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## NEW AND PREVIOUSLY KNOWN MILLIPEDS OF PANAMA

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Although the Panama Canal Zone and the adjacent areas of Panama are parts of Central America frequently visited by scientists, the millipeds reported from there are few in number, as compared with those reported from Guatemala or nearby Costa Rica. Only nine species were known from the whole of Panama in 1922 when Chamberlin published "The Millipeds of Central America" and added three new species. In subsequent papers (1925, 1940, 1941, 1947), he increased the number by 1 established species and 38 species purporting to be new. The two largest of these papers (1925, 1940) have no illustrations of critical structures of any species, and many of the descriptions are brief and founded on females or even immature specimens, the most extreme case being three moults from maturity, so that identification of the species is at best difficult, and several may require rearing young of the same stage as the type specimen for exact identity of the mature animal.

In recent years short papers containing descriptions of Panamanian millipeds have been published by Hoffman (1950, 1951, 1953, 1954, 1955) and Loomis (1958, 1959), and the number of species ascribed to the area has reached a total of 62, some of which are not considered valid members of the fauna for one reason or another, as will be shown.

The collection here studied is based primarily on material gathered since 1923 by the late Dr. O. F. Cook and the present writer during several visits to Panama and on material found on Barro Colorado Island, Panama Canal Zone, in 1955 and 1956 by Carl W. and Marion E. Rettenmeyer. A part of this latter material was collected in association with army ants and was described in a previous paper (1959) and is therefore not under consideration here. Represented in the collection are 42 identifiable species, 22 new and several typifying new genera (these are described and drawn in the following pages) and 4 identifiable to genus only. As an aid for future workers in making identifications, drawings of diagnostic parts and some additional structural notes have been prepared for 10 of the 16 species originally described by Dr. Chamberlin. Study of the collection and review of the pertinent papers have also resulted in the disclosure of several misidentifications and the reduction of some genera and species to synonymy.

Descriptions of new species are based essentially on the holotype specimen, but differences exhibited by other specimens, either allotype or paratypes, are mentioned without reference to the specimen. Characters of immature specimens have not been included. All illustrations of new species are from the holotype specimen. All holotype and allotype specimens of new species are deposited in the U.S. National Museum, as are specimens of previously described species from which illustrations were made for this paper.

## Family Glomeridesmidae

### Genus *Glomeridesmus* Gervais

*Glomeridesmus* Gervais, Ann. Sci. Nat., zool. ser. 3, vol. 2, p. 61, 1844.

#### *Glomeridesmus latus*, new species

##### FIGURE 1a-c

**HOLOTYPE:** Male, USNM myriapod collection 2655, from Cerro Campana, Panama, Mar. 16, 1958, G. B. Fairchild and H. F. Loomis.

**PARATYPE:** Male, same data as holotype, author's collection.

**DIAGNOSIS:** Differing from the closely related *G. parvior* in the oval postantennal pit, close to the socket, and in the broad last segment and the segments preceding it having their lower posterior corners scarcely produced.

**DESCRIPTION:** Length 3.5 to 5 mm., caudal segments but slightly narrowed; color in alcohol light brown with no distinct lighter markings. Antennae separated by little more than the diameter of one of the sockets, slender; joints 4, 5, and 6 very slightly thicker than basal

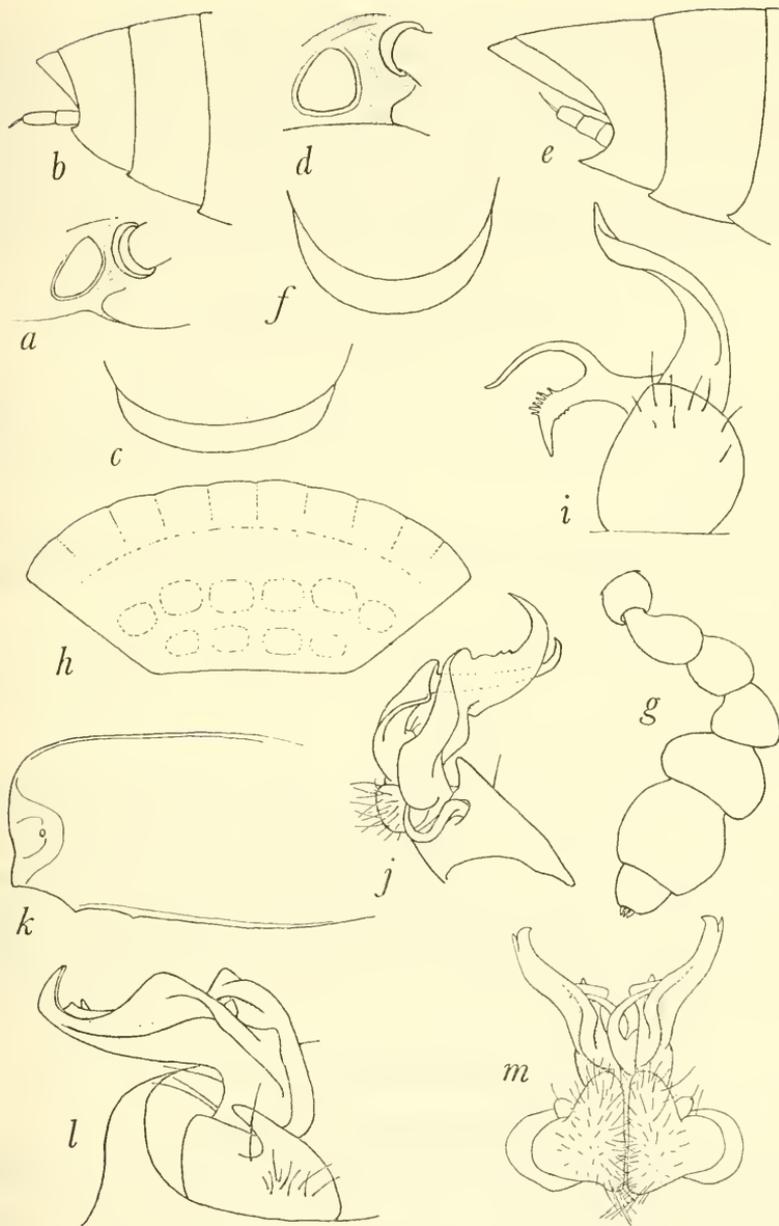


FIGURE 1.—*a-c*, *Glomeridesmus latus*: *a*, Postantennal pit; *b*, last 3 segments, lateral view; *c*, last segment from above. *d-f*, *Glomeridesmus parvior*: *d*, Postantennal pit; *e*, last 3 segments, lateral view; *f*, last segment from above. *g-i*, *Docodesmiella insularis*: *g*, Antenna; *h*, segment 1 from above; *i*, left gonopod, lateral view. *j*, *Chondrodesmus panamensis*, right gonopod, mesal view. *k-l*, *Chondrodesmus pittieri*: *k*, Lateral keel of segment 5; *l*, right gonopod, posterior view. *m*, *Trichomorpha extrema*, gonopods, posterior view.

joints but not conspicuously so, as in *G. parvior*; postantennal pit nearly oval and very close to the antennal socket (fig. 1a). Segment 1 longer on dorsum than in *parvior*, the sides slightly more abruptly rounded. Ensuing segments with lateral striations weakly impressed; lower posterior corners not produced into acute angles, except very small ones on about three segments preceding the last (fig. 1b); pleurae with no apparent striations. Last segment short and broad, with rounded lateral angles, the posterior margin evenly convex (fig. 1c).

#### *Glomeridesmus parvior* Chamberlin

##### FIGURE 1d-f

*Glomeridesmus parvior* Chamberlin, Bull. Univ. Utah, vol. 30, No. 9, p. 4, 1940.

Male, Barro Colorado Island, Canal Zone, Mar. 8-15, 1958, E. M. and H. F. Loomis; male, Piña area, Canal Zone, Mar. 18, 1958, H. F. Loomis.

Since the original description gave only color, body size, and comparative size of the penes, as contrasted with other species, the following characters are given:

Head with antennae separated by slightly less than twice the diameter of one of the sockets, the basal joints slender but joints 4, 5, and 6 noticeably thicker; postantennal pit subtriangular, well removed from the antennal socket (fig. 1d).

Segment 1 with sides less abruptly rounded than in *G. latus*, the dorsum relatively shorter. Ensuing segments with lateral striations pronounced; posterior end of body narrowing more rapidly than in *latus*; segments 13 to 19 with lower posterior corners increasingly produced (fig. 1e); pleural plates, at midbody at least, smooth, shining and with no apparent striations. Last segment quite narrow, without posterior corners but with the posterior margin strongly rounded throughout (fig. 1f).

### Family Chytodesmidae

#### *Docodesmiella*, new genus

TYPE SPECIES: *Docodesmiella insularis*, new species, by present designation and monotypy.

DIAGNOSIS: The minute size, the 19 segments, and the moniliform-clavate antennae with joint 6 largest are noteworthy characters. Differing further from *Docodesmus*, to which it seems related, in having the lateral keels with a posterior margining rim instead of being lobed and in the outer margins of keels of segment 5 being distinctly four lobed instead of three lobed, but all other keels lobed as in *Docodesmus*,

DESCRIPTION: Body very small, short, and broad with only 19 segments; lateral carinae descending less obliquely than the dorsum; dorsal surface of all segments with low swellings rather than pronounced tubercles, the swellings and intervening spaces beset with distinct rounded granules.

Head with labral and clypeal area separated from front by a conspicuous depression. Antennae short, strongly clavate, joints moniliform; joint 5 wider than long, joint 6 of same width but longer than any other.

Segment 1 with anterior margin 10 lobed; disk with a transverse row of 6 swellings in front, followed by a row of 4 others. Ensuing segments with outer margin of normally poreless keels three lobed, the normally poriferous ones four lobed although no pores were seen. Last segment small, crossed by a row of four setae with four others clustered at the slightly deflexed apex. Preanal scale as long as wide, with apex broadly rounded.

Gonopods each with coxal joint galeate, an outer simple branch curving mesally, and a median bifurcate branch directed caudally.

*Docodesmiella insularis*, new species

FIGURE 1*g-i*

HOLOTYPE: Male, USNM myriapod collection 2634, collected with Berlese funnel, Barro Colorado Island, Canal Zone, September 1, 1956, C. W. and M. E. Rettenmeyer, No. 2267.

ALLOTYPE: Female, USNM, same data as holotype.

PARATYPES: Male, author's collection, remaining specimens, Snow Museum, same collection data as holotype; female, author's collection, Barro Colorado Island, Canal Zone, March 8-15, 1958, E. M. and H. F. Loomis.

DESCRIPTION: Length 3 mm., width 0.6 mm.; body composed of 19 segments; color in alcohol light brown.

Labral and clypeal area of head separated from front by a broad depression, surface smooth and shining; clypeus crossed by a transverse band of fine erect setae; sides of head inflated laterad of antennae, granular and setose; surface between antennae flat, continuous with vertex and, like it, evenly finely granular; behind each antenna is a small, sharply raised, rounded tubercle; antennae separated by a little more than the diameter of a socket and short, moniliform-clavate, with joint 5 wider than long, joint 6 longest (fig. 1*g*).

Segment 1 (fig. 1*h*) concealing head from above; front margin somewhat raised, divided into 10 lobes, behind them a transverse row of 6 rounded quadrangular swellings followed by a row of 4

similar ones; surface of swellings and intervening spaces covered with small, distinct, rounded granules also present on other segments.

Ensuing segments with four longitudinal rows of swellings, three in each row, the two median rows most conspicuous with the two anterior swellings in each transversely oval-rectangular, the posterior swelling round; in each outer row the front swelling is oval and farthest laterad, the other two nearly round. Lateral carinae very thin, semitransparent, with front and back margins rimmed; outer margins on segments 2-4, 6, 8, 11, and 14 three lobed, other carinae four lobed, all lobes with a projecting seta; pores, if present, inconspicuous. Segment 18 with lateral carinae reduced in size, outer margin rounded, the four lobes distinct, posterior angles somewhat produced backward. Last segment small, irregularly roughened, crossed by a row of four setae with four others in the slightly deflexed apex. Preanal scale as long as broad, subtriangular, apex broadly rounded.

Gonopods as shown in figure 1i.

Females essentially like males.

## Family Chelodesmidae

### Genus *Alocodesmus* Silvestri

*Alocodesmus* Silvestri, Boll. Mus. Zool. Torino, vol. 11, No. 254, p. 5, 1896.

#### *Alocodesmus dromeus* Chamberlin

*Alocodesmus dromeus* Chamberlin, Proc. U.S. Nat. Mus., vol. 60, Cert. 8, p. 48, pl. 18, figs. 4-7, 1922.

Canal Zone, a number of broken specimens, including 2 males, Monte Lirio, June 8, 1923, O. F. Cook.

### Genus *Chondrodesmus* Silvestri

*Chondrodesmus* Silvestri, Boll. Mus. Zool. Torino, vol. 12, No. 305, p. 12, 1897.

#### *Chondrodesmus atrophus* Chamberlin

*Chondrodesmus atrophus* Chamberlin, Proc. Biol. Soc. Washington, vol. 38, p. 42, 1925.

Canal Zone, female, Monte Lirio, June 8, 1923, O. F. Cook.

Panama, female, Juan Días, June 3, 1923, O. F. Cook and H. F. Loomis.

*Chondrodesmus panamenus* Chamberlin

FIGURE 1j

*Chondrodesmus panamenus* Chamberlin, Proc. U.S. Nat. Mus., vol. 60, Art. 8, p. 46, pl. 17, fig. 10, pl. 18, figs. 1-3, 1922.

Canal Zone, broken male and female, Barro Colorado Island, June 6, 1923, O. F. Cook; single females, same locality, February 1955 and May and June 1956, C. W. and M. E. Rettenmeyer.

The gonopods (fig. 1j) are relatively small for the size of the animal and are withdrawn into the body with only the tips projecting in the single male seen.

*Chondrodesmus pittieri*, new species

FIGURE 1k-l

HOLOTYPE: Male, badly broken, USNM myriapod collection 2635, Puerto Obaldía, Panama, collected by H. Pittier prior to 1916.

DIAGNOSIS: Relationship with the Peruvian *C. maranonus* Chamberlin, founded on a female, seems indicated by the large size and location of the pores but differs in the much less produced posterior corners of the keels.

