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On some new Hadrotarsidae (Araneae) with Notes on their Internal Anatomy

By

V. V. HICKMAN

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PLATES I-V

The family Hadrotarsidae contains only two species, namely, *Hadrotarsus barbirussa* Thorell from Yule Island, New Guinea, and *Gmogala scarabaea* Keyserling from Sydney, New South Wales. Thorell (1881, p. 190) appears to have had only two specimens of *H. barbirussa*, one a male, the other a female. He has given a detailed account of the male, but the female was damaged before he was able to complete the description and therefore very little is known of its characters. Keyserling's account of *Gmogala scarabaea* is based on a female specimen which was later lodged in the British Museum. Pocock (1903, p. 619) re-examined the specimen, and offered some supplementary remarks on the genus. He came to the conclusion that Keyserling's description was 'defective in many points, erroneous in others', and that the two genera, *Hadrotarsus* and *Gmogala*, were identical.

Hadrotarsidae are particularly rare. Rainbow (1902, p. 315) states that there is a single female specimen of *G. scarabaea* in the Australian Museum, Sydney. This appears to be the only Hadrotarsid in any museum in Australia. When Simon wrote his comprehensive work he had no specimen of this family for study and was forced to rely on the descriptions given by Thorell and Keyserling. More recently Petrunkevitch (1933, p. 305) remarked that no specimens of Hadrotarsidae were 'available in any museum in the world for anatomical studies'. It follows, therefore, that our knowledge of this group is very deficient. Some authorities have suggested abandoning the Hadrotarsidae and transferring the genera *Hadrotarsus* and *Gmogala* to other families (see Berland, 1932, p. 359, Crosby, 1934, p. 21, and Gerhard and Kästner, 1938, p. 592).

The present paper deals with three new species which, in my opinion, belong to the genus *Hadrotarsus* and justify the retention of the family Hadrotarsidae. The main features of the internal anatomy of two of the species are described and a new definition of the family is given.

Order ARANEAE

Sub-order *DIPNEUMONOMORPHAE*

Family HADROTARSIDAE

Genus **Hadrotarsus** *Thorell*, 1881

Hadrotarsus ornatus, sp. n.

Male. Measurements in millimetres:—

Total length	1·5660
Length of cephalothorax	0·4932
Width of cephalothorax	0·6165
Length of abdomen	1·2330
Width of abdomen	1·0412

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	0·3425	0·2055	0·2877	0·1781	0·3151	1·3289
2	0·2740	0·1918	0·2603	0·1644	0·3014	1·1919
3	0·2603	0·2055	0·2466	0·1712	0·2877	1·1713
4	0·3562	0·2603	0·3151	0·2192	0·3425	1·4933
Palp	0·1781	0·1096	0·0685	....	0·4110	0·7672

Colour. Carapace yellowish brown with narrow black lateral margins and a black reticulate pattern behind eyes. Ocular area black anteriorly. Legs yellowish brown becoming darker towards the apex. Chelicerae, palpi, labium, maxillae, and sternum yellowish brown. Dorsal shield of abdomen yellowish brown crossed by four transverse black bands, which are interrupted in the middle. Ventral sclerites yellowish brown.

Carapace. Wider than long, somewhat narrowed in front, emarginate behind and with well-rounded sides. Thoracic groove wanting. Radial grooves faintly marked. Head part moderately high. From behind PME the carapace slopes gradually to the posterior margin. Surface smooth, shining and almost glabrous (pl. I, fig. 1).

Eyes. Viewed from above the eight eyes are seen to be arranged in two rows. The front row appears slightly recurved. Viewed from in front the anterior row is distinctly procurved, the lateral eyes being nearer the edge of the clypeus than are the median eyes. The posterior row is strongly procurved (pl. I, fig. 2). The eye ratio AME : ALE : PME : PLE = 5 : 5 : 8 (long) : 5. AME are on a small tubercle and are separated from each other by $\frac{2}{3}$ and from PME by $\frac{2}{5}$ of their diameter. They are in contact with ALE, which are in contact with PLE. PME are large, reniform, and flat. They are almost contiguous with each other, but separated from PLE by a space equal to the diameter of AME. The width of the eye-group is slightly less than the width of the carapace in the region of the eyes. The quadrangle formed by the median eyes is wider in front than behind in ratio 12 : 9. Its length is greater than its anterior width in ratio 14 : 12. The AME are dark, the other eyes pearly white. The height of the clypeus in front of AME is about 18/5 of diameter of AME.

Chelicerae. Small, conical, vertical, and without lateral condyles. Their inner edges obliquely diverging, devoid of teeth and scopula, but furnished with a row of three straight setae near the base of the fang. The fangs are moderately long and falcate. They lie transversely and cross each other (pl. I, fig. 3).

Maxillae. Triangular, converging in front of labium. Their inner ends pointed and membranous. A serrula consisting of eleven teeth is situated on the antero-lateral margin. The inner margin has a short scopula (pl. I, fig. 4).

Labium. Triangular, rounded and membranous in front. Wider than long in ratio 7 : 5. Furnished with three pairs of setae (pl. I, fig. 4).

Sternum. Convex, rounded and triangular. Width equal to length. The posterior end truncate. Fourth coxae separated by slightly more than their width. Middle of sternum glabrous, but its sub-marginal region is clothed with a few hairs which point inwards (pl. II, fig. 13).

Legs. 4.1.2.3. The first pair of legs with swollen tarsi. The joint between tarsus and metatarsus in both the first and second pairs of legs not constricted (pl. I, figs 5 and 6). Integument is clothed with barbed hairs. These are coarser and more numerous on the tarsi than elsewhere, especially on the ventral surface of the first tarsi. Spines and scopulae are wanting. Each leg has three trichobothria; one on the metatarsus near the apex and two on the tibia, one of which is near the middle, the other near the base. Two tarsal claws situated on a short onychium are present. The prolateral and retrolateral claw of each leg, excepting those of the fourth pair, are pectinate on both promargin and retromargin. The number of teeth and their arrangement differ on the different claws, as is indicated in the following table:—

	Prolateral Claw		Retrolateral Claw	
	Teeth on Promargin	Teeth on Retromargin	Teeth on Promargin	Teeth on Retromargin
Leg 1	12	1	10	1
Leg 2	11	1	9	1
Leg 3	10	1	1	8
Leg 4	8	0	0	8

The pectination of the claws of the first, third, and fourth pairs of legs is shown in pl. I, figs 7, 8, and 9. At least one pair of barbed setae on each tarsus appear to act as spurious claws.

Palpi. Moderately long. Cymbium spoon-shaped. Tibia short and saucer-shaped, devoid of apophyses but provided with a single trichobothrium. Patella short. The genital bulb has the form shown in pl. I, fig. 10. It is provided with a long, coiled embolus which makes two complete turns in the basal half of the cymbium and then passes round the retrolateral margin and apex to make a complete turn in the distal half of the cymbium. The tip of the embolus projects slightly on the prolateral side. Parallel with the end of the embolus is a hard, slender, terminal apophysis, which is provided with a few minute teeth on one side (pl. I, fig. 11). Near the tip of this apophysis is a small hook-like projection on the cymbium. Under high magnification the embolus is seen to have a small barb near the tip (pl. I, fig. 12).

