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A REVISION OF THE MYGALOMORPH SPIDER GENUS *MONODONTIUM* KULCZYNSKI (BARYCHELIDAE: ARANEAE)

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***ABSTRACT.* –** The genus *Monodontium*, putatively, the sister genus of all other barychelids is revised. Of the five nominal subspecies originally named, only two, *M. mutabile* Kulczynski, 1908, and *Monodontium tetrathela* Kulczynski, 1908, status novus, are considered valid species; other subspecies (*M. mutabile minus*, *M. m. occulatissimum*, *M. m. oculatior*) are placed in the synonymy of *M. mutabile*. Three new species are described: *M. malkini* from New Guinea, *M. bukittimah* from Singapore, and *M. sarawak* from Sarawak. The latter two include the first known males of the genus. The relationships of the genus are briefly discussed. The question of barychelid synapomorphies is addressed and the book-lung comb is found to occur throughout the arbanitine Idiopidae as well as in the Barychelidae.

***KEY WORDS*. –** Mygalomorphae, Barychelidae, taxonomy, phylogeny, Papua New Guinea, Singapore, biogeography, cladistics, homology.

INTRODUCTION

Monodontium is one of the least known but probably most significant barychelid genera. The combination of plesiomorphic characters it presents suggest that it should lie most basally in the phylogeny of the Barychelidae (as suggested by Raven, 1994). At the turn of the 20th century, a collection of spiders was made by Ludovico Biro in Southeast Asia, New Guinea and Australia, for the National Museum of Hungary. Kulczynski (1908) described the mygalomorphs (and Uloboridae) from that collection and named 10 new mygalomorph species placed in eight genera of which one was *Monodontium*. Kulczynski (1908) described only one species but included five subspecies, including the nominate subspecies. Dr Tracey Churchill and I located juvenile material in the unsorted collections of the Natural History Museum, London, and of the Bernice P. Bishop Museum, Honolulu, respectively. I also found a female in the collections of the American Museum of Natural History, New York, as well as a male that was collected in litter by Joerg Wunderlich in Singapore; further material was also available after the initial submission of this manuscript. Apart from a total of five species based upon five adult females and two adults males, nothing else is known of their biology except that they are litter-dwelling.

The validity of *Monodontium* was briefly cast in doubt by Main (1982: 589). With the kind intercession of Dr Marianne Horak, Australian National Insect Collection, CSIRO, Canberra, and Dr S. Mahunka, Director, Natural History Museum, Hungary, I was able to validate the genus (Raven, 1985) and recognise that *Monodontium* is one of the most distinctive barychelid genera in that females have biserially dentate claws — a feature noted by Kulczynski (1908). However, presumably Kulczynski was more impressed by the consistent presence of a single cuspule on the labium of all of the material he examined; nothing else seems to reflect the (one-tooth) etymology of the genus name.

Raven (1985), on the other hand, found more interest in the claws of female *Monodontium*. In females of most mygalomorphs with claw tufts (Theraphosoidina Raven, 1985), the claw dentition is reduced. However, in their putative outgroup (Nemesiidae), biserial dentition, at least of the paired claws, is one diagnostic character of the family. Raven (1985) had difficulty determining the significance of the biserial dentition in *Monodontium*. The only other barychelid with biserially dentate claws in females is the blind *Troglothele* Fage (Raven, 1985). In males, on the other hand, Raven (1985) considered the biserial dentition of paired claws of male barychelids a synapomorphy of the family and reduction of teeth in females, a synapomorphy of the Theraphosoidina (including the Theraphosidae, Paratropididae and Barychelidae). As males of *Monodontium* were then unknown, Raven (1985) left *Monodontium* unplaced within the Barychelinae. The question then posed is whether the biserial condition in *Monodontium* and *Troglothele* is a plesiomorphic retention or a homoplasy. The question was discussed at length by Raven (1994: 323) who, although unable to come to full resolution, declared that

Monodontium, must at least be considered the sister group of all other barychelids.

The Barychelidae of the Western Pacific (as well as *Rhianodes* from Singapore) were revised and that region was found to have 21 endemic genera, far more than the Ethiopian (11 genera) or Neotropical (nine genera) regions (Raven, 1994). In that monograph, *Monodontium* species were not treated although the characters of the genus were tabulated and discussed and the existence of a male noted. The relationships of the Western Pacific taxa were also not discussed as they did not appear to constitute a monophyletic group and my unpublished cladogram of the taxa including *Monodontium* showed only very high homoplasy and instability in the groups. But equally, as more material of a new theraphosoid genus from the Pacific (Raven & Churchill, in prep.) was sought, it was clear that genus was pivotal in the relationships of the Theraphosoidina and would cast better light on the position of *Monodontium*.

MATERIALS AND METHODS

All measurements except those for eyes are given in millimetres (mm). Eye measurements are taken from camera lucida drawings made at 50 times magnifications; any error was taken as 0.02 mm, or 1 mm on the enlarged figure. Eye interspaces, which are measured along a line joining the centres of the respective eyes, are given as diameters of an AME. The width of the eye group or the median ocular quadrangle (abbreviated as MOQ) is the distance between the two most separated points in a line orthogonal to the long axis of the spider. Presence of leg spines are specified by the number recorded with their position. Spine positions are as follows: dorsal, if on or close to the midline; pro- or retrolateral, if spine bases are visible pro- or retrolaterally when viewed dorsally; ventral, if bases are visible when viewed ventrally. Spines are considered weak, if only marginally thicker than other setae on that surface. Despite being weaker, they are treated as spines because their number and position suggest they are the weaker form of thick spines on other species. Abbreviations: ALE, anterior lateral eyes; AME, anterior median eyes; fe, femur; me, metatarsus; MOQ, median ocular quadrangle; p, prolateral; pa, patella; PLE, posterior lateral eyes; PLS, posterior lateral spinnerets; PMS, posterior median eyes; PMS, posterior median spinnerets; pv, proventral; r, retrolateral; rv, retroventral; ; ta, tarsus; ti, tibia; v, ventral; w, weak.

Intuitional abbreviations are as follows: the National Museum of Natural History (NMNH), Budapest, Hungary; Natural History Museum, (BMNH), London, Britain; Bernice P. Bishop (BPNH), Honolulu, Hawaii; American Museum of Natural History (AMNH), New York; Museum of Natural History, Geneva (MNHG), Switzerland; Queensland Museum (QM); and the Raffles Museum of Biodiversity Research, Zoological Reference Collection (ZRC) Singapore. Coordinates given in square brackets for the localities of the material indicate that they were obtained from the locality name and were not given by the author. An allotype is a paratype of the opposite sex to the holotype, i.e. female.

TAXONOMY

BARYCHELIDAE Simon, 1889

Monodontium Kulczynski, 1908

Monodontium Kulczynski, 1908: 446; Roewer, 1942: 224; Bonnet, 1957: 2984; Brignoli, 1983: 129; Raven, 1985: 114; Platnick, 1989: 92; Platnick, 1993: 96; Raven, 1994: 334, Figs. 16B, 19E. (Type species by original designation *Monodontium mutabile* Kulczynski, 1908; types in NMNH, examined).
Poikilothele Mello-Leitão, 1923: 273 (nomen nudum).

***Diagnosis.* –** Differs from other known barychelid genera in the combined presence of eyes and two rows of teeth on the paired claws of legs I, II of females; males have the unique combination of biserially dentate claws on legs I, II and legs with little or no scopula.

Cymbium bilobed; bulb with simple pyriform palp; tibia I of males with distal megaspine. Claw tufts small, distinct on legs, absent on female palp. Four or two spinnerets; apical segment of PLS short, domed or triangular. Eight eyes in two or three rows forming rectangular, subquadrate or trapezoidal group. Anterior lobe of maxillae indistinct or absent. Leg scopulae sparse, thin in females, absent in males. Paired claws of females with two rows on legs I, II, each with few short teeth; paired claws of males with teeth in two rows (I) or claws bare (IV). Cheliceral rastellum with few weak spines or absent. Carapace as high in front of fovea as behind.

***Description.* –** Carapace and legs uniformly setose. Eight eyes in rectangular to subquadrate group of two to three rows; tubercle distinct, low. Clypeus absent. Rastellum a few spines or absent; intercheliceral tumescence absent in males. Stridulatory lyra absent. Males with weak coupling spur on tibia I; palpal tibia stout, cymbium distinctly bipartite; bulb simple, pyriform with twisted flattened embolus. Maxillae of females with 9–20 cuspules, 2–3 incipient or up to ca. 8 blunt in males; lyra absent; heel rounded. Labium wider than long; female with one or no cuspules; cuspules entirely absent in males. Sternum broad, cordate, with six small, marginal sigilla, if evident; at most posterior sigilla evident in males. Labiosternal suture a distinct groove. Legs of females short, with tarsi as wide as metatarsi; scopulae sparse, thin, or absent. Basifemoral thorns and metatarsal preening combs absent. Paired claws of females with two rows of teeth claws of legs I, II; claws of females of similar size on legs I and IV. Males with two rows of teeth on legs I, II. Palpal claw of females with few teeth or bare; palpal claw tufts absent. Spines reduced or absent on all legs of females. Leg tarsi of females not cracked or pseudosegmented. Trichobothria filiform, in two rows on tibiae, one row on metatarsi, in broad band (of filiform only) on tarsi. Bothrial bases corrugiform. Tarsal organ low with shallow concentric ridges and set back from distal edge. Combs not evident in book-lung apertures. PMS

reduced or absent. PLS short with apical segment domed. Females with one median or two entire or divided spermathecal receptacula.

