available for type consideration. I therefore designate this specimen, already safely returned to the Zoologisk Museum in Copenhagen, as lectotype of *Melanoplus sanguinipes* (F.).

Concern about the precise geographic origin of the lectotype involves the travels of the collector, Rohr, but unfortunately the available information is indefinite. Julius Philip Benjamin von Rohr was briefly treated biographically in 1923 (Ent. Meddel. 15, pp. 125–126). He was born about 1735 and became one of Fabricius' important collectors until lost at sea in 1792. He spent much time between 1757 and 1792 in the Danish West Indies, especially at St. Croix, but traveled widely on other West Indian islands, and did much collecting at Cayenne.

Rohr was detailed to make a special study of the cotton plant, which resulted in his book "Anmerkungen über den Cattunbau," first part 1791, second part 1793. The foreword of the first part by a Kiel professor, P. G. Hensler, explains that in 1784–85 Rohr made a trip among the West Indian islands and to the mainland; however, except for Central American localities no mention of his having been on the North American mainland has been found in the book. It is stated, also by Hensler, in the foreword to the second part, which foreword probably was prepared before Rohr's death though published afterward, that Rohr was going to go by way of Rhode Island to London, then to Guinea (in Africa). Whether he may have visited Rhode Island and collected specimens which were sent to Fabricius prior to the loss of the ship going to Guinea is not clear. In any case, he may have visited the United States earlier during his approximately 35 years residence in the West Indies.

The original description of *M. sanguinipes* (F.) gives "America boreali" as the type locality, though the rewritten label on the lectotype specimen reads "Am. sept." Dr. Tuxen reports that it is not rare to find the locality "America boreali" in Fabricius' book, but "Am. sept." on the rewritten labels, and he does not attach importance to the variation. At any rate, Fabricius' 1798 work includes descriptions of more than a dozen insect species from "America boreali" collected by Rohr, as well as others from "America meridionali," "Americae meridionalis Insulis," "Americae Insulis," and elsewhere by the same collector. Insofar as I have been able to check the distribution of the Fabrician species from "America boreali," hoping for indications of the limits of the area where Rohr probably collected them, these species are widely distributed insects of the eastern United States, with several occurring from southeastern Canada to Texas. No clues have been obtained from Staig's volumes on the Fabrician types in the Hunterian Collection at Glasgow (Vol. 1, 1931, Glasgow University Publication, XIX; Vol. 2, 1940, Ibid., L), nor from Mrs. Doris Blake's account of some Coleoptera types of Fabricius (Coleopterists' Bull. 5, pp. 39–41, 1951). So, the extent of Rohr's travels in the Northern States is a mystery, but during those travels *sanguinipes* apparently was collected. In any event, the lectotype almost surely is from a Northeastern State, which is of importance if eastern and western populations of *M. sanguinipes* should be accorded separate status by future students.

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REVIEW OF THE GENUS *LEPTONYCTERIS* (MAMMALIA: CHIROPTERA)

By William B. Davis and D. C. Carter

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On 29 November 1959, Carter captured a series of large *Leptonycteris* at Tepoztlán, Morelos, México. These specimens are referable to the population described by Stains (Univ. Kans. Publ., Mus. Nat. Hist., 9 (10): 353–356, 1957) as *Leptonycteris nivalis longala*, but they are from a locality far south of the range ascribed to that race and from an area where a smaller *Leptonycteris* had been previously collected. This anomaly has led us to review the systematic status of representatives of this genus. Previously, all Mexican *Leptonycteris* have been assigned to a single species, *L. nivalis*, but actually two distinct populations occur there. One is characterized by: (1) fur short and dense (that on the back about 4 to 5 mm long); (2) forearm, 52–56 mm; (3) terminal phalanx of third digit, 10–12 mm; (4) total length of third finger averaging 97 mm (92–101); (5) uropatagium nearly 6 mm wide at the midline, scantily haired, and with no distinct fringe of hairs. The second is larger, and is characterized by: (1) fur long and fluffy (that on back about 7 to 8 mm long); (2) forearm, 55–60 mm; (3) terminal phalanx of third finger, 16–19 mm; (4) total length of third finger averaging 110 mm (108–112); (5) uropatagium 4 mm or less in width at the midline, more heavily haired, and with a conspicuous fringe of hairs 3 to 4 mm long.

The problem of assigning Saussure's name *nivalis* to one of these populations is complicated by the fact that the type specimen apparently has been lost. Reference to the original description and plate (Rev. et Mag. Zool. Paris, ser. 2, 12: 492–493, 1860), however, reveals that Saussure had a specimen of the long-haired form because he gives the length of the forearm as 60 mm. This measurement is well above the maximum for the short-haired bats and at the maximum for the long-haired ones. Also, he gives the width of the uropatagium as 4 mm at the midline, a measurement that also agrees with that for the long-haired bats. From the drawing, Plate 20, which Saussure indicates is natural size, one can determine the length of the third metacarpal and of each phalanx of the third digit. These, in sequence, are 51.3, 17, 25, and 16.7; total length of third finger, 110. These measurements, too, are above the maxima for the short-haired bats. Consequently, all available evidence indicates that Saussure applied the name *nivalis* to the larger, long-haired *Leptonycteris*.

Two other names have been applied to this large, long-haired *Leptonycteris*; namely, *Leptonycteris nivalis yerbabuenae* Martinez and Villa (An. Inst. Biol. Mex., 11 (1): 291–361, 1940), type locality, Yerbabuena, Guerrero, and *Leptonycteris nivalis longala* Stains (*supra cit.*), type locality, *ca.* Arteaga, Coahuila. Although the entire series on which the name *yerbabuenae* was based has been destroyed, the measurements recorded on length of the third finger and length of the terminal phalanx of that finger fall within the ranges of variation of those measurements in the long-haired population and are above the maxima for the short-haired bats. Stains' name *longala* without question applies to the long-haired group. It becomes necessary, therefore, to submerge *L. n. longala* Stains and *L. n. yerbabuenae* Martinez and Villa as synonyms of *Leptonycteris nivalis* Saussure on the basis of priority.

In his review of the genus *Leptonycteris*, Hoffmeister (J. Mamm., 38 (4): 454–461, 1957) placed *L. curasoae* Miller of the Netherlands Antilles as a subspecies of *L. nivalis* (Saussure) and he described as new the short-haired, short-winged Mexican population, giving it the name *Leptonycteris nivalis sanborni*. Our study leads us to the conclusion that these three populations are specifically, rather than subspecifically, distinct. The Mexican short-haired *Leptonycteris* resembles the West Indian *Leptonycteris curasoae* Miller (Proc. Biol. Soc. Wash., 13: 126–127, 1900) in that the uropatagium is sparsely

TABLE 1.—Comparative measurements (in mm) of three species of *Leptonycteris*

MEASUREMENT OF	*L. nivalis*		*L. sanborni*		*L. curasoae*
	7♀♀	3♂♂	5♀♀	5♀♀	4♂♂, 2♀♀ (pooled)
Forearm	56.6 (54.5–58.2)	57.6 (55.4–59.5)	54.7 (53.9–55.0)	53.5 (51.7–55.6)	54.7 (54.0–55.3)
3rd Metacarpal	50.3 (49.0–51.5)	50.1 (49.0–51.7)	48.8 (47.6–49.5)	47.3 (45.6–48.5)	48.6 (48.0–49.4)
1st Phalanx III	16.0 (15.5–16.4)	15.8 (14.7–16.6)	14.3 (13.4–14.8)	14.1 (13.0–14.8)	14.7 (14.2–15.5)
2nd Phalanx III	26.1 (25.4–26.5)	26.9 (25.4–28.3)	23.9 (22.9–25.0)	23.0 (21.5–24.8)	23.5 (22.8–23.8)
3rd Phalanx III	17.9 (17.0–18.3)	17.6 (16.2–18.7)	11.5 (10.6–12.3)	11.3 (9.8–12.4)	12.1 (10.5–12.8)
3rd Finger	110.0 (108.4–112.3)	110.4 (107.1–115.3)	98.5 (95.1–101.2)	95.6 (92.1–100.3)	99.1 (97.8–99.9)
Condylobasal length	27.2 (26.2–28.3)	27.1 (26.5–28.0)	26.0 (25.7–26.5)	25.7 (25.5–26.1)	27.4 (27.0–28.0)
Zygomatic breadth	11.3 (10.9–11.6)	11.4 (10.7–12.0)	10.8 (10.1–11.3)	10.9 (10.8–11.0)	11.4 (11.1–11.8)
Interorbital width	5.1 (4.3– 5.4)	5.3 (5.3– 5.4)	4.6 (4.4– 4.7)	4.6 (4.3– 4.8)	5.1 (5.0– 5.4)
Mastoidal breadth	11.8 (11.5–12.0)	12.0 (11.5–12.5)	10.9 (10.7–11.1)	10.8 (10.7–10.9)	11.0 (10.6–11.5)
Length of palate, from alveolus	14.5 (13.3–15.3)	14.5 (14.0–15.0)	14.3 (13.9–14.7)	14.2 (14.0–14.5)	15.3 (15.2–15.6)
Maxillary toothrow	9.2 (8.5– 9.5)	9.2 (8.9– 9.6)	8.9 (8.7– 9.2)	8.6 (8.5– 8.8)	9.6 (9.5– 9.7)
Length of mandible	19.1 (18.2–20.3)	19.2 (18.5–19.7)	18.7 (18.1–19.0)	18.5 (18.0–18.8)	19.3 (19.2–19.7)

haired, the body fur is short, dense, and velvety, and the third finger is short (less than 100 mm). That the two are not conspecific, however, is suggested by two noticeable differences in the skull and the dentition. Reference to Table 1 reveals that the skull of *curasoae* is large like that of *nivalis*. In fact, in six of the seven cranial measurements recorded, the minimum of *curasoae* exceeds the maximum found in the Mexican short-haired population here referred to *L. sanborni*. In addition, the upper incisors of *curasoae* are evenly spaced, not in two pairs separated by a broad median gap, and the individual teeth are larger. The first upper molar of *curasoae* measures from 2.1 to 2.3 mm (avg. 2.2) in crown length as opposed to 1.7 to 2.0 mm in *sanborni*. The crescentic condition of the second lower premolar (actually the first in the series of three) is not of any taxonomic importance, as was pointed out by Hoffmeister (*op. cit.*), because it occurs in all three populations studied.

In summary, we recognize the following three species of *Leptonycteris* in our samples:

1. *Leptonycteris nivalis* (Saussure)

Synonyms: *L. n. longala* Stains
L. n. yerbabuena Martinez and Villa

Diagnosis: Fur long, lax; uropatagium moderately hairy and with a conspicuous fringe of hairs 3 to 4 mm long; forearm, 55–60 mm (avg. 57); length of third finger, 107–115 mm (avg. 110); length of terminal phalanx of third finger, 16–19 mm (avg. 17.7); upper incisors in two pairs with median gap; depth of mandible behind last molar, 2.0–2.5 mm, deeper in males than in females.

Range: From Arizona south to Oaxaca; east to Hidalgo and Veracruz.

2. *Leptonycteris curasoae* Miller

Diagnosis: Fur short and dense; uropatagium sparsely haired and with a slight fringe; forearm, 54–55 mm (avg. 54.7); length of third finger, 97.8–99.9 mm (avg. 99.1); length of terminal phalanx of third finger, 10.5–12.8 mm (avg. 12.1); upper incisors rather large and evenly spaced; depth of mandible behind last molar, 2.0–2.6 mm, deeper in males than in females.

Range: Netherlands West Indies.

3. *Leptonycteris sanborni* Hoffmeister

Diagnosis: Fur short and dense; uropatagium nearly naked; forearm, 51.7–55.6 mm (avg. 54.1); length of third finger, 92.1–101.2 mm (avg.

97.5); length of terminal phalanx of third finger, 9.8–12.4 mm (avg. 11.4); upper incisors small and in two pairs separated by a median gap; depth of lower mandible behind last molar, 1.5–1.7 mm, deeper in males than in females.

Range: Texas and Coahuila; south in winter to Morelos and Veracruz.

L. curasoae differs further from both *nivalis* and *sanborni* in having heavier dentition, especially noticeable when comparing the inner upper incisors and the first upper molars.

Specimens examined: *L. sanborni*—OAXACA: 6 mi NW Mixteguilla, 15 (TCWC); ¾ mi W San Sebastian (= Los Fustes), 2 (TCWC); Cuicatlán, 1 (KU); 3 km WNW Dominguillo, 730 m, 2 (KU); 3 mi W Mitla, 1 (KU). GUERRERO: El Papayo, 25 ft, 1 (TCWC); Tres Palos, 10 ft, 1 (TCWC); 1 mi S Palo Blanco, 3,000 ft, 3 (TCWC); 4 mi E Colotlipa, 3,200 ft, 1 (TCWC). MORELOS: *ca.* Huajintlán, 3,410 ft, 2 (1, UI; 1, TCWC). PUEBLA: 1 mi E Raboso, 4,350 ft, 1 (KU). VERACRUZ: 3 km W Boca del Rio, 5 (KU). MÉXICO, D. F.: 2.8 mi NNW Milpa Alta, 2,620 m, 16 (KU). HIDALGO: 6 km NW Tasquillo, 5,000 ft, 1 (KU). MICHOACÁN: 12 mi S Tzitzio, 1,050 m, 61 (UM). JALISCO: 5 mi W Chapala, 51 (KU); 8 mi NE Ocotlán, 1 (KU); Hacienda San Martín, 5,000 ft, 18 mi W Chalapa, 3 (KU); 5 mi SW Cojumatlán, 5,600 ft, 5 (TCWC). SINALOA: 1 mi N, ½ mi E San Miguel, 1 (KU); Eldorado, 8 (KU). SONORA: ¼ mi W Aduana, 1,600 ft, 4 (KU); 25 mi N Hermosillo, 1,500 ft, 1 (TCWC); Santa Maria Mine, El Tigre Mts, 3 (UM). CHIHUAHUA: Carimechi, Río Mayo, 5 (2 skins only) (UM). ARIZONA: 27–28 mi SW Casa Grande, Pinal Co., 14 (UI); Colossal Cave, Pima Co., 2 (UI); Miller Canyon, 10–15 mi SE Ft. Huachuca, Cochise Co., 55 (UI); 8 mi W Ft. Huachuca, Cochise Co., 1 (UI); 5 mi E Patagonia, Santa Cruz Co., 5 (UI).

L. nivalis—TEXAS: Chisos Mts., Brewster Co., 20 (TCWC). COAHUILA: 12 mi S, 2 mi E Arteaga, 7,500 ft, 21 (KU). MORELOS: Tepoztlán, 6 (UM); 3 mi E Tepoztlán, *ca.* 6,000 ft, 17 (TCWC).

L. curasoae—NETHERLANDS WEST INDIES: Quaridikiri Cave, Aruba, 6 (AMNH); Willemstad, Curaçao, 2 (USNM).

Examination of the above records reveals that *L. sanborni* is the most abundant and widespread *Leptonycteris* in México. *L. nivalis* appears to be a rarer species whose range overlaps that of *sanborni,* at least in winter, in southern México. Known dates of capture of *nivalis* in southern México (Guerrero, Morelos) are from November to February; the only known summer records are from Texas and Coahuila. *L. sanborni,* on the other hand, is present at all seasons in southern México.

We wish to express our appreciation to the following individuals for the loan of specimens: E. R. Hall, Kansas University (KU); Donald Hoffmeister, University of Illinois (UI); William H. Burt, University of Michigan (UM); Richard Van Gelder, American Museum of Natural History (AMNH); C. O. Handley, Jr., U. S. National Museum (USNM). Locality records followed by (TCWC) are for specimens deposited in the Texas Cooperative Wildlife Collections, Texas A. and M. College.

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TWO NEW SUBSPECIES OF BIRDS FROM VENEZUELA, THE RUFOUS PHASE OF *PAUXI PAUXI*, AND OTHER NOTES

By William H. Phelps and William H. Phelps, Jr.

Further study of the birds in our collection in Caracas and of specimens in the American Museum of Natural History, New York, and the Carnegie Museum, Pittsburgh, have shown the following undescribed subspecies. We thank the Curators of these two institutions for access to their collections.

Specimens listed are in the Phelps Collection, Caracas, unless otherwise specified. Names of colors are capitalized when direct comparison has been made with Ridgway's "Color Standards and Color Nomenclature," 1912. Wing measurements are of the chord.

The Rufous Phase of *Pauxi pauxi* (Linné)

The monotypic genus *Pauxi* has three subspecies: *pauxi* Linné, of the mountains of the Caracas Region and the Andes of the Mérida Region and the adjacent part of Colombia; *gilliardi* Wetmore and Phelps, of the Perijá Mountains on both the Venezuelan and Colombian sides; and *unicornis* Bond and de Schauensee, of Bolivia.

Of the 64 specimens of the genus which we have been able to locate in American and European museums and in Venezuelan collections, only four are in the rufous phase described by Ogilvie-Grant in the Cat. Birds Brit. Mus. (22: 488, 1893) as the normal female adult plumage. The other 60 specimens, males and females, are in the black and white plumage. Those in the rufous plumage are as follows:

In the *American Museum of Natural History*—One unsexed, demounted specimen from the Elliott Collection, 6485, "Northwestern Venezuela." Subspecies *pauxi.*

In the *British Museum* (*Natural History*)—One adult female, "S. America." This specimen was first listed by Sclater and Salvin (Proc. Zool. Soc. London, p. 519, 1870) and again by Ogilvie-Grant (*supra*). In both publications the rufous phase was described and, in the latter, as that of the adult female.

In the *Phelps Collection*, Caracas—One unsexed, Alto Río Negro, Sierra de Perijá, Zulia. Donated by the Pons Collection. For many years it was alive in the Maracaibo Zoo. Subspecies *gilliardi.*

In the *Pons Collection,* Maracaibo—One female, Río Tocuco, Sierra de Perijá, Zulia. On deposit in the Phelps Collection. Subspecies *gilliardi.*

Ogilvie-Grant (*supra*) says: "Some females resemble the males in plumage and differ only in being somewhat smaller; but these are apparently abnormal specimens, or barren females which have assumed male plumage." We cannot agree that the abnormal plumage of the female is black and white, because it may be assumed that half of the 64 collected specimens in museums are females and, at the most, only four of these are rufous. In any case, at this time, we cannot say that the rufous phase is confined to the females but we do know that it is not exclusively juvenile because the Maracaibo Zoo specimen in our collection never changed the color of its plumage during the years that it lived there.

Why does the rufous phase occur and in such a small percentage (6.2)? Is it an occasional throwback to remote ancestors, as suggested to us by Dr. Alexander Wetmore? In this connection, we note that in the allied genus *Crax* (which has a crest instead of the bony casque) the females of the species *rubra* Linné (Mexico to Ecuador) are always rufous and the males are always black and white.

The 64 specimens of *Pauxi pauxi* located are in the Natural History Museums in the following cities: Amsterdam, 2 (*pauxi*); Berlin, 6 (*pauxi*); Cambridge, 1 (*pauxi*); Caracas, La Salle Museum, 2 (*gilliardi*); Caracas, Museo Ciencias Naturales, 1 (*pauxi*); Caracas, Phelps Collection, 10 (3 *pauxi,* 7 *gilliardi,* including 1 rufous); Frankfurt, 1 (*pauxi*); Leiden, 2 (*pauxi*); Maracaibo, Pons Collection, 5 (*gilliardi,* including 1 rufous); Maracay, Rancho Grande Biological Station, 2 (*pauxi*); New York, 7 (*pauxi*); Paris, 3 (*pauxi*); Philadelphia, 7 (5 *pauxi,* 2 *unicornis*); Pittsburgh, 2 (*pauxi*); Stockholm, 1 (*pauxi*); Washington, 5 (*gilliardi*). Of these 64 specimens, 26 are males, 14 females, and 24 unsexed.

Colinus cristatus parvicristatus (Gould)

Ortyx parvicristatus Gould, Proc. Zool. Soc. London, 11: 106, 1843. (Santa Fé de Bogotá; Fómeque, suggested by Chapman, Birds of Colombia, 1917: 199.)

That this subspecies inhabits Venezuela is shown by a further study of our specimens of *C. cristatus* from the southwestern part of the country. We find that our specimens from the upper Apure River, previously listed as *C. c. barnesi* Gilliard, and those of northwestern Bolívar and northern Territorio Amazonas, which we have referred to *C. c. sonnini* (Temminck), are the same as *parvicristatus* of the eastern Andes and the Llanos of the Meta River, in Colombia.

Our male specimens of *parvicristatus* differ from our *sonnini* in the following characters listed by Hellmayr (Birds of Americas, etc., I, 1, 1942): shorter crest (16 per cent); crown and crest darker, brown instead of whitish-buffy; and ear coverts darker, brown instead of grayish. Measurements of the crests of our specimens: 14 *parvirostris,* 19–27 mm (21); 20 *sonnini* (eastern Venezuela), 21–29 (25), making the *sonnini* crests 19 per cent longer.

The *parvicristatus* in our collection are: APURE—Guasdualito, 3 ♂, 1 ♀; Palmarito, 1 ♂, 3 ♀. TERR. AMAZONAS—Caño Cataniapo, 2 ♂; Caño Parucito, 1 ♂. BOLIVAR—Caño Guaniamo, Río Cuchivero, 1 ♂, 1 ♀; La Paragua, Río Paragua, 7 ♂, 5 ♀.

Porzana albicollis typhoeca Peters

Porzana albicollis typhoeca Peters, Proc. New Eng. Zool. Club, 13: 66, 1932. (Río Frío, Santa Marta, Colombia.)

One ♂, La Frontera (Venezuelan-Brazilian boundary). Collected 14 June 1948, by Manuel Castro, at 1,000 meters. This locality is between the Hato Divina Pastora (see 1 : 1,000,000 map of the American Geographical Society, Roraima sheet) and Cabulla Quitá on the trail toward Cerro Uei-tepui from Santa Elena, Bolívar. There are three "malocas" there of the Taurepanes Indians on the Venezuelan side of the boundary at 940 meters altitude.

This specimen extends the range of the subspecies to Brazil.

Xiphorhynchus picus paraguanae, new subspecies

Type: From Adícora, Península de Paraguaná, Falcón; sea level. No. 13277, Phelps Collection, Caracas. Adult male collected 5 May 1941, by Fulvio Benedetti. (On deposit at the American Museum of Natural History.)

Diagnosis: Differs from *X. picus picirostris* (Lafresnaye) of the Santa Marta region of Colombia and of the northwestern part of Lake Maracaibo; from *X. p. choica* (Wetmore and Phelps) of the north-central coast; and from *X. p. phalara* (Wetmore) of the northeastern coast and the Llanos, by a longer bill and more extensive white throat patch. From *X. p. longirostris* (Richmond) of Margarita Island it differs by lighter rufous, more yellowish, upper parts and a lighter brown abdomen.

Range: The arid coast region of the State of Falcón from the San Luis Mountains and the Paraguaná Peninsula westward to Casigua, and southward through northern Lara to Quebrada Arriba and Carora.

Description of type: Lores, top of head and nape, near to Bister with Cream-Buff, tear-shaped spots, much larger and Cartridge Buff spots on the nape; sides of head Cartridge Buff; ear coverts grayish; upper back Cinnamon-Brown merging into the Tawny of lower back and uropygium. Chin and throat Cartridge Buff; breast with Cartridge Buff elongated spots, the feathers edged with brownish black, these spots narrower and more elongated on the upper abdomen; sides, abdomen and under tail coverts Dresden Brown. Upper surface of wings Cinnamon-Brown × Tawny; outer primaries and tips of others dusky; under surface of remiges Orange-Cinnamon; under wing coverts and axillaries Pinkish-Cinnamon. Upper surface of tail Russet, under surface Cinnamon-Brown.

Bill (in life) "ivory;" feet "greenish;" iris "brown." Wing, 103 mm; tail, 80; exposed culmen, 30; culmen from base, 33; tarsus, 23.

Remarks: Sexes alike. Size similar to *picirostris* but bill longer (10 per cent). Range of measurements of specimens from the coast of

Falcón: 13 adult males, including type—wing, 98–109 (102.8) mm; tail, 80–89 (83.6); culmen from base, 32–36 (33.2); 12 adult females—wing, 95–106 (98.8); tail, 75–86 (78); culmen from base, 32–36 (34.1). Measurements of *picirostris* from Bonda, Santa Marta: 3 adult males—wing, 91–106 (97); tail, 75–81 (77.7); culmen from base, 27–30.5 (29.8); 5 adult females—wing, 91–100 (95.4); tail, 74–80 (77.6); culmen from base, 30–32.5 (30.8); 5 of undetermined sex—wing, 95–101 (99.4); tail, 70–83 (76.6); culmen from base, 28.5–32 (30.1).

Specimens Examined

Xiphorhynchus p. picirostris.—COLOMBIA[1]: Santa Marta and Bonda, 3 ♂, 5 ♀, 14 (?). VENEZUELA: Zulia: Paraguaipoa, 1 ♂, 3 ♀; Cerro Alto del Cedro, boundary, 1 (?); Río Socuy, 7 ♂, 4 ♀, 3 juv.; Santa Cruz de Mara, 1 ♂, 1 ♀; Palmarejo, Río Aurare, 2 ♂, 1 (?).

X. p. saturatior.—Zulia: Las Múcuras, Perijá, to Mene Grande, var. locs.,[2] 25; Táchira: La Fría, 7 ♂, 3 ♀, 2 (?); Ureña, 4 ♂, 1 ♀.

X. p. paraguanae.—Falcón: Península de Paraguaná (Inc. type), var. locs., 9 ♂, 14 ♀, 3 (?); Casigua, 1 ♂; Urumaco, 1 ♂; Dabajuro, 1 ♂; Sabaneta, 2 ♂, 1 ♀; Curimagua, 1 ♂; Lara: Carora, 6 ♂, 5 ♀, 1 (?); Quebrada Arriba, 2 ♂.

X. p. choica.—Falcón: Boca de Tocuyo, 2 ♀, 1 (?); San Juan de los Cayos, 1 ♀; Carabobo: Urama, 2 ♂, 1 ♀, 1 (?); Puerto Cabello, 2 ♂, 5 ♀, 1 (?); Miranda: Carenero, 4 ♂, 1 ♀; Distrito Federal: Los Caracas, 1 ♀.

X. p. phalara.[2]—Anzoátegui, 11; Sucre, 15; Guárico, 20; Portuguesa, 3; Apure, 29; Bolívar: Caicara, 11.

X. p. longirostris.—Isla de Margarita, var. locs., 28.

Myiarchus crinitus (Linné)

Turdus crinitus Linné, Syst. Nat., 10th ed., 1: 170, 1758. (Carolina.)

1 ♀, Machiques, Zulia (January); 1 ♂, 1 ♀, El Vigía, Mérida (November); 1 ♂, Zea, Mérida (November); 1 ♂, 1 ♀, San Fernando de Atabapo, Terr. Amazonas (November).

These specimens constitute the first records of this migrant in Venezuela. It has been recorded from Colombia.

Myiophobus fasciatus fasciatus (Müller)

Muscicapa fasciata P. L. S. Müller, Natursyst., Suppl., p. 172, 1776. (Cayenne.)

1 ♂, La Frontera (Venezuelan-Brazilian boundary). Collected 27 May 1948, by Manuel Castro at 1,000 meters. For this locality see above under *Porzana*.

This specimen extends the range of the subspecies to Brazil.

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[1]Specimens in American Museum of Natural History.
[2]For localities see Proc. Biol. Soc. Wash., 65: 46, 1952.

Thlypopsis fulviceps meridensis, new subspecies

Type: From Zea, Mérida; 1,200 meters. No. 64576, Phelps Collection, Caracas. Adult male collected 8 November 1958, by Ramón Urbano. (Type on deposit at the American Museum of Natural History.)

Diagnosis: Differs from *T. f. fulviceps* Cabanis, of the Caracas and Turumiquire regions, by darker back, more grayish dusky green, less yellowish tint; and much darker below, with darker gray breast, sides and flanks; less extensive white on abdomen, and with whitish under tail coverts instead of buffy. From *T. f. obscuriceps* Phelps and Phelps, Jr., of Perijá, differs by olivaceous back instead of dark gray; darker gray below with whitish under tail coverts instead of buffy, and lighter rufous head. From *T. f. intensa* Todd, of Santander, Colombia, differs by olivaceous instead of dark gray back, head lighter rufous and darker gray below.

Range: Known by three specimens from the subtropical zone of the Mérida Region.

Description of type: Head, all around, Sanford's Brown; back and uropygium Deep Olive. Breast and sides Olive-Gray; flanks and shanks more olivaceous; center line of abdomen whitish; and under tail coverts Ivory-Yellow. Remiges and primary coverts Fuscous; other wing coverts and outer margins of secondaries and tertials uniform with back; outer margins of primaries light gray; under wing coverts and inner edges of remiges basally whitish. Rectrices greenish fuscous edged externally with Deep Olive.

Bill (in life) "black with grayish base;" feet "bluish gray;" iris "dark." Wing, 63 mm; tail, 51; exposed culmen, 9; culmen from base, 12; tarsus, 18.

Remarks: Size similar to *T. f. fulviceps*.[3] The juvenile specimen differs from the type: instead of the all-chestnut head the crown is olivaceous, merging into the olivaceous brown of nape and postauricular region, the lower face is yellowish olive and the lower chin and throat buffy white; the back and rump are more yellowish olive; and the gray of underparts paler.

Specimens Examined

Thlypopsis f. intensa.—COLOMBIA: La Palmita, Santander,[4] 1 ♂ (type), 2 ♀.

T. f. obscuriceps.—Zulia: Sierra de Perijá, var. locs., 8.[3]

T. f. meridensis.—Táchira: Queniquea, 1 (?) juv.; Mérida: Zea-Tovar road, 1 ♂ (type); Altos de Estanques, 1 (?).[1]

T. f. fulviceps.[3]—Carabobo: 1; Aragua: var. locs., 2; Distrito Federal: 13; Miranda: 1; Anzoátegui: 6; Sucre: 9; Monagas: 7.

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[3]For measurements and localities see Proc. Biol. Soc. Wash., 66 (139), 1953.
[4]Specimens in the Carnegie Museum.

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PROCEEDINGS

OF THE

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A NEW BLUE JAY (*CYANOCITTA CRISTATA*) FROM NEWFOUNDLAND

By Gorman M. Bond

An excellent series of specimens in the U. S. National Museum, collected by Peters and Burleigh in Newfoundland, reveals that the jays from that region represent a hitherto undescribed race which may be known as:

Cyanocitta cristata burleighi, new subspecies

Type: No. 382153, U. S. National Museum collection. Adult male, South Brook, Newfoundland, 1 June 1942, H. S. Peters and T. D. Burleigh. Measurements of type: Wing (chord), 139.0 mm; tail, 122.5; culmen from base, 26.5; tarsus, 37.0; middle toe without claw, 20.0.

Subspecific characters: Similar in size to *Cyanocitta cristata bromia* Oberholser (Auk, 38: 83–89), but blue of upper parts deeper and more intense, completely lacking in any trace of purple. Blue of crest restricted to outermost tips of gray feathers, giving the crest a paler appearance than that of *bromia*. Underparts generally paler. White tips of greater coverts, tertials, secondaries, and rectrices, larger than in *bromia*. Sexes alike.

Specimens examined: NEWFOUNDLAND: Cape St. George, 1; Corner Brook, 1; Humbetmouth, 1; Jeffreys, 1; Lawrence, 1; Pasadena, 1; St. Andrews, 2; St. Anthony, 1; South Brook, 5; Stephensville Crossing, 2; Tomkins, 1.

Distribution: Permanent resident in Newfoundland. A review of the collection of blue jays in the U. S. National Museum indicates that some birds occasionally wander southward into the United States in winter, as specimens from the following localities should be referred to this race: DISTRICT OF COLUMBIA: 1. ILLINOIS: Richland Co., Olney 2. NEW YORK: Catskill Mountains, 1. VIRGINIA: Alexandria, 1; Curles Neck, 1; Mt. Vernon, 1.

Remarks: I am pleased to name this new race for Thomas D. Burleigh, U. S. Fish and Wildlife Service, whose diligent field work in Newfoundland has added much to our knowledge of the birds from that area.

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PROCEEDINGS
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A NEW CRAYFISH OF THE PROPINQUUS GROUP OF THE GENUS *ORCONECTES* FROM THE OHIO DRAINAGE SYSTEM IN WEST VIRGINIA (DECAPODA: ASTACIDAE)

By Horton H. Hobbs, Jr. and J. F. Fitzpatrick, Jr.

Smithsonian Institution; Department of Biology, University of Virginia

A precise definition of the Propinquus Group has never been accomplished, and adequate data are not presently available to delimit accurately the range of variation within the group. There seems no reason to doubt that the new species described below, however, has its closest affinities with *Orconectes propinquus sanborni* (Faxon, 1884: 128), *O. p. propinquus* (Girard, 1852: 88), *O. p. jeffersoni* Rhoades, 1944: 123, *O. obscurus* (Hagen, 1870: 69), *O. erichsonianus* (Faxon, 1898: 659), *O. illinoisensis* Brown, 1956: 163, and *O. virginiensis* Hobbs, 1951: 122, an assemblage that has been designated the Propinquus Group.

This new subspecies is found well within the range of the group; indeed, its present range is surrounded by that of *O. p. sanborni* and *O. obscurus,* and although it is described as a subspecies of *propinquus,* collections are entirely inadequate to delineate the area of intergradation. The evidence that such an area exists is in the variation observed in specimens collected in Roane and Summers Counties, West Virginia (see Variations).