Abdomen. Ovate, covered dorsally by a hard shield, which has a narrow V-shaped notch in the middle of its anterior margin. On both sides of the notch are a few coarse spine-like setae. The rest of the shield is lightly clothed with fine, short hairs. The front of the abdomen overhangs the carapace. The anterior half of the ventral surface is covered by a large epigastric scute, which extends forward and surrounds the pedicle. The lung covers are incorporated in the scute

and appear as a pair of long oval patches, one on each side. The epigastric furrow lies immediately behind the epigastric scute. The two lung slits are situated in the furrow, one on each side. Behind the furrow is a small median sclerite, on each side of which is a slightly larger lateral sclerite fused to the epigastric scute round the outer end of the lung slit. These two lateral sclerites partly overlap the posterior edge of the epigastric scute, thus hiding part of the epigastric furrow (pl. II, fig. 13). Behind the median and lateral sclerites is a large ventral scute, which covers most of the posterior half of the ventral surface. Near the antero-lateral angles of this scute is a pair of small rounded sclerites, one on each side. Attached to the posterior edge of the ventral scute and immediately in front of the spinnerets is a small median sclerite, on which is situated the single tracheal spiracle. The integument at the sides of the abdomen exhibits a series of three longitudinal folds, two of which are continuous anteriorly above the pedicle and posteriorly above the anus. The two most ventral folds on each side are reinforced with a number of small sclerites which tend to fuse together forming irregular longitudinal bars. Posteriorly, some of the bars unite with the ventral scute and with one another so as to form a hard chitinous ring almost surrounding the spinnerets.

Spinnerets. Six. The anterior pair short, conical, and close together. Each consists of a basal segment and a small apical segment. The inner surface of the basal segments thickly chitinized and marked with fine transverse ridges to form what is probably a stridulating organ. The small apical segment is furnished with three long, slender, spinning tubes (pl. II, fig. 14). The middle spinnerets are very small and not visible unless the other spinnerets are parted. Each consists of a single narrow segment provided with one spinning tube (pl. II, fig. 16). The posterior spinnerets are short, conical, and two-segmented. The apical segment is provided with a very wide spinning tube or spigot and two slender tubes (pl. II, fig. 15). A colulus is wanting.

Female. Measurements in millimetres:—

Total length	1·8084
Length of cephalothorax	0·5891
Width of cephalothorax	0·6165
Length of abdomen	1·2878
Width of abdomen	1·0459

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	0·3562	0·2192	0·2603	0·1781	0·3014	1·3152
2	0·3425	0·2055	0·2329	0·1781	0·2877	1·2467
3	0·3151	0·2055	0·2329	0·1781	0·2877	1·2193
4	0·3973	0·2603	0·2945	0·2192	0·3425	1·5138
Palp	0·1370	0·0616	0·1233	....	0·1781	0·5000

The female resembles the male in coloration, markings, and general appearance. Hence only the following features need be described: —

Eyes. The eight eyes are arranged as in the male. The width of the eye-group is less than the width of the carapace in the region of the eyes in ratio 20 : 25. Viewed from above, the front row of eyes is almost straight, but viewed from the front it is procurved, the lateral eyes being nearer the edge of the clypeus than are the median eyes. The posterior row is strongly procurved. Ratio of eyes AME : ALE : PME : PLE = 4 : 5 : 7 (long) : 5. AME are slightly smaller than in the male. They are separated from each other by $\frac{3}{4}$ and from PME by 2/4 of their diameter. They are in contact with ALE, which are in contact with

PLE. PME are large, flat, and reniform. They are almost contiguous with each other but separated from PLE by a space equal to the diameter of AME. The median ocular quadrangle is wider in front than behind in ratio 11 : 9. Its length is greater than its anterior width in ratio 15 : 11.

Labium. Triangular, rounded in front, wider than long in ratio 9 : 4, provided with seven setae.

Chelicerae and *Maxillae.* As in the male.

Sternum. Convex, rounded, and triangular. Longer than wide in ratio 28 : 26. Clothed with a few sub-marginal hairs which point inwards. Posterior end truncate. Fourth coxae separated by slightly more than their width.

Legs. 4.1.2.3. As in the male, but the tarsal claws show slight differences in the number of teeth. See following table:—

	Prolateral Claw		Retrolateral Claw	
	Teeth on Promargin	Teeth on Retromargin	Teeth on Promargin	Teeth on Retromargin
Leg 1	12	1	11	1
Leg 2	12	1	9	1
Leg 3	9	1	1	9
Leg 4	8	0	0	8

Palpi. Clothed with barbed setae but devoid of spines. One trichobothrium on tibia, elsewhere none. The single tarsal claw has eleven teeth on the promargin and one on the retromargin. The claw is so curved that the row of teeth on the promargin is almost transverse to the long axis of the tarsus, and the claw appears like a minute rake (pl. II, fig. 17).

Abdomen. Ovate, and provided with a hard dorsal shield as in the male. The scutes on the ventral surface, however, are somewhat different from those of the male (pl. II, fig. 18). There is a large ring-like sclerite surrounding the base of the pedicle, the ring being wider anteriorly than posteriorly. Behind the ring is a moderately large rectangular median scute occupied by the epigynum. On each side of this median scute, but separated from it, is an elongated pulmonary sclerite protecting the book-lung. The openings of the book-lungs lie, one on each side, between the pulmonary sclerite and a smaller sclerite, which is partly fused to its posterior margin. Behind the epigynum is a small median rectangular sclerite, on each side of which and behind the postero-lateral angle of the pulmonary sclerite are two small lateral sclerites situated one behind the other. The posterior half of the ventral surface is covered by a large ventral scute. Attached to the posterior margin of this ventral scute and immediately in front of the spinnerets is a small sclerite on which is situated the tracheal spiracle. The longitudinal lateral folds reinforced with sclerites as described in the male also occur in the female.

Spinnerets. Similar to those of the male and provided with similar stridulating ridges on the anterior pair.

Epigynum. The form of the epigynum in surface view is shown in pl. II, fig. 19, and as a transparent object in pl. V, fig. 39.

Habits. Specimens kept in the laboratory did not spin a web or make any nest. The spider occurs in grass-tussocks, moss, and other situations close to the ground, and is usually found during the months May to September.

Localities. The type specimens were found in grass-tussocks on the eastern slopes of the Domain, Hobart. Co-types were collected at Glen Dhu, the Punch Bowl, and Trevallyn, near Launceston.

Hadrotarsus fulvus, sp. n.

Male. Measurements in millimetres:—

Total length	1·3974
Length of cephalothorax	0·4932
Width of cephalothorax	0·4658
Length of abdomen	0·9727
Width of abdomen	0·6028

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	0·3699	0·2055	0·3014	0·1644	0·3014	1·3426
2	0·3014	0·1918	0·2603	0·1507	0·2877	1·1919
3	0·2740	0·1918	0·2466	0·1507	0·2740	1·1371
4	0·3699	0·2329	0·3562	0·2055	0·3562	1·5207
Palp	0·1918	0·0822	0·0411	....	0·2548	0·5699

Colour. Yellowish brown without markings. Ocular area black anteriorly. Two dorsal muscle spots on abdomen.

