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A new species of the genus *Tithaeus* from China (Arachnida: Laniatores: Epedanidae)

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Abstract

The genus *Tithaeus* Thorell, 1891 is newly recorded from China with a new species: *T. drac*, based on specimens collected from Guangxi Province. The new record represents an expansion of 700 km to the northeast of the known range of the genus. The taxonomic status of the genus *Tithaeus* is discussed, based on external and male genital morphology.

Key words: Opiliones, Laniatores, *Tithaeus*, new species, China, Indo-Malaysian Region, WWF Ecoregions

Introduction

Opilionids of the genus *Tithaeus* Thorell, 1891 are usually average-sized, with a body length of 2.5–5.0 mm, and mainly collected under stones and rotting wood, but can sometimes be found in forest leaf litter. Since being established by Thorell (1891) for the Malaysian species *T. laevigatus*, 33 species have been reported from southeast Asia (Indo-Malaysian Region).

Tithaeus was placed in the subfamily Phalangodinae of Phalangodidae by Roewer (1912, 1923, 1949). Suzuki (1969a, 1969b, 1972, 1985) followed this placement and described 5 new species from Malaysia and Thailand. Kury (1993, 2003, 2006) transferred *Tithaeus* to the Epedanidae, based on the form of the male genitalia.

Several small, monotypic genera from SE Asia—*Istithaeus* Roewer, 1949 (Borneo), *Kondosus* Roewer, 1949 (Borneo), *Metatithaeus* Suzuki, 1969 (Brunei), *Sterrhosoma* Thorell, 1891 (Sumatra), *Tithaeomma* Roewer, 1949 (Myanmar)—which do not appear to be distinct from *Tithaeus*, apart from tarsal counts and other minor details. The status of these genera therefore requires further study.

To date, 13 species belonging to 12 genera of Laniatores have been reported from China (Li & Song 1993; Zhu & Lian 2006). Based on an examination of the arachnological collections of the Museum of Hebei University (MHBU), the genus *Tithaeus* is here recorded from China for the first time, with a species described as *T. drac* **sp. nov.** Types of the new species are deposited in the Museum of Hebei University, Baoding, China (MHBU). All measurements are given in mm.

Systematics

Tithaeus Thorell, 1891

Tithaeus Thorell, 1891: 371, type species by original designation: *Tithaeus laevigatus* Thorell, 1891; Loman, 1905: 33; Roewer, 1912: 120 (in part); 1923: 79; 1927: 279; 1949: 44; Banks, 1931: 67; Suzuki, 1969a: 24; 1972: 3.

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Sinis Loman, 1892: 12 [junior homonym of *Sinis* Heer 1862 (Coleoptera) and of *Sinis* Thorell 1878 (Araneae)].
Sinniculus Loman, 1902: 198 [valid replacement name for *Sinis* Loman, 1892].

Diagnosis. Medium-sized epedanids with a low or moderate common eye tubercle removed from the anterior margin of carapace, without a median spine. Few with a slight hump situated between the eye tubercle and the anterior margin, lower than eye tubercle. Scutal region divided into five areas. Palpus relatively short and thickened, its femur and patella each usually provided with a setiferous tubercle medially-distally. Tarsal formula (I–¦IV): 5: more than 5: 5: 6. Distitarsi of first and second tarsus usually with two tarsalia each. Tarsi III–IV with simple and smooth double claws, no scopulae. Distal margin of ventral plate of penis usually with deep cleft, glans with simple membranous lobe to protect the stylus, stylar tip ending with a bifurcate lobe or slightly inflatable. Each lobe of ovipositor usually with 2 ventral and 2 dorsal setae.

Distribution. Indo-Malaysian Region: Burma (Myanmar), Indonesia, Malaysia, Singapore, Thailand, (Roewer 1912, 1923, 1949; Suzuki 1969a, 1969b, 1972, 1985) and China (new record). There is a record from Timor in the Australasian Region, but this is highly doubtful because it does not fit with the known distribution of the genus, otherwise confined to the Indo-Malaysian side of Wallace's Line (Fig. 3). Timor is a common word in Bahasa Indonesia and applies to many different places. In the absence of further records of *Tithaeus* from Australasia, and in view of the notorious cases of mislabelled localities in the Roewer collection (e.g., Helversen & Martens 1972; Kury 2003), it is reasonable to assume a mislabeling by Roewer. On the other hand, significance of the Wallace's Line and other related lines in the Wallacea is evident for mammals, birds, some reptiles, and freshwater fish. However, biogeographical boundaries between Oriental and Australasia are rather obscure for insects and arachnids in the Wallacea. In Opiliones there are many representatives that are distributed in both western and eastern part of Indonesia beyond the Wallace's Line, like laniatorids Dampetrinae, podoctids such as *Ibalonius* Karsch, 1880 and epedanids such as *Beloniscus* Thorell, 1891 (assuming these taxa do represent monophyletic units).

