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Systematics of the Mygalomorph Spider Genus *Masteria* (Masteriinae : Dipluridae : Arachnida)

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Abstract

Masteria is regarded as the senior subjective synonym of *Accola* and *Antrochares,* and is recognized as a subfamily in the Dipluridae. Further figures of *Masteria hirsuta, Accola lucifuga* and *Antrochares macgregori* are provided. *Masteria toddae,* sp. nov., from northern Australia is described. A phylogeny of males of *Masteria* species is shown to require a further character to eliminate ambiguity. *Masteria* is regarded as the sister-group of the Macrotheline tribe Evagrini, consisting of *Evagrus, Allothele, Cethegus* and *Phyxioschaema.* The occurrence of the paraembolic apophysis or its proposed homologue, the conductor, in mygalomorphs suggests that it has undergone parallel derivation.

Introduction

Masteria is a six-eyed diplurid spider that, until now, was known only from the type, *Masteria hirsuta* Koch, 1873, from Ovalau, 17° 40′S, 178° 48′E.–a small island in the Fijian group. A sister genus, *Accola* Simon, 1889, that differs from *Masteria* in the shape of the eye group, was described from Venezuela. Later authors have placed further diplurid species with the anterior lateral eyes reduced or absent into *Accola.* A further genus, *Antrochares* Rainbow, 1898, was described from New Guinea. Simon (1903) placed *Antrochares* into the Ctenizidae. As Rainbow had not placed *Antrochares* into a family, his brief description of the single specimen has led later authors into following Simon (1903). The holotype is in poor condition; and, as the posterior lateral spinnerets are not entire, Rainbow's description of them as 'short' explains the errors of later authors. These three genera, *Masteria, Accola* and *Antrochares,* have six, or sometimes eight, eyes and long posterior lateral spinnerets, and are among the smallest mygalomorphs. They are collected from leaf litter by sieving, hand sorting, or by the use of tullgren funnels or pit-traps; other than this their habits are unknown.

Recent collections by the Queensland Museum throughout the coastal vine forests of north Queensland, yielded numerous specimens of a new *Masteria* species. Due to the small size of the spiders, their appendages required examination with a scanning electron microscope. This revealed the wider utility of ultrastructure characters that had been used by Platnick (1977) in higher systematics. The related genera, *Accola* and *Antrochares,* were then examined for these additional characters, to determine their relationship to *Masteria.* A full revision of the genus *Masteria* is not attempted here, as males of all species are not yet known.

Materials and Methods

All line drawings were done by the author using a camera lucida. Abbreviations are those used conventionally in araneid literature, and may be found recently in Raven (1978). The paraembolic apophysis (Fig. 25) is the process arising adjacent to the embolic origin.

Family **DIPLURIDAE**
Subfamily **MASTERIINAE**

Genus **Masteria** Koch

Masteria Koch, 1873, p. 458.
Accola Simon, 1889, p. 191; Simon, 1891, p. 552; Simon, 1892*b*, p. 35; Kulczynski, 1908, p. 459; Petrunkevitch, 1925, p. 92; Petrunkevitch, 1929, p. 13; Mello-Leitao, 1939, p. 43; Chickering, 1945, pp. 159–67; Chickering, 1964, pp. 175–7. New synonymy.
Antrochares Rainbow, 1898, p. 332. New synonymy.

Diagnosis

Small mygalomorph spiders with AME reduced or absent or all eyes lacking. Ocular area wider than long. Carapace with long, widely spaced hairs; caput low; fovea short, transverse. Chelicerae porrect; 1 row of promarginal teeth on furrow; rastellum absent. Labium wider than long, lacking cuspules. Maxillae entally bulbous; lacking cuspules; serrula consisting of a straight row of numerous long 'teeth'. Sternum cordate, apparently without sigilla; separated from labium by a groove. Legs with few spines on anterior legs; no tarsal spines. 3 claws; superior claws with a single row of long teeth, inferior claw well developed with long teeth. 1 row of trichobothria on tarsi and metatarsi; 2 rows on tibiae. Trichobothrial bases entirely and deeply corrugiform. Males with a distal spur on tibia I composed of 2 or 3 prolateral processes; palpal tarsus with apical spines. Palpal bulb with or without a paraembolic apophysis. Internal genitalia of females with a single atrium which has a pair of lobes on each side.

Type-species: ♀, *Masteria hirsuta* Koch, 1873. Zoologischen Staatsinstituts und zoologischen Museums Hamburg.

Type-locality: Ovalau, Fiji; 17°40′S., 178°48′E.

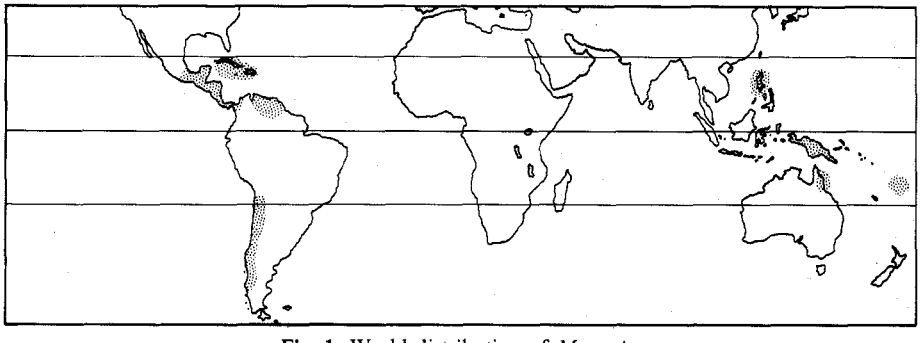


Fig. 1. World distribution of *Masteria.*

Distribution (Figs 1, 2)

Masteria Koch, 1873 occurs in the Philippines, New Guinea, northern Australia, Fiji, Venezuela, Panama and Chile. The habits of *Masteria* are probably similar to those described for the litter-dwelling mecicobothriid genus, *Microhexura,* by Chamberlain and Ivie (1945).