Carapace. Almost as wide as long (pl. III, fig. 20). Thoracic groove wanting. Clothed with a few minute scattered hairs, otherwise the surface is smooth, shining and glabrous.

Eyes. The eye-group occupies about $\frac{2}{3}$ of the width of the carapace in the eye-region. The eight eyes are arranged in two rows. Viewed from above the front row appears slightly recurved. From the front it is seen to be strongly procurved. The posterior row is procurved. PME large, flat, and reniform. AME dark, the other eyes pearly white. Ratio of eyes AME : ALE : PME : PLE = 3 : 3 : 6 (long) : 3. AME separated from each other by $\frac{2}{3}$ of their diameter and from PME by about the same distance. ALE in contact with both AME and PLE, forming a crescent-shaped row. Height of clypeus in front of AME is about twice the diameter of AME.

Chelicerae. Conical, small, and vertical. Their inner edges obliquely diverging. Lateral condyles, teeth, and scopula wanting. A row of three straight setae near base of fang. Fangs moderately long and falcate. They lie transversely and cross each other (pl. III, fig. 23).

Maxillae. Converging in front of labium. Apex pointed, membranous, and pellucid. A serrula consisting of a row of eight teeth is situated on the antero-lateral margin, and a small scopula on the inner margin near the apex.

Labium. Triangular with apex rounded. Wider than long in ratio 5 : 4. Provided with three pairs of setae. The apex is colourless and difficult to see.

Sternum. Shield-shape, convex, longer than wide in ratio 25 : 23. The posterior end is truncate and separates the fourth coxae. The middle of the sternum is smooth and glabrous, the sub-marginal region clothed with a few setae which point inwards (pl. III, fig. 24).

Legs. 4.1.2.3. Tarsi of first pair of legs swollen. Integument lightly clothed with barbed hairs. Two trichobothria on each tibia and one near the apex of each metatarsus, elsewhere none. Spines absent. Metatarsi much shorter than tarsi. Tarsal claws two, situated on an onychium, which also carries a pair of barbed hairs resembling spurious claws. Claws of the first three pairs of legs pectinated on both margins, those of the fourth pair on one margin only. The number of teeth on each claw is given in the following table:—

	Prolateral Claw		Retrolateral Claw	
	Teeth on Promargin	Teeth on Retromargin	Teeth on Promargin	Teeth on Retromargin
Leg 1	10	1	9	1
Leg 2	9	1	8	1
Leg 3	9	1	1	6
Leg 4	7	0	0	6

Scopulae and claw tufts wanting.

Palpi. The form of the right palpus is shown in pl. III, figs 21 and 22. The tibia is very short, saucer-shaped, and without apophyses. It has a small trichobothrium. The cymbium is very large and the alveolus is on the retrolateral side. The embolus is long and thread-like. It arises on the retrolateral side, and passes down and round the margin of the cymbium. It then curves back and ends near its point of origin on the retrolateral side.

Abdomen. The dorsal surface is covered by a hard chitinous shield, which has a small median V-shaped notch in the anterior margin (pl. III, fig. 20). On each side of the notch are a few short, thick setae. Elsewhere the scute is lightly clothed with small hairs. There is a pair of large conspicuous muscle spots near the middle of the scute. The front half of the ventral surface of the abdomen is covered by a large epigastric scute, which anteriorly surrounds the base of the pedicle (pl. III, fig. 24). Immediately behind the posterior margin of this scute is the epigastric furrow, in which lie the pulmonary spiracles, one on each side. Behind the furrow is a transverse row of three small scutes, the two lateral ones of which are fused to the epigastric scute round the outer ends of the pulmonary spiracles. The posterior half of the ventral surface is mainly covered by a large ventral scute, near the antero-lateral angles of which is a pair of very small sclerites, one on each side. Between the ventral scute and the spinnerets is a transverse row of three small sclerites, the middle one of which bears the tracheal spiracle, which is immediately in front of the spinnerets. The lateral sclerites in the row sometimes show a tendency to fuse with the large ventral scute, but in most cases they are quite separate. On each side of the abdomen below the dorsal shield the integument forms three longitudinal folds, two of which are continuous anteriorly above the pedicle and posteriorly above the anal tubercle.

Spinnerets. Six. There is a small sclerite on each side of the spinnerets, but the group is not surrounded by a chitinous ring. Anterior and posterior spinnerets are two-segmented, the apical segment being very short and conical. As in *H. ornatus* the inner surface of the basal segment of each anterior spinneret is marked by a series of fine transverse ridges to form what appears to be a stridulating organ. (Pl. III, fig. 27, shows the anterior spinnerets of the female,

which are similar to those of the male.) The middle spinnerets are very small and one-segmented. The posterior spinnerets are provided with a spigot having a very wide tube.

Female. Measurements in millimetres:—

Total length	1·4248
Length of cephalothorax	0·5206
Width of cephalothorax	0·4521
Length of abdomen	0·9316
Width of abdomen	0·6302

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	0·3699	0·2055	0·2603	0·1507	0·2466	1·2330
2	0·3151	0·1781	0·2329	0·1507	0·2603	1·1371
3	0·3014	0·1781	0·2192	0·1507	0·2740	1·1234
4	0·4110	0·2329	0·3425	0·2055	0·3288	1·5207
Palp	0·1096	0·0685	0·0822	....	0·1370	0·3973

Colour. The female resembles the male in colour and general appearance. Hence, only the following characters need be described:—

Eyes. The eight eyes are arranged in two rows. The anterior row viewed from above appears very slightly recurved; viewed from in front, it is distinctly procurved, the lateral eyes being nearer the edge of the clypeus than are the median eyes. The posterior row is procurved. Ratio of eyes AME : ALE : PME : PLE = 4 : 4 : 7 (long) : 4. The width of the eye-group is slightly less than the width of the carapace in the region of the eyes. AME are separated from each other by a space equal to their diameter and from PME by about half this distance. They are in contact with ALE, which are in contact with PLE. PME are large, flat, and reniform. They are contiguous with each other but separated from PLE by a space equal to half the diameter of AME. The quadrangle formed by the median eyes is wider in front than behind in ratio 9 : 8. Its length is greater than its anterior width in ratio 14 : 9. AME are dark, the other eyes pearly white. The height of the clypeus in front of AME is about 9/4 times the diameter of AME.

Chelicerae, Maxillae, Labium, and *Sternum.* As in the male.