The distinctive feature of this crayfish is the presence of a *caudal eminence* on the caudal surface of the mesial process of the first pleopod of the male. This eminence is so prominent that a cursory examination would result in the conclusion that it is actually comparable to one of the terminal elements (Hobbs, 1940: 56). Only one other member of this genus, *O. quadruncus* (Creaser, 1933: 10), a member of the Hylas

Group, has a mesial process bearing such an eminence and there it is much less prominent than in this crayfish.

We should like to express our appreciation to Dr. E. C. Raney of Cornell University for his kindness in sending us the first specimens we had seen of this new crayfish—those collected by Messrs. van Meter and Taylor.

Orconectes propinquus erismophorous,[1] new subspecies

Diagnosis: Pigmented, eyes normal. Rostrum with marginal tubercles or spines, concave above, median carina absent, margins subparallel or slightly converging distally and not thickened; length of areola 30–40 per cent of entire length of carapace, 3.7 to 4.9 times longer than broad, and with three or four punctations across narrowest part; postorbital ridges strong, terminating cephalically in strong divergent, corneous tubercles; a single lateral spine on each side of carapace. First pleopod of first form male reaching almost to coxopodite of second pereiopod when abdomen is flexed; no strong cephalic shoulder present; central projection slightly longer than mesial process with tip curving caudodistally over mesial process; mesial process straight, subparallel to central projection, distinctly spatulate, with a caudal eminence originating along basal half and projecting distally almost half the distance from its origin to tip of mesial process and subparallel to the latter (Figs. 1, 3, 5). Annulus ventralis immovable, weakly sculptured (Fig. 8).

Holotypic Male, Form I: Body subcylindrical, slightly depressed. Abdomen narrower than cephalothorax (9.7–9.9 mm in widest parts respectively). Width of carapace greater than depth in region of caudodorsal margin of cervical groove (9.9–7.3 mm).

Areola moderately broad (4.1 times longer than wide) with two or three punctations across narrowest part. Cephalic section of carapace about 1.9 times as long as areola; length of areola 34.3 per cent of entire length of carapace.

Rostrum with subparallel margins which are not distinctly thickened but terminate distally in strong tubercles; upper surface deeply concave and bearing setiferous punctations; a single row of such punctations along mesial sides of marginal ridges extending onto acumen and along lateral sides of margins to marginal tubercles. Acumen long, slender, and extending distad to distal end of peduncle of antennule; tip not upturned. Subrostral ridges evident in dorsal aspect for a short distance at their bases.

Postorbital ridges strong, grooved dorsolaterally, and produced cephalad in prominent divergent tubercles. Suborbital angle lacking. Branchiostegal spines acute. Lateral surface of carapace with a strong acute spine

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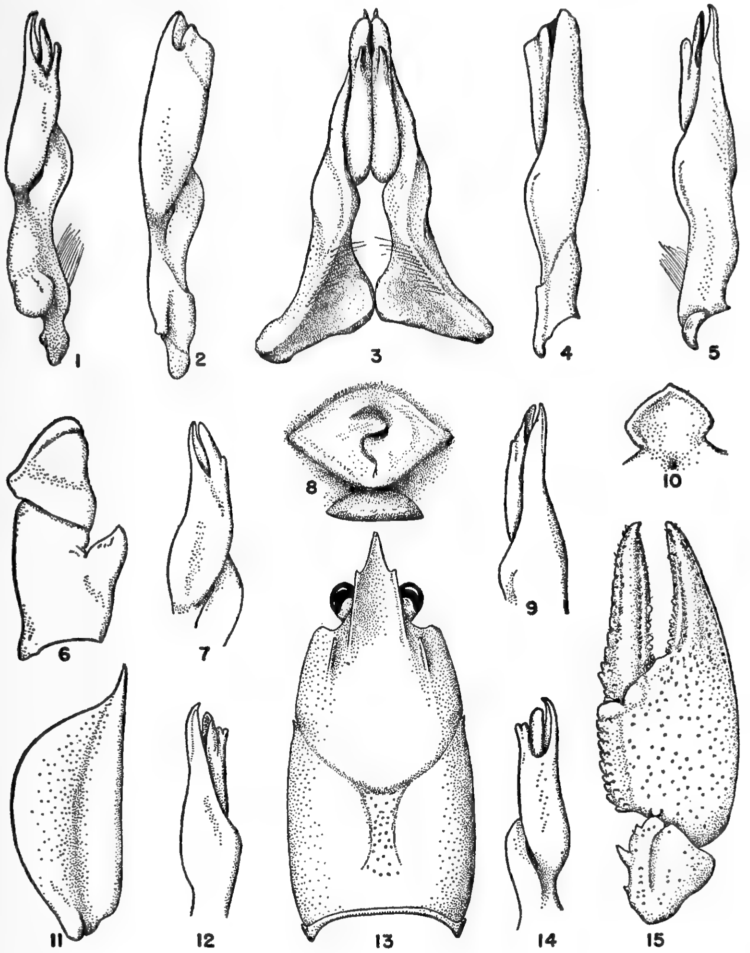
[1] *erismophorous*, from *erisma*, Gr., a buttress, and *phero*, Gr., to bear; so named because of the buttress-like eminence borne on the caudal surface of the mesial process of the first pleopod of the first form male.



FIGS. 1–15. *Orconectes propinquus erismophorous,* new subspecies. 1, Mesial view of first pleopod of holotype. 2, Mesial view of first pleopod of morphotype. 3, Caudal view of first pleopods of holotype. 4, Lateral view of first pleopod of morphotype. 5, Lateral view of first pleopod of holotype. 6, Basipodite and ischiopodite of third pereiopod of holotype. 7, Mesial view of distal portion of first pleopod of first form male from Roane County, West Virginia. 8, Annulus ventralis of allotype (injury not illustrated). 9, Lateral view of pleopod in Fig. 7. 10, Epistome of holotype. 11, Antennal scale of holotype. 12, Lateral view of distal portion of first pleopod of first form male from Tucker Creek, 8.4 mi upstream from Elizabeth, Wirt County, West Virginia. 13, Dorsal view of carapace of holotype. 14, Mesial view of pleopod in Fig. 12. 15, Upper surface of distal podomeres of cheliped of holotype.

on each side. Entire carapace studded with setiferous punctations except in extreme cephalolateral ventral portions which bear setiferous granulations.

Abdomen longer than carapace (22.0–20.4 mm). Cephalic section of telson with two spines in each caudolateral corner.

Epistome (Fig. 10) broadly ovate with a tubercular cephalomedian projection.

Antennules of the usual form with a prominent spine on ventral surface of basal segment. Antennae broken, but appear to have extended to about midlength of abdomen. Antennal scale (Fig. 11) about 2.2 times longer than broad and with mesial margin of lamellar portion evenly rounded and widest slightly distal to midlength.

Chela (Fig. 15) somewhat depressed, with palm slightly inflated; all surfaces bearing setiferous punctations. Tubercle present on lower surface of palm at base of dactyl. Inner margin of palm with two irregular rows of tubercles, lower row of eight and upper one of seven. Fingers with a slight gap at base. Upper surface of immovable finger with a broad rounded submedian longitudinal ridge flanked by setiferous punctations; another ridge along proximal three-fourths of finger immediately mesial to aforementioned ridge. Outer margin of immovable finger with a well-defined keel extending proximally two-thirds length of palm; opposable margin of finger with a row of three small rounded tubercles at base and a single one at base of distal one-fourth and crowded minute denticles along distal two-thirds; a submedian longitudinal ridge on lower surface of finger. Dactyl similar to immovable finger above and below; mesial margin with a double row of tubercles along proximal two-thirds, lateral row extending almost to tip of dactyl; opposable margin with four tubercles along basal half and crowded minute denticles in distal half.

Carpus of cheliped longer than broad with a broad shallow longitudinal furrow above; setiferous punctations over entire surface and a few small tubercles on upper surface mesial to furrow; mesial surface with a prominent curved acute spine, and upper mesiodistal surface with a smaller one, upper proximomesial surface with a prominent tubercle; lower submedian distal margin with a small tubercle and lower laterodistal margin with a strong spine. Upper and lower surfaces of merus with scattered setiferous punctations; lateral surfaces generally smooth; two acute spines on upper distal surface; lower mesial surface with a row of eight spines increasing in size distally, terminating in a strong acute distal spine; a single acute distal spine on lower laterodistal margin and a row of three or four tubercles proximal to it. Lower proximal surface of ischiopodite with a small rounded tubercle. Hooks on ischiopodites of third pereiopods only (Fig. 6); hooks simple.

First pleopod extending cephalad almost to coxopodite of second pereiopods when abdomen is flexed. Tip terminating in two distinct parts with an accessory prominent eminence on mesial process; rami separated for a short distance from tips (Figs. 1, 3, 5). Central projection corneous, straight except tip curved caudodistally. Mesial process not extending so far distad as central projection, non-corneous, distinctly spatulate, subparallel to central projection, and with a distinct subcylindrical caudal eminence arising at its base and projecting distally, subparallel to process, to base of distal half of process (Fig. 1). Pleopods symmetrical (*sensu* Hobbs, 1962).

Morphotypic Male, Form II: Differs from the holotype in the following respects: Carpus of cheliped with a less prominent spine on mesiodistal surface. Palm less inflated and proportionally smaller than holotype. Epistome without a median tubercle on cephalic margin. Tip of acumen slightly upturned. Hooks on ischiopodites of third pereiopod much reduced. Both elements of first pleopod (Figs. 2, 4) non-corneous, blunter, and in close apposition almost to tips; caudal eminence prominent but not so distinctly set off from mesial process; a suture delimiting basal and distal portion of pleopod (Figs. 2, 4).

Allotypic female: Differs from the holotype in the following respects: Acumen slightly upturned. Carpus of cheliped lacking spine on upper mesiodistal surface. Merus less stout and lacking row of tubercles on lower laterodistal margin. First pleopod biramous but weakly developed.

Annulus ventralis immovable, broader than long, fused cephalically with sternum and scarcely elevated (ventrally) above it. Surface weakly sculptured. Sinus arising slightly cephalic to midlength, curves caudodextrally across median line and bends gently caudosinistrally to median line where it turns caudad and terminates submedially in caudal fourth of annulus (Fig. 8). The allotype, the only fully mature female available, has a small crack (not illustrated) in the middle of the annulus.

Measurements: As follows (in millimeters):

	Holotype	Allotype	Morphotype
Carapace—height	7.3	6.5	7.0
width	9.9	8.5	8.4
length	20.4	18.1	17.6
Areola— length	7.0	6.0	6.0
width	1.7	1.5	1.5
Rostrum— length	6.0	5.5	5.3
width	3.2	2.9	2.9
Chela—	right	left	right
length of inner margin of palm	5.9	3.6	3.9
width of palm	7.0	4.5	4.5
length of outer margin of hand	16.5	9.9	11.8
length of dactyl	9.4	6.1	6.2

Type locality: Crane Nest Creek at Pee Wee, Wirt County, West Virginia. Here, in a cultivated area, the stream is some 15 feet in width, up to 1 foot in depth and flows rapidly over a gravel bottom.

Disposition of types: The holotypic male, form I, the allotypic female, and the morphotypic male (USNM Nos. 107597, 107598, and 107599, respectively) are deposited in the U. S. National Museum. The paratypes are distributed as follows: a first form male, a second form male, and a juvenile female are in the Tulane University Collection; and seven first form males, one second form male and five juvenile females are in the collection of the senior author.

Range: The type series was collected from tributaries of the Little Kanawha River in the vicinity of Elizabeth, Wirt County, West Virginia —type locality (4-1761-2), coll. R. H. Gilpin and H. H. Hobbs, Jr.; Tucker Creek, 6 mi N of Elizabeth (9-1349-2), coll. H. van Meter and G. Taylor; 4.9 mi W of Elizabeth (4-1761-4a), coll. RHG and HHH; 8.4 mi upstream from Elizabeth (4-1761-5a), coll. RHG and HHH. In addition, specimens interpreted as intergrades between *erismophorous* and *sanborni* were collected from the following localities: near Alderson, 0.5 mi W of Greenbriar Co. line (Greenbriar Dr.) on Rt. 3, Summers Co., W. Va. (4-1561-4a), coll. RHG and HHH; 1.6 mi S of Walton on Rt. 119 (Big Kanawha Dr.), Roane Co., W. Va. (4-1661-8), coll. RHG and HHH.

Variations: Perhaps the most conspicuous variations are to be found in the rostrum and in the arrangement of tubercles along the inner margin of the palm of the chela. In general, the rostral margins are subparallel or only slightly convergent distally; however, the length of the rostrum is somewhat variable—in some specimens noticeably shorter than in others, and the same can be said of the acumen. The tubercles along the inner margin of the palm are arranged roughly into two longitudinal rows but in all of the specimens there are additional tubercles between and flanking these rows; in a few instances they are so numerous as almost to obscure a linear arrangement. Three first form males from Tucker Creek exhibit a variation in the caudal eminence on the mesial process of the first pleopod in that the distal extremity of the eminence on one of the pair in each instance is bilobed (Figs. 12, 14).

The specimens that have been interpreted as representing intergrade populations are from a tributary of the Kanawha River in Roane County and from a tributary of the Greenbriar River in Summers County. Specimens from the former locality include those which appear to be typical *sanborni* in every respect; however, three males have pleopods which exhibit various degrees of development of the caudal eminence of the mesial process. In none of them, however, is the eminence so strongly developed as it is in typical *erismophorous*. In the collection from the tributary of the Greenbriar, there are three first form males, which possess a uniformly weak caudal eminence on the pleopods (Figs. 7, 9); thus they are neither good *sanborni* nor good *erismophorous* and have been assigned to the intergrade series. Geographically, this latter population is situated deep within the range of *sanborni*, and an interpretation of this apparent anomaly must await series of specimens from many more localities in the Kanawha drainage system.

Relationships: There seems to be no doubt that *O. p. erismophorous* has its closest affinities with *O. p. sanborni* but may be distinguished from it by the presence of a prominent caudal eminence on the mesial process of the first pleopod of the male.

Remarks: Because of the rarity of ornamentation of the mesial process of the first pleopod in the Cambarinae and the appearance of the caudal eminence in *erismophorous,* the possibility was considered that this lobe represented the retention of the cephalic process of the hypothetical ancestor (Hobbs, 1940). Superficially, it appeared possible that there could have been an extreme rolling of the distal portion of the pleopod with the displacement of the cephalic process caudomesially to lie caudal to the mesial process. Gross dissection of one of the pleopods proved inadequate to establish the relationships of the eminence and the mesial process to the central projection and a second appendage was sectioned at 20 microns. The rationale involved was that if the mesial process were continuous with the central projection only through the caudal eminence, it would indicate that the eminence was the retained cephalic process; if, to the contrary, the mesial process was continuous with the central projection and the eminence arose as an outgrowth from the former, then the caudal eminence must be considered an outgrowth of the mesial process. The latter relationship was demonstrated to exist. Thus, although the first pleopod appears to terminate in "three parts," morphologically it actually ends in "two parts" with an embossment on the mesial process.

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SEVEN NEW SPECIES OF STOMATOPOD CRUSTACEANS FROM THE NORTHWESTERN ATLANTIC[1]

By Raymond B. Manning

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The following new species were discovered while examining stomatopod crustaceans from various sources during the course of a general revision of the western Atlantic members of the group. As it will be some time before the revision can be completed, differential diagnoses for the species are presented here in order to make the species known.

The count of teeth on the raptorial dactylus always includes the terminal tooth. The measurements given after the number of specimens in the material examined are total length. The letters UMML (The Marine Laboratory, University of Miami) or USNM (U. S. National Museum) after each lot indicate where that lot of material will be deposited.

This work was done with the support of the National Science Foundation under Grant No. G11235.

Squilla chydaea, new species

Eyes large, triangular, corneal axis exceeding peduncular axis; cornea placed obliquely on stalk; rostral plate elongate with a faint median carina; median carina of carapace bifurcate anteriorly; anterolateral spines of carapace not extending to rostral base; posterolateral margin of carapace with a distinct angle; raptorial claw large, dactylus armed with six teeth; outer margin of dactylus a simple curve; five epipods present; mandibular palp present; lateral process of fifth thoracic somite a single spine, strongly curved anteriorly; lateral processes of sixth and seventh thoracic somites acute, sharp, directed posterolaterally, each with an anterior lobe; submedian carinae present on last three thoracic and all abdominal somites; abdominal carinae sharp, spined as follows: submedian, (4) 5–6; intermediate, (1) 2–6; lateral, 1–6; marginal, 1–5; telson with prelateral lobes and six strong, elongate, marginal spines; denticles 2–4, 7–11, 1; penultimate segment of outer branch of uropod with seven to eight, usually eight, graded, movable spines, last not extending to midpoint of ultimate segment.

[1] Contribution No. 379 from The Marine Laboratory, University of Miami.

Remarks: This species closely resembles *S. lijdingi* Holthuis from the northern coast of South America. The elongate eyes, elongate rostral plate with a faint median carina, strongly curved lateral process of the fifth thoracic somite, and markedly elongate marginal spines of the telson, separate this species from *S. lijdingi.* Mature males of *S. chydaea* have noticeable swellings at the bases of the marginal teeth of the telson.

S. chydaea also resembles *S. brasiliensis* Calman, but the latter species has stouter eyes, a shorter and anteriorly rounded rostral plate which lacks a median carina, and more marked swellings on the telson of mature males.

S. chydaea has been recorded in the literature as *S. brasiliensis* Calman (Springer and Bullis, 1956; Manning, 1959).

The name *chydaea* (Latin *chydaeus* = abundant) alludes to the abundance of this very common species.

Holotype: 1 ♂, 97.5 mm; Gulf of Mexico (Florida); 30°02.5′N, 86°53′W; 60 fms; OREGON Sta. 332; 5 May 1951; USNM 92387.

Paratypes: 1 ♀, 78.7 mm; Gulf of Mexico (Mexico); 24°12′N, 97°17′W; 40 fms; OREGON Sta. 662; 13 November 1952; USNM 94465.

1 ♂, 68.3 mm; 2 ♀ ♀, 69.0–71.7 mm; Gulf of Mexico (Texas); 27°46′N, 96°51.5′W; 13 fms; PELICAN Sta. 39; 20 April 1938; USNM.

2 ♂ ♂, 70.2–74.9 mm; 1 ♀, 82.8 mm; Gulf of Mexico (Texas); PELICAN Sta. 42; 22 April 1938; USNM.

1 ♂, 65.0 mm (damaged); 2 ♀ ♀, 52.4–108.2 mm; Gulf of Mexico (Texas); 27°18′N, 96°02′W; 200 fms; OREGON Sta. 162; 28 November 1950; USNM 91947.

1 ♂, 85.1 mm; Gulf of Mexico (Texas); 27°22′N, 96°08′W; 103 fms; OREGON Sta. 156; 27 November 1950; USNM 92385.

1 ♀, 108.1 mm; Gulf of Mexico (Texas); 27°29′N, 96°16′W; 58 fms; OREGON Sta. 159; 27 November 1950; USNM 92386.

1 ♂, 76.7 mm; 1 ♀, 70.2 mm; SE of Port Aransas, Texas; 14 fms; H. Compton; 14 March 1961; USNM 107022.

3 ♂ ♂, 76.4–92.6 mm; 1 ♀, 105.4 mm; Gulf of Mexico (Louisiana); 28°48′N, 89°51′W; 30 fms; PELICAN Sta. 69–6; 13 May 1939; USNM.

1 ♀, 74.7 mm; Gulf of Mexico (Louisiana); 28°14′N, 91°41′W; 39 fms; PELICAN Sta. 84–3; 12 July 1938; USNM.

1 ♀, 117.1 mm; Gulf of Mexico (Louisiana); 28°19.5′N, 91°24′W; 35 fms; PELICAN Sta. 85–6; 12 July 1938; USNM.

1 ♂, ca. 87.0 mm (damaged); Gulf of Mexico (Louisiana); 28°39.5′N, 89°58.5′W; 80 fms; PELICAN Sta. 96–1; 14 November 1938; USNM.

1 ♂, 61.7 mm; 1 ♀, 59.3 mm; south of Grand Isle, Louisiana; 15 fms; C. E. Dawson; 20 November 1959; USNM 104748.

1 ♂, 74.5 mm; Gulf of Mexico (Louisiana); 29°22′N, 88°40′W; 28 fms; OREGON Sta. 843; 22 October 1953; USNM 96278.

1 ♀, 104.5 mm; Gulf of Mexico (Louisiana); 29°14′N, 88°35′W; 40 fms; OREGON Sta. 90; 24 August 1950; USNM 92384.

1 ♀, 71.6 mm; Gulf of Mexico (Louisiana); 29°14′N, 88°35′W; 37 fms; OREGON Sta. 88; 23 August 1950; USNM 91439.

1 ♀, 69.9 mm; Gulf of Mexico (Louisiana); 29°12′N, 88°50′W; 30 fms; OREGON Sta. 103; 12 September 1950; USNM 91438.

1 ♀, 104.6 mm; Gulf of Mexico (Louisiana); 29°07.5′N, 88°50.5′W; 46 fms; OREGON Sta. 101; 12 September 1950; USNM 91440.

2 ♀ ♀, 79.1–82.5 mm; Gulf of Mexico (Louisiana); 28°53.5′N, 89°36.5′W; 37 fms; OREGON Sta. 107; 13 September 1950; USNM 91441.

2 ♂ ♂, 78.4–108.5 mm; Gulf of Mexico (Louisiana); 28°50′N, 89°33′W; 43 fms; OREGON Sta. 342; 7 May 1951; USNM 92389.

2 ♂ ♂, 85.6–104.1 mm; Gulf of Mexico (Louisiana); 28°50′N, 89°33′W; 43 fms; OREGON Sta. 340; 7 May 1951; USNM 92388.

1 ♂, 60.6 mm; 3 ♀ ♀, 69.4–81.0 mm; Gulf of Mexico (Louisiana); 28°55′N, 89°15′W; 33 fms; OREGON Sta. 845; 23 October 1953; USNM 96287.

1 ♂, 112.5 mm; Gulf of Mexico (Louisiana); 28°04′N, 92°05′W; 43 fms; SILVER BAY Sta. 181; 22 September 1957; UMML.

1 broken ♀; Gulf of Mexico (Louisiana); 28°07′N, 92°37′W; 49 fms; SILVER BAY Sta. 182; 22 September 1957; UMML.

1 ♀, 123.4 mm; Gulf of Mexico (Mississippi); 29°11′N, 88°30′W; 88.5 fms; PELICAN Sta. 11; 5 February 1938; USNM.

1 damaged ♂; Gulf of Mexico (Mississippi); 29°13.5′N, 88°12′W; 125 fms; OREGON Sta. 2203; 26 June 1958; UMML.

1 ♂, 124.5 mm; 1 ♀, 123.0 mm; Gulf of Mexico (Mississippi); 29°16.5′N, 88°04.5′W; 90/80 fms; OREGON Sta. 2827; 17 July 1960; UMML.

1 ♂, 108.0 mm; Gulf of Mexico (Florida); 29°50′N, 86°30′W; 50 fms; OREGON Sta. 944; 21 March 1954; USNM 96401.

Squilla discors, new species

Eyes large, triangular, corneal axis exceeding peduncular axis; cornea placed obliquely on stalk; rostral plate without carinae, length and width subequal; median carina of carapace not bifurcate anteriorly; anterolateral spines of carapace not extending to rostral base; posterolateral margin of carapace angled anteriorly; raptorial dactylus armed with six teeth, outer margin a simple curve; five epipods present; mandibular palp present; lateral process of fifth thoracic somite a strong spine, curved anteriorly; lateral processes of sixth and seventh thoracic somites sharp, directed posteriorly, that of the seventh with a prominent anterior lobe; submedian carinae present on last three thoracic and all abdominal somites; intermediate carinae of sixth, seventh, and eighth thoracic somites spined posteriorly in old specimens; abdominal carinae spined as follows: submedian, (4) 5–6; intermediate, (1) 2–6; lateral, 1–6; marginal, 1–5; telson with prelateral lobes and six strong marginal spines; dorsal surface of telson distinctly tuberculated; denticles 5–7, 8–11, 1; penultimate segment of outer branch of uropod with six to eight graded, movable spines, last not extending to midpoint of ultimate segment.

Remarks: This species is closely related to the Atlantic *S. rugosa* Bigelow and to the eastern Pacific *S. hancocki* Schmitt, inasmuch as the dorsal surface of the telson is tuberculated. *S. discors* can be distinguished from *S. rugosa* by the more elongate cornea, the elongate-triangular rostral plate, the anteriorly curved lateral process of the fifth thoracic somite, the lack of accessory spinules on the fifth and sixth abdominal somites, and the smaller number of carinae and tubercles on the dorsal surface of the telson. The shape of the eyes, rostral plate, and lateral processes of the thoracic somites will separate *S. discors* from *S. hancocki*.

The specimen from COMBAT Sta. 334 was reported by Manning (1959) as *S. rugosa pinensis* (Lunz).

The specific name is from the Latin (*discors* = different) and alludes to the distinctness of this species from *S. rugosa*, with which it has been confused for many years.

Holotype: 1 ♂, 63.3 mm; Caribbean Sea (Venezuela); 11°07′N; 62°14′30″W; 73 fms; ALBATROSS Sta. 2120; 30 January 1884; USNM 7832.

Paratypes: 1 ♂, 43.2 mm; 3 ♀ ♀, 24.1–40.3 mm; off North Carolina; 35°08′30″N, 75°10′W; 49 fms; ALBATROSS Sta. 2596; 17 October 1885; USNM 11260.

1 ♀, 57.7 mm; off East Florida; 29°15′N, 80°13′W; 30 fms; COMBAT Sta. 334; 1 June 1957; UMML.

1 ♂, 44.7 mm; Great Bahama Bank; 26°06′N, 79°10′W; 122/125 fms; SILVER BAY Sta. 2480; 9 November 1960; UMML.

2 ♂ ♂, 39.0–43.7 mm; Great Bahama Bank; 23°35′N, 79°34′W; 130/100 fms; SILVER BAY Sta. 2460; 6 November 1960; USNM.

6 ♂ ♂, 29.2–51.0 mm; 10 ♀ ♀, 29.0–53.0 mm; 4 miles off Islamorada, Florida; 40 fms; D. deSylva, M. Manning, W. Starck II; 20 August 1961; UMML.

1 ♀, 41.8 mm; Gulf of Mexico (Florida); 29°50′N, 86°30′W; 50 fms; OREGON Sta. 944; 21 March 1954; USNM.

1 broken ♂; Gulf of Mexico (Florida); 28°30′N, 85°36′W; 120 fms; OREGON Sta. 36; 27 June 1950; USNM 91097.

1 ♀, 52.1 mm; Gulf of Mexico (Florida); 28°09′N, 84°54′W; 80 fms; OREGON Sta. 920; 11 March 1954; USNM 96400.

2 ♂ ♂ (1 broken), 40.2 mm; 3 ♀ ♀, 37.0–56.7 mm; Gulf of Mexico (Florida); 26°36′30″N, 83°15′30″W; 27 fms; ALBATROSS Sta. 2411; 18 March 1885; USNM 9832.

2 ♀ ♀, 28.0–31.6 mm; southern Caribbean Sea; no other data; UMML.

Squilla randalli, new species

Eyes large, triangular, cornea set transversely on stalk; rostral plate cordiform, without carinae; carapace without carinae except for reflected marginals and short laterals on posterior fourth; anterolateral angles of carapace not armed; posterolateral margins not angled; raptorial dactylus armed with four teeth; three epipods present; mandibular palp absent; lateral process of fifth thoracic somite a blunt lobe running obliquely dorso-ventrally; a pair of sharp ventral spines present on this somite; lateral processes of sixth and seventh thoracic somites rounded laterally, spined posteriorly; submedian carinae present on sixth abdominal somite only; abdominal carinae spined as follows: submedian, 6; intermediate, 5–6; lateral, 1–6; marginal, 1–5; telson without prelateral lobes, with six strong marginal spines, submedians with movable tips; submedian carinae short; denticles 4–5, 7, 1; basal prolongation of uropod with six to nine long teeth on inner margin; penultimate segment of uropod with seven graded, movable spines on outer margin, last extending past midpoint of ultimate segment.

Remarks: A small species resembling S. *quadridens* Bigelow in the short submedian carinae on the telson. S. *randalli* differs from S. *quadridens* Bigelow, S. *tricarinata* Holthuis, and S. *schmitti* Lemos de Castro in having but three epipods and in having the lateral processes of the sixth and seventh thoracic somites produced into strong spines directed posteriorly.

The species is named for John E. Randall who collected this and several other species of stomatopods for the author in the U. S. Virgin Islands.

Holotype: 1 ♀, 23.8 mm; off Yawzi Point, Lameshur Bay, St. John, Virgin Islands; depth 30 feet; J. Randall and L. P. Thomas; 21 December 1958; USNM 107873.

Lysiosquilla campechiensis, new species

Eyes large, triangular, corneal axis exceeding peduncular axis; rostral plate cordiform, broader than long, with median carina on anterior third; carapace without carinae; one mesiodorsal and two ventral papillae on antennal protopod; antennal scale elongate, three times as long as broad; raptorial dactylus armed with seven teeth; five epipods present; mandibular palp present; lateral margins of sixth and seventh thoracic somites rounded anteriorly, truncate posteriorly, lateral margins faintly carinate; abdomen depressed, unarmed dorsally; submedian portions of fifth abdominal somite noticeably wrinkled, pleuron smooth; sixth abdominal somite wrinkled either side of smooth midline, with a rounded longitudinal carina parallel to lateral margin; telson half again as wide as long, with three raised, smooth, longitudinal bosses; lateral and posterior surfaces wrinkled and eroded, not spinulose; four marginal teeth on telson either side of midline; prominent longitudinal carina present on lateral tooth parallel to marginal carina; dorsal surface of basal segment of uropod wrinkled and eroded, not spinulose except for terminal dorsal spine; penultimate segment of outer branch of uropod with eight graded, movable spines, last extending about to midpoint of ultimate segment; inner branch of uropod two and one-half times as long as wide; basal prolongation of uropod with inner spine much the longer.

Remarks: This species is closely related to the common species, *L. scabricauda* (Lamarck) and *L. glabriuscula* (Lamarck). From *L. scabricauda* the present species can be distinguished by the smaller number of teeth on the raptorial dactylus (7 instead of 9–13), the absence of spines on the posterior margins of the fifth and sixth abdominal somites, the dorsal surface of the telson and the basal segment of the uropods. *L. campechiensis* agrees with *L. scabricauda* in general body shape and in the elongate shape of the antennal scale and inner branch of the uropod. From *L. glabriuscula* the present species can be distinguished by the wrinkled lateral portions of the fifth and sixth abdominal somites, lateral and posterior portions of the telson, and dorsal surface of the proximal segment of the uropod; also, in the present species, the antennal scale and inner branch of the uropods are more elongate than in *L. glabriuscula.*

The name is derived from the type locality, the Gulf of Campeche.

Holotype: 1 ♂, 100.4 mm; Gulf of Campeche; 21°15′N, 92°16′W; 34–36 fms; OREGON Sta. 411; 17 August 1951; USNM 92651.

Lysiosquilla enodis, new species

Eyes small, cornea bilobed, set obliquely on stalk; rostral plate broader than long, anterolateral margins rounded, apex with a strong spine; carapace without carinae; one mesiolateral and two ventral papillae on antennal protopod; raptorial dactylus armed with nine teeth; no more than four epipods present; mandibular palp absent; lateral margins of sixth and seventh thoracic somites rounded anteriorly, truncate posteriorly; abdomen smooth, depressed, armed only at posterolateral angles of sixth somite; telson broader than long, roughened but not spinulose dorsally; posterior margin of telson with a large, rounded median projection, flanked on either side by two spatulate lobes followed by two sharp spines; telson armed ventrally with a median row of 17 denticles and, laterally on either side, a movable submedian spine followed by a denticle under each of the four marginal spines; inner spine of basal prolongation much the longer; penultimate segment of outer branch of uropod armed with five graded, movable, spatulate spines, last not extending to midpoint of ultimate segment.

Remarks: Although the Massachusetts specimens were originally identified by S. I. Smith as his *L. armata,* these specimens are quite distinct from that species. Bigelow (1894) commented on these materials, and pointed out some differences between them and *L. armata.* The nine projections on the telson separate this species from all others in the western Atlantic.

The name *enodis* is from the Latin (*enodis* = smooth) and refers to the smoothness of the fifth and sixth abdominal somites.

Holotype: 1 ♀, 57.5 mm; off Vineyard Sound, Massachusetts; 17–27 fms; U. S. Fish. Comm. Sta. 1247-1251, from the stomach of a flounder; S. I. Smith; 1887; USNM 12787.

Paratypes: 1 fragmented ♂; data as in holotype; USNM.

1 broken ♀; off North Carolina; 35°35′N, 74°58′W; 27 fms; ALBATROSS Sta. 2296; 20 October 1884; USNM 8816.