***Distribution.* –** Singapore, Indonesia, Malaysia: Sarawak, Papua New Guinea and West Papua.

***Included Species.* –** *Monodontium mutabile* Kulczynski, 1908; *M. tetrathela* Kulczynski, 1908; *M. malkini*, new species; *M. bukittimah*, new species; *M. sarawak*, new species.

***Remarks.* –** Raven (1994: 323) incorrectly described the condition of the palpal claw tufts of female *Monodontium* as weak in the text, but correctly (herein) as absent in table 2 where the genus was incorrectly headed "Sasoninae".

RELATIONSHIPS

Synapomorphies of the Barychelidae

Raven (1985) considered the loss of the third claw and biserial dentition of the paired claws of males as the synapomorphies of the Barychelidae. To that, he suggested that the well-developed tarsal scopula was a possible third synapomorphy. However, the problem with all characters was the homoplasy in the closely related Theraphosidae if not also elsewhere. Since Raven (1985), only Goloboff (1993) and Raven (1994) have examined higher relationships of Barychelidae; however, neither author accepted their analysis to the point of restructuring family groups. Goloboff (1993) rejected the barychelid synapomorphies of Raven (1985) because they were homoplasies in the Theraphosidae, if nowhere else. Goloboff considered that the best synapomorphy of the Barychelidae was a newly-noted comb across the book-lung apertures. Although the character is widespread in the Barychelidae, Goloboff noted it also present in an Australian idiopid. As far as I can determine from the limited material, no such comb is present in any *Monodontium* species; however, it is present in all genera of the Australian Arbanitinae (Idiopidae; Raven, unpublished data). Hence, as a homoplasious synapomorphy, the book-lung comb is also not a good character for the Barychelidae.

Raven (1994) discussed the relationships of *Monodontium* extensively and noted that tufts are absent from the female palpal tarsus, the tarsal organ is subdistal, clavate trichobothria are absent, and the female claws are biserially dentate. These characters place *Monodontium* basally in the Barychelidae.

The only known phylogeny of barychelids was made by Raven (1985). In that study, difficulty was encountered interpreting the biserial dentition of paired claws of males of many barychelids and some theraphosids. The biseriate condition is present in the Nemesiidae, the sister group of Barychelidae + Theraphosidae + Paratropididae (Raven, 1985). However, in some nemesiid genera (most Bemmerinae), males have only a single S-shaped row on the paired claws. In barychelids, the common condition is the reverse: males have biserially dentate claws whereas females have few or no teeth. That may represent a further synapomorphy of the Barychelidae. Rarely do females have biserial dentition. The exceptions are blind spiders of the genus *Troglothele* (from Cuba) and *Monodontium*. Hence, the interpretation of the biserial dentition in female barychelids remains unresolved. As mentioned elsewhere, a cladogram forced by a new theraphosoid genus will contribute further to the debate.

Interspecific relationships

Elucidation of the relationships within *Monodontium* is only tentative because males, the most informative sex, are known for only two species. The two characters which can be polarised across the five species are the eye group shape and the number of spinnerets. The plesiomorphic eye group shape is rectangular and twice as wide as long; it is the state in the two outgroups, the Theraphosidae + Paratropididae and the Nemesiidae. It is rectangular only in *M. bukittimah* but rhomboidal and only 1.2–1.5 times wider than long in other species. The spinnerets also can be polarised: the plesiomorphic state is four spinnerets; the posterior medians are absent in *M. mutabile*, *M. malkini*, *M. sarawak* and *M. bukittimah*. Hence, the "signal" from the two characters is in conflict and the homoplasy cannot be resolved. However, in the two equally parsimonious cladograms, *M. mutabile* and *M. malkini* are sister groups:
Monodontium bukittimah [*M. tetrathela* (*M. sarawak–M. mutabile–M. malkini*)]
Monodontium tetrathela [*M. bukittimah* (*M. sarawak–M. mutabile–M. malkini*)]

This paper describes the first males of *Monodontium* (*M. bukittimah*, *M. sarawak*) with matching females; the inclusion of the males in *Monodontium* was principally by elimination, in combination with several characters. Among the barychelids, the only genera in which the eye group is in the plesiomorphically wide format and are known to have biserially dentate paired claws in males are *Sipalolasma* and *Trichopelma* (Raven, 1985). Few barychelids are known with a rectangular eye group and of those all have clavate trichobothria on the leg tarsi, tarsal scopulae and four spinnerets except *Monodontium*. The very small size is unusual in barychelids except for *Monodontium* and the Sasoninae.

BIOGEOGRAPHY

With only five species and two equally parsimonious and weakly informative cladograms (above), little may be said except that the sister group relationship of the two more geographically disparate species *M. malkini* from mid-north of New Guinea and *M. mutabile* from the Port Moresby area suggests that more data are needed. The distribution of the genus in Singapore to New Guinea is rare in spiders and indicates that more intensive searching of litter is needed at least from Malaysia to Vietnam. Given the putative

plesiomorphic position of the genus in the family or superfamily, parallels with the distribution of plesiomorphic mesothele genus *Liphistius*, viz., Thailand, Sumatra, Myanmar (Platnick, 2004) are suggested. Clearly, litter from these countries needs to be sampled in search of *Monodontium*.

Monodontium mutabile Kulczynski, 1908

(Figs. 1, 2A–E; Table 1)

Monodontium mutabile Kulczynski 1908: 446; Roewer, 1942: 224.
Monodontium mutabile typica Kulczynski 1908: 450; Roewer, 1942: 224.
Monodontium mutabile minor Kulczynski 1908: 450; Roewer, 1942: 224; Bonnet, 1957: 2984 (emended to *M. m. minus* by Platnick, 2001). New synonymy.
Monodontium mutabile oculatissimum Kulczynski 1908: 450; Roewer, 1942: 224; Bonnet, 1957: 2984. New synonymy.
Monodontium mutabile oculatior Kulczynski 1908: 450; Roewer, 1942: 224; Bonnet, 1957: 2984. New synonymy.

***Material examined.* –** *Monodontium mutabile:* holotype ("typus") female, 2 juv. paratypes, Erima (Astrolabe Bay) J.Z.P.A.N. 46/51 (NMNH).
Monodontium m. minus: syntypes, 1 penultimate male, 2 juv., "N.G. sept-or: Sattelberg [6º29'S 147º46'E], III.1899, L. Biro/ 46/51" (NMNH).
Monodontium mutabile oculatissimum: "1 juv. syntypi N.G. sept-or: Sattelberg [6°29'S 147°46'E], L. Biro/ 46/51. U." (NMNH).
Monodontium m. oculatior: "4 juv. syntypi, Madang [=Friedrich-Wilhelmschafen, 5º00'S 145º30'E,] leg. L. Biro". Y.Z.P.A.N. 46; "1 juv syntypi Hansemannberg 23.v. leg L. Biro" (NMNH).

***Diagnosis.* –** Females differs from those of *M. malkini* in having the claws of legs IV with two rows of teeth and in the relatively longer eye group.

***Description.* –** Holotype, female (NMNH): Carapace 3.48 long, 2.84 wide. Abdomen 4.00 long, 2.72 wide. Total length, 9.0.

Colour in alcohol: Carapace brown with black margins and dark brown mottling on lateral caput and interstrial ridges, chelicerae light brown, legs light brown with slightly darker annulations on tibiae and metatarsi. Abdomen with many distinct white spots, laterally pallid, venter similar with short transverse bands laterally.

Carapace: Bristles: many moderately long brown along margins and on interstrial margins; line present anteromedially; few between PME and in front of AME. Clypeus absent. Fovea straight. Striae shallow, glabrous.

Eyes: Tubercle low but distinct. Three rows; back row slightly procurved. Eye group occupies 0.34 of head-width; front width, back width, length, 31:38:25. MOQ front width, back width, length, 20:25:16. AME:ALE:PME:PLE, 10:11:7:9. Eye interspaces: AME–AME, 0.2, AME–ALE, 0.5, ALE–ALE, 1.4, PME–PME, 1.5, ALE–PLE, 0.9.

Chelicerae: Small, rounded. Narrow band of moderately long brown bristles dorsally and narrower band of shorter bristles laterally. Distally with curved stiff spines, thickest spines on edge forming a line of about 10–12 stiff spines. No modification on inner or outer faces. Outer fang smooth, inner with single medial keel. Promargin of furrow with 8 large and one smaller tooth; basomesally with a group of 10–15 granules.

Labium: 0.80 wide, 0.36 long; wider than long, with one cuspule; separated from sternum by continuous groove.

Maxillae: 1.06 long in front, 1.34 long behind, 0.64 wide; with about 17–20 cuspules along inner edge. Anterior lobe indistinct; heel broadly rounded. Lyra absent. With transverse glabrous groove on anterior face.

Sternum: 1.80 long, 1.70 wide. Rounded; uniformly setose; sigilla evident as small round shallow depressions near margin.

Legs: Scantily setose but not hirsute. Coxae not modified. Scopula: very thin and widely divided on palpal tarsi, metatarsi I, and tarsi I, II; absent elsewhere. Thorn spines and preening combs absent.

