Journal of the Arkansas Academy of Science

Volume 3 Article 15

1950

New Genera and Species of Millipeds

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NEW GENERA AND SPECIES OF MILLIPEDS - PARAIULIDAE (JULOIDEA)

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While studying millipeds from various parts of the United States several specimens showing marked differences from previously described forms have appeared. Some of these warrant their description and naming as new genera and species.

The type specimens of **Illiulus illinoensis, Saiulus sandersoni,** and **Spathiulus elegantulus** are in the permanent collection of the Illinois Natural History Survey at Urbana, Illinois. They are from the milliped collection of the Natural History Survey Division of Illinois which, through the kindness of Dr. Milton W. Sanderson, I have had an opportunity to study. The type specimens of the other species described in this paper have been deposited in the Academy of Natural Sciences of Philadelphia. The type collection of **Saiulus immaculatus** (Wood) was examined through the courtesy of Dr. J.A.G. Rehn, and the Oklahoma specimens were loaned from the Museum of the University of Oklahoma.

Aliulus, gen. nov.

Similar to **Aniulus**, but the coxal lobes of the anterior gonopods are in the form of transverse plates with the medial margins cleft. Each posterior gonopod consists of a seminal blade and a simple accessory blade arising at its base; the seminal blade is contiguous with its mate medially and then continues caudad and ectad, with a minute subterminal tooth in both known species. In the male the sternite of the eighth segment is produced cephalad as shown in the figure from the genotype.

Genotype.-**Aliulus carrollus**, sp. nov.

Aliulus carrollus, sp. nov.

Color at a distance light brown; black mid-dorsal line and lateral spots; irregular brown bands and maculae on segments; venter lighter. Collum roughly quadrate, with lateral margins slightly concave and marginal sulcus dividing (Fig. 1). Caudal spine acute, straight, and extending slightly beyond anal valves. Sternite of eighth segment of male produced anteriorly in a tongue-shaped process as shown in Figure 2.

The form of the anterior gonopods is shown in Figure 3; they are distinctive in that the medial margin of each coxal lobe has a shallow cleft, with the anterior division pointed and the posterior rounded; the cleft margins of the two coxal lobes are contiguous medially. The form of the posterior gonopods is shown in Figure 4; the flattened and curved seminal blade has a minute subterminal tooth on the dorsal margin; the accessory blade is shorter, slightly curved, and attenuated. **In Situ** the seminal blades are contiguous in the medial line about midway of the seventh segment; then each bows laterad and ends just beyond the posterior extension of the coxal lobes of the anterior gonopods.

Length of the male holotype, 48 mm., width 2.4 mm., 60 segments.

Locality: Arkansas, Carroll County, Blue Spring. One specimen was taken by the author Oct. 29, 1949. Other males have been taken in Washington County.

Aliulus caddoensis sp. nov.

Light brown with the usual black mid-dorsal line and lateral spots; irregular light bands on mid and hind belts; venter lighter. Collum roughly quadrate as in **Aliulus carrollus;** lateral margins with one entire sulcus or one divided. Stipes of mandible of male produced anteriorly as in **carrollus.** Caudal spine acute, straight, length of anal valves. Sternite of eighth segment of male produced anteriorly in a tongue-shaped process.

The form of the anterior gonopods of the male is shown in Figure 5; as in **carrollus** the medial margin of the coxal lobe is cleft, with the anterior division pointed and the posterior rounded; the posterior division lies flat, but the anterior division, unlike **carrollus,** is slightly twisted and sharply bent ventrally. The seminal blade of the posterior gonopod is sigmoid, flattened, and there is a minute subterminal tooth on the dorsal margin; the attenuated accessory blade, also sigmoid, is almost as long as the seminal blade (Fig. 6). **In situ** the seminal blades are contiguous medially, then each bows laterad with the ends projecting beyond the coxal lobes, which are not contiguous.

Length of male holotype, about 42 mm., width 2.2 mm., 58 segments.

Locality: Oklahoma, Caddo County. The male holotype was collected Oct. 29, 1934; two additional males were collected at Wilburton Nov. 17, 1934, all by Dr. J.R. Carpenter.

Aniulus impressus (Say)

The gonopods from a specimen from Chicago, Illinois, are shown in Figures 7 and 8. This common species is known from as far west as Turtle River State Park, North Dakota.