Lysiosquilla schmitti, new species

Eyes small, cornea hemispherical, set obliquely on stalk; rostral plate rectangular, half again as long as broad; anterolateral margins angled; anterior margins concave, sloping to obtuse apex; carapace without carinae; antennal protopod without papillae; raptorial dactylus armed with ten to eleven teeth; four epipods present; mandibular palp absent; lateral margins of sixth and seventh thoracic somites concave; abdomen smooth, depressed, posterolateral angles of sixth somite acute; telson much broader than long, with median crest on posterior fourth; false eave of telson with an obtuse lateral prominence, separated from crest by a concavity; ventral armature of telson, on either side, consisting of a row of seven to nine submedian denticles, a movable submedian spine lateral and anterior to the denticles, and four sharp lateral spines with a smaller denticle between each; inner spine of basal prolongation of uropods much the longer; outer margin of penultimate segment of uropods with four to five movable, graded, spatulate spines, last extending about to midpoint of ultimate segment.

Remarks: A small *Lysiosquilla,* closely related to the western Atlantic *L. grayi* Chace, *L. antillensis* Manning, and *L. hancocki* Manning. However, *L. schmitti* can be distinguished from these and all previously described species by the configuration of the telson, which has the false eave divided into a sharp or rounded median crest on its posterior fourth, flanked on either side by an obtuse or rounded lobe.

The species is named for Dr. Waldo L. Schmitt, who collected the specimens and who laid the foundation for the systematic studies of American stomatopods.

Holotype: 1 ♂, 20.2 mm; seining beach, Long Key, Tortugas, Florida; dug from sand; W. L. Schmitt; 7 August 1930; USNM 107874.

Paratypes: 1 ♀, 27.4 mm; Tortugas, Florida; W. L. Schmitt; 5 August 1930; USNM.

2 ♂ ♂, 21.7–24.7 mm; 5 ♀ ♀, 18.5–24.9 mm; Long Key, Tortugas, Florida; dynamite in flat of seining beach; W. L. Schmitt; 16 August 1930; USNM.

Lysiosquilla floridensis, new species

Eyes small, cornea subglobular, set transversely on stalk and overhanging stalk laterally; rostral plate with anterolateral angles spiniform, extending beyond median spine; carapace without carinae; antennal protopod with one large ventral and one small mesial papilla; raptorial dactylus armed with nine to eleven teeth; five epipods present; mandibular palp absent; abdomen smooth, depressed, posterolateral angles of sixth somite acute; telson with a dorsal transverse row of five spines; posterior armature, on either side of the midline, consisting of three submedian denticles, outer by far the largest, and a large, movable, submedian spine flanked laterally by four large fixed teeth; a minute denticle present between each of the four fixed posterior teeth; inner spine of basal prolongation of uropod much the longer; outer margin of penultimate segment of uropod with six graded, movable spines, last extending past the midpoint of the ultimate segment.

Remarks: This small *Lysiosquilla* closely resembles *L. digueti* Coutiere from the eastern Pacific. *L. floridensis* differs from *L. digueti* in lacking the mandibular palp and in having more teeth on the raptorial dactylus (9–11 instead of 6–8). There is also one major color difference, in that the Atlantic species lacks the prominent black spot on the posterolateral angles of the carapace.

The name is derived from the type locality.

Holotype: 1 ♂, 48.0 mm; shoreline along Cape Florida, Key Biscayne, Miami, Florida; C. R. Robins and class; 15 May 1961; USNM 107875.

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PROCEEDINGS

OF THE

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NEW SPECIES OF *KEWOCHTHONIUS* CHAMBERLIN FROM CALIFORNIA (ARACHNIDA: CHELONETHIDA)

BY ROBERT O. SCHUSTER
University of California, Davis

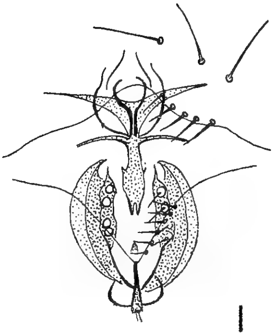
The only previously reported species of California *Kewochthonius* is *stanfordianus,* described by Chamberlin in 1929. Numerous collections from San Mateo County, near the type locality, have been of one species and it is assumed to be that described by Chamberlin. A similar but much larger species also occurs in California.

Another new species proposed here resembles *paludis* (Chamberlin) but, on the basis of descriptive information, differs in certain structural features. *K. paludis* is reported only from the eastern United States.

Kewochthonius spingolus, new species

This interesting species shares a number of characters with *Chthonius californicus* Chamberlin. The seven spines of the second coxa and the space between the anterior and posterior pairs of internal genital setae resemble the condition encountered in *C. californicus.* These characters separate *spingolus* from other California species of *Kewochthonius,* and ally it with *K. paludis.* It differs from *paludis* by having 18 instead of 20 setae on the carapace. The length of the palpal femur is 350 μ for *paludis* and 450 μ for *spingolus.*

Male: Total length 1.25 mm. Carapace 385 μ long, faintly reticulate. Epistomal process of 12–14 teeth. Chaetotaxy of carapace: 4 in anterior row; 2 in posterior row: 18 total. Anterior eyes conspicuous, posterior eye spots large. Tergite border setae number 4:4:4:4:6:6:6:6:6:4:6:0. Palps with trochanter 150 μ long $\times$ 105 μ wide. Femur 455 μ long $\times$ 95 μ wide, widest distally. Tibia 180 μ long $\times$ 105 μ wide. Chela 660 μ long, the movable finger 440 μ. Fixed finger with 52 teeth, the teeth largest at distal third (at level of setae *it* and *est*). Movable finger with about 30 poorly defined teeth. Coxa II with seven spines, four in an anterior row and three in a posterior row. Coxa III with three spines. Spines long and thin, their pinnulae short (Fig. 2). Male genital structure with anterior and posterior pairs of internal setae spaced, general facies as in Fig. 1. Chaetotaxy of sternites IV through XII approximately 11:8:6:6:6:6:7:6:2.



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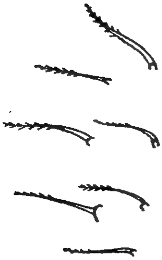

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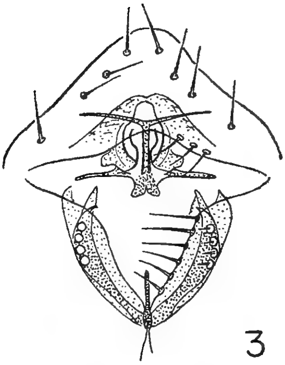

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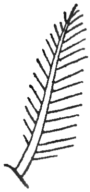

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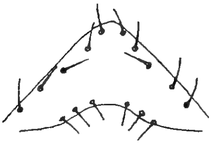

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Figs. 1, 2, *Kewochthonius spingolus* Schuster. 1, Male genital area, setae omitted from left side; 2, spines of coxa II. Figs. 3, 4, *K. amplus* Schuster. 3, Male genital area, setae omitted from left side; 4, one spine of coxa II. Fig. 5, *K. stanfordianus* Chamberlin. Male anterior genital operculum.

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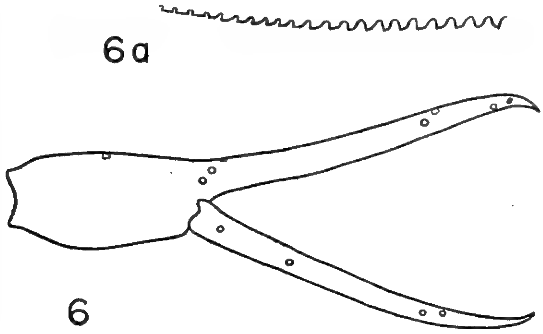

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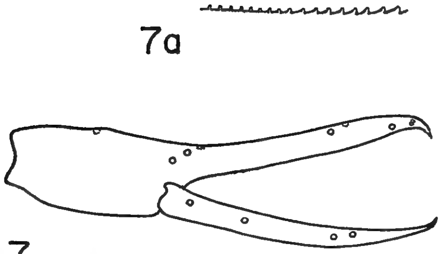

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FIGS. 6, 6*a*, *K. amplus* Schuster. 6, Male chela, setae and teeth omitted; 6*a*, marginal teeth of fixed finger. Figs. 7, 7*a*, *K. spingolus* Schuster. 7, Male chela, setae and teeth omitted; 7*a*, marginal teeth of fixed finger.

Female similar except larger. Carapace 430 μ long, the palpal femur 520 $\mu \times$ 113 μ, chela 770 μ long. Anterior genital operculum with one median seta, four or five anterolateral setae on each side. Sternite III with 14–15 setae, IV with ten setae, remaining sternites as for the male.

This species is known from five males and eight females collected along State Highway 78 between Ramona and Julian, 26 December 1958, by L. M. Smith. They were in litter beneath deciduous trees. The male holotype is deposited in the California Academy of Sciences.

Kewochthonius amplus, new species

The length of the palpal femur on male specimens assigned to *stanfordianus* Chamberlin varies from 335 μ to 390 μ; for this species from 440 μ to 495 μ. The five pairs of anterolateral setae on the anterior genital operculum of *stanfordianus* (Fig. 5) seem to be constant as does the occurrence of only four pairs for this species. North of San Francisco, *stanfordianus* appears to be most prevalent along the coast while *amplus* is found in mountain areas in Napa and Yolo Counties and in the Sacramento Valley along the eastern border of the Coast Range.

Male: Total length 1.40 mm. Carapace 430 μ long, faintly reticulate. Epistomal process of about 15 teeth. Chaetotaxy of carapace: 4 in anterior row: 2 in posterior row: 18 total. Anterior eyes inconspicuous, posterior eye spots obsolete. Tergal border setae number 4:4:4:4:6:6:6:6:6:4:6:0. Palps with trochanter 182 μ long × 123 μ wide. Femur 558 μ long × 120 μ wide, widest proximally. Tibia 210 μ long × 110 μ wide. Chela 770 μ long, the movable finger 540 μ. Fixed finger with about 45 teeth, the teeth largest opposite seta *it*. Movable finger with about 33 weak teeth. Coxa II with four spines in a single row. Coxa III with three spines. Spines with long pinnulae (Fig. 4). Male genital structure with internal setae equally spaced, general facies as in Fig 3. Anterior genital operculum with four setae along each anterolateral margin. Chaetotaxy of sternites IV through XII 11:8:7:6:6:6:7:6:2.

Female essentially as the male but usually larger. Carapace length 410 μ to 450 μ, the palpal femur 590 μ × 127 μ. Anterior genital operculum normally with five anterolateral setae on each side.

This species is described from eight males and ten females taken near Winters, Yolo County, California, on 23 April and 25 December 1959, by F. C. Raney. The April collection was made at the Putah Creek Ranchette, from the top 4 inches of litter beneath *Sambucus*, in complete shade. The December collection, near Winters, was from the top 3 inches of litter at the base of a *Quercus lobata*. The male holotype is deposited in the California Academy of Sciences.

KEY TO CALIFORNIA *Kewochthonius*

1. —Coxa II with seven spines staggered to form two rows .... *spingolus* n. sp.
   Coxa II with four spines in a single row 2

2(1).—Small species, palpal femur of male less than 400 μ long; anterior genital operculum of male with five pairs of anterolateral setae (Fig. 5) .... *stanfordianus* Chamberlin
   Large species, palpal femur of male 430 μ or longer, usually over 450 μ; anterior operculum of male with four pairs of anterolateral setae (Fig. 4) .... *amplus* n. sp.

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PROCEEDINGS

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NATURAL HISTORY OF PLUMMERS ISLAND, MARYLAND[1]

XV. Descriptions of the Stages of *Chaetodactylus krombeini*, New Species, a Mite Associated with the Bee, *Osmia lignaria* Say (Acarina: Chaetodactylidae)

By Edward W. Baker

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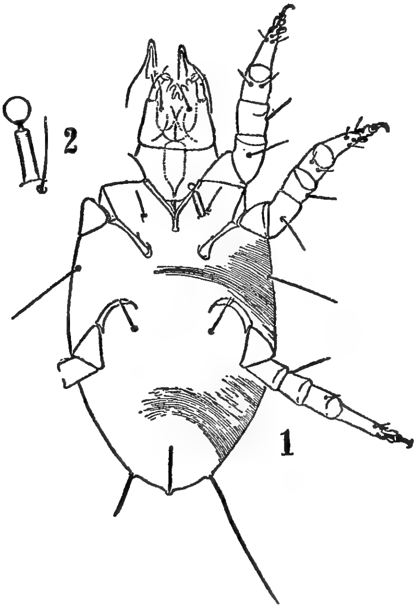
Although the mites belonging to the family Chaetodactylidae are commonly found on bees of the genus *Osmia*, and related genera, little is known about them. Trouessart (1904), working with *Chaetodactylus ludwigi* (Trouessart), and Popovici-Baznosanu (1913), working with *C. osmiae* (Dufour), discovered the encysted hypopial stage. They believed that this was an overwintering form that transformed into an adult in the spring. Michael (1903) reared *C. osmiae* from the migratory hypopus through the third nymph into the adult. However, he did not find the encysted hypopial stage. Zakhvatkin (1941) has presented the most complete bibliography of the family Chaetodactylidae.

The rearing of a new species of *Chaetodactylus* in association with the bee *Osmia lignaria* Say, from Plummers Island, Maryland, by K. V. Krombein, has presented us with the opportunity to give more details on the morphology and biology of this genus and its relationship to the host bee. The biology will be discussed in the article immediately following by K. V. Krombein.

Banks (1902) records, with doubt, the presence of *Chaetodactylus osmiae* (Duf.) from *Osmia* sp., Sea Cliff, New York. This may be the species we are dealing with in this paper.

[1]The preceding number in this series was published in Proc. Biol. Soc. Wash., 75: 19–24, 1962. Publication costs of the present number have been defrayed by the Washington Biologists' Field Club to promote its primary objective of research on the fauna and flora of Plummers Island and adjacent areas.



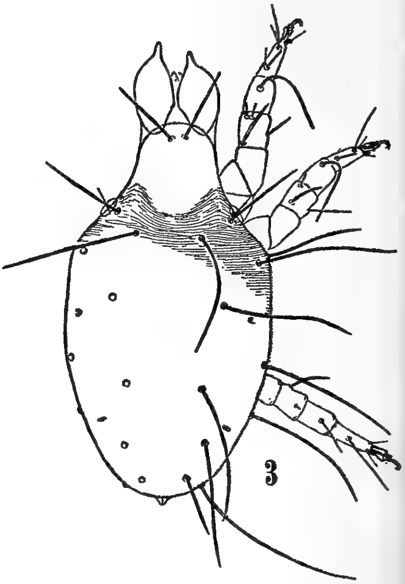
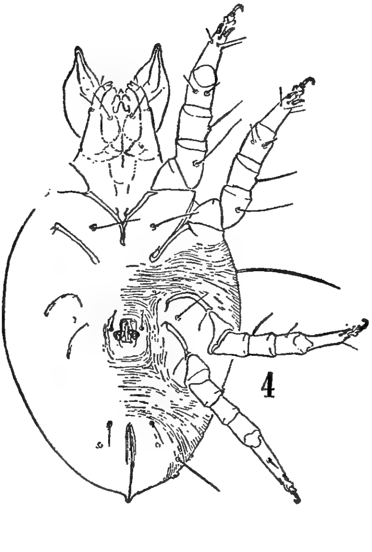


Fig. 1. Venter of larva. Fig. 2. Coxal rod of larva. Fig. 3. Dorsum of larva.



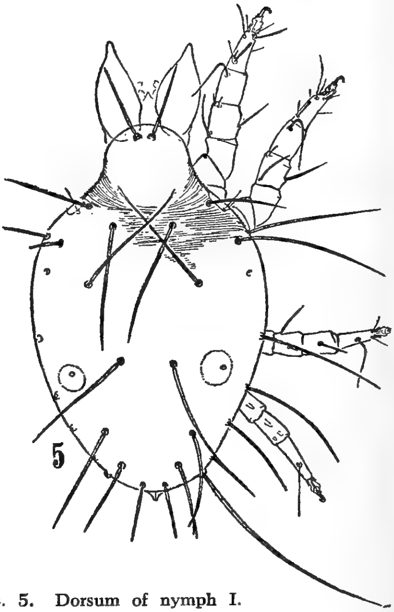


Fig. 4. Venter of nymph I. Fig. 5. Dorsum of nymph I.

As considered here, the family Chaetodactylidae consists of only four genera, *Chaetodactylus, Sennertia, Sennertionyx,* and *Cerophagopsis.* Baker (1962) placed *Tortonia* and *Horstia* in the Acaridae, and it is possible that *Neohorstia* and *Cerophagus* also belong there.

Chaetodactylus krombeini, new species

(Figs. 1–24)

This species is separated from the others in the genus in having the distinctive, swollen ventral setae in the migratory hypopial stage. The adults of *Chaetodactylus osmiae* (Duf.) and *C. ludwigi* (Trt.) are inadequately described and figured, and comparisons with these cannot be made.

Egg: Smooth, oval, measuring 170–185 μ long by 110–120 μ wide. Only one mounted female was gravid, and only a single egg was present. (Fig. 14.)

Larva: Small, six-legged, with transverse striae dorsally and ventrally as figured. Chelicerae relatively large in proportion to body, chelate, dentate. Venter of rostrum with a single pair of simple setae. Dorsum of body transversely striate except for propodosomal shield; with 12 pairs of long, whip-like setae; vertical external setae missing; supracoxal setae small, hair-like. Humeral and hysterosomal gland pores present. Venter of larva without external genitalic development; with posterior anal opening, but without anal setae. Apodemes of leg I forming a Y; those of legs II and III free, widely separated. Apodemes of leg I each contain a hair-like seta, and none, one, or both sides may possess the coxal rod which is of medium length, tube-like, supporting distally a balloon-like process. A pair of short ventral humeral setae present. Apodemes of coxae III each contain a simple, hair-like seta; rest of venter of body bare. All legs short, stout, but leg III more slender than I and II; setal pattern as figured; empodial claws borne on prominent caruncles, with a pair of rods connecting claw to tarsus; all tarsi with a pair of distal-ventral claw-like setae; tarsus I with solenidion, without famulus, and with whip-like seta adjacent to solenidion; tarsus II with solenidion only. Length of body 223–236 μ. (Figs. 1–3.)

Nymph I: With four pairs of legs; body striate transversely dorsally and ventrally, except for genital area where striae are circular. Chelicerae large, stout, chelate; venter of rostrum similar to that of larva. Dorsum of body with propodosomal shield; with 15 pairs of strong, whip-like setae; vertical external setae missing; supracoxal setae small, hair-like. Dorsum with two pairs of pores, one humeral and the other opening into hysterosomal glands. Coxal I apodemes forming Y, enclosing a pair of whip-like setae; apodemes of coxae II, III, and IV free, and those of coxae III enclosing a pair of whip-like setae. With a single pair of genital setae, and a single pair of genital discs. Anal area not striate, with a single pair of anterior setae, a single pair of pores posterior to

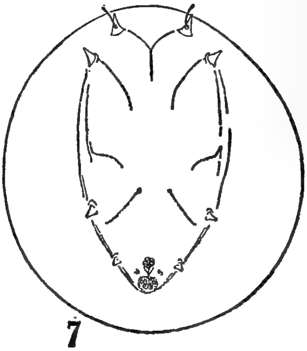
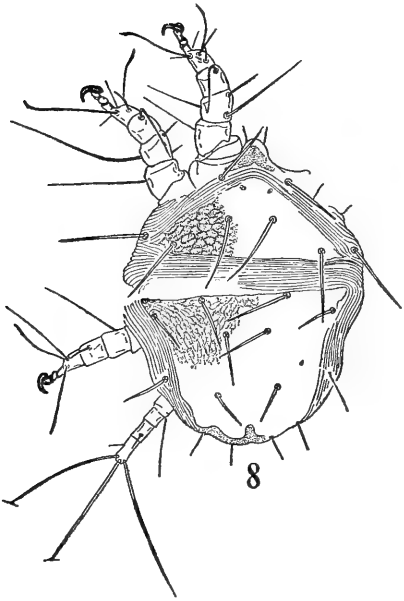


FIG. 6. Section of nymph I skin which contains encysted hypopus.
FIG. 7. Venter of encysted hypopus.



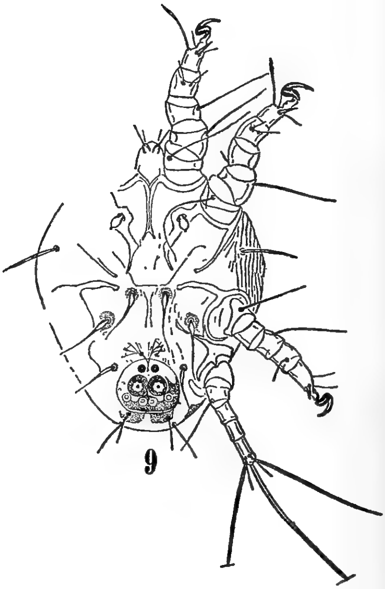


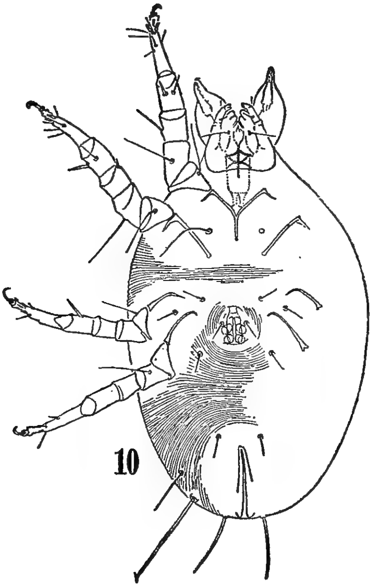
FIG. 8. Dorsum of hypopus. FIG. 9. Venter of hypopus.

these, and a pair of setae posterior to and laterad of anal pores. Legs I and II stout, legs III and IV more slender; tarsus I with solenidion, famulus, and hair-like seta arising from same base; tarsus II with solenidion and hair-like seta; all tarsi distal-ventrally with a pair of claw-like setae, those on tarsi III and IV weak; empodial claws as in larva. Length of body 319–414 μ. (Figs. 4, 5.)

Encysted nymph: Skin of nymph I wrinkled internally, forming protective case for encysted nymph. Encysted nymph round, smooth, with four pairs of conical projections which represent legs; anterior pair of projections each with sensory rod indicating these represent tarsi only. Coxal apodemes rudimentary, visible; suctorial plate rudimentary, visible. Length of body 306–325 μ; width of body 287–300 μ. (Figs. 6, 7.)

Hypopus (*Nymph II*): Dorsal body setae long, saber-like; body with propodosomal and hysterosomal shields; reticulate pattern of propodosomal shield somewhat transverse, that of hysterosomal shield longitudinal, gnathosoma represented by two strong tubercles supporting a pair of setae of medium length. Apodemes of legs I coalesced anteriorly; apodemes of legs II and III free; apodeme of coxa II broadened and supporting a short, broad seta; between apodemes of coxae III a pair of long setae strongly widened at base; apodemes III each enclosing a similar seta; apodemes IV each containing a similar but not as strong seta. A saber-like humeral seta present ventrally. Suctorial plate as figured. Legs I–III stout, each with strongly recurved empodial claw; leg IV slender, tarsus without claw, ending bluntly, with three, long, whip-like setae and two short simple setae; setal patterns of legs as figured, tarsi I–III each with a pair of long setae spatulate distally; tarsus I with solenidion and famulus; tarsus II with solenidion only. Length of body 306–331 μ. (Figs. 8, 9.)

Nymph III: With four pairs of legs, I and II stronger than others. Dorsum of body striate except for propodosomal shield; venter transversely striate except for anal region which is bare and for circular striae in genital region. Chelicerae large, stout, chelate. Venter of rostrum with a single pair of setae. Dorsum of body with 15 pairs of strong, whip-like setae, and a marginal pair of humeral setae; vertical external setae missing; supracoxal setae small, hair-like. Humeral and hysterosomal gland pores present. Coxal I apodemes forming a Y, enclosing a single pair of whip-like setae; coxal II apodemes straight, free; coxal III apodemes short, enclosing a single pair of short, hair-like setae; coxal IV apodemes longer. A pair of short setae anterior and laterad of genital area, and a similar pair posterior and laterad of genital area; a single pair of genital setae; two pairs of genital discs; striae circle genital area. Anal opening longitudinal, posterior, surrounded by non-striated area, with a pair of setae anterior to anal opening; a pair of short setae lie in striated area laterad of anal opening. Legs I and II stronger than III and IV; tarsi I and II each with distal pair of strong ventral claw-like setae; tarsi III and IV with similar but weak setae; tarsus I with solenidion, famulus, and hair-like seta on same base; tarsus II with solenidion



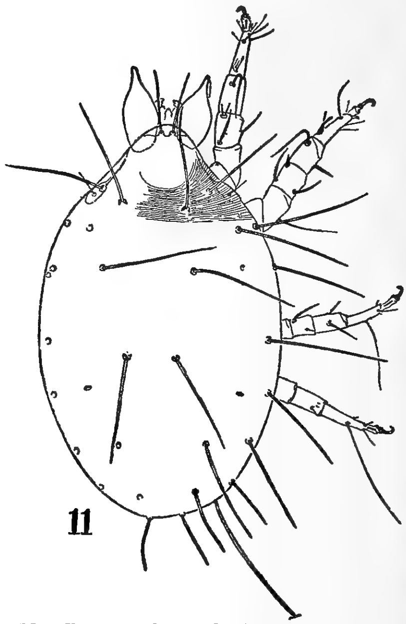
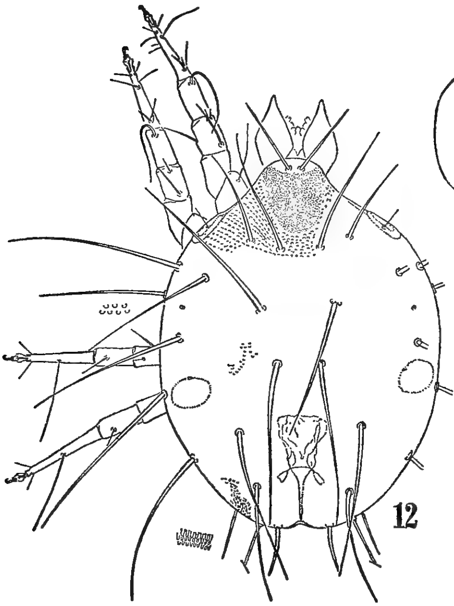
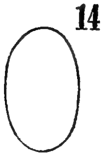


Fig. 10. Venter of nymph III. Fig. 11. Dorsum of nymph III.





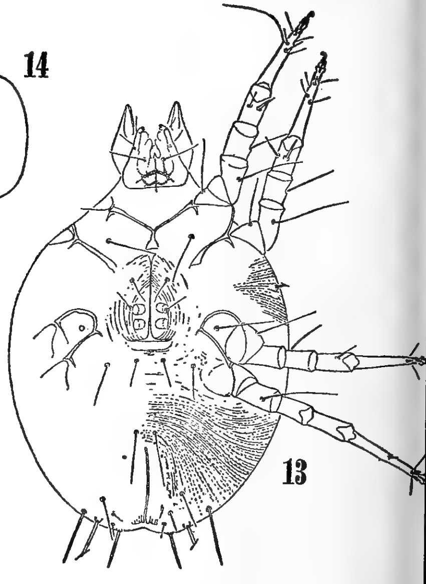


Fig. 12. Dorsum of female. Fig. 13. Venter of female. Fig. 14. Egg.

and hair-like seta, other setae as figured. Length of body 408–427 μ. (Figs. 10, 11.)

Female: Chelicerae large, chelate. Dorsum of body with 15 pairs of setae, those on dorsum long, whip-like, those on posterior margin short; external vertical setae absent; supracoxal seta short, hair-like. Propodosomal shield small, punctate; rest of dorsum tuberculate, the tubercles following a more or less transverse pattern, dorsal anterior tubercles rounded, posterior tubercles elongate, finger-like. Humeral and hysterosomal gland pores present. Bursa copulatrix posterior, spermatheca as figured. Venter of rostrum with single pair of setae. Apodemes I forming a Y, stem end short, the apodemes enclosing a pair of hair-like setae; apodemes II short, free; apodemes III and IV enclosed, surrounding a pair of hair-like setae. Genital opening longitudinal, reaching nearly to sternum (fused apodemes I), with transverse opening posteriorly; with two pairs of genital discs, with two pairs of genital setae, and with two pairs of setae posterior to opening; genital area surrounded by smooth striae. Anal opening not quite reaching posterior margin of body, with a pair of long anterior anal setae, a pair of pores located behind these setae, and with three pairs of posterior anal setae, decreasing in length from anterior to posterior, laterad of posterior half of anus; other setae assumed to be dorsal setae. Smooth circular striae surround genitalia; transverse tuberculate striations between coxae II and III, not meeting medially; tuberculate striations surrounding anal area and meeting medially anterior to anal opening. Legs slender in relation to body, legs I and II stronger than III and IV; setation as figured; tarsus I with solenidion, famulus, and hair-like seta; all tarsi with distal ventral claw-like setae, those on tarsi I and II only slightly stronger than those on III and IV. Length of body 542–669 μ. (Figs. 12, 13.)

Male: Chelicerae chelate, small in relation to body. Dorsum of body with 15 pairs of setae, of varying lengths and sizes, all whip-like except for two pairs on posterior margin of body; humeral seta long, slender. Propodosomal shield small, punctate; rest of dorsum covered with sharp conical tubercles. Humeral and hysterosomal gland pores present. Venter of rostrum with single pair of setae. Coxae I apodemes forming a Y, enclosing a pair of hair-like setae; apodemes of coxae II free, nearly straight; apodemes III enclosed with apodemes IV, surrounding a pair of hair-like setae. Genitalia located posterior of coxae IV; an anterior pair of setae between coxae III, another pair anterior and laterad of genitalia. Anal opening posterior, with anterior lateral pair of pores, and a pair of short, posterior anal setae; a pair of longer setae laterad of anal opening in tuberculate area. Legs relatively slender, as figured. In all other stages empodial claw connected with tarsus by two rods, but in male only one rod present. Tarsus I with solenidion, famulus, and hair-like seta; tarsus II with solenidion and hair-like seta only. Length of body 453–478 μ. (Figs. 15, 16.)

Legs: The legs of both sexes, as well as those of all stages, have a relatively simple setal pattern. The legs of the male and female are

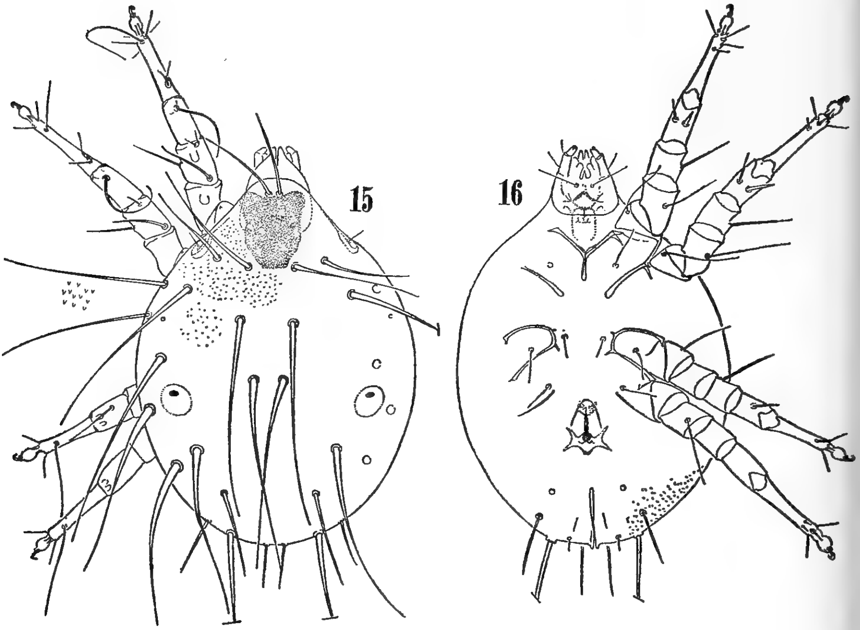


FIG. 15. Dorsum of male. FIG. 16. Venter of male.

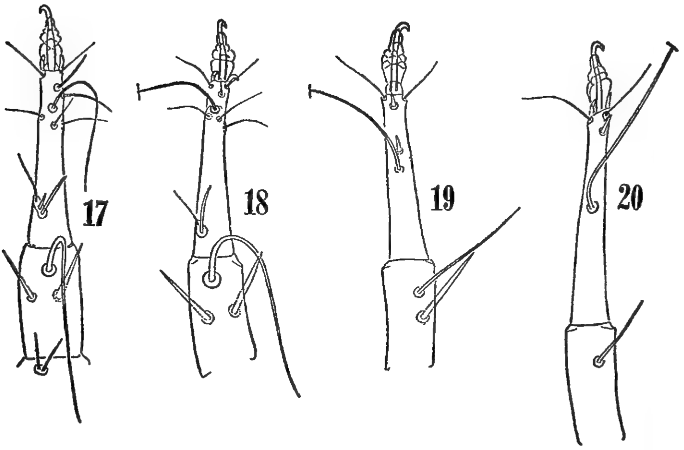


FIG. 17. Tibia and tarsus I ♀. FIG. 18. Tibia and tarsus II ♀.
FIG. 19. Tibia and tarsus III ♀. FIG. 20. Tibia and tarsus IV ♀.