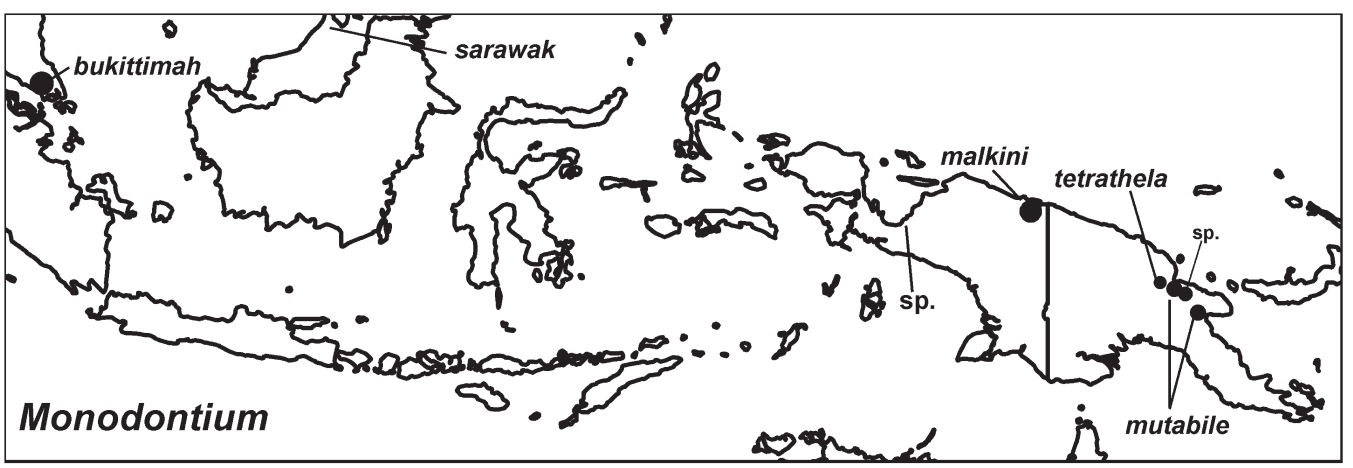

Fig. 1. Occurrence of *Monodontium*.

Table 1. Leg measurements of *Monodontium mutabile*, holotype female.

	I	II	III	IV	Palp
Femur	2.36	2.04	1.88	2.64	1.64
Patella	1.60	1.44	1.16	1.72	1.08
Tibia	1.68	1.48	1.20	2.24	1.12
Metatarsus	1.24	1.28	1.48	2.76	–
Tarsus	0.88	0.96	0.92	1.16	0.96
Total	7.76	7.20	6.64	10.52	4.80

Spines: Many thick stiff setae on prolateral tibiae and metatarsi I and II. Leg 1, me v2; leg 2, ti v1, me v3; leg 3, pa p2, ti p2, r1, v4, me p3, r2, v11; leg 4, fe d1, pa r1, ti p3, r3, v6, me p4, d1, r3, v12; palp, ti v4.

Claws: Three to five teeth in each of two rows on paired claws; leg I–III with 3 in outer, and 5 on inner rows; leg IV with 3 in both rows. Palpal claw bare. Tufts small, distinct, apically separated.

Trichobothria: In two rows on tibiae, each of 10–12 for two-thirds of length; all filiform on metatarsi and tarsi in irregular rows.

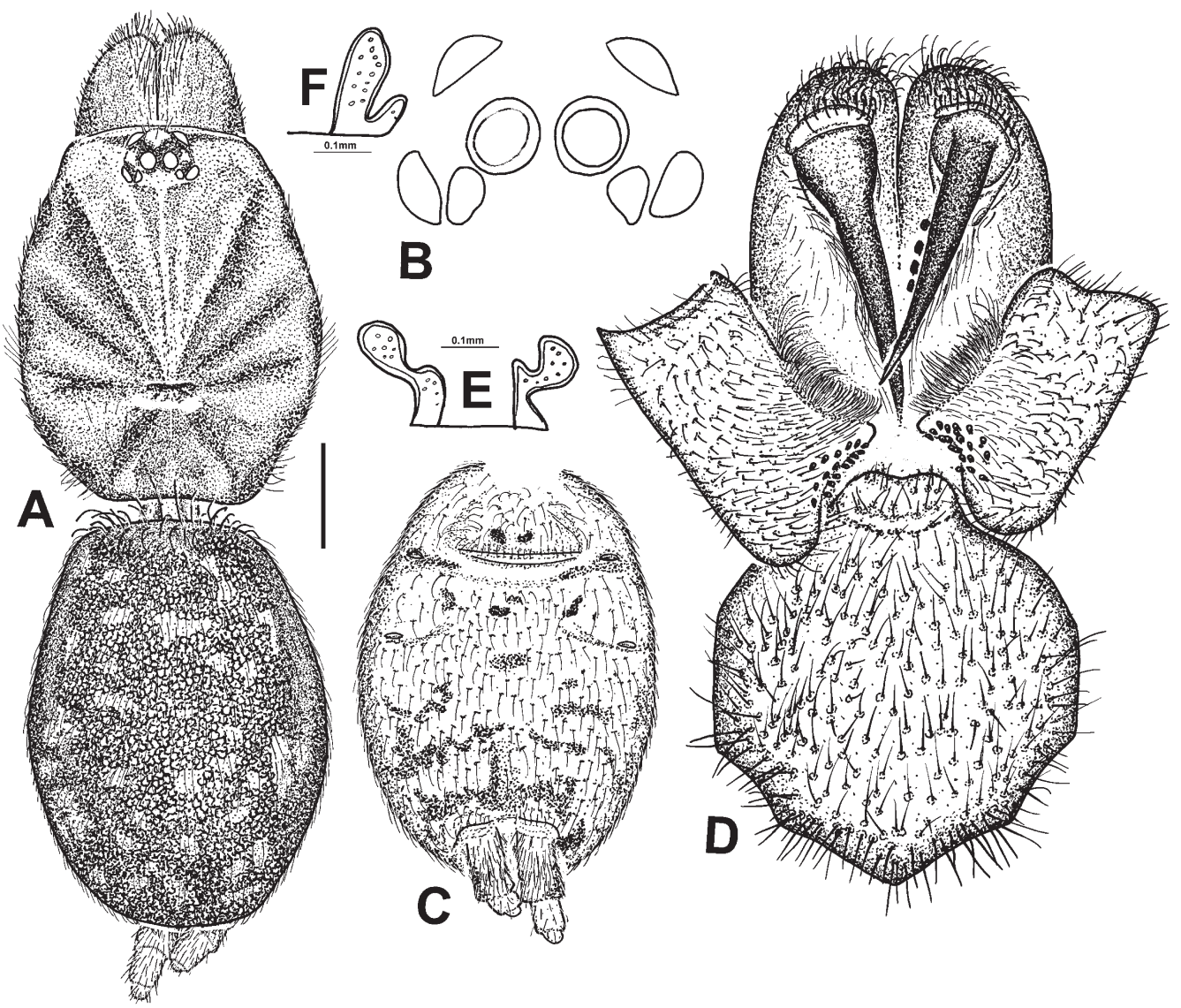

Fig. 2. *Monodontium mutabile* Kulczynski, holotype female, A–E: A, cephalothorax and abdomen, dorsal view; B, eyes, dorsal view; C, abdomen, ventral view; D, sternum, maxillae, labium and chelicerae; E, spermathecae. F, *Monodontium tetrathela* Kulczynski, spermathecae. Scale bars = 1 mm for A, C; 0.5 mm for B, D.

Palp: Claw tufts absent.

Spermathecae: Two, each a bipartite (not divided) lobe reflexing laterally at its midpoint (Fig. 2E).

Spinnerets: Two, PMS not represented by tuft of hair. PLS length of basal, middle, apical, and total articles 0.68, 0.28, 0.16, 1.12, respectively; basal segment 0.34 in diameter.

Male: Unknown.

Distribution. **–** Madang and region near Astrolabe Bay, NE Papua New Guinea.

***Remarks.* –** Kulczynski (1908) described only one species of *Monodontium*, *M. mutabile*. In that species, he included four varieties subsequently considered subspecies which were not recognised by Bonnet (1957) and not explicitly placed in synonymy. Of the types of those subspecies: *M. m. minus*, the largest is a penultimate male, the others are about one-third its size and at least three moults from maturity; all material of *M. m. oculatior* and *M. m. oculatissimum* are juvenile, even as labelled by Kulczynski (1908). All material of the subspecies were labelled as syntypes; however, the holotype of the nominate species was so labelled.

Monodontium tetrathela Kulczynski, 1908
(Figs. 1, 2F, 3A–D)

Monodontium mutabile tetrathela Kulczynski, 1908: 450; Roewer, 1942: 224; Bonnet, 1957: 2984.

***Material examined.* –** Lectotype: Female, 4 juvenile paralectotypes (labelled syntypes, new designations), Lemien Berlinhafen, Bogadjim [= "Stephansort", 5º25'S 145º45'E], L. Biro (NMNH).

***Diagnosis.* –** Females differs from those of all other species in the presence of distinct PMS (Fig. 3C).

***Description.* –** Lectotype, female (NMNH): Carapace 2.68 long, 2.04 wide. Abdomen 2.68 long, 2.04 wide. Total length, 6.0.