Legs. 4.1.2.3. In form, clothing, and arrangement of the trichobothria the legs resemble those of the male. However, they are somewhat shorter, except in the case of the fourth pair, and there is a slight difference in the pectination of the claws on the third and fourth tarsi, as indicated in the following table:—

	Prolateral Claw		Retrolateral Claw	
	Teeth on Promargin	Teeth on Retromargin	Teeth on Promargin	Teeth on Retromargin
Leg 1	10	1	9	1
Leg 2	9	1	8	1
Leg 3	8	1	1	6
Leg 4	6	0	0	5

Palpi. Lightly clothed with barbed setae. A single trichobothrium is present near the middle of the tibia. The tarsal claw is curved and expanded so that the promarginal teeth form a row, which is almost transverse to the long axis of the tarsus. The claw is carried on a short onychium and has eight teeth on the promargin and one on the retromargin (pl. III, fig. 25).

Abdomen. The dorsal surface is covered by a hard oval shield resembling that of the male. There is a small V-shaped median notch in the anterior margin, and on each side of the notch a number of coarse setae. The rest of the shield is clothed with small hairs. The ventral surface is provided with a ring-like sclerite surrounding the base of the pedicle. Behind this is a median shield, on which the epigynum is situated. On each side of this median shield, but separated from it is an elongate pulmonary sclerite covering the book-lung. The lung-slit is situated between the posterior end of the pulmonary sclerite and a smaller sclerite immediately behind it. Posterior to the epigynum is a small triangular scute, on each side of which are two small sclerites, one behind the other. The posterior half of the ventral surface of the abdomen is covered by a large rectangular scute, behind which is a transverse row of three small sclerites. The median sclerite of the row is immediately in front of the spinnerets and bears the tracheal spiracle (pl. III, fig. 26). The sides of the abdomen have a series of longitudinal folds as in the male.

Spinnerets. Six. The anterior pair and posterior pair two-segmented, the apical segment small and conical. The posterior pair slightly smaller than the anterior pair. The middle spinnerets are very small and usually hidden by the others. On the inner surface of the basal segment of each anterior spinneret the chitin is thickened and provided with fine transverse ridges forming a stridulating organ as in the male (pl. III, fig. 27).

Epigynum. The form of the epigynum in surface view is shown in pl. III, fig. 28, and in transparent preparations in pl. V, fig. 40. In surface view it appears as a somewhat triangular depression, from the apex of which there projects backward a short scape or ovipositor. The spermathecae are visible through the integument as two dark circular areas, one on each side of the scape.

Habits. Specimens kept in the laboratory did not spin a web or make any nest. A male and female were observed in copulation on 24th August, 1934. The position adopted is shown in pl. IV, fig. 29. Unfortunately the female died without making an egg-sac. The spider is usually found during the months May to September. It occurs in grass-tussocks, moss, and lichens.

Localities. The type-specimen (♂) was collected at Fingal and the ♀ on the Domain, Hobart. Co-types were found at Trevallyn, Launceston. My collection also contains a male, found by Mr. C. Oke in Victoria.

Hadrotarsus setosus, sp. n.

Male. Measurements in millimetres:—

Total length	1·4385
Length of cephalothorax	0·5891
Width of cephalothorax	0·5343
Length of abdomen	1·1097
Width of abdomen	0·7535

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	0·4110	0·2329	0·3288	0·1781	0·3288	1·4796
2	0·4110	0·2055	0·2740	0·1781	0·2877	1·3563
3	0·3699	0·2055	0·2740	0·1644	0·2877	1·3015
4	0·4795	0·2740	0·3562	0·2466	0·3562	1·7125
Palp	0·3151	0·1096	0·0685	....	0·3425	0·8357

Colour. Light chestnut brown without markings. Ocular area black anteriorly Two large muscle spots near middle of dorsal surface of abdomen.

Carapace. Slightly longer than wide. Clothed with a few small scattered hairs. Thoracic groove wanting. Sides well rounded. Front somewhat narrowed (pl. IV, fig. 30).

Eyes. The eye-group occupies almost the whole width of the carapace in the region of the eyes. The eight eyes are arranged in two rows. Viewed from above the front row is slightly recurved, but viewed from in front it is strongly procurved, ALE being nearer the edge of the clypeus than are AME. The posterior row is procurved. AME dark, the other eyes pearly white. Posterior median eyes large, flat, and reniform (pl. IV, fig. 31). Ratio of eyes AME : ALE : PME : PLE = 4 : 4 : 6 (long) : 4. AME separated from each other by $\frac{3}{4}$ of their diameter and from PME by slightly more than $\frac{1}{4}$ of their diameter. AME are in contact with ALE, which are in contact with PLE. The PME are almost in contact with each other but are separated from PLE by $\frac{1}{2}$ the diameter of AME. The quadrangle formed by the median eyes wider in front than behind in ratio 9 : 8. Its length is greater than its anterior width in ratio 10 : 9. The height of the clypeus in front of AME is equal to nearly three times the diameter of AME.

Chelicerae. Very small, conical, and lacking teeth, scopula and lateral condyles. Fangs long, sharp, and falcate.

Maxillae. Triangular, converging in front of labium. Apex pointed, membranous, and pellucid. A serrula consisting of a row of about ten teeth is situated on the antero-lateral margin.

Labium. Triangular with rounded apex. Nearly twice as wide as long.

Sternum. Convex, rounded and triangular. Longer than wide in ratio 27 : 24. Posterior end truncated. Fourth coxae well separated. Middle of sternum smooth and glabrous, the sub-marginal region with a few setae which point inwards (pl. IV, fig. 32).

Legs. 4.1.2.3. Tarsi of first pair distinctly swollen. Metatarsi much shorter than tarsi. Two trichobothria on each tibia and one near the apex of each metatarsus. Clothing of legs consists of barbed hairs, but spines, scopulae, and claw-tufts are absent. Two tarsal claws situated on an onychium are present. The onychium also carries a pair of barbed setae resembling spurious claws. The pectination of the true claws resembles that of the preceding species. The following table gives the number of teeth on each claw:—

	Prolateral Claw		Retrolateral Claw	
	Teeth on Promargin	Teeth on Retromargin	Teeth on Promargin	Teeth on Retromargin
Leg 1	9	1	7	1
Leg 2	7	1	7	1
Leg 3	6	1	1	5
Leg 4	5	0	0	5

Palpi. The form of the right palpus is shown in pl. IV, figs 33 and 34. The tibia is very short and saucer-shaped. It carries a single trichobothrium. The cymbium is large and spoon-shaped with the alveolus more or less on the retro-lateral side. The embolus is long and thread-like. It makes about three complete circular turns on the side of the genital bulb. In the single specimen examined the free end of the embolus projected beyond the cymbium and then curved back as shown in the figure. It is probable, however, that the end had become dislodged from the normal resting position. No apophysis is present on the tibia or tarsus.

Abdomen. The dorsal surface is covered by a hard shield which has a small median V-shaped notch on its front margin. On each side of the notch are several setae which are longer and more slender than those of the two preceding species. Moreover, the hairs which cover the rest of the dorsal shield are coarser than in the case of either *H. fulvus* or *H. ornatus*. There are two conspicuous muscle spots near the middle of the scute. The anterior half of the ventral surface is covered by a large epigastric scute, which extends forward and surrounds the pedicle (pl. IV, fig. 32). Behind the large scute is a transverse row of three small scutes, the middle one of which is smaller than the lateral ones. The latter are fused to the posterior angles of the large epigastric scute leaving, on each side, a narrow transverse notch, which opens towards the middle. In the two notches thus formed the openings of the two book-lungs are situated. The posterior half of the ventral surface of the abdomen is mainly covered by a large ventral scute. Situated near the antero-lateral angles of the ventral scute are two small sclerites, one on each side. Immediately in front of the spinnerets and partly hidden by the posterior margin of the large ventral scute is a small sclerite, on which is situated the tracheal spiracle. The integument between the dorsal and ventral surfaces of the abdomen forms three longitudinal folds, two of which appear to be continuous above the pedicle in front and the anal tubercle behind.

