The Toxopidae, a new Family of Spiders

By

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PLATES XVII, XVIII, XIX

The present paper is a contribution to the work of the Tasmanian Biological Survey, and deals with a new spider, *Toxops montanus*, from the summit of Mt. Wellington. The characters of the spider seem to justify the establishment of a new family, for which the name Toxopidae is suggested.

Order ARANEAE

Sub-order *DIPNEUMONOMORPHAE*

Branch *TRIONYCHAE*

TOXOPIDAE, fam. nov.

Cribellum and calamistrum lacking. Colulus present. Six spinnerets, anterior pair larger than the others. Chelicerae with a scopula and lateral condyle. Both margins toothed. Labium free. Maxillae slightly converging and furnished with a scopula. Legs laterigrade and without scopulae. Trochanters not notched. A distinct pretarsus present. Three tarsal claws. Upper claws pectinate in a single row, similar in male, dissimilar in female. A tarsal pulvillus consisting of a pair of large tenent hairs present. Spurious claws wanting. Trichobothria in two rows on tibiae, in one on metartarsi and in an irregular row on tarsi. Integument with barbed hairs. Eight eyes, which, when viewed from above, form a recurved row. Posterior lateral eyes very large. One pair of book-lungs in normal position. A single tracheal spiracle close to spinnerets. Tracheal system extending into the cephalothorax and its appendages. Pedipalp of female with a straight non-pectinate claw.

Toxops, gen. nov.

Carapace as in *Xysticus*. Eight eyes in a recurved row. PLE very large. PME minute and in front of PLE. Clypeus narrow. Furrow of chelicerae oblique, promargin with one conical tooth and a bicuspid tooth, retromargin with three teeth. Labium wider than long, reaching slightly beyond middle of maxillae. Sternum shield-shaped, as wide as long. Legs 4.2.3.1. in male. Spines on femora, tibiae and metatarsi, but none on tarsi.

Genotype.—*Toxops montanus*, sp. nov.

Toxops montanus, sp. nov.

(Plates XVII, XVIII, XIX)

Male.—Measurements in millimetres:—

Total length	2·78
Length of cephalothorax	1·22
Width of cephalothorax	1·16
Length of abdomen	1·56
Width of abdomen	1·04

Leg	*Femur*	*Patella*	*Tibia*	*Metatarsus*	*Tarsus*	*Total*
1	1·10	0·46	0·87	0·75	0·52	3·70
2	1·27	0·46	0·98	0·81	0·52	4·04
3	1·22	0·46	0·93	0·81	0·52	3·94
4	1·22	0·46	0·98	0·93	0·52	4·11

Colour.—Carapace light brown with black lateral margins and a wide dark brown band on each side, extending from PLE to the posterior margin. Legs, palpi, chelicerae, sternum and maxillae light brown. Labium dark brown. Dorsal surface of abdomen brown with a median longitudinal dark-brown mark anteriorly, followed by three or four pairs of dark brown spots, which tend to form chevrons towards posterior end.

Carapace.—Nearly as wide as long. Head part flat. The thoracic groove longitudinal, its front end being on a level with the posterior margin of the PLE. Posterior declivity steep and much shorter than the flat portion of the carapace. There is a slender bristle on each side of the thoracic groove. The flat part of carapace is lightly clothed with white barbed hairs, while at the sides, in front and on the lateral margins, are a few black setae. The form of the carapace resembles that of the female (Pl. XVIII, figs. 5 and 6).

Eyes.—Viewed from above the eight eyes form a recurved row (Pl. XVIII, fig. 5). The PLE are very large and mounted on conspicuous black tubercles. The PME are minute and in front of the PLE. The eye ratio AME:ALE:PME:PLE = 12:15:7·5:24. The AME are separated from each other by about 16/12 of their diameter; from ALE by 14/12 of their diameter. The ALE are separated from PME by a space equal to 9/12 of the diameter of AME. The PLE are separated from ALE and from PME by a space equal to 18/12 of the diameter of AME. Viewed from in front the ALE are at a higher level than the AME (Pl. XVIII, fig. 7). The clypeus is 15/12 of the diameter of AME.