Okliulus, gen. nov.

Resembles **Hakiulus,** but the general direction of the parts of the gonopods is cephalad rather than caudad. The femorae of the anterior gonopods are short and stout, and the short coxal lobes (except for the anterior medial extension in the only known species) are confined to the lateral parts of the gonopodal cavity; the coxal plates extend far back, covering most of the gonopodal cavity dorsally. The posterior gonopods, contiguous medially and then turning slightly laterad, consist of a relatively short seminal blade bent sharply cephalad distally and a lateral accessory blade, bifid distally in the genotype. Sternite of eighth segment of male not produced anteriorly. First legs of male relatively thinner and longer than is known in any other genus of the family.

Genotype.-**Okliulus carpenteri,** sp. nov.

Okliulus carpenteri, sp. nov.

Brown above; buff on venter and on sides as high as horizontal striae and incomplete sulci on collum; antennae and legs darker. Collum of male roughly quadrate with lateral margins slightly convex and with two incomplete and one entire lateral sulci; stipes of mandible produced cephalad; first legs longer and thinner than is usual in the family (Fig. 9). Eyes composed of eight rows of ocelli with from 12 to three in each row. Sternite of eighth segment of male not produced anteriorly.

The form of the anterior gonopods is shown in Figures 10 and 11; each is distinctive in the shorter femora, the short coxal lobe with the medio-cephalic extension, and the coxal plate, which with its mate covers most of the gonopodal cavity dorsally.

The form of the posterior gonopods is shown in Figure 12; the short seminal blade is contiguous with its mate medially, then it turns cephalad and slightly laterad; the accessory blade, arising on its lateral surface, is about as long as the seminal blade and is distally bifid.

Width of male holotype, 3 mm.

Locality: Oklahoma, Wilburton. A fragment, the male holotype, was collected Nov. 17, 1934, by Dr. J.R. Carpenter, for whom the species is named.

Illiulus, gen. nov.

Resembles **Aniulus**, but differs in that the posterior gonopods have no separate accessory blade, that structure probably being represented by a ridge which arises at the base of the lateral surface of the seminal blade; seminal blades parallel in genotype. Coxal lobe of anterior gonopods a simple leaf-like piece. Sternite of eighth segment of male produced anteriorly in a narrow keel-like process.

Genotype.-**Illiulus illinoensis** sp. nov.

Illiulus illinoensis, sp. nov.

Brown above and below; irregular buff maculae and bands; blank mid-dorsal line and lateral spots; legs red. Cephalic angle of collum of male broadly rounded, a single entire sulcus on lateral margin; stipes of mandible produced as shown in Figure 13. Eyes roughly quadrate, with nine rows of ocelli. Sternite of eighth segment of male produced anteriorly in a small keel-like process as shown in Figure 17.

The form of the anterior gonopods is shown in Figures 14 and 15. The leaf-like coxal lobe is flattened in the vertical plane, with the cephalic surface concave and the ventral margin thickened and a dark spot near the tip. The form of the posterior gonopods is shown in Figure 16; the ridge on the lateral surface of the seminal blade, probably homologous with the accessory blade, begins at the base and continues for more than half its length, where it is abruptly cut off. **In situ** the tips of the coxal lobes are contiguous and the seminal blades are parallel, extending caudad just to the coxal lobes.

Width of male holotype, 2.2 mm., 56 segments.

Locality: Illinois, La Rue. One specimen, the male holotype, was collected April 19, 1949, by Drs. H.H. Ross and M.W. Sanderson from wet debris at McCann's Spring.

Spathiulus elegantulus, sp. nov.

This species is near **Spathiulus trilobus** Chamberlin, but it can be distinguished by differences in the posterior gonopods of the male.

Preserved specimen a buff color with light brown lateral spots. Segmental sutures bend toward repugnatorial pores, but are relatively far from them. Segments finely punctuate, shining, smooth. Lateral margin of collum of male with two sulci; mandibular stipes produced both anteriorly and ventrally as shown in Figure 18. Eyes triangular, composed of six or seven rows of ocelli with from seven to one in each row. Caudal spine stout and straight, not extending beyond anal valves. Sternite of eighth segment of male not produced anteriorly.