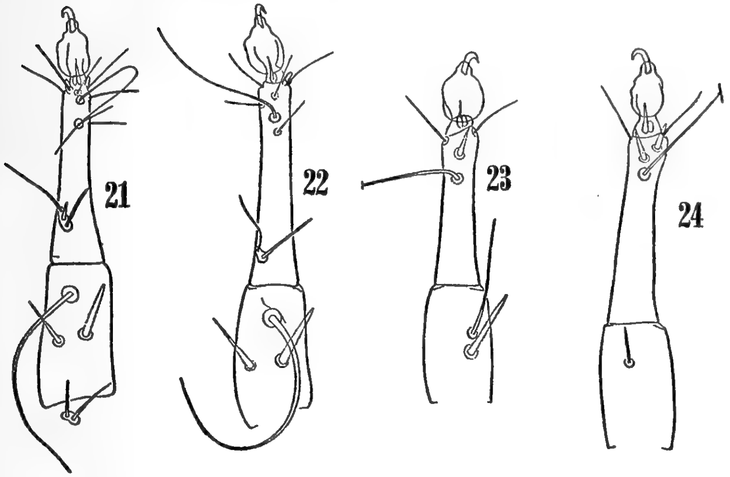


Fig. 21. Tibia and tarsus I ♂. Fig. 22. Tibia and tarsus II ♂. Fig. 23. Tibia and tarsus III ♂. Fig. 24. Tibia and tarsus IV ♂.

figured. Of interest is the presence of the two rods connecting the empodial claw to the tarsus in the female, but in the male one rod has dropped out, although the base is present, and the remaining rod reaches only about halfway to the claw. The membrane containing the empodial claw of the female is very ornate, while that of the male is simple. On tarsus I the solenidion is accompanied by the famulus and a hair-like seta. (Figs. 17–24.)

Holotype: Migratory hypopial nymph, U. S. National Museum No. 2815, ex *Osmia lignaria* Say, Plummers Island, Maryland, 17 October 1961, by K. V. Krombein.

Paratypes: Ten migratory hypopial nymphs with the above data. Three larvae from nest K 41 of *Osmia lignaria*, 10 August 1961. Forty-five nymph I's from nest, 3 October 1961. Thirteen encysted hypopi from nest, 10 August 1961, and 20 encysted hypopi from nest, 3 October 1961. Two nymph III's from nest, 10 August 1961. Four males from nest, 3 October 1961, and one male from nest, 9 May 1958. Six females from nest, 13 October 1961. All collections were made by K. V. Krombein at Plummers Island, Maryland.

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PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

NATURAL HISTORY OF PLUMMERS ISLAND, MARYLAND[1]

XVI. Biological Notes on *Chaetodactylus krombeini* Baker, a Parasitic Mite of the Megachilid Bee, *Osmia* (*Osmia*) *lignaria* Say (Acarina: Chaetodactylidae)

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During my field studies of solitary wasps and bees that nest in borings in wood, I found nests infested with mites belonging to several different families. I recently published biological notes on some mites of the families Saproglyphidae and Acaridae associated with these wasps and bees (Krombein 1961, 1962). The present contribution contains notes on a newly described mite, *Chaetodactylus krombeini* Baker of the family Chaetodactylidae, which I found in nests of the megachilid bee *Osmia* (*Osmia*) *lignaria* Say at Plummers Island, Maryland. I am very much indebted to my colleague, E. W. Baker, for describing (1962) this mite and other new ones discovered during the course of my field studies.

For more than a century hymenopterists and acarologists have noted and published on the presence of mite hypopi on adult megachilid bees. In 1839 the French worker Dufour described the hypopial stage of *Trichodactylus osmiae* which he found on adults of *Osmia* (*Osmia*) *rufa* L. Some years later Rondani made *osmiae* the genotype of his *Chaetodactylus.* Still later Canestrini proposed *Trichotarsus,* for *Trichodactylus* Dufour, *nec* Latreille. However, no details of the biology of this species or others were discovered until the present century.

Michael (1903: 17–28, pls. 22, 39, figs. 13–15) obtained

[1]The preceding number in this series was published in Proc. Biol. Soc. Wash., 75: 227–236, 1962. Publication costs of the present number have been defrayed by the Washington Biologists' Field Club to promote its primary objective of research on the fauna and flora of Plummers Island and adjacent areas.

migrating hypopi of *osmiae* from *Osmia rufa* bees. He reared them in small glass cages, and found that the hypopus transformed into what he called an ordinary nymph [= tritonymph]. After some difficulty he succeeded in rearing adults from tritonymphs on a beeswax substratum. He illustrated the migrating form of the hypopus, tritonymph, and adult male and female.

Trouessart (1904*a*) described *Chaetodactylus ludwigi* from nests of *Lithurgus* (*Lithurgus*) *scabrosus* (Smith) [recorded as *Megachile lonalap* Ludwig] from Ponape, one of the Micronesian islands. The mite was supposedly living as a commensal in nests of the bee in *Hibiscus*. He also found *C. osmiae* mites in nests of *Osmia cornuta* (Latr.) in France. He stated that there were two kinds of hypopi in the nests during the winter, an encysted hypopus [Hypope enkyste] and a migrating hypopus [Hypope migratile]. The encysted hypopi were found in greater abundance. He also stated that both kinds of hypopi were induced by lack of food. Later (1904*b*) Trouessart stated that the encysted hypopus was a second nymph, and that all of these hypopi were nubile females. From the absence of males he wrongly postulated that the mites must have been fertilized before their encystment.

Popovici-Baznosanu (1913) seems to have been the first to observe the activities of *C. osmiae* mites shortly after construction of the bee nest. In Roumania he found nests of *Osmia bicornis* [= *rufa*] and *O. cornuta* in rose canes. In the early spring some cells contained adult mites of both sexes, as well as eggs, larvae, and nymphs [= protonymphs]. Later in the season he found migrating hypopi and encysted nymphs. He also said that the encysted nymph was capable of withstanding years of dryness, apparently inferring that the encysted forms developed as a result of lowered humidity. He said that *T. osmiae* sometimes acted as a commensal, developing simultaneously with the bee, and that at other times it acted as a parasite and prevented development of the bee.

No additional biological observations were published until van Lith (1957) presented a few notes on *Chaetodactylus osmiae* in nests of *Osmia rufa* in the Netherlands, and on an undescribed species of *Chaetodactylus* in nests of another megachilid bee, *Chelostoma florisomne* (L.). He found that the mites killed the young bee larvae, and then multiplied on the pollen-nectar mass stored as food for the bee larva. Apparently he did not observe the formation of encysted hypopi, because no mention is made of this peculiar overwintering form.

In the same year Hirashima (1957) made brief mention of the occurrence of a mite in nests of *Osmia excavata* Alfken in bamboo or reed stems in Japan. In his brief English summary, he noted only that this mite destroyed all stages of the bee except adults. He included a photograph (Fig. 3) of a male bee with hundreds of mite hypopi clinging to the body hairs. E. W. Baker examined some of Hirashima's mite material, and found that it represents another undescribed species of *Chaetodactylus*, not a species of *Saproglyphus* as Hirashima stated.

My own observations on Krombein's hairy-fingered mite were made at Plummers Island, Md., from 1958 to 1961. Inasmuch as the life cycle of the mite is intricately adjusted to that of the host bee, it seems desirable to present first a brief summary of the life history of the bee.

Life History of *Osmia lignaria* Say

Osmia lignaria is a univoltine vernal bee which is on the wing in the Washington, D. C., area for about 2 months beginning in late March or early April. It nests in a variety of sheltered situations such as abandoned borings of other insects in dead trees or in structural timber, in old mud dauber nests, or in crevices behind shingles. It can very easily be induced to nest in artificial nesting sites made in sticks of straight-grained pine $\frac{3}{4} \times \frac{3}{4} \times 6\frac{1}{2}$ inches. A boring 6 inches long having a diameter of $\frac{3}{16}$, $\frac{1}{4}$, or $\frac{1}{2}$ inch is drilled in each stick. At Plummers Island, I set these out in situations where there are abandoned insect borings in the substrate, such as on rafters of the cabin porch, or in bundles of assorted sizes attached to dead limbs or tree trunks. The traps are split open after the nests are constructed, so that the developmental cycle of the occupants can be studied.

Osmia lignaria will nest in any of the three sizes of borings

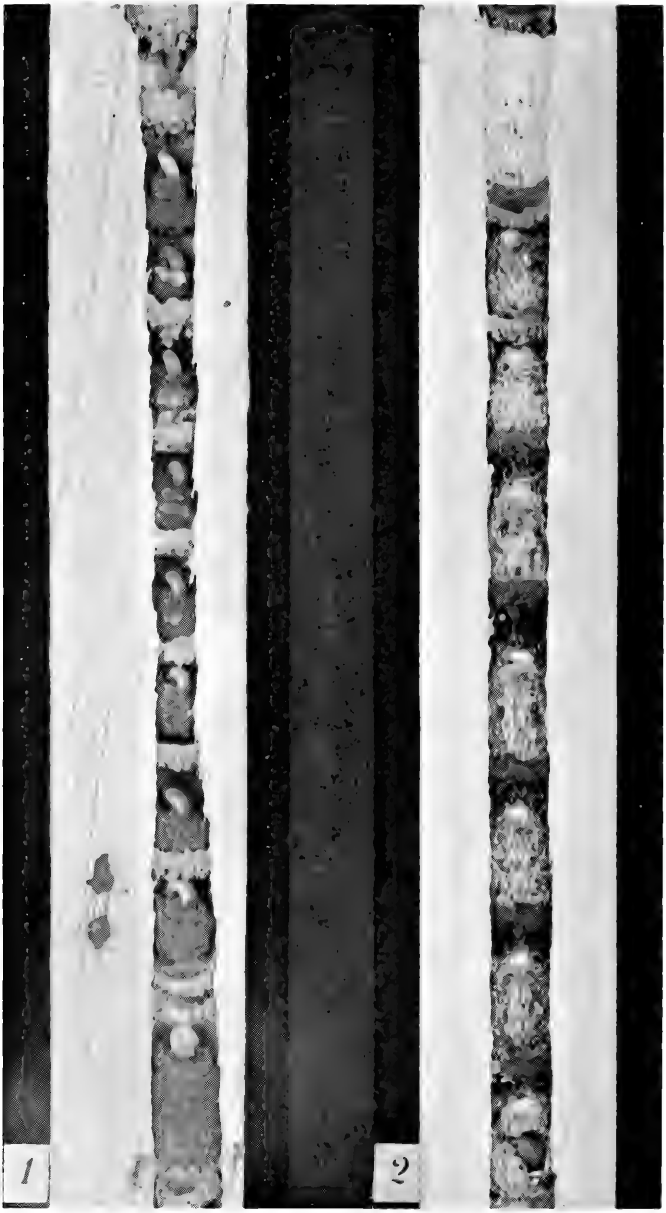

Plate I. Nests of *Osmia* (*Osmia*) *lignaria* Say in ¼-inch borings from Plummers Island, Md.; entrance to nest at upper end. (Two innermost cells in each nest missing in these photographs.) Fig. 1, Nest Y 85, listed above, but shows a decided preference for those having a diameter of ¼ inch, and apparently uses the ½-inch size only when borings of the smaller diameters are unavailable. The bee usually begins her nest at the inner end of the boring by storing a moist, sticky mass of pollen and nectar. The volume of this mass is dependent upon the sex of the bee to be reared upon it. In ¼-inch nests the mass stored for a female averages 7.9 mm in length, and for a male 5.2 mm. The bee lays the egg on the oblique outer surface of the mass, thrusting the posterior fourth of the egg into the moist pollen-nectar mass, so that it sticks out at an oblique angle, as shown in the outermost cell of Fig. 1.

The bee walls off the cell about 4 mm from the end of the stored food by constructing a tight partition from pellets of moist mud. These partitions vary somewhat in thickness, but the average is about 2 mm in the ¼-inch nests. Then the bee constructs and provisions additional cells with pollen and nectar in the same manner until there is a linear series of usually 9 to 12 cells. The bee builds an empty vestibular cell at the outer end of the boring, as shown in Figs. 1 and 2. The length of this cell is quite variable, but averages 29 mm, including the terminal plug in ¼-inch nests. The terminal plug is almost always at the outer end of the boring, is made of the same material as the cell partitions, and has an average thickness of 4.4 mm. Data from 14 nests indicate that a female bee will provision an average of 2.4 cells per day.

The bee egg is slightly curved, sausage-shaped, and approximately 3 mm long and 1 mm wide when first laid. The larva hatches in 5 to 7 days depending upon the prevailing temperatures during the incubation period. The larva feeds slowly, begins to void small meconial pellets about 6 days after hatching, and requires 17 to 21 days to consume the pollen-nectar mass provided for it. The larva then spins a tough silken cocoon (Fig. 2), the inner walls of which are varnished with a

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19 May 1959: Egg almost ready to hatch in outermost cell, feeding larvae in older cells; innermost cell is a female, the rest are male cells. Fig. 2, Nest Y 44, 2 June 1959: Cocoons, that in innermost cell partially opened to show full-grown, resting larva. (× 1.4; photographs by U. S. Department of Agriculture.)

secretion from the gut. Male cocoons average 8.6 mm in length, those of females 10.6 mm.

Pupation occurs about 10 to 11 weeks after hatching of the egg. The adult bees eclose about mid-August, but they remain inside the cocoons over the winter without breaching the walls. They emerge from the cocoons and the nests in late March and early April.

Life History of *Chaetodactylus krombeini* Baker

Relatively few nests of *Osmia lignaria* were infested with this mite at Plummers Island. Three (S 17, S 18, S 29) of 20 nests were so infested in 1958, 3 (Y 44, Y 65, Y 66) of 62 nests in 1959, none of 7 nests in 1960, and 3 (K 37, K 40, K 41) of 32 nests in 1961. Likewise, the number of infested cells per nest was quite low. Only 14 of the 95 cells in these 9 infested nests harbored the mites. This low rate of parasitism has been confirmed by examination of specimens of *lignaria* in the National Museum collection obtained in earlier years at Plummers Island. Very few of the females bear mite hypopi and, furthermore, there are very few hypopi per female bee. Male bees are more commonly infested with hypopi, and also have more hypopi per bee. Undoubtedly this phenomenon is a consequence of the skewed sex ratio and of the prior emergence of males in the spring.[2] Therefore, we can hypothesize that no venereal transmission (Cooper, 1955) of hypopi occurs during mating or, at least, that such transmission is negligible.

The migrating hypopus or deutonymph [= Hypope migratile of Trouessart] is the only form of the mite found on adult bees and, consequently, it is the form which normally initiates the infestation in the nest. The hypopi cling tightly to the adult bee with their hooked tarsal claws and ventral suctorial plate. They are disposed in random fashion over the bee's body, although the majority attach to hair on the hind part of the thorax or fore part of the abdomen. One or more of these hypopi crawl off the body of the female bee while she is provisioning the cell with pollen and nectar. Presumably they then transform into tritonymphs, as is normal for the hypopi

[2]The sex ratio was 1 ♀ : 2 ♂♂ in the 565 bees that I reared from a total of 754 provisioned cells. In the 1959 nests over 60% of the males emerged in the initial emergence period of 4 days during which time less than 15% of the females emerged.

that occur in other families. I have never observed any nests soon enough after infestation to detect this stage early in the spring.

Adult mites of both sexes are present in an infested cell 3 to 4 days after the cell is provisioned. Trouessart (1904*b*) was certainly incorrect in thinking that the encysted hypopi are fertilized before encystment, or else the mites he observed are quite different in this respect from *C. krombeini.* What possibly happens is that the hypopi transform into females, each of which lays a single egg that develops very rapidly into an adult male. This male mates with its mother, or with another female that may be in the same cell, and the female then proceeds to lay fertilized eggs. This aspect of the life history requires further investigation. This phenomenon possibly occurs in the anoetid mite, *Histiostoma julorum* (Koch), and most other species of that genus. Hughes and Jackson (1958: 36, 186) found that virgin females of many of the anoetid mites will lay eggs that hatch into males only. They did not carry their observations far enough to determine whether these males would then mate with their mothers, but the short life cycle of 6 days insures that the virgin mothers would still be alive when their sons reached maturity.

In 1958 and 1959 I observed adult mites attacking and feeding on the bee egg in each of the infested cells in several nests. Apparently only the fluid contents of the egg were consumed, because the shriveled chorion was left untouched. In mite-infested cells in other nests from these two years, the bee eggs were shriveled when I first examined the nests at a later period of development. Obviously, these eggs also had been destroyed by the mites. I assumed from these earlier observations that *krombeini* differed in this respect from *osmiae,* which van Lith (1957) had reported as attacking only the bee larvae. However, in the two infested cells in one of the 1961 nests I found the adult mites feeding on newly hatched bee larvae which were dying from the mite attack, so *krombeini* will attack either the egg or young larva in a newly provisioned cell. If the mites are able to leave an infested cell,[3]

[3]This apparently happens only if the clay partitions are breached, as when the nest is opened for observation, because it does not seem likely that the mites could burrow through 2 mm of dried mud to gain access to other cells.

they invade other cells and I have seen them feed on and kill half-grown bee larvae (Fig. 5). Ordinarily, however, the mites are unable to gain access to uninfested cells once the infested cell is capped, and they are confined to the original cell until the partition is broken down the following spring by emergence of an adult bee from one of the earlier constructed cells.

After killing and feeding on the bee egg or young larva, the female mite deposits her eggs principally on the cell walls beyond the pollen-nectar mass. The eggs are ovoid, 170–185 μ long and 110–120 μ wide. They hatch in 4 to 5 days into six-legged larvae, 250 μ by 160 μ. These larvae have well-developed mouthparts, and feed on nectar from the pollen-nectar mass. They transform into the eight-legged protonymphs, which also have well-developed mouthparts and continue to feed on the nectar.

There is some doubt as to what happens next, but it seems probable that the protonymphs occurring early in the season transform directly into tritonymphs, bypassing the deutonymph or hypopial stage completely. Ordinarily, in other families having a hypopus, the protonymph transforms to the migratory hypopus, which is a quiescent, nonfeeding stage especially adapted for transport on its host because it possesses a ventral suctorial plate. However, *Chaetodactylus* hypopi were never found in nests early in the spring. This phenomenon of direct transformation from protonymph to tritonymph is known in the acarid mite, *Rhizoglyphus echinopus* (Fumouze and Robin). Garman (1937) noted [under the name *R. hyacinthi* Banks] that the hypopial form frequently is lacking in cultures of *echinopus,* and that the protonymphs transform directly into tritonymphs. Garman hypothesized that some necessary change in cultural conditions caused the interpolation of hypopi between the proto- and tritonymphs in *echinopus,* but he was unable to ascertain precisely what the change was. Likewise, Hughes and Jackson (1958: 35–36) stated that the deutonymphal stage could be present or absent in the life cycle of the anoetid mite, *Histiostoma julorum* (Koch). Krombein (1962) noted that the hypopial stage of the acarid mite *Horstia virginica* Baker was omitted in successive generations in nests of the carpenter bee, *Xylocopa* *virginica krombeini* Hurd, so long as there was an adequate food supply.

The tritonymphs transform into adults which in turn repeat the cycle, egg–larva–protonymph–tritonymph–adult, over and over within the infested cell until all the nectar has been consumed and there remains in the cell just a teeming mass of mites and dry pollen grains (Fig. 3). The number of generations and duration of breeding is dependent on the volume of the pollen-nectar mass. On 28 June 1961, I obtained an infested pollen-nectar mass about 12 mm long from a cell in nest K 41, provisioned during the week of 5 May. I put this mass in a glass vial and the mites continued to breed until about 18 July, at which time they had used up all of the accumulated food. At that time many of the protonymphs contained encysted hypopi. Baker found eggs, larvae, protonymphs, encysted hypopi, tritonymphs, and adults of both sexes in slides which I made on 10 August from other cells in this nest. Live adults of both sexes, larvae, protonymphs, and encysted hypopi were still present in the same nest as late as 3 October. It is of interest to note that Baker was unable to find any indication of what the mites were feeding on in any of the slides.

It should be emphasized that the migrating hypopus was never observed in the nest referred to above, but only the encysted hypopus. This encysted hypopus is formed within the skin of the protonymph. The legs are represented by small conical processes in the encysted hypopus, and there is a very poorly developed suctorial plate. The encysted hypopus is not formed until all of the nectar has been utilized. Thus, formation of the encysted hypopus in *Chaetodactylus* may be due to lack of food or to decreased humidity caused by the use of all of the nectar, or to a combination of both factors. It is not possible to state what factors determine whether encysted and/or migratory hypopi will develop in an individual nest. Trouessart (1904*a*) found both hypopial forms in overwintering nests, van Lith (1957) apparently found only migratory hypopi, and I found only encysted hypopi in the one nest in which the mite infestation did not die out. It may be that extreme desiccation, such as that caused by frequent opening of

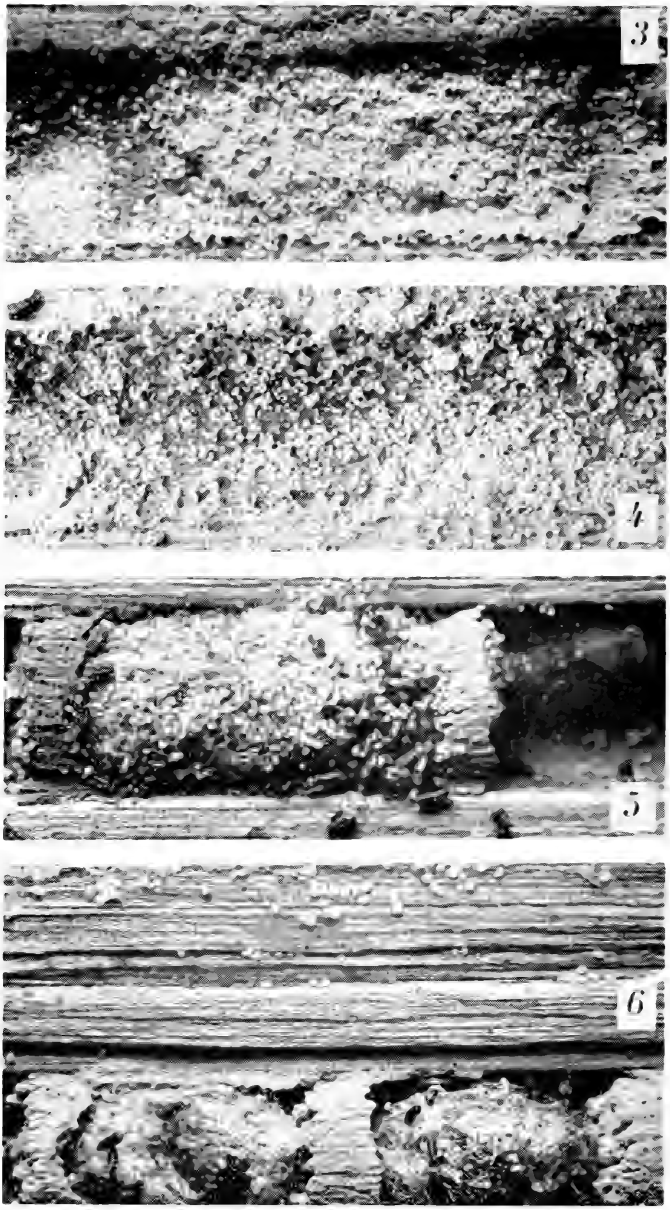

PLATE II. Nest K 41, January 1962, of *Osmia* (*Osmia*) *lignaria* Say in ¼-inch boring from Plummers Island, Md., infested by *Chaetodactylus* the nest for observation, may be the primary factor in causing development of only encysted hypopi.

In an undisturbed nest both encysted and migratory hypopi probably are confined to the originally infested cells, because of the presumed inability of the mites to break through the mud partitions separating the cells. However, these barriers are breached when the trap nests are split open for observation, so that the active feeding stages of the mite can then invade other cells in the nest. If the bees in these other cells are still feeding larvae, they may be killed by the mites (Fig. 5) or, as suggested by Popovici-Baznosanu (1913), the mites may develop as commensals without harming these larvae. On the other hand, if these bees have already spun their cocoons, the mites are unable to penetrate the cocoon wall, in which event they feed on any unused food in the cells and, finally, transform into hypopi on the cell or cocoon walls (Figs. 5, 6).

Very early in the spring the migratory hypopus presumably attaches to an adult bee as the latter chews its way out of the cocoon and through the mud seal capping its cell. In an undisturbed nest the mites in the innermost cell or cells would possibly die *in situ* because of their inability to mount an adult bee.[4] The mites would need to infest some cells in the middle or near the outer end of the nest, so that bees would develop in the innermost cells and provide the necessary vehicle for migration of the mites as the bees chewed their way out of the nest. From this standpoint it is of interest to note that in the nine *lignaria* nests infested by this mite, the infestations occurred in one or two of the innermost cells in only two nests,

[4]Mites trapped in the innermost cell might be released by a female bee chewing through the closing partition during her efforts to clean out the debris from the old nest for re-use.

krombeini Baker. Fig. 3, Cell 2 showing dried pollen grains after infestation and continued breeding by mites for several weeks. Fig. 4, The other half of cell 2 showing many dead protonymphs attached to the cell wall. Fig. 5, Cell 5 at left showing many encysted hypopi clustered on cocoon of bee, and half-grown bee larva in cell 6 at right which was killed in June 1961 by invasion of mites from cells 1 and 2. Fig. 6, Cells 10 and 11, cocoon in cell 10 with a few encysted hypopi; note also that some nymphs encysted on the split surface of the wood between the two halves (above the cocoons in the photograph). ($\times$ 4; photographs by author.)

in one or two of the middle cells in five nests, and in one or more of the outermost cells in the other two nests.

The role of the encysted hypopus in initiating a new infestation requires additional investigation. Some of the encysted hypopi in nest K 41 referred to above transformed to tritonymphs several days after the bees left the nest in the spring of 1962. I was also able to induce transformation of the encysted hypopus to the tritonymph by placing hypopi for 5 days in a small sealed glass cell provided with moisture. Theoretically, it would be possible for the encysted hypopi to remain in that stage in an old nest for some days. If this nest was then re-used subsequently by another bee, the capping of cells by that bee would increase the humidity to the point where the hypopi would transform into tritonymphs which would then infest the cells provisioned by that bee.

Obviously, the presence of both encysted and migratory hypopi in a mite species may be of profound evolutionary significance. The migratory hypopi, which attach to the body of the host bee and then drop off in a new nest of that same bee species, insure only the continuation of the same host relationship. But the occurrence of encysted hypopi, which remain in the old nest, gives the mite species an opportunity to parasitize other species of bees which also nest in abandoned borings.

Other Possible Hosts of *Chaetodactylus krombeini*

I have reared other mites belonging to this genus from nests of *Osmia* (*Chalcosmia*)*coerulescens* (L.) in borings in wood from Rochester, New York, sent to me by Dr. Kenneth W. Cooper of the Dartmouth Medical School. Dr. Baker found these migratory hypopi to be similar to those of *C. krombeini* except for having slightly but consistently shorter body setae. The taxonomic significance of this variation is not apparent at the present time.

At Plummers Island, I also observed mites in one nest made by *Osmia* (*Melanosmia*) *bucephala* Cr. in a wooden trap. Unfortunately, this infestation died out and I failed to preserve any of the mites. Future observations will be needed to determine whether *bucephala* is attacked by *krombeini* or by some other mite.

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SIMKINION, A NEW GENUS OF PSELAPHID BEETLES FROM NEW ZEALAND

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Between May 1951 and March 1952, about 1,000 specimens of Pselaphidae were collected by the junior author in New Zealand, chiefly from the northern part of the North Island. In this material were fifteen specimens of a new genus, containing two new species, described in this paper.

The two type specimens and half of the paratypes are in the collection of the senior author, with eventual deposition in the Chicago Natural History Museum; half of the paratypes are deposited with the junior author, at least some of which are to be deposited in the British Museum of Natural History.

Acknowledgment is made to many people who facilitated the course of this study, especially making available collections of pselaphids of New Zealand for comparison: the British Museum of Natural History (the Broun Collection); Director and staff of the Dominion Museum at Wellington and the Aukland Institute; private collections of Mr. A. E. Brooks, Mr. C. E. Clarke, and Dr. T. E. Woodward. To Dr. René Jeannel, of the Paris Museum, who confirmed the novelty of the series, we express our thanks, and to Mr. G. O. K. Sainsbury, of Wairoa, for his identification of the mosses in which these beetles are found.

The new genus is named in honor of Bishop Simkin, of Aukland. It is sluggish in the field, quite local in distribution, and appears to be a bryocole, living in mosses on the forest floor and on rotten wood.

Simkinion, new genus

Diagnosis: Brachyglutini having the following combination of structural features: (1) Four-segmented maxillary palpi, of which the first is short and cylindrical; second elongate-sinuate with the distal end swollen; third short and subspherical and slightly wider than swollen end of second; fourth as long as second and slightly wider than third. The fourth segment bears distally a minute hyaline cone, which shows a central canal at 400 diameters magnification. (2) Ventral surface of head bearing a median, longitudinal carinoid ridge. (3) Mesocoxae slightly separated, and metacoxae well separated. (4) First visible sternite prominent between metacoxae. (5) Abdomen of five visible tergites and six visible sternites in both sexes, with well-formed lateral margins on the first three segments.

Simkinion has some affinity with the brachyglutine *Triomicrus* of China and Japan, but the latter has very different maxillary palpi and has the mesocoxae much more separated. The general aspect of *Simkinion* is eupinoid, and the *Eupines* complex is strongly represented in New Zealand, but these brachyglutines have the first sternite hidden beneath the metacoxae.

Genotype: *Simkinion prelaticum*, new species

Simkinion prelaticum, new species

Type male: 1.2 mm long $\times$ 0.5 mm wide (through elytra). Eupinoid aspect with shining integuments. General body color bright orange-brown. Head subimpunctate; pronotum with punctation slight and at times scarified; elytra punctate; abdomen subimpunctate, with a few scattered punctures on first tergite. Pubescence moderate on head and pronotum; elytra with short stiff setae; abdomen with pubescence more obvious and subappressed.

Head with length (frontal margin to cervicum) and width (through eyes) subequal, with evenly rounded corners. Eyes not prominent, slightly oblique suboval, each of ten facets, and placed far down on sides of head at about center of head length. Face simple, slightly concave. Vertex complex with an excavation at center of posterior third. This excavation interrupted anteriorly by a pair of deeper excavations which extend anteriorly beneath a conspicuous vertexal cap. This cap ends on frontal margin, between antennal bases. Posteriorly this cap is deeply and obliquely biexcavated, so that from a dorsal view the cap is trilobed. The lateral lobes of the cap are more or less rounded and dorsally carinoid, whereas the median lobe is acute. The excavations beneath the cap are setose and separated medianly by a lamina.

Antennae ten-segmented, twice as long as head, with a two-segmented club. First segment elongate; second slightly shorter and narrower than first, elongate; third much smaller and obconical; fourth as wide as third, shorter, obtriangular; fifth slightly wider than fourth and subspherical; sixth slightly wider than fifth, obviously elongate, and longer than either fifth or seventh; seventh small, slightly narrower than sixth, obtrapezoidal; eighth larger than seventh, transverse trapezoidal; club of last two, with ninth suddenly larger and transverse moniliform; tenth largest, nearly three times as long as ninth and obviously wider, with distal third subacute and bearing a slight asymmetric incisure.

Maxillary palpi as noted for genus; labrum transverse; mandibles each with an acute ramus, left crossed dorsal to right. Ventral surface of head with a median, longitudinal carinoid elevation.

Pronotum slightly longer than wide, widest behind middle, with posterior third slightly oblique; disc unmodified; a small, nude antebasal fovea each side, these lateral foveae free; a vague fovea at center near base.

Elytra relatively simple; each elytron with two minute, nude antebasal foveae; an entire sutural stria from sutural fovea and a vague impression from humeral fovea; flank not foveate.

Metathoracic wings absent.

Abdomen with five visible tergites in following length ratio: 2.6/1.2/1.0/1.0/0.8 with last two subvertical; distinct lateral margins on first three segments. First tergite complex; median third posterior incised to form a transverse fossa, the anterior margin of which is slightly produced medianly; laterally this fossa is bounded by a glabrous, slightly concave lobe; medianly the posterior margin of fossa bears a stellate cluster of setae borne on a small cuspoid tubercle. No basal abdominal carinae evident. Six visible sternites in length ratio as follows: 0.6/1.6/0.4/0.4/0.4/1.0 with the first seen as a rounded-triangular piece as long as metacoxae, and fitting into the arcuation of the metasternum, between the metacoxae; last sternite bearing a transversely oval concavity for median half of width.

Prosternum not medianly longitudinally carinate. Procoxal cavities confluent; mesocoxal cavities almost closed, there being a slight separation between the meso- and metasternal processes. Metasternum with posterior margin deeply arcuate between metacoxae; metacoxae separated by about the width of a mesocoxa.

Legs relatively simple. Pro- and mesofemora slightly inflated in distal three-fourths. At 400 diameters magnification, there appears to be a minute tooth on each metacoxa below the articulation of coxa and trochanter. Three-segmented tarsi, with first segment very short; second long, slightly wider distally; third shorter than second, bearing a single acute tarsal claw.

Aedeagus (Fig. 1) brachyglutine, 0.20 mm long $\times$ 0.10 mm wide.

Female as described for male except that (1) head slightly wider than long, rounded hexagonal; with circular eyes which are slightly more posterior than in male. (2) Vertex simple, slightly vaulted medianly, with a pair of nude vertexal foveae on a line through the anterior eye margins. (3) Antennae simple, eleven-segmented. (4) Abdomen of five tergites in length ratio of 2.2/1.2/1.0/0.8/0.8 with first tergite simple and unmodified. As in the male, there are no apparent basal abdominal carinae. (5) Six sternites with a length ratio of 0.8/1.8/0.6/0.4/0.2/1.0. (6) Femora much less inflated than in male.