***Tithaeus drac* sp. nov.**
(Fig. 1)

Type material. Female holotype, CHINA: Guangxi Province, Longsheng County, Hongtan village, about 700 m alt., 24°83'N, 110°26'E, 12 Sep. 2005, Gao Chao leg.; 1 male paratype, same details as holotype.

Additional material. Two females, CHINA: Guangxi Province, Tianlin County, Langping village, about 1125 m alt., 24°29'N, 106°216'E, 27 May, 2006, Ming-Sheng Zhu and Wei-Guang Lian leg. WWF Ecoregion IM0118 (Jian Nan subtropical evergreen forests).

Etymology. Species name refers to the fictitious reptilian species called "drac" from the 1985 science fiction film "Enemy mine", produced by Twentieth Century Fox and directed by Wolfgang Petersen. The shape of the drac's head is strongly reminiscent of the cheliceral bulla of *T. drac* **sp. nov.**.

Diagnosis. The new species is similar to *T. similis* Suzuki, 1985, described from northern Thailand (Suzuki, 1985: 78–79, fig 5) in general appearance, but differs distinctly from the latter by the following characters: 1) Female materials with larger body in size, chelicera and palpus strong and completely similar to male; 2) cheliceral bulla of male with notable posterior granulous elevation, absent on *T. similis*; 3) the distal margin of ventral plate of penis has a small shallow cleft compared to the deeper cleft of *T. similis* and the setae of the ovipositor are distinctly longer.

Description. Female (holotype) habitus as in Figs 1A–B. Coloration: body and appendages entirely dark brown; carapace and eye tubercle with yellow-brown reticulation; lateral margins and opisthosomal areas of scutum, and free tergites banded with black brown; chelicerae and palpus dark brown, with yellow dots above; legs dark brown, with yellow dots on the dorsal surface from trochanter to tibia.

