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On Centipeds and Millipeds from Mexican Caves

BY

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CENTIPEDS AND MILLIPEDS FROM MEXICAN CAVES

By Ralph V. Chamberlin.

This paper is a report on centipeds and millipeds taken in the caves in the states of Vera Cruz, San Luis Potosi, Nuevo Leon and Guerrero by Drs. F. Bonet and C. Bolivar and associates of the Escuela Nacional de Ciencias Naturales of Mexico. The material from these caves forms part of an extensive collection of chilopods and diplopods made in several states of Mexico by these zoologists and by them submitted to the author for study and report. The special interest attaching to the cave-dwelling forms seems to justify their consideration apart from the general report to be made upon the collection as a whole. Publication is provided for from the University of Utah Research Fund.

The caves from which specimens were secured are as follows:

Cueva de los Sabinos, near Ciudad Valles, state of San Luis Potisi.

Cueva Chica, state of San Luis Potosi.

Gruta del Palmito, Bustamente, state of Nuevo Leon.

Gruta de Garcia, Garcia, state of Nuevo Leon.

Gruta del Carrizal, Lampazos, state of Nuevo Leon.

Gruta de Atoyac, state of Vera Cruz.

Gruta de Cacahuamilpas, state of Guerrero.

Cueva de Jutxlahuaca, Colotlipa, state of Guerrero.

The holotypes of the new species are deposited in the Escuela Nacional at Mexico City and duplicates, where present, in the author's collection at the University of Utah.

Chilopoda

Scolopendra sumichrasti Saussure

Locality. — San Luis Potosi: Ciudad Valles, Cueva de Sabinos. One specimen taken April 3, 1942, as part of material collected on that date by F. Bonet, C. Bolivar, D. Pelaez and B. Osorio.

The occurrence of this form in the cave was undoubtedly sporadic. This large, well-defined species is common over much of Mexico and southward to Guatemala and Honduras.

Newportia sabina, new species

General color of body, legs and antennae light yellow, the head above light chestnut.

Punctae of cephalic plate sparse and light; short, sharply impressed, paired sulci over basal border. Antennae composed of seventeen articles of which the first two are simply setose, the others also with a dense coat of finer, short hairs.

First dorsal plate with a continuous semicircular transverse impression behind which the paired sulci are furcate, forming a w-shaped figure contiguous with the transverse sulcus but not crossing it. In the possession of these furcate sulci differing from *N. longitarsis* (Newport) in which the paired sulci are unbranched.

Median paired sulci present on second to twenty-second tergites, lateral sulci, which do not reach caudal margin, present from third segment to twenty-second. All tergites smooth. Last dorsal plate without median sulcus.

Last ventral plate narrowed caudad, the caudal border excavated, the margin forming an obtuse, re-entrant angle.

Pseudopleurae produced into acute processes behind with apices ending in single spines; a series of short spinules along mesal edge.

Femora of anal legs armed beneath with a series of large teeth which are much shorter than the diameter of the joint, these in the type 4 in number on the left and 7 on the right leg which seems to be abnormal or regenerated; tibia of left leg with three teeth beneath, or right with four. First tarsal joint about two thirds as long as the tibia; total number of tarsal joints in the left leg, 39 plus one long, smooth, wholly undivided terminal joint or section; the tarsus of the left leg much shorter, the joints mostly not regular or clearly defined, being much as in species of the group *Scolopendrides.*

Length, about 60 mm.; length of anal legs, about 34 mm.

Locality.—San Luis Potosi: Cueva de los Sabinos. July 19, 1942. One specimen in collection by C. Bolivar, B. Osorio and M. Cardenas.

Newportia pelaezi, new species

The type has the body nearly white with the head yellow; cephalic plate smooth, without sulci.

Antennae short, composed of seventeen short articles.

First dorsal plate with a sharply impressed semicircular sulcus behind which the paired sulci are furcate. Paired sulci complete on tergites from second to twenty-second. Last tergite without median sulcus.

Pseudopleurae with caudal processes long and slenderly acuminate.

Femora of anal legs armed beneath with a series of four relatively short teeth, the patellae with a similar series. Tibiae unarmed. First joint of tarsus obviously more than half the length of the tibia; tarsus beyond first joint a flagellum in which joints are not distinctly separated (*Scolopendrides* type), the entire flagellum about equal in length to the portion of the leg proximad of it.