The anterior gonopods of the male closely resemble those of **trilobus**, with the spath-like process extending well beyond the bases of the ninth legs, (Fig. 19). Each posterior gonopod (Fig. 20) consists of three slender processes almost as long as the spath-like processes, which almost obscure them **in situ**; the largest is distally serrated and with a small vermiform process (Fig. 21); springing from its base and turning abruptly from it is the second, or attenuated, process; the third process is medial, more slender, and slightly shorter than either of the other two, and is distally bifid.

Length of male holotype about 19 mm., width 1.3 mm., 50 segments, the last three legless.

Locality: California, Yosemite National Park, Mariposa County, area of Happy Isle. One specimen, the male holotype, was collected by Marie O'Brien Aug. 19, 1947, from leaf mould in a swampy area.

Saiulus sandersoni, sp. nov.

Color of preserved specimen medium brown; numerous buff maculae; venter cream; distal joints of legs mottled brown; black middorsal line and lateral spots; antennae, vertex, and caudal segment brown. Segments finely punctuate. Vertical sutures distinct, usually straight in region of pores and far from them. Lateral margin of collum of male with three entire sulci. Eyes roughly triangular, with ocelli in seven rows, ten to three in each row. Mandibular stipes of male typical of genus. Caudal hook slightly longer than in **Saiulus immaculatus** and **S. jerseyi**. Sternite of eighth segment of male not produced anteriorly.

The genital apparatus and third segment of the female are shown in Figures 22, 23, and 24.

The form of each anterior gonopod of the male is shown in Figure 25; the medial subterminal notch in the coxal plate is a distinctive feature of the species; the short coxal lobe is dorsal and recurved dorsally at its lateral margin. Each posterior gonopod, as in **S. jerseyi**, is composed of five longitudinal pieces (Fig. 26). The widest piece is slightly shorter than the column on its dorsal surface; the column is finely pubescent distally; medially there is an attenuated piece as long as the column; at the base of the medial piece is the aciculate piece, and at the base of the wide piece is the short fifth piece.
the coxal plates are contiguous medially, with the medial pieces of the posterior gonopods visible in their notch; the long pieces of the posterior gonopods extend between and beyond the femorae of the anterior gonopods.

Length of male holotype about 34 mm., width 2.3 mm., 51 segments.

Locality: Illinois, La Rue, Drs. H.H. Ross and M.W. Sanderson collected the male holotype April 4, 1944, from ground cover and the female paratype April 19, 1947, at Thebes.

Saiulus jerseyi, sp. nov.

Color medium brown, lighter ventrally; black mid-dorsal line and lateral spots; dark brown vertical line connecting pores dorsally; irregular buff maculae below pores. Segments finely punctuate. Vertical sutures distinct, straight in region of pores. Lateral margin of collum of male with three entire sulci. Eyes roughly triangular, with ocelli in seven rows, ten to two in each row. Caudal hook and mandibular stipes typical of genus.

Sternite of eighth segment of male not produced anteriorly.

The genital apparatus and the third segment of the female are shown in Figures 27 and 28. The genital apparatus is distinguished from that of **Saiulus immaculatus** by the wider anterior extension of the medial pieces and the absence of deep excavations in the ventral surface of the lateral pieces.

The anterior gonopods of the male closely resemble those of **immaculatus**, but they can be distinguished by differences in the emargination of the coxal plates and lobes (Fig. 29). Each posterior gonopod consists of five pieces (Fig. 30); the most conspicuous is wide, ventro-lateral, with a longitudinal ridge, and terminating in three points of very distinct configuration from those of **immaculatus**; dorsal to the wide piece and enclosed by it is a column distally clavate and finely pubescent; medially there is a narrow piece slightly longer than either of the preceding two; at its base is an aciculate piece about half its length; the fifth piece is medio-dorsal, flattened, attenuated, about the length of the aciculate piece.

Width of male holotype, 2.5 mm. Length of female paratype about 28 mm., width 2.5 mm. 50 segments.

Locality: New Jersey, Rockaway. Two females and a fragment of a male were collected by Mr. J.K. Dankel in October, 1949.

Saiulus immaculatus (Wood)

This description is based upon lectotypic specimens taken from the original collection, which is at the Academy of Natural Sciences of Philadelphia.