Evolution in Masteria

The use of female characters is believed to confuse data provided by males; therefore they are not involved in this phylogeny. As males of only four of the total 11 species of *Masteria* are known, phylogenetic speculation must be based upon these four species: *M. spinosa* Petrunkevitch, 1925, *M. lewisi* Chickering, 1964, *M. petrunkevitchi* Chickering, 1964, and *M. toddae,* sp. nov.

Three characters of males allow a preliminary cladistic analysis. These are the number of eyes; the number of processes on the first tibia; and the development of the paraembolic apophysis.

In *Masteria* the anterior eyes may be very small or absent. As the presence of anterior median eyes is almost universal in the Mygalomorphae, their absence is considered apomorph.

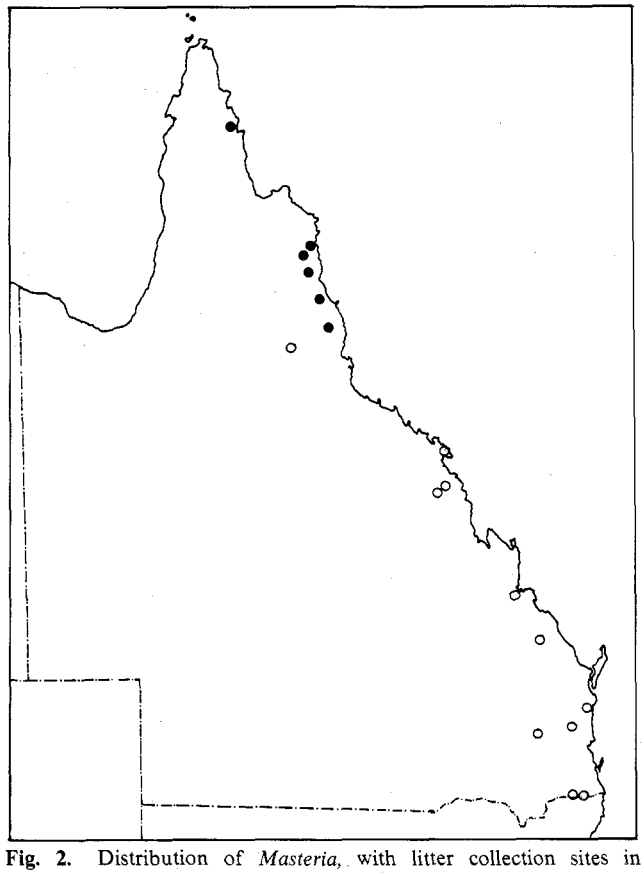
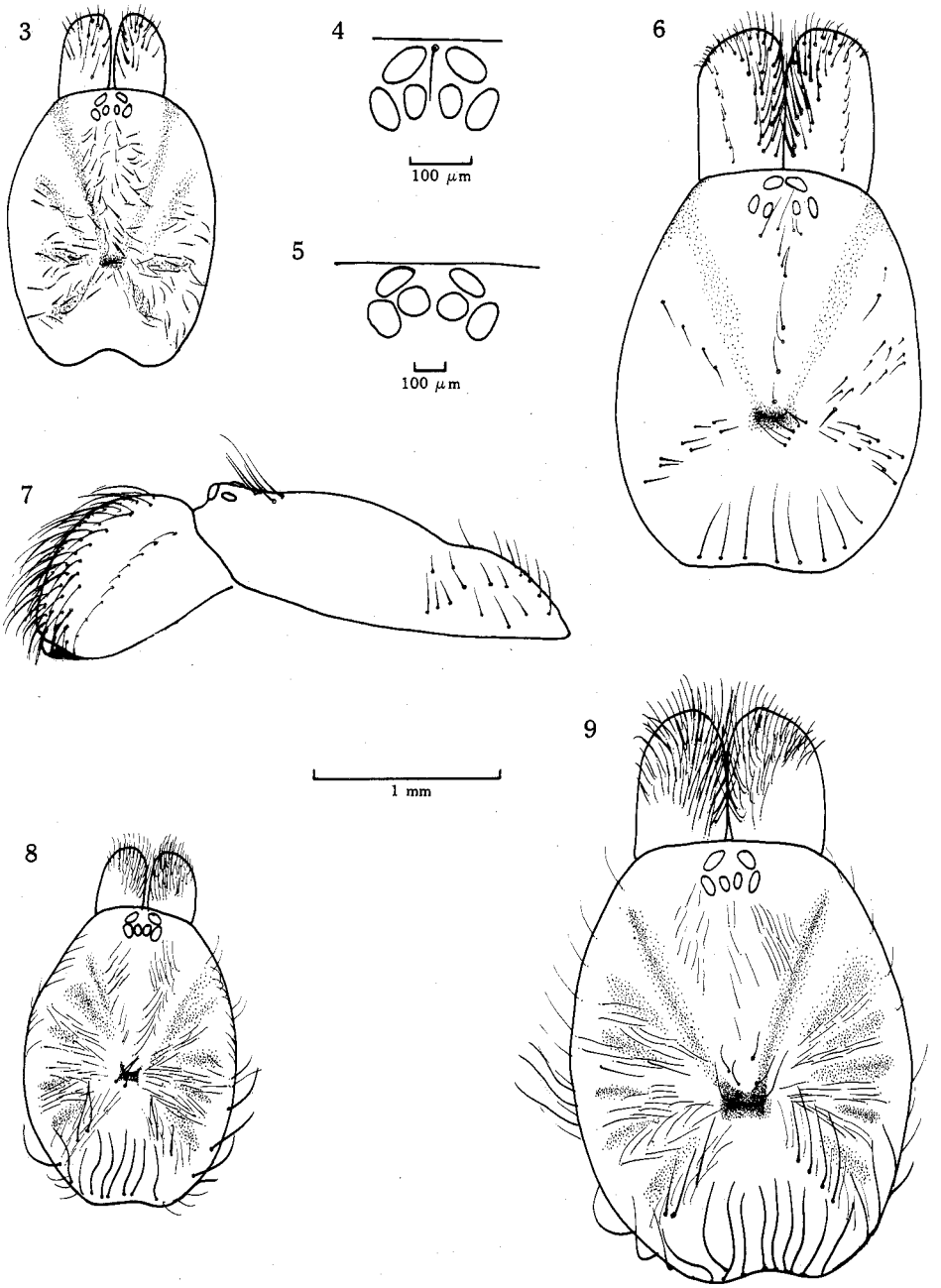


