



On the systematic position of *Dino* Loman and *Toccolus* Roewer (Opiliones, Laniatores, Epedanidae), with the description of a new species from western Java, Indonesia

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Abstract

A new species, *Toccolus javanensis* **sp. nova**, is described from a rainforest in Gunung Puncak, western Java, Indonesia. It is the fourth species of the genus, which was hitherto known only from continental SE Asia. It possesses a low ocularium and general body shape strongly resembling *Dino weberi* Loman from Sumatra. The relationships of *Toccolus* are discussed and the closely related genus *Dino* Loman is transferred from Podoctinae (Podoctidae) to Epedaninae (Epedanidae).

Key words: Arachnida, Harvestmen, Dibuninae, Podoctidae, Podoctinae, Sumatra, Indo-Malaya, Grassatores

Introduction

Based on the material collected by the Max Wilhelm Carl Weber (1852–1937) Expedition in the Dutch East Indies (1888), Loman (1893) described a number of Opiliones from Sumatra, Java and Flores. Among the Epedanoidae (roughly equal to today's Epedanidae) he included the new genus *Dino* Loman, with the type species *Dino weberi* Loman, from Sumatra. Later, Roewer (1912) synonymized Epedanidae and many other families with Phalangodidae, transferring *Dino* into the Podoctinae (currently Podoctidae) where it has remained until now. He reexamined and redescribed Loman's material of *Dino weberi*. No further material of the genus has been recorded in the literature and its familial placement has never been questioned.

Roewer (1927) created the genus *Toccolus* for a species from Vietnam. Suzuki (1969; 1976) added two more species, respectively from Thailand and Malaysia. In the present paper, based on material from Java deposited in AMNH, a new species of *Toccolus* is described, which resembles *Dino weberi* and thus prompted a comparison with *Dino*. This allows the transfer of the genus *Dino* from Podoctidae to Epedanidae.

Acronyms of repositories: AMNH — American Museum of Natural History, New York, NY, U.S.A. ZMAN—Instituut voor Taxonomische Zoologie, Zoologisch Museum, Universiteit van Amsterdam, Amsterdam, Netherlands. WWF Ecoregions follow classification of WWF (2007). Abbreviations: AL, abdominal scutum length from scutal groove to posterior border of scutum; AW, abdominal scutum maximum width; CL, carapace length down to scutal groove; CW, carapace maximum width; ID, interocular distance, measured between the internal rim of each cornea.

Epedaninae Sørensen, 1886

Epedanoidae Sørensen 1886: 66; Loman 1893: 12.

Epedanidae: Loman 1902: 197.

Epedaninae (Phalangodidae): Roewer 1912: 220; Roewer 1923: 196 (key to genera).

***Dino* Loman, 1893**

Dino Loman 1893: 17; Loman 1902: 198; Roewer 1912: 209; Roewer 1923: 179 [type species *Dino weberi* Loman, 1893, by monotypy].

Etymology. From the Greek Δεινώ, one of the Graeae (Loman 1893: 17, footnote).

Remarks. Roewer (1923) gives 1892 as the publication date of the name *Dino*. The volume by Max Weber is dated 1894, but some individual parts surely appeared earlier. Both Neave's *Nomenclator zoologicus* and the Zoological Record give 1893 for Loman's chapter, which is the date I use here, in the absence of any other source of information on the precise publication date.

Diagnosis. Epedanidae with peltidium subrectangular, sides concave. Ocularium absent, eyes situated on separated, individual eyemounds. Basichelicerite elongate and very slender. Pedipalpal trochanter and femur armed ventrally with strong spines. Femur short and curved distally. Patella ventro-mesally with 1 spine, ventro-ectally unarmed. Leg I strongly enlarged (femur I 75% as long as peltidium and thicker than pedipalpal femur). Tarsal counts 6(2)/14(2)/6/7.

***Dino weberi* Loman, 1893**

Dino weberi Loman 1893: 17, pl. 1, figs 10–11; Loman 1902: 198; Roewer 1912: 209, fig 47; Roewer 1923: 179, figs 200–201.

Type material. ZMAN, unsexed (probably ♀) holotype (not examined) “Sumatra. Kaju tanam” [Indonesia, Sumatra Island, Sumatera Barat Province, Limapuluhkoto Regency, Kajutanam, -0.5500° 100.3333°]. WWF Ecoregion: IM0159 (Sumatran Montane Rain Forests).