Length, about 10 mm.

Locality.—Nueva Leon: Gruta del Palmito, Bustamente. July 17, 1942. One young specimen. Collectors, Bolivar Bonet, Osorio and Pelaez.

Readily distinguished from the allied *N. brevipes* Pocock in having a distinctly separated first tarsal joint in the anal legs, the flagellum in *brevipes* being attached directly to the tibia.

Genus **GARCIBIUS**, new

A lithobiid genus in which the ocelli are absent or rudimentary. Antennae very long, composed of numerous articles, Prosternal teeth numerous. Typically posterior angles of only eleventh and thirteenth plates produced, processes small. Coxal pores in a single series. Claw of female gonopds tripartite.

Genotype.—*Garcibius osorioi*, new species.

The known species of *Typhlobius* are also blind; but in that genus the prosternal teeth are fixed at 2 + 2, the antennae are short and none of the dorsal plates have the posterior angles produced.

Garcibius osorioi, new species

Color yellow throughout.

Antennae very long, composed of numerous, e.g. sixty-one, long articles. Organ of Tomosvary large. Ocelli represented by very small, pigmentless seriate rudiments. Head with marginal interruptions pronounced.

Prosternal teeth 6 + 6, the ectal spine setiform.

Posterior angles of eleventh and thirteenth dorsal plates produced, the processes. small but acute.

Coxal pores circular or a little transverse, the poriferous surface depressed or channeled; in number, e.g., 5, 6, 7, 5.

Ventral spines of first legs 0, 0, 2, 3, 2; dorsal 0, 0, 3, 2, 2. Ventral spines of anal and penult legs, 0, 1, 3, 3, 2; dorsal 1, 0, 3, 2, 2. Last two pairs of coxae laterally armed.

Claw of genital forceps of female tripartite, the teeth all well developed, acute; basal spines 2 + 2.

Length, about 21 mm.

Locality. — Nueva Leon: Gruta de Garcia. July 14, 1942. One adult female and one imperfect young specimen. C. Bolivar, F. Bonet, B. Osorio and D. Pelaez, collectors.

Cruzobius atoyacus, new species

A form in general structure agreeing closely with *C. verus*, the genotype, but obviously smaller and differing in the more slender anal legs of the male. In these the dorsal peg of the tibia is apparently reduced to a nodule or else was at some time broken off in the type when the tarsus was also lost. It also differs in having the ocelli in a compact group in two series instead of in one; e.g., 1 +2, 2 or 1 + 1, 2 or 1 +2, 1, in addition to a separate ocellus or ocellus-like organ separated and farther forward. The antennae are much shorter, with the articles notably compact. The female has the claw of the gonopods entire with the basal spines 2 + 2.

Locality. — Vera Cruz: Gruta de Atoyac. A male and female taken November 11-13, 1941, by F. Bonet and C. Bolivar.

A form probably not restricted to caves.

Scutigera linceci (Wood)

Locality. — Vera Cruz: Gruta de Atoyac, November 11-13, 1941. One specimen by F. Bonet and C. Bolivar.

Guerrero: Cueva de Cacahuamilpa, December 13-15, 1939. One nearly grown specimen and one very young, taken by Bolivar, Bonet, Dampf and Pelaez. Also Cueva de Jutxlahuaca, January 15, 1941, when one specimen was taken by Dr. Bonet.

A form widespread in Mexico and not restricted to caves.

Scutigera carrizala, new species

A pale, inconspicuously marked species, similar in appearance to *Pselliodes sabinorum;* middle region of dorsum lighter than lateral portions; legs not annulate, darker distally than proximally; antennae light ferruginous.

A larger form than *S. buda* of Texas, also differing conspicuously in longer antennae with more numerous articles, about 95 articles in first division and about 245 articles in second division, articles very short in relation to width.

Caudal margin of last tergite truncate or a little incurved at middle.