Discussion: The sixth antennal segment of the male appears to be the equivalent of the sixth plus seventh segments of the female, as though

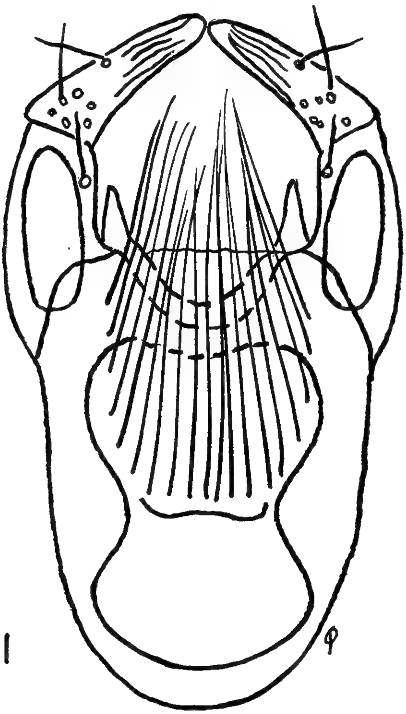

FIG. 1. Aedeagus of *Simkinion prelaticum* new species, 0.20 mm long and 0.10 mm wide, drawn from a slide mount at 400 ×.

there had been a fusion through the process of selection. The sexes are easily differentiated by the presence of the highly modified vertex and first tergite of the male, as well as the different number of antennomeres, i.e., ten in the male, and eleven in the female. Among the male and female paratypes, the ocular facet number was constant at ten, but the eye outline varied from oblique oval to circular. Two other variations are to be noted. The median antebasal fovea of pronotum varied from a vague puncture with irregular margin to a well-formed but minute fovea. The extent and outline of the discal elytral impression from the lateral antebasal elytral fovea varied a good deal as between the specimens, but was always short.

This new species is described on a series of six specimens, type male, two male paratypes, and three female paratypes. All six were collected by E. J. Pearce on 26 December 1951, in mosses in the native forest through which the main road extends, near Russell, North Island, New Zealand.

Simkinion bimanum, new species

Type male: 1.25 mm long × 0.41 mm wide (through elytra), i.e., slightly longer and more slender than *prelaticum*. General body color and punctation as in *prelaticum*, but the pubescence seemingly more obvious.

Head slightly wider than long; rounded hexagonal. Eyes, face, maxillary palpi, and ventral surface of head as in *prelaticum*. Vertex modified, but much simpler, vaulted medianly between a pair of small, nude vertexal foveae which are placed on a line through anterior eye margins. The vaulted tumidity is gradually sloped anteriorly to frontal margin, but posteriorly this tumidity is suddenly declivous. Beneath this posterior face of the tumidity the integument is formed into a transverse to lunate impression. (From a lateral view, this tumidity of *bimanum* appears as a subacute tubercle, whereas in *prelaticum* the vertexal cap is seen as a prominent, subappressed, and posteriorly directed horn. Another obvious difference in the vertex is that *bimanum* has the vertexal foveae obvious, as in the majority of Pselaphidae, whereas in *prelaticum* the vertexal foveae are not visible, being involved in the deep excavations beneath the vertexal cap.)

Antennae eleven-segmented and relatively simple. First two segments as in *prelaticum*; third, fourth, fifth subequal, obconical; sixth slightly transverse; seventh subequal to sixth, subspherical; eighth slightly wider than seventh, transverse trapezoidal; ninth larger than eighth, transverse trapezoidal; club of last two segments, tenth transverse lenticular and eleventh largest, and similar to last segment in *prelaticum*.

Pronotum and elytra as in *prelaticum*; no metathoracic wings.

Abdomen with five visible tergites in following length ratio: 2.0/1.4/1.0/1.0/0.8 with first tergite simple and unmodified. First three tergites with distinct lateral margins. First tergite with a pair of basal abdominal carinae which are short, straight, one-tenth as long as segment and separated by one-sixth of total segmental width. Six visible sternites, in length ratio of 0.6/1.6/0.4/0.4/0.3/1.2 with first sternite as in *prelaticum* and last sternite with a concave trapezoidal concavity for entire length of segment and occupying median half.

Sterna and coxal cavities as in *prelaticum*. Legs also similar for male *prelaticum*, except that the femora are distinctly more clavate.

Aedeagus (Fig. 2) qualitatively different from that of *prelaticum*, and slightly larger, being 0.23 mm long × 0.11 mm wide.

Female as described for male except that (1) the vertex is simply convex, not bearing the median vertexal tubercle; (2) basal abdominal carinae slightly more widely separated, being mutually apart by not quite a fifth of total segmental width; (3) sixth sternite simply, evenly convex; (4) femora not clavate.

Discussion: *S. bimanum* is much less modified in the male than is *prelaticum*, and consequently the secondary sex characters are much less obvious. Both sexes have eleven-segmented antennae and simple first

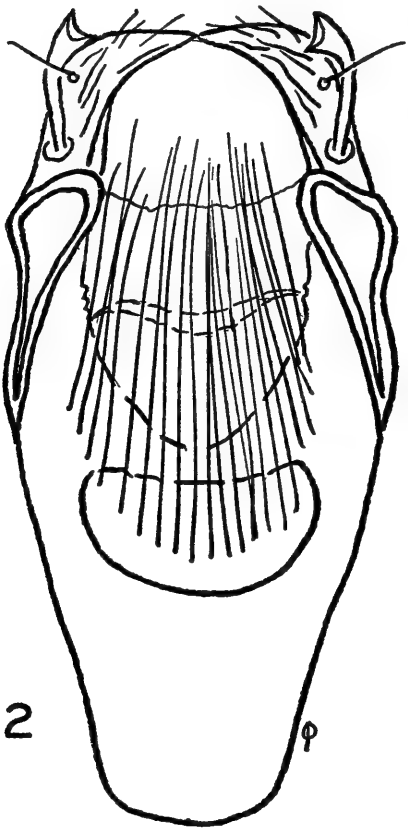

FIG. 2. Aedeagus of *Simkinion bimanum* new species, 0.23 mm long and 0.11 mm wide, drawn from a slide mount at 400 ×. The pair of distal clavate processes suggested the name for the taxon.

tergites. The features most easily used to separate sexes in *bimanum* are the vertexal tubercle and concave last sternite in the males.

This new species is described on two specimens, male type and male paratype, both collected by E. J. Pearce on 26 December 1951, in mosses in Dobbie's Park, Whangerai, North Island, New Zealand. This is the type locality. We have seven additional specimens of *bimanum*, fully congeneric with the type series but from different localities, as follows: one male and one female collected by E. J. Pearce on 21 December 1951, in mosses in the type locality given for *prelaticum*; one male and one female by the same collector on 18 December 1951, in mosses in the Puketi Forest, North Island, New Zealand; one male and two females by the same collector on 29 May 1951, in mosses in the Kauri Forest, near Kaeo, North Island, New Zealand.

Mosses occupied by *Simkinion* are: *Weymouthia cochlearifolia* (Schwaegr.) Dix; *Mniodendron comosum* (LaBill.) Lindbl; *Dicranoloma Menziesii* (H. & W.) Par.; *Dicranoloma Billardieri* (Schwaegr.) Par.; *Hypopterygium novaeseelandiae* C. M. and *Ptychomnion aciculare* (Brid.) Mitt.

Neither of the two new species was collected in a single moss, so *Simkinion*, as far as is known, would appear to be a generalized bryocole. Small eyes of only ten facets, and lack of wings, suggest that the genus would expand its range slowly, and tend to be very local in distribution.

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NEW LIBERIAN LEAFHOPPERS OF THE GENUS *RECILIA* (HOMOPTERA: CICADELLIDAE: DELTOCEPHALINAE)

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The purpose of this paper is to clarify the status of *Recilia* and to make known the included Liberian species.

Recilia was erected by Edwards (1922) with full generic standing. It has been treated subsequently as either a synonym of *Deltocephalus* by Wagner (1939), or as a subgenus of *Deltocephalus* by Ribaut (1952). Except for the fact that the connective and aedeagus are solidly fused together in both *Deltocephalus* and *Recilia*, the two genera have quite dissimilar male genitalia. The most apparent difference is in the basic shape of the connective. In *Deltocephalus* the connective consists of two approximately parallel bars which are tangent basally and fused distally with the aedeagus (Ribaut, 1952, Fig. 603). In *Recilia* the connective consists of a more or less Y-shaped bar with the arms of the "Y" pinched together and the stalk fused with the aedeagus (Fig. 15; Ribaut, 1952, Fig. 609). Other differences are listed below:

Recilia Edwards

1. Gonopore on dorsum of aedeagal shaft and usually very poorly delimited.
2. Extreme apex of aedeagus entire.
3. Lateral margins of male plates usually convex.
4. Usually one cross vein between sectors of forewings.
5. Distribution entirely Old World.

Deltocephalus Burmeister

1. Gonopore at apex of aedeagal shaft and clearly delimited.
2. Extreme apex of aedeagus notched.
3. Lateral margins of male plates usually straight or concave.
4. Always two cross veins between sectors of forewings.
5. Distribution primarily New World.

In light of the enumerated differences and current practices in leafhopper taxonomy, *Recilia* is considered as a distinct and valid genus.

The European species of *Recilia* were fully treated by Wagner (1939: 164) and Ribaut (1952: 250). Of the three European species, *coronifer* (Marsh.), *horvathi* (Then.), and *schmidtgeni* (Wagner), two are known from North Africa. Ribaut (1952: 250) reports both *coronifer* and *schmidtgeni* as occurring in Morocco. These two palearctic species are not included in the following key, but the species known from islands adjacent to West Africa are included for the sake of completeness. There is little doubt, however, that many additional species will be added to *Recilia* when the West African fauna becomes better known.

Key to Liberian Species of *Recilia*

(*Canary and Cape Verde Islands included*)

1.—Ground color of head, pronotum, and scutellum black and either unicolorous or with yellow markings 2
Ground color of head, pronotum, and scutellum stramineous to light brown and either unicolorous or with contrasting darker markings 5

2.—Head, pronotum, and scutellum uniformly black; forewings almost entirely milky white .... *lactipennis*, n. sp.
Head not uniformly black but with some yellow markings; forewings largely dark and bicolored 3

3.—Yellow markings in the form of wide transverse bands on face, crown, pronotum, and scutellum .... *banda*, n. sp.
Yellow markings in the form of narrow lines or small spots on face or crown; pronotum and scutellum uniformly black 4

4.—Coronal disc with some small yellow angular spots; forewings with two distinct, transverse, solid yellow bands which extend nearly from one costal margin to the other (Lindberg, 1953, Fig. 65) .... *trifasciata* (Lindberg)
Coronal disc uniformly black; forewings with one partial, transverse, yellow band limited to claval area and with some yellowish spots in area of claval apices to costal margins .... *clavata*, n. sp.

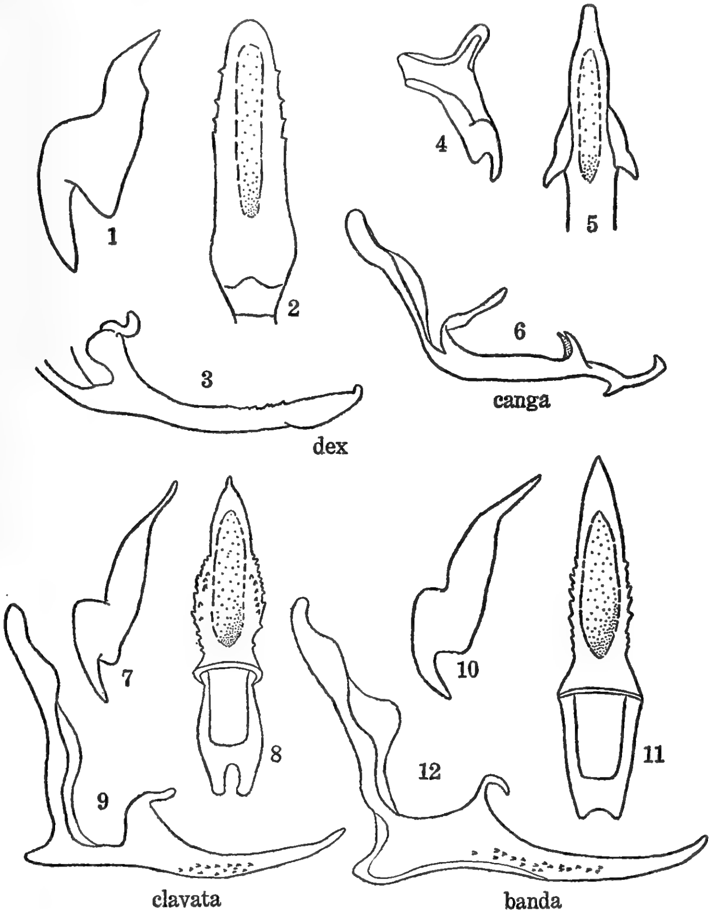
5.—Aedeagal shaft with a pair of large preapical, dorsal projections (Figs. 6, 17) 6
Aedeagal shaft without large preapical, dorsal projections (Figs. 3, 13) 7

6.—Preapical dorsal projections of aedeagus simple, venter of aedeagal shaft with preapical hook, aedeagal apex not greatly enlarged (Fig. 6) .... *canga*, n. sp.
Preapical dorsal projections of aedeagus toothed, venter of aedeagal shaft without preapical hook, aedeagal apex greatly enlarged (Figs. 16–19) .... *dolabra*, n. sp.

7.—Aedeagus in lateral view with a distinct basal spur (Fig. 22) .... *dispar*, n. sp.
Aedeagus in lateral view without basal spur 8

8.—Aedeagus in lateral view with apex simple (Fig. 13) .... *mica*, n. sp.
Aedeagus in lateral view with apex modified 9

9.—Aedeagus in lateral view with minute preapical, dorsal teeth, extreme apex sharply upturned and blunt (Fig. 3) .... *dex*, n. sp.
Aedeagus in lateral view with minute preapical, dorsal fin, extreme apex gradually upturned and pointed (Lindberg, 1958, Fig. 97*c*) .... *hesperidium* (Lindberg)



Figs. 1–12. 1–3, *Recilia dex*; 1, distal portion of style shown ventrally; 2, dorsal view of aedeagus; 3, lateral view of aedeagus. 4–6, *R. canga*; 4, dorsal view of style; 5, distal portion of aedeagus shown dorsally; 6, lateral view of aedeagus and connective. 7–9, *R. clavata*; 7, distal portion of style shown dorsally; 8, dorsal view of aedeagus; 9, lateral view of aedeagus and connective. 10–12, *R. banda*; 10, distal portion of style shown dorsally; 11, dorsal view of aedeagus; 12, lateral view of aedeagus and connective.

Recilia lactipennis, new species

Length: 3.0–3.5 mm.

Coloration: Venter including legs stramineous (females with extreme apex of ovipositors blackened). Face black with antennae and ocelli pale yellow. Crown, pronotum, and scutellum solid black. Basal portion of forewings adjacent to pronotum and scutellum black, apical portions of forewings slightly embrowned, rest of forewings uniformly milky hyaline.

Male genitalia: Aedeagus in lateral view slender, simple, and apically upturned with a few minute preapical dorso-lateral teeth (Fig. 25). Gonopore opens on dorsum of shaft at a point considerably posterior to apex (Fig. 24). Mesal lobe of style long and slightly undulated (Fig. 23).

Female genitalia: Pregenital sternum with a broad and shallow U-shaped incision on posterior margin.

Types: Holotype ♂, Suakoko, Liberia, 8 July 1952, Carl C. Blickenstaff. USNM Type No. 65916. Allotype ♀ same data except date 24 November 1952. Paratypes, eleven, same data except various dates in 1951 and 1952.

Recilia banda, new species

Length: 3.25–3.50 mm.

Coloration: Venter including legs fuscous. Ground color of head, pronotum, and scutellum black. Face with lower portion broadly yellow and with a yellow band between antennal bases. Face and crown separated by a narrow wavy yellow band. Additional transverse yellow bands on posterior margins of crown, pronotum, and preapically on scutellum. Forewings mainly fuscous touched with yellow at cross veins, some cells clear hyaline, extreme apices hyaline.

Male genitalia: Aedeagus in lateral view slipper-shaped, barely upturned apically, and with a distinct basal heel and a few small lateral teeth (Fig. 12). Aedeagus in dorsal view shallowly but broadly notched basally with gonopore occupying most of distal portal (Fig. 11). Style undistinguished (Fig. 10).

Female genitalia: Pregenital sternum with a broad and shallow U-shaped incision on posterior margin. There is a slight suggestion of a tooth at the center of the incision.

Types: Holotype ♂, Suakoko, Liberia, 2 December 1951, Carl C. Blickenstaff. USNM Type No. 65917. Allotype ♀ same data except date 13 December 1951.

Recilia clavata, new species

Length: 3.0–3.25 mm.

Coloration: Venter including legs largely black or dark fuscous. Distal portion of femur, all of tibia, and tarsus of pro- and mesothoracic legs stramineous. Tibia of metathoracic legs variably touched with stramineous. Face black with mesally broken yellow arcs on upper portion. Ocelli yellow-margined. Crown uniformly black except for extreme anterior margin which is marked with three tiny elongate yellow spots; a fourth minute elongate yellow spot occurs directly behind the central marginal spot. Pronotum and scutellum uniformly black. Forewings black with apex hyaline and some yellow markings. Yellow markings limited to spotting in area of claval apex to costal margin and to clavus. When the wings are at rest, the yellow claval marking appears as a narrow saddle.

Male genitalia: Aedeagus in lateral view similar to *banda* but constricted near base (Fig. 9). Aedeagus in dorsal view expanded in distal one-half with margins irregular, deeply and rather narrowly notched basally, and with gonopore occupying most of distal portion (Fig. 8). Style undistinguished (Fig. 7).

Female genitalia: Pregenital sternum indistinguishable from *banda*.

Types: Holotype ♂, Suakoko, Liberia, 18 November 1952, Carl C. Blickenstaff. USNM Type No. 65918. Allotype ♀ same data except date 25 January 1952. Paratypes, four, same data except various dates in 1951 and 1952.

Recilia trifasciata (Lindberg), new combination

Deltocephalus trifasciatus Lindberg 1953: 212.

This species and *clavata* are exceedingly close, but the two are readily separated by the easily observed color markings as indicated in the key. The male genital structures of *trifasciata* (Lindberg, 1953, Fig. 53) are quite like *clavata* (Figs. 7–9). However, in dorsal view the aedeagus of *clavata* is broader with less regular margins in the distal one-half than *trifasciata*.

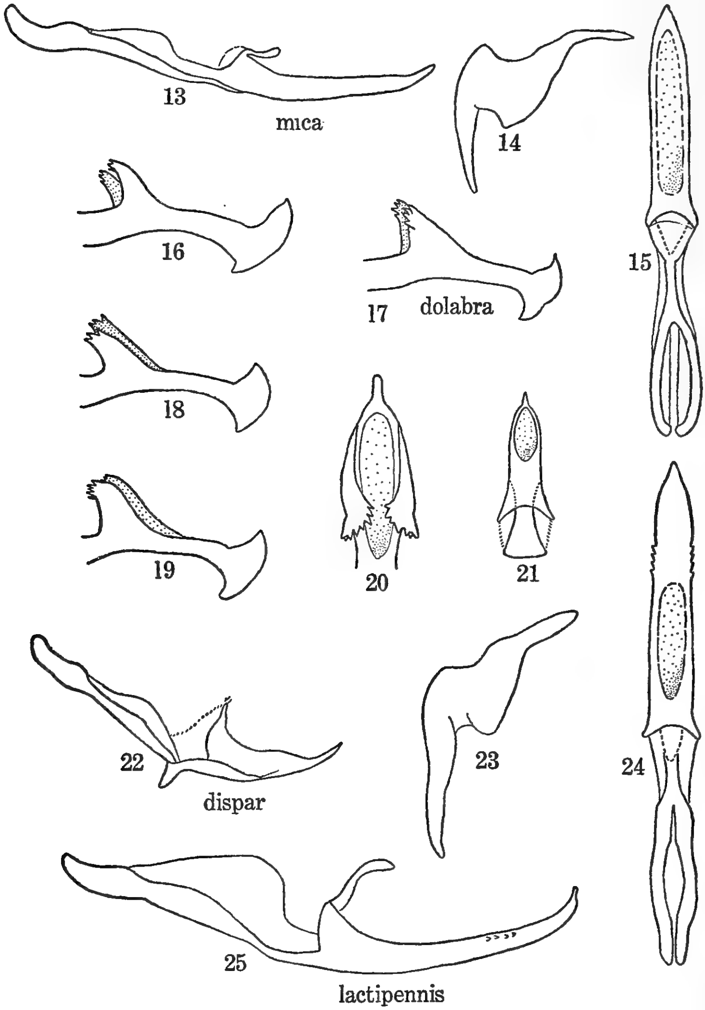
Lindberg described *trifasciata* from the Canary Islands, and it has not been reported elsewhere. Although I have seen no Liberian specimens referable to *trifasciata*, there are two female specimens from Alamata, Ethiopia, in the collection of the U. S. National Museum which appear to be properly placed here.

Recilia canga, new species

Length: 3.3–3.6 mm.

Coloration: Venter including legs sordid stramineous marked irregularly with brown. Face stramineous usually with brown clypeal arcs and some other darkened areas. Crown pale stramineous with six brown apical spots, each lateralmost spot located behind ocellus, additional ill-defined yellow markings on disc. Pronotum sordid stramineous, often darkest anteriorly, and with four weakly delimited yellowish longitudinal stripes. Scutellum sordid stramineous with anterior angles darker. Forewings sordid stramineous with veins white and cells variably infuscated at margins.

Male genitalia: Aedeagus in lateral view slender, upturned distally with a pair of large simple preapical dorsal projections, and a single preapical ventral hook (Fig. 6). Gonopore apparently a poorly delimited



FIGS. 13–25. 13–15, *Recilia mica*; 13, lateral view of aedeagus and connective; 14, distal portion of style shown dorsally; 15, dorsal view of aedeagus and connective. 16–20, *R. dolabra*; 16–19, distal portion of aedeagus in lateral view showing variations; 20, distal portion of aedeagus shown dorsally. 21–22, *R. dispar*; 21, dorsal view of aedeagus; 22, lateral view of aedeagus and connective. 23–25, *R. lactipennis*; 23, distal portion of style shown dorsally; 24, dorsal view of aedeagus and connective; 25, lateral view of aedeagus and connective.

area on distal portion of aedeagal dorsum (Fig. 5). Style undistinguished (Fig. 4).

Female genitalia: Pregenital sternum mesally indented on posterior margin.

Types: Holotype ♂, Suakoko, Liberia, 21 March 1952, Carl C. Blickenstaff. USNM Type No. 65919. Allotype ♀ same data except date 3 May 1952. Paratypes, twelve, same data except various dates in 1952.

Recilia dolabra, new species

Length: 3.0–3.3 mm.

Coloration: Indistinguishable from *canga*.

Male genitalia: Aedeagus in lateral view variable slender, expanded dorsally and ventrally at apex and with a pair of large, toothed, preapical dorsal projections (Figs. 17, holotype, and 16, 18, 19, paratypes). Gonopore a weakly defined area on distal portion of aedeagal dorsum (Fig. 20).

Female genitalia: Female unknown.

Types: Holotype ♂, Suakoko, Liberia, 21 March 1952, Carl C. Blickenstaff. USNM Type No. 65920. Paratypes, three, two with same data as holotype and one same data except date 28 January 1952.

Recilia dispar, new species

Length: 4.0–4.5 mm.

Coloration: In general very much like *canga* with the following exceptions: Face and crown separated by a light yellow stripe which runs between the ocelli. This stripe is bordered ventrally on the face by a twice-arched brown line and dorsally on the crown by a broken brown line. In a dorsal view of the crown, the broken line appears as either two or four brown elongate apical spots depending upon the degree of coalescence. Dorsum with two inconspicuous yellowish longitudinal stripes running from anterior coronal margin across crown, pronotrum, and scutellum. Two additional inconspicuous yellowish longitudinal stripes flank the long pair on the pronotum.

Male genitalia: Aedeagus in lateral view comparatively stout but narrowed apically and with a distinct basal spur (Fig. 22). Gonopore opens on dorsum of shaft in distal one-half (Fig. 21). Style similar to *canga*.

Female genitalia: Posterior margin of pregenital sternum broadly but shallowly notched mesally; base of notch transverse or nearly so.

Types: Holotype ♂, Suakoko, Liberia, 5 May 1952, Carl C. Blickenstaff. USNM Type No. 65921. Allotype ♀, same data. Paratypes, three, same data except various dates in 1952.

Recilia mica, new species

Length: 2.7–3.3 mm.

Coloration: Not easily distinguishable from *canga* but usually lighter with a more yellowish cast. Markings essentially the same in both species.

Male genitalia: Aedeagus in lateral view slender, simple, scarcely upturned apically (Fig. 13). Gonopore ill-defined but occupying most of aedeagal dorsum (Fig. 15). Style with mesal lobe rather slender (Fig. 14).

Female genitalia: Pregenital sternum with posterior margin approximately straight across.

Types: Holotype ♂, Suakoko, Liberia, 28 January 1952, Carl C. Blickenstaff. USNM Type No. 65922. Allotype ♀ same data except date 21 March 1952. Paratypes, twelve, same data except various dates in 1952.

Recilia dex, new species

Length: 3.75–4.0 mm.

Coloration: Essentially a pale-yellow leafhopper sparsely marked with fuscous ventrally. The crown varies from immaculate to marked with six small apical spots. There are usually two highly obscure yellowish longitudinal stripes running from anterior coronal margin across crown, pronotum, and scutellum. Two additional inconspicuous yellowish longitudinal stripes flank the long pair on the pronotum. Each forewing has four small but distinct patches of infuscation which appear as spots.

Male genitalia: Aedeagus in lateral view quite slender with minute preapical dorsal teeth and extreme apex sharply upturned and blunt (Fig. 3). Gonopore opens on dorsum of shaft (Fig. 2). Style not distinguished (Fig. 1).

Female genitalia: Pregenital sternum with posterior margin slightly notched at middle.

Types: Holotype ♂, Suakoko, Liberia, 9 April 1952, Carl C. Blickenstaff. USNM Type No. 65923. Allotype ♀ same data except date 29 March 1952. Paratypes, six, with same data except various dates in 1952.

Recilia hesperidium (Lindberg), new combination

Deltocephalus hesperidium Lindberg 1958: 186.

This species appears rather close to *canga* on the basis of coloration. The male genital structures are, however, unique (Lindberg, 1958, Fig. 97*c*). Lindberg described *hesperidium* from the Cape Verde Islands, and it has not been reported elsewhere. I have not seen any Liberian material referable to this species.

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A NEW SPECIES OF *EULEPIDOTIS* HÜBNER FROM SOUTH AMERICA (LEPIDOPTERA: NOCTUIDAE)

By E. L. Todd

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The following description is presented in order to make available a name for four specimens from the collections of the U. S. National Museum, one specimen from the American Museum of Natural History, New York, N. Y., and one specimen sent for identification by Bruno Pohl, São Paulo, Brazil.

Eulepidotis preclara, new species

Head with proboscis well developed; labial palpi upcurved, reaching about to vertex of frons, third segment shortest (0.50 mm), clothed mostly with appressed dark scales, extreme apex and ventral patch slightly distad of base white, first and second segments longer (0.70–0.80 and 0.90–1.00 mm), second segment dark with ventral patches of white scales at base and apex, third segment pale yellow with a dorsolateral patch of dark scales at apex, scales at base of venter longer, forming a loose tuft; frons flat, smooth, scarcely exceeding anterior margin of eyes; eyes moderately wide, in frontal aspect subequal to width of frons, naked, hemispherical; ocelli present, small, adnate to dorsal margin of eye caudad of base of antenna; antenna filiform in both sexes, dark-scaled dorsally, minute cilia and spicules on venter, spicules of terminal articles longest. Vestiture of head and patagium mainly of dark scales but with transverse lines of white or pale-yellow scales present; tegula mostly white, some dark scales present at base, apex a tuft of white hairs; thorax clothed with broad yellow and white appressed scales; dorsum of abdomen white, becoming straw-yellow posteriorly; venter of abdomen white, scales of eighth segment of male extending farther distad than those of dorsum and concealing moderate ventral hair tufts. Pectus clothed with white and pale-yellow hair and scales; tympanum moderate, only partially shielded by abdominal hood; legs moderate, tibiae and tarsi of front and middle legs light brown or yellowish-brown, hind legs mostly white, tibiae of middle and hind legs of male with sexual modifications, middle tibia swollen, folded, forming a longitudinal groove containing a pale hair pencil, hind tibia with large, irregular dorsal tufts of hairs at middle, some of the hairs dark in color, hind tibia of female with a smaller, white dorsal tuft at middle. Forewing triangular, 14 to 17 mm in length; costa nearly straight, slightly convex basally and apically; termen evenly rounded except slightly concave before tornus; inner margin straight except convex near base; R_1 free, from near middle of cell; R_3 from R_2, anastomosing with R_4 to near apex, forming a small elliptical areole; R_5 from R_{4+5} near apex of areole; M_1 from base of areole; M_2 and M_3 arising just above lower angle of cell; Cu_1 from lower angle of cell; Cu_2 from apical third of cell; cell open, about half as long as wing. Hind wing rather rectangular, termen roundly angled at M_3; $Sc+R_1$ adnate with cell for basal fourth; Rs and M_1 from upper angle of cell; M_2 from slightly above and basad of lower angle of cell; M_3 and Cu_1 from lower angle of cell; Cu_2 from apical third of cell; cell open, less than half length of wing.

Pattern of maculation as illustrated (Fig. 1), the same for both sexes. Ground color of upper side of forewing white; transverse and oblique bands and lines brown, terminal line darkest, the two basal oblique bands with median areas pale gray-brown with metallic reflections; fringe brown, yellow-brown at tornus. Upper surface of hind wing mostly pale-yellow; fine terminal line between R_s and M_3 black, preceded by a fine white line; an intense black terminal spot at end of cell M_3 and part of cell Cu_1; a small terminal, triangular white patch in cell Cu_1; an irregular subterminal patch of orange in cells M_1 through Cu_1, the median part in cell Cu_1 opalescent and containing some scattered black scales; fringe yellow-brown except fuscous distad of black terminal spot at angle of wing, scales of fringe reduced and curled at this point forming a short curved tail at anterior edge of notch. Lower surfaces of wings mainly yellow; apex of forewing from outer third of costa to Cu_2 fuscous; lower surface of hind wing similar to upper surface except

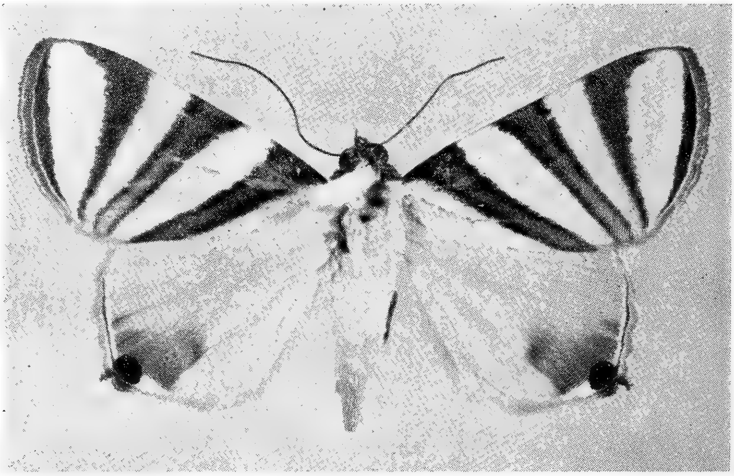

FIG. 1. Type, female, *Eulepidotis preclara*, n. sp., Tingo Maria, Perú.

orange subterminal patch is absent, terminal black spot of angle is smaller, and the white basad of fine black terminal line is more extensive.

Male genitalia moderately large, about 3.5 mm from base of uncus to ventral end of vinculum. Valves simple, flat, symmetrical, membranous lobes, apices rounded and inner surface covered with a mat of fine hairs; costa sclerotized for basal three-fourths, distal end of sclerotized part of costa a free blunt lobe; base of outer surface of valve with a long, membranous, protrusible lobe covered with fine, long hairs, lobe 7 to 8 mm in length when extended. Uncus swollen for apical third, cygnate, swollen part crowned with dense mass of short, fine hairs. Tegumen elongate, narrow at base of uncus, ventral part provided with a small, triangular, posteriorly directed projection from area level with aedeagus. Aedeagus rather stout, about 4 times as long as greatest diameter; vesica provided with one large, curved cornutus, cornutus about one-third as long as aedeagus, arising from vesica near apex of aedeagal shaft.

The genitalia of the male are similar to those of *E. geminata* Packard, but in that species the valves are more elongate, the posteriorly directed projection of the tegumen larger, the aedeagus longer and much more slender (about 7 times as long as greatest diameter), the single cornutus of the vesica much smaller (about one-eighth as long as aedeagus) and not curved.