No trace of the original color remains. Eyes triangular, with ocelli in seven or eight rows, nine to one in each row. Vertical sutures distinct, scarcely bent in region of pores. Collum of male with two lateral marginal sulci. Mandibular stipes and caudal hook typical of genus; the caudal hook is shown in Figure 31. Sternite of eighth segment of male not produced anteriorly.

The genital apparatus and the third segment of the female are shown in Figures 32 and 33. When viewed laterally, the second and third segments of the female project equally below the ventral extensions of the first and fourth segments.

The male gonopods are shown as they appear **in situ** in Figure 34; the coxal plates are seen to be contiguous medially and emarginate caudally, with the dorsal coxal lobes projecting beyond them; the long pieces of the posterior gonopods can be seen between and beyond the femorae of the anterior gonopods. Viewed dorsally (Fig. 35), each anterior gonopod is seen to have an additional lateral or minor coxal lobe which extends dorso-medially; a similar piece occurs in **jerseyi**. Each posterior gonopod appears to be composed of four longitudinal pieces (Fig. 36); the widest is ventro-lateral and terminates in three points of distinctive configuration; dorsal to and enclosed by it is the slightly longer column, which is distally irregular and pubescent; the long medial piece is slightly clavate; the fourth piece is short, flattened, attenuated, and medio-dorsal. On neither the type specimen nor on a male from Lafayette, New Hampshire, could an aciculate piece be seen at the base of the medial piece; such a piece was seen, however, on a specimen from Charteroak, Pennsylvania; which corresponds otherwise with the type.

Width of male holotype, 1.8 mm. Length of female paratype about 32 mm., width 2 mm., 50 segments.

Locality: New York, Catskill Mountains, Dr. H.C. Wood's collection from which the lectotypes have been taken consisted of three males, all fragmented, and two entire females. The Charteroak, Pa., collection was made by Dr. L.J. Stannard Oct. 3, 1947, and consisted of one male and two females. The Mt. Lafayette, N.H., collection was made by Dr. D.B. Burks Sept. 4, 1947, and consisted of one male and two immature females.

Oriulus grayi, sp. nov.

Brown; black mid-dorsal line and lateral spots; vertex and antennae dark brown; legs light brown; venter cream with light brown triangles and maculae. Cephalic angle of collum of male rounded as shown in Figure 37, its margin with a short secondary sulcus at the caudal angle. Caudal spine straight, not extending beyond anal valves. Striae, sutures, eyes, first and second legs typical. Sternite of eighth segment of male produced anteriorly under base of gonopods as a broadly rounded triangle.

The form of each anterior gonopod of the male is shown in Figure 38; except for the black line the color is amber. The form of each posterior gonopod is shown in Figure 39; the sigmoid seminal blade is flattened, or rather even width, and rounded distally; the accessory blade, arising from its base on the lateral surface, is sinuate, but viewed sublaterally it appears to be straight. **In situ** the seminal blades cross medially; their distal ends extend just beyond and curve slightly around the tips of the femorae of the anterior gonopods. Viewed ventrally **in situ**, the coxal lobes appear as a pair of almost parallel rods lateral to the femorae and extending somewhat beyond the tips of the seminal blades.

The form of the third segment of the female is shown in Figure 40; the pleural lobes are shorter, more truncated, and closer together than in **Oriulus medianus**, which this species closely resembles. The form of the female genital apparatus is shown in Figures 41 and 42.

Length of male holotype, 30 mm., width 2 mm., 50 segments.

Locality: Arkansas, De Valls Bluff. Mr. Leroy Gray, for whom the species is named, collected the male in December, 1949, and the female in February, 1950.

EXPLANATION OF FIGURES

Plate 1

Figure 1. **Aliulus carrollus**, right side of anterior end of male.
Figure 2. **Aliulus carrollus**, sternite of eighth segment of male.
Figure 3. **Aliulus carrollus**, left anterior gonopod, ectal view.
Figure 4. **Aliulus carrollus**, left posterior gonopod, ectal view.
Figure 5. **Aliulus caddoensis**, right anterior gonopod, ectal view.
Figure 6. **Aliulus caddoensis**, left posterior gonopod, ectal view.
Figure 7. **Aniulus impressus** (Say), left anterior gonopod, cephalic view.
Figure 8. **Aniulus impressus** (Say), left posterior gonopod, medial view.