DESCRIPTION: Width 15 mm. Mentum of gnathochilarium with numerous very long, slender, forwardly directed setae closely appressed to the surface. Dorsum less convex than usual in the genus, the lateral carinae broad and more nearly horizontal. Dorsal surface so greatly eroded through drying or other causes that its exact sculpturing cannot be determined, but there is a series of 10 to 14 small low rounded tubercles adjacent to the posterior margin of segments, with a few others scattered over surface in front of them. Lateral carinae with anterior margin smooth; outer margin of poreless segments almost straight, the others emarginate opposite the median portion of the callus area; posterior margin with a distinct tooth near posterior angle and a smaller one mesad of it; posterior angles small, slightly more pronounced on poriferous segments but scarcely caudally produced except on segments 17 to 19. Pore calluses dorsal (fig. 1k), greatly flattened and consisting of a raised semicircular swelling enclosing the pore except on the outer side where the margin is no thicker than on poreless segments; pores well removed from lateral margin and opening almost vertically.

Gonopods as shown in figure 1l, the basal joint with a fingerlike lobe arising from ventromesal side and curving outward; both terminal branches bent sharply outward near middle. Ventral surface of segment 7 strongly elevated in front of the opening for the gonopods.

## Genus *Trichomorpha* Silvestri

*Trichomorpha* Silvestri, Boll. Mus. Zool. Torino, vol. 12, No. 305, p. 11, 1897.

### *Trichomorpha extrema* Chamberlin

#### FIGURE 1m

*Trichomorpha extrema* Chamberlin, Proc. Biol. Soc. Washington, vol. 38, p. 43, 1925.

Canal Zone, Barro Colorado Island, male, several females, June 6, 1923, O. F. Cook and H. F. Loomis; 2 males, 1 female, March 8-15, 1958, E. M. and H. F. Loomis.

The gonopods are shown in figure 1m.

### *Trichomorpha fratrellus* Chamberlin

*Trichomorpha fratrellus* Chamberlin, Proc. Biol. Soc. Washington, vol. 60, p. 64, pl. 2, figs. 5-7, 1947b.

Canal Zone, specimens of both sexes, "Pacific side," 1923, O. F. Cook and H. F. Loomis; numerous specimens, Barro Colorado Island, March 8-15, 1958, E. M. and H. F. Loomis.

### *Trichomorpha panamica* Chamberlin

#### FIGURE 2a

*Trichomorpha panamica* Chamberlin, Proc. Biol. Soc. Washington, vol. 30, p. 43, 1925.

*Trichomorpha kraussi* Chamberlin, Proc. Biol. Soc. Washington, vol. 60, p. 63, pl. 2, figs. 1-4, 1947b. New synonymy.

Canal Zone, male and female, Frijoles, July 13, 1923, and 2 males, Piña area, March 18, 1958, H. F. Loomis; several males and females, Barro Colorado Island, March 8-15, 1958, E. M. and H. F. Loomis.

Panama, female, El Valle, March 22, 1958, E. M. and H. F. Loomis; 2 males, Cerro Campana, March 16, 1958, G. B. Fairchild and H. F. Loomis.

Vertical view of the gonopods shown in figure 2a.

In the paper in which *T. panamica* and *T. extrema* were described (1925), Chamberlin also founded two other species—*T. nidicola* and *T. recta*—each based on a single female specimen. All four species have the common type locality of Barro Colorado Island. No additional specimens of the two latter species have since been reported, and it is now considered that the validity of each is in question.

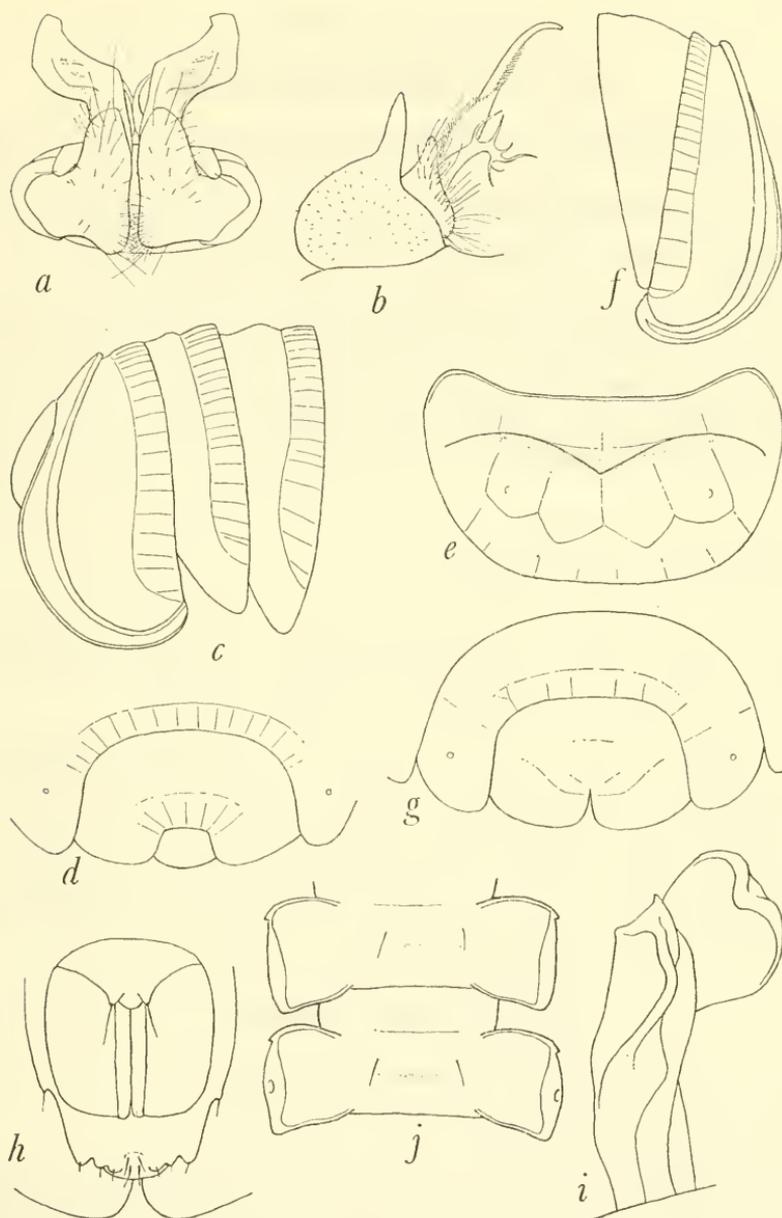


FIGURE 2.—*a*, *Trichomorpha panamica*, gonopods, posterior view. *b*, *Oncodesmoides angulatus*, right gonopod, posterior view. *c-d*, *Lignydesmus panamanus*: *c*, Segments 1 to 4, lateral view; *d*, segments 18, 19, and 20, from behind. *e-i*, *Panamadesmus sculptilis*: *e*, Segment 1 from above; *f*, segment 2, with segment 3 in outline, from above; *g*, segments 18 and 19, from behind; *h*, apex of segment 19, segment 20, anal valves and preanal scale, ventral view; *i*, right gonopod, anterior view. *j*, *Aceratophallus quadratus*, segments 11 and 12 of male, dorsal view.

## Family Euryuridae

### Genus *Seminellogon* Chamberlin

*Seminellogon* Chamberlin, Pan-Pacific Ent., vol. 9, p. 18, figs. 6-8, p. 13, 1923.  
*Sigmogonotropis* Hoffman, Proc. U.S. Nat. Mus., vol. 102, p. 240, fig. 84, 1951.

#### *Seminellogon panamicus* (Chamberlin), new combination

*Aphelidesmus panamicus* Chamberlin, Proc. Biol. Soc. Washington, vol. 38, p. 41, 1925.

Canal Zone, male, Gorgona, February 10, 1911, William R. Maxon; 2 females, Monte Lirio, June 8, 1923, O. F. Cook and R. D. Martin; male and female, Barro Colorado Island, August 2, 1955, C. W. Rettenmeyer; male, 2 females, Barro Colorado Island, March 1956, C. W. and M. E. Rettenmeyer; female, Piña area, March 18, 1958, H. F. Loomis.

Panama, male, female, and young, Cerro Campana, March 16, 1958, E. M. and H. F. Loomis.

This species was founded on a single female, and no males have been reported. Not only do the above males allow placement of the species in the correct genus but they also indicate the generic similarity of *Sigmogonotropis* to *Seminellogon*, a similarity which R. L. Hoffman has also seen after examining one of the above males.

Comparison of above specimens with the description of *Sigmogonotropis serratus* Hoffman also shows great similarity of the two species; the serrations on the side of the larger branch of the gonopods of *S. serratus* are the only major structural difference between them, since the gonopods of *S. panamicus* lack serrations. Further collections between the respective ranges of the species are likely to show that only a single species is involved.

## Family Oniscodesmidae

### Genus *Oncodesmoides* Kraus

*Oncodesmoides* Kraus, Senckenberg Biol., bd. 35, p. 41, 1954.

The milliped that has been reported from Panama as *Oncodesmus granosus* (Gervais and Goudot), or any of its synonyms, probably is one of the most common species in the region of the Canal Zone but appears to have been wrongly identified and in reality is a new species of the genus *Oncodesmoides*, which contains two Peruvian species.

*Oncodesmoides angulatus*, new species

FIGURE 2b

HOLOTYPE, Male, USNM myriapod collection 2636, Piña area, Canal Zone, March 18, 1958, H. F. Loomis.

PARATYPES: Male and 2 females, USNM; male and female, Snow Museum; several males and females, author's collection, same data as holotype. Canal Zone, Barro Colorado Island, June 6, 1923, O. F. Cook and H. F. Loomis; August 1956, C. W. and M. E. Rettenmeyer; March 8-15, 1958, E. M. and H. F. Loomis; Frijoles, July 13, 1923, H. F. Loomis; Fort Sherman, April 20, 1925, O. F. Cook—all in author's collection. Panama, Juan Días, June 3, 1923, O. F. Cook and H. F. Loomis; Almirante, November 28, 1937, H. F. Loomis; El Valle, March 22, 1958, E. M. and H. F. Loomis—all in author's collection.

DIAGNOSIS: Principally differing from the other species in details of the gonopods, the closest relationship being with *O. rectus* Kraus from Peru.

DESCRIPTION: Length 11 to 13.5 mm., diameter 2.3 to 2.5 mm. Vertex of head, segment 1, and metazonites of other segments dull black; front of head, antennae, prozonites, and ventral surfaces, including legs, colorless.

Front of head hispid, finely roughened but shining, the sides swollen laterad of each antenna; vertex with a short, thick, uneven ridge on each side in front projecting outward, with its anterior portion covering part of the first antennal joint from behind; surface between the ridges and elsewhere behind them finely and evenly granular-tubercular but lacking setae.

First segment almost semicircular, anterior margin straight across, with a small indentation a short distance from each lateral angle; surface inflated on each side of middle and with larger tubercles than in the broad median depression, the largest being adjacent to the anterior margin mesad of the excavation; all tubercles with an apical seta.

Segment 2 with sides vertical, greatly expanded in front and below, the posterior margin with two deep notches above the lower limits; median surface flat, as wide as segment 1, its anterior margin deeply and evenly concave; the expanded sides joining the dorsum in almost a right angle marked in front, in strongly sculptured specimens, by a raised ridge, which is a continuation of the anterior side margin, the ridge followed by two or more large, elongate tubercles.

From segment 3 backward there are four longitudinal rows of large dorsal tubercles increasing in size on segments 17 to 19, three tubercles

in each inner row and two in each outer one with another large tubercle well below and anterior of them; in addition small seta-bearing tubercles are scattered elsewhere over the surface, those on lateral carinae smaller. From segment 5 or 6 to near posterior end of body the anterior margin of each carina is bowed forward; outer limits of carinae of segments 3 to 6 or 7 rather sharply rounded, ensuing ones gradually longer, the first of which have two lobes faintly indicated, the posterior ones with three lobes indicated; posterior margin of carinae with a deep notch at middle. Pores apparently in normal sequence but difficult to see, opening from a tubercle similar in shape and color to adjacent ones but slightly larger and located behind central point of carina.

Last segment short, between three and four times as broad as long, surface with scattered tubercles of which a median pair are larger; posterior margin with three distinct lobes each side of the apical one, the lobes separated by deep, narrow notches, outer lobe on each side largest.

Gonopod as shown in figure 2*b*.

### Genus *Lignydesmus* Cook

*Lignydesmus* Cook, Brandtia, fasc. 5, p. 28, 1896.

#### *Lignydesmus panamanus*, new species

##### FIGURE 2*c-d*

HOLOTYPE: Female, USNM myriapod collection 2637, Almirante, Panama, November 29, 1937, H. F. Loomis.

PARATYPE: 19-segmented female, author's collection, same collection data as holotype.

DIAGNOSIS: Differing principally from *L. rubriceps* (Peters), as shown in Cook's paper (Proc. U.S. Nat. Mus., vol. 21, pp. 451-468, pl. 30, figs. 2*a-f*, 1898) in having segment 1 crossed by a transverse biarcuate sulcus, sides of segment 2 extending only slightly below those of segment 3, areate portion of segments less convex than the smooth anterior portion.

DESCRIPTION: Length 9 mm., width 4 mm. Surface of segments in front of areations finely granular and dull, the areate border less granular, somewhat shining and less convex. Color in life probably white.

Head with clypeus almost parallel sided, the lateral margin behind it directed sharply outward and backward; surface of clypeus and front to between the antennae evenly convex with numerous erect seta; vertex with a low but distinct median ridge across anterior half, followed by a broad and deep depression across the basal half.

First segment quadrangular, front margin smooth, lacking the irregularities shown in Cook's figure 2*d* for *L. rubriceps*, almost straight and longer than posterior margin, which is convex and overlaps segment 2; anterior corners rounded, deflexed slightly and with a strong, thin, raised rim; surface considerably behind front margin with a prominent biarcuate sulcus nearly reaching the sides and more impressed on either side than at middle; surface on either side behind the sulcus smooth but evenly inflated; posterior margin faintly areate, with short sulci.