Female genitalia with ventral plate only slightly developed, nearly transverse, posterior margin very slightly convex; a large sinus vaginalis present, the sides of latter subparallel, anterior margin broadly rounded, ventral and lateral parts formed by two large, weakly sclerotized plates from pleural region of the seventh segment, dorsal part of sinus vaginalis formed by two smaller, irregular plates and a groove leading to ostium, inner edges of the dorsal plates scobinate; ductus bursae membranous on right side, left side with a blunt conical sclerotization near posterior end and a weaker, vague, sclerotized area toward anterior end; bursa copulatrix moderate, posterior part a short, membranous tube, median part largest, extended to the left, left side with numerous, prominent, parallel folds, inner surface of area with folds minutely scobinate, a strap-like signum present, scarcely distinguishable from the parallel folds, anterior part of bursa copulatrix a weak, membranous sac; ductus seminalis from posterior margin of left side of median part of bursa copulatrix; posterior apophyses very long and slender (nearly 3 times as long as width of sinus vaginalis); anterior apophyses shorter and stouter (about 2 times as long as width of sinus vaginalis).

The female genitalia are similar to those of *E. geminata* Packard, but in *geminata* the entire left side of the ductus bursae is sclerotized and there is but one dorsal plate in the sinus vaginalis. The dorsal plate is ventrad and cephalad of the ostium and the posterior margin is pointedly emarginate.

Type, ♀, Tingo Maria, Perú, 11 December 1949, H. A. Allard, U. S. National Museum Type No. 64635; one ♀ paratype, same place and collector, 15 December 1949; one ♂ paratype, Jepelacio, Perú, donor

F. Johnson; and one ♂ paratype, "St. Catherines" (Santa Catarina), Brazil, donor F. Johnson, in the U. S. National Museum, Washington, D. C. One ♂ paratype, Cauca Valley, Colombia, F. C. Nicholas, in the American Museum of Natural History, New York, N. Y. One ♀ paratype, Benjamin Constant, Amazonas, Brazil, August 1942, B. Pohl, in the personal collection of Mr. Pohl, São Paulo, Brazil.

This species differs from all the others of this genus that have white on the forewings, with one exception, in that the basal oblique band extends from the base of the costa to the tornus. In the other species the band does not reach the base of the costa. In the exception, *E. metamorpha* Dyar, the basal oblique band does arise from the base of costa, but the apical fourth of the wing is brown and, exclusive of the fringe, only two white areas are present. *E. preclara* is obviously most closely related to *E. geminata* Packard, but the latter is larger, the basal oblique band arises from basal third of costa, the subterminal transverse line of the forewing is more or less uniform in width, a large black apical spot is present on the hind wing, and the terminal black spot at the angle of the outer margin of the hind wing is divided by a fine, longitudinal, white line. In addition, the tibia of the male of *geminata* is provided with a larger sinuous brush of hairs. The hairs of the brush extend from the outer surface at the base to near the apex of the dorsum of the tibia.

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JAPYGIDAE OF SOUTH AMERICA. 3: JAPYGIDAE OF CHILE

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The Japygidae of Chile are all members of the two subfamilies Parajapyginae and Japyginae. The subfamily Parajapyginae remained unknown in Chile until the present paper. Two specimens of *Parajapyx isabellae* (Gr.) were collected in irrigated soils in avocado orchards at La Cruz, Valparaiso Province, Chile, 16 April and 17 March 1961, by L. M. Smith and Nelson Hichins and five specimens on the Fundo Santa Teresa, Quillota, Valparaiso Province, by Dr. L. Caltagirone on 16 August 1961. No other specimens of this subfamily are known from Chile.

The great bulk of Chilean japygids therefore belong to the subfamily Japyginae. The great subfamily Evalljapyginae, dominant along the Pacific Coast of North America, through Mexico and as far south as Guatemala, has not yet been found in Chile. The Japyginae of Chile, as set forth in this paper, are:

Teljapyx megalocerus (Silv.). San Vicente (Concepción)
Teljapyx profundus L. Smith. El Cobre, Valparaiso Prov.
Teljapyx riestrae Silv. Temuco
Nelsjapyx hichinsi L. Smith. Viña del Mar
Nelsjapyx soldadi L. Smith. El Cobre, Valparaiso Prov.
Rossjapyx australis L. Smith. Puyehue, Osorno Prov.; Mocopulli, Chiloe Prov.; Los Muermos, Llanquihue Prov.
Rossjapyx anodus (Silv.). Temuco and Villa Rica
Chiljapyx caltagironei L. Smith. Olmué-Limache
Valpjapyx botani L. Smith. Viña del Mar
Valpjapyx talcae L. Smith. Talca
Penjapyx altus L. Smith. La Laguna, Cordillera de Coquimbo

Abbreviations and Terms Used

M = macrosetae, larger setae of the body set in reinforced setal sockets, so as to move anteriorly and posteriorly, but not laterally.

m = sub-macrosetae, medium-sized setae usually set in simple setal sockets.

Microsetae = minute setae visible only under high magnification, always set in simple sockets.

Antecedent setae = those setae on sternite I just anterior to the lateral and median subcoxal areas, set in reinforced setal sockets, more or less reversed from those of M.

Trichobothria = specialized seta-like sensoria located on antennal segments 4, 5, and 6, consisting of a large setal socket, not reinforced, from which projects a long rod-like seta of uniform diameter, which under extreme magnification is seen to be plumose.

Proliferated setae of the antennae = accessory setae on 4 to 6 segments near the middle of an antenna. These proliferated setae lie between the basal and distal whorls of setae and are postero-lateral on the segment when the antenna is extended to the side.

Friction setae = a type of microseta with large sockets which occurs in groups where the body integument folds or moves upon itself and would otherwise cause abrasion.

Calcar setae = two setae at the ventral apex of a tibia which may be thicker or more robust than other tibial setae, but not longer than these latter setae.

Glandular setae = one or more rows of strongly tapered setae, without setal sockets located on the intersegmental membrane just posterior to sternite I, between the styli but not usually meeting in the mid-line.

Sensory setae = one row of thin setae with large simple sockets located just posterior to the glandular setae when the area is evaginated. When the intersegmental area is invaginated the sensory setae appear to lie anterior to the glandular setae.

Setae A of the forceps = a dorso-median seta of the primitive whorl of large setae at the base of each arm of the forceps (Fig. 1).

Placoid sensillae = disc or oval-shaped sensory areas on the ultimate segment of the antenna, usually in two whorls.

Sensillae of the female = two groups of microsetae with large sockets located at either side of the genital opening of the female on slightly raised areas, which are comparable to the papillae of the male.

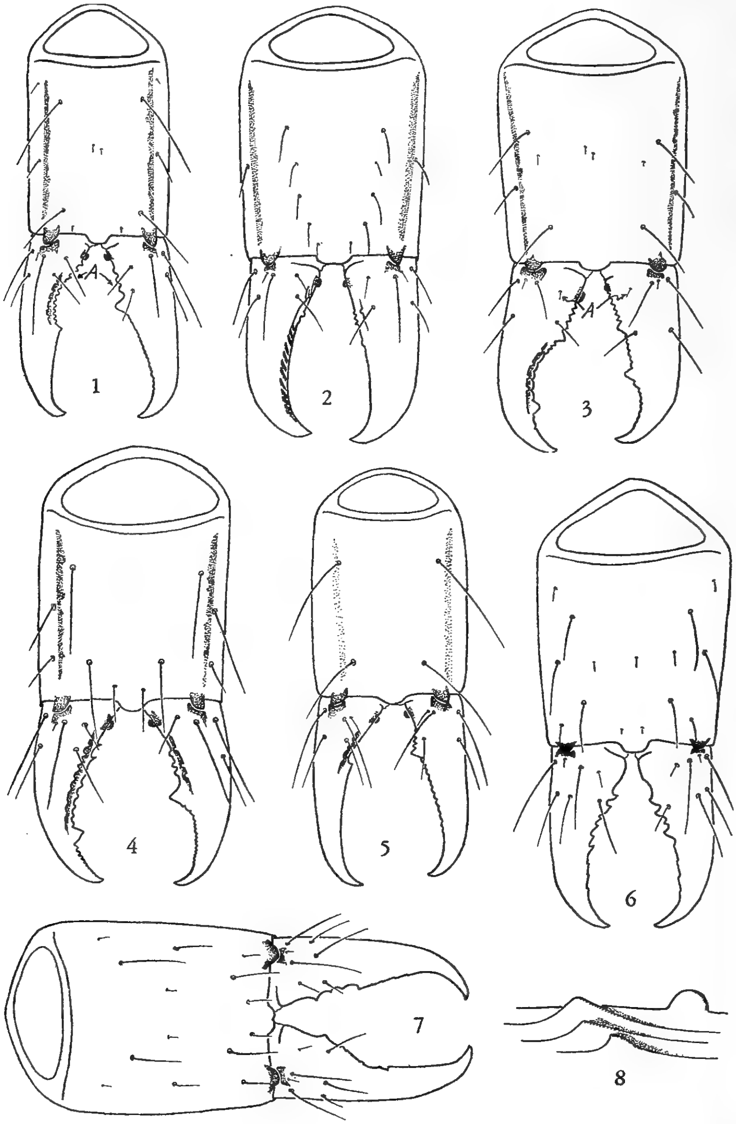
Lateral subcoxal organs = the area occupied by the glandular setae and the sensory setae on the intersegmental membrane posterior to sternite I and between the styli.

Median subcoxal area = an area between the lateral subcoxal organs, usually projected to the rear when the area is evaginated. When this area contains special structures it is often called the median subcoxal *organ*.

Prepleurite = the small anterior sclerite of an abdominal pleuron.
Pleurite = the large posterior sclerite of an abdominal pleuron.
Apotome = the anterior sclerite of an abdominal sternum.
Sternite = the posterior sclerite of an abdominal sternum.
Genital area = the entire area on the intersegmental membrane between segments VIII and IX, devoted to reproduction. This area can only be studied when evaginated and the following definitions relate to the structure when evaginated.
Papillae = two palp-like structures at either side of the genital orifice in the male.
Anterior lobes = two lobes anterior to the genital orifice.
Posterior flap = a large median projection posterior to the genital orifice.
Spermatophore burster = a sclerotized tube or needle-like structure, internal in the female, slightly anterior to the genital orifice. This structure has been called spermatheca by some workers, but spermatophore burster may be its true function.
Carinae = a pair of sclerotized lines on the tergum of segment X or on the sternum of this segment, called dorsal carinae or ventral carinae.
Acropygidium = a semicircular or flatter projection of tergite X in the mid-dorsal region, dorsal to the forceps.
Dorsal articulation of the forceps = a heavily sclerotized ball of a ball-and-socket type of moving joint for the forceps which lies internal in segment X but is distinctly visible in cleared specimens.
Basal buttress = a sclerotized ventral projection of the forceps near their bases, which does not function as a tooth.
Tooth = a larger projection of the ventral edge of either arm of the forceps.
Toothlet = a smaller projection on the forceps which is pointed.
Denticle = a smaller projection on the forceps which is rounded, hemispherical.
Predental = basal to the first large tooth.
Postdental = distal to the last large tooth.
Interdental = between two large teeth.

Valpjapyx, new genus

Distal lamina of lacinia pectinate, lacinia falciform, without a tooth, antenna with 35 to 44 segments, four or more antennal segments showing ventral setal proliferation on midsection of antenna, mandible with five teeth with dorsal tooth small, labrum not emarginate or slightly so, lateral subcoxal organs each occupying one-third of the distance between the styli, glandular setae of two lengths: posterior row with setae twice as long as those in anterior row, longest glandular setae two-thirds as long as stylus, sensory setae half as long as shorter glandular setae, sensory setae separated by width of setal socket, median subcoxal area projecting posteriorly with $3 + 3$ setae on posterior edge, no disculi or pores, tarsal claws unequal, empodium shorter than pretarsus and directed upward, styli with small rounded secondary cone, external seta



FIGS. 1–7. Dorsal views of tergite X and forceps, showing dorsal setae and the first two whorls of setae on the forceps, other setae omitted. 1, *Teljapyx profundus* L. Smith, ♀. 2, *Rossjapyx australis* L. Smith, ♂. 3, *Chiljapyx caltagironei* L. Smith, ♀. 4, *Valpjapyx botani* L. Smith, ♀. 5, *Penjapyx altus* L. Smith, ♂. 6, *Nelsjapyx hichinsi* L. Smith, ♀. 7, *Nelsjapyx soldadi*, ♀. FIG. 8, denticles at base of left arm of forceps of *Rossjapyx australis* L. Smith.

one-fourth to one-half as long as stylus, one basal pore, abdominal tergite I prescutum 1 + 1M, scutum 1 + 1M, tergites I to VI with postero-lateral angles rounded, tergite VII with angles projected to the rear, tergite X between the carinae 2 + 2M and 1 + 1 large posterior m, carinae distinct, convergent posteriorly, acropygidium prominent, rounded, forceps: seta A well developed (Fig. 4), dorsal articulation elongated, pointed to the rear, basal buttress large and conspicuous, both arms of forceps biseriate, right arm with a large slightly premedian tooth, predental tubercles $2/3$, postdental tubercles 12–20, left arm with smaller, postmedian tooth, predental tubercles $8/10$, postdental tubercles 10–12.

Type: *Valpjapyx botani* L. Smith.

Valpjapyx botani, new species

Female: Head with about 18 + 18 long setae and 12 + 12 shorter setae, distal lamina of lacinia with about 12 teeth, lacinia falciform, without tooth or flange, all laminae curved, galea with one external seta, thumb of galea with two lateral setae and about 20 projections of which four large ones form an external line to the apex, terminal segment of maxillary palpus with 22 setae, the longest, median, 1.6 times as long as stylus I, antenna with 35 segments, tapered, segment 3 of antenna with 42 setae of various lengths not distinctly arranged in two whorls, segments 13 to 19 with postero-ventral proliferation of setae between the distal and basal whorl, terminal segment of antenna not hemispherical, placoid sensillae 2, trichobothria equal in length to longest seta on same segment, labial palpus somewhat tapered, three times as long as wide at the base, with 16 setae of which the longest, terminal, almost as long as the palpus.

Thorax: Setae typical except scutum of mesothorax apparently 6 + 6M by strong development of a pair of antero-lateral m, mesocoxa with 4 large and 7 small setae, trochanter with 5 large and 11 small setae, dorsal apex of femur with a close row of 6 setae as follows: 3 large, 1 small, 1 large, and 1 small with the small setae approximately half as long as the long setae, ventral apex of tibia with only one stout calcar seta, tarsi with 6 or 7 large setae in each ventral row, tarsal claws unequal, empodium subequal to pretarsus, parallel to claws.

Abdomen: Tergite I prescutum 1 + 1M, scutum 1 + 1M and a few microsetae, tergite II 3 + 3M and 5 + 5m, tergites III–VII 5 + 5M with discal setae disappearing on posterior segments and replaced by enlarged lateral setae, tergites I–VI with postero-lateral angles rounded, tergite VII with angles projected to rear, tergite VIII dorsal 6 + 6 setae, segment IX dorsal no setae, tergite X between carinae 2 + 2M and 1 + 1 large postero-median m, and microsetae, carinae distinct, convergent, pygidium prominent, rounded. Sternum I apotome 4 + 4M alternating with 5 + 5m, sternite 16 + 16M and 20 + 20m, antecedent setae 19 + 20 in two irregular rows, lateral subcoxal organs each occupying two-fifths of the distance between the styli, composed of two anterior rows of short glandular setae and one posterior row of long glandular setae each about twice as long as the short glandular setae, long glandular setae widely separated 19 + 19, equal in length to stylus I, short glandular setae with bases contiguous, about 40 + 40, sensory setae shorter than the short glandular setae, about 28 + 28, sparse, separated by 2 to 3 times the diameter of a setal socket, median subcoxal area protruding posteriorly with 3 + 3 setae on posterior margin, no disculi or pseudopores. Sterna II–VII apotomes without setae, sternites II–VII 16 + 16M, sternum VIII 8 + 8M, 6 + 6m, and microsetae, genital area: anterior lobes each with 5 long setae and 4 small sensory setae, posterior lobe with a row of 8 small sensory setae, papillary areas with 10 + 12 small sensory setae, spermatophore burster tubular, slightly curved and enlarged anteriorly, segment IX ventral 3 + 3M, segment X between ventral carinae 12 + 12M and 9 + 9m, ventral carinae distinct.

Forceps: Seta A about one-third as long as adjacent long seta, dentition typical for the genus.

Male unknown.

Length of body including forceps: 15.0 mm.

Types: Holotype ♀ in California Academy of Sciences, paratype juvenile ♂ and one-third instar in University of California, Davis.

Habitat: The three above specimens were taken in soil and humus, Jardín Botánico Nacional, near Viña del Mar, Chile, 4 July 1961 by L. M. Smith and Nelson Hichins.

Valpjapyx talcae, new species

Female: Similar to *V. botani* L. Smith except: thumb of galea with 4 lateral setae, terminal segment of maxillary palpus with 32 setae, antenna with 44 segments, segment 3 of antenna with 50 setae of various sizes, placoid sensillae 6, trichobothria half as long as longest seta on same segment, tarsi with 9 or 10 large setae in each ventral row, tergites II–VII 6 + 6M, tergite VIII 5 + 5M, tergite IX 3 + 3m, sternite I antecedent setae 150 + 150 reaching the mid-transverse line of the sternite, long glandular setae about 40 + 40, short glandular setae and sensory setae correspondingly numerous, sterna II–VI with 25 + 25M and numerous m, sternum VII with 22 + 22M, sternum VIII with 7 + 7M, forceps seta A three-fourths as long as adjacent long seta.

Male unknown.

Length of body including forceps: 23.0 mm.

Types: Holotype ♀ in California Academy of Sciences, two juveniles in University of California, Davis.

Habitat: All three specimens collected 22 miles north of Talca, Chile, 22 December 1950 by Ross and Michelbacher.

Teljapyx Silvestri, 1949

Silvestri's original description was very brief. The following paragraph defines the genus in more detail.

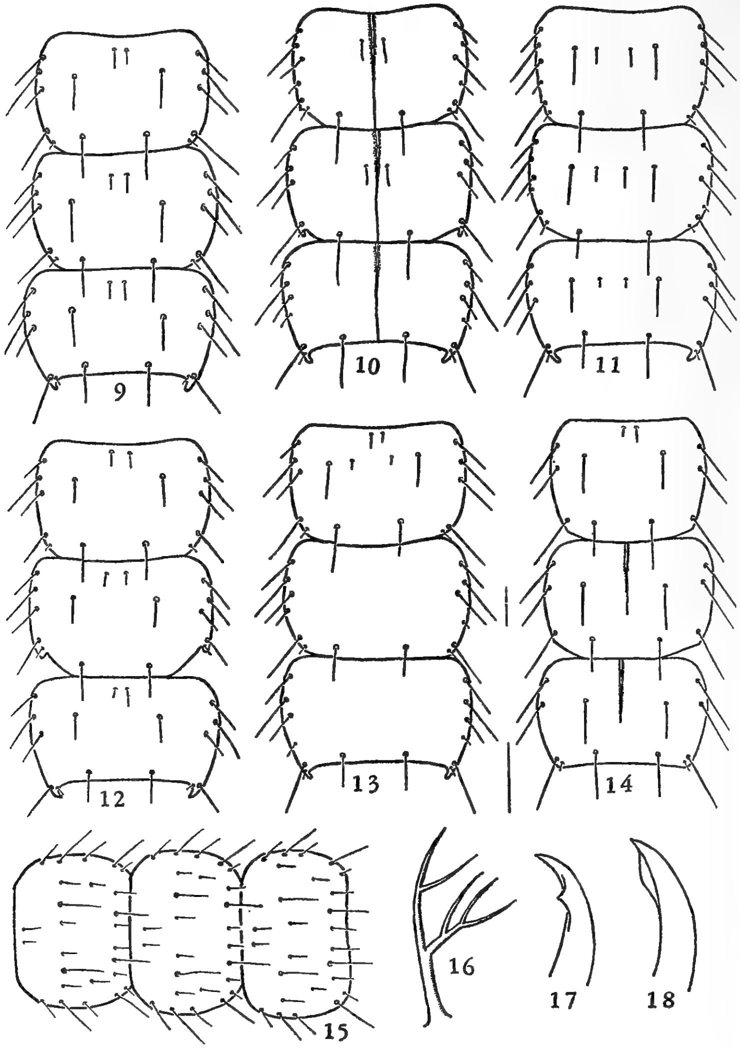
Distal lamina of lacinia pectinate, lacinia with slight subapical flange, antenna with 30 segments strongly tapered apically, four or more midsegments of the antenna showing setal proliferation, mandible with 5 teeth, labrum emarginate, lateral subcoxal organs each occupying about two-fifths of the distance between the styli, glandular setae of two lengths: one posterior row of long setae, each about half as long as stylus I, and two or three anterior rows of short glandular setae about half as long as the long glandular setae, one close row of sensory setae each about half as long as the short glandular setae, median subcoxal area only slightly projected to the rear with 1 + 1 microsetae and 2 + 2 pores, tarsal claws markedly unequal, empodium strongly developed, longer than the pretarsus and parallel to the claws, styli I–VII with large, pointed secondary cone, one seta half as long as the stylus, and two pores, abdominal tergum prescutum with 1 + 1M, scutum with 1 + 1M postero-median or these may be reduced to m, tergite VII with postero-lateral angles projected to the rear, tergite VI angles rounded, or slightly projected to the rear, tergite X between the carina 2 + 2M and a pair of medio-lateral m which may be strongly developed in some species, carinae distinct, parallel, acropygidium prominent, rounded, forceps seta A well developed (Fig. 1), dorsal articulation elongate, pointed to the rear, basal buttress present, right arm of forceps uniseriate, large premedian pointed tooth, predental tubercles 3 slightly separated, postdental margin crenulate, left arm basal half arcuate with $\frac{9}{10}$ denticles of which the basal two or three are pointed and the others rounded and slightly separated from one another, median tooth small and continuous with the postdental margin which is entire.

Type: *Teljapyx riestrae* Silv. 1949 (original designation).

Teljapyx profundus, new species

Female: Head with about 16 + 16M and an equal number of large m, distal lamina of lacinia with 16 teeth, all laminae curved, galea with one external seta, thumb of galea slightly sclerotized with 3 terminal projections longer than the others, terminal segment of maxillary palpus with 23 setae, the largest, median, 1.2 times the length of the palpal segment, mandible with 5 teeth, antenna with 30 segments, tapered, segment 3 of antenna with a distal whorl of 25 setae and a basal whorl of 12 setae, longest seta 1.2 times greatest diameter of segment 3, trichobothria half as long as longest adjacent seta, setal proliferation on antennal segments 8–12, ultimate segment (sclerotized portion) 1.5 times as long as wide, placoid sensillae large, conspicuous in two whorls of 3 each, labial palpus tapered near the tip, three times as long as wide at the base, with 14 setae of various lengths, the longest, terminal equal in length to the palpus.

Thorax: Normal 10, 10, 10 and a few large m, with 1 + 1M on prescuta, longest seta 0.3 as long as corresponding tibia, mesocoxa with 3 large setae and 11 small setae, trochanter with 4 large setae and 9 small setae, dorsal apex of femur with a row of 4 setae, anterior one largest, tibia with one calcar seta distinguishable, tarsi with 5–6 large setae per ventral row, tarsal claws and empodium typical for genus.



FIGS. 9–15. Dorsal views of tergites V, VI and VII. 9, *Chiljapyx caltagironei* L. Smith, ♂. 10, *Teljapyx profundus* L. Smith, ♀. 11, *Valpjapyx talcae* L. Smith, ♀. 12, *Rossjapyx australis* L. Smith, ♂. 13, *Valpjapyx botani* L. Smith, ♀. 14, *Penjapyx altus* L. Smith, ♂. 15, *Nelsjapyx hichinsi* L. Smith, ♀. FIG. 16, branched seta from male sac, urite III, *Rossjapyx australis* L. Smith. FIG. 17, lacinia of *Chiljapyx caltagironei* L. Smith, showing a tooth. FIG. 18, lacinia of *Rossjapyx australis* L. Smith, showing a flange.

Abdomen: Tergite I prescutum 1 + 1M, scutum 8 + 8 microsetae, tergum II 3 + 3M, terga III–VI 6 + 6M with antero-median pair reduced posteriorly, tergum VII 5 + 5M by complete loss of antero-median pair, tergum VIII 4 + 4M, tergum IX 3 + 3 microsetae, tergum X between carinae 2 + 2M and 4 + 4 small m, all prescuta without setae, tergites VI and VII with postero-lateral angles projected to the rear, sides convex. Sternum I apotome 3 + 3M alternating with 4 + 4m, sternum 16 + 16M, antecedent setae small 28 + 30, lateral subcoxal organs each occupying two-fifths of the distance between the styli composed of one posterior row of long glandular setae and 3 rows anterior shorter glandular setae, sensory setae shorter than the short glandular setae, sockets nearly contiguous, about 50 + 50, median subcoxal area slightly projected to the rear, with 2 microsetae and 4 pores, sterna II–VII apotomes without setae, sternites II–VII with 17 + 17M, sternite VIII 7 + 7M and many microsetae, genitalia typical, sensillae 9 + 9, segment IX ventral 3 + 3M, sternite X between the ventral carinae 10 + 10M large setae of uniform size, scattered m and microsetae.

Forceps: Seta A half as long as adjacent long seta, dentition typical for the genus.

Male unknown.

Length of body including forceps: 17 to 21 mm.

Type: Holotype ♀ in California Academy of Sciences, paratype ♀ in University of California, Davis.

Habitat: Two females (above) found in loam soil 12 to 24 inches deep, Quebrada El Soldado, El Cobre, Valparaiso Province, Chile, 15 July 1961 by L. M. Smith and Nelson Hichins.

Teljapyx riestrae Silvestri, 1949

I have not seen specimens of this species. Silvestri described it from Temuco, Chile.

Teljapyx megalocerus (Silv.) 1901

Silvestri (1949) reported this species from Talcahuano, Concepción Province, Chile. This species does not fit well into the genus, but must remain here pending further collections and study.

Key for the Separation of the Species of *Teljapyx*

1. Left arm of forceps with a large basal tooth, antenna with 52 segments, pronotum 6 + 6M, glandular setae all same length, median subcoxal area with 3 + 3 small setae, no pores, antennal segments clothed with hundreds of small setae .... *T. megalocerus* (Silv.)

   Left arm of forceps without basal tooth, antenna with 30 segments, pronotum 5 + 5M, glandular setae of two distinct lengths, median subcoxal area with 1 + 1 small setae and 2 + 2 pores, antennal segments not with vestiture of small setae 2

2. Abdominal scutum I 1 + 1M, tergite VI postero-lateral angles rounded, antecedent setae 100 + 100, length of body 14 mm,

discal area of abdominal tergites V–V11 with 2 + 2M .... *T. riestrae* Silv.

Abdominal scutum I with no large setae, tergite VI postero-lateral angles projected to the rear, antecedent setae 28 + 30, length of body 17–21 mm, discal area of abdominal tergites V–VII with 1 + 1M .... *T. profundus* L. Smith

Nelsjapyx, new genus

Distal lamina of lacinia pectinate, lacinia falciform without a tooth, antenna with 26 segments (in type species), no distal proliferation on midsegments of antenna, labrum emarginate, mandible with four teeth, lateral subcoxal organs each occupying one-fourth of the distance between the styli, glandular setae subequal in length, arranged in a single row, sensory setae half as long as glandular, spaced about the width of one setal socket apart, median subcoxal area projecting posteriorly without disculi or pores, but with 2 + 2 microsetae, tarsal claws subequal, empodium absent or minute, styli with small secondary cone, external seta, and no pores, abdominal tergite I prescutum 1+1M, and 1+1+1m, scutum 4 + 4M and 3 + 3 large m near the mid-line, all tergites with postero-lateral angles broadly rounded, tergite X dorsum 3 + 3M and 6+1+6m, dorsal carinae absent, forceps seta A small (Fig. 6), articulation rounded, basal buttress absent, forceps nearly symmetrical, with toothlets but no denticles, both arms uniseriate, right arm with three toothlets in basal half, left arm slightly arcuate with two basal toothlets followed by 8 smaller toothlets. Males without setose sacs in segments III or IV.

Type: *Nelsjapyx hichinsi* L. Smith.

Nelsjapyx hichinsi, new species

Female: Head with about 15 + 15M dorsally, labrum emarginate, distal lamina of lacinia with 5 to 6 teeth, all laminae curved except the distal one, galea with one external seta, thumb of galea with usual projections, terminal segment of maxillary palpus with 8 setae of various sizes with the longest basal on the segment, mandible with 4 large teeth and a small dorsal knob representing the fifth tooth, antenna with 26 segments, very slightly tapered terminally, segment 3 with a distal whorl of 5M ventral and 2m dorsal, and a basal whorl of 3M dorsal and 2m ventral, terminal segment of antenna nearly hemispherical, placoid sensillae not visible, trichobothria as long as longest antennal seta on same segment, labial palpus barely tapered, twice as long as wide at the base, with 5 setae, two terminal slightly longer than the palpus.

Thorax: Prothorax with 5 + 5M and 4 + 4 large m, mesothorax prescutum 1 + 1M and 1 + 1m, scutum 5 + 5M and 6 + 6 large m, metathorax prescutum 1 + 1M and 2 + 2m, scutum 5 + 5M and 5 + 5 large m, legs: coxa 5 setae, trochanter 6 setae, dorsal apex of femur with a row of four large subequal setae, tibia with calcar setae not different from other large setae on the tibia, tarsi with 3 large ventral setae per row, tarsus strongly tapered to the tip, pretarsus small, empodium absent.

Abdomen: Tergite I prescutum 1 + 1M and 1 + 1 + 1m, scutum 1 + 1M and 6 + 6 large m, tergites II–VII 5 + 5M and 6 + 6 large m, tergite VIII 4 + 4M and 6 + 6 large m, tergite IX 4 + 4 setae on posterior margin, tergite X 3 + 3M and 7 + 1 + 7m on dorsum, dorsal carinae absent, pygidium broad and flat, not prominent. Sternum I apotome 3 + 3M and 4 + 4m alternating, sternite 9 + 9M and 11 + 11m, antecedent setae 7 + 7 in a straight row, lateral subcoxal organs protruding, each occupying one-fourth of the distance between the styli, glandular setae 12 + 14, all same length, arranged in a single row, length of seta half length of stylus I, sensory setae 10 + 12, half as long as glandular setae, distance between sensory setae once or twice socket diameter, median subcoxal area with posterior extension, rugose or wrinkled, no pores or disculi, but with 2 + 2 microsetae. Sterna II–VII apotomes without setae, sternites 16 + 16M and 16 + 16m, sternite VIII 7 + 7M and 12 + 12m, genital area: anterior lobes each with 5 long setae, posterior flap with 13 long setae, genital orifice not ringed with setae, at either side a raised area with 4 or 5 small sensory setae, spermatophore burster tubular; ventral portion of IX with 2 + 2M, sternum X 8 + 8M and 14 + 14m, ventral carinae indistinct. Abdominal pleurae: prepleurite with 1M and 1m, pleurite 2M and 3m. Styli uniformly tapered to a point.

Forceps: Right arm from base to tip: 2 large toothlets, one very small toothlet, one large toothlet, and 5 small flat toothlets, left arm from base to tip two large toothlets and 7 small toothlets.

Male: Similar to female, male genital papillae conical, 1.5 times as long as wide at the base, mesad surface with many long setae, laterad 4 long setae, genital orifice ringed with many small setae, no sensory sensillae on genital papillae, genital flap with one posterior row of 4 long setae and anterior row of 8 shorter setae. No male sacs in III or IV.

Length of body including forceps: average, females 6.5, males 6.0 mm.

Types: Holotype ♀ and paratype ♂ in California Academy of Sciences, paratypes in USNM, California Insect Survey, and University of California, Davis.

Habitat: Type female, 31 paratype females and 25 paratype males all collected at Jardín Botánico Nacional, Viña del Mar, Chile, by L. M. Smith and Nelson Hichins on 16 May and 4 July 1961. This species lives readily in dry leaf mold, and was found there during the dry season. In alcohol, specimens become very adhesive and all debris clings to them. A protective covering, like mucus (in alcohol) appears on the body and cannot be removed in lacto-phenol. Probably a special body coating enables this species to live under dry conditions, inimical to all other japygids.

Species dedicated to the collector, Mr. Nelson Hichins.

Nelsjapyx soldadi, new species

Similar to *N. hichinsi* L. Smith except: third segment of antenna with a distal whorl of 6 large setae ventral and 2m dorsal, terminal segment with 2 placoid sensillae visible, labial palpus with 8 setae, six of which are large, trochanter with 7 setae, tarsi with four large ventral setae per row, empodium present, shorter than pretarsus, and pointed upward, antecedent setae 18 + 17 in two irregular rows, lateral subcoxal organs each occupying one-third of the distance between the styli, glandular setae 18 + 18, sensory setae 24 + 24, setal sockets not separated from one another, sternum X 9 + 9M, forceps left arm from base to tip two toothlets and arcuate margin, right arm four toothlets.

Length of body: average, females 6.0, male 5.0 mm.

Types: Holotype ♀ and paratype ♂ in California Academy of Sciences, paratypes in USNM and University of California, Davis.