Tarsus I of first legs composed of 15 articles, tarsus II of 35. Tarsus I of second legs composed of 15 articles, tarsus II of 30. Tarsus I of third legs composed of 10 articles, tarsus II of 32. Tarsus I of leg IV of 9 articles, II of 31. Tarsus I of leg V of 8 articles, II of 31. Tarsus I of sixth leg of 8 articles, II of 29. Tarsus I of seventh leg of 8 articles, II of 27. Tarsus I of eighth leg of 8 articles, II of 24.

Outer margins of female gonopods straight, diverging distad from base; portion of gonopods between united base and claw comparatively short; interval between free part of gonopods wide, widening gradually but not strongly distad.

Length, about 19 mm.

Locality.—Nueva Leon: Gruta del Carrizal, Lampozos. July 16, 1942. One female in collection of Bonet, Bolivar, Osoria and Pelaez.

Pselliodes sabinorum, new species

Dorsum pale brown with a median longitudinal stripe lighter, sometimes in part nearly white and in some rather vaguely geminate. Legs not annulate, distally of ferruginous cast. Antennae ferruginous.

The antennae are composed of articles of variable length, broader than long to as long as broad and longer than broad as are most of them, especially in the distal division. First division composed of from 78 to 90 articles; the second of about 150 articles.

Last of the ordinary tergites conspicuously narrowed caudad, with caudal margin convex.

Tarsus I of second legs composed of 15 articles; tarsus II of 37. Tarsus I of third leg of 14 articles; tarsus II of 39. Tarsus I of leg four composed of 11 articles, the second tarsus of 36. First tarsus of leg five composed of 10 articles, the second of 33. Tarsus I of legs nine composed of 9, tarsus II of 30.

The gonopods of female beyond the consolidated base diverging distad with the interval wide.

Length, up to about 20 mm.

Locality. — San Luis Potosi: Cueva de los Sabinos. Five specimens taken July 19, 1942, by C. Bolivar, B. Osorio and D. Pelaez.

Readily separated from other known species, such as *P. nigrovittata* and *P. harveyi* of Panama, in coloration, such as paler color of dorsum with inconspicuous banding, in lacking annuli on legs, and in the form and number of articles of antennae.

Diplopoda

Gymnostreptus guerreronus, new species

Pl. I, figures 1, 2.

General color of body brown ringed with darker annuli, a dark annulus embracing each segmental furrow but lying chiefly behind it. Legs of ferruginous cast.

Head smooth. Eyes well developed; ocelli typically in five transverse series forming an elliptical area.

The form of collum in the male and the arrangement of its sulci are represented in figure 1.

Segmental furrows wide and deep throughout. Longitudinal striae sharply impressed and complete to about level of pore above which is running across furrow and for a short distance caudad of it, becoming shorter above. Under lens the surface is seen to be finely and densely punctate.

Last tergite much exceeded by the anal valves; obtusely angular behind, with the caudal portion set off by a deep transverse sulcus.

Gonopods of male characterized by the form of the distal portion of the anterior pair, especially of its ectal cone, and by the form of the distal end of the posterior gonopods as is represented in figure 2.

Number of segments in the male holotype, 59.

Length of male holotype, about 50 mm.; diameter, 3.2 mm. Diameter of female allotype, 4.1 mm.

Locality. — Guerrero: Cueva de Jutxlahuaca. Four adult and several immature specimens taken January 15, 1941, by Dr. Bonet.

Genus **CAVOTA,** new

Related to *Cleidogona* but differing in characteristics of the males. In these the ninth legs are slender throughout, though having the last three articles more reduced, the first two joints not specially enlarged as in *Cleidogona* and the third longer than the second. The eyes are weakly developed with the ocelli pale and fewer in number than in *Cleidogona*. Keels of segments weak.

Genotype. — *Cavota crusis*, new species.

Cavota crucis, new species

Pl. I, figures 3 to 7.

Pale throughout, with legs white.

Antennae long and slender, with third joint longest and the fifth next in length; sixth joint clavate, with the seventh cylindrical and of about same length as the sixth. (See figure 3).

Ocelli entirely lacking pigment, forming a small triangular patch in which arranged usually in four longitudinal series; e.g., 5, 4, 3, 2, a total of 14.

Anterior tergites with keels but weakly developed but showing as distinct shoulders, the keels farther back becoming striaeform or in posterior region not evident. Dorsal setae short.