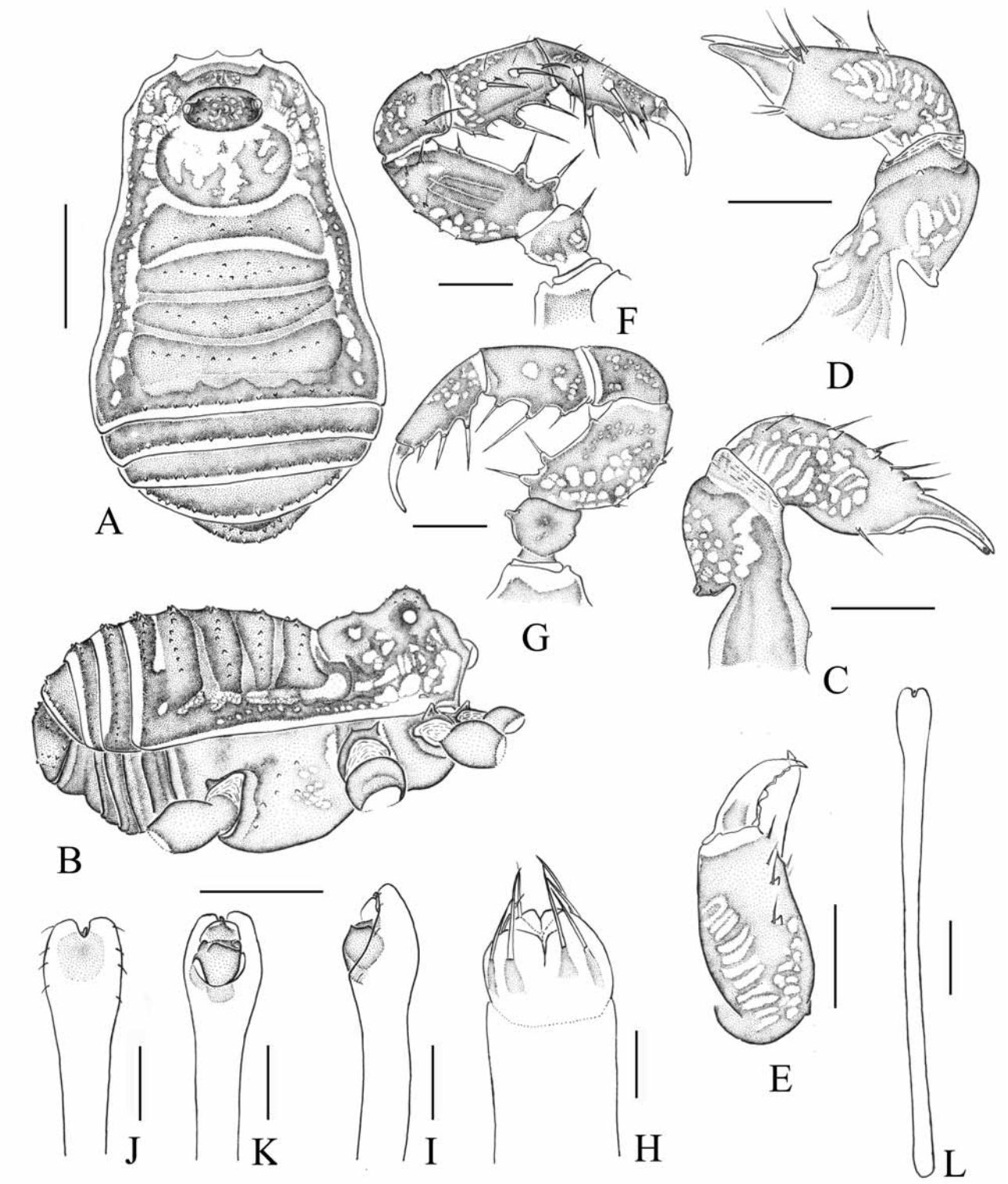

FIGURE 1. *Tithaeus drac* **sp. nov.** (A–H female holotype, I–L male paratype). A. Female body, dorsal view. B, Female body, lateral view. C, Left chelicera, female, anterior view. D, Left chelicera, female, posterior view. E, Distal segment of the left chelicera, female, above view. F, Left palpus, female, anterior view. G, Left palpus, female, posterior view. H, Ovipositor. I, Penis, lateral view. J, Penis, ventral view. K, Penis, dorsal view. L, Whole penis. Scale bars: A–B, 1.0 mm; C–G, 0.5 mm; H, L, 0.2 mm; I–K, 0.1mm.

Dorsal scutum trapezoid in shape; abdomen blunt behind. Eye tubercle broad oval, removed from the anterior border of carapace, without a median spine. Opisthosomal region of scutum with five areas. A row of

rounded tubercles along the lateral margins of the scutum. Free tergites each with a transverse row of conical tubercles spread over its entire width.