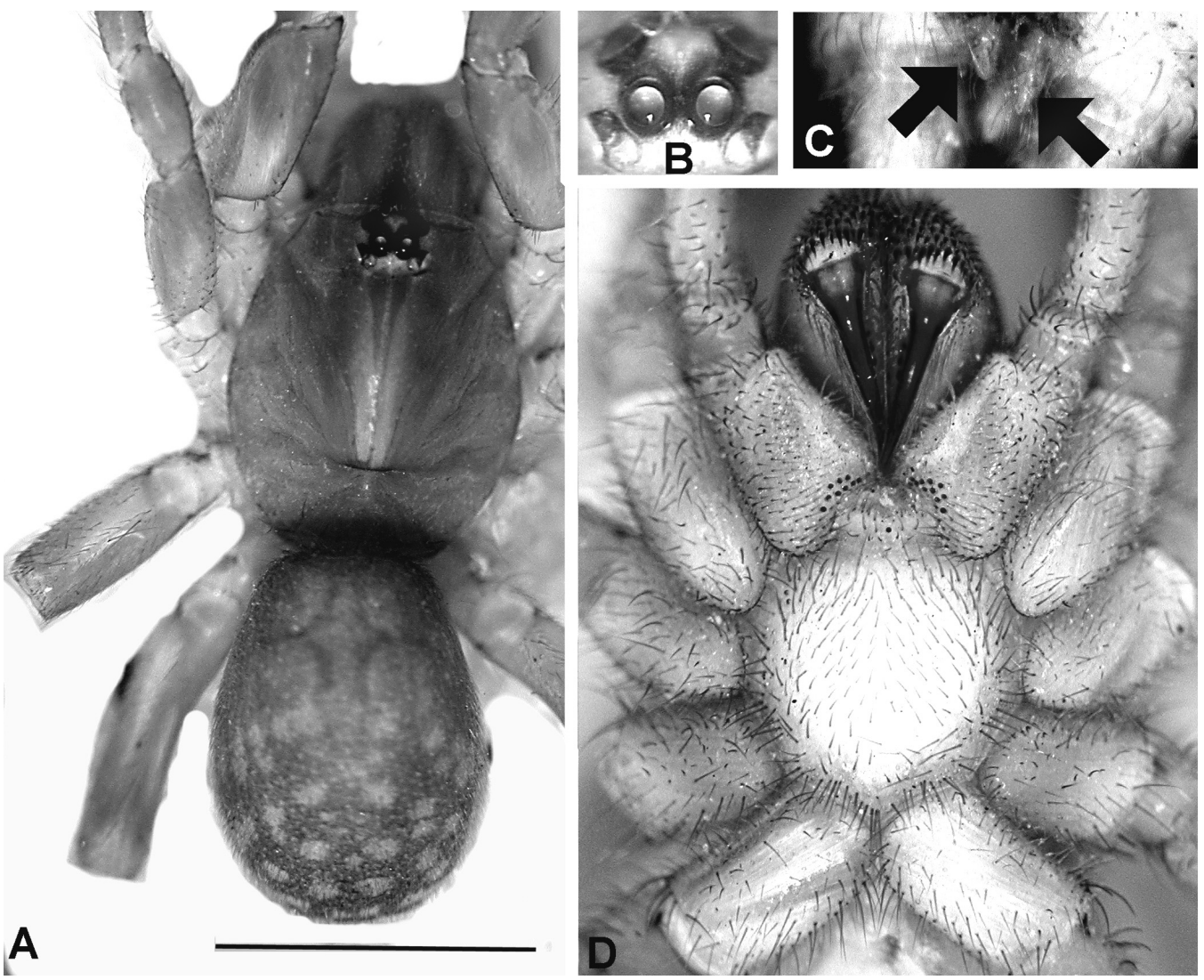

Fig. 3. *Monodontium tetrathela* Kulczynski, holotype female, photomicrographs: A, cephalothorax and abdomen, dorsal view; B, eyes, dorsal view; C, spinnerets, showing PMS; D, sternum, maxillae, labium and chelicerae. Scale bar = 1 mm.

Colour in alcohol: Carapace red-brown with darker margins and brown caput and interstrial ridges, chelicerae light brown, legs uniformly yellow-brown. Abdomen dorsally brown with many white spots in posterior half, laterally pallid, venter similar with short transverse bands laterally.

Carapace: Bristles: few moderately long brown along lateral and interstrial margins; line was present anteromedially; few between PME and in front of AME. Clypeus absent. Fovea short, straight. Striae shallow, glabrous.

Eyes: Tubercle distinct. Three rows; back row slightly procurved. Eye group occupies 0.35 of head-width; front width, back width, length, 25:32:22. MOQ front width, back width, length, 17:21:13. AME:ALE:PME:PLE, 8:9:6:7. Eye interspaces: AME–AME, 2, AME–ALE, 4, ALE–ALE, 9, PME–PLE, 2, PME–PME, 12, ALE–PLE 8.

Chelicerae: Small, rounded. Narrow band of moderately long brown bristles dorsally and narrower band of shorter bristles laterally. Distally with few curved stiff spines, thickest spines on edge forming line of about 8–10 stiff spines. Outer fang smooth, inner with single medial keel. Promargin of furrow with 6 large teeth; basomesally with few granules.

Labium: 0.52 wide, 0.16 long; wider than long, with one cuspule; separated from sternum by continuous groove.

Maxillae: 0.76 long in front, 1.00 long behind, 0.46 wide; with about 9–11 cuspules along inner edge. Anterior lobe indistinct; heel broadly rounded. Lyra absent. With transverse glabrous groove on anterior face.

Sternum: 1.26 long, 1.30 wide. Rounded; uniformly setose; sigilla not evident.

Legs: Broken; patella to tarsus of leg IV and palp missing. Scantily setose but not hirsute.

Scopula: Very thin and widely divided on metatarsi I, and tarsi I, II; absent elsewhere.

Spines: Many thick stiff setae on prolateral tibia and metatarsi I and II. Leg 1, me v2. Leg 2: ti v1; me v2. Leg 3: pa p2; ti p1r1v2; me p3r2v9. Leg 4: fe 0; rest absent; palp, fe 0; rest absent.

Claws: Legs I, II with 3 teeth in outer, and 5 on inner rows; leg III with 3 in both rows. Claws of leg IV and palp unknown.

Trichobothria: In two rows on tibiae, each of 5–7 for two–thirds of length; about 5–7 filiform on metatarsi and tarsi in irregular rows.

Palp: Missing from femur.

Spermathecae: Two, each an unequally divided lobe (Fig. 2F).

Spinnerets: Four, PMS distinct; 0.12 long, 0.04 wide, 0.02 apart; PLS basal 0.38 long, 0.24 wide, 0.08 medial, 0.06 apical.

Male: Unknown.

Distribution. **–** Known only from Stephansort, NE New Guinea.

Remarks. **–** The type series of syntypes includes only one adult female; for the purposes of stability, designation of that as the lectotype is important as juvenile mygalomorphs often lack characters distinguishing the species.

Monodontium malkini, new species

(Figs. 1, 4A–G; Table 2)

Monodontium sp.: Raven, 1994: 319, 322, Figs. 16B, 19E.

Material examined. **–** Holotype. "Hollandia [=Djajapura, West Papua, 2º32'S 140º42'E], Dutch New Guinea", female, Apr.1945, Borys Malkin (AMNH).

Diagnosis. **–** Females differ from those of *M. mutabile* in the absence of the outer row of teeth on the claws of leg IV and from *M. tetrathela* in the absence of the posterior median spinnerets. Spermathecae: two, each a narrow twisted duct.

Etymology. **–** Named in honour of the collector, Borys Malkin.

Description. **–** Holotype female (AMNH): Carapace 3.13 long, 2.38 wide. Abdomen 3.42 long, 2.28 wide. Total length, 7.0.

Colour in alcohol: Carapace orange-brown with brown marks on caput and along margin, chelicerae, maxillae, labium, and sternum orange, legs orange-brown with distinct brown annulations proximally on all tibiae to about one-third their length. Abdomen dorsally brown with eight small, irregular, paired areas in posterior half, laterally with small white mottling; ventrally pallid with three long irregular brown areas between posterior booklungs and two irregularly shaped areas in front of the spinnerets.

Carapace: Pilosity: almost glabrous; striae indistinct, narrow; no bristles dorsally on caput save for few anteromedially; 2 bristles between PME, and 5 long between ALE; long between AME, long brown bristles on lateral margins. Fovea straight; one pair of foveal bristles. Clypeus absent.

Eyes: Tubercle distinct. In three rows (2.2.4); back row procurved. Eye group occupies 0.29 of head-width; front width, back width, length, 23, 23, 19, respectively. MOQ front width, back width, length, 13, 16, 9, respectively. AME:ALE:PME:PLE, 4: 8: 4: 5. Eye interspaces: AME–AME, 0.5; AME–ALE, 1.3; ALE–PLE, 2.0; PME–PME, 2.5; ALE–ALE, 2.0.

Chelicerae: With narrow band of spaced thin brown bristles prodorsally, laterally with few fine hairs. Rastellum of 2–3 long curved spines on inner edge and 6 thinner in transverse line laterally. Furrow promargin with 3 thick close teeth anteriorly and 4 smaller spaced teeth posteriorly teeth, basomesally with curved line of 10–15 fine red teeth.