Chelicerae.—Conical, 0·46 mm. long. Clothed in front with a few hairs. A small lateral condyle is present. Furrow oblique. Promargin armed with a small conical tooth and a large bicuspid tooth (Pl. XVIII, fig. 13). Retromargin armed with three teeth, that nearest the base of fang being the largest. A scopula consisting of 5 or 6 barbed hairs is present on the promargin and a very long barbed hair on each side near base of fang.

Maxillae.—Slightly converging, 0·35 mm. long. Outer angle rounded. Serrula long, reaching outer angle. Scopula as shown in Pl. XIX, fig. 17.

Labium.—Wider than long in ratio 3:2. Apex truncate, reaching slightly beyond the middle of maxillae.

Sternum.—Shield-shape, slightly convex, as wide as long, ending in a point, which separates the fourth coxae. Lightly clothed with black hairs (Pl. XIX, fig. 17).

Legs.—4.2.3.1. Coxae cylindrical. The podomeres are clothed with barbed hairs. About eight trichobothria arranged in two rows on each tibia, three in a single row on each metatarsus, and three in an irregular row on each tarsus. The trichobothria increase in length towards the apex of the segment. Each leg has a distinct pretarsus carrying three tarsal claws. The superior claws are pectinate, the inferior claw smooth. In the first pair of legs the pro-claw has six blunt teeth, the retro-claw six blunt teeth and one small sharp tooth near the base (Pl. XVIII, fig. 11). In the other legs the claws are similar but with only five teeth. A scopula is lacking. Claw-tufts, however, are represented by a pair of large club-shaped tenent hairs. These tenent hairs form a kind of pulvillus, resembling that in *Apostenus fuscus* Westr. (Simon 1897, p. 137, fig. 145). Except for a difference in the pectination of the claws, the pretarsus of the male resembles that of the female (Pl. XVIII, fig. 8).

Palpi.—The form of the right palpus is shown in Pl. XVIII, figs. 9 and 10. The podomeres have the following lengths in mm:—Femur 0·406, patella 0·232, tibia 0·30, tarsus 0·64. The copulatory apparatus consists of a flat sickle-shaped translucent conductor, which, extending beyond the margin of the tarsus, curves round the apex and prolateral side. The tip rests against the ventral surface of the tibia. The embolus makes one complete turn in an opposite direction to that of the conductor. On the dorsal side the tarsus is furnished with a large basal excavation, within which the surface is finely granulate. The tibia is broad and somewhat dorso-ventrally compressed. On its dorsal surface near the apex is a large curved apophysis, which projects into the excavation on the tarsus. Two other apophyses are present on the retro-lateral side of the tibia near the apex. Three trichobothria are arranged in a triangular group on the dorsal surface of the tibia.

Spines—First leg.—Femur: dorsal 1-1, prolateral 1, elsewhere 0. Patella: dorsal 1-1, elsewhere 0. Tibia: dorsal 1-1, prolateral 1, retrolateral 1, ventral 2-2-0. Metatarsus: dorsal 1, prolateral 0, retrolateral 0, ventral 2-2-2. Tarsus 0. *Second leg.*—Femur: dorsal 1-1, prolateral 1, elsewhere 0. Patella: dorsal 1-1, elsewhere 0. Tibia: dorsal 1-1, prolateral 0, retrolateral 1, ventral 2-2-0. Metatarsus: dorsal 1, prolateral 0, retrolateral 0, ventral 2-2-2. Tarsus 0. *Third leg.*—Femur: dorsal 1-1, elsewhere 0. Patella: dorsal 1-1, elsewhere 0. Tibia: dorsal 1-1, prolateral 0, retrolateral 1, ventral 2-2-0. Metatarsus: dorsal 1, prolateral 0, retrolateral 0. ventral 2-2-2. Tarsus 0. *Fourth leg.*—Femur: dorsal 1-1, elsewhere 0. Patella: dorsal 1-1, elsewhere 0. Tibia: dorsal 1-1. prolateral 0, retrolateral 1, ventral 2-2-1. Metatarsus: dorsal 1, prolateral 0, retrolateral 0, ventral 2-2-2. Tarsus 0.

Abdomen.—Oval, clothed with recumbent barbed hairs and fine erect bristles. Six spinnerets. The anterior pair are short truncated cones, two-jointed, but the apical joint is very small and difficult to see, except in microscopic preparations. The other spinnerets are much smaller than the anterior pair, and in ventral view are hidden by the latter. There is a small colulus immediately in front of the anterior spinnerets.