Gonopods and ninth, tenth and eleventh legs of males as shown in figures 4, 5, 6 and 7.

Length, about 14 mm.

Locality. — Vera Cruz: Gruta de Atoyac. Five specimens taken November 11 and 12, 1941, by F. Bonet and C. Bolivar, and five specimens taken in the same place May 30, 1941, by Dr. Bonet.

Ilyma colotlipa, new species

Pl. I, figures 8 to 10.

Background of dorsum pale yellow, but appearing dusky or black from accumulation of fine particles of dirt on prominences of surface. Legs and antennae yellowish.

Collum concealing the head and antennae from above; border with ten rounded crenatures separated by deep incisions; convex posterior portion densely tuberculate, with two transverse series of much more prominent tubercles, six in each series, the outermost at each end smaller than the others.

Keels of second tergite with three lateral crenatures, the others with but two, the separating incisions deep. On the poriferous keels the posterior crenature replaced by the pore process or cone. Tergites between keels covered with three transverse series of well-defined tubercles; of these tubercles four lines of more elevated ones form longitudinal rows and, in addition, another series adjacent to base of keel on each side are also more prominent, the most caudal tubercle in this outer series being largest.

Seventh and eighth keels as shown in figure 8, Form of eighteenth and nineteenth tergites and keels as shown in figure 9.

The position and relative size of the twentieth segment as shown in figure 10. Maximum length of types, 6 mm.

Locality. — Guerrero: Calotlipa, Cueva de Jutlahuaca. Four adult females and one immature specimen taken by Dr. Bonet on January 16, 1941.

Family CERATESMIDAE, new

Resembling the Stiodesmidae and Hercodesmidae, in the narrower sense, in the position and form of the processes bearing the repugnatorial pores, but differing strongly in the armature of the tergites. All tergites, excepting the twentieth, bearing a pair of stout, conical processes or horns, but entirely lacking tubercles. The surface of tergites, including processes, in general densely clothed with short, somewhat bacilliform, setae of uniform length, giving appearance of an even surface.

Genus **CERATESMUS**, new

With the characters of the family. Repugnatorial pores on processes at caudo-lateral corners of keels of fifth, seventh, tenth, thirteenth and sixteenth segments.

Genotype. — *Ceratesmus clarus*, new species.

Ceratesmus clarus, new species

Pl. I, figures 11 to 13.

A middorsal stripe and a stripe ectad of the dorsal horns on each side, yellowish, the horns and the keels dusky. Head above, dusky, the lower portion, the antennae and the legs yellow.

Antennae distally enlarged, somewhat geniculate at junction of third and fourth segments.

Head and antennae concealed from above by the collum. Anterior border of collum divided into ten areas which are separated by deep incisions; paired conical horns stout as shown in lateral view in fig. 11.

Surface of metazonites, including keels, bearing numerous short setae. Outer margin of second keels with three crenatures, the other, non-poriferous keels with but two. Poriferous keels not notched laterally. Keels not notched on posterior side as base. See further figures 12 and 13, the former showing the posterior end from above.

Length, about 6.2 mm.

Locality. — Vera Cruz: Gruta de Atoyac. Female holotype taken November 12, 1941, by Drs. Bonet and Bolivar.

Genus **BOLIVARESMUS**, new

A genus of Stiodesmidae readily distinguished from all others in the family in having repugnatorial pores on only four segmens, namely, the fifth, seventh, tenth and thirteenth.

Genotype. — *Bolivaresmus sabinus*, new species.

Bolivaresmus sabinus, new species

Pl. II, figures 14 to 17.

The metazonites are blackish above and down the sides to the legs, the sternites between the legs and the entire prozonites yellow. Under the microscope the black is seen to form a close, regular network over a yellowish background. The head is also black above down to level of antennae, below which and on the sides it is yellow. Legs and antennae yellow.

Antennae moderately long, clavate, being rather abruptly thicker, beginning with the fifth joint.

Collum widely concealing the head in dorsal view; strongly convex within the flaring, subhorizontal border which is divided into ten areas by radial sulci, the corresponding marginal crenatures weak. (See figure 14).