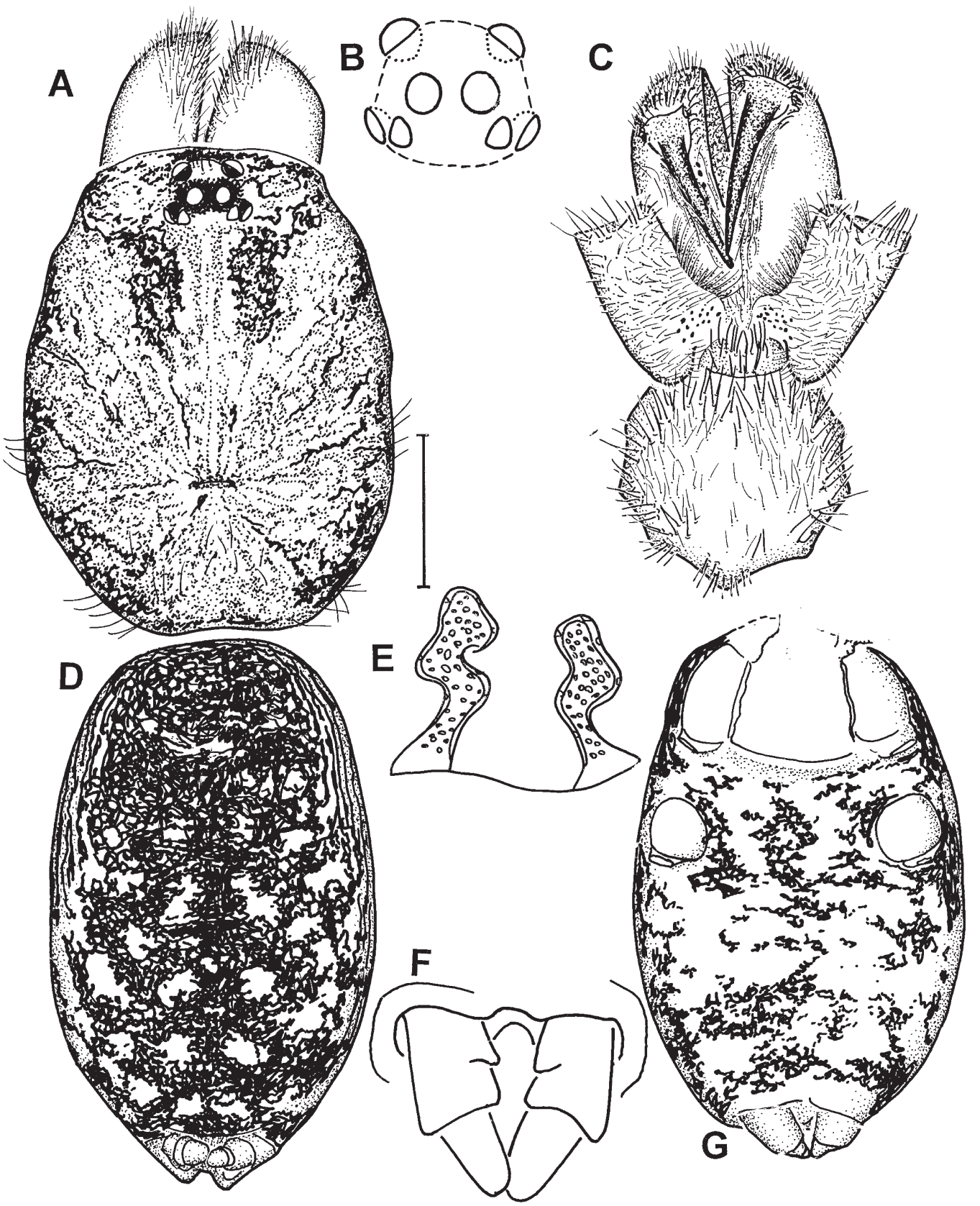

Fig. 4. *Monodontium malkini*, new species, holotype female: A, cephalothorax, dorsal view; B, eyes, dorsal view; C, sternum, maxillae, labium and chelicerae; D, abdomen, dorsal view; E, spermathecae; F, spinnerets, showing apical segment of PLS; G, abdomen, ventral view. Scale bars = 1 mm for A, C, D, G; 0.5 mm for B, F; 0.25 mm for E.

Table 2. Leg measurements of *Monodontium malkini*, holotype female.

	I	II	III	IV	Palp
Femur	1.85	1.68	1.50	2.10	1.40
Patella	1.45	1.33	1.03	1.35	0.95
Tibia	1.40	1.25	0.90	1.88	0.90
Metatarsus	0.98	0.95	1.20	2.23	–
Tarsus	0.75	0.73	0.75	0.93	0.80
Total	6.43	5.94	5.38	8.49	4.05

Labium: 0.28 long, 0.63 wide. One cuspule present; labiosternal suture narrow.

Maxillae: 0.88 long in front, 1.28 long behind, 0.58 wide; with 16–17 cuspules in inner angle. Heel rounded; anterior lobe indistinct.

Sternum: 2.08 long, 1.53 wide. Sigilla small, oval, marginal.

Legs: Coxae I, II with slightly pronounced heel.

Scopula: Metatarsi: I, II, distal thin, divided widely; absent on III, IV. Tarsi: palp, I, II, thin, sparse, widely divided by band 6–8 setae wide; absent on III, IV.

Spines: Leg 1: fe p1d3; pa 0; ti 0; me v2. Leg 2: fe p1d3; pa 0; ti v1; me v2. Leg 3: fe 0; pa p2r1; ti p1r1v8; me p3r2v8. Leg 4: fe r1; pa 0; ti r2v8; me p3r2v10. Palp: fe 0; pa 0; ti v3.

Claws: Three to four teeth on paired claws of legs I–III in two rows; 3 teeth on prolateral faces on IV, none on other face; three teeth on inner face of palpal claw. Claw tufts thin, narrow, terminating well below curve of claws.

Trichobothria: In two rows on tibiae, each of 5–7 for half length; about 6 on metatarsi in diagonal line; about 8–10 filiform but none clavate on tarsi.

Spermathecae: Two, each a narrow twisted duct.

Spinnerets: PMS absent. Basal, middle, apical, total segments of PLS, 0.43, 0.15, 0.10, 0.68 long, respectively.

Male: Unknown.

***Distribution.* –** Djajapura, north-east West Papua.

***Remarks.* –** The tarsal organ and claw tufts of *Monodontium* sp. (Raven, 1994: Figs. 19E and 16B, respectively) are those of *M. malkini*.

Monodontium bukittimah, new species
(Figs. 1, 5A–H, 6A–F; Tables 3, 4)

***Material examined.* –** Holotype. Male, Bukit Timah Hill, Singapore, [1°20'N 103°47'E], J. Wunderlich, 1986 (ZRC–ARA–459).

Allotype female. Bukit Timah Nature Reserve, Jungle Fall Valley, 100 m (rainforest along small stream), 9 Jun.2001, P. Schwendinger, SIM01/01 (MNHG).

***Diagnosis.* –** Differs from other species in the presence of rastellar spines and in the rectanguloid eye group and from *M. mutabile* in that PME are larger (relative to PLE) and the centres of the eyes of the back row form a recurved line whereas in *M. mutabile* the line is clearly procurved.

***Etymology.* –** A noun in apposition from the type locality.

***Description.* –** Holotype, male (ZRC–ARA–459): Carapace 2.16 long, 1.68 wide. Abdomen 1.65 long, 1.27 wide. Total length, 4.0.

Colour in alcohol: Carapace dark orange-brown, chelicerae dark red-brown, and legs yellow-brown, not annulated. Abdomen dorsally dark brown; ventrally pallid.

Carapace: Pilosity: lightly setose but without hairs; striae indistinct, shallow, narrow. Bristles: 1–2 long erect black beside posterior striae; ca. 5 anteromedially and 8–10 in band beside caput; 4–6 long thick and no finer between PME, and 1 long thick recurved and 3–5 finer between ALE; ca. 10 long bristles on each lateral margins. Fovea broad, straight.

Eyes: Tubercle distinct. Three rows. Back row straight. Eye group occupies 0.40 of head-width; front width, back width, length, 26:30:15. MOQ front width, back width, length, 15:21:10. AME:ALE:PME:PLE, 7:9:4:6. Eye interspaces: AME–AME, 0.3, AME–ALE, 0.3, ALE–ALE, 2.1, PME–PME, 2.7, ALE–PLE, 0.6.

Chelicerae: With narrow band of bristles prodorsally, laterally a narrow band of setae. Rastellum is 4 long strong spines, 2 on raised bases but not on common mound, on inner distal corner overhanging fang. Intercheliceral tumescence evidently absent. Furrow promargin with 2 small distal and 2 small basal and one tooth at mid-length, basomesally with no teeth evident.

Labium: 0.36 wide, 0.20 long; lightly setose with 4–5 setae transversely behind midpoint. Labiosternal suture a narrow shallow groove. Cuspules absent.

Maxillae: 0.69 long in front, 0.87 long behind, 0.34 wide; without cuspules or incipient spines. Heel distinctly produced, squared; anterior lobe broad and indistinct.

Table 3. Leg measurements of *Monodontium bukittimah*, holotype male.