Fig. 2. Distribution of *Masteria,* with litter collection sites in Queensland. ● Present. ○ Absent.

There may be either two or three tibial processes on the first leg. Three processes are regarded as apomorph.

The paraembolic apophysis (Figs 25, 27) may be well developed, a small process, or absent. The paraembolic apophysis is regarded by Raven (1978) as a precursor of the conductor; and, as its presence as a well developed apophysis is limited to few genera, it is regarded as apomorph. However, as the polarity of this character stands upon such slender ground, the alternative polarity was also tested.



Figs 3-9. *Masteria,* carapace and eyes: *3, 4, M. lucifuga,* syntype; *5, 6, 7, M. hirsuta,* holotype female; *M. macgregori,* holotype female; *8, 9, M. toddae: 8,* holotype male; *9,* paratype female.

If the character polarities outlined above are correct, there are only two parsimonious cladograms. The cladograms are:

{[*(M. toddae, M. lewisi) M. spinosa*] *M. petrunkevitchi*} = Type I;

{[*(M. toddae, M. spinosa) M. lewisi*] *M. petrunkevitchi*} = Type II.

The type I cladogram suffers in that it requires the parallel evolution of the paraembolic apophysis in *M. toddae* and *M. spinosa.* Similarly, the type II cladogram implies that the development of six eyes in *M. toddae* and *M. lewisi* was parallel. Alternative cladograms, based upon different character polarities, have two parallelisms or have ambiguous groups. Thus a fourth character is necessary to decide which of the cladograms is correct.

Masteria hirsuta Koch

(Fig. 5)

Masteria hirsuta Koch, 1873, p. 458.

*Female**

The cephalothorax quite low, almost flat, shorter than patella plus tibia of leg IV, about 0·5 mm longer than wide, caput only slightly arched, laterally rounded, moderately narrowed in front and more than $\frac{1}{2}$ as wide in front than in the middle, somewhat glossy, covered with long, separated hairs. The caput set apart by lateral grooves on the thorax, with crescent-shaped impressions posteriorly on the caput; on both sides of thorax, 3 radiating grooves proceeding from the small round fovea which is situated a little behind the middle of the cephalothorax.

Six eyes on a small protuberance, slightly wider behind; front eyes looking sideways and, from front, elliptical oblique, diverging towards the back, positioned opposite each other; equidistant from each other and PLE. ALE their longest diameter from clypeus. The back row somewhat wider; the PLE as large as ALE, elliptical and arched, and obliquely positioned to be divergent in front. The PME low, subrotund, almost angular; they are equidistant from each other and PLE, from which they are narrowly separated.

The chelicerae are anteriorly strongly arched and long—as long as anterior patellae; they are laterally compressed and covered abundantly with long bristles, somewhat glossy; no rastellum. The fangs very long; the retromargin of furrow with long scopula.

The maxillae of characteristic form, short, only slightly longer than wide, arched, their front surface deeply hollowed out; the palps articulate here. The labium very strongly arched, separated from the sternum by a deep semicircular groove; not as long as broad basally.

The sternum heart-shaped, arched, somewhat glossy, covered lightly with separated hairs. The abdomen dull; in front gradually swelling from the base towards the back to its full width, rounded at the back with long widely spaced hairs.

The spinnerets long; 2 pairs; the inner pair as long as the first article of the outer pair, although narrower; the outer pair as long as the abdomen, 3-articled, covered by long hairs; the femoral limb bent towards the outside, laterally compressible, distally thickened; the tibial and tarsal part are the same length.

* The description is paraphrased extracts from the original German.

The legs thin with long hairs, without scopula. Three tarsal claws. Cephalothorax length 2·75 mm; abdomen length 3 mm; PLS 2·75 mm; palp 4·75 mm, leg I 8·0 mm; leg II 7·00 mm; leg III 6·00 mm; leg IV 9·00 mm. From Ovalau; an example in the Godeffroy Museum.