Plate 2

Figure 9. **Okliulus carpenteri**, right side of anterior end of male.
Figure 10. **Okliulus carpenteri**, left anterior gonopod, ectal view.
Figure 11. **Okliulus carpenteri**, left anterior gonopod, caudal view.
Figure 12. **Okliulus carpenteri**, left posterior gonopod, ectal view.
Figure 13. **Illiulus illinoensis**, right side of anterior end of male.
Figure 14. **Illiulus illinoensis**, left anterior gonopod, ectal view.
Figure 15. **Illiulus illinoensis**, left anterior gonopod, caudal view.

Plate 3

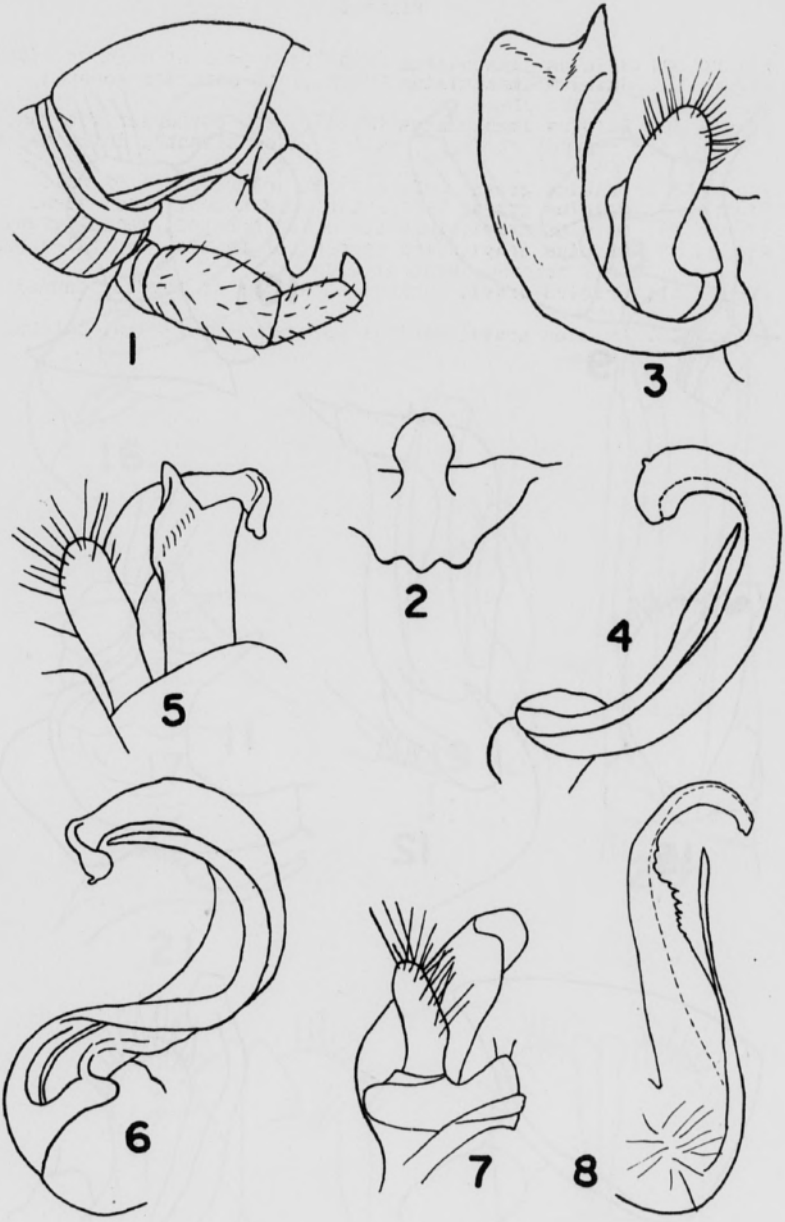
Figure 16. **Illiulus illinoensis**, left posterior gonopod, ectal view.
Figure 17. **Illiulus illinoensis**, sternite of eighth segment of male.
Figure 18. **Spathiulus elegantulus**, right stipes of male, ectal view.
Figure 19. **Spathiulus elegantulus**, left anterior gonopod, dorsal view.
Figure 20. **Spathiulus elegantulus**, left posterior gonopod, subdorsal view.
Figure 21. **Spathiulus elegantulus**, end of main process of posterior gonopod.
Figure 22. **Saiulus sandersoni**, female genital apparatus, caudal view.
Figure 23. **Saiulus sandersoni**, female genital apparatus, cephalic view.