Segment 2 (fig. 2*c*), compared with that of *L. rubriceps*, not produced downward as far, scarcely exceeding segment 3, the side more expanded forward, the lower posterior corner less produced backward. On succeeding segments the surface in front of the areate portion is more convex than the areate border but on posterior end of body both portions are flatter and the areations less evident. Pores borne on low rounded elevations on segments 5, 7, 9, 10, 12, 13, and 15, a very slightly raised swelling on segment 16 with the pores of 17 and 18 opening from the level surface. Posterior end of body shown in figure 2*d*. Last segment thick and strongly convex, broadly rounded behind and, in ventral view, the margin with a small rounded lobe on either side of the median portion.

Female with ventral margin of segment 3 raised at middle into a triangular lobe.

### *Panamadesmus*, new genus

TYPE SPECIES: *Panamadesmus sculptilis*, new species, present designation and monotypy.

DIAGNOSIS: Probably most closely related to *Mesesmus* Chamberlin but differing as stated below.

DESCRIPTION: Body the shape and size of *Lignydesmus* Cook and *Mesesmus* Chamberlin and with pores borne in similar manner—but readily distinguished by the much more definitely sculptured first segment, which is emarginate in front; the almost completely closed sinus of segment 19, hiding segment 20 from above; the erect gonopods of which the outer division ends in a mesally concave spoonlike expansion, the inner division being stout, straight, and bluntly pointed; joint 3 of third male legs distally swollen, whereas no such modification of the male legs has been reported for *Lignydesmus*, and no males of *Mesesmus* are known. The genus differs further from *Mesesmus* in having segment 2 descending considerably below segment 3 instead of scarcely exceeding it as shown in Chamberlin's illustration. Last segment considerably exceeding anal valves with a small seta-bearing lobe on either side and several subapical ones. Preanal scale with two seta-bearing subapical tubercles, sides concave.

*Panamadesmus sculptilis*, new speciesFIGURE 2*e-i*

HOLOTYPE: Male, USNM myriapod collection 2638, Piña area, Canal Zone, March 18, 1958, H. F. Loomis.

ALLOTYPE: Female, USNM, same collection data as holotype.

PARATYPES: Male, Snow Museum, 2 males and female, author's collection, same collection data as holotype.

DESCRIPTION: Length 10 mm., width 4 mm. Color in life uniform cinnamon brown.

Head with clypeal area smooth and shining, convex, raised slightly above frontal area which is transversely wrinkled; anterior half of vertex with a short weak median ridge, surface behind it smooth and convex for a short distance, followed by a median depression, deepest in front, not reaching the back of the head; antennae crassate with joint 5 longest and thickest.

Segment 1 (fig. 2*e*) with front margin deeply concave, having a raised rim extending around the anterior margin; surface behind front margin gradually raised into a high biarcuate crest descending gradually at middle but abruptly on either side of it; between crest and the faintly areate posterior border are four large flat sharply marked subquadrangular areas.

Segment 2 (fig. 2*f*) shaped much as in *Mesesmus insulatus*, as shown by Chamberlin, but with each side extending farther downward, well below the side of segment 3; areate border as in above species and similar to that of ensuing segments. On these segments the sulcus between the areate border and anterior portion definitely more impressed than in *Lignydesmus panamanus* but the convexity of the two portions similar; surface of anterior portion very finely granular, dull, that of the areate border less densely granular and somewhat shining. Pores on prominent swellings to segment 13, reduced on segment 15 and lacking swellings on segments 16-18. Segments 18 and 19 as shown in figure 2*g*, the latter with median sinus very narrow, not exposing segment 20 which is thick, convex, and with a tuberculate margin as shown in figure 2*h*.

Gonopods (fig. 2*i*) composed of two erect branches, an outer spoon-like one and a shorter, thicker inner one terminating in an obtuse point.

Joint 3 of third male legs swollen distally. Female with ventral anterior margin of segment 3 raised at middle into a low, triangular lobe that is not as high as the one in *L. panamanus*.

**Genus *Detodesmus* Cook**

*Detodesmus* Cook, *Brandtia*, fasc. 5, p. 28, 1896.

NOTES: On the basis of differences in the gonopods shown in illustrations by both Cook (*Proc. U.S. Nat. Mus.*, vol. 21, pl. 30, figs. 1a-c, 1898) and Brolemann (*Ann. Soc. Ent. France*, vol. 67, pl. 26, figs. 127-141, 1898), Professor Chamberlin (1941) pointed out the misidentification of a Venezuelan milliped, which Brolemann reported as *Detodesmus* (*Oniscodesmus*) *aurantiacus* (Porat) Cook, and provided it with a new specific name, *Detodesmus brolemanni*, a step obviously needed. Professor Chamberlin, however, hardly went far enough for the first of Brolemann's figures shows an animal with areate posterior border on segment 2, a condition specifically denied by Cook for the genus *Detodesmus* and sustained by his illustration (pl. 30, fig. 1c), of the genotype species. Prof. Chamberlin recognized the nonareate condition of segment 2 in *Detodesmus*, for he used the areations of *Mesesmus* as a separating character, but he seems to have overlooked the implication of Brolemann's figure. Thus the species to which the new name *brolemanni* was given was incorrectly assigned to *Detodesmus*, and it is now proposed to return it, for the time being, to the genus where Brolemann originally placed it, as *Oniscodesmus brolemanni*. Cook neither described nor illustrated the gonopods of the supposed type of *Oniscodesmus oniscinus* (Gervais and Goudot), the genotype, which he saw in the British Museum, but illustrated those of a species he described as *Oniscodesmus micrurus*. Certainly *micrurus* and *brolemanni* are not congeneric, but it cannot be determined which, if either, is congeneric with *O. oniscinus* until its type specimen is examined, when the position of these two species may be evaluated.

Chamberlin (in *Univ. Utah Biol. Ser.*, vol. 11, No. 5, p. 46, fig. 80, 1950) described *Detodesmus tingonus* as a new species from Peru, but the illustration of the gonopod (fig. 80) precludes the generic assignment. Instead, the species is believed to typify a new genus, to which the name *Huanucodesmus* may be applied. Also in the above paper, *Detodesmus aurantiacus* is credited to Colombia, whereas I believe it has been reported only from Venezuela.

**Family Peridontodesmidae****Genus *Peridontodesmus* Silvestri**

*Peridontodesmus* Silvestri, *Ann. Mus. Civ. Stor. Nat. Genova*, vol. 36, p. 197, 1896.

***Peridontodesmus* species**

A 19-segmented male, Cerro Campana, Panama, March 16, 1958, G. B. Fairchild and H. F. Loomis, is the first record of this genus in Panama.

## Family Rhachodesmidae

In the present collection are two vials labeled "1923, Haiti?, O. F. Cook," containing a female *Chondrodesmus* species and two species of rhachodesmids, one representing a new genus. The fact that no rhachodesmids or species of *Chondrodesmus* are known from Haiti was called to Dr. Cook's attention, and he sent me this note: "Collections also had been made in the Canal Zone that year and it seems probable that the material was from there." Species of *Chondrodesmus* but no rhachodesmids have been reported from Panama, although they are known from adjacent regions. Still it seems reasonable to accept Dr. Cook's explanation and describe the new forms as likely members of the Panamanian fauna.

### Genus *Aceratophallus* Carl

*Aceratophallus* Carl, Rev. Suisse Zool., vol. 10, p. 608, 1902.

#### *Aceratophallus quadratus*, new species

FIGURES 2j, 3a-b

**HOLOTYPE:** Male, USNM myriapod collection 2639, presumably from Canal Zone (see paragraph above), 1923, O. F. Cook.

**ALLOTYPE:** Female, USNM, collection data same as for holotype.

**PARATYPES:** Male, Snow Museum, male and female, author's collection, collection data same as for holotype.

**DIAGNOSIS:** Closely related to *A. lamellifer* Brolemann as indicated by the gonopods, which show obvious differences; also the body is shorter and relatively broader.

**DESCRIPTION:** Largest male 26 mm. long, 4 mm. wide; largest female 31 mm. long, 5 mm. wide; original color bleached out.

Body parallel sided, compact, little of prozonites showing; dorsum of male nearly flat, female more convex; lateral keels nearly horizontal, wide, projecting squarely outward with ectal margin nearly straight, giving segments a strikingly rectangular appearance. Head completely beset with variable length setae, those at back of vertex shortest; vertex with deep median furrow; antennae slender, joint 2 longest, followed by subequal joints 3 and 6.

Segment 1 sublunate, over three times as broad as long; anterior margin with raised rim behind which are six erect setae; surface coriaceous or smooth at middle but granular on sides; posterior border conspicuously emarginate across middle.

Beginning with segment 2 both corners of keels are almost acutely squared, the anterior corner with a sharp tooth present to segment 18; from middle of body backward anterior corners slightly rounded,

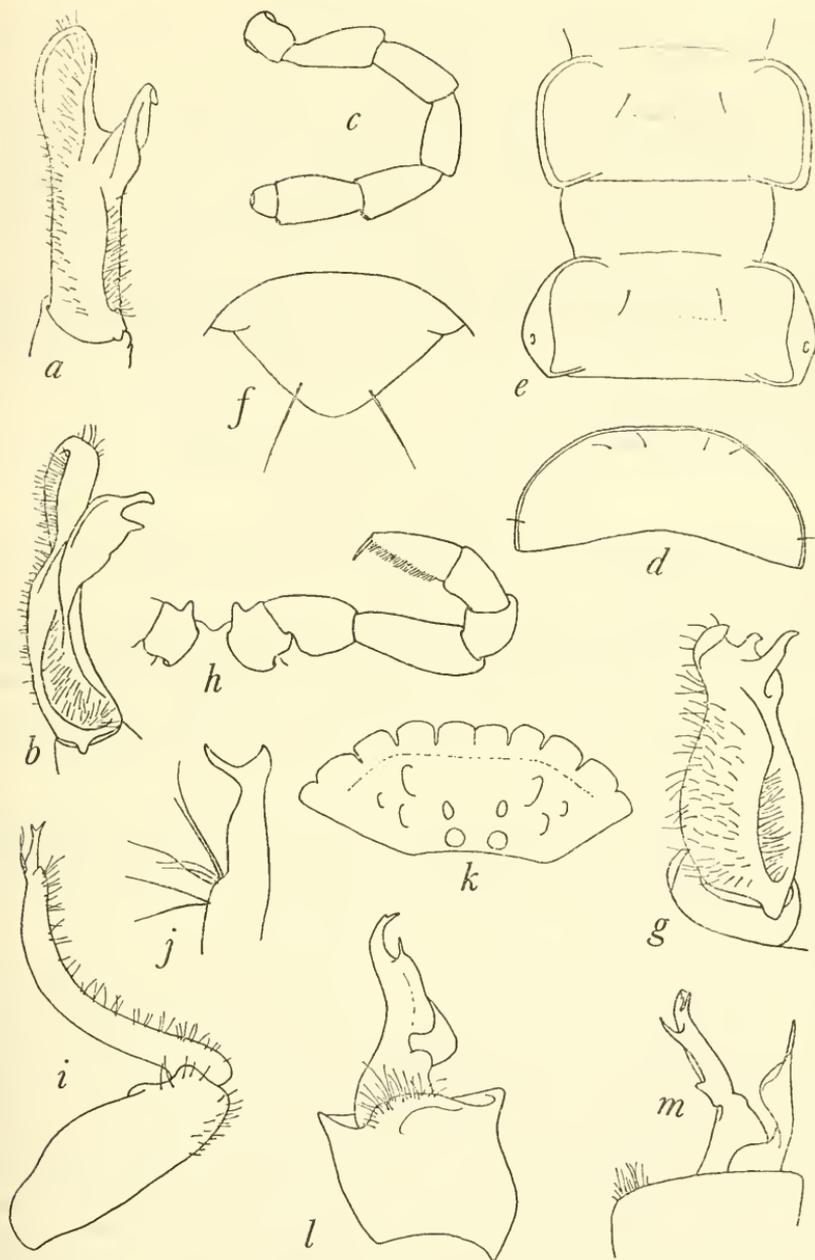


FIGURE 3.—*a-b*, *Aceratophallus quadratus*: *a*, Right gonopod, posterior view; *b*, right gonopod mesal view. *c-h*, *Teinorhachis tenuis*: *c*, Antenna; *d*, segment 1, dorsal view; *e*, segments 11 and 12, dorsal view; *f*, preanal scale; *g*, right gonopod, posterior view; *h*, third male leg and sternum, posterior view. *i-j*, *Sphaeriodesmus conformans*: *i*, Right gonopod, lateral view; *j*, tip of right gonopod, posterior view. *k-m*, *Botrydesmus coronatus*: *k*, Segment 1, dorsal view; *l*, left gonopod, anterior view; *m*, left gonopod, oblique lateral view.

posterior ones to segment 15 a little produced caudally (fig. 2j), thereafter slightly more so; segment 19 with keels reduced in size, posterior corners small; dorsum of segments with a broad, faint median depression in front of which are two erect setae; median surface of segments smooth or coriaceous, the keels finely and densely granular, margins of keels with raised rims; pores opening laterally from the usual segments; outer margin of poreless segments slightly longer than the adjacent poriferous ones. Last segment with two dorsal setae near apical third; four others at base of apex, two being dorsal plus one each side; apex with four long setae; posterior margin adjacent to each valve with three setae; preanal scale large, triangular, with two long setae.

Gonopods as in figure 3a-b.

Anterior male legs unmodified, like those of female.

### *Teinorhachis*, new genus

TYPE SPECIES: *Teinorhachis tenuis*, new species, by present designation and monotypy.

DIAGNOSIS: Related to *Strongylodesmus* Saussure but much smaller, with normal pore formula, and none of the posterior angles of the keels are spiniform. Differing from other genera of the family in the shape and proportions of body, different widths of poriferous and poreless segments on anterior half of body, and the size and shape of the gonopods.

DESCRIPTION: Body slender, loose jointed, gradually narrowed from in front. Males less convex than females and with wider lateral carinae. Antennae rather slender, joints 2 to 6 about subequal in length and thickness; joints 5 and 6 with a small sensory area at dorsal apex.

Segment 1 sublunate, about three times as broad as long. Segment 2 or 3 widest, narrowing thereafter. Dorsal surface of segments smooth, a broad transverse median depression present in front of which are two erect setae; lateral keels little projecting in female and lower on sides of body, those of male nearly at level of dorsum, the poriferous ones on front half of body wider than the adjacent poreless ones and with both angles and outer margin more rounded; on caudal segments posterior corners are lightly produced; pores opening outward from usual segments. Last segment with narrowed apical half convexly raised above anterior half; anal valves strongly inflated, margins thin and strongly elevated; preanal scale triangular, swollen each side at base. Legs long, the four outer joints projecting beyond the keels.