Ordinary tergites strongly convex in middle region, much as in species of *Cynedesmus*, with the keels nearly horizontal. Low, confluent tubercles forming four longitudinal ridges along dorsum, the outer ridge on each side weaker and sometimes obscure. Each keel with a deep incision on posterior side between base and distal end. Non-poriferous keels with a single obtuse notch in outer margin behind middle. Poriferous tubercles pale, directed caudoectad on posterior corner. See further figure 15.

For form of posterior tergites see figure 16.

Gonopods of male small, of form shown in figure 17.

Length of female allotype, about 6.5 mm.; width, 1.4 mm.

Locality. — San Luis Potosi: Cueva de los Sabinos, Valles. Sixteen specimens taken April 3, 1942, by Bolivar, Bonet, Osorio and Peleaz. Also Cueva Chica: four specimens taken April 4, 1942, by the same collectors.

Genus **BONETESMUS**, new

An Oniscodesmoid genus differing from other known American genera, excepting *Schedypodesmus* of Argentina, in having only nineteen body segments. From the *Schedypodesmus* it is readily distinguished in having the tergites without tubercles or granules.

Genotype. — *Bonetesmus verus*, new species.

Bonetesmus verus, new species

Pl. II, figures 18 tot 20.

The type specimens as preserved appear nearly black, due to the accumulation over the tergites of a thick coat of dirt particles. When this coat is removed, the color is pale testaceous. The head and antennae are nearly white.

The head has a deep median sulcus across the vertex. Antennae long, with second, third and fifth articles longest; first four articles but little enlarged distad, the fifth and sixth thicker and more strongly clavate, the seventh narrowed from vase distad, its free end rounded.

The second tergite with lateral keels strongly expanded and concealing the head in side view as shown in figure 18. The wings of this tergite nearly vertical and parallel with each other.

Dorsum strongly convex, with the keels bent downward but flaring outward at an obtuse angle with the surface of median portion of segment. Second keels longer across base than at distal end, the outer margin evenly convex. Other keels typically broad distally with outer

margin a little convex or nearly straight; all margins smooth, with no indication of incisions. Surface of tergites clothed with straight setae to which dirt adheres, the setae of the eighteenth segment longer and denser. Pores not definitely identified.

Last tergite broad, convex behind. (See figure 19.)

Gonopods of male as illustrated in figure 20.

Length, about 12 mm.; width, 1.5 mm.

Locality. — Vera Cruz: Gruta de Atoyac, Male holotype and female allotype, the caudal end of which is missing, taken November 11, 1941, by Drs. Bonet and Bolivar, and an adult male and an immature specimen taken by the same collectors on November 12, 1941.

Genus **CEUTHAUXUS**, new

Related closely to *Pararachistes* in general structure. It differs in having conspicuous processes on the coxae of the third legs as well as on the coxae of the second legs of the male. It differs in the gonopods of the male in lacking the large inner spine from base of telopodite. It is also characterized by the great size of the seminal cavity in base of telopodite on mesal side.

Genotype. — *Ceuthauxus nuevus* (Chamberlin).

The genotype was originally described under *Pararachistes*. (See Proc. Biol. Soc. Washington, 1941, Vol. 54, p. 63, figs. 1 and 2).

Ceuthauxus palmitonus, new species

Conspicuously different from the genotype, *C. nuevus* in wholly lacking the green pigmentation so marked in the latter species, the color being pale, in part almost white.

Also a decidedly smaller form than the genotype. Keels of first few segments with a minute tooth on antero-lateral corner, wholly absent from others.

Gonopods of male superficially differing from those of *C. nuevus* in having the terminal division smaller and located on dorsal side of end of femoral division so as to be concealed in ventral view, instead of being distal in position and conspicuously exposed in ventral view.

Length of male holotype, about 20 mm., width, 2.4 mm. Length of female allotype, 23 mm.

Locality.—Nuevo Leon: Gruta del Palmito, Bustamente. July 17, 1942. Twenty-five specimens taken by C. Bolivar, F. Bonet, B. Osorio and D. Pelaez.

The genotype, *C. nuevus*, likewise occurs in Nuevo Leon, the types having come from Sabinas Hidalgo but not from caves, the difference in habitat being reflected in the striking contrast in pigmentation.

Pararachistes amblus, new species

Pl. 11, figures 21, 22.