Spinnerets. Six. There is a small sclerite on each side of the spinnerets, but the group is not surrounded by a chitinous ring. Each spinneret, however, has a hard investment of chitin. The anterior pair consist of a large basal segment and a small conical apical segment. The inner surface of the basal segment is thickened and marked with stridulating ridges as in the two preceding species. The posterior spinnerets are slightly smaller than the anterior pair. They are two-segmented, the apical segment being very small and sunken in the end of the basal segment. The middle spinnerets are very small and almost hidden by the others.

Locality. Victoria. A single male specimen collected by Mr. C. Oke.

Notes on the Internal Anatomy.

The following notes refer to the main features of the internal anatomy of *H. ornatus* and *H. fulvus*. Specimens were fixed in Carnoy's Fluid and studied in serial sections stained with haematoxylin and eosin. As only one specimen of *H. setosus* was available, no attempt was made to examine its internal structure.

Abdominal Musculature. The musculature of the abdomen is much reduced. There is a pair of latero-cardiac muscles, which arise from the dorsal shield and pass obliquely downwards, one on each side of the heart, and close to the second pair of ostia. They are inserted in the posterior end of the lorum of the pedicle (pl. V. fig. 35). Some distance behind the latero-cardiac muscles is a pair of strong dorso-ventral muscles, which arise from the two conspicuous muscle spots near the middle of the dorsal shield and pass downwards to be inserted in two pairs of

median endosternites. These are close together and above the epigastric furrow. They probably represent the endosternites of the 8th and 9th body-segments (i.e., the 2nd and 3rd segments of the abdomen). Hence the dorso-ventral muscle bands, which appear single, are probably composed of the dorso-ventral muscles of the two segments. Connecting the margin of the dorsal shield with the ventral sclerites are numerous short dorso-ventral muscles which do not appear to have any segmental arrangement. In addition to the muscles mentioned, there are two pairs of dorso-ventral muscles in the pedicle and a series of longitudinal ventral muscles, as shown in pl. V, fig. 35.

Digestive System. The thoracenteron is of the classic type. It consists of four pairs of caeca extending outwards and downwards to the coxae of the four pairs of legs.

The primary branching of the chylenteron gives rise to a single midventral diverticulum, two pairs of lateral diverticula and one pair of dorsal diverticula. The midventral diverticulum and the first pair of lateral diverticula arise close together from the main tube a short distance behind the pedicle. Farther back the second pair of lateral diverticula are given off and posterior to these the dorsal diverticula arise.

Each maxilla contains a single oblong multi-cellular gland, which is about two-thirds the length of the endite. It has a large lumen which acts as a reservoir. The ducts of the gland are not clearly visible, but they appear to open on the inner margin of the maxilla near the base of the scopula. A rostral gland is also present. It is rounded without any appearance of being bilobed. It opens into a wide transverse slit-like aperture on the front of the rostrum near the apex (pl. V, fig. 38).

Excretory System. The usual pair of biramous malpighian tubules are present. They open into the gut just in front of the stercoral pouch. No trace of coxal glands in the cephalothorax could be found.

Poison Glands. These glands are endocephalic. They are fusiform in shape and situated in an almost vertical position. In *H. ornatus* they extend from immediately below the posterior median eyes into the base of the chelicerae. In *H. fulvus* the glands are similar in shape, but smaller.

Silk Glands. In the females of both *H. ornatus* and *H. fulvus* two very large pear-shaped glands are situated below the stercoral pouch (pl. V, fig. 36). They extend forward as far as the ovary. Posteriorly they open by the large spigot on the hind spinnerets.

Six cylindrical glands are also present. These are situated, three on each side, one above the other and close to the large pear-shaped glands. They extend forward nearly to the front of the ovary and their anterior ends are somewhat bent or twisted. Of the three glands on each side the uppermost one opens on the corresponding middle spinneret, the other two on the inner side of the posterior spinneret. In the males these cylindrical glands appear to be absent. The wall of the glands is very thick and stains deeply.

The anterior spinnerets are supplied with silk from a large number of small pyriform glands arranged in two groups, one on each side and close to the basal segments of the spinnerets.

Reproductive System. The appearance of the vaginal system of *H. ornatus* and *H. fulvus*, as seen in transparent preparations, is shown in pl. V, figs 39 and 40. In both species the afferent ducts leading to the spermathecae are very long. In

H. ornatus they are coiled so as to form a narrow spiral surrounded by a wider spiral. In *H. fulvus* the ducts are not coiled, but form several loops which extend laterally as far as the book-lungs. In both species the spermathecae are large and rounded. In *H. fulvus* each is connected with a spermathecal gland situated towards the front of the vaginal system.

In the males the vasa deferentia open into a large spherical vesicula seminalis situated near the genital aperture.

Circulatory System. The heart is fusiform and curved dorso-ventrally. It has two pairs of ostia (pl. V, fig. 37). The anterior pair are the larger and are situated in a dorso-lateral position at the front of the heart. The second pair are smaller and also dorso-lateral in position. The descending latero-cardiac muscles pass close to them. The interval between the first and second pair of ostia is slightly less than that between the second pair and the posterior end of the heart.

Respiratory System. The organs of respiration consist of a single pair of book-lungs and a system of tracheal tubes. The book-lungs occupy the normal position, one on each side, in front of the epigastric furrow. In *H. ornatus* each book-lung has eleven leaves and in *H. fulvus* nine. The tracheal system is confined to the abdomen and is composed of four simple tubes, which unite in a short atrium before opening on the exterior by the single median spiracle in front of the spinnerets. Two of the tubes are short and run straight forward parallel with the longitudinal ventral muscles to end near the epigastric furrow. The other two tubes pass outwards and run obliquely forwards converging on the heart. They pass through the wall of the pericardium in front of the latero-cardiac muscles and enter the pericardial cavity, where they lie, one on each side of the heart. They end near the front of the heart.