***Toccolus* Roewer, 1927**

Toccolus Roewer 1927: 203 [type species: *Toccolus minimus* Roewer, 1927, by monotypy].

Etymology. From Tocco Concession.

Included species. *Toccolus minimus* Roewer, 1927, *Toccolus chibai* Suzuki, 1976, *Toccolus globitarsis* Suzuki, 1969 and *Toccolus javanensis* **sp. nova**.

Diagnosis. Epedanidae with peltidium subrectangular, sides concave. Ocularium always present, varying from very low to high armed with a median acuminate tubercle, high or low. Basichelicerite robust. Pedipalpal trochanter and femur ventrally armed with strong spines. Femur short and curved distally. Patella ventro-mesally with 2, ventro-ectally with 1 spine. Leg I weak (femur I 55% as long as peltidium and much thinner than pedipalpal femur). Tarsal counts 5-8(2)/11-21(3)/6/6-10.

Key to the species of *Toccolus*

1. Pedipalpal femur dorsal with 2 high spines (as long as femur width); ocularium armed with high spine (much longer than height of ocularium) *T. chibai* (Malaysia)
 - Pedipalpal femur dorsal with a row of 7–10 small tubercles (much shorter than femur width); ocularium armed with small tubercle (much shorter than height of ocularium).....2
2. Ocularium very low; pedipalpal tarsus ventro-ectal and ventro-mesal sides each with 4 spines; tarsus I with 8 articles..... *T. javanensis* (Java)
 - Ocularium elevated; pedipalpal tarsus ventro-ectal and ventro-mesal sides each with 3 spines; tarsus I with 5–6 articles3
3. Basichelecerite with 2 very short acuminate tubercles (much shorter than basichelecerite width); pedipalpal coxa dorsal with row of 3 dentiform apophyses, middle apophysis anchor-shaped (“dorsal mit 3 Zähnen, deren mittlerer ankerförmig ist” [Roewer 1938: 103]) *T. minimus* (Vietnam)
 - Basichelecerite with 3 high (almost as long as basichelecerite width) spines; pedipalpal coxa dorsal with 2 short curved apophyses (“a short but robust spine which is acutely bent forward at the distal end, and with a small tubercle exterior to it, also a further blunt tubercle at the base” [Suzuki 1969: 93])
..... *T. globitarsis* (Thailand)

Toccolus javanensis sp. nova

(Figs 1–8)

Type material. AMNH AK 172 ♂ holotype “Poentjak, S.F. 1920” [Indonesia, Java Island, Jawa Barat Province, Bogor Regency, Gunung Puncak, -6.70585° 106.976°]. WWF Ecoregion: IM0167 (Western Java Montane Rain Forests).

Etymology. From the island of Java, to contrast with the other species, known from continental SE Asia.

Description of male holotype.

Measurements. ID 0.9, CL 1.9, AL 1.0, CW 2.4, AW 2.7. See Table 1 for measures of appendages.

TABLE 1. Appendage measurements of *Toccolus javanensis*. Abbreviations: claw, pedipalpal claw; Fe, femur; Mt, metatarsus; Pa, patella; Ta, tarsus; Ti, tibia; Tr, trochanter.

	Tr	Fe	Pa	Ti	Mt	Ta	claw
Pedipalpus	0.6	2.6	4.1	1.5	–	1.3	1.0
Leg I	0.3	1.7	0.6	1.4	2.3	1.4	–
Leg II	0.5	2.3	0.8	?	?	?	–
Leg III	0.5	2.2	0.8	1.7	2.7	?	–
Leg IV	0.5	2.9	0.8	2.0	3.5	1.8	–

Dorsum (Figs 1–2). Peltidium subrectangular, with sides concave. Cheliceral sockets very deep. Ocularium very low, ovoid, with a median small tubercle. Three ill-defined mesotergal areas, area I and II fused together. Peltidium and all free tergites smooth and unarmed.

Chelicera (Figs 1–3). Basichelecerite very robust, two-thirds as long as peltidium, with bulla attenuate, armed with dorsal, dorso-ectal and dorso-mesal strong acuminate tubercles. Cheliceral hand swollen (presumably only in male). Dentition of fingers composed of (1) basal larger isolated teeth and (2) distal smaller grouped teeth. Teeth of movable finger in double row, forming a locking area for fixed finger.