Female.—Measurements in millimetres:—

Total length	2·90
Length of cephalothorax	1·22
Width of cephalothorax	1·16
Length of abdomen	1·74
Width of abdomen	1·27

Leg	*Femur*	*Patella*	*Tibia*	*Metatarsus*	*Tarsus*	*Total*
1	0·94	0·48	0·68	0·63	0·44	3·17
2	1·08	0·52	0·75	0·65	0·44	3·44
3	1·01	0·45	0·71	0·63	0·44	3·24
4	0·93	0·38	0·70	0·65	0·44	3·10

The female (Pl. XVII, fig. 1) resembles the male in coloration and general appearance. Hence only the following characters need be described:—

Eyes.—The eight eyes are arranged as shown in Pl. XVIII, figs. 5, 6 and 7. The eye-ratio AME: ALE: PME:PLE = 5:8:2:14. The AME are separated from each other by twice their diameter and from ALE by 7/5 of their diameter. The ALE are separated from PME by a space equal to 6/5 of the diameter of AME. The PLE are separated from ALE by twice the diameter of AME and by slightly less than this distance from PME.

Legs.—These are much shorter than those of the male, and the order of the relative lengths is different, being 2.3.1.4. The tarsi end in a pretarsus carrying three claws and a pulvillus (Pl. XVIII, fig. 8). The inferior claw is shorter and blunter than in the male. The superior claws are markedly dissimilar. The pro-claw has ten well-developed teeth, which gradually increase in size towards the apex of the claw. The retro-claw has only one well developed tooth, the others being vestigial (Pl. XVIII, fig. 12).

Trichobothria and spines are arranged as in the male.

Palpi.—The segments have the following lengths in mm:—Femur 0·38, patella 0·22, tibia 0·33, tarsus 0·38. The tarsal claw is straight and smooth. There are five trichobothria on the dorsal side of the tibia, arranged in a prolateral row of 2 and a retrolateral row of 3. None on tarsus. Spines are arranged as follows:—Femur: dorsal 1-1, elsewhere 0. Tibia: dorsal 1-1, prolateral 2-2, retrolateral 1-1, ventral 0. Tarsus: dorsal 1-1, prolateral 2-2-2, retrolateral 2-2-2, ventral 0.

Epigynum.—The form of the epigynum as seen in transparent preparations is shown in Pl. XIX, fig. 14. The spermatheca of each side is a strongly convoluted tube. The convolutions are close to the ventral surface and in most specimens are visible through the integument. The inner surface of the posterior coils is furnished with a number of conical projections.

Locality.—Mount Wellington, Tasmania. 31st May, 1939.

Respiratory System

The respiratory system was studied both in serial sections and in specimens treated with caustic potash solution. One pair of book-lungs is present in the normal position in front of the epigastric furrow. In the adult female each book-lung has 17 leaves.

The tracheal spiracle in front of the spinnerets leads into a shallow atrium. From this two stout trunks pass directly forward below the ventral longitudinal muscles. Just beyond the epigastric furrow each trunk gives rise to a large number of fine tubules which pass through the petiolus into the cephalothorax. In a transverse section through the petiolus of one specimen, nearly two hundred of these tubules could be counted (Pl. XIX, fig. 15). Each leg receives about six tubules. The other tubules penetrate to all parts of the cephalothorax.

The abdomen is supplied with tracheae given off from the sides of the two main trunks. These are well shown in a whole mount of the tracheal system removed from the last exuvium of a specimen which underwent ecdysis in captivity (Plate XVII, fig. 4).

The Heart

No attempt was made to study the circulatory system in detail. The heart, however, was examined in serial sections and also dissected from the abdomen and examined whole. It has three pairs of ostia.

The Thoracenteron

The thoracenteron gives rise to three pairs of lateral caeca, which extend laterally and ventrally ending near the coxae of the second, third and fourth pairs of legs respectively (Pl. XIX, fig. 16). In addition to the lateral caeca there is a median bilobed caecum arising near the junction of the thoracenteron with the sucking stomach and extending forward above the latter.