New Definition of the Family Hadrotarsidae

Dipneumone, quadrostiate spiders. Carapace without thoracic groove. Eight eyes in two rows. Posterior median eyes large, flat, and reniform. Chelicerae without teeth and lateral condyles. Poison glands endocephalic. Fang falcate. Maxillary lobes strongly converging and provided with a serrula. Sternum triangular and rounded with truncated posterior end separating the fourth coxae. Lip free, wider than long. Tarsal segments of first pair of legs swollen. Metatarsi much shorter than tarsi. Trochanters without notch. Two trichobothria on each tibia and one on each metatarsus. Legs lacking spines, scopulae and claw-tufts. Two tarsal claws situated on an onychium. The claws of the first three pairs of legs pectinate in a double row, those of the fourth pair in a single row. Dorsal surface of abdomen covered with a hard shield, ventral surface with an epigastric scute, a ventral scute and several smaller sclerites. In the males the epigastric scute surrounds the pedicle. The two pulmonary spiracles situated one on each side in the epigastric furrow. The single median tracheal spiracle immediately in front of the spinnerets leads into a short atrium which gives rise to four tracheal tubes, which are confined to the abdomen. Six spinnerets. Anterior spinnerets contiguous, two-segmented and with transverse stridulating ridges on the inner surface of the basal segment. Median spinnerets small, contiguous and composed of one segment. Posterior spinnerets two-segmented and slightly shorter than anterior pair. Integument with barbed hair. Genital bulb of male provided with a long thread-like embolus. Epigynum of female complex.

The family Hadrotarsidae as defined above includes the four species of the genus *Hadrotarsus*. The position of *Gmogala scarabaea* Keyserling must remain uncertain until the type specimen is again examined and described in greater detail. However, it has so many features in common with species belonging to the genus *Hadrotarsus* that it might be expected to have a similar respiratory system. Pocock's description of the tracheal spiracles as a 'pair of contiguous round dark spots, surrounded by a circular rim' might apply equally well to a small sclerite with a pair of round dark spots representing the small cup-like depressions from which a pair of setae had been rubbed off or removed. While Pocock corrected some of the errors made by Keyserling in the original description of *G. scarabaea*, he has left students in doubt with regard to several important features of the external anatomy.

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PLATE I.

Hadrotarsus ornatus, sp. n.

FIG. 1.—Dorsal view of male. Legs of left side omitted.
FIG. 2.—Eyes of male viewed from above.
FIG. 3.—Right chelicera of male viewed from the front.
FIG. 4.—Maxillae and labium of male.
FIG. 5.—Leg of first pair showing swollen tarus and the position of the trichobothria on the tibia and metatarsus.
FIG. 6.—Leg of second pair showing position of the trichobothria.
FIG. 7.—Ventral view of tarsal claws of first leg of male.
FIG. 8.—Ventral view of tarsal claws of third leg of male.
FIG. 9.—Ventral view of tarsal claws of fourth leg of male.
FIG. 10.—Left palpus of male showing genital bulb and the coiled embolus.
FIG. 11.—Terminal apophysis of genital bulb.
FIG. 12.—End of embolus showing barb near the tip.

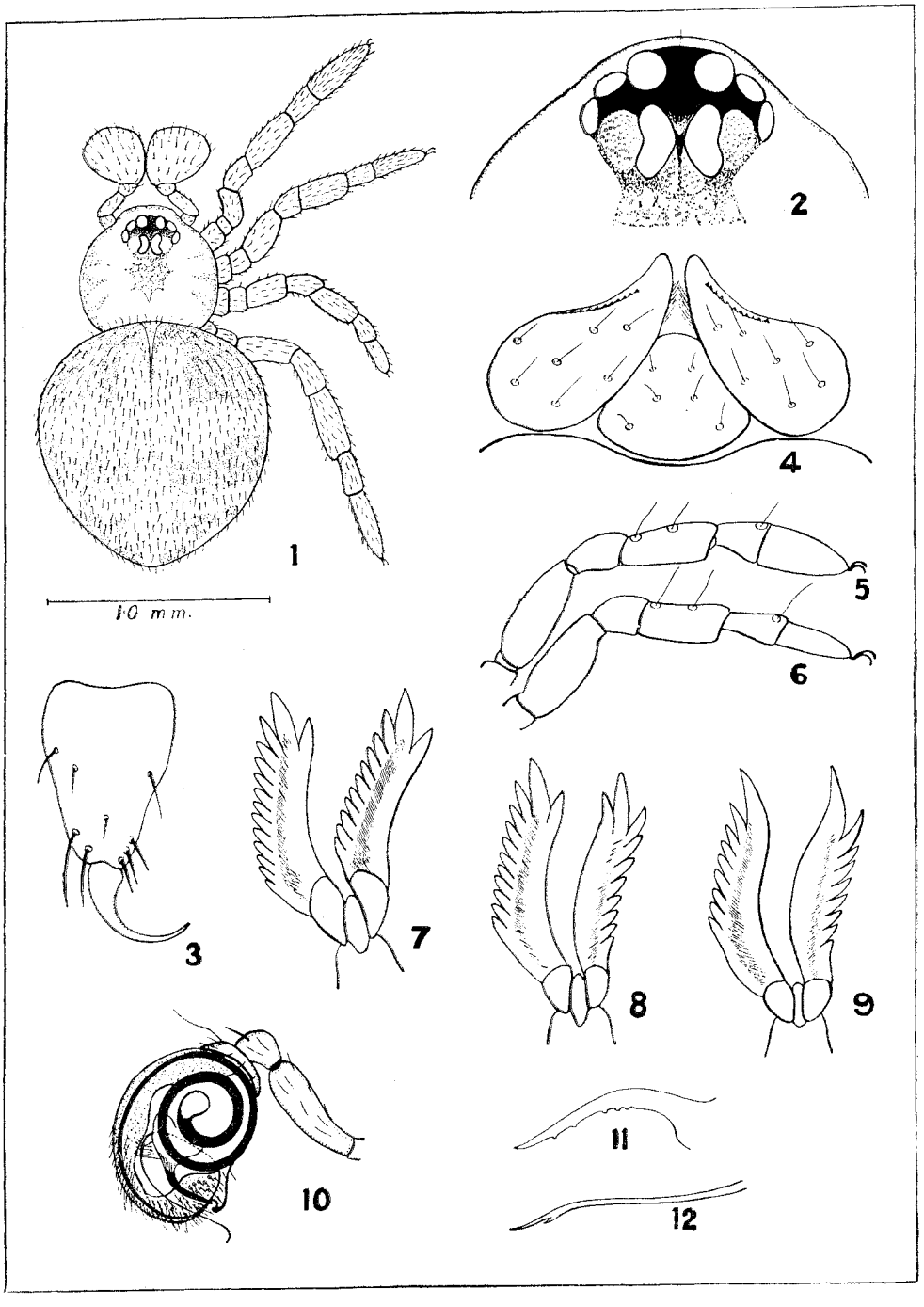
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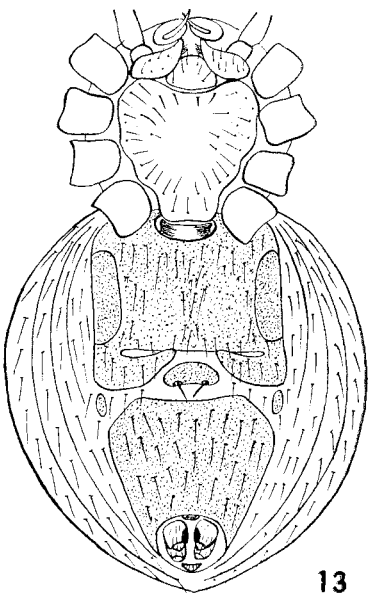
PLATE II.