Material Examined

Only the holotype female, in which legs were not sufficiently entire to allow description of spination.

Remarks

The number and position of trichobothria, and teeth on the tarsal claws, are similar to those in *M. toddae*, sp. nov., and although *M. hirsuta* is not redescribed in full here it is similar in most respects to females of *M. toddae*.

M. hirsuta is distinguished from other *Masteria* species by the joint possession of six eyes, with the large PME forming a strongly recurved back row, and in the small separation of the anterior laterals, which present a very compact but wide eye group overall.

Accola lucifuga Simon

(Figs 3, 4, 10, 14)

Accola lucifuga Simon, 1889, p. 191.

Supplementary Notes

Based on six female and two juvenile syntypes.

Carapace. With numerous long erect bristles along strial edges, behind eyes, and arising from foveal region. 1 bristle between ALE. Fovea a short shallow pit. Cuticular surface with minute shallow depressions uniformly spaced. Caput barely elevated.

Chelicerae. Promargin of furrow with 9 teeth; intermediate basal row with 5–10 small teeth.

Labium (Fig. 10). Wider than long.

Maxillae. Truncate pyriform.

Spines. Femoral and tarsal spines absent; no spines on pedipalp or first leg. *Second leg*: tibia, p. 1; metatarsus, v. 2. *Third leg*: patella, p. 1. r. 1; tibia, p. 1. r. 2. v. 4.; metatarsus, p. 2. r. 1. v. 6. Superior tarsal claws each with about 9 long teeth; inferior tarsal claw with 4–5 teeth; palpal claw with about 17 teeth.

Trichobothria: 4–5 in a single straight row on metatarsi and tarsi; 2 rows on tibia.

Material Examined

6 ♀, 2 juv. syntypes, Tovar, Venezuela. Museum National d'Histoire Naturelle, Paris.

Remarks

Simon (1889, 1892*a*) used the difference in the shapes of the fovea and labium to distinguish *Masteria* and *Accola*. From the above descriptions and figures of the types it may be seen that Simon's characters are too indefinite, or exaggerated

through misinterpretation, to warrant the further retention of two genera. *M. lucifuga* differs from *M. hirsuta* in the longer eye group.

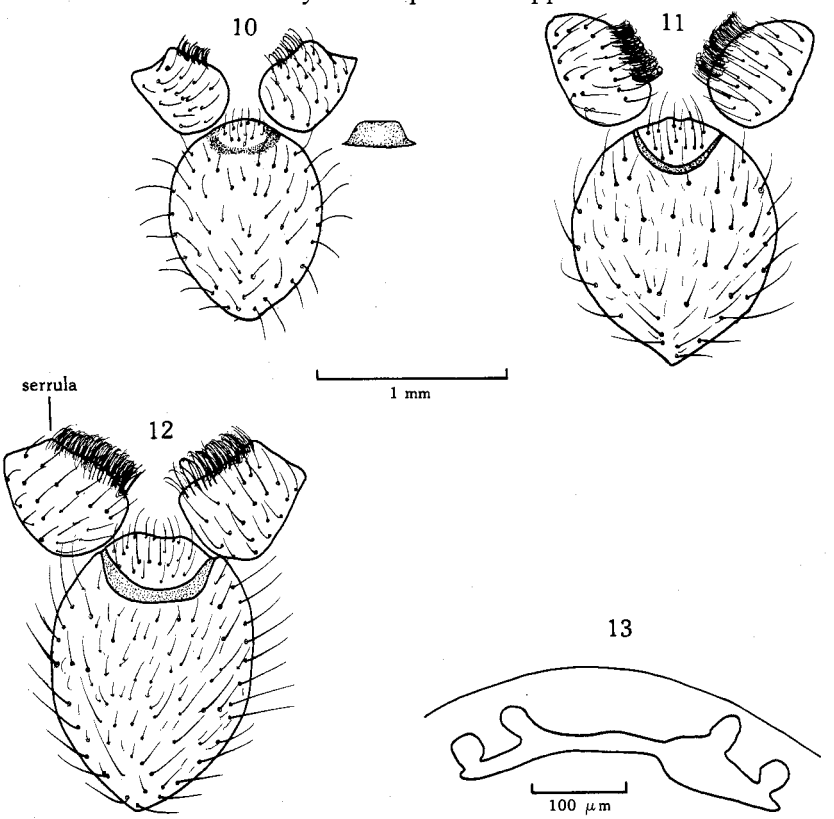
Masteria macgregori (Rainbow)

(Figs 6, 7, 11, 15)

Antrochares macgregori Rainbow 1898, p. 332. Comb. nov.

Remarks

The holotype consists of cephalothorax, ruptured abdomen, and several broken leg segments. The cephalothorax and legs are cleared, and eyes are discernible only with considerable difficulty. The specimen appears to be a mature female



Figs 10–12. *Masteria,* sternum, maxilla and labium: *10, M. lucifuga,* syntype female, with labium viewed parallel to surface; *11, M. macgregori,* holotype female; *12, M. toddae,* paratype female.
Fig. 13. *M. toddae,* internal genitalia, paratype female.

as it has a produced epigastic plate. The posterior median spinnerets are both represented only by scars, and the apical and subapical segment of the posterior lateral spinerets are also absent. The apparently short spinnerets must have misled Simon (1903) into placing *Antrochares* into his Ctenizinae.