	I	II	III	IV	Palp
Femur	1.71	1.62	1.52	2.10	0.98
Patella	0.89	0.83	0.67	0.92	0.51
Tibia	1.14	1.14	0.79	1.75	0.70
Metatarsus	1.14	1.08	1.17	1.94	–
Tarsus	0.76	0.67	0.67	0.89	0.48
Total	5.64	5.34	4.82	7.60	2.67

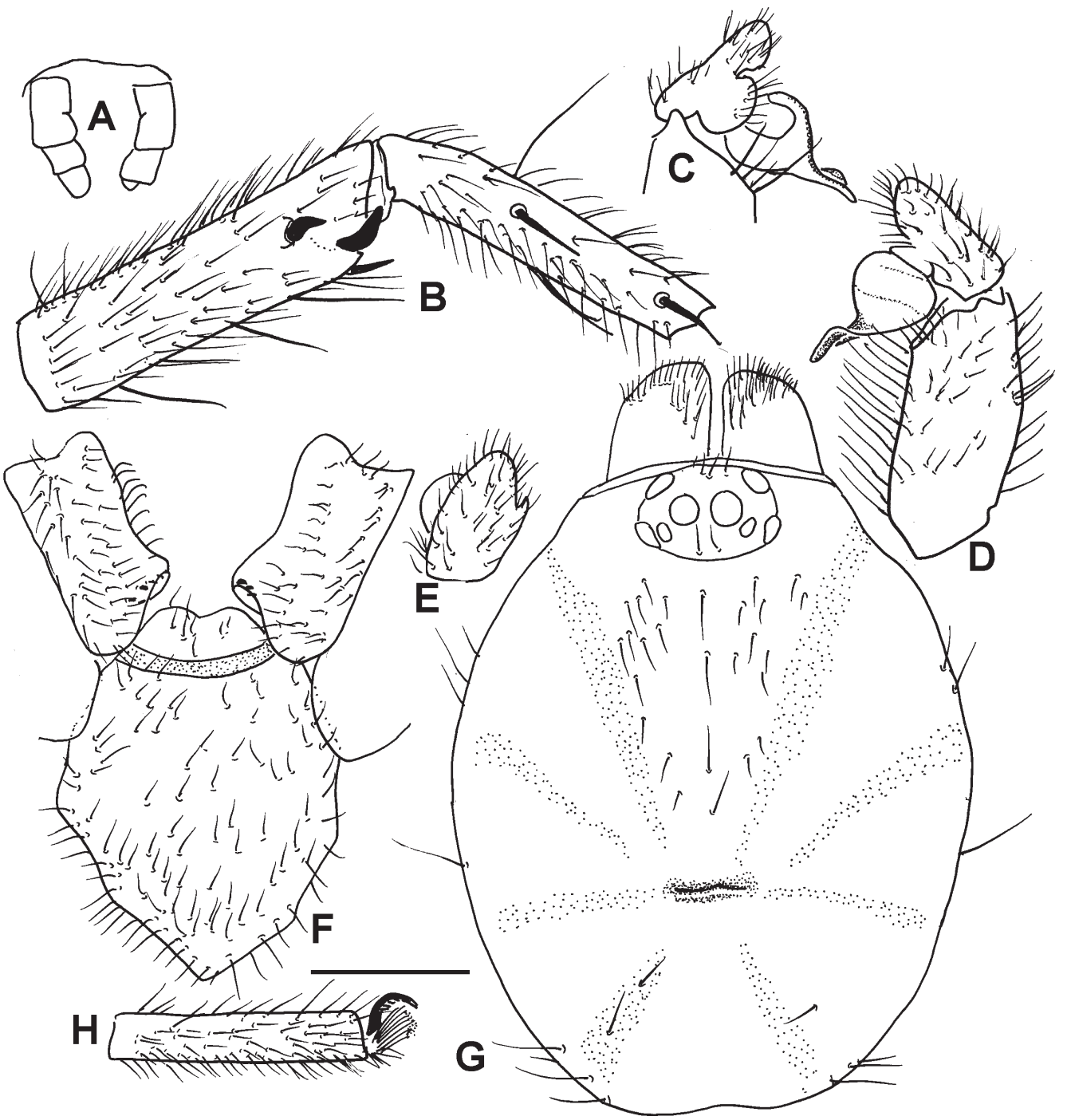

Fig. 5. *Monodontium bukittimah*, new species, holotype male: A, spinnerets, showing apical segment of PLS; B, tibia and metatarsus I, prolateral view; C, D, palp, distal tibia, tarsus and bulb, retrolateral view (C), prolateral view (D); E, palpal tibia, dorsal view; F, sternum, maxillae, labium and chelicerae; G, cephalothorax, dorsal view; H, tarsus; I, lateral view. Scale bars = 0.5 mm for F, G; 1 mm for rest.

Table 4. Leg measurements of *Monodontium bukittimah*, allotype female.

	I	II	III	IV	Palp
Femur	1.41	1.22	1.13	1.56	1.03
Patella	0.96	0.84	0.66	0.88	0.75
Tibia	0.96	0.91	0.56	1.16	0.59
Metatarsus	0.69	0.63	0.72	1.13	–
Tarsus	0.53	0.47	0.53	0.66	0.63
Total	4.55	4.07	3.60	5.39	3.00

Sternum: 1.06 long, 0.87 wide. Sigilla not evident.

Legs: Tibia I with slightly raised spur distoventrally with triangular apex, above that a stout curved megaspine, microspur absent. Femur III incrassate but much less so than in *M. sarawak*, new species. Mid-width 1.14 times basal and 1.06 wider than distally.

Scopula: Entirely absent.

Spines: Leg 1: fe d3w; pa 0; ti p1v3 + megaspines; me p2v1. Leg 2: fe d3; pa 0; ti v4; me p2v0. Leg 3: fe p3d3r1; pa p2v1; ti p2d3r1v6; me p3r3v6. Leg 4: fe p1d5w; pa r1; ti p3d2r3v12; me p3r3v8. Palp: fe d2w; rest, 0.

Claws: Three to five teeth in each of two rows (I–II), one row entally on III, on leg IV bare.

Trichobothria: In two rows, each of 8 for length of tibiae; ca. 8 on metatarsi in slightly diagonal row; ca. 10 small filiform on tarsi, none clavate.

Palp: Bulb relatively large quickly tapering to short flanged embolus; cymbium bilobed, dorsal lobe broadly pointed, prolateral lobe almost semi-circular; no tuft distally on cymbium. Cymbium short, with group of long strong spine-like setae basally on dorsum.

Spinnerets: PMS absent. PLS 0.20 apart, 0.11 wide basally; length of basal, middle, apical, and total articles 0.23, 0.11, 0.06, 0.40, respectively.

***Description.* –** Allotype, female (MNHG): Carapace 2.12 long, 1.60 wide. Abdomen 2.32 long, 1.52 wide. Total length, 6.0.

Colour in alcohol: Carapace brown with darker marks on lateral caput forming narrow median pallid zone to fovea, darker markers also along lateral margins and interstrial ridges, chelicerae light brown, maxillae, labium, and sternum fawn, legs fawn with indistinct darker areas on lateral femora and tibiae. Abdomen dorsally brown; ventrally pallid.

Carapace: Pilosity: glabrous; striae distinct, wide; bases of 5 thick anteromedial bristles from eyes to fovea; two lines, each of about 10, posteriorly-directed bristles extend from PME to fovea (i.e., foveal bristles) along lateral borders of medial pallid zone; 2 thick and 6 smaller bristles between PME; 3 long and 4 shorter between AME; 1 long bristle in posterior striae; few fine bristles on lateral margins. Fovea straight. Clypeus absent.

Eyes: Tubercle distinct. In two rows; front strongly procurved so anterior edge of AME and posterior edge of ALE in line, back row slightly recurved. Eye group occupies 0.33 of head-width; front width, back width, length, 26, 30 and 17, respectively. MOQ front width, back width, length, 14, 21, 11, respectively. AME:ALE:PME:PLE, 5: 7: 5: 6. Eye interspaces: AME–AME, 0.4; AME–ALE, 1.0; ALE–PLE, 0.8; PME–PME, 2.6; ALE–ALE, 1.6.

Chelicerae: With narrow band of spaces thin brown bristles prodorsally, laterally with few fine hairs. Rastellum of 2–3 long thick curved spines on inner edge and about 10 thinner but strong spines in transverse line laterally; three long spines above group on inner edge. Furrow promargin with 6 teeth, basomesally with group of about 10 long fine teeth.

Labium: 0.22 long, 0.44 wide. One short blunt cuspule beside a short pointed spine; labiosternal suture narrow.

Maxillae: 0.58 long in front, 0.74 long behind, 0.50 wide; with 8–9 cuspules in inner angle. Heel large, broad, rounded; anterior lobe indistinct. Anterior face with pallid groove for length just above lower edge, groove dorsally bordered by narrow band of two lines of short setae. No lyra evident on chelicerae entally or ectally.

Sternum: 1.00 long and wide. Only small, oval, marginal posterior sigilla evident.

Legs: Coxae I, II with slightly pronounced heel.

Scopula: For length of metatarsi I but thin, divided widely; absent on II–IV. Tarsi: palp and I, thin, sparse, widely divided by band 6–8 setae wide; absent on II–IV.

Palp: Claw tufts absent; "cage" of thicker setae around base of claw on tarsus edge, 4 in long vertical line laterally and group of about 5 below claw with two thicker spine-like setae just basal.

Spines: Only long curved bristles on femora and patellae, and on tibiae I, II; none on leg tarsi. Leg 1: me v1.1.1–3. Leg