Plate 4

Figure 24. **Saiulus sandersoni**, third segment and female genital apparatus, subcaudal view.
Figure 25. **Saiulus sandersoni**, left anterior gonopod, dorsal view.
Figure 26. **Saiulus sandersoni**, left posterior gonopod, ventral view.
Figure 27. **Saiulus jerseyi**, female genital apparatus, caudal view.
Figure 28. **Saiulus jerseyi**, third segment of female, subcaudal view.
Figure 29. **Saiulus jerseyi**, right anterior gonopod, dorsal view.
Figure 30. **Saiulus jerseyi**, right posterior gonopod, ventral view.
Figure 31. **Saiulus immaculatus** (Wood), caudal end of female.
Figure 32. **Saiulus immaculatus** (Wood), female genital apparatus, caudal view.
Figure 33. **Saiulus immaculatus** (Wood), female genital apparatus, cephalic view.

Plate 5

Figure 34. **Saiulus immaculatus** (Wood),gonopods of male *in situ*.
Figure 35. **Saiulus immaculatus** (Wood),left anterior gonopod, dorsal view.
Figure 36. **Saiulus immaculatus** (Wood), left posterior gonopod, ventral view.with medial piece slightly deflected to the left.
Figure 37. **Oriulus grayi**, left side of anterior end of male.
Figure 38. **Oriulus grayi**, left anterior gonopod, ectal view.
Figure 39. **Oriulus grayi**, left posterior gonopod, medial view.
Figure 40. **Oriulus grayi**,third segment of female, genital apparatus removed, ventral view.
Figure 41. **Oriulus grayi**, genital apparatus of female, caudal view.
Figure 42. **Oriulus grayi**, genital apparatus of female, lateral view.



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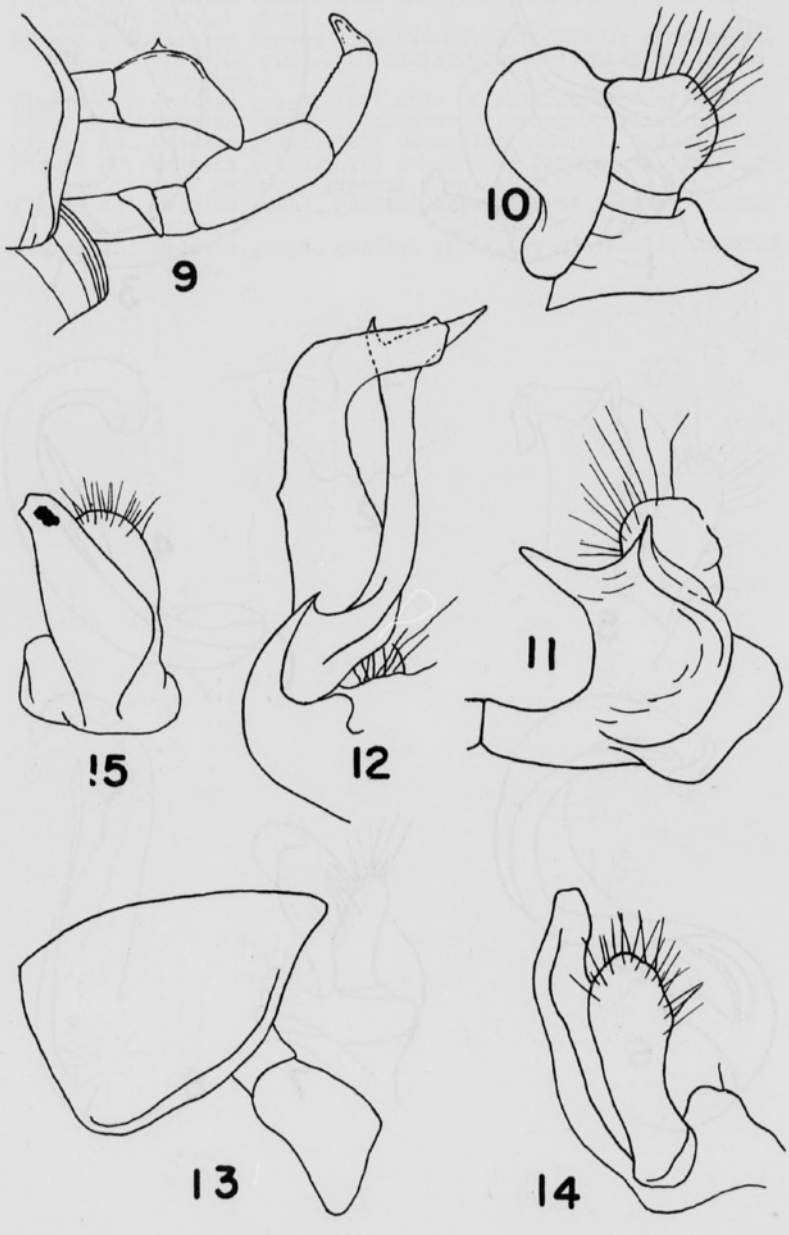