Masteria macgregori is probably the senior subjective synonym of *Masteria pallida* (Kulczynski, 1908) although the condition of the former type will not facilitate this decision.

Material Examined

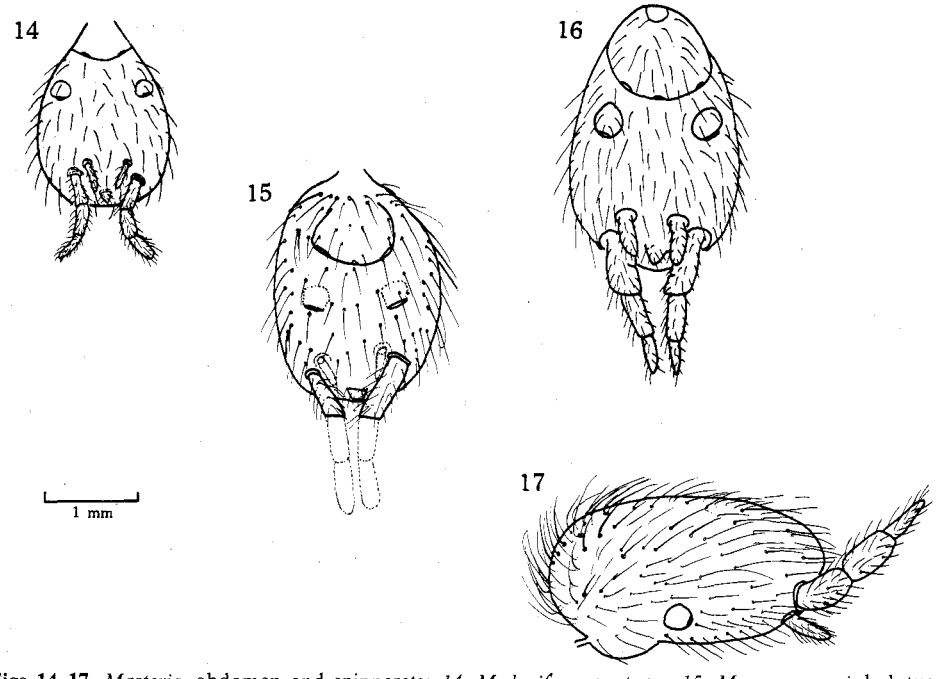
♀, holotype, Neneba, New Guinea, QM.

Masteria toddae, sp. nov.

(Figs 2, 8, 9, 12, 13, 16, 17, 18–29)

Types

Holotype, ♂, allotype, ♀, 5 ♂ paratypes, Home Rule, NE. Queensland, 15° 44′S., 145° 18′E., pitfall trap, 28.x–18.xi.1974, V. E. Davies, R. Monroe, QMS 198, 199. Other paratypes: NE. Queensland: 1 ♂, Shipton's Flat, 15° 48′S., 145° 15′E., 16–21.xi.1975, V. E. Davies, R. Monroe, QM S200; 1 ♂, 1 ♀, 4 juv., 12-Mile Scrub, 15° 53′S., 145° 19′E., under bark, 22–28.xi.1975, V. E. Davies, R. Monroe, QM S201; 1 ♀, 1 juv., Spear Creek, near Mt Molloy, 16° 42′S., 145° 24′E., 3–10.xi.1975, V. E. Davies, R. Raven, QM S202; 1 ♀, 2 juv., Mt Finlay, 15° 53′S., 145° 19′E., 29.xi–5.xii.1975, V. E. Davies, R. Monroe, QM S203; 4 juv.,



Figs 14–17. *Masteria,* abdomen and spinnerets: *14, M. lucifuga,* syntype; *15, M. macgregori,* holotype female; *16, 17, M. toddae,* paratype female.

Gordon Creek, Iron Range, 12° 43′S., 145° 19′E., 28.vi.1976, V. E. Davies, R. Raven, QM S204; 2 ♂, 1 ♀, Majors Mt, S. of Ravenshoe, 17° 38′S., 145° 32′E., pitfall trap, 14–20.iv.78, V. E. Davies, R. Raven, QM S206.