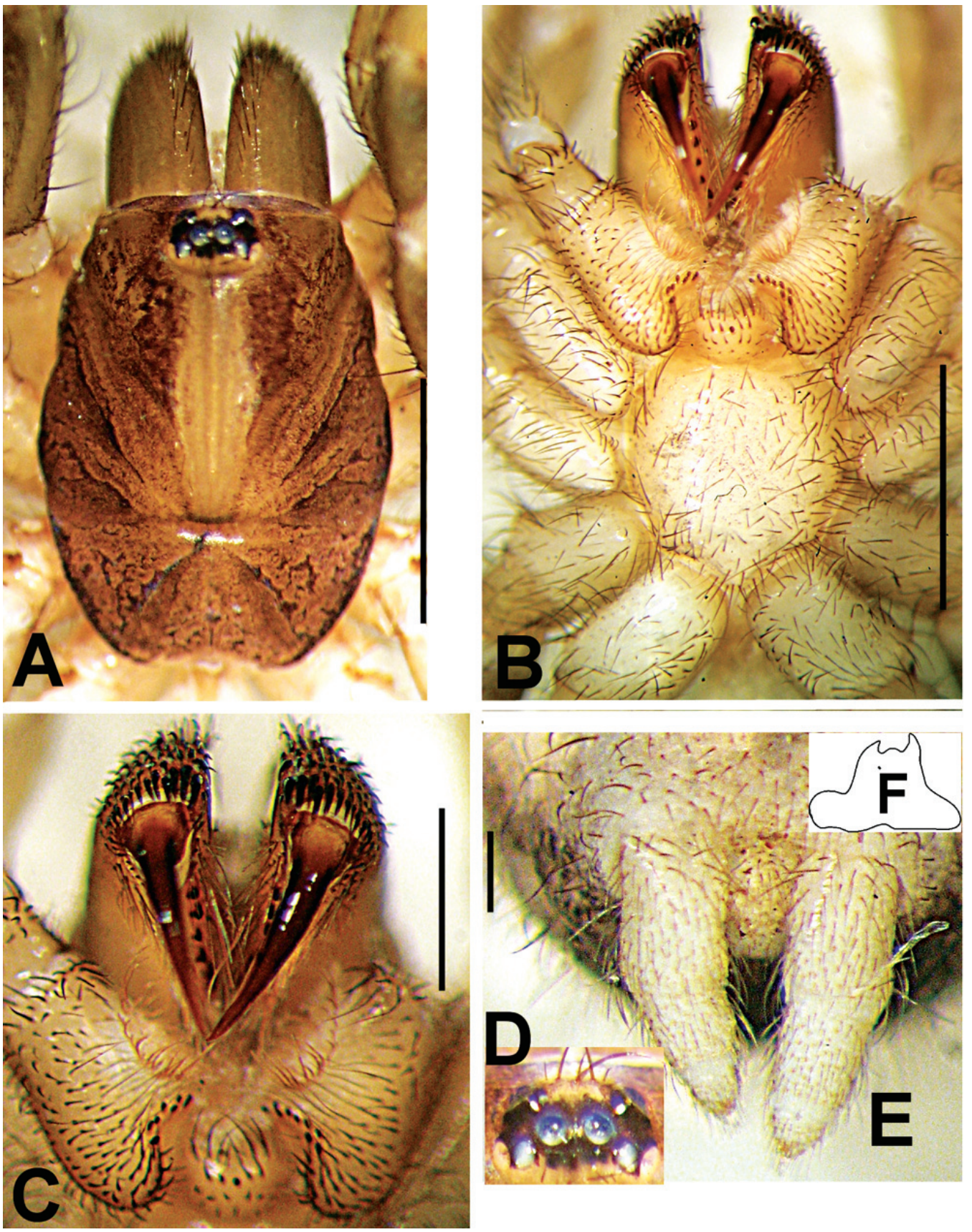

Fig. 6. *Monodontium bukittimah*, new species, allotype female: A, cephalothorax, dorsal view; B, C, sternum, maxillae, labium and chelicerae; D, eyes; E, spinnerets; F, spermathecae. Scale bars = 1 mm for A, B; 0.5 mm for C; 0.2 mm for D, E; 0.1 mm for F.

2: me v1.1.1.3. Leg 3: pa p2 thorns; ti p1r1v2w; me p1.2r1.1.1v1.2.3. Leg 4: pa p0; ti r1v1.2.3w; me p2r2v1.1.1.3. Palp: fe 0; pa 0; ti v3w; tarsus v3w.

Claws: Three to four teeth on paired claws of legs I–II in two rows; three teeth on prolateral faces on IV, none on other face; three short teeth on inner face of palpal claw. Claw tufts on I–IV distinct, wide, reach at least to curve of claws.

Trichobothria: As for *M. malkini.*

Spermathecae: A broad based lobe apically with two horn-like tips.

Spinnerets: PMS absent. Basal, middle, apical, total segments of PLS, 0.31, 0.20, 0.08, 0.74 long, respectively.

***Distribution and Habitat.* –** Known only from tropical rainforest on Bukit Timah Hill, Singapore.

***Remarks.* –** Cuspules are often lost entirely or represented only by incipient spines in males (noted by Raven, 1994) whereas they are present in the female.

Monodontium sarawak, new species

(Figs. 1, 7A–D, 8A–E; Tables 5, 6)

***Material Examined.* –** East Malaysia: Sarawak: Lambir Hill National Park, 20km north of Miri, 4°14'N 114°02'E, 200 m, 17–18 Aug.2003, A. Schulz, Winkler Extraction, AS/03–6. MNHG, holotype male MNHN; allotype female, Matang area, via Kuching, 23 Nov.1977, T.E. Woodward, rainforest, litter, QM S72600.

***Diagnosis.* –** The male differs from that of *M. bukittimah* by the very incrassate third femur, and other species in the presence of rastellar spines and in the rectanguloid eye group and from *M. mutabile* in that PME are larger (relative to PLE) and the centres of the eyes of the back row form a recurved line whereas in *M. mutabile* the line is clearly procurved. The female, like the male, is unique in the incrassate femur 3.

***Etymology.* –** A noun in apposition from the type locality.

***Description.* –** Holotype, male (MNHN): Carapace 1.58 long, 1.20 wide. Abdomen 1.30 long, 0.80 wide. Total length, 3.3. Like *M. bukittimah* except:

Colour in alcohol: Carapace, chelicerae and legs fawn, not annulated; narrow post-foveal area brown. Abdomen dorsally purplish brown, laterally, ventrally and laterodorsally pallid.

Carapace: Pilosity: lightly setose but without hairs; striae indistinct, shallow, narrow. Bristles: 1–2 long erect black opposite fovea and beside posterior striae; ca. 20 posteriorly directed on caput; 3 long thick recurved; 5 or 6 short bristles on lateral margins anterior to fovea, 5–7 longer near posterior corners and 1 each posteriorly on posterior striae and 4 asymmetrically located behind fovea. Fovea short, slightly recurved, groove closed.

Eyes: Tubercle distinct. 3 rows. Back row procurved. Eye group occupies 0.42 of head-width 17:20:15. MOQ front width, back width, length, 9:13:8. AME: ALE: PME: PLE, 4:8:5:6.

Chelicerae: Rastellum of 3–5 long tapering spines. Furrow promargin with 6 teeth.

Labium: 0.24 wide, 0.06 long; cuspules absent.

Maxillae: 0.40 long in front, 0.54 long behind, 0.28 wide; with 5–8 blunt cuspules.

Sternum: 0.80 long and wide. Very small posterior sigilla evident in margin.

Legs: Tibia I predistally with slightly raised spur with stout curved megaspine, at base of spur slightly thick, blunt spine directed slightly prolateral of ventral; microspur small, triangular; upper megaspine stout, curved. Femur III strongly incrassate, medially 1.6 wider than basal width and 2 times wider than distal width.

Spines: Leg 1: fe d3w; pa 0; ti v2 distal + megaspines; me v1.2. Leg 2: fe d3w; pa 0; ti v1.1.3; me p2v1.3. Leg 3: fe d3r2; pa p2v1; ti p2d3r1v1.2.3; me p3r3v2.2.3. Leg 4: fe d3wr1; pa r1; ti p2r2v3.3.3; me p4r4v5.3. Palp: see Palp (below).

Claws: Three to five teeth in each of two rows (I–II), 2 rows of 2–3 on III, ectal row evident on IV. Tufts divided but narrow, weak, with few hairs on I, more numerous on III, IV.

Palp: Tibia with 13 short to long curved spines on retroventral tumesence beside embolus tip. Bulb relatively large quickly tapering to short slightly flanged embolus bent slightly at tip; cymbium bilobed, dorsal lobe broadly pointed; no tuft distally on cymbium. Cymbium short, with 2–4 long spine-like setae basally on dorsum giving the impression of spines.

Spinnerets: PMS absent. PLS 0.10 apart, 0.16 wide basally; length of basal, middle, apical, and total articles 0.20, 0.20, 0.04, 0.40, respectively.

Description: Allotype Female. QM S72600. Like male except as follows: Carapace 2.06 long, 1.47 wide. Abdomen 1.97 long, 1.31 wide. Total length, 4.63.

Colour in alcohol: Faded, partially translucent. Carapace light brown with slightly darker mottling. Abdomen dorsally brown, ventrally pallid.

Carapace: Pilosity: glabrous; 5 thick and 3 thinner anteromedial bristles; 2 thick and 4 smaller bristles between PME; 4 long between AME; 5–6 long bristles in posterior striae; few fine bristles on lateral margins. Fovea slightly procurved.

Eyes: Back row straight. Eye group occupies 0.44 of head-width; front width, back width, length, 28:32:18. MOQ front width, back width, length, 17,23,10. AME:ALE:PME:PLE, 6:7:5:8. Eye interspaces: AME–AME, 0.5; AME–ALE, 1.2; ALE–PLE, 0.5; PME–PME, 2.5; ALE–ALE, 2.3.

Chelicerae: Rastellum of 2–4 long thick curved spines on inner edge and about 8 thinner but strong spines in transverse line laterally; only weak bristles above group on inner edge. Furrow promargin with 6 teeth, basomesally with group of about 15 fine teeth.

Labium: 0.19 long, 0.41 wide. Cuspules absent but 4 short pointed spinules in posterior half.

Maxillae: 0.59 long in front, 0.78 long behind, 0.47 wide; with 8–9 blunt cuspules.

Sternum: 1.00 long, 0.88 wide. No sigilla evident.

Legs: Femur III clearly the thickest; fringe of 6–8 strong bristles forming comb prodistally on femora III, IV and dorsally and laterally on patellae and tibiae III.

Palp: Claw tufts absent; dorsally with cluster of 10–15 short pointed bristles basodorsally. Few teeth on claw promargin.