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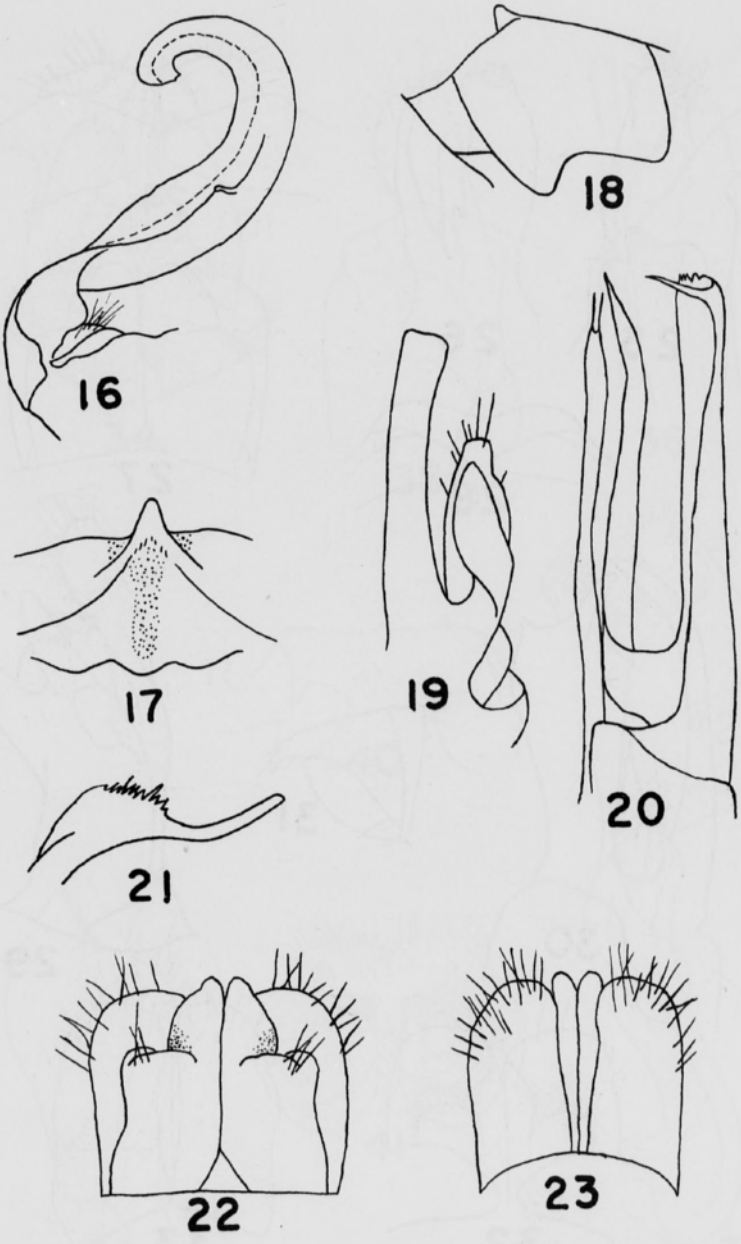