Pedipalpus (Figs 1–2, 4–5). Coxa very long, with 2 strong dentiform dorsal apophyses, anterior one very

large, anchor-shaped and ventro ectal subdistal setiferous tubercle. Trochanter short, with two robust ventral divergent setiferous tubercles and one dorsal setiferous tubercle. Femur straight, a little shorter than peltidium, armed dorsally with two rows of small tubercles and ventrally with a row of 6 large spines. Femur mesal sub-distal with two large spines. Patella ventro-ectally with 1 and ventro-mesally with 2 large setiferous tubercles. Tibia ventro-ectally with 4 and ventro-mesally with 3; tarsus ventro-ectal and ventro-distal with 4 large setiferous tubercles each. Both tibia and tarsus flattened dorsally, neither bulbous nor forming a subchela with femur.

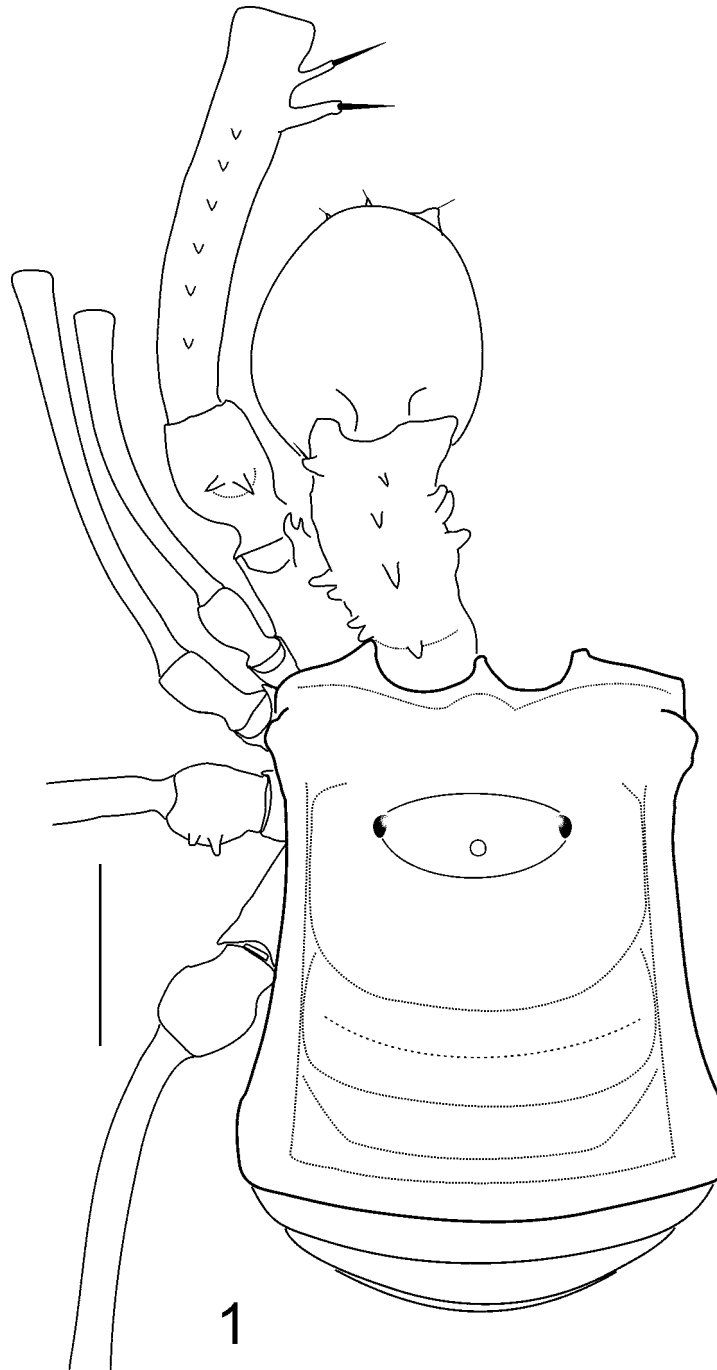
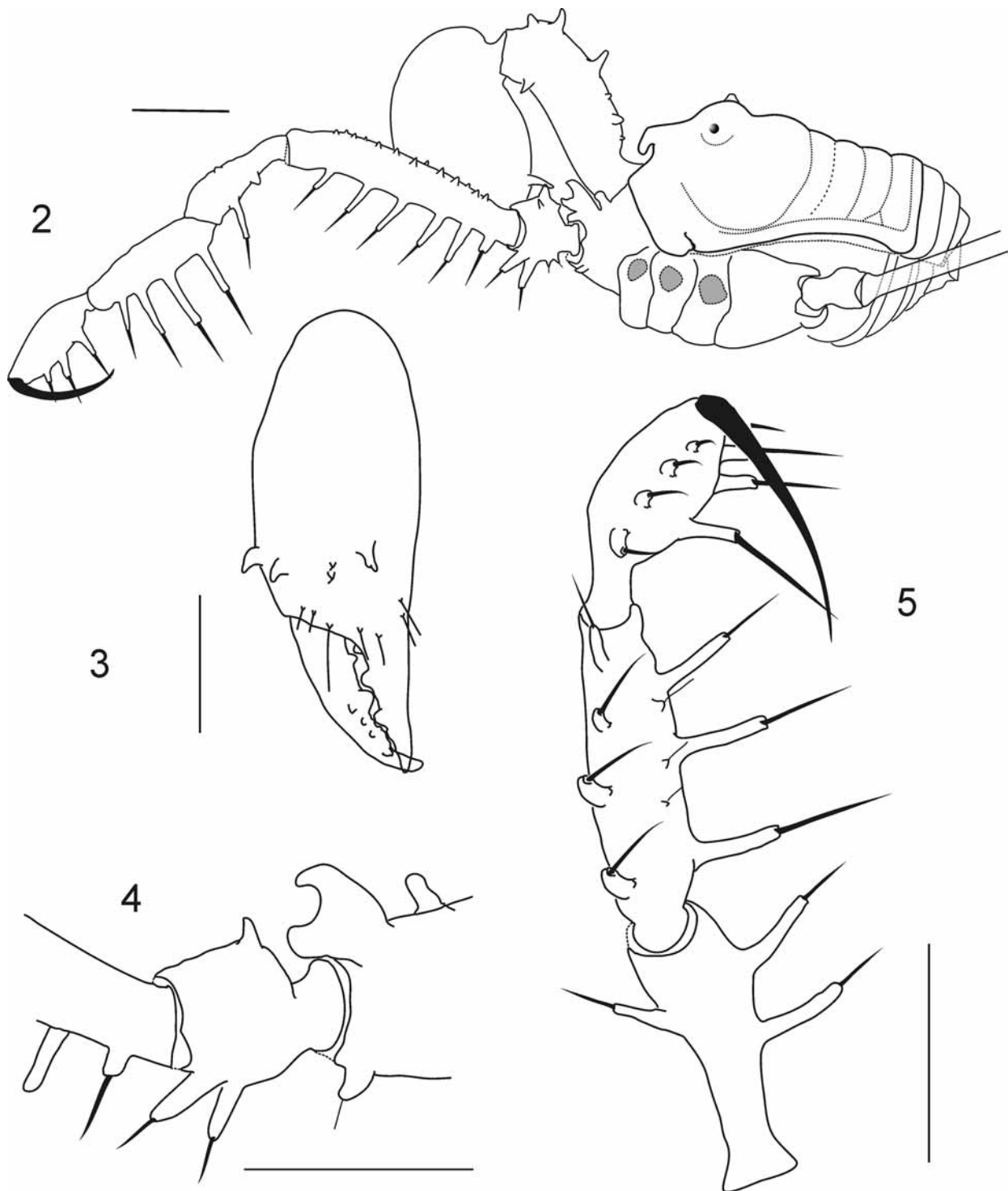