Gonopods short and stout, subcolumnar, ending in an inwardly curved outer plate and two digital processes of different lengths.

Anterior male legs with secondary modifications.

*Teinorhachis tenuis*, new species

FIGURE 3c-h

HOLOTYPE: Male, USNM myriapod collection 2640, probably from Canal Zone (see family heading, p. 92), 1923, O. F. Cook.

PARATYPES: Three 19-segmented females, author's collection, same collection data as for holotype.

DESCRIPTION: Male 18 mm. long, 1.7 mm. wide. Body slender, loose jointed, the prozonites especially exposed in midregion of body; body widest at segment 2 or 3, gradually narrowing thereafter; dorsum smooth, convex in female with lateral keels thick, narrow and projecting just above middle line of sides; male more flattened with keels wider and nearly on level of dorsum; color destroyed by preservation. Legs exceeding keels by the four outer joints, joint 3 longest; sterna high, finely hispid, and nearly as wide as combined lengths of joints 1 and 2 of legs.

Head, from a short distance above antennae to the front margin, rather densely beset with fine erect hairs of various lengths; vertex without a median furrow in male but a strong one in females; antennae slender with joints 2 to 6 subequal in length and thickness (fig. 3c).

Segment 1 sublunate, three times as wide as long, front margin with a raised rim followed by setae as shown in figure 3d. Ensuing segments with a broad, indefinite transverse median depression in front of which are two erect setae; lateral keels of segments 2 to 4 thin and with both corners more squarely angular than ensuing ones; poriferous keels through segment 14 wider and with outer margins and posterior angles more rounded than adjacent poreless keels (fig. 3e); from segment 15 backward keels have posterior angles increasingly produced to segment 18 on which keels are narrower, and those of segment 19 even less developed with posterior angles half as large as on segment 18; anterior corners of segments 2 to 6 with an outer tooth in male, a similar tooth present to segment 15 or 16 in female. Last segment long, the narrowed apical half longitudinally convex and sharply raised above the forward half; apex with four terminal setae; anal valves strongly inflated with thin, high margins; preanal scale shown in figure 3f.

Gonopods as in figure 3g, relatively small, reaching forward only between the coxae of seventh legs. Pregenital legs of male with outer joint, especially on first three pairs, heavier than those following the gonopods and densely hairy beneath; third male leg and sternum shown in figure 3h.

**Family Sphaeriodesmidae**  
**Genus *Sphaeriodesmus* Peters**

*Sphaeriodesmus* Peters, Monats. Preuss. Akad. Wiss. Berlin, p. 529, 1864.

***Sphaeriodesmus conformans* Chamberlin**

FIGURE 3i-j

*Sphaeriodesmus conformans* Chamberlin, Proc. Biol. Soc. Washington, vol. 38, p. 44, 1925.

Canal Zone, male, female and young, Barro Colorado Island, June 6, 1923, O. F. Cook and H. F. Loomis; many females, Piña area, March 18, 1958, H. F. Loomis.

Panama, many females, Juan Díaz, June 3, 1923, O. F. Cook and H. F. Loomis; male, 2 females, Alahjuela, July 20, 1923, H. F. Loomis. Gonopods as shown in figure 3i-j.

**Family Stylodesmidae**  
**Genus *Botrydesmus* Loomis**

*Botrydesmus* Loomis, Smithsonian Misc. Coll., vol. 89, p. 62, 1934.

***Botrydesmus coronatus*, new species**

FIGURE 3k-m

**HOLOTYPE:** Male, USNM myriapod collection 2641, collected with Berlese funnel from inside log on Barro Colorado Island, Canal Zone, July 7, 1956, C. W. and M. E. Rettenmeyer, No. 2113.

**ALLOTYPE:** Female, Snow Museum, same data as for holotype.

**PARATYPES:** Canal Zone, young male, Barro Colorado Island, March 8-15, 1958, E. M. and H. F. Loomis; young male, Piña area, March 18, 1958, H. F. Loomis.

**DIAGNOSIS:** A smaller species than *B. cryptus* Chamberlin and with the two median lobes of segment 1 less separated by a sinus than the adjacent lobes; dorsum without a third ridge on each side.

**DESCRIPTION:** Length 3 mm., width 0.5 mm.

Head with sides of labrum and clypeus straight but oblique, surface slightly convex, smooth, shining and finely hispid to a line across tops of antennal sockets; vertex raised above front and with a strong median furrow; a large rounded tubercle behind and mesad of each antenna; crest of vertex with a row of six rounded tubercles increasing in size mesad; vertex roughened in front of crest but smooth behind it.

Front margin of segment 1 (fig. 3k) having 10 lobes of which the 2 outermost on each side are little separated and nearly horizontal while the 6 intermediate ones are definitely upturned and separated by open sinuses; disk with 5 tubercles on each side, the 4 anterior

ones elongate oval with the foremost one largest, the fifth tubercle submedian, round and next in size.

Ensuing segments with four high thin triparted ridges of equal size on all segments to 17 or 18, where the outer ridge decreases and the two inner ones increase in size and are moderately produced caudally; there is no indication of a third ridge on each side as in *B. cryptus*; surface between ridges and laterad of them apparently roughened but mostly hidden beneath coating of organic matter; lateral carinae broader than in genotype, the outer margin of those on segments 2 and 18 trilobed, the intervening ones bilobed; pores in normal sequence, opening from a broad, low swelling on surface of last lobe of carina except on penultimate segment which has lateral carinae reduced in size but more strongly produced backward, the pore opening from a conic tubercle projecting back over the posterior margin of the third lobe. Last segment rather large with an elongate ridge on each side of middle, posterior margin broadly and evenly rounded, with a broad median lobe and three smaller lobes on each side, separated by more or less open sinuses, depending on amount of organic matter they contain.

Gonopods as shown in figure 3*l-m*.

### Genus *Cynedesmus* Cook

*Cynedesmus* Cook, American Nat., vol. 30, p. 419, 1896.

#### *Cynedesmus trinus* Loomis

*Cynedesmus trinus* Loomis, Journ. Kansas Ent. Soc., vol. 32, No. 1, figs. 9-10, 1959.

A mature and two 19-segmented females, Cerro Campana, Panama, March 16, 1958, G. B. Fairchild and H. F. Loomis.

### Genus *Poratia* Cook and Cook

*Poratia* Cook and Cook, Ann. New York Acad. Sci., vol. 8, p. 238, 1894.

*Dominicodesmus* Chamberlin, Proc. Biol. Soc. Washington, vol. 36, p. 189, 1923.

*Tidopterus* Chamberlin, Zoologica, New York, vol. 3, No. 21, p. 420, pl. 27, figs. 7-9, 1923.

In determining specimens in the present collection, reference was made to Silvestri's excellent treatment of *Poratia* (Bol. Soc. Española Hist. Nat., vol. 23, pp. 372-375, illus., 1923), when it was found that specimens of the genotype species, *P. digitata* (Porat), were represented in the Panamanian fauna. Its resemblance to *Psochodesmus crescentis* Cook led the writer, on a recent visit to Washington, to seek the type of that species in the U.S. National Museum collection. Fortunately, this was found and a brief examination showed it to be a male with gonopods, which were not dissected, very similar to those

shown in Silvestri's figure 4, but with the crossed terminal branches more slender. Dissection just made of a gonopod of a male *P. crescentis* (fig. 4a) collected between Arcadia and Okeechobee, Florida, now shows the genus to be distinct from *Poratia*. Furthermore, Chamberlin's *Dominicodesmus* and *Tidopterus*, once placed as synonyms of *Psochodesmus* now are seen to be synonyms of *Poratia* on the basis of their gonopods. Reappraisal of the description of *Xerodesmus* Chamberlin (Occas. Pap. California Acad. Sci., vol. 12, p. 403, figs. 36-38, 1923), which I once placed as a synonym of *Psochodesmus*, now leads me to consider it a valid genus insofar as *Psochodesmus* or *Poratia* are concerned. Chamberlin's name, however, was preoccupied by *Xerodesmus* Cook (Brandtia, fasc. 1, p. 2, 1896), and Attems (Das Tierreich, Lief 70, p. 322, 1940), has replaced it with *Kapyrodesmus*.

#### *Poratia digitata* (Porat)

*Scytonotus digitatus* Porat, Ent. Tidskr., vol. 10, p. 35, 1889.

*Poratia digitata* Cook and Cook, Ann. New York Acad. Sci., vol. 8, p. 238, 1894.

*Poratia heterotuberculata* Carl, Rev. Suisse Zool., vol. 10, p. 267, pl. 11, fig. 99, 1902.

*Dominicodesmus panamicus* Chamberlin, Bull. Univ. Utah, vol. 30, No. 9, p. 6, 1940.

Numerous specimens from Canal Zone, Monte Lirio, June 8, 1923, and Gamboa, Apr. 19, 1925, O. F. Cook; Frijoles, July 13, 1923, H. F. Loomis

#### *Poratia granulofrons* (Chamberlin)

*Treseolobus granulofrons* Chamberlin, Bull. Mus. Comp. Zool., vol. 62, p. 221, 1918.

*Dominicodesmus geophilus* Chamberlin, Proc. Biol. Soc. Washington, vol. 36, p. 189, 1923.

*Psochodesmus granulofrons* Loomis, Smiths. Misc. Coll., vol. 89, No. 14, p. 54, 1934.

Canal Zone, 2 females, Barro Colorado Island, March 8-15, 1958, E. M. and H. F. Loomis; 2 females, Piña area, March 18, 1958, H. F. Loomis.

Panama, 2 females, Taboga Island, July 15, 1923, O. F. Cook and H. F. Loomis.

#### *Tracheloaspis*, new genus

TYPE SPECIES: *Tracheloaspis tumida*, new species, by present designation and monotypy.

DIAGNOSIS: Possibly related to *Gasatomus* Chamberlin, of which males still are unknown, but with stouter body; shorter, broader first segment having more extensive front margin and slightly crenulate back margin; keels of segments 6 to 19, four lobed, those of segments 17 to 19 strongly produced caudally.

DESCRIPTION: Body short and broad with 20 segments, the dorsum strongly convex. Head with vertex not abruptly raised above frontal area, surface granular with a large tubercle above each antennal socket; antennae clavate with joint 6 longest and thickest.

Segment 1 with extensive expanded front margin divided into 12 lobes ending in faint crenations; posterior margin of median portion weakly crenate, the disk with 10 large rounded tubercles.

Ensuing segments each with four longitudinal rows of three tubercles but the anterior one in each row on segment 2 is transversely expanded, especially the two medial ones; keels of segments 2 to 5 with three outer lobes, those thereafter with four lobes; pores on segments 5, 7, 9, 10, 12, 13, 15, and 16, opening from large tubercles projecting outward and slightly downward and backward from below the middle lobe of keel on segment 5 but below the third lobe thereafter; on the poriferous keels the lobe above the tubercle does not project out as far as on poreless segments and its outer edge is completely free and separate from the tubercle beneath it; keels of segments 17 to 19 strongly produced caudally. Last segment margined by eight distinct seta-bearing tubercles in addition to the apex with its customary four setae.

Gonopods with a galeate basal joint supporting two simple, caudally curved branches.

*Tracheloaspis tumida*, new species

FIGURE 4b-e

HOLOTYPE: Male, USNM myriapod collection 2642, Barro Colorado Island, Canal Zone, March 8-15, 1958, E. M. and H. F. Loomis.

ALLOTYPE: Female, USNM, same collection data as holotype.

PARATYPES: Male, author's collection, same collection data as holotype. Canal Zone, 1 female, Monte Lirio, June 8, 1923, R. D. Martin. Panama, Juan Días, June 3, 1923, O. F. Cook and H. F. Loomis; Alahjuela, April 13, 1925, O. F. Cook—all in author's collection.

DESCRIPTION: Length 7 mm., width 1.5 mm. Head with labral area smooth and shining, the surface above it to the vertex finely, transversely wrinkled and with fine short setae; vertex not suddenly elevated above front, lacking a median groove; surface finely and densely granular with a larger tubercle just above each antennal socket; antennae as shown in figure 4b.

Segments 1 and 2 shown in figure 4c. Segments frequently with incrustation of organic matter obliterating the minor sculpturing, which consists of small inconspicuous secondary tubercles, the pri-

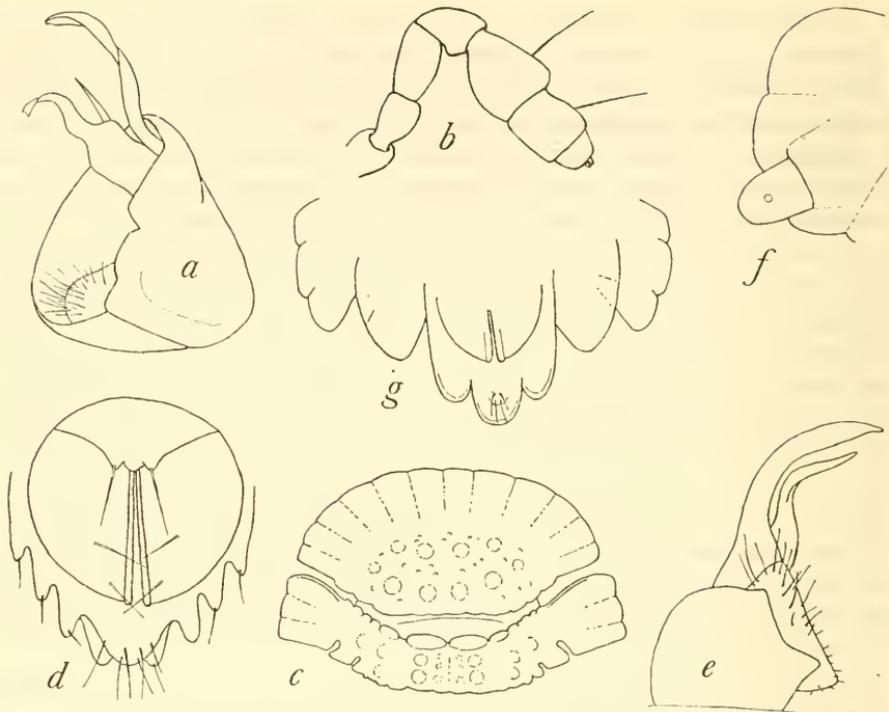


FIGURE 4.—*a*, *Psochodesmus crescentis*, posterior and slightly mesal view of left gonopod. *b-e*, *Tracheloaspis tumida*: *b*, Antenna; *c*, segments 1 and 2, dorsal view; *d*, last segment, anal valves, and preanal scale, ventral view; *e*, right gonopod, lateral view. *f-g*, *Xenoporus cariniceps*: *f*, Lateral keel of segment 15; *g*, segments 18, 19, and 20, ventral view.

mary ones well exposed. Last segment with marginal lobes as shown in figure 4*d*, in which the valves and preanal scale are also shown.