Habits, Egg-sac and Courtship

Toxops montanus is found on low shrubs, especially the Grass-tree, *Richea scoparia* Hooker, growing on the summit of Mount Wellington. The spider does not spin a web. It runs very quickly and its laterigrade legs enable to to creep between the closely arranged leaves of the Grass-tree. During May, 1939, several mature females, together with immature specimens of both sexes, were collected. These were placed in a small vivarium in the laboratory and provided with small branches from the shrubs on which they were found. The spiders require fairly moist conditions, and it was necessary frequently to sprinkle the vivarium with water.

About the 16th July, 1939, one of the mature females made an egg-sac, which was oval in outline and measured 3·54 mm. long by 2·32 mm. wide. It was closely applied to the upper surface of a leaf of the Grass-tree and was made of pure white silk. The egg-sac was covered with leaf fragments and other debris (Pl. XVII, fig. 3). After about four weeks the sac was opened and found to contain two eggs in process of development. Each egg measured 0·93 mm. long by 0·75 mm. wide. They were not disturbed but allowed to remain in the egg-sac until they hatched. This occurred on 17th September, 1939. The newly-hatched spider underwent its first ecdysis on 6th October, 1939.

Some of the immature males and immature females collected on Mount Wellington were kept until they reached maturity, the two sexes being placed in separate vivaria. A male underwent its final ecdysis on the 17th July, 1939, and a female on the 10th August, 1939. These two spiders were placed together in a glass specimen tube on the 20th August, 1939. The male soon gave signs of sexual excitement and was observed to rub the tarsi of the first pair of legs against the side of the tube. Apart from this, however, there seemed to be very few indications of a preliminary courtship. After repeating the movements of the tarsi several times, the male rushed at the female and copulation occurred. This took place at 1.20 p.m., the spiders adopting the position shown in Pl. XIX, fig. 18. The female remained in a more or less passive state during the whole process, which lasted for more than an hour. Its completion, however, was not observed.

At 7.10 p.m. the male was removed from the tube and another male admitted. Copulation with the latter occurred at 7.20 p.m. and lasted for more than five hours, the spiders being kept under observation until 12.20 a.m. on 21st August, 1939. The male palpi were not employed simultaneously, the left palpus being applied first and then the right.

The female was removed next morning and kept alive in a separate vivarium until 4th November, when she made her first egg-sac. It follows from the above observations that spermatozoa may be stored in the spermatheca of the female for at least 74 days before eggs are laid.

Systematic Position of Toxops montanus

Toxops montanus shows many features possessed by the Agalenidae, but it differs from members of this family in the arrangement of the eyes, the pectination

of the tarsal claws, the presence of a distinct pretarsus and pulvillus and in the tracheal system extending into the cephalothorax.

In being a dipneumone spider having the tracheal spiracle close to the spinnerets and the tracheal system penetrating the cephalothorax, *Toxops montanus* resembles the families Uloboridae, Dictynidae, Micryphantidae, Prodidomidae and Attidae and also the genus *Zodarion*. In other respects it differs widely from these groups.

The arrangement of the eyes approaches that of the Selenopidae.

The peculiar tarsal pulvillus recalls the similar structure in *Apostenus fuscus* Westr., but the latter spider is one of the Clubionidae and has only two tarsal claws. These, however, like the upper claws of the female of *T. montanus*, are dissimilar.

T. montanus thus possesses characters found in several widely separated families. For these reasons the establishment of the new family, Toxopidae, seems necessary.

The above research was carried out in the Biology Department of the University of Tasmania and under the auspices of the Trustees of the Ralston Bequest.

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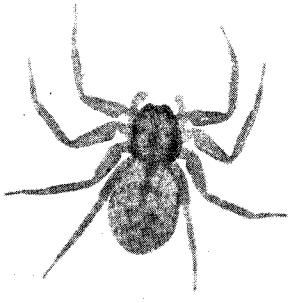
SIMON, E., 1897.—*Hist. Nat. des Araignées*, 2, p. 137.

PLATE XVII

Toxops montanus, sp. nov.

FIG. 1.—Photograph of female. X 7.
FIG. 2.—Photograph of male. X 7.
FIG. 3.—Photograph of egg-sac on leaf of *Richea scoparia*. X 7.
FIG. 4.—Microphotograph of tracheal tubes removed from the exuvium of the penultimate instar. X 47.