Differing in general appearance from the previously known species in lacking the conspicuous green pigment, the color of the dorsum being a dull brown with the keels paler, possibly yellow in life.

The keels of the typical general form but appearing a little wider; the tooth on anterocctal corner distinct on all but the first tergite on which obsolete.

Legs long and hairy, with sixth joint a little shorter than fourth and fifth taken together.

The male differing from *P. elevatus* Pocock, the genotype, in the coxal processes of the second legs in that the posteriorly directed branches are relatively shorter and more slender, while the anteriorly directed processes are obviously larger. Especially distinct in the details of the male gonopods; e.g., in having the basal spine from the mesal side of the telopodite longer than the principal branch and in having two short spinour processes from the ectal side of the base of the latter. (See further figures 21 and 22.)

Length of male holotype, 40 mm.; width, 4 mm.

Locality. — Guerrero: Cueva de Jutxlahuaca, Colotipla. Two adult males, five females, and fifteen immature specimens in various stages taken by Dr. Bonet on January 16, 1941.

Figures and Explanations

PLATE I.

Fig. 1. *Gymnostreptus guerreronus*, sp. n. Collum viewed from right side.

Fig. 2. The same. Right gonopod of male, anterior view.

Fig. 3. *Cavota crucis*, sp. n. Antennae.

Fig. 4. The same. Right gonopod of male, ectal view.

Fig. 5. The same. Ninth leg of right side of male, caudal view.

Fig. 6. The same. Tenth right leg of male, basal portion, caudal view.

Fig. 7. The same. Eleventh right legs of male, basal portion, caudal view.

Fig. 8. *Ilyma colotlipa*, sp. n. Right keels of seventh and eighth segments, dorsal view.

Fig. 9. The same. Caudal end of body, dorsal view.

Fig. 10. The same. Caudal end of body, lateral view, showing position of reduced twentieth segment.

Fig. 11. *Ceratesmus clarus*, sp. n. Anterior tergites, viewed from left side, in outline.

Fig. 12. The same. Caudal segments in outline, dorsal view.

Fig. 13. The same. Left thirteenth and fourteenth keels, dorsal view.

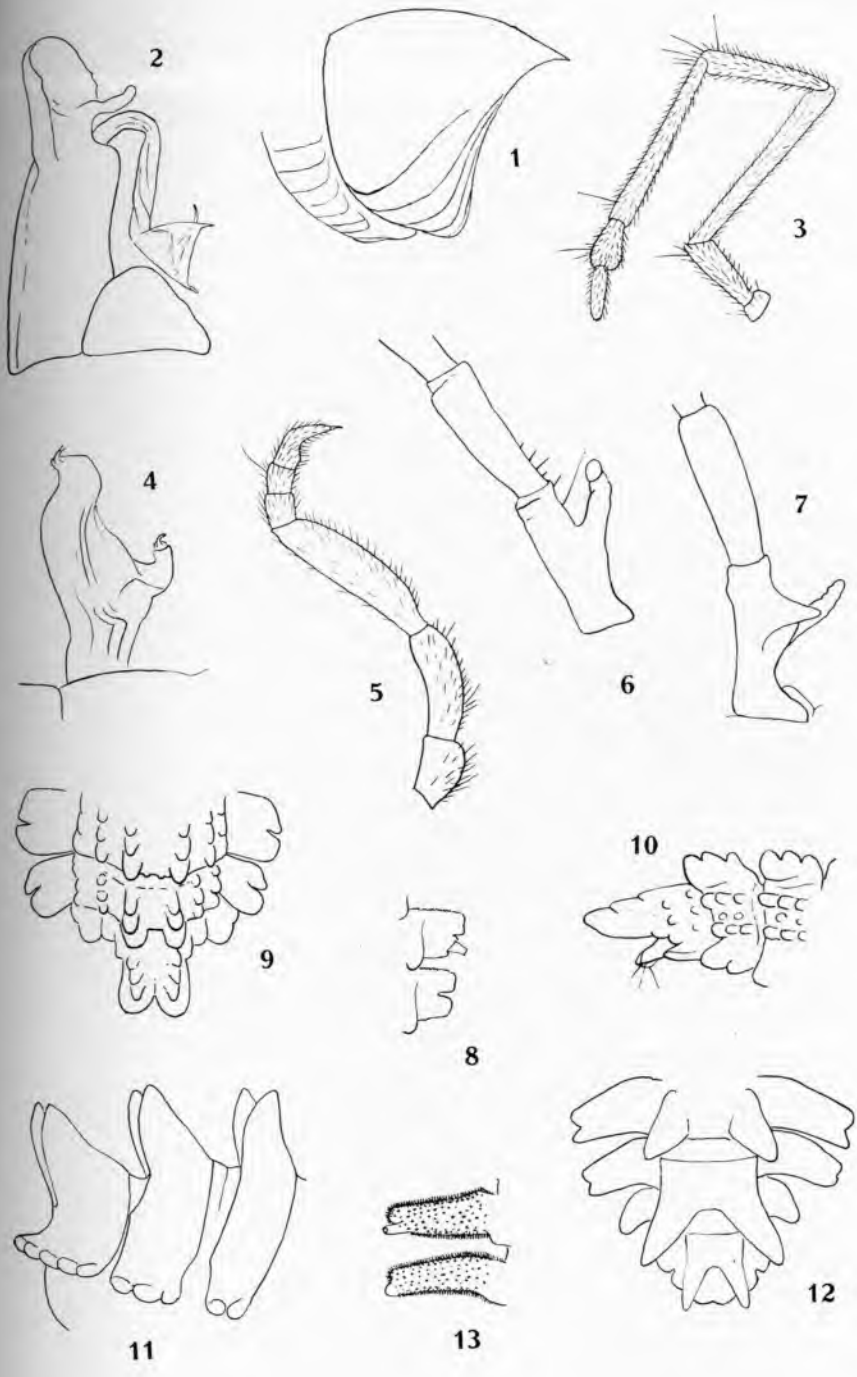
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PLATE II.