Gonopods shown in figure 4*e*. Anterior male legs and sterna without modifications. Females with a high, slightly rolled crest or lip behind second pair of legs.

#### *Xenoporus*, new genus

TYPE SPECIES: *Xenoporus cariniceps*, new species, by present designation and monotypy.

DIAGNOSIS: Probably most closely related to *Gasatomus* Chamberlin but differing particularly in having the pores opening from upper side of the pore tubercles and in the form of the gonopods. Distinguished further by the unlobed margins of the keels of segment 19 and the strongly concave ventral surface of the lobes of segment 20.

DESCRIPTION: Body small and about five times as long as broad, dorsum strongly convex with broad keels from low on the sides. Head covered by segment 1; vertex with a granular ridge on either

side; antennae short, clavate, joint 5 twice as long as any other joint and slightly thicker, a long seta projecting from the upper side and a similar one on joint 6.

Segment 1 of much the same shape as in *Tracheloaspis*, the expanded front margin somewhat reflexed, divided into 12 areas with anterior border faintly crenate; median area with 10 large rounded tubercles in 2 transverse rows.

Ensuing segments each with four longitudinal rows of three tubercles each that are transversely oval; almost no secondary tubercles between the two inner rows but they are separated by a narrow deep groove; secondary tubercles between the inner and outer rows usually three, arranged in a triangle pointing forward; lateral keels from segment 2 to 18 three lobed, the poriferous tubercle produced from the third lobe of segments 5, 7, 9, 10, 12, 13, 15, and 16, being large and sub-conical with the pore opening from just beyond middle of its upper side. Segment 19 with outer margin smooth and continuous, lacking crenations. Last segment rather long, parallel sided and with three strong terminal lobes which are concave below; dorsal surface with a broad median ridge continuing along the median lobe.

Gonopods with hemispherical basal joint from which the inner or terminal joint projects but slightly. Male with joint 2 of third legs showing secondary modification.

*Xenoporus cariniceps*, new species

FIGURES 4f-g, 5a

HOLOTYPE: Male, USNM myriapod collection 2643, El Valle, Panama, March 22-23, 1958, E. M. and H. F. Loomis.

PARATYPE: Female, author's collection, same collection data as holotype.

DESCRIPTION: Body about five times as long as wide, 4.2 mm. long, 0.9 mm. wide.

Head with clypeal and frontal areas shining, sparsely setose; vertex separated from front by a transverse depression on a line with tops of the antennal sockets, a distinct median impression present, surface finely granular, each side with a prominent granular ridge beginning behind each antenna and extending outward obliquely to back of head.

Segment 1 with median area convex, crossed by two rows of rounded tubercles, four in front row and six in the back row following the curve of the posterior margin, the outer tubercle on each side smaller than the other eight.

Ensuing segments with dorsum strongly convex, keels low on the sides, projecting outward and slightly downward; dorsal surface

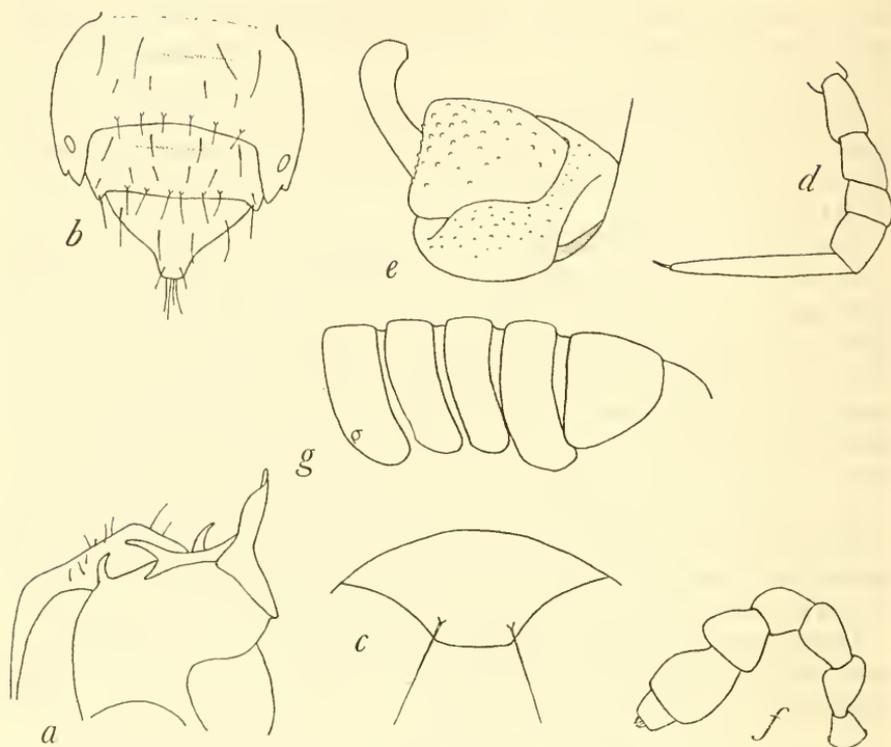


FIGURE 5.—*a*, *Xenoporus cariniceps*, left gonopod, mesal view. *b-e*, *Enantiogonus fragilis*: *b*, Segments 17, 18, and 19, dorsal view; *c*, preanal scale; *d*, leg from middle of body; *e*, right gonopod, oblique lateral view from slightly behind. *f-g*, *Hypsiloporus proclivis*: *f*, Antenna; *g*, first 5 segments, with setae omitted, lateral view.

as in generic description except that the rows of primary tubercles do not increase in height on posterior segments but are closer together; keels all three lobed to segment 18 with outer margin thickened; pore opening from the upper side of a large tubercle projecting from dorsal side of the third lobe of the keel (fig. 4*f*), keels of segment 17 scarcely produced caudally, those of segments 18 and 19 strongly so with the latter showing no lobes on the outer margin in strong contrast to those preceding (fig. 4*g*). Last segment long, much exceeding segment 19; sides nearly parallel; apex occupied by three large lobes, which are strongly concave below, the quadrisetose ventral tubercle well in advance of apex of middle lobe; dorsal surface with broad median ridge extending to end of median lobe.

Gonopods as in figure 5*a*.

Male with second joint of third legs thicker and longer than in other legs, an acute tooth near outer end on ventral side.

The foregoing generic and specific descriptions were based on the male only as the female shows a number of differences and may

represent another species. It is 5.5 mm. long and 1 mm. wide; tubercles of anterior row on segment 1 are larger than those of the second row or any of those on segment 1 in the male; on ensuing segments the tubercles of the primary rows are round and the two inner rows have two distinct rows of secondary tubercles between them.

### Family Vanhoeffeniidae

#### Genus *Cryptogonodesmus* Silvestri

*Cryptogonodesmus* Silvestri, Anal. Mus. Nac. Buenos Aires, ser. 2, vol. 6, p. 59, 1898.

#### *Cryptogonodesmus* species

Numbers of females or young from the localities below are not identifiable as to species.

Canal Zone, Barro Colorado Island, June 6, 1923, O. F. Cook and H. F. Loomis; March 8–15, 1958, E. M. and H. F. Loomis.

Panama, Juan Días, June 3, 1923, O. F. Cook and H. F. Loomis.

#### *Enantiogonus*, new genus

TYPE SPECIES: *Enantiogonus fragilis*, new species, by present designation and monotypy.

DIAGNOSIS: Probably most closely related to *Irazunus* Attems, of Costa Rica, the males of which have 19 segments, the females 20 segments, but differing in the gonopods and possibly in the truncated preanal scale, which was not described for *Irazunus*.

DESCRIPTION: Body small, delicate, and poorly chitinized, resembling a tiny *Polydesmus* in appearance, composed of 19 segments.

Head with margin of labrum scarcely emarginate, sides of head straight but oblique; antennae not especially slender, joints 2 to 6 little different in length but joints 5 and 6 somewhat thicker.

Segment 1 semicircular, narrower than ensuing segments, encircled by 16 erect setae, 8 near anterior and 6 near posterior margin and 1 in each outer angle; there are 4 additional setae across middle of disk.

Ensuing segments with three transverse rows of setae, apparently 4–4–6 or 6–4–6, but so many are rubbed off this cannot be determined; surface of segments finely reticulated and raised into large faintly polygonal areas; also there is a distinct transverse median impression; lateral carinae thin with anterior corners rounded, posterior corners angular beginning with segment 2, those of segments 15, 16, and 17 increasing rapidly in size but those of segment 18 greatly reduced; on all except the caudal segments the posterior margin between the produced angles is triarcuate; pores large, opening outward and

backward from posterior side of a swelling in front of the produced angle of segments 5, 7, 9, 10, 12, 13, 15-17, and 18?. Last segment with apex narrowed and deflexed, surpassing the valves. Preanal scale truncate at apex.

Gonopods with basal joint broad, flattened and with a smaller semiglobular second joint supporting a simple curved half-cylindrical blade.

*Enantiogonus fragilis*, new species

FIGURE 5b-e

HOLOTYPE: Male, USNM myriapod collection 2644, Piña area, Canal Zone, March 18, 1958, H. F. Loomis.

DESCRIPTION: Body slender, 3.2 mm. long; color in alcohol light brown.

Head with labrum scarcely indented at middle, sides straight, strongly oblique; front finely hispid; antennae rather slender with joints 2 to 6 subequal in length, joint 7 two-thirds as long as 6, joints 2 to 4 equal in width, slightly exceeded by joint 5 with joint 6 a little thicker.

Segment 1 narrower than segment 2, semicircular, the lateral angles sharply rounded. Ensuing segments with a transverse median impression; surface finely reticulated, raised into indistinct polygonal areas and with setae as mentioned for the genus.

Segment 2 with outer margin of carinae rather broadly rounded and with two or three indefinite teeth (two on succeeding segments), posterior angle on each side slightly produced backward, posterior margin between the two angles triarcuate, becoming more noticeably so to about segment 11 or 12; posterior corners also more produced on succeeding segments to 17 where they reach their maximum size but are greatly reduced on segment 18 (fig. 5b). Pores large, definitely dorsal, opening obliquely outward and backward from posterior side of a swelling in front of the produced corner. Last segment ending in a deflexed, truncate tip bearing four setae. Preanal scale broadly truncate at apex, the sides concave (fig. 5c). Legs with joint 6 slender and nearly as long as joints 2 to 5 combined (fig. 5d).

Gonopods as shown in figure 5e.

*Hypsiloporus*, new genus

TYPE SPECIES: *Hypsiloporus proclivis*, new species, by present designation and monotypy.

DIAGNOSIS: The shape of the body, segments and keels suggest *Inodesmus* Cook but the 20-segmented body and the dorsal setae in three rows, instead of scattered over the surface, immediately distinguish this genus.

DESCRIPTION: Body very small, strongly convex, composed of 20 segments which are crossed by 3 transverse rows of strongly clavate setae, most of which, especially the first 2 rows on anterior segments, curve dorsocephalad; lateral carinae narrow, continuous with dorsum, produced forward and with rounded anterior and posterior corners except on last few segments where the posterior corners are somewhat angular but not produced backward beyond posterior margin. Head densely setose above antennae, the frontal area with fewer and longer setae; antennae rather short and thick.

Segment 2 projecting forward and downward considerably below both segments 1 and 3. Pores large, each opening from a sharply conic elevation near posterior margin mesad of corner of segments 5, 7, 9, 10, 12, 13, 15-19. Last segment with apex narrow, deflexed, and slightly exceeding the valves. Last pair of legs with a slender seta at the dorsal apex of joint 5 that is longer than joint 6; similar setae, rapidly decreasing in length, are on legs immediately in front of last pair.

Although males are lacking, sufficient outstanding characters are shown by the females to provide identification marks for future specimens of this genus.

*Hypsiloporus proclivis*, new species

FIGURE 5f-g, 6a

HOLOTYPE: Female, USNM myriapod collection 2645, Barro Colorado Island, Canal Zone, March 8-15, 1958, E. M. and H. F. Loomis.

PARATYPES: Female and juvenile specimen, author's collection, same collection data as for holotype.

DESCRIPTION: Body 2.5 mm. long; white in alcohol; surface of segments, both above and below, finely but distinctly reticulated.

Head densely covered with very short erect setae; antennae short and stout (fig. 5f); joints 2, 3, and 4 subequal in length and width; joint 5 of same length but much wider, equaling joint 6, which is considerably longer. Anterior end of body shown in figure 5g.

Segment 1 broadly semioval, posterior margin straight, outer angles abruptly rounded; 3 transverse series of clavate setae curving dorsocephalad, 10 near anterior margin, 4 across middle, and 6 near posterior margin.

Ensuing segments with three transverse rows of similar setae, those of the first two rows usually curving dorsocephalad, third row more obliquely backward; setae rubbed from the specimens but appearing to number 6-4-6 in the rows; lateral carinae with three more setae on dorsal surface projecting somewhat outward beyond lateral margin.