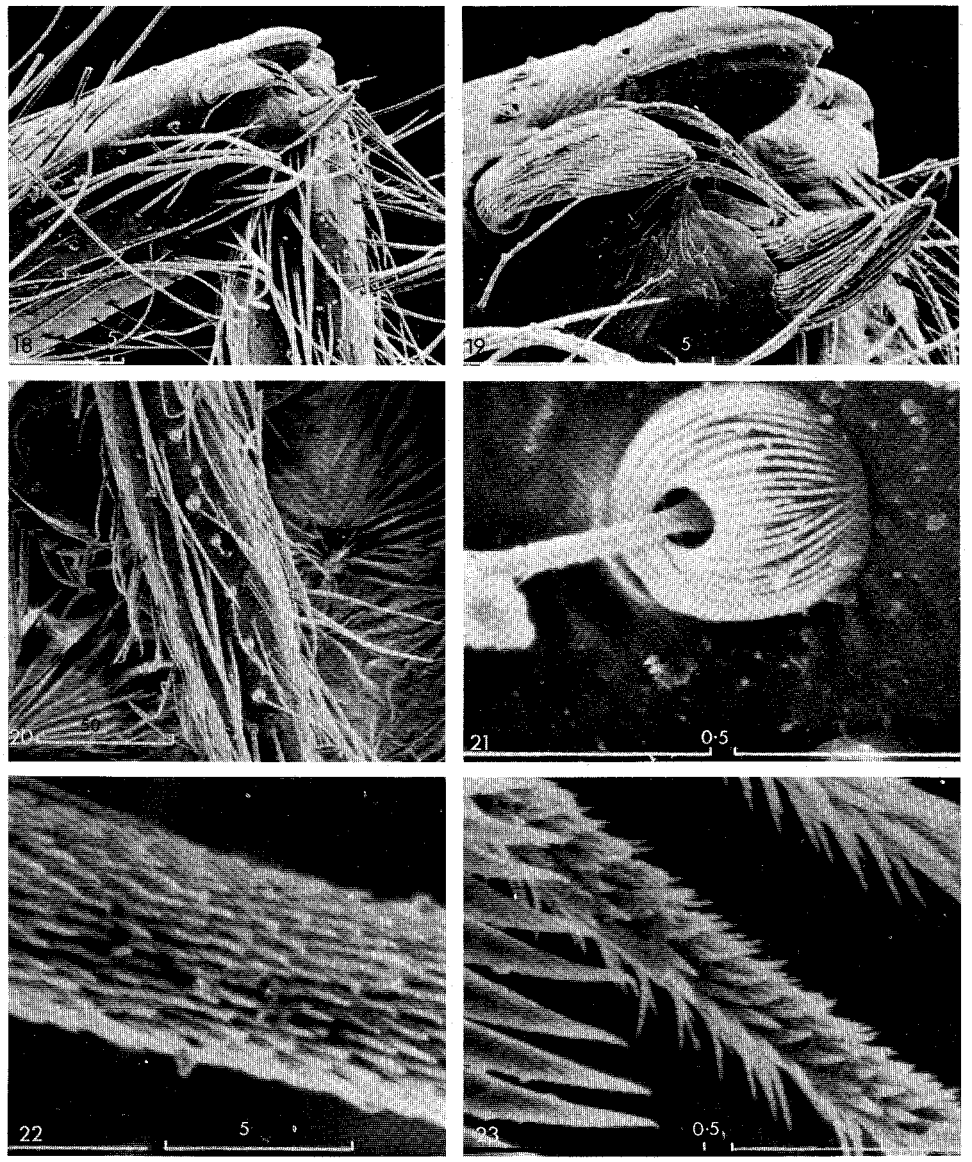
Measurements (millimetres; range, mean ± SE)

Carapace length of 8 males: 1·30–2·20, mean 1·62 ± 0·10. *Spines*: Tibia III, 5–7, mean 6·00 ± 0·13; metatarsus III, 4–8, mean 6·00 ± 0·26; tibia IV, 6–7, mean 6·31 ± 0·13; metatarsus IV, 6–9, mean 6·85 ± 0·27.

Carapace length of 4 females, 1·40–2·26, mean 1·97 ± 0·20 mm. *Spines*: Tibia III, 4–6, mean 5·29 ± 0·04; metatarsus III, 5–7, mean 5·83 ± 0·31; tibia IV, 6–7, mean 6·13 ± 0·12; metatarsus IV, 6–8, mean 7·00 ± 0·33.

Holotype Male (QM S198)

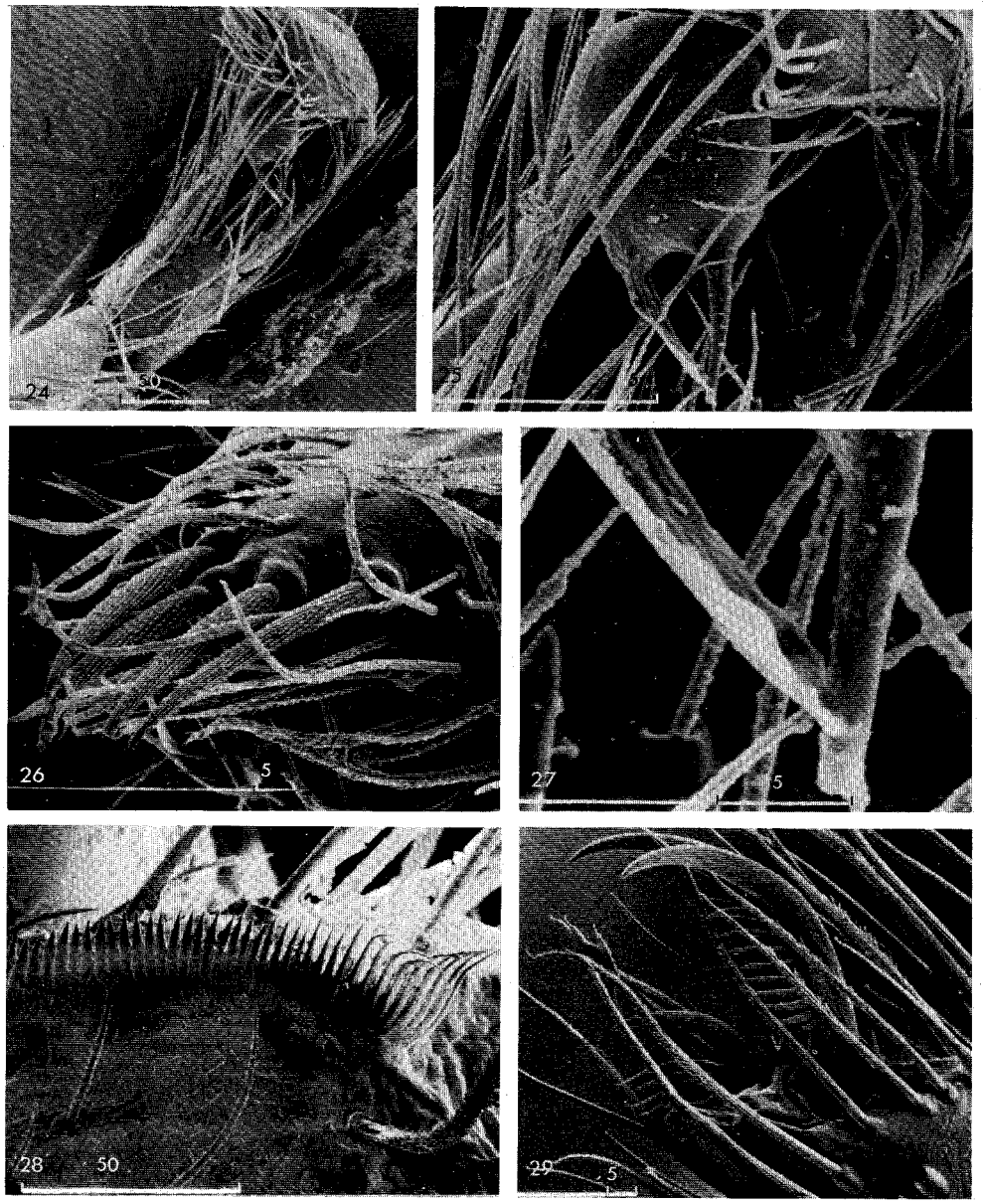
Carapace length 1·56, width 1·08 mm. Abdomen length 0·92, width 0·68 mm.