FIGURE 1. *Tocolus javanensis* sp. nova, male holotype from Gunung Puncak, Java, habitus, dorsal view. Scale bar = 1 mm.

Legs. All podomeres slender and unarmed. Coxa IV very small, reaching only posterior border of area I/II, as is typical in epedanids (contrasting to larger coxa, almost reaching end of mesotergum, as for example in

Toccolus minimus, based on Roewer's figure), distal part visible in dorsal view, surpassing peltidium at posterior line of carapace. Tarsal counts: 8(2)/21(3)/?/10.

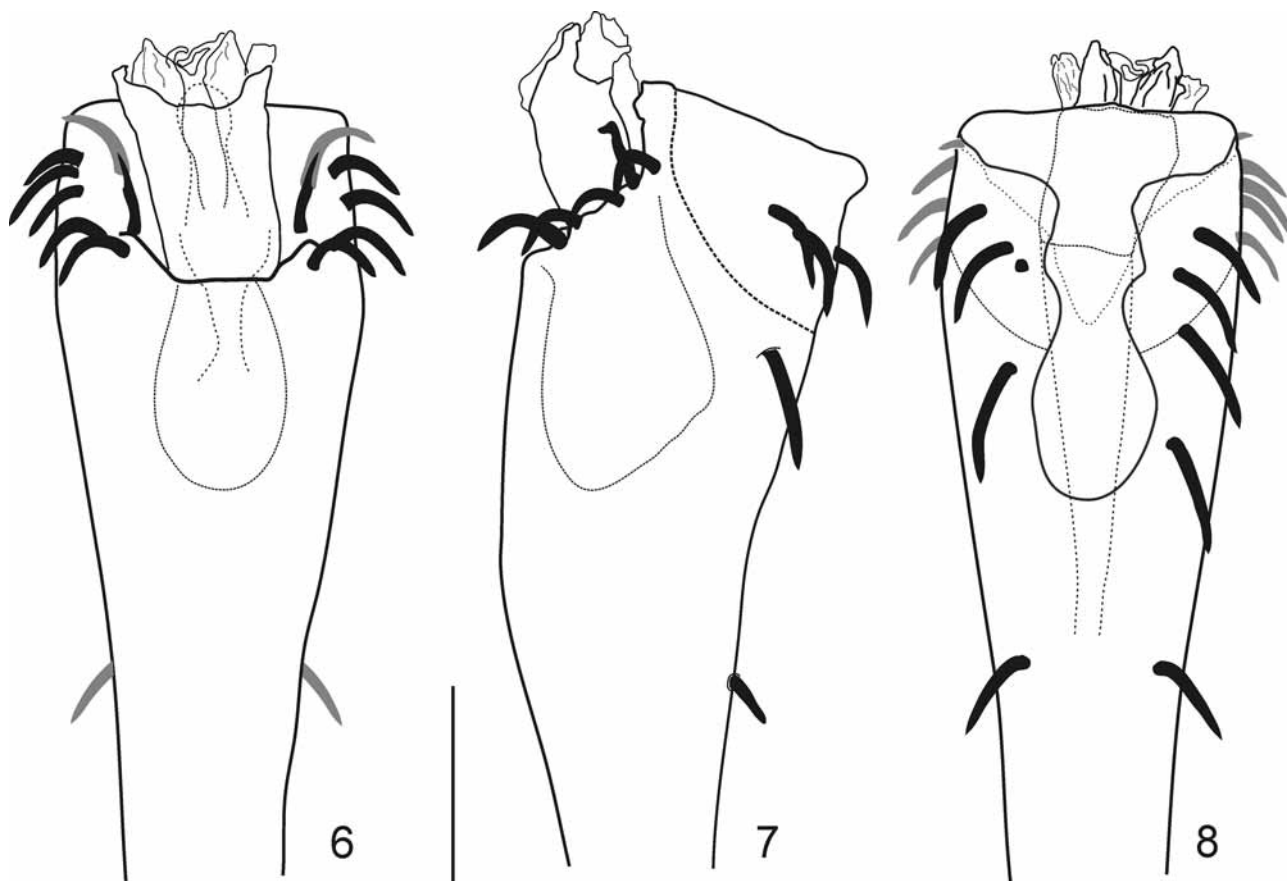


FIGURES 2–5. *Toccolus javanensis* sp. nova, male holotype from Gunung Puncak, Java. 2, habitus, lateral view; 3, Right chelicera, frontal view; 4, Left pedipalpal trochanter, ectal view, detail; 5, Right pedipalpal patella to tarsus, ventral view. Scale bars = 1 mm.

Color. Body and appendages uniform dark orange brown with faint black reticulation. Posterior margin of combined areas I–II with a black rim.

Genitalia (Figs 6–8). Pars distalis of truncus with a broad excavation ventrally forming a thin medial lam-

ina, which bends back upon itself by means of left and right hyaline folds, leaving a long V-shaped opening in the middle. [the previous sentence is not clear. A thin median lamina is not evident in the figure. The truncus seems to have more of an excavation, rather than being concave. Also, the line in the lateral view (f.7) seems to be a sharp edge and so should also be visible in the ventral view. The dorsal part of pars distalis slopes gently, forming a terrace from which the glans projects. The numerous paired setae are distributed as follows: 1) 1 pair ventro-basal on the pars distalis of truncus; 2) 1 pair ventral strongly asymmetrical on the base of the folds; 3) 3 ventral pairs along the hyaline part of the folds; 4) 5–6 strongly curved setae on each side encircling the glans insertion; 5) 1 pair of erect setae flanking the glans. Glans formed by a follis including two stages, basalmost column more or less rigid, and a complex of haematodochae surrounding the stylus, which is not free.