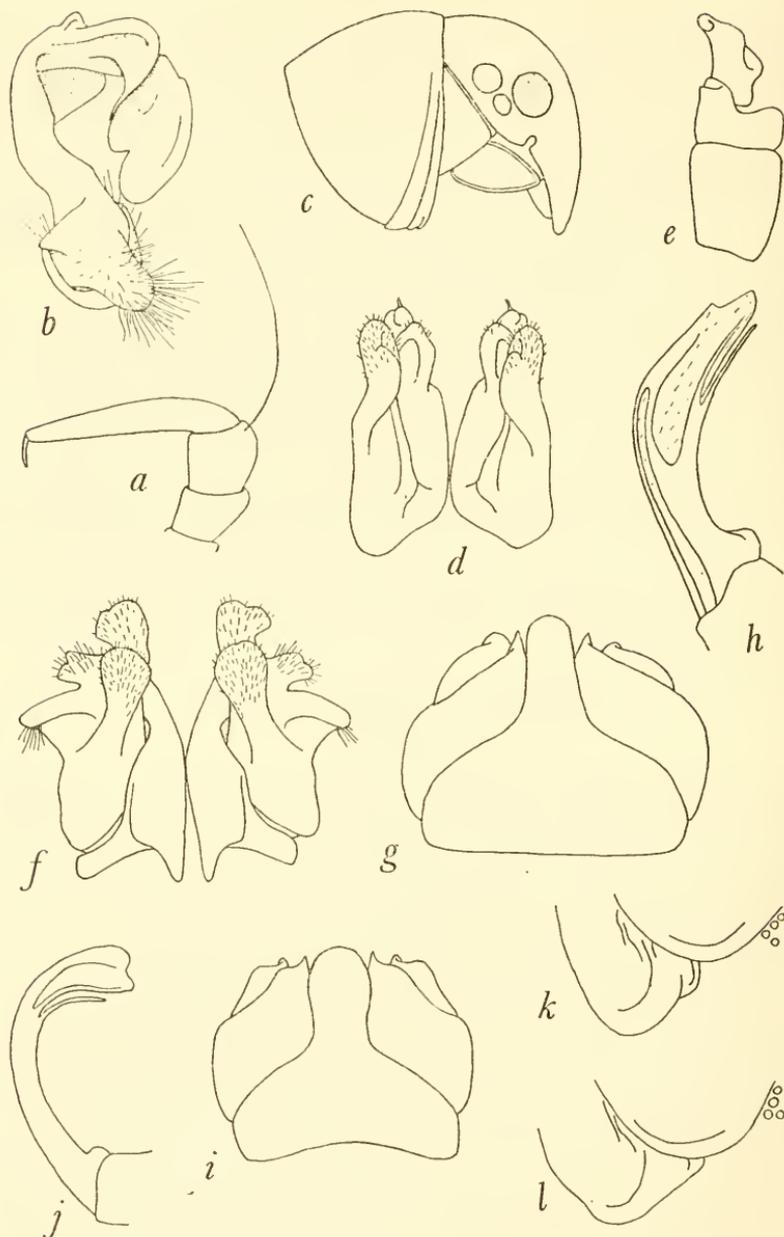


FIGURE 6.—*a*, *Hypsiloporus proclivis*, last leg showing the long seta. *b*, *Mestosoma isthmianum*, right gonopod, posterior view. *c-e*, *Prostemiulus oculus*: *c*, Head and segment 1, lateral view; *d*, gonopods, anterior view; *e*, second male leg, anterior view. *f*, *Stemmiulus canalis*, gonopods, anterior view. *g-h*, *Eurhinocricus cooki*: *g*, Gonopods, anterior view; *h*, inner left gonopod, posterior view. *i-j*, *Oxyptyge benedictus*: *i*, Gonopods, anterior view; *j*, inner left gonopod, posterior view. *k-l*, *Rhinocricus insulatus*: *k*, Lower margin of segments 1 and 2, lateral view; *l*, lower margin of segments 1 and 2 of another specimen.

Segment 2 with sides curving forward and extending considerably lower than either segment 1 or 3; it and ensuing segments to caudal end of body with anterior and posterior corners of lateral carinae rounded, the posterior ones of segments 16 to 19 somewhat angular; carinae thick, narrow, continuous with the descending dorsum and all curving forward noticeably except on caudal segments. Last segment with apex narrowed and decurved, surpassing the valves.

Legs not noticeably long or slender, the last pair with a slender seta at the outer dorsal end of joint 5 that is longer than joint 6 (fig. 6a); similar setae rapidly decreasing in length are on the fifth joints of legs immediately in front of the last pair.

### Family Strongylosomidae

#### Genus *Mestosoma* Silvestri

*Mestosoma* Silvestri, Boll. Mus. Anat. Comp. Torino, No. 283, vol. 12, p. 3, figs. 1-5, 1897.

*Nearctoma* Chamberlin, Ann. Ent. Soc. America, vol. 45, p. 582, fig 46, 1952.

TYPE SPECIES: *N. cuzconum* Chamberlin.

#### *Mestosoma isthmianum*, new species

##### FIGURE 6b

HOLOTYPE: Male, USNM myriapod collection 2646, Alahjuela, Panama, July 20, 1923, H. F. Loomis.

ALLOTYPE: Female, USNM, same collection as for holotype.

PARATYPES: Male and female, author's collection, same collection data as for holotype. Canal Zone, several males and females from Balboa, Paraiso, and Pedro Miguel, July 1923, O. F. Cook and R. D. Martin.

DIAGNOSIS: Related to *M. araguanum* (Chamberlin) from Venezuela as indicated by the gonopods but differing in certain details and in having the dorsum smooth and shining, instead of irregularly roughened as in that species.

DESCRIPTION: Length 25 to 27 mm., width 2.5 to 3 mm.; males more slender than females.

Body smooth, strongly shining; each segment with four setae near the anterior margin except on last segment, which has them near the middle with another series of four just in front of the apex; segment 1 also has an additional seta on each side of the middle at the posterior third. Color in alcohol nearly black throughout except for a broad longitudinal median yellowish-brown stripe extending from the anterior margin of segment 1 to the produced apex of the last segment; head, antennae, and anal valves wholly black; preanal scale yellow.

Head as wide as the first segment; median furrow of the vertex narrow but strongly impressed; antennae separated by a distance equal to the diameter of a socket; joints 2 and 5 subequal in length with joint 6 slightly shorter.

Segment 1 subreniform, the sides rounded with a raised rim, posterior margin slightly emarginate at middle. Segments 1 to 4 subequal in width, noticeably narrower than those that follow. Segment 2 produced forward into an acute angle on each side below the lateral margin of segment 1; surface behind it with a thin longitudinal ridge extending to the posterior margin. Segments 3 and 4 with each lateral carina reduced to a slight swelling set off above, but not below, by a fine sulcus; ensuing poriferous carinae represented merely by a swollen prominence, broad in front and converging to a low angulation near the posterior margin, the swelling set off above by a strong sulcus and by a weaker one below; pore located a short distance in front of the angulation on usual segments; on poreless segments the swellings are much less prominent; segment 17 with pore swelling reduced and absent from segments 18 and 19.

Metazonites of segments 5 to 18 with a strongly impressed transverse median sulcus not reaching the pore swellings; other segments without trace of a sulcus. Segments 4 to 16 or 17 with a thin but pronounced crescentic ridge, bowed downward, on each side a third of the way from the base of the legs to the carinal swelling. Last segment with apex much exceeding the valves and decurved. Preanal scale triangular, two-thirds as long as wide.

Gonopod as shown in figure 6*b*.

Male with joint 3 of legs 4 to 7 with a small conic, setiferous tubercle at the apical fourth on the lower side; a dense cushion of hairs on ventral face of two outer joints of all legs except the last two pairs.

### **Genus *Orthomorpha* Bollman**

*Orthomorpha* Bollman, U.S. Nat. Mus. Bull. 46, p. 159, 1893.

#### ***Orthomorpha coarctata* (Saussure)**

*Polydesmus coarctatus* Saussure, Mém. Soc. Phys. Nat. Genève, vol. 15, p. 297, pl. 3, fig. 18, 1860. (For additional synonymy, see Chamberlin and Hoffman, U.S. Nat. Mus. Bull. 212, p. 83, 1958.)

Several specimens, Barro Colorado Island, Canal Zone, January and February 1955, C. W. Rettenmeyer.

## Family Stemmiulidae

Genus *Prostemmiulus* Silvestri

*Prostemmiulus* Silvestri, Boll. Lab. Zool. Portici, vol. 10, pp. 313, 323, 1916.

*Prostemmiulus oculus*, new species

## FIGURE 6c-e

HOLOTYPE: Male, USNM myriapod collection 2647, El Valle, Panama, March 22, 1958, E. M. and H. F. Loomis.

PARATYPES: 2 females, author's collection, Juan Días, Panama, June 3, 1923, O. F. Cook and H. F. Loomis.

DIAGNOSIS: The gonopods more closely resemble those of *P. mexicanus* Silvestri than any other member of the genus but are obviously different. Also the large eyes and striations of segment 1 further distinguish this species.

DESCRIPTION: Length 23 to 29 mm., width 2 mm.; number of segments 48 or 49; body with segment 2 widest, slightly constricted thereafter and narrowest at segment 5 behind which the shape is fusiform; anterior two-thirds of body terete, the posterior third laterally compressed.

Head with ocelli large with the lower one more than half the diameter of the other, almost touching the antennal socket (fig. 6c); furrow of vertex short, not reaching a line that would join tops of antennal sockets; antennae with joint 2 nearly as long as joints 3 and 4 together; joints 3 to 6 subequal in length.

Segment 2 with two strong lateral striae, the back one longest; on succeeding segments the oblique striae do not reach onto the dorsum until segment 14 or 15; median dorsal sulcus very strong and ending in a tiny inconspicuous notch of posterior margin; last segment a little more than half as long on dorsum as preceding segment.

Gonopods and second male legs as shown in figure 6d-e; third legs with joints 2, 3, and 4 expanded vertically but little thicker than those that follow.

Genus *Stemmiulus* Gervais

*Stemmiulus* Gervais, Ann. Soc. Ent. France, ser. 2, vol. 2, p. xxix, 1844.

*Stemmiulus canalis* Chamberlin

## FIGURE 6f

*Stemmiulus canalis* Chamberlin, Bull. Univ. Utah, vol. 30, No. 9, pp. 14-15, 1940.

Canal Zone, many specimens from the following locations: Barro Colorado Island, June 6, 1923, O. F. Cook and H. F. Loomis; March 8-15, 1958 E. M. and H. F. Loomis; Piña area, March 18, 1958. H. F. Loomis.

Panama, many specimens from following locations: Cayo Largo, above Alahjuela, April 14, 1923, and Juan Días, June 3, 1923, O. F. Cook; Alahjuela, June 20, 1923, H. F. Loomis.

This is one of the commonest millipeds of the area and originally was considered to be *S. bioculatus* (Gervais) but the answer to this question must await reexamination of the type of that species, if it exists, or of true topotype males.

Gonopods shown in figure 6f.

## Family Rhinocricidae

### Genus *Eurhinocricus* Brolemann

*Eurhinocricus* Brolemann, Ann. Soc. Ent. France, vol. 72, p. 131, 1903.

#### *Eurhinocricus biolleyi* Brolemann

*Eurhinocricus biolleyi* Brolemann, Ann. Soc. Ent. France, vol. 72, p. 132, pl. 50, figs. 1-6, 1903.

Canal Zone, male, Fort Sherman, April 6, 1925, O. F. Cook; male, female, Barro Colorado Island, May 1956, C. W. and M. E. Rettenmeyer; male, female, Piña area, March 18, 1958, H. F. Loomis.

Panama, male, El Valle, March 22, 1958, E. M. and H. F. Loomis.

Although slightly smaller than Brolemann's specimens, these agree in other particulars. The transverse sulcus is scarcely evident on any segment but the supplementary one in front is strongly impressed; pores seldom followed by an impressed sulcus. The slender branch of the posterior gonopods usually lies so close to the expanded branch as to appear adnate to it, but when the gonopods are dried slightly the branches separate, as shown in Brolemann's drawing.

#### *Eurhinocricus cooki*, new species

##### FIGURE 6g-h

HOLOTYPE: Male, USNM myriapod collection 2648, Piña area, Canal Zone, March 18, 1958, H. F. Loomis.

PARATYPES: Young female, USNM, same collection data as for holotype; female, author's collection, Barro Colorado Island, Canal Zone, June 6, 1923, O. F. Cook and H. F. Loomis.

DIAGNOSIS: The impressed transverse sulcus of the segments, pores followed by a long impressed sulcus, apically rounded preanal scale, and peculiarities of the gonopods distinguish this species from *E. biolleyi*.

DESCRIPTION: Male 32 mm. long, 3 mm. wide, with 44 segments and ocelli in 7 rows starting nearest segment 1 are 7-7-7-6-5-3-2; female 49 mm. long, 4.9 mm. wide, 46 segments and ocelli in 6 rows are 7-7-7-7-6-4. Mandibulatory stipe surrounded by a raised rim;

rectangular and nearly twice as long as wide, thus longer than in *E. biolleyi*, and with tooth at lower anterior corner larger.

Segment 1 with sides evenly rounded, a fine raised rim extending from lower corner of eye only to lower limit of side. Segment 2 with sides almost like those of ensuing ones, with only a faint shoulder. Surface of segments slightly dulled, rather coriaceous with tiny punctations and very fine, short aciculations; transverse sulcus strong and impressed on all but a few posterior segments, surface behind it convex; secondary sulcus much more evident and also continuous across dorsum; pores large, followed by a deep, straight sulcus almost reaching posterior margin of segments except at rear end of body; scobinae with deep, reniform pits separated by twice their diameter; last segment exceeded by anal valves, which are somewhat compressed with rather prominent margins; preanal scale large, broadly rounded at apex, sides slightly emarginate near base.

Gonopods as shown in figure 6*g-h*; the posterior ones rather similar to those of *E. biolleyi* but noticeably shorter and stouter; median plate with apical portion much more narrow. Coxae of male legs 3, 4, and 5 produced into rounded conic lobes; third legs to those near middle of body with terminal joint inflated beneath.

### Genus *Oxypyge* Silvestri

*Oxypyge* Silvestri, Boll. Mus. Zool. Univ. Torino, vol. 11, No. 254, p. 4, 1896.

#### *Oxypyge benedictus* Chamberlin

FIGURE 6*i-j*

*Oxypyge benedictus* Chamberlin, Proc. Biol. Soc. Washington, vol. 38, p. 40, 1925.

Canal Zone, many specimens from following locations: Barro Colorado Island, June 6, 1923, O. F. Cook and H. F. Loomis and March 8-15, 1958, E. M. and H. F. Loomis; Piña area, March 18, 1958, H. F. Loomis.

Gonopods shown in figure 6*i-j*.

### Genus *Rhinocricus* Karsch

*Rhinocricus* Karsch, Zeitschr. Ges. Naturwiss., vol. 54 (ser. 3, vol. 6), p. 68, 1881.