Figs 18-23. *Masteria toddae,* scanning electron micrographs: *18, 19,* tibia and metatarsus I, male; *20,* dorsal tarsus I, showing trichobothria; *21,* tarsal trichobothrial base; *22,* tibial spine; *23,* maxillary setae. Numerals on scale lines are arbitrary: 50 ≡ 125 μm; 5 ≡ 12·5 μm; 0·5 ≡ 1·25 μm.

Colour in alcohol. Carapace, chelicerae and abdomen pale yellow-brown with no pattern.

Carapace. Ovate, anteriorly and posteriorly truncate. Fovea a square pit. Carapace highest slightly anterior to fovea; sloping equally on all sides. Striae



Figs 24-29. *Masteria toddae*: *24,* male palp; *25,* palpal bulb, showing paraembolic apophysis; *26,* spines on apical palpal tarsus, male; *27,* terminal portion of embolus and paraembolic apophysis; *28,* maxillary serrula; *29,* tarsal claws. Numerals on scale lines are arbitrary: 50 ≡ 125 μm; 5 ≡ 12·5 μm.

differentiable as long glabrous depressions. Interstrial ridges with *c.* 10–30 centrally directed prostrate bristles. Posterior half of carapace margins with a single row of long erect bristles. 7–9 pairs of erect bristles arising from and anterior to fovea. 1 bristle between the ALE.

Eyes. 6 oval eyes on a low tubercle occupying 0·39 times the width of the head; ocular area length : width ratio 11 : 45. Ratio of longest diameters of ALE : PME : PLE, 9 : 5 : 7. PME oval. Centres of posterior row form a slightly recurved line.

Chelicerae. Small, slightly geniculate and clothed with numerous long bristles dorsally. Fang long and slender; 8 teeth on promargin of cheliceral furrow.

Labium. With a small broad ridge anteromedially; laterally rounded, lacking cuspules; wider than long in the ratio 25 : 15, and separated from the sternum by a broad groove.

Table 1. Leg measurements of *Masteria toddae*
Values are for holotype male, with paratype female in parentheses

	Leg I	Leg II	Leg III	Leg IV	Palp
Femur	1·30 (1·70)	1·00 (1·54)	1·00 (1·48)	1·30 (2·00)	0·80 (1·20)
Patella	0·76 (1·10)	0·60 (0·94)	0·52 (0·84)	0·64 (1·04)	0·44 (0·66)
Tibia	1·04 (1·40)	0·66 (1·00)	0·64 (1·00)	1·00 (1·54)	0·60 (0·90)
Metatarsus	0·74 (1·04)	0·64 (1·00)	0·78 (1·12)	1·06 (1·52)	– –
Tarsus	0·64 (0·76)	0·56 (0·72)	0·58 (0·64)	0·64 (0·70)	0·24 (0·82)
Total	4·48 (5·98)	3·46 (5·20)	3·52 (5·08)	4·64 (6·78)	2·08 (3·58)

Maxillae. Small, proximally bulbous with a pale prolateral, glabrous, pear-shaped region on the inner edge. Longer than proximal width in the ratio 30 : 24; distoventrally with an acute edge. Serrula consisting of *c.* 40 long spinules 35–60 μm long (Fig. 28). Maxillary hairs densely spiked with long thin thorns (Fig. 23).

Sternum. Shield-shaped; without sigilla (?); anteriorly concave; length : width 65 : 60.

Legs (Table 1). 4.1.3.2. Tibia I with prominent distolateral coupling system consisting of 3 large spurs: dorsal spur simply a broadly pointed extension of the tibia; lower spurs arise as separate processes with a fibrous appearance. Cuticle surface smooth.