FIGURES 6–8. *Tocolus javanensis* sp. nova, male holotype from Gunung Puncak, Java, penis distal part. 6, dorsal view; 7, lateral view; 8, ventral view. Scale bar = 0.1 mm.

Discussion

Judging from the illustrations given by Roewer (1923) and Loman (1893), the only known specimen of *Dino weberi* must be a female (Roewer stated “sex uncertain”). The cheliceral hand not being swollen is a strong indicator of this supposition.

The similarity between *D. weberi* and *T. javanensis* is immediately apparent, which initially led me to consider the generic allocation of the new species to *Dino*. The following concordant characters may be cited: (1) peltidium virtually identical in dorsal view, down to details such as the protoglyph (cheliceral socket) and the frontal teeth; (2) Pp Coxa strongly developed; (3) general proportions of Pp articles; (4) scutal grooves very faint and arched frontward.

On the other hand, there are striking differences between *T. javanensis* and *D. weberi*, which suggest they are not male and female of the same species: (1) basichelicerite robust (instead of very long and slender); (2) Pp Coxa with huge dorsal hook (instead of unarmed); (3) leg I weak (instead of extremely robust); (4) ocularium well defined, though low (instead of eyes separated, placed back on the carapace); (5) pedipalpal spination and shape of spines is very different (although the trochanter, as drawn by Loman, is similar to the new species). Similarities 2 and 5 (and also 1?) are probably due to sexual dimorphism, which remains unknown in the genus. In Epedanidae, sexual dimorphism is expressed mainly in the form of the cheliceral hand.

I have seen differences such as 3 and 4 among species of the same genus in the gonyleptid subfamily Tricommatinae: in *Caramaschia* one species has lost the ocularium (Kury 2002) while in the others it is normal (Kury, unpubl. data); in *Spinopilar* only one species has very stout leg I while it is normal in all other species (Kury, unpubl. data).

It remains a mystery why Roewer included *Dino* in the Podoctinae. It does not share a single synapomorphy of the family Podoctidae, as defined by Kury (2007). The biantid-like disposition of the eyes in *Dino weberi* also occurs in the Dibuninae and might suggest a possible placement in this group, but none of the putative synapomorphies of Dibuninae (Kury & Mendes, unpubl. obs.) occur in *Dino*. Furthermore, it seems that Roewer, in his interpretative drawing, exaggerated the position of the eyes backwards and apart to resemble more closely the biantid-style (Roewer 1923: 179, fig 200). In fact, Loman's original drawing (Loman 1893: pl. 1, fig. 10) shows that an ocularium is absent, but the eyes are in the ordinary position, in front, and much closer to each other, which is quite consistent with *T. javanensis*.

The Roewerian paradigm for illustrations may also be responsible for keeping *Dino* outside Epedanidae: Roewer illustrated *Dino weberi* in dorsal view (repeating the same view as Loman's drawing) while the standard for his Epedanidae drawings was the lateral view. The result is that my own illustrations of *T. javanensis* in the two views either strongly resemble *Dino weberi* (dorsal view) or typical epedanines, such as *Toccolus* (lateral view).

Based on the basichelicerite/ocularium shape, mesotergal armature and spination of pedipalpal femur, *Dino* seems to be closest to *Toccolus* Roewer, 1927 (from Malaysia, Thailand and Vietnam). The new species seems to be an intermediate between *Dino* and the three known species of *Toccolus*. The largest anchor-shaped dorsal apophysis of the pedipalpal coxa of *T. minimus*, (Roewer 1927: fig 20) is clearly reminiscent of that of *T. javanensis*. The drawings of *Toccolus chibai* by Suzuki (1976: figs 5D–G) show a genital morphology very closely matching that of *T. javanensis*. It appears that *Dino weberi* is a specialized *Toccolus* with modified pedipalps, leg I and ocularium, while *T. javanensis* has an intermediate, low ocularium. If this proves to be the case, the genus *Dino* would have to be expanded to include *Toccolus* because it would otherwise leave *Toccolus* paraphyletic. However, in the absence of a cladistic analysis of the genera of Epedanidae, this is only speculation at present. Finally, it is worth noting that the asymmetry of the setae on the pars distalis of the truncus penis, which occurs very clearly in *T. javanensis*, has previously been recorded only in Epedanidae among Laniatores, as clearly illustrated in the literature (e.g., Suzuki 1969: fig. 11; Suzuki & Stone 1986: fig. 8), although it is also known in Phalangodidae (D. Ubick, *in litt.*, 2008).

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