#### *Rhinocricus insulatus* Chamberlin

FIGURES 6*k-l*, 7*a-b*

*Rhinocricus insulatus* Chamberlin, Proc. Biol. Soc. Washington, vol. 38, p. 39, 1925.

*Rhinocricus williamsi* Chamberlin, Bull. Univ. Utah, vol. 30, No. 9, p. 15, 1940.

*Eurhinocricus insulatus* Hoffman, Proc. Biol. Soc. Washington, vol. 68, p. 34, 1955.

*Eurhinocricus williamsi* Hoffman, Proc. Biol. Soc. Washington, vol. 68, p. 35, 1955.

Canal Zone, many specimens from following locations: Barro Colorado Island, Frijoles, Monte Lirio, Fort Sherman, 1923, O. F. Cook and H. F. Loomis; Barro Colorado Island, 1955 and 1956, C. W. and M. E. Rettenmeyer, and 1958, E. M. and H. F. Loomis; Cruces Trail, Madden Dam, 1955, Hartig and Johnson; Piña area, 1958, H. F. Loomis.

Panama, many specimens collected by O. F. Cook and H. F. Loomis or individually in 1923 from Alahjuela and Juan Días.

This is probably the most common milliped in the region of the Canal Zone. Abundance of specimens was indicated by Chamberlin for both of his species, but the descriptions of them are only partially comparable with each other although each applies rather well to the present specimens. In view of this and that no illustrations of either species were given and that no other species of *Rhinocricus* has been found in the present collection, it is believed that Chamberlin was dealing with but a single species.

DESCRIPTIVE NOTE: The prominent lateral ridge of segment 2, an outstanding character of the species, is rather variable as shown in figure 6*k-l*. Transverse sulcus of segments strongly impressed across dorsum; pores large, followed by a fine impressed sulcus. Last segment with apex thick, definitely exceeding anal valves, which are flattened on the sides with margins continuous and not separately raised. Preanal scale large, thick, triangular, not quite half as long as wide, apex not acute but rather sharply rounded.

Gonopods as shown in figure 7*a*, in which the median plate, variable in width in this species, is seen in its wide phase; posterior gonopod as shown in figure 7*b*. Male legs 3, 4, and 5 with coxae raised into quite thin transverse lobes, subconic on leg 3 but becoming increasingly broader on legs 4 and 5; last joint of legs from third pair to behind middle of body inflated beneath.

## Family Spirostreptidae

### Genus *Orthoporus* Silvestri

*Orthoporus* Silvestri, Boll. Mus. Zool. Anat. Comp. Univ. Torino, vol. 12, No. 283 p. 7, 1897.

#### *Orthoporus canalis* Chamberlin

*Orthoporus canalis* Chamberlin, Proc. Biol. Soc. Washington, vol. 38, p. 38, 1925.

Canal Zone, many specimens from following localities: Barro Colorado Island, June 6, 1923, O. F. Cook and H. F. Loomis; Monte Lirio, June 8, 1923, O. F. Cook and R. D. Martin; Piña area, March 18, 1958, H. F. Loomis.

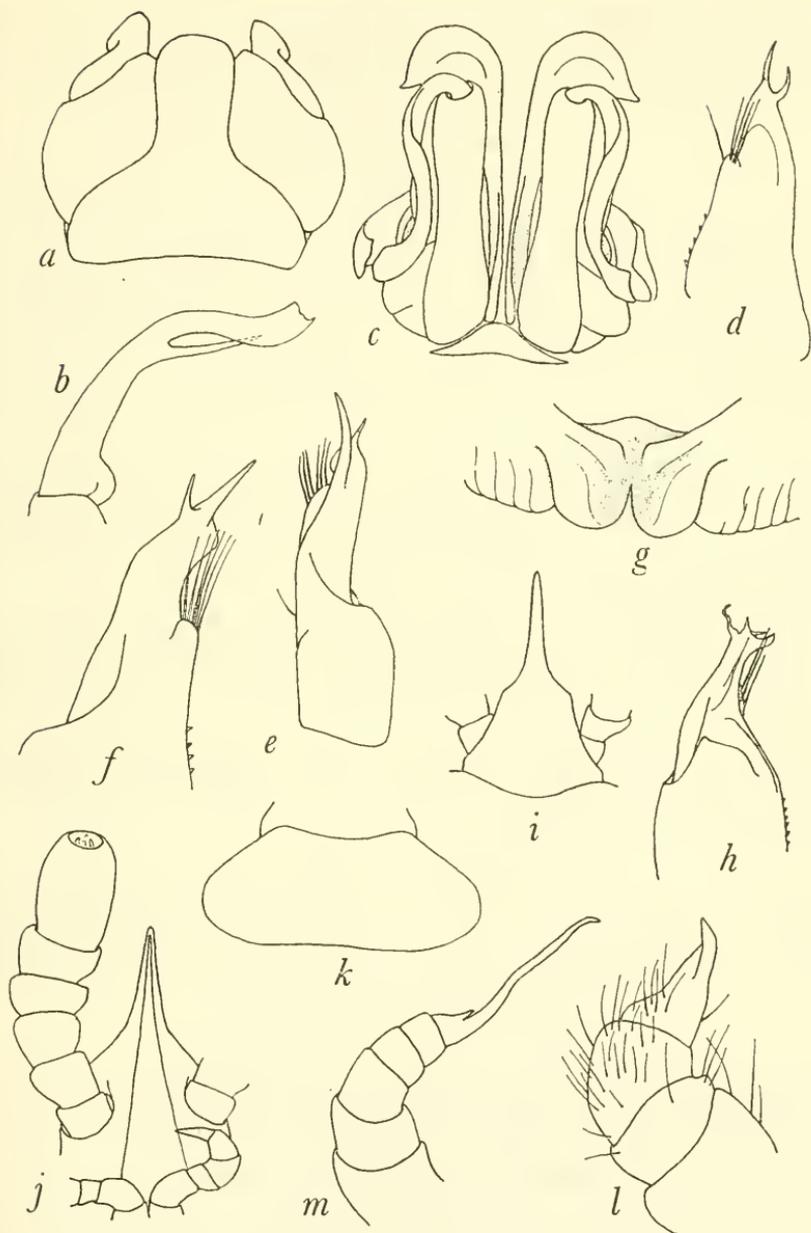


FIGURE 7.—*a-b*, *Rhinocricus insulatus*: *a*, Gonopods of form with broad median plate, anterior view; *b*, inner left gonopod, posterior view. *c*, *Orthoporus festae*, gonopods, posterior view. *d*, *Epinannolene affinis*, left gonopod, posterior view. *e-g*, *Epinannolene robusta*: *e*, Right gonopod, anterior view; *f*, distal half of same gonopod more enlarged, lateral view; *g*, median portion of segment 7 of male, ventral view. *h*, *Epinannolene plana*, right gonopod, lateral view. *i-m* *Siphonocybe pilosa*: *i*, Head, dorsal view; *j*, head, ventral view, more enlarged with the beak foreshortened; *k*, segment 1, dorsal view; *l*, left anterior gonopod, lateral view; *m*, left posterior gonopod, lateral view.

Panama, several specimens, Alahjuela, April 14, 1925, O. F. Cook. The slender body and dorsally channeled posterior subsegments distinguish this species from other local ones.

*Orthoporus festae* (Silvestri)

FIGURE 7c

*Plusioporus festae* Silvestri, Boll. Mus. Anat. Comp. Torino, vol. 11, No. 254, p. 3, 1896.

*Orthoporus festae* Pocock, Biologia Centrali-Americana, Zoologia, Chilopoda and Diplopoda, p. 102, 1909.

*Diaporus culebrae* Chamberlin, Proc. U.S. Nat. Mus., vol. 60, Art. 8, p. 18, pl. 8, figs. 8-9, pl. 9, fig. 1, 1922.

*Diaporus barroensis* Chamberlin, Proc. Biol. Soc. Washington, vol. 38, p. 39, 1925.

Canal Zone, many specimens from following locations: Barro Colorado Island, February 1955, C. W. Rettenmeyer, and March 8-15, 1958, E. M. and H. F. Loomis; Frijoles, July 13, 1923, H. F. Loomis; Monte Lirio, June 8, 1923, O. F. Cook and R. D. Martin; Piña area, March 18, 1958, H. F. Loomis.

Panama, many specimens from following locations: Boquete, 1914, probably William R. Maxon; Juan Díaz, June 3, 1923, O. F. Cook and H. F. Loomis; Taboga Island, July 15, 1923, O. F. Cook and H. F. Loomis.

Shape of lateral ridge of segment 1 and of apex of the anterior gonopods differs considerably in the specimens seen.

Gonopods shown in figure 7c.

*Orthoporus* species

A mature female and immature male differing from foregoing two species, Cerro Campana, Panama, March 16, 1958, H. F. Loomis.

Family Epinannolenidae

Genus *Epinannolene* Brolemann

*Epinannolene* Brolemann, Ann. Soc. Ent. France, vol. 72, p. 135, 1903.

*Epinannolene affinis*, new species

FIGURE 7d

HOLOTYPE: Male, USNM myriapod collection 2649, Piña area, Canal Zone, March 18, 1958, H. F. Loomis.

ALLOTYPE: Female, USNM, same collection data as for holotype.

PARATYPES: Male and young specimen, author's collection, same collection data as for holotype; female, author's collection, El Valle, Panama, March 22, 1958, E. M. and H. F. Loomis.

**DIAGNOSIS:** Closely related to *E. bicornis* Brolemann but considerably smaller and apparently with a longer stria on each side of segment 1 and no indistinct ones near the posterior margin; gonopods quite similar but with fewer spinelike hairs on the posterior median lobe.

**DESCRIPTION:** Length of largest female 24 mm., width 1.5 mm.; 48 segments and ocelli in 4 rows of 3-5-7-8, beginning near antennae; largest male (type) 19 mm. long, 1.2 mm. wide with 43 segments and ocelli in 3 rows of 3-6-8; other male with 40 segments and ocelli arranged 3-5-7.

Segment 1 with raised rim of anterior margin beginning opposite lower corner of eye and extending around side to posterior margin; above it a single strong stria starting immediately behind upper end of margining rim, or even some distance above it, and extending obliquely downward and backward in a straight line to the posterior margin a short distance above the corner. Body segments with a well-impressed transverse sulcus, the surface behind it strongly convex; lateral striae of segments highest on sides of segment 4, where they reach a little over half way to the line of pores, rapidly restricted on segments 5, 6 and 7, behind which they are confined to the ventral surface and do not extend beyond tips of legs; pores larger than in other species here described, somewhat depressed in surface and encircled by a distinct ring. Last segment with apex very short, rounded, rather thick and considerably exceeded by the anal valves.

Gonopods as shown in figure 7*d*, the posterior median lobe with about half the number of stiff hairs found in *E. bicornis*. Ventral rim of segment 7 of male with two elevated lobes slightly less prominent than those of *E. robusta* but apparently more prominent than those of *bicornis*.

*Epinannolene robusta*, new species

FIGURE 7*e-g*

**HOLOTYPE:** Male, USNM myriapod collection 2650, rain forest, Cerro Campana, Panama, March 16, 1958, G. B. Fairchild and H. F. Loomis.

**ALLOTYPE:** Female, USNM, same collection data as for holotype.

**PARATYPE:** Young specimen, USNM, same collection data as for holotype.

**DIAGNOSIS:** Although the gonopods indicate close relationship with *E. bicornis* from Costa Rica, there are evident differences; furthermore, the body is shorter, stouter, and with fewer segments than in that species or any other one known.

**DESCRIPTION:** Male with 37 segments, 18 mm. long and 1.6 mm. in diameter; female same diameter, 15 mm. long with 36 segments.

Color rather light with a large dark area on side of each segment and a small median dorsal one.

Head with ocelli in three series of 2-6-7 or 3-6-8, beginning in front; antennae shorter and more crassate than in *E. plana*.

Segment 1 rather broadly rounded on each side, front margin rimmed from behind the eye to the lateral limit; from posterior margin just above lateral limit a short stria projects forward and upward; above this a stronger sulcus, at least twice as long, nearly parallels the raised anterior margin some distance away.

Ensuing segments with a strong transverse constriction, lacking a sulcus, at the anterior third; in its bottom a series of rounded pits that are small and distinct across dorsum but larger on the sides; dorsum on both sides of constriction smooth and strongly shining, the anterior portion less convex, the posterior one strongly convex and with the back margin thick and rising abruptly above the next segment; pores of moderate size, located a third of the way from the constriction to the back margin; lateral striations extending half way up sides of anterior segments but gradually becoming more restricted toward posterior end of body.

Gonopods as shown in figure 7e-f.

Ventral median surface of segment 7 of male elevated into two prominent lobes directed obliquely caudad above posterior margin, the face of each lobe deeply excavated for tip of gonopod as shown in figure 7g.

*Epinannolene plana*, new species

FIGURE 7h

HOLOTYPE: Male, USNM myriapod collection 2651, El Valle, Panama, March 22, 1958, E. M. and H. F. Loomis.

ALLOTYPE: Female, USNM, same collection data as for holotype.

PARATYPES: Male, 4 females, author's collection, same collection data as for holotype.

DIAGNOSIS: The gonopods seem to associate this species with *E. arius* Chamberlin from Colombia. It differs from all species in the stout body and in the segments lacking a transverse constriction or lateral striations

DESCRIPTION: This stout species looks more like a rhinocricid than a member of this genus; length of largest specimen, a female with 56 segments, 25 mm., diameter 1.5 mm.; males with 51 and 52 segments, respectively; all specimens have 2 legless segments preceding the terminal one. Color very light, dorsum without median dark

spots; sides of several specimens darkened somewhat, others entirely light.

Ocelli dark, in three rows starting nearest antenna, 3-6-7-or 3-7-or 4-7-8.

Segment 1 rather broadly rounded on each side, a raised rim on the front margin from behind eye to the lateral limit, above which, from posterior margin, a short stria extends forward and upward; above this a stronger stria nearly parallel to the anterior rim and, in some specimens, almost as long; a very short stria occasionally present above the long one.

Ensuing segments flat with only the faintest indication of a transverse constriction, the back margin thin and not noticeably raised above the next segment; surface of segments smooth and shining throughout, there being no lateral striations except on segments 2 to 6 or 7 after which there are only one or two short ones ventrally adjacent to the sterna. In several specimens lighter lines in the body wall indicate the divisions between forebelt, midbelt, hindbelt, and the longitudinal junction of dorsum and venter; pores large and located at intersection of lateral and second transverse line.