Spines: Leg 1: fe d6w; pa 0; ti v3w; me v1.1.2. Leg 2: fe d5w; pa 0; ti v3w; me p1v1.1.2. Leg 3: fe (thick bristles)

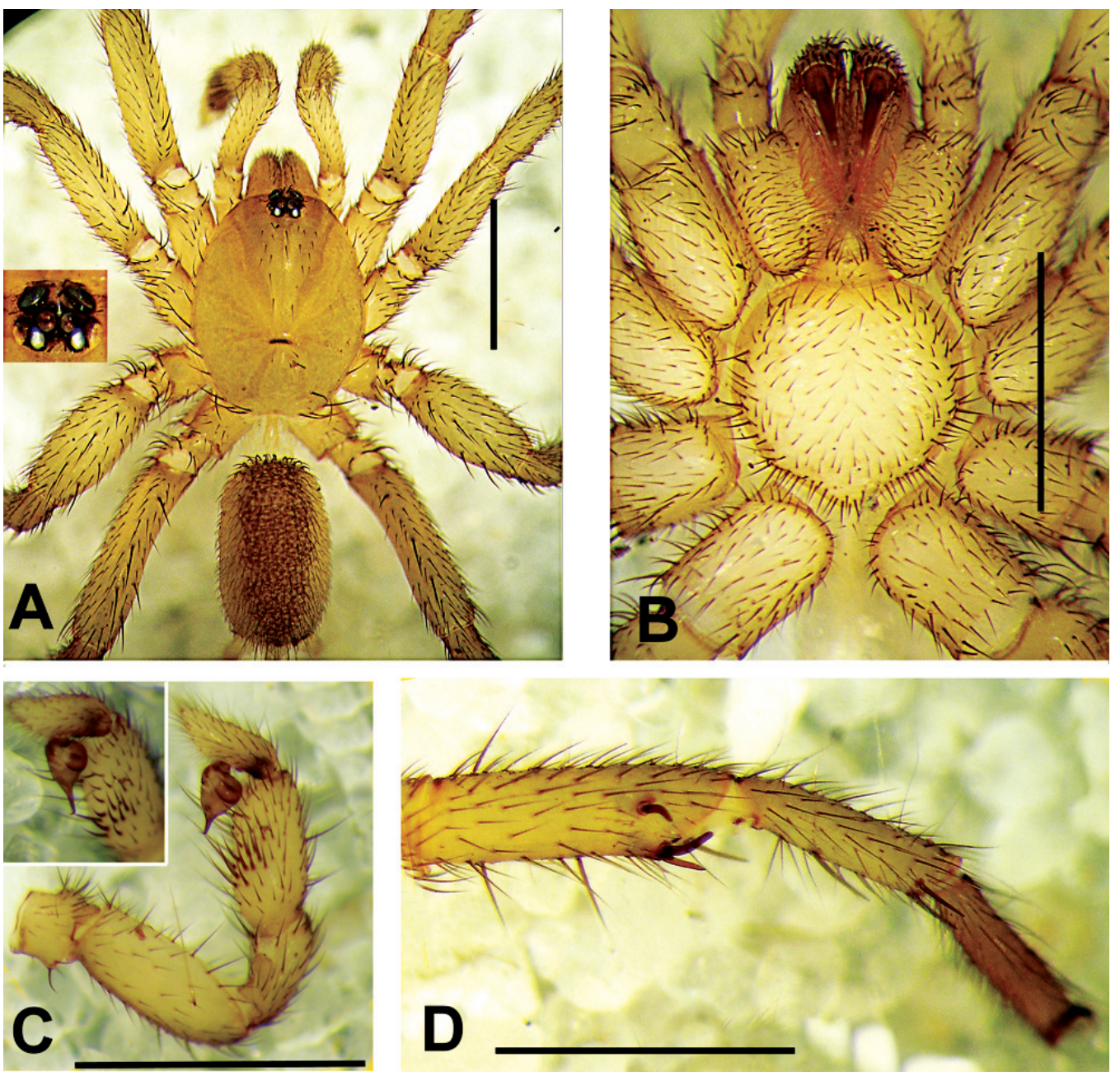

Fig. 7. *Monodontium sarawak*, new species, holotype male: A, carapace, abdomen, femora, dorsal view showing incrassate femur III, inset, eyes; B, sternum, maxillae, labium and chelicerae; C, palp, bulb (inset), retrolateral view; D, tibia and metatarsus I, prolateral view. Scale bar = 1 mm.

Table 5. Leg measurements of *Monodontium sarawak*, holotype male.

	I	II	III	IV	Palp
Femur	1.22	1.02	1.02	1.40	0.62
Patella	0.76	0.70	0.50	0.72	0.48
Tibia	0.92	0.66	0.56	1.10	0.48
Metatarsus	0.70	0.66	0.74	1.16	–
Tarsus	0.50	0.50	0.40	0.54	0.38
Total	4.10	3.54	3.22	4.92	1.96

Table 6. Leg measurements of *Monodontium sarawak*, allotype female.

	I	II	III	IV	Palp
Femur	1.25	1.13	0.88	1.34	1.00
Patella	0.88	0.72	0.63	0.78	0.63
Tibia	0.94	0.78	0.47	1.09	0.63
Metatarsus	0.63	0.59	0.66	1.09	–
Tarsus	0.50	0.47	0.47	0.56	0.56
Total	4.20	3.69	3.11	4.86	2.82

d2r1; pa p2; ti p2d2r1v2; me p3r3v2.2.4. Leg 4: fe d3w; pa 0; ti weak bristles+v1; me p1r1v2.2.4. Palp: fe 0; pa 0; ti v2.2.3; ta r2v2.

Claws: There are ca. 6 teeth in each of two rows (I–II); III, IV long narrow, bare. Tufts weak.

Scopula: For length of metatarsus I but thin, divided widely; absent on II–IV. Tarsi: palp and I, thin, sparse; absent on II–IV.

Spinnerets: PMS absent. PLS length of basal, middle, apical, and total articles 0.40, 0.09, 0.03, 0.50, respectively.

Spermathecae: A single broad lobe with smaller anterior lobe joined by narrow neck.

Distribution. **–** Known only from tropical rainforest in Sarawak, East Malaysia.

Remarks. **–** Two females from Sarawak in the same collection are not adult but have teeth on promargin of palpal claw, no tufts on palp, and no sign of teeth on legs 3 and 4 but 2 rows on legs I and 2.

Other material examined. **–** 1 juv., Nabire [3º23'S 135º31'E], New Guinea, 5 Sep.1962, H. Holkmann, (BPBH); 1 juv.,

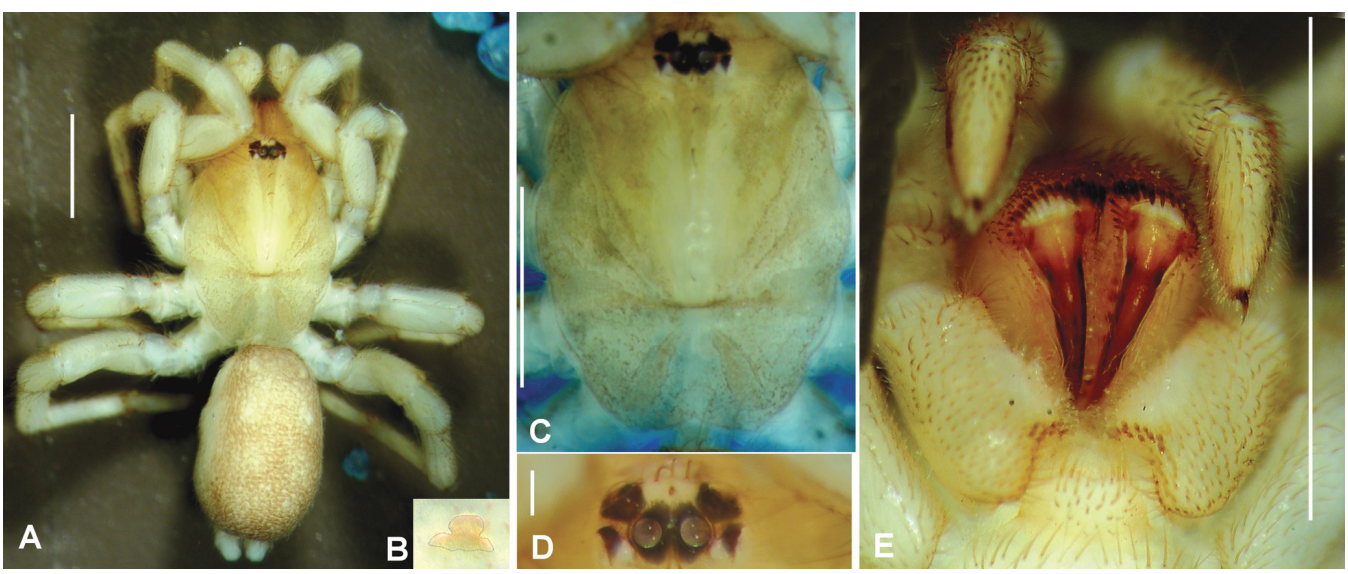

Fig. 8. *Monodontium sarawak*, new species, allotype female: A, habitus. B, spermathecae; C, carapace, dorsal view; D, eyes; E, sternum, maxillae, labium and chelicerae with rastellum. Scale bars = 1 mm, except B, D = 0.10 mm.

Finisterre Mts, Nakok Valley, Budemu, [5º54'S 146º06'E], 4,150 ft (ca. 1,265 m), M.E. Bacchus coll. no 51, 15–25 Oct.1964, BMNH & Newcastle-upon-Tyne Expedition (BMNH).

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