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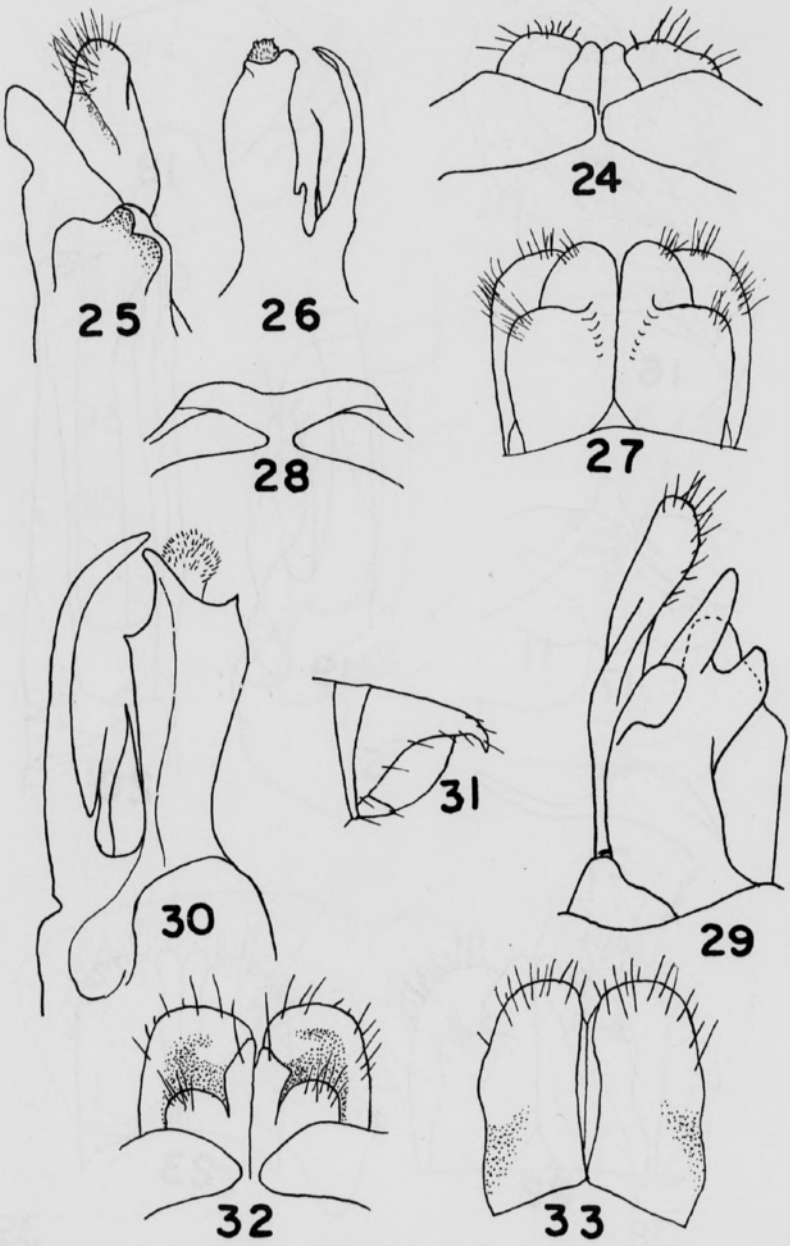

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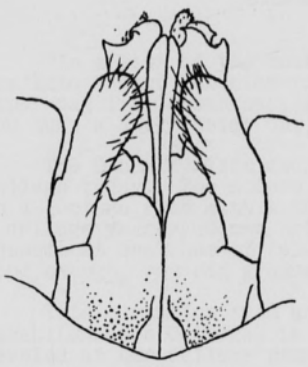

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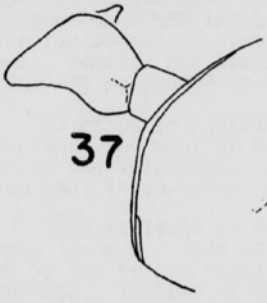

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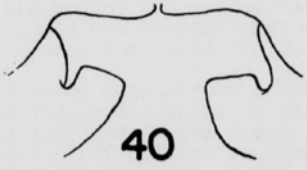

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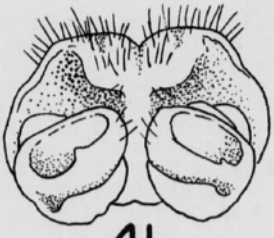

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Plate 5