Last segment with apex short, thick, rounded and projecting slightly beyond anal valves in lateral view.

Gonopods as shown in figure 7*h*, the mesal face of the lower half of each with many tiny, short, conic tubercles. Segment 7 of the male not raised behind gonopods.

#### *Epinannolene* species

Female, differing from any of the foregoing species, from Piña area, Canal Zone, March 18, 1958, H. F. Loomis.

### Family Polyzoñiidae

#### Genus *Siphonotus* Brandt

*Siphonotus* Brandt, Bull. Sci. Acad. Imp. Sci. Saint-Petersbourg, vol. 1, No. 23, p. 179, 1836.

#### *Siphonotus angulifer* Chamberlin

*Siphonotus angulifer* Chamberlin, Bull. Univ. Utah, vol. 30, No. 9, p. 16, 1940.

Canal Zone, specimens, often in great abundance, from following localities: Las Cascadas, April 11, 1925, and Monte Lirio, June 8, 1923, O. F. Cook; Barro Colorado Island, March 8-15, 1958, E. M. and H. F. Loomis; Piña area, March 18, 1958, H. F. Loomis.

**Family Siphonophoridae**  
**Genus *Siphonocybe* Pocock**

*Siphonocybe* Pocock, Biologia Centrali-Americana, Diplopoda, p. 50, 1903.

With the study entailed by the finding of another species of *Siphonocybe* some doubt arises as to the justification for maintaining the genus as distinct from *Siphonophora*. While the anterior gonopods of the three *Siphonocybe* species, here illustrated, are of a single type, this form is not greatly different from one found in some species of *Siphonophora*, and the posterior gonopods of all species, where known, appear to show no generic differences and rather minor specific ones. Hence, the principal character remaining on which *Siphonocybe* may be maintained is the large keels, caudally produced on at least the posterior segments. This character probably should be considered of subgeneric rather than generic value in the classification; however, until our knowledge of the various species of *Siphonophora* becomes greater no advantage is seen in changing the present status of *Siphonocybe*.

***Siphonocybe pilosa*, new species**

FIGURE 7i-m

**HOLOTYPE:** Male, USNM myriapod collection 2652, Fort Sherman, Canal Zone, April 20, 1925, O. F. Cook.

**ALLOTYPE:** Female, USNM, same collection data as for holotype.

**PARATYPES:** 4 males, 1 female, author's collection, same collection data as for holotype; female, Pifia area, Canal Zone, March 18, 1958, H. F. Loomis, and 2 females, Cerro Campana, Panama, March 16, 1958, G. B. Fairchild and H. F. Loomis, author's collection.

**DIAGNOSIS:** Most closely related to *S. harti*, as indicated by its body shape, dense pilosity, and color but differing in shape of head and first segment and in the more inflated keels.

**DESCRIPTION:** Body of intermediate length but stout and convex, tapering gradually for 7 or 8 segments at each end; females with 53 to 75 segments; 12 to 24 mm. long, 1.2 to 1.9 mm. wide; males with 52 to 70 segments; 14 to 22 mm. long, 1.3 to 1.6 mm. wide; color in alcohol rusty brown; dorsum densely beset with long setae, the surface scarcely showing through.

Head (fig. 7i) campanulate, beak slightly deflexed and composing two-fifths its length, reaching to middle of antennal joint 6; mentum with sides straight, diverging evenly from in front (fig. 7j), hypostoma completely hidden; antennae short, stout, increasing in thickness to joint 5 with joint 6 slightly narrower but longer than joints 4 and 5 together, joint 4 shortest.

Segment 1 broad (fig. 7*k*), its outer limits greatly thickened and very convex, being almost hemispherical with the free lateral edge so greatly curved under body that it is not visible in side view but only from below.

Ensuing segments with dorsum strongly convex; keels rising slightly on each side, strongly swollen, with sides continuing the same convex curve below pores; keels near caudal end of body more elevated and slightly produced backward beyond posterior border of segments. First pair of legs lacking coxal lobes, not noticeably heavier than those immediately following but the first seven or eight pairs a little heavier than those thereafter.

Gonopods as shown in figure 7*l-m*.

***Siphonocybe alba* Loomis**

FIGURE 8*a*

*Siphonocybe alba* Loomis, Bull. Mus. Comp. Zool., vol. 80, No. 1, pp. 13-14, 1936.

Smaller and more slender than the other two species. Segment 1 descending as in *S. harti*, with the lateral margin exposed from the side, broadly rounded and nearly twice as long as segment 2. Anterior gonopod as in figure 8*a*.

***Siphonocybe harti* (Pocock)**

FIGURE 8*b*

*Siphonorhinus harti* Pocock, Ann. Mag. Nat. Hist., ser. 6, vol. 15, p. 375, 1895.

*Siphonocybe harti* Pocock, Biologia Centrali-Americana, Zoologia, Chilopoda and Diplopoda, p. 50, 1903.

In direct comparison with *S. pilosa* the head is much more rounded and each side of segment 1 is not greatly inflated but descends almost vertically inward with the free lateral margin fully exposed from the side, rounded, and no longer than the lateral margin of segment 2. Keels not as inflated as in *S. pilosa*, the sides below them much less convex but more keels are caudally produced. Anterior gonopod as in figure 8*b*.

**Genus *Siphonophora* Brandt**

*Siphonophora* Brandt, Bull. Sci. Acad. Imp. Sci. Saint Pétersbourg, vol. 1, No. 23, p. 179, 1836.

***Siphonophora aviceps*, new species**

FIGURE 8*c-f*

HOLOTYPE: Male, USNM myriapod collection 2653, Barro Colorado Island, Canal Zone, May, 1956, C. W. and M. E. Rettenmeyer.

PARATYPES: Male, female, Snow Museum, same collection data as for holotype. Canal Zone, 7 males, 8 females, Barro Colorado Island,

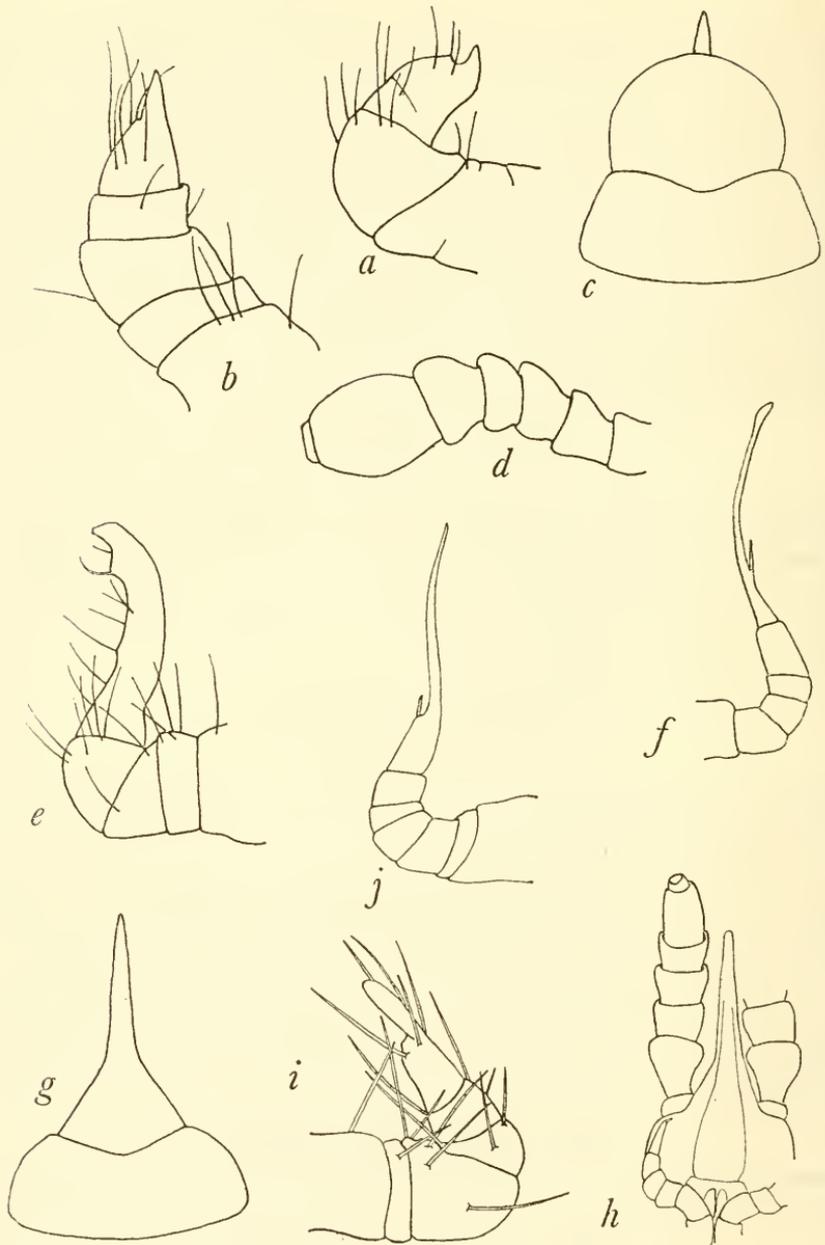


FIGURE 8.—*a*, *Siphonocybe alba*, left anterior gonopod, lateral view. *b*, *Siphonocybe harti*, left anterior gonopod, lateral view. *c-f*, *Siphonophora aviceps*: *c*, Head and segment 1, dorsal view; *d*, antenna; *e*, left anterior gonopod, lateral view; *f*, right posterior gonopod, lateral view. *g-j*, *Siphonophora panamensis*: *g*, Head and segment 1, dorsal view; *h*, head, ventral view; *i*, right anterior gonopod, lateral view; *j*, left posterior gonopod, lateral view.

March 8–15, 1958, E. M. and H. F. Loomis, and female, Piña area, March 18, 1958, H. F. Loomis, author's collection. Panama, six females, Juan Díaz, June 3, 1923, O. F. Cook and H. F. Loomis, author's collection.

**DIAGNOSIS:** Related to *S. telana* Chamberlin, based on a single female, but differing in the smaller size, fewer segments, stouter antennae with differently shaped joints, as compared with his illustration, and the proportions of segment 1.

**DESCRIPTION:** Males 5 to 12 mm. long and 0.6 to 0.8 mm. wide with 34 to 65 (type) segments; females 7 to 15 mm. long and 0.7 to 0.8 mm. wide with 42 to 58 segments.

Body with anterior end very gradually widening to segment 7 or 8; posterior end with sides almost parallel to penultimate segment whose sides narrow rapidly; dorsum rather strongly and evenly convex to outer edge of keels, which are not prominent, separately raised, nor produced backward on any segment but are represented by only a slight swelling from which the pore opens; dorsum with short, moderately dense setae through which the shining surface is somewhat evident.

Head (fig. 8c) almost globular, beak shorter than the head, barely exceeding joint 4 of antennae, straight and set low, the front rising abruptly from it and concealing its base somewhat in vertical view; antennae short and stout, clavate, evenly setose, joint 6 longest and widest, joint 2 next in length but narrower, joint 4 shortest (fig. 8d). Mentum wide at base, its sides strongly convex; hypostoma not exposed.

Segment 1 narrow with sides slightly thickened, the free edge curved inward and barely visible in lateral view. First legs somewhat crassate, second and third ones decreasingly so, the ones thereafter slender and uniform; first legs without anterior coxal lobes.

Gonopods as shown in figure 8e–f.

Chamberlin (1940) reported "a number of mostly immature specimens" from Barro Colorado Island to be his *S. fallens*, described from Guatemala. That species certainly is not represented in the present collection, and it seems much more likely that those specimens actually are *S. aviceps*.

*Siphonophora panamensis*, new species

FIGURE 8g–j

**HOLOTYPE:** Male, USNM myriapod collection 2654, Piña area, Canal Zone, March 18, 1958, H. F. Loomis.

**PARATYPES:** Canal Zone, many specimens from following localities: Barro Colorado Island, March 8–15, 1958, E. M. and H. F. Loomis;

Fort Sherman, April 20, 1925, O. F. Cook; Frijoles, July 13, 1923, H. F. Loomis; Monte Lirio, June 8, 1923, O. F. Cook. Panama, many specimens from following localities: Alahjuela, July 20, 1923, H. F. Loomis; El Valle, March 22, 1958, E. M. and H. F. Loomis; Juan Días, June 3, 1923, O. F. Cook and H. F. Loomis. All paratypes in author's collection.

DIAGNOSIS: Related to *S. progressor* Chamberlin but differing in shape and proportions of head and beak as well as in features of the gonopods.

DESCRIPTION: Body parallel-sided except for two or three segments at each end, where it narrows abruptly; extremely variable in length and number of segments, mature males ranging from 20 to 40 mm. long and 1 to 1.2 mm. wide, with 75 to 145 (type) segments; females 20 to 64 mm. long and 1.1 to 1.3 mm. wide, with 75 to 170 segments; color in life grayish white becoming yellowish in alcohol; dorsum not strongly convex, the keels fairly conspicuous and slightly raised above the adjacent dorsal surface so that in cross section the dorsal outline is triarcuate, none of the keels caudally produced; sides below pores nearly flat, scarcely convex, descending vertically or obliquely inward; dorsum rather sparsely covered with short erect hairs through which the shining surface is seen easily.

Head triangular, considerably exceeded in length by the nearly straight beak, which reaches to end of antennal joint 5 (fig. 8g-h); antennae with joint 2 as long or longer than any other joint, very strongly clavate, its base narrower than any other joint and much less setose, the suddenly widened apical portion as wide as or wider than any other joint; joint 6 narrower than preceding ones; hypostomal plate well exposed, wide, the apex squarely truncate (fig. 8i), sides diverging caudally; mentum narrow at base, sides slightly convex.

Segment 1 wider, shorter, less deeply emarginate in front, and with each side more divergent caudally than in *S. progressor*; outer side of segment descending almost vertically to the free edge, which is not curved under body, is nearly straight and twice as long as the edge of segment 2.

First and second legs of both sexes stouter than any that follow; first pair with anterior face of each coxa produced into a rather long narrow lobe exposed over the hypostomal plate.

Anterior and posterior gonopods shown in figure 8i-j.

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