Fig. 14. *Bolivaresmus sabinus*, sp. n. Anterior end, dorsal view.

Fig. 15. The same. Sixth and seventh right keels in outline.

Fig. 16. The same. Posterior end, dorsal view, in outline.

Fig. 17. The same. Left gonopod of male, ectal view.

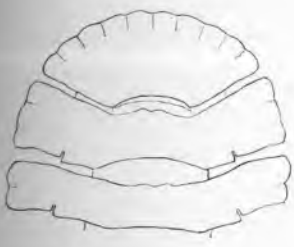
Fig. 18. *Bonetesmus verus*, sp. n.. Anterior end viewed from right side, showing second and third tergites.

Fig. 19. The same. Posterior end, viewed from right side.

Fig. 20. The same. Right gonopod of male in situ, ectal view.

Fig. 21. *Pararachistes amblus*, sp. n. Right gonopod of male, anterior view.

Fig. 22. The same. Right gonopod of male, ectal view.



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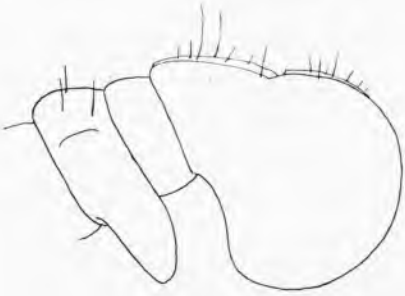

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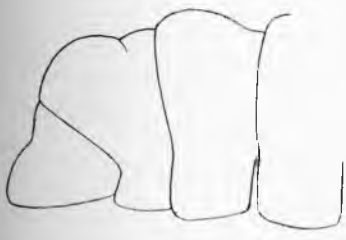

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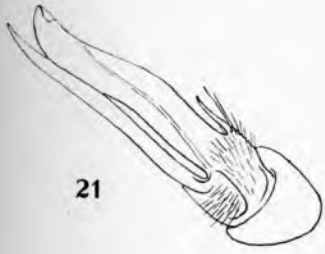

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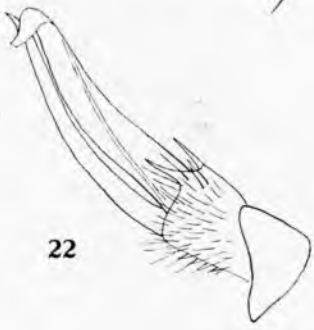

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