Habitat: Type female, 3 paratype females and one male, 3 to 16 inches deep in loam soil, Quebrada El Soldado, El Cobre, Valparaiso Province, Chile, 15 July 1961 by L. M. Smith and Nelson Hichins. This species also has the gummy integument (in alcohol) as in *N. hichinsi.*

Chiljapyx, new genus

Distal lamina of lacinia pectinate, lacinia usually with 1 or 2 teeth, antenna with 30 segments (in type species), setal proliferation on mid-segments of the antenna, lateral subcoxal organs each occupying about one-fourth of the distance between the styli, and showing one to four rows of glandular setae in the male, and only one row of glandular setae in the female, sense setae not minute, medium subcoxal area without protruding flap and from 3 to 6 minute setae with large sockets at each side, no disculi, empodium between tarsal claws slightly longer than pretarsus and directed upward, all styli with large secondary cone, one large external seta and one or two basal pores, tergite I prescutum with 1 + 1M, scutum 2 + 2M, tergite VII with postero-lateral angles projected to the rear, tergite VI not projected, tergite X between the carinae 2 + 2M, forceps seta A minute, see Fig. 3, basal buttress well developed especially on left arm of forceps, dorsal articulation of forceps rounded, right arm with one premedian and one postmedian tooth, predental margin with (4–6) sharp toothlets, interdental margin uniseriate with (5–7) sharp toothlets, postdental margin crenulate, left arm of forceps with one basal and one distal tooth (which can encompass the large teeth of the right arm when the forceps close), predental margin with (4–6) sharp toothlets, interdental margin biserially dentate, postdental margin crenulate. Male without setose sacs in III or IV.

Type species: *Chiljapyx caltagironei* L. Smith.

This genus is similar to the genera *Hecajapyx* and *Occasjapyx* (Smith, 1959), which are known only from California, U.S.A., in the following respects: dentition of the forceps, basal buttress present, postero-lateral angles of tergite VII projected to the rear, seta A of the forceps minute, no disculi on the median subcoxal area, and males without setose sacs in urites III or IV. It may be that these three genera form a natural or phylogenetic group. They can be recognized by the following key:

1. Dorsal articulation of forceps rounded, distal lamina of lacinia

pectinate, antennal segments 30 .... *Chiljapyx*
Dorsal articulation of forceps projected and pointed posteriorly, distal lamina of lacinia falciform, antennal segments 24 2

2. Median subcoxal area with two groups of short setae with large sockets, terminal segment of the antenna twice as long as wide, four midsegments of the antenna with marked proliferation of setae, abdominal tergite I with 2 + 2M, postero-lateral angles of tergite V projected to the rear, tergite X between the carinae 2 + 2M .... *Occasjapyx*
Median subcoxal area without setae with large sockets, terminal segment of the antenna about as long as wide, no proliferation of setae on the antenna, abdominal tergite I with 3 + 3M, postero-lateral angles of tergite V rounded, not projected to the rear, tergite X between the carinae 2 + 1 + 2M .... *Hecajapyx*

Chiljapyx caltagironei, new species

Female: Head with 15 + 15M dorsally, labrum emarginate, lacinia with large median tooth, distal lamina of lacinia pectinate and nearly as long as the next lamina, all laminae curved, galea with two external setae, thumb of galea with many small projections and terminally three strong curved projections, terminal segment of maxillary palpus with 14 setae, four of which are very long, mandible with four strong teeth and a lateral knob representing the fifth tooth, antenna with 30 segments, slightly tapering apically, segment 3 with a whorl of 8 large setae and a basal whorl of 8 small setae, trichobothria ½ to ⅔ as long as the longest adjacent antennal seta, terminal segment of antenna narrower than the penultimate, placoid sensillae four, terminal four segments of antenna with minute circular sense organs as follows: segment 27 one, 28 three, 29 five, and segment 30 three, labial palpus with eight setae the two terminal of which are as long as the palpus.

Thorax: Normal, scuta each with 10M, legs normal, coxa with 3 setae, trochanter 4 setae, femur with a dorsal apical row of 4 subequal setae, tibia with two large calcar setae, tarsus with two ventral rows of 5 setae each, tarsal claws unequal, empodium as long as the pretarsus and pointed somewhat upward.

Abdomen: Tergite I 3 + 3M, tergite II–VI 7 + 7M, with postero-lateral angles rounded, tergite VII 7 + 7M with postero-lateral angles projected to the rear, sides convex, tergite VIII dorsally 2 + 2M, postero-lateral angles slightly projected to the rear, tergite IX 3 + 3m on the posterior margin, tergite X between the carinae 2 + 2M and 1 + 2 + 1m. Sternum I apotome 3 + 3M, sternite 16 + 16M and 30 + 30 shorter antecedent setae arranged in two irregular rows just anterior to the lateral subcoxal organs, each lateral subcoxal organ occupying one-fourth of the distance between the styli, composed of one irregular row of glandular setae the same length as the antecedent setae and a row of contiguous sensory setae, one-third as long as the glandular setae, glandular setae 8 + 8 in older specimens to 6 + 6 in young adults and

5 + 5 in the third instar, sensory setae as numerous as the glandular setae. Median subcoxal area without posterior extension and with 5 + 5 minute setae with large sockets in older specimens. Sterna II to VII apotomes no setae, sternites 16 + 16M and many microsetae, sternite VIII 7 + 7M, genital area with paired anterior lobes each bearing 10 minute setae with large sockets on the posterior surface and about 10 long setae on the anterior surface, posterior large median unpaired lobe with 5 + 5 sensory-type setae near the distal margin on the anterior surface, posterior surface with large setae, papillae at either side of genital orifice slightly raised and bearing 7 to 10 short sensory setae each, genital opening not ringed with setae, spermatophore burster a slender tube, ten times as long as wide, slightly swollen posteriorly, sternite IX 2 + 2M, sternite X 8 + 8M, ventral carinae distinct, acropygidium distinct, rounded. Abdominal pleurae: prepleurite 1M, pleurite 1M and 2m. Styli typical.

Forceps: Right arm uniserial with two prominent teeth near median, predental margin with 6 sharp toothlets (4 in young specimens), interdental 6 toothlets grading posteriorly into denticles, postdental margin with 8 visible crenulations; left arm with two prominent teeth, one basal and one distal, predental margin uniserial with 7 sharp toothlets (5 in young adults), interdental margin with 4/8 denticles, postdental margin crenulate.

Male: Similar to female, except stage I male with one row of glandular setae in the lateral subcoxal organs, average 6 + 7 setae, stage II with two rows of glandular setae, average 25 + 25 setae, stage III males with three rows of glandular setae, average 45 + 45 setae, and stage IV males with 4 rows of glandular setae, average 75 + 75 setae. Male genital papillae conical as wide at the base as long, mesad surface of papilla with 11 setae each as long as the papilla, shorter setae on the laterad side, genital orifice ringed with 20 setae anteriorly and 20 larger setae posteriorly, posterior flap with 50 large uniform setae.

Length of body including forceps: average, five largest females 12.0, five largest males 10.0 mm.

Types: Holotype ♀ and paratypes in California Academy of Sciences, paratypes in USNM, California Insect Survey, Berkeley, and University of California, Davis.

Habitat: Type female, 8 paratype females, 10 paratype males, and 10 juveniles collected in humus and soil, Olmué, near Limache, Chile, 21 April 1961 by L. M. Smith and N. Hichins; 2 males, 2 females and one juvenile, Jardín Botánico Nacional, Viña del Mar, Chile, 4 July 1961 by L. M. Smith and N. Hichins; 5 males, 3 females, and one juvenile, 3 to 16 inches deep in soil, Quebrada El Soldado, El Cobre, Chile, 15 March 1961, L. M. Smith and N. Hichens; 6 females, 1 male and 1 juvenile, Hacienda La Palma, Quillota, Chile, 12 August 1961 by N. Hichins; 4 females and 2 males, Cerro El Quisco, Quillota, Chile, 1 August 1961, 19 males, 18 females and 5 juveniles, El Soldado, El Cobre, Valparaiso

Province, Chile, 18 October 1961, by L. Caltagirone and N. Hichins.
Dedicated to Dr. L. E. Caltagirone.

Silvestri (1948–49) named the new genus *Hapljapyx* and as a description stated how it differed from *Austrjapyx*. The type is *Hapljapyx lopesi* Silv. from Brazil. In this same publication Silvestri described 14 species in this genus collected in Brazil, Argentina, Paraguay, Chile, and Nairobi, Africa. A study of these species shows that the glandular setae of the lateral subcoxal organ may be of unequal length, same length, in one row, or several rows; the median subcoxal organ may be devoid of structures, or with pseudopores, or setae, or special loop-shaped structures, male sacs may be absent, or present on segment III, or III and IV, with or without internal setae, postero-lateral angles or tergite VII may be projected to the rear, or not projected, simply rounded, antennae with 24 to 34 segments. It thus appears that this genus is a catchall, and not susceptible of definition. Silvestri's two Chilean species may be identical and show characters different from other species now in the genus *Hapljapyx*. I therefore place them in the new genus *Rossjapyx* and define it as follows.

Rossjapyx, new genus

Distal lamina of lacinia pectinate, lacinia with a subapical flange, antenna with 27 segments (in type species), no setal proliferation on midsegments of the antenna, lateral subcoxal organs each occupying about one-third of the distance between the styli, glandular setae subequal in length, arranged in 1 to 3 rows, sensory setae almost as long as the glandular setae, and widely spaced, few in number, median subcoxal area protruding posteriorly, without disculi or pseudopores, but with $2 + 2$ microsetae, empodium as long as pretarsus and parallel to tarsal claws, all styli with large secondary cone, one large external seta and one basal pore, abdominal tergite I prescutum with $1 + 1$M, scutum $2 + 2$M, tergites VI and VII with postero-lateral angles projected to the rear (rarely VI not so), tergite X between the carinae $3 - 4 + 3 - 4$M or $2 + 1 + 2$M but carinae often faint or absent, forceps setae A small (Fig. 2), basal buttress small, dorsal articulation of forceps elongate pointed to the rear, forceps nearly symmetrical with denticles located only in the basal third of each arm, right arm usually uniseriate with two or three small denticles, but rarely ⅓, the rest of margin slightly crenulate, left arm with 1/1/1/1 followed by 3 to 5 small hemispherical denticles widely separated, or these latter may be absent, inner face of right arm with 15 ± vertical ridges sclerotized. Male with setose sacs in III and IV with $6 - 12 + 6 - 12$ branched setae.

Type: *Rossjapyx australis* L. Smith.

Rossjapyx australis, new species

Female: Head with about $15 + 15$M dorsally, labrum emarginate, lacinia falciform without a tooth, distal lamina of lacinia pectinate, and nearly as long as the next lamina, all laminae curved, galea with one external seta, thumb of galea with many small projections and terminally three larger curved projections, terminal segment of maxillary palpus with 17 setae, 6 of which are very long, mandible with 4 strong teeth and a dorsal knob representing the fifth tooth, antenna with 27 segments, slightly tapering apically, segment 3 with a whorl of 12 large setae and a basal whorl of 12 smaller setae, terminal segment of antenna narrower than penultimate, placoid sensillae three, trichobothria one-half to two-thirds as long as adjacent longest antennal setae, labial palpus tapered 2.6 times as long as wide at the base, with 8 setae the two terminal of which are slightly shorter than the palpus.

Thorax: Normal, scuta each with 10M, legs normal, coxa with 4 setae, trochanter with 10 setae, femur with a dorsal apical row of 3 long, 1 short, and 1 long, tibia with one calcar seta clearly thicker than other tibial setae, tarsi with 4 or 5 large ventral setae per row, tarsal claws unequal, empodium longer than the pretarsus and pointed slightly upward.

Abdomen: Tergite I 3 + 3M, tergites II–VII with 7 + 7M, postero-lateral angles of tergites II–V rounded, of tergites VI and VII slightly projected to the rear as blunt processes, sides convex, tergite VIII dorsally 3 + 3M, postero-lateral angles slightly projected to the rear, tergite IX 3 + 3m on posterior margin, tergite X between the carinae 4 + 4M and 4 + 4m and a few microsetae, carinae indistinct. Sternum I apotome 3 + 3M alternating with 3 + 3m, sternite 16 + 16M, and 12 + 12 shorter antecedent setae arranged in two irregular rows just anterior to the lateral subcoxal organs, each lateral subcoxal organ occupying one-third of the distance between the styli, composed of 2 to 3 rows of glandular setae subequal in length and one-half as long as the antecedent setae, a sparse row of sensory setae, widely spaced, varying from 2 to 12 on each side, as long as the glandular setae, glandular setae 50 – 100 + 50 – 100, median subcoxal area with posterior extension, rugose, with 2 + 2 microsetae, no other structures. Sterna II–VII apotomes with no setae, sternites 16 + 16M and many microsetae, sternite VIII 8 + 8M and 6 + 6m, genital area normal with 8 – 12 + 8 – 12 short sensory setae at either side of the genital orifice on slightly raised areas, spermatophore burster a slender tube ten times as long as wide, not swollen posteriorly, ventral portion of IX with 3 + 3M, sternite X with 10 + 10M, ventral carinae indistinct, acropygidium distinct, rounded rugose, abdominal pleurae: prepleurite 1M, pleurite 1M, 2m, and 7 microsetae. Styli typical.

Forceps: Typical for the genus.

Male: Similar to female. Male genital papillae conical, twice as long as wide at the base, mesad surface with 9 long setae, laterad 5 minute sensory setae and 2 long setae, posterior flap with 8 large setae in one transverse row, each seta longer than the genital papilla. Male setose sac in III with 16–18 branched setae, and in IV with 8–13 branched setae.

Length of body including forceps: average, 2 males 14.0, 3 females 15.0 mm.

Types: Holotype ♀ in USNM, paratypes in California Academy of Sciences and University of California, Davis.

Habitat: Type female, Mocopulli, Chiloe, Chile, 22 February 1945 by E. A. Chapin; 1 ♂ and 1 ♀ Los Muermos, Llanquihue, Chile, 20 January 1951, Ross and Michelbacher; 1 ♀ 8 miles west of Puerto Varas, Llanquihue, Chile, 24 January 1951, both by Ross and Michelbacher.

Genus dedicated to Dr. Edward S. Ross.

Rossjapyx anodus (Silv.)

Hapljapyx anodus Silv. 1948–49.

Hapljapyx subanodus Silv. 1948–49.

Female: Similar to *R. australis* except: segment 3 of antenna with basal whorl of 6 small setae, coxa with 8 setae, trochanter with 14, abdominal tergite I 2 + 2M, tergite VIII 4 + 4M, tergite X 3 + 1 + 3, carinae distinct, sternite VIII 7 + 7M, segment X with ventral carinae distinct, abdominal pleurae: prepleurite 1M, pleurite 2M + 1m and 10 microsetae.

Male: Similar to *R. australis* with 12–24 branched setae in sacs on III and IV.

Silvestri (1949) described *H. anodus* from Temuco and *H. subanodus* from Coipué near Villa Rica, Chile. These two occur 75 miles apart in similar terrain. They were distinguished by a single row of glandular setae in *anodus* as compared to 2 rows in *subanodus*. I have examined a topotype ♀ of *anodus* from Temuco and this specimen shows two rows of glandular setae. It is well known that the number of rows of glandular setae may increase in some species with successive adult molts and they are therefore regarded as synonymous.

Penjapyx, new genus

Distal lamina of lacinia pectinate, lacinia with small subapical tooth, antenna with 32 segments, strongly tapered apically, 4 or more mid-segments of the antenna showing setal proliferation, mandible with 4 teeth and a small obtuse projection representing the fifth tooth, labrum emarginate, lateral subcoxal organs each occupying about one-fourth of the distance between the styli, glandular setae all same length, four-tenths as long as stylus I, arranged in one row, sensory setae half as long as glandular setae, separated by width of setal socket, median subcoxal area slightly projected to the rear with 2 + 2 microsetae, no pores or disculi, tarsal claws unequal, empodium absent or very small, styli I–IV with large, pointed secondary cone, external seta subequal in length to stylus, one basal pore, abdominal tergite I prescutum with 1 + 1M and 2 + 2 microsetae, scutum 1 + 1M and some microsetae, tergites I–VII with 5 + 5M and with postero-lateral angles rounded, tergite X between the carinae 2 + 2M, carinae distinct, parallel, acropygidium prominent, rounded, forceps seta A one-fourth as long as adjacent long seta, dorsal articulation rounded, basal buttress present, right arm of forceps uniseriate, premedian, pointed tooth, predental tubercles 3, postdental crenulations 15–20, left arm basal portion slightly arcuate with 5/6 denticles, rest of margin smooth. Male without setose sacs in III or IV.

Type: *Penjapyx altus* L. Smith.

Penjapyx altus, new species

Male: Head with 9 + 9M and a few microsetae, distal lamina of lacinia with 10 teeth, all laminae curved, galea with one external seta, thumb of galea with one lateral seta, thumb sclerotized, and three terminal projections forming hooks directed toward the mouth, terminal segment of maxillary palpus with 15 setae of various sizes, the largest of which, median, 1.2 times length of palpal segment, mandible with 4 teeth, antenna with 32 segments, tapered, segment 3 of antenna with distal whorl of 10 setae, 6 of which long, and basal whorl of 12 setae, 3 of which long, segments 8 to 15 with postero-ventral proliferation of setae between distal and basal whorl, terminal segment not hemispherical but somewhat elongate, placoid sensillae 6, trichobothria half as long as longest seta on same segment, labial palpus slightly tapered, 2.5 times as long as wide at the base, with 8 setae of which two terminal, longest, slightly longer than the palpus.

Thorax: Classical 10, 10, 10 setae on scuta, each as long as corresponding tibia, not confused by large m, mesocoxa with 4 setae and 2 microsetae, trochanter with 4 setae and some microsetae, dorsal apex of femur with a row of 4 subequal setae, tibia with two calcar setae nearly equal, tarsi with 6 stout setae per ventral row, tarsal claws unequal, empodium a small swelling on the pretarsus.

Abdomen: Tergite I prescutum 1 + 1M, scutum 1 + 1M, and a few microsetae, terga II–VII 5 + 5M, angles rounded, tergite VIII dorsal 6 + 6M, IX dorsal no setae, X between carinae 2 + 2M, carinae distinct, parallel, pygidium distinct, flattened. Sternum I apotome 3 + 3M and 2 + 2m, sternite 13 + 13M, and some microsetae, antecedent setae: a group of 9 laterad of each stylus, 26 + 29 anterior to lateral subcoxal organs, and 6 + 6 anterior to median subcoxal area, lateral subcoxal organs each occupying one-fourth of the distance between the styli, composed of one row of equal glandular setae 21 + 24 and sensory setae 23 + 25 separated by the width of one setal socket, median subcoxal area projecting slightly to rear with 2 + 2 microsetae, no pores or disculi, sterna II–VII apotomes without setae, sternites II–VI 15 + 15M and microsetae, sternite VII 14 + 14M, sternite VIII 7 + 7M, segment IX ventral 3 + 3M, genital area: papillae rounded at apex, 1.5 times as long as wide at the base, mesad surface covered with short setae, laterad surface without setae, genital orifice ringed with small setae, posterior flap with a row of 12 long setae, segment X between ventral carinae 8 + 8M and 1 + 1 postero-median m.

Forceps: Seta A one-fourth as long as adjacent seta, dentition typical for the genus.

Female unknown.

Length of body including forceps: 12 mm.

Type: Holotype ♂ in California Academy of Sciences.

Habitat: La Laguna, Cordillera de Coquimbo, Chile, November 1957, 6,600 feet elevation, by Mr. L. E. Peña.

Silvestri (1949) erected the genus *Merojapyx* with *M. speggazzinii* Silv. as the type. This Argentinian species was characterized by having the postero-lateral angles of the seventh tergite conspicuously projected to the rear. In the same publication Silvestri described *Merojapyx porteri* from a single juvenile female and *Merojapyx riverosi* from a single juvenile male, both from Chile. These two specimens, according to Silvestri, do not have the postero-lateral angles of the seventh tergite projected to the rear, and for other reasons cannot be assigned to the genus *Merojapyx*. In the same publication, Silvestri redescribed *Merojapyx bidentatus* Schaffer (under the name *bidentaus*!) from a specimen collected in Chile, but he stated that it disagreed in important characters with Schaffer's description. From these facts, I conclude that the genus *Merojapyx*, native of Argentina, has not yet been demonstrated to occur in Chile.

Key to Genera of Chilean Japyginae

1. Both arms of forceps uniserially dentate, dorsal carinae of segment X absent, abdominal tergites with 12 large m, antenna with 26 segments .... *Nelsjapyx*
   Left arm of forceps biserially dentate, dorsal carinae of segment X present, abdominal tergites with less than 6m, antenna with more than 26 segments 2
2. Forceps without large teeth, basal denticles and toothlets only, biserial on right arm and in four ranks on left arm, segment X with 5 + 5 setae between dorsal carinae, antenna with 27 segments .... *Rossjapyx*
   Each arm of forceps with at least one large tooth, segment X with 2 + 2M or 3 + 3M between dorsal carinae, antenna with 30 or more segments 3
3. Teeth of both arms of forceps premedian or one median, segment X 1.2 times as long as wide 4
   Left arm of forceps with a distinctly postmedian tooth, segment X as wide as long 5
4. Left arm of forceps with tooth median, tergites VI and VII with postero-lateral angles projected to the rear, and with 3 + 3 antero-lateral M, antenna with 30 segments .... *Teljapyx*
   Left arm of forceps with tooth premedian, tergites VI and VII with postero-lateral angles not projected to the rear, and with 2 + 2 antero-lateral M, antenna with 32 segments .... *Penjapyx*
5. Both arms of forceps biserially dentate, each arm with one large tooth, dorsal articulation pointed, seta A of forceps about one-third as long as adjacent large seta, antenna with 35 to 44 segments .... *Valpjapyx*

Right arm of forceps uniserially dentate, each arm with two large teeth, dorsal articulation rounded, seta A of the forceps reduced practically to microseta, antenna with 30 segments .... *Chiljapyx*

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Vol. 75, pp. 293–294 28 August 1962

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

A NEW TORTRICID GENUS FROM SOUTH AMERICA

By J. F. Gates Clarke
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This genus is described here to provide a name for a number of South American Tortricidae which will be treated by my friend and colleague Dr. Nicholas S. Obraztsov. Originally I had intended that the diagnosis and illustrations for this genus should appear in my forthcoming paper on the "Microlepidoptera of the Juan Fernandez Islands," but because publication of the latter paper has been delayed, and the name is needed, I am proposing it now. The generic characters and details of the two included species will be illustrated at a later date.

Proeulia, new genus

Typus generis.—*Eulia robinsoni* Aurivillius, 1922, *in* Skottsberg, The Natural History of Juan Fernandez and Easter Island, 3: part 2, 266, Pl. 11, Fig. 17.

Antenna ciliate in male, finely and shortly pubescent in female. Labial palpus porrect, about twice as long as head; third segment one-third the length of second. Head rough. Forewing smooth, broad, termen nearly straight; 12 veins, all veins separate; 1c strongly preserved at margin; 2 from about three-fifths of cell; 3, 4 and 5 separate and about equidistant at bases; 6 twice as far from 7 as 7 is from 8; 9 remote from 8; 11 from before middle of cell; upper internal vein from between 10 and 11. Hind wing with 8 veins; 2 very distant from 3, arising from three-fifths of cell; 3 and 4 connate; 6 and 7 short-stalked.

Male genitalia: With simple harpe, gnathos and uncus present; socii well developed; transtilla a sclerotized band; vesica armed.

Female genitalia: Without signum but with sclerotized, projecting process from ventral surface of bursa copulatrix; inception of ductus seminalis on ventro-lateral surface of bursa copulatrix.

Proeulia differs from *Eulia* by the porrect labial palpus, stalked veins 6 and 7 of hind wing, unmodified transtilla and absence of normal signum.

The two included species are:

Proeulia robinsoni (Aurivillius), new combination

Eulia robinsoni Aurivillius, 1922, *in* Skottsberg, The Natural History of Juan Fernandez and Easter Island, 3: part 2, 266, Pl. 11, Fig. 17.

Proeulia griseiceps (Aurivillius), new combination

Eulia griseiceps Aurivillius, 1922, *in* Skottsberg, The Natural History of Juan Fernandez and Easter Island, 3: part 2, 267, Pl. 11, Fig. 18.

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PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

REDESCRIPTIONS OF TWO EXOTIC SPECIES OF MONOGENETIC TREMATODES AND THE PROPOSAL OF A NEW FAMILY [1]

By Emmett W. Price
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In 1936, Ishii described as *Pseudaxine katsuwonis* and *P. vagans* two species of monogenetic trematodes from the gills of *Katsuwonus vagans* (Lesson) from Japan. The descriptions of these worms were in Japanese, but a study of the illustrations showed certain rather marked differences, particularly in the opisthohaptoral clamp structure, that seemed to make questionable their inclusion in the genus *Pseudaxine* Parona and Perugia, 1890. In the English descriptions of these species by Ishii and Sawada (1938), no emphasis was placed on the haptoral clamp structure which is of major importance in determining family relationships. In order to check this and other points, specimens of *P. katsuwonis* and *P. vagans* were made available through the kindness of the late Prof. Ishii. A study of the specimens showed, as the writer surmised, that the species were not congeneric with *Pseudaxine trachuri* Parona and Perugia. This was evident also to Yamaguti (1943), who proposed the new genus *Allopseudaxine* for *P. katsuwonis,* retaining, however, the closely related *P. vagans* in the genus *Pseudaxine.*

Unnithan (1957), apparently unaware of the papers by Ishii (1936), Ishii and Sawada (1938), and Yumaguti (1943), proposed the genus *Uraxine* for *Uraxine chura* and *U. chura macrova,* which were obtained from the gills of *Euthynnus affinis* (Cantor) at Trivandrum, India. He placed the genus *Uraxine* in his new subfamily Monaxininae of his family Axini-

[1] This work was supported by a grant (G13002) from the National Science Foundation.

dae. In a recent paper, the writer (Price, 1962) pointed out that *Uraxine* Unnithan was a synonym of *Allopseudaxine* Yamaguti and excluded it from the Monaxininae because its characters seemed to relate it to the Gastrocotylidae.

In the course of preparation of a paper on the gastrocotyloid Monogenea, and in view of the more or less confused relationships of the helminths in question, it seemed desirable to restudy Ishii's *Pseudaxine katsuwonis* and *P. vagans.* In doing so it became evident that Ishii's and Unnithan's species, while congeneric, could not be included in any of the existing families without expanding the concepts of these taxa to a point where they would be virtually meaningless. Consequently, since the above-mentioned species have both microcotylid and gastrocotylid characters, a new intermediate family, Allopseudaxinidae, is proposed for them.

Allopseudaxinidae, new family

Diagnosis: Body flat, somewhat lanceolate in outline. Prohaptoral suckers aseptate, unarmed. Opisthohaptor consisting of a single row of strong clamps arranged along one side of posterior part of body and terminating in a languette bearing two pairs of anchors and probably, in young forms, a pair of marginal hooklets between pairs of anchors. Clamps of modified microcotylid-type; median or looped sclerite broad and imperfectly sclerotized, without accessory sclerites. Gentinal atrium armed with corona of hooked spines; cirrus delicately sclerotized. Testes numerous, pre-ovarial and post-ovarial. Ovary long and slender, with proximal and distal ends directed posteriad. Genito-intestinal canal well developed. Vagina double, openings dorsolateral. Vitellaria well developed, extending to posterior end of body. Eggs relatively large, with filament at each pole. Parasites of scombroid fishes.

Type genus: Allopseudaxine Yamaguti, 1943.

This family, as defined, includes at present only the genus *Allopseudaxine* Yamaguti. The opisthohaptoral clamps of the included species are of a modified microcotylid-type in that they lack the accessory sclerites characteristic of the Gastrocotylidae. On the other hand, the presence of gastrocotylid-type anchors and the nature of the genital spines point to relationship with the genus *Gastrocotyle.* The intermediate position of *Allopseudaxine* as regards the families Microcotylidae and Gastroctylidae is analogous to that of *Tagia* Sproston, which in some respects resembles members of both the Discocotylidae and Diclidophoridae.

Genus *Allopseudaxine* Yamaguti, 1943

Synonyms: Pseudaxine Parona and Perugia, 1890, in part; *Uraxine* Unnithan, 1957.

Diagnosis: Characters of family.

Type species: *Allopseudaxine katsuwonis* (Ishii, 1936) Yamaguti, 1943.

Included species: Allopseudaxine chura (Unnithan, 1957) n. comb. (syn. *Uraxine chura* Unnithan, 1957); *A. macrova* (Unnithan, 1957) n. comb. (syn. *U. c. macrova* Unnithan, 1957); and *A. vagans* (Ishii, 1936) n. comb. (syn. *Pseudaxine vagans* Ishii, 1936).

In view of some inaccuracies and oversights in the originial descriptions of *A. katsuwonis* and *A. vagans,* and the availability of specimens of both, redescriptions of these species are given herein.

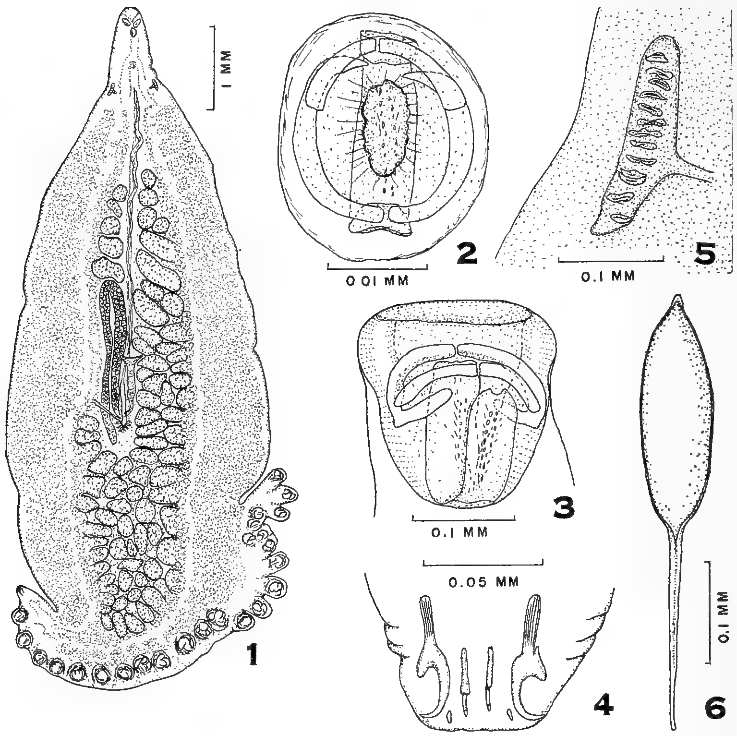
Allopseudaxine katsuwonis (Ishii, 1936) Yamaguti, 1943
(Figs. 1–6)

Synonym: Pseudaxine katsuwonis Ishii, 1936.

Description: Body 8 mm long by 3.2 mm wide at level of anterior limit of opisthohaptor, markedly attenuated cephalic to level of vaginal apertures. Prohaptoral suckers about 0.040 by 0.080 mm, aseptate, unarmed. Opisthohaptor frill-like, extending along left side of posterior third of body, bearing single row of 24 pedunculate clamps, and terminating in lobe or languette bearing 2 pairs of anchors and possibly, in young specimens, a pair of larval hooklets located between pairs of anchors. Clamps 0.156 to 0.195 mm wide with framework of modified microcotylid-type; median or looped sclerite spring-like, broad and poorly sclerotized, accessory sclerites absent. Anchors of outer pair 0.050 mm long, those of median pair about 0.027 mm long; larval hooklets not present but their position between anchors of outer and inner pair marked by presence of small, oval ogives (Euzet, 1955). Pharynx oval, 0.090 by 0.060 mm; esophagus simple, bifurcating at or near level of genital aperture; intestinal limbs with short inner and longer lateral diverticula, terminating in distal portion of opisthohaptoral region. Genital atrium about 0.1 mm in diameter, about 0.8 mm from anterior end, muscular, armed with corona of about 14 (Ishii gives 12) hook-like spines, their exact number and size obscured by mass of shell material in atrium.

Testes numerous, about 60, occupying interintestinal field from about midway between genital atrium and anterior limit of ovary to near posterior end of body. Vas deferens filled with sperm, extending in median field in an undulating manner to genital atrium.

Ovary slender, in equatorial third of body, with proximal and distal ends directed posteriad. Genito-intestinal canal opening into right intestinal branch at or near level of distal end of ovary. Vitelline reservoir



FIGS. 1–6. *Allopseudaxine katsuwonis.* 1, Complete worm, ventral view; 2, opisthohaptoral clamp, open; 3, clamp, closed; 4, anchors; 5, vaginal atrium; 6, egg.

Y-shaped, extending anteriorly to about level of middle of ovarian length. Vagina double, terminating in elongated atria, opening dorsally through tranverse cuticularized slits, and located about 1 mm from anterior end of body. Egg about 0.216 mm long with filament at posterior pole and knob at anterior pole (obviously abnormal; specimen apparently senescent as uterus contained considerable unorganized shell material).