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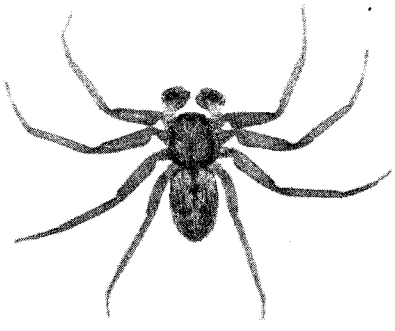

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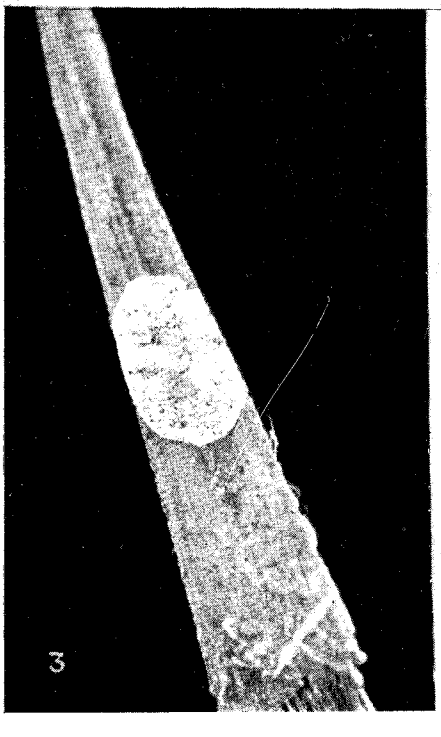

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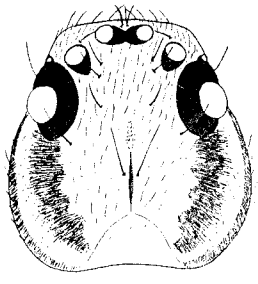
PLATE XVIII

Toxops montanus, sp. nov.

FIG. 5.—Dorsal view of carapace and eyes, ♀.
FIG. 6.—Lateral view of carapace and eyes, ♀.
FIG. 7.—Front view of face and chelicerae, ♀.
FIG. 8.—End of tarsus showing pretarsus, claws and the two large tenent hairs forming a pulvillus, ♀.
FIG. 9.—Ventral view of right palpus, ♂.
FIG. 10.—Dorsal view of right palpus, ♂.
FIG. 11.—Pectination of tarsal claws, ♂.
FIG. 12.—Pectination of tarsal claws, ♀.
FIG. 13.—Retrolateral view of left chelicera showing bicuspid tooth on promargin, ♂.



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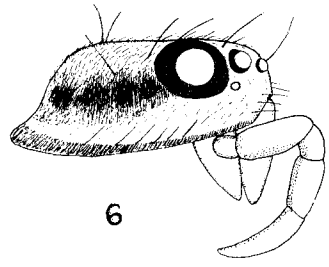

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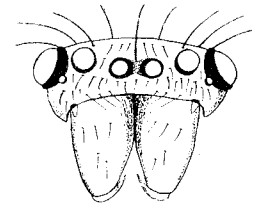

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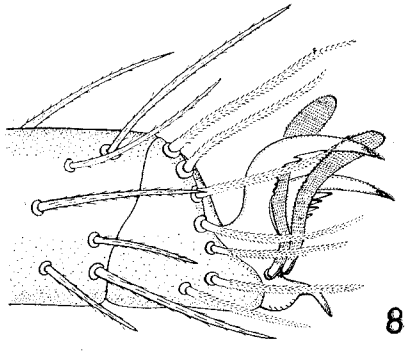

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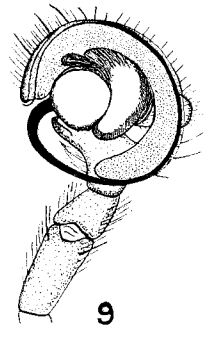

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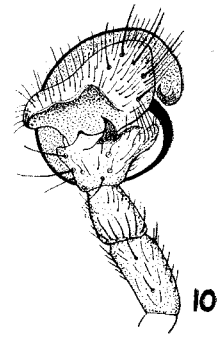