Hadrotarsus ornatus, sp. n.

FIG. 13.—Ventral view of sternum and abdomen of male.
FIG. 14.—Anterior spinnerets of male showing the tranverse ridges probably used in stridulating.
FIG. 15.—A posterior spinneret of male showing the large spigot.
FIG. 16.—A middle spinneret of male.
FIG. 17.—Ventral view of tarsal claw of left palpus of female. *p.t.*, promarginal teeth; *r.t.*, retromarginal tooth.
FIG. 18.—Ventral view of sternum and abdomen of female.
FIG. 19.—Epigynum in surface view.



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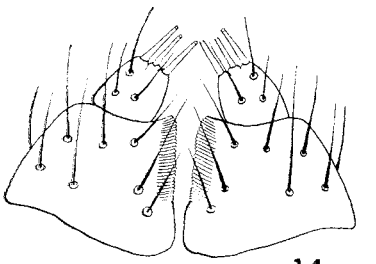

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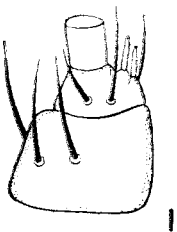

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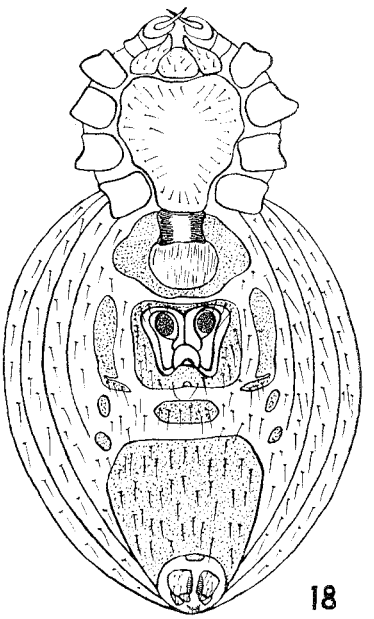

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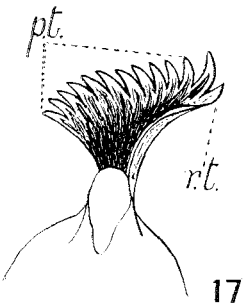

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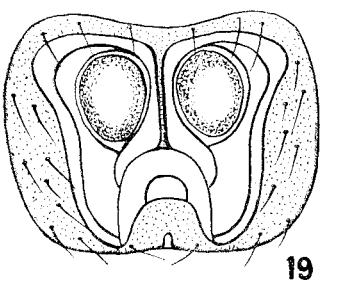

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PLATE III.

Hadrotarsus fulvus, sp. n.

FIG. 20.—Dorsal view of male. Legs of left side omitted.
FIG. 21.—Retrolateral view of right palpus of male.
FIG. 22.—Prolateral view of right palpus of male.
FIG. 23.—Right chelicera of male viewed from the front.
FIG. 24.—Ventral view of sternum and abdomen of male. *p.s.*, position of pulmonary spiracle; *t.s.*, tracheal spiracle.
FIG. 25.—Ventral view of tarsal claw of right palpus of female.
FIG. 26.—Ventral view of sternum and abdomen of female.
FIG. 27.—Anterior spinnerets of female showing the transverse stridulating ridges. *t.s.*, tracheal spiracle on small sclerite in front of spinnerets.
FIG. 28.—Epigynum in surface view.

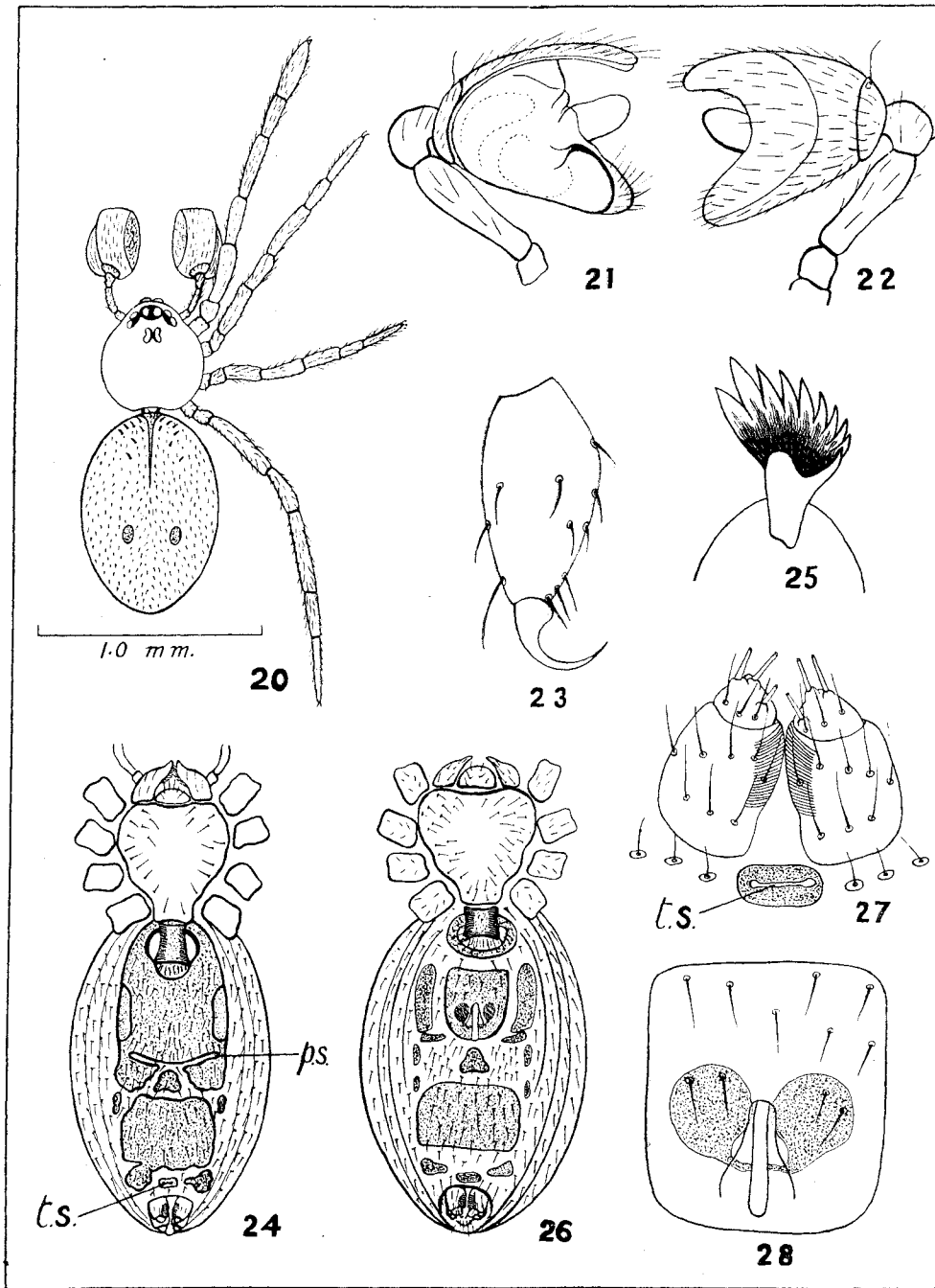
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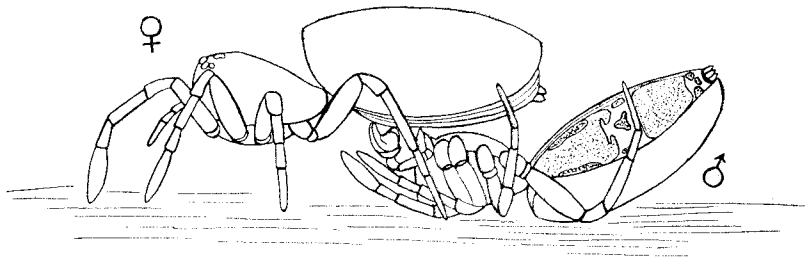
PLATE IV.