Palp (Figs 24–27). Tibia subcylindrical. Tarsus apically armed with 4–5 spines (Fig. 26). Bulb (Fig. 25) barrel-shaped; embolus straight, tapering; paraembolic apophysis (Fig. 19) as long as embolus; proximally broad, tapering to a distal groove, partly supporting the embolus (Fig. 27).

Spines. Tarsal and femoral spines absent; spines absent on most segments of legs I and II. *First leg*: metatarsus, v.1. *Second leg*: tibia, p. 1; metatarsus, v. 3. *Third leg*: patella, p.1. r.1; tibia, p. 2. d. 2. r. 2. v. 4; metatarsus, p. 1. d. 1. r. 1. v. 7. *Fourth leg*: patella, p. 1. r. 1; tibia, p. 2. d. 2. r. 2. v. 6; metatarsus, p. 2. d. 1. r. 3. v. 7. Spines with numerous fine thorns. Superior tarsal claws with 8–9 teeth in a single row, inferior claw with 5 long teeth (Fig. 29).

Trichobothria. Tibiae with 2 rows of trichobothria, each of 6, proximodorsally. Each metatarsus with 2 distodorsally. Each tarsus (excluding palp) with 4

trichobothria in a single straight row on the proximal one-third of the tarsus. Bases deeply corrugiform (Fig. 21).

Spinnerets. Posterior median spinnerets 0·20 mm long; basal, median, apical and total segments of posterior lateral spinnerets 0·44, 0·40, 0·44, 1·28 mm long respectively.

Allotype Female (QM S199)

Carapace length 2·26, width 1·84 mm. Abdomen length 2·80 mm; width 1·70 mm.

Colour and Carapace. As in holotype.

Eyes. Occupying 0·30 times the width of the head. Ocular area length : width ratio 15:21. Ratio of ALE : PME : PLE 10 : 5 : 7. Centres of posterior row recurved.

Labium, Maxillae and Sternum. As in holotype.

Legs and Spines. 4.1.2.3. First leg and palp lack spines. *Second leg*: tibia, p.1; metatarsus, p. 1. v. 1. *Third leg*: patella, p. 1. r. 1; tibia, p. 2. d. 2. r. 2. v. 2; metatarsus, p. 3. d. 1. r. 1. v. 5. *Fourth leg*: patella, p. 1. r. 1; tibia p. 2. d. 2. r. 2. v. 3; metatarsus, p. 4. d. 1. r. 1. v. 7. Superior tarsal claws with 8 teeth, inferior tarsal claw with 4–5 teeth.

Spinnerets. Posterior median spinnerets 0·50 mm long with several distal spigots. Posterior lateral spinnerets with numerous ventral spigots and a faint retrolateral subsegmentation of the basal segment; basal, median, apical and total segments of posterior lateral spinnerets 0·62, 0·50, 0·54, 1·66 mm long respectively.

Internal genitalia. Within a prominent projecting plate. Consisting of 4 lobes (2 on each side) all interconnected by a single transverse atrium.

Etymology

This species is named after Dr V. E. Todd Davies, through whose intensive collecting these and many other species were collected, while she was in receipt of an Australian Biological Survey research grant.

Remarks

Masteria toddae differs from *M. hirsuta* in the less compact eye group with smaller posterior median eyes forming a straight to slightly recurved posterior row.

Males of *M. toddae* and *M. spinosa* (Petrunkevitch, 1925) show remarkable similarity of the palp and first tibial processes, although *M. spinosa* was shown by Chickering (1945) to have eight eyes with a minute pair of anterior median eyes.

Discussion

As *Masteria* has three claws, long posterior lateral spinnerets, a maxillary serrula, and one row of teeth on the tarsal claws, its sister-group must lie within the taxa Macrothelinae, Hexathelinae and Mecicobothriidae. In possessing cuspules on the mouthparts, the Hexathelinae and the macrothelinid genera *Atrax, Ischnothele, Macrothele, Porrhothele* and *Evagrella* are excluded from this possibility. Furthermore, unlike *Masteria, Mediothele* Raven & Platnick and the mecicobothriids have collariform trichobothrial bases. Thus the possible sister-group of *Masteria* is reduced to the macrothelinid genera which resemble *Evagrus, Cethegus, Allothele*

and *Phyxioschaema.* These genera, here regarded as the tribe Evagrini within the Macrothelinae, have a hirsute carapace, in contrast to *Masteria* that has a sparsely hirsute carapace. Thus *Masteria* is regarded as the sister-group of the Evagrini, with the synapomorphous possession of deeply corrugiform trichobothrial bases, although it is elevated to subfamilial status—equivalent to that level recognized by Simon (1892*a*, 1903).

The Male Palpal Bulb of Masteria

As the paraembolic apophysis on the bulb of *Masteria toddae* (Fig. 25) is very long and appears to support the embolus tip, it is very likely that its function is analogous to the conductor of the atypids. As this paraembolic apophysis is a process rarely present in the Mygalmorphae it is regarded as apomorph. Within the Mygalomorphae, the conductor is well developed in the Atypidae and most Mecicobothriidae, an elongate process in *Masteria* and *Scotinoecus* Simon, and a long process in *Bymainiella* Raven. Although these taxa are related, they are not regarded as monophyletic, thus, should the paraembolic apophysis or conductor be regarded as apomorph, it cannot be a synapomorphy for the entire group, but merely for or within the subgroups.

Acknowledgments

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