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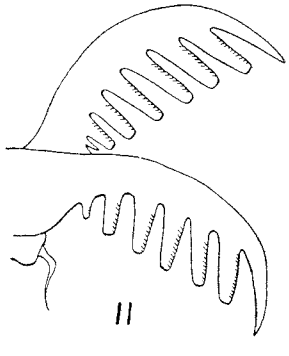

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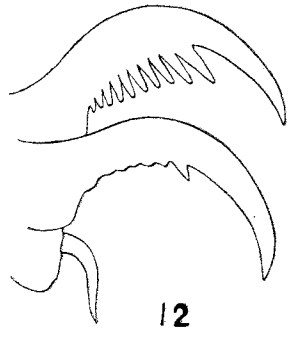

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PLATE XIX

Toxops montanus, sp. nov.

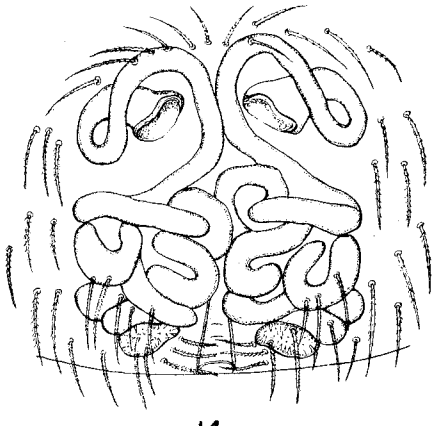
FIG. 14.—Ventral view of epigynum as seen in transparent preparations.

FIG. 15.—Transverse section through petiolus showing the large number of tracheal tubules below the gut, ♀.

FIG. 16.—Dorsal view of thoracenteron *in situ*, ♀.

FIG. 17.—Sternum, labium and maxillae, ♂.

FIG. 18.—Position adopted by male and female in copulation.



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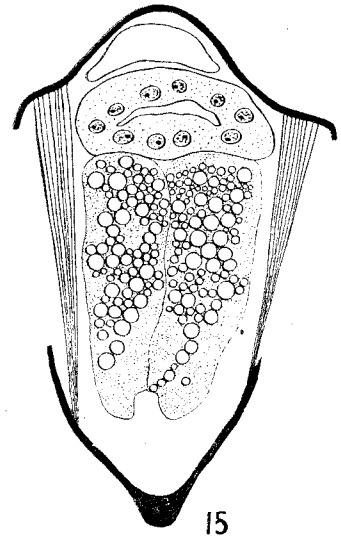

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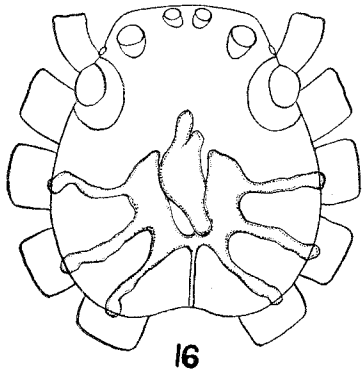

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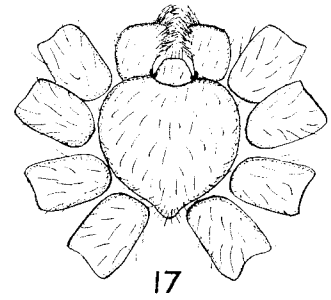

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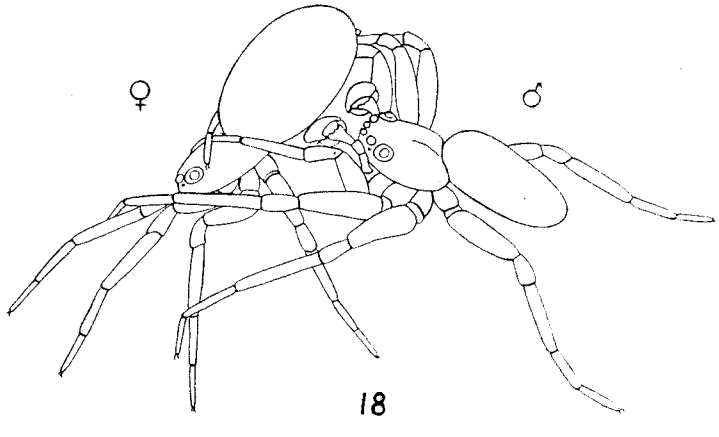

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