Hadrotarsus fulvus, sp. n.

FIG. 29.—Lateral view of male and female in copulation.

Hadrotarsus setosus, sp. n.

FIG. 30.—Dorsal view of male. Legs and palpi omitted.
FIG. 31.—Eyes of male viewed from above.
FIG. 32.—Ventral view of sternum and abdomen of male.
FIG. 33.—Retrolateral view of right palpus of male showing coiled embolus.
FIG. 34.—Prolateral view of right palpus of male.



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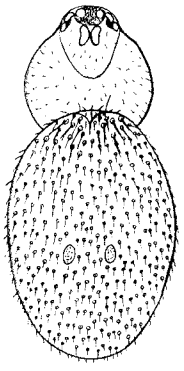

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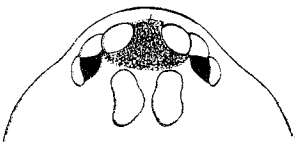

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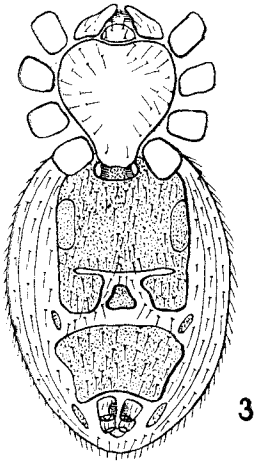

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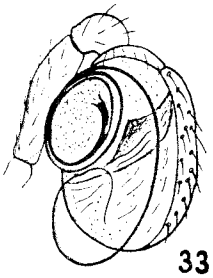

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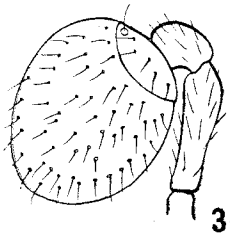

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PLATE V.

Hadrotarsus ornatus sp. n.

FIG. 35.—Muscles of abdomen. *d.v.* VIII and IX, dorso-ventral muscles of body segments VIII and IX; *lc.*, latero-cardiac muscle; *ml.* VIII, IX, and X, median longitudinal muscles of body segments VIII, IX, and X; *s.p.*, stercoral pouch.

FIG. 36.—Transverse section of abdomen of female passing through the front of the stercoral pouch. *c.g.*, cylindrical silk-glands; *d.d.* dorsal diverticula of gut; *l.t.*, lateral tracheal tube; *s.g.*, large pear-shaped silk gland; *v.d.*, midventral diverticulum of gut; *v.t.*, ventral tracheal tubes.

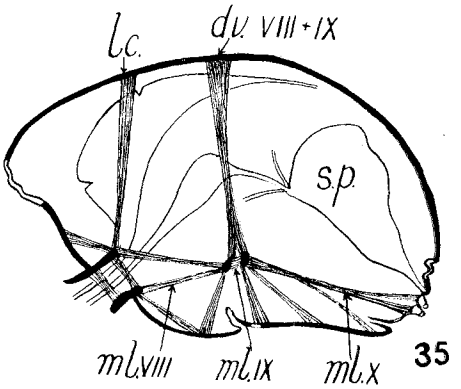
FIG. 37.—Dorsal view of heart showing the position of the four ostia. *lc.*, latero-cardiac muscle.

FIG. 38.—Frontal section through rostrum showing the rostral gland. *ap.*, slit-like aperture of gland.

FIG. 39.—Epigynum as seen in transparent preparations.

Hadrotarsus fulvus, sp. n.

FIG. 40.—Epigynum as seen in transparent preparations.



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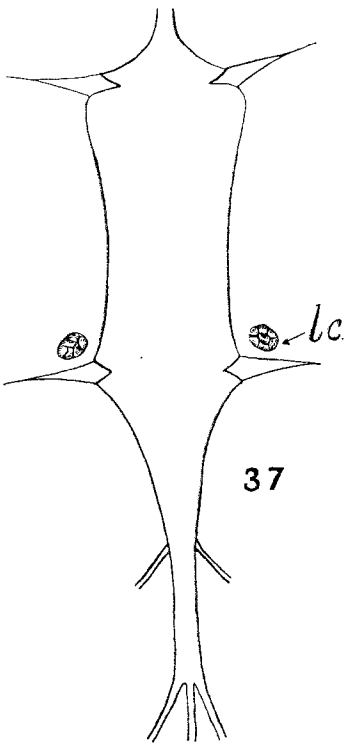

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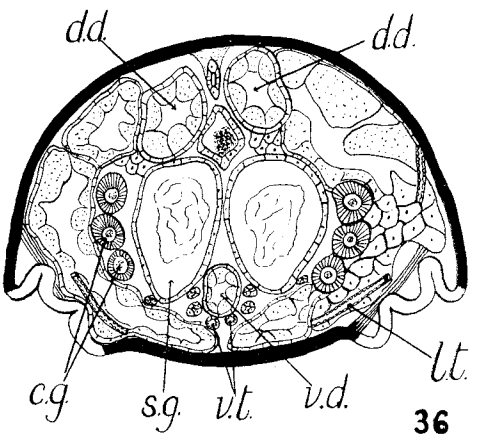

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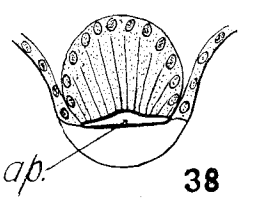

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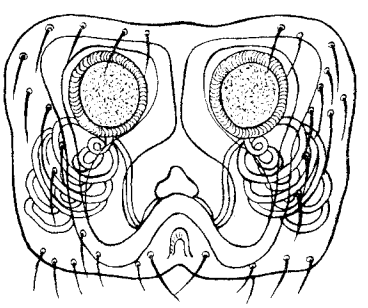

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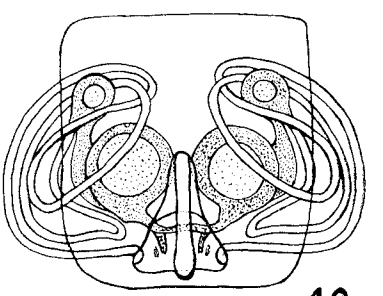

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