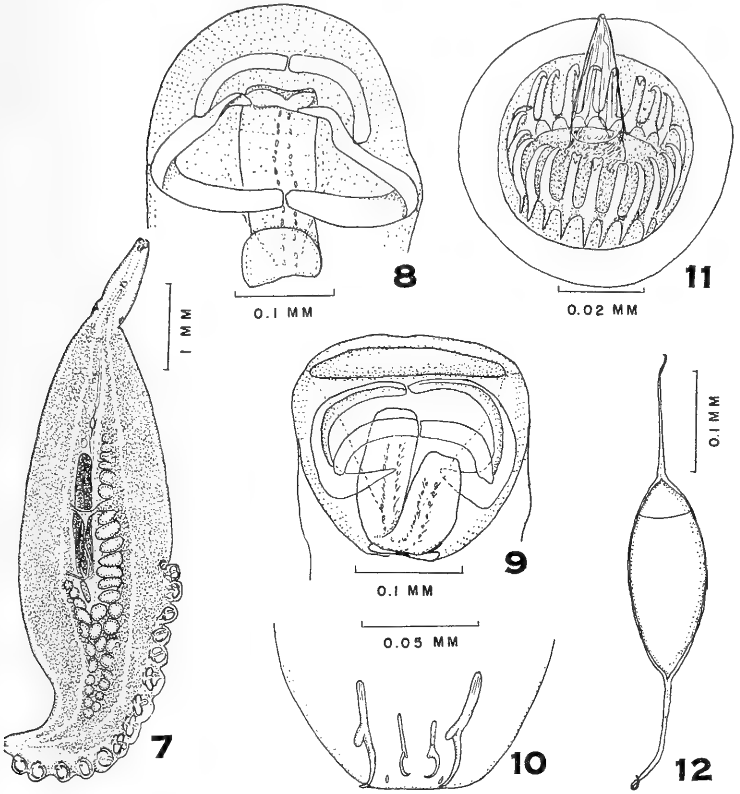
Host: Katsuwonus vagans (Lesson).

Location: Gills.

Distribution: Japan.

Specimen: USNM Helm. Coll. No. 37746.

In general, Ishii's and Ishii and Sawada's descriptions of this species are adequate. These authors, however, failed to emphasize one of the most conspicuous characters, namely, the gill-like openings of the vaginal atria which alone would distinguish *A. katsuwonis* from *A. vagans.*



FIGS. 7–12. *Allopseudaxine vagans.* 7, Complete worm, ventral view; 8, clamp, open; 9, clamp, closed; 10, anchors; 11, genital corona; 12, egg.

Allopseudaxine vagans (Ishii, 1936), new combination (Figs. 7–12)

Synonym: Pseudaxine vagans Ishii, 1936.

Description: Body lanceolate, 5 to 7 mm long by 1.8 to 2 mm wide at level of anterior limit of opisthohaptor, markedly attenuated cephalaic to anterior limits of vitellaria. Prohaptoral suckers about 0.080 by 0.040 mm. Opisthohaptor similar to that of *A. katsuwonis,* bearing 15 clamps, 0.015 to 0.250 mm wide, and a terminal languette armed with 2 pairs of anchors and probably a pair of laval hooklets in young specimens. Outer anchors 0.050 mm long, inner 0.026 mm; location of larval hooks represented by small ogives situated between and slightly posterior to outer and inner anchors. Pharynx oval, 0.080 by 0.050 mm; esophagus simple, bifurcating at level of genital atrium; intestinal tract similar to that of *A. katsuwonis.* Genital aperture about 0.460 mm from anterior end; genital atrium about 0.060 mm wide, with thick walls, and provided with corona of 22 gastrocotyloid spines. Cirrus conical, delicately cuticularized, unarmed; testes about 30 or 35, distributed as in *A. katsuwonis;* remainder of genital system similar to that in *A. katsuwonis.* Vaginal apertures dorsal, about 1 mm from anterior end of body, not opening to exterior through multiple transverse slits. Egg oval, 0.200 mm long by 0.080 mm wide, with relatively long filament at each pole.

Host: *Katsuwonus vagans* (Lesson).

Location: Gills.

Distribution: Japan.

Specimens: USNM Helm. Coll. No 37747 (paratypes).

In Ishii's original description and figure of *Pseudaxine vagans,* the testes were represented as being few and located posterior to the ovary. Actually the testes, while fewer in number, are located as in *A. katsuwonis.* Aside from fewer testes and opisthohaptoral clamps, the most distinguishing character of *A. vagans* is in the absence of the gill-like vaginal slits which are so prominent in *A. katsuwonis.*

In Unnithan's (1957) descriptions of *Uraxine chura* (=*A. chura*) and *U. c. macrova* (= *A. macrova*), obtained from the gills of *Euthynnus affinis* (Cantor)[1], no mention was made of the presence of vaginal slits and in this respect they are closely related to *A. vagans.* As a matter of fact, it is possible that when the extent of variation in clamps and egg sizes, as well as the number of genital spines, is known, Unnithan's species may be found to be identical with *A. vagans.* In any event, these species should be restudied, since Unnithan stated in connection with *U. chura* that "the two *lateral vaginal canals* starting from the base of the vaginal pores are connected behind the level of the intestinal bifurcation by narrow transverse connections which unite in the middle to form a *median* longitudinal *vaginal canal* which opens at the posterior sides of the ootype." This connection with the oötype is shown in his figure 5,*f*. Unless Unnithan has confused the "vaginal canal" with the vas deferens, which seems probable, this arrangement is unique among the monogeneans.

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PROCEEDINGS
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BIOLOGICAL SOCIETY OF WASHINGTON

A NEW GENUS OF DIGGER WASPS FROM SOUTH AMERICA (HYMENOPTERA: SPHECIDAE)

By Arnold S. Menke
University of California, Davis

While identifying the Sphecinae in the collection of the Museum of Comparative Zoology, Harvard University, specimens of a wasp generally known as *Chlorion cyaniventris* (Guérin) were examined. This study has revealed that *cyaniventris* possesses features not found in *Chlorion* or any other sphecine genus, and therefore the following new genus is proposed for Guérin's species.

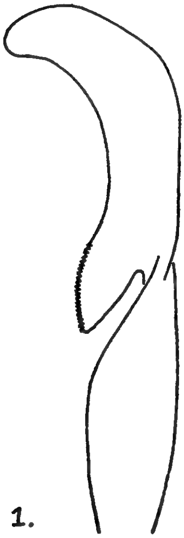
Stangeella, new genus

Description: Mouthparts short, third maxillary palpomere symmetrical; female mandible with two mesal teeth on inner margin; flagellomere I one and one-half times length of II in female, subequal to II in male; male antenna with fossulae; female clypeus produced, free margin sinuate; male clypeus produced, truncate at apex; second submarginal cell of forewing slightly higher than wide, receiving the first recurrent vein, second recurrent vein interstitial with submarginal II and III (Fig. 3); propodeum with stigmatal groove; petiole slightly longer than hind coxa; male sternites IV–VII with velvety pubescence; pygostyles present in male; female with a psammophore; tarsal claws with a single basal tooth on inner margin (Fig. 2); intersegmental membrane of tarsomeres with oval pads ventrally; blade-like terminal setae of last tarsomere separated by more than twice a setal breadth.

Type of genus: *Pelopoeus cyaniventris* Guérin, 1831.

Etymology: Stangeella is named in honor of Lionel A. Stange.

Discussion: This monotypic genus does not fit conveniently into any of the the three tribes of the Sphecinae. Tarsal characters and the general form of the body eliminate placement of *Stangeella* in the Ammophilini. A strong relationship to the Sceliphronini is suggested by the short mouthparts, the single claw tooth, the presence of pads on the intersegmental membrane of the tarsus, and the narrow blade-like setae of the last tarsomere. However, in the Sceliphronini the claw tooth is mesal, not basal as in *Stangeella*. The basal tooth suggests a relation to the Sphecini but in this tribe there are always two or more teeth and



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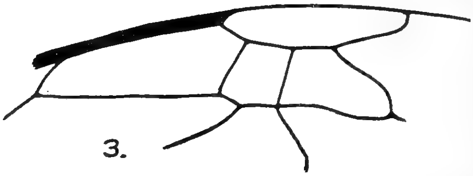

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FIGS. 1–3. *Stangeella cyaniventris.* FIG. 1—Apical half of dissected aedeagus. FIG. 2—Tarsal claw. FIG. 3—Portion of forewing showing submarginal cells and recurrent veins.

tarsal pads are unknown. It would appear that *Stangeella* is intermediate between the Sceliphronini and the Sphecini, and the final disposition of the genus will have to await the conclusion of a world-wide generic and tribal study of the Sphecinae being carried out at present by R. M. Bohart, University of California, Davis, and the author.

Stangeella cyaniventris (Guérin)

Pelopoeus cyaniventris Guérin, 1831. *In* Duperry, Voyage autor du Monde, ... La Coquille, Zoology, 2 (part 2, div. 1): 263, Atlas volume (1826), pl. 8, fig. 15.

Male: Average length 20 mm; head, thorax, and petiole black, gaster metallic blue; wings evenly dark violaceous; erect hair of body black; face and tegula with appressed silver pubescence; flagellomeres II–VI with broad fossulae; thorax everywhere densely punctate, coxa, and the femora to a less extent, coarsely punctate; genitalia as in Fig. 1.

Female: Average length 22 mm; essentially as in male.

Taxonomy: In his original description, Guérin gave the length of the body as 30 and the wingspread as 45 mm. These figures are certainly in error since the measurements taken from the atlas figure are 22.5 and 35 mm, respectively. The location of Guérin's type material is unknown but presumably is in Genoa or Paris. His figure of the wasp and the description of the wing venation positively identify the species.

Biology: According to Willink (1951), who quotes Claude-Joseph, these wasps are solitary ground-nesters and dig a single-celled nest. Prey consists of Mantidae (*Mantis crenaticollis*) and possibly Proscopidae. The mantids are carried to the prepared nest on the wing. Among all the genera of Sphecinae, *Stangeella* is unique in provisioning with Mantidae.

Distribution: I have seen examples from Chile and Argentina, and Guérin gave Brazil as the type locality in his original description.

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PROCEEDINGS
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A NEW SPECIES OF *OROPUS* CASEY (COLEOPTERA: PSELAPHIDAE)

BY ALBERT A. GRIGARICK AND ROBERT O. SCHUSTER
Department of Entomology and Parasitology,
University of California, Davis

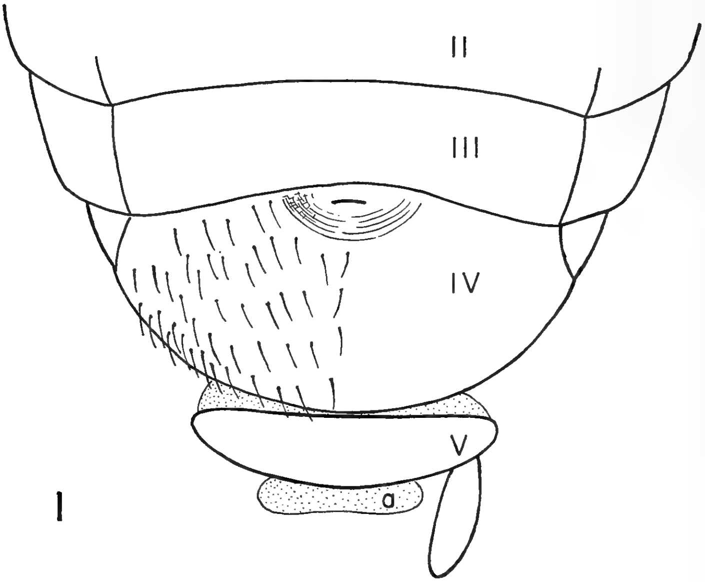
Species of this genus have been recorded only from the Pacific Slope of North America. Specimens of *Oropus* are most easily collected from moist organic debris accumulated in areas of leaf drop. The specimens are generally recovered by processing the leaf litter in Berlese funnels.

A recent revision of *Oropus* by Schuster and Grigarick (1960) divided the genus into two groups based on the length of tergite I in relation to tergite II. The species described in this paper belongs to the section of the revision designated as group B in which tergite I is over half again as long as tergite II and sternite IV is generally void of long setae.

Oropus helferi, new species
(Figs. 1, 2)

Male (slide): Head 227μ × 363μ wide; antenna 563μ long; pronotum 395μ long × 390μ wide; elytra 436μ long; metatibia 405μ long; aedeagus 135μ wide.

Eyes of about 8 peripheral facets; lacking tubercles around eyes; vertexal foveae with inner diameter of 18μ, on a line behind middle of eyes, separated by twice distance from foveae to eye; postantennal apodemes wedge-shaped, attaining those of vertexal foveae; mandibular rami with 6 teeth left, 7 right; labrum 91μ wide; length of palpal segment IV including cone 104μ, with sensory setae 35μ from base; lengths/widths of antennal segments in microns: I 104/54, II 50/50, III through VIII approximately 27/36–54, IX 42/68, X 45/77, XI 136/91. Pronotal teeth small, blunt, R=0.75. Brachypterous. Mesocoxae confluent; postcoxal apodemes directed transversely. Tergite I 292μ long × 450μ wide, median impression of I 158μ wide



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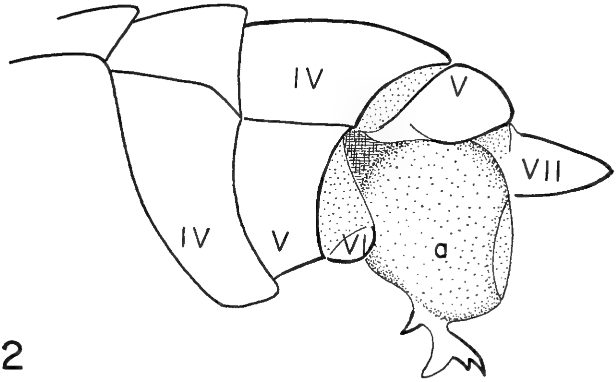

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FIGS. 1–2. *Oropus helferi,* new species. FIG. 1.—Dorsal view of terminal segments of abdomen. FIG. 2—Lateral view of abdomen. Tergites and sternites, II–VII; *a,* aedeagus.

apically, 235μ wide basally; II 121μ long $\times$ 420μ wide. Tergite III slightly emarginate to accommodate IV, IV 158μ long $\times$ 326μ wide; setae on basal development of IV thickened but not spatulate, other setae not on tubercles; sternite IV lacking median setae; V lacking pits, deeply emarginate distally.

Additional description from point-mounted specimen: Eyes contain about 25 facets. Tergite IV relatively flat, with small polished basal depression behind a minute, setate integumental projection, without microsetigerous area. Sternite IV without long setae.

Female: unknown.

Holotype ♂ (slide-mount): Mendocino, Mendocino County, California, 19 July 1953, J. R. Helfer. Paratype ♂, Fort Bragg, Mendocino County, California, 5 January 1957, J. R. Helfer. The holotype is deposited at the California Academy of Sciences and the paratype at the University of California at Davis.

Oropus helferi keys to couplet 8 of group B in the key to the revision of this genus (Schuster and Grigarick, 1960). This couplet contains *O. fenderi* and *O. acumenis* which have a basal development on tergite IV. These latter two species are deeply concave behind the basal development, whereas *O. helferi* has only a very shallow depression at this location. Another prominent difference is found in the shape of the apex of the basal development.

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PROCEEDINGS
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ASTROBLEPUS PHOLETER, A NEW SPECIES OF CAVE-DWELLING CATFISH FROM EASTERN ECUADOR

By Bruce B. Collette
Ichthyological Laboratory, Bureau of Commercial Fisheries, U.S. National Museum, Washington 25, D.C.

The discovery of an essentially unpigmented, minute-eyed species of *Astroblepus* Humboldt in a cave in eastern Ecuador is of great interest because no cavernicolous species of Astroblepidae has previously been reported. Padre Pedro I. Porras G. of Mision Josefina, Tena, Ecuador collected the first known specimen and sent it to the U.S. National Museum where I have been permitted to study it. Upon learning that it was a new species, Padre Porras kindly wrote to me concerning the exact locality, life colors, and habitat of this heretofore unknown catfish and returned to the cave to collect three additional specimens which he graciously forwarded to me. The figures were drawn by Mildred H. Carrington of this Laboratory. Drs. Daniel M. Cohen, J. A. F. Garrick, and W. Ralph Taylor have read the manuscript and made valuable comments.

Astroblepus pholeter, new species
(Figs. 1–2)

Diagnosis: A species of *Astroblepus* (see Gosline, 1947: 92–93) which is pinkish-white in life; lacks bands, spots, or other pigmentation; has minute eyes (5.0–6.3 times in the interorbital distance); long filaments on the tips of the leading elements of the pectoral, dorsal, and caudal fins; a long maxillary barbel which reaches to the base of the pectoral fin; an elongated barbel on the nasal flap; and a well-developed spine in the adipose fin.

Description: Interobital distance slightly less than distance from eye to rear margin of posterior nostril; tip of adpressed pelvic fin reaching to anus or slightly beyond; prominent spine in adipose fin projecting beyond thin membrane connecting adipose to caudal peduncle; origin

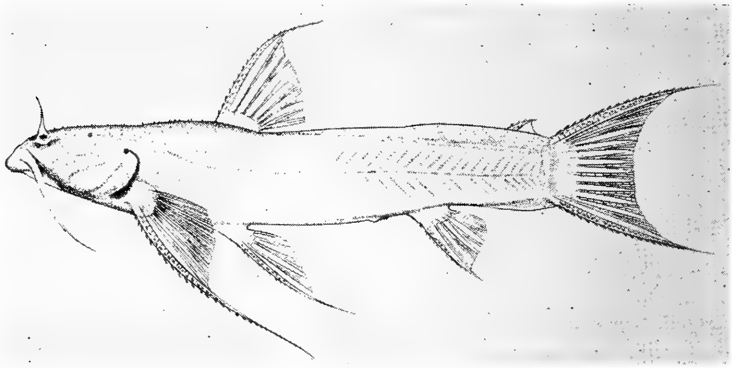

FIG. 1. Lateral view of holotype of *Astroblepus pholeter*, new species.

of pelvic fins slightly posterior to origin of dorsal fin; teeth in outer row of upper jaw unicuspid except for 2–4 on each side of midline which are deeply bicuspid; teeth in posterior rows of upper jaw bicuspid; teeth in outer row of lower jaw mostly Y-shaped bicuspids; upper surface of head and body in front of origin of dorsal fin sparsely covered with small prickles; anus located two-thirds of distance posteriorly from pelvic origin to anal origin; pectoral filament reaching to anus; dorsal rays i,6; anal i,5 or 6; pectoral i,9 (i,10 on the right side of one specimen); pelvic i,4; and caudal 5+6 branched rays plus an upper and lower elongated and unbranched ray; vertebrae 26–27 (exclusive of anterior fused vertebrae).

As is the case in adult males of all species of *Astroblepus* examined, the single known male of *A. pholeter* has an elongate urogenital papilla which probably functions as an intromittent organ. However, the urogenital papilla of this male differs in being forked for the last 3.0 mm of its 8.1-mm length. Although it appears normal in other respects, additional males will have to be examined to see if a forked urogenital papilla is a distinguishing characteristic of *A. pholeter*.

In his definition of the Astroblepinae, Gosline (1947: 92–93) wrote "gill-rakers absent or rudimentary." I find that *A. pholeter*, like 16 other species of *Astroblepus* examined, have fairly well-developed gill-rakers. Gill-rakers are absent or rudimentary on the first arch, but well-developed ones are present on the more posterior arches. *A. pholeter* lacks gill-rakers on the first arch, has two or three poorly developed rakers on the second arch, and five to seven well-developed rakers on the last three arches.

Types: The holotype is USNM 196623, a female 62 mm in standard length (Figs. 1–2) collected in a large cave in Latas, 4 km north of Archidona, Napo Province, eastern Ecuador, by Padre Pedro Porras G. in 1961. The stream issuing from this cave empties into the Misagualli

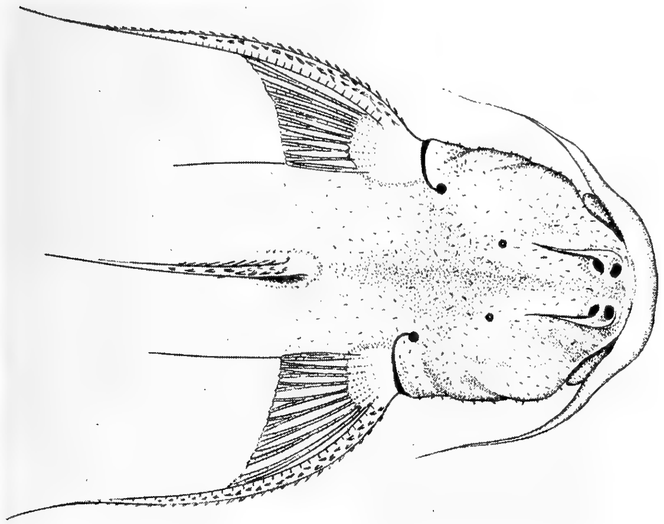

FIG. 2. Dorsal view of head of holotype of *Astroblepus pholeter*, new species.

River which drains into the Napo River, a tributary of the Amazon. Paratypes from the same locality are USNM 196671, a male 64 mm SL and a female 66 mm SL, and Chicago Natural History Museum 63855, a female 57 mm SL, all taken on 28 January 1962 by Padre Porras.

Etymology: The Greek name *pholeter* means "one who lurks in holes," in reference to the cavernicolous habits of this species.

Comparisons: Astroblepus pholeter is very different from all other known species of *Astroblepus*. It appears to be the least pigmented species in the genus. Its eyes are much smaller than in most of the other species. Its pectoral filament, nasal barbel, and maxillary barbel are all more elongate than those in any of the other 31 forms in the key to the *Astroblepus* of northern South America presented by Schultz (1944: 278–282). The adipose spine is larger than in any of the species (at least 16) represented in the National Museum collection. *A. pholeter* differs strongly from the types of 13 species of *Astroblepus* in the collections of the U.S. National Museum and the Chicago Natural History Museum. It superficially resembles *A. longifilis* (Steindachner) in having long filaments on the dorsal and anal fins, long pelvic fins, and a barbel on the nasal flap. However, it differs markedly in its smaller eyes, lack of pigment, longer nasal barbel, longer pectoral filament, well-developed adipose spine, and lack of an adipose ridge extending from the posterior end of the dorsal to the base of the caudal fin.

Habitat and habits: Padre Porras has informed me that he has collected *A. pholeter* only in the region of perpetual darkness in the cave, 300 m to 2 km from its mouth. He characterizes the waters of the stream as notably calcareous. The temperature was 15°C. These catfish hide in holes in rocks and are very timid and difficult to capture. They are usually found in the proximity of detritus which has been washed down into the cave or near bat guano which contains large numbers of invertebrate larvae. The stomach of the male paratype contained three specimens of mayfly nymphs (Ephemeridae). R. D. Burks of the U.S. National Museum has identified them as the genus *Euthyplocia* Eaton (specimens deposited in the USNM). A few broken pieces of *Euthyplocia* tusk were found in the stomach of one of the female paratypes. A specimen of a normally pigmented species of characin (*Piabucina* Valenciennes, determined and now under study by James E. Böhlke, Academy of Natural Sciences, Philadelphia) plus several crustaceans were also taken in the cave with *A. pholeter.*

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PROCEEDINGS
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A NEW SUBSPECIES OF THE BLACK-CHINNED FRUIT PIGEON

By S. Dillon Ripley
Peabody Museum of Natural History, New Haven, Conn.

In their "Contribution to the Ornithology of Formosa, Part 2" (1951, Quart. J. Taiwan Mus., 4: 135), Hachisuka and Udagawa list the black-chinned fruit pigeon, *Ptilinopus leclancheri,* as a rare and mysterious member of the Formosan avifauna. They ascribe the population to the Philippine subspecies *longialis* Manuel, described in 1936 (Philippine J. Sci., 59 (2): 307) from two males and a female, subsequently destroyed in Manila in 1945. Their publication lists three specimens taken on Formosa at Kijinsho, Tainan Pref., in 1922, at Koshun in the south, and on Botel Tobago Island in 1934.

Through the kindness of Dr. Yamashina I have learned that two of these three specimens in the Takatsukasa collection were destroyed in 1945, leaving a single immature male, the specimen from Tainan, in the Kyoto University collection. This specimen (perhaps taken by the late Dr. Moichiro Maki) was collected 1 November 1922 at Kijinsho, Tainan, Formosa.

A fourth specimen must now be added to this record, an adult male collected in 1961 at K'en-ting, P'ing-tung Hsien, Formosa by Mr. Morioka. This specimen differs markedly in color from the species *leclancheri* of the Philippines and deserves recognition as follows:

Ptilinopus leclancheri taiwanus, new subspecies

Type: From K'en-ting, P'ing-tung Hsien, Formosa; 250 meters. No. 40078, Yale Peabody Museum Collection, New Haven, Conn. Adult male collected 19 July 1961 by Hiroyuki Morioka.

Diagnosis: From *leclancheri* this form differs by larger size, at least in the tail and culmen measurements, and in color, being somewhat darker green above, heavily splotched with bluish on the crown, nape, and back (this splotching may be an individual aberration; it appears unlikely to be a racial character, but I have not observed it in other specimens). On the underparts the breast spot is large and not so dark as in *leclancheri,* more maroon, as is the anterior portion of the chin spot. The lower surface is dark dull green, washed with dark gray, much darker than in Philippine birds.

Measurements: Manuel's three specimens of *longialis* did not differ in color from *leclancheri,* but were larger, as follows:

	P. l. longialis	*P. l. leclancheri*
Wing	♂ ♂ 160, 161, ♀ 164	♂ ♂ 146–154
Tail	♂ ♂ 119, 121, ♀ 118	♂ ♂ 102.5–104
Culmen	♂ ♂ 15, 16	♂ ♂ 17.5–20
Tarsus	♂ ♂ 20, 22	♂ ♂ 21–24
Middle toe and claw	♂ ♂ 31, 31.5, ♀ 35	♂ ♂ 26–29

The single specimen of *taiwanus* measures as follows: wing 158, tail 117, culmen 22.5, tarsus 28, middle toe with claw 36. Thus, in bill and tarsus measurements, it is far larger than *longialis.* The bill is much more massive altogether than in *leclancheri,* more deep and strongly built than the simple difference in measurements indicates.

Dr. Yamashina reports (pers. comm.) : "I observed all of the above 3 skins about 20 years ago and I still keep a memo written at that occasion reading:

> " 'Comparing with the skins caught at Philippine Islands the Formosan skins are different in several parts, for instance, the latter's head is more greenish and the colour of back is deeper whereas the chestnut purple patch on the lower breast is smaller.' And the sizes of (1) and (2) are as follows:

	Wing	*Tail*	*Ex. C.*	*Tarsus*
(1)	158	103	19	25
(2)	158	104	19	24

> "As mentioned above, it was admitted then that the colour of skins (of birds) living in Formosa and Philippine Islands was quite different. . . ."

Of course the wing and tail measurements are useless in immature birds, as is the size of the breast spot, but the culmen and tarsus sizes are valuable indicators of the large size of the single adult.

Remarks: The scantiness of records of this species of fruit pigeon from Formosa has been ascribed to the species being a vagrant from the Philippines. The persistence of scattered records from one area, and the differences in size and coloration incline me to the belief, however, that we are dealing here with a local resident population. Formosan birds are still comparatively little known as the experience of the Naval Medical Unit recently collecting specimens for epidemiological purposes has shown. These collections will be reported upon in the future by H. G. Deignan and will prove, I know, to be full of interest.

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Vol. 75, pp. 317–319 31 December 1962

PROCEEDINGS
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TWO NEW MURINE RODENTS

By David H. Johnson
United States National Museum

During the past two decades numerous collections of small mammals have come to the United States National Museum from eastern Asia and the islands of the Pacific Ocean. As is to be expected, many of the included specimens are murine rodents and a large proportion of these are in the complex group of genera of which *Rattus* forms the core. The newly acquired material helps in some instances to solve taxonomic problems presented by the earlier and smaller collections. In other instances, by presenting completely new species and subspecies such as the ones described below, it clearly indicates that we are yet some distance from the preliminary goal of listing all the taxa of this extraordinarily varied group of mammals.

The type specimen of the first form here described is from a large series of rodents collected on Ponape Island by the Pacific Island Rat Ecology Project of the Pacific Science Board. The second form is represented by a single specimen collected in Luzon as a by-product of a survey of animal-borne virus diseases conducted by the Graduate School of Public Health of the University of Pittsburgh.

Rattus rattus mansorius, new subspecies

Type specimen: United States National Museum, No. 302027; adult female, skin and skull; collected 1 September 1955, by William B. Jackson, original No. 31.

Type locality: Kolonia, Ponape, Caroline Islands.

Diagnosis: A house rat resembling *Rattus rattus mindanensis* of the Philippine Islands in general, but differing from that subspecies in having less cinnamon color on upper parts, no brownish band across throat, and a narrower and relatively longer cranial rostrum.

Description: Color of type specimen—Upper parts Buffy Brown to Tawny-Olive, darkened in midback by numerous long black bristles, lightened on shoulders and sides by scattered whitish spines; no sharply defined lateral line of demarcation between upper and lower color areas; underparts Smoke Gray with a faint Cinnamon wash, which is most pronounced in the median pectoral area; hind feet pale, each with a weakly defined dark patch over third and fourth metatarsal bones; forefeet dark above to base of toes, pale on outer and inner sides; tail dark throughout.

Skull narrower than that of *R. r. mindanensis,* the rostrum especially longer and narrower, but fully as deep; in other features essentially similar to *mindanensis.* Tail relatively shorter and occipital part of skull noticeably more elevated than in *R. r. rattus.*

Measurements: Type specimen (followed in parentheses by corresponding measurements of type of *R. r. mindanensis,* USNM 125274, adult male)—Head and body 185 mm (215), tail 190 (220), hind foot, dry 39 (41), ear 23 (23), condylobasal length of skull 42.0 (45.6), zygomatic breadth 20.8 (21.1), incisive foramina 8.5 (9.1), upper toothrow 7.7 (7.9), length of auditory bulla 7.6 (8.3).

Distribution: Micronesian islands in general, exclusive of Kusaie and the Marshall Islands area. About 300 specimens examined from the following islands and island groups: Tinian, Saipan, Rota, and Guam in the Marianas; Palau, Yap, and Ulithi in the western Carolines; Truk, Ponape, and Ant in the eastern Carolines.

Remarks: The fact that the common large house rats of the Caroline and Mariana Islands are related to the Philippine form *mindanensis* first became apparent when series of specimens were collected by various epidemiological survey parties during the second world war. The logical assumption is that the rats were introduced from the Philippines by Spaniards around the seventeenth century, but it is also possible that the introduction was made by earlier navigators before Europeans entered the Pacific. In any event, the populations on these remote oceanic islands are fairly uniform among themselves, resemble *R. r. mindanensis* in general, and also differ from that form in detail as described above.

For the present I follow the convenient modern practice of treating the various members of this complicated group as subspecies of *Rattus rattus.*

Apomys sacobianus, new species

Type specimen: United States National Museum, No. 304352; adult male, skin and skull; collected 16 August 1956, by D. H. Johnson, original No. 8555.

Type locality: Sacobia River, Clark Air Base, Pampanga Province, Luzon, Philippine Islands.

Diagnosis: A large lowland species of *Apomys,* about the size of the montane *A. major* Miller (?= *datae* Meyer), but shorter-haired, grayer, with lighter feet and underparts, longer hind feet, and a shorter cranial rostrum; larger than *A. abrae* Sanborn and other Philippine species.

Description: Upper parts between Hair Brown and Chaetura Drab (contrasted with dark Snuff Brown in the type of *major*); underparts becoming progressively paler toward midline, where heavily washed with dull white; feet whitish, with dark dorsal color restricted to upper surfaces and ending at wrists and ankles; tail sharply bicolored, dark above and creamy white below. Skull much as in *A. major,* but with notably longer braincase and shorter rostrum. Cheekteeth comparatively simple, the worn surfaces forming a step-like pattern as in the species of *Melomys,* cusps of laminae barely indicated; second and third upper molars lacking anteroexternal cusp or accessory element; first lower molar with anterior border undivided.

Measurements: Type specimen (followed in parentheses by corresponding measurement of type of *A. major,* USNM 157513, old female) —Head and body 141 mm (143), tail 149 (144), hind foot 40, ear 22, condylobasal length of skull 34.4 (34.6); zygomatic breadth 18.0 (17.3), length of nasals 13.8 (15.1); incisive foramina 5.8 (5.9), upper toothrow 7.1 (6.5), length of auditory bulla 5.4 (5.3).

Remarks: The generic name *Apomys* is used here essentially as it was used by Mearns, Hollister, and Miller in their respective works, to designate a distinctive group of species that occurs only in the Philippine Islands. Ellerman (Families and Genera of Living Rodents, vol. 3, pp. 54–56 and 73–76, 1949) regards *Apomys* as a subgenus of *Rattus* and includes in it a large number of extralimital forms. Some of the latter, especially *Rattus rajah* and *Rattus alticola,* have different dentition and in my opinion are not related to the Philippine species of *Apomys.* In the simple structure and the step-like manner of wearing of the molar teeth, *Apomys* is closer to the genus *Melomys* than to *Rattus.*

Apomys sacobianus is known only from the type specimen, which was trapped in the narrow forested canyon of the Sacobia River, just above the point where it emerges from the foothills of the Zambales Mountains onto the plains of Pampanga.

CORRECTION

In the article "Review of the Genus *Leptonycteris* (Mammalia: Chiroptera)" by W. B. Davis and D. C. Carter (Proc. Biol. Soc. Wash., 75: 193–198, 1962) the stated ranges of *Leptonycteris nivalis* (p. 196) and *Leptonycteris sanborni* (p. 197) were inadvertently transposed. The range of *L. nivalis* should read: Texas and Coahuila; south in winter to Guerrero, Morelos and Veracruz. That of *L. sanborni* should read: from Arizona south to Oaxaca; east to Hidalgo and Veracruz.——

W. B. Davis

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(new names in **boldface**; see p. v for list of authors)

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