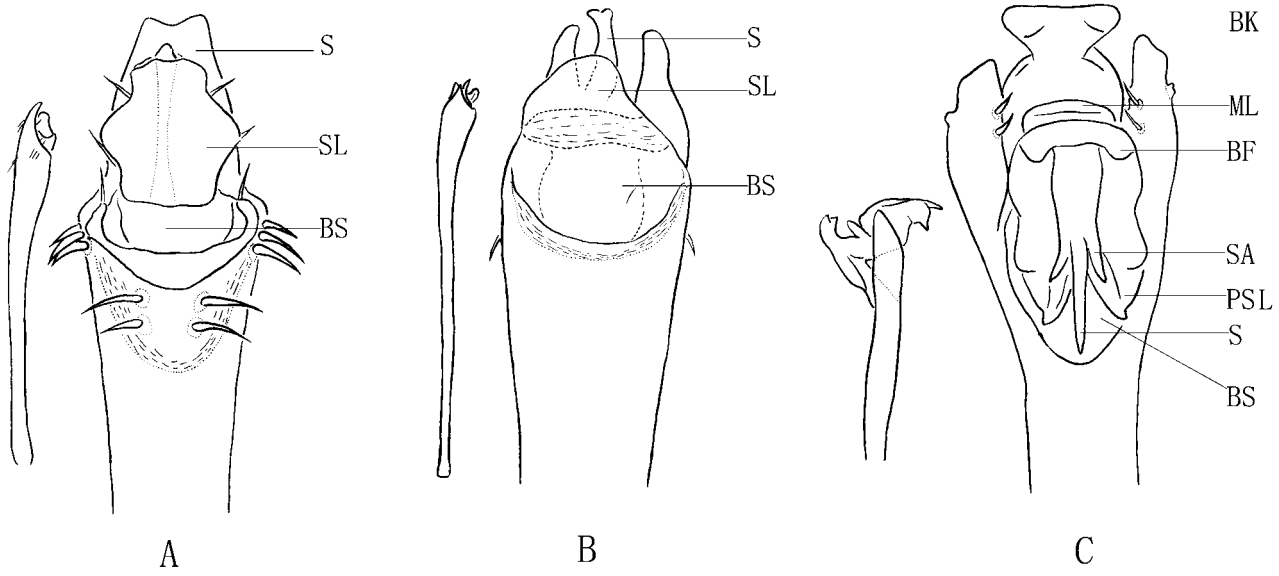

FIGURE 2. A, *Kilungius insulanus* (Hirst, 1911) (redrawn from Suzuki 1973). B, *Tithaeus similis* Suzuki, 1985 (redrawn from Suzuki 1985). C, *Texella bilobata* Ubick & Briggs, 1992 (redrawn from Ubick & Briggs 1992). Abbreviations: S = stylus, SL = stylar lobe , BS = basal sac, BK = basal knob, ML = middle lobe, SA = stypar apophysis, PSL = parastylar lobe.

Venter. Coxa I armed with two transverse rows of hair-tipped granules, these distinctly larger than the remaining granules scattered on coxae II–IV. Dorsal surface of coxa IV with several slightly larger hair-tipped tubercles. Coxa III with a row of low humps along the frontal and rear margins. Tracheal stigma clearly visible. A transverse row of very small, hair-tipped granules across each free sternite.

Chelicera (Figs 1C–E). Proximal segment relatively long, visibly swollen disto-dorsally, with notable posterior granulous elevation. Second segment widened, with two slightly larger tubercles in the middle of the prodorsal surface (Fig. 1E). Fingers relatively short but strong; inner edges toothed as illustrated (Fig. 2E)

Palpus (Figs 1F–G) short and robust, femur especially so. Trochanter ventrally with a short setiferous tubercle followed transversely by a small hair-tipped tubercle. Femur ventrally with three setiferous tubercles, distally on prolateral side with a short setiferous tubercle as illustrated. Patella medio-distally with a setiferous tubercle. The ventral surface of tibia and tarsus with three prolateral and retrolateral setiferous tubercles respectively arranged as illustrated (Figs 1F–G). Tarsal claw longer than one half length of tarsus, strongly curved.

Legs slender and relatively elongated. Femora I–IV straight. All leg segments unarmed, with very short hairs. Tarsi III–IV with simple double claws, no scopulae. Tarsal formula: 5/11/5/6. Distitarsi of first and second tarsi each with two tarsalia.

Ovipositor as illustrated (Fig. 1H). Each lobe with 2 ventral and 2 dorsal setae.

Male. Shape, coloration and markings similar to the female, but smaller in size. Tarsal formula (I–IV): 5/10/5/6.

Penis (Figs 1I–L**)**. Ventral plate with a moderate cleft in middle of distal margin; setae arranged as shown in Fig. 2J. Basal sac inflatable, developed immovable and partly sunken into truncus, lacking complex introverting structures, stylus smooth and arising straight from the glans, stylar tip ended sharply and unexpanded, stylar lobe entire and warped upwards surrounding the stylus.

Measurements: Holotype female (male paratype in parentheses): Body 3.97 (3.89) long, 2.38 (2.38) wide at the widest portion, scutum 3.10 (3.02) long; eye tubercle 0.68 (0.65) long; 0.35 (0.35) wide. Measurements of left palpus and legs as in Table 1.

Habitat. Collected under humid fallen logs on a hill near village.

Distribution: Guangxi Province, China.

TABLE 1. Measurements (in mm) of palpus and legs of female holotype and male paratype (in parentheses).

	Trochanter	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
Palpus	0.38 (0.35)	0.91 (0.84)	0.65 (0.42)	0.84 (0.65)	–	0.84 (0.75)	3.62 (3.01)
Leg I	0.48 (0.40)	1.90 (1.51)	0.63 (0.63)	1.59 (1.51)	2.62 (1.98)	1.90 (1.26)	9.12 (7.29)
Leg II	0.63 (0.63)	4.76 (3.33)	0.95 (0.87)	4.60 (3.02)	6.59 (3.97)	3.73 (2.78)	21.26 (14.60)
Leg III	0.63 (0.71)	2.38 (2.07)	0.79 (0.71)	1.98 (1.67)	2.94 (2.46)	1.98 (1.67)	10.70 (9.29)
Leg IV	0.71 (0.63)	3.41 (2.78)	0.95 (0.79)	2.86 (2.22)	4.13 (3.57)	2.38 (1.90)	14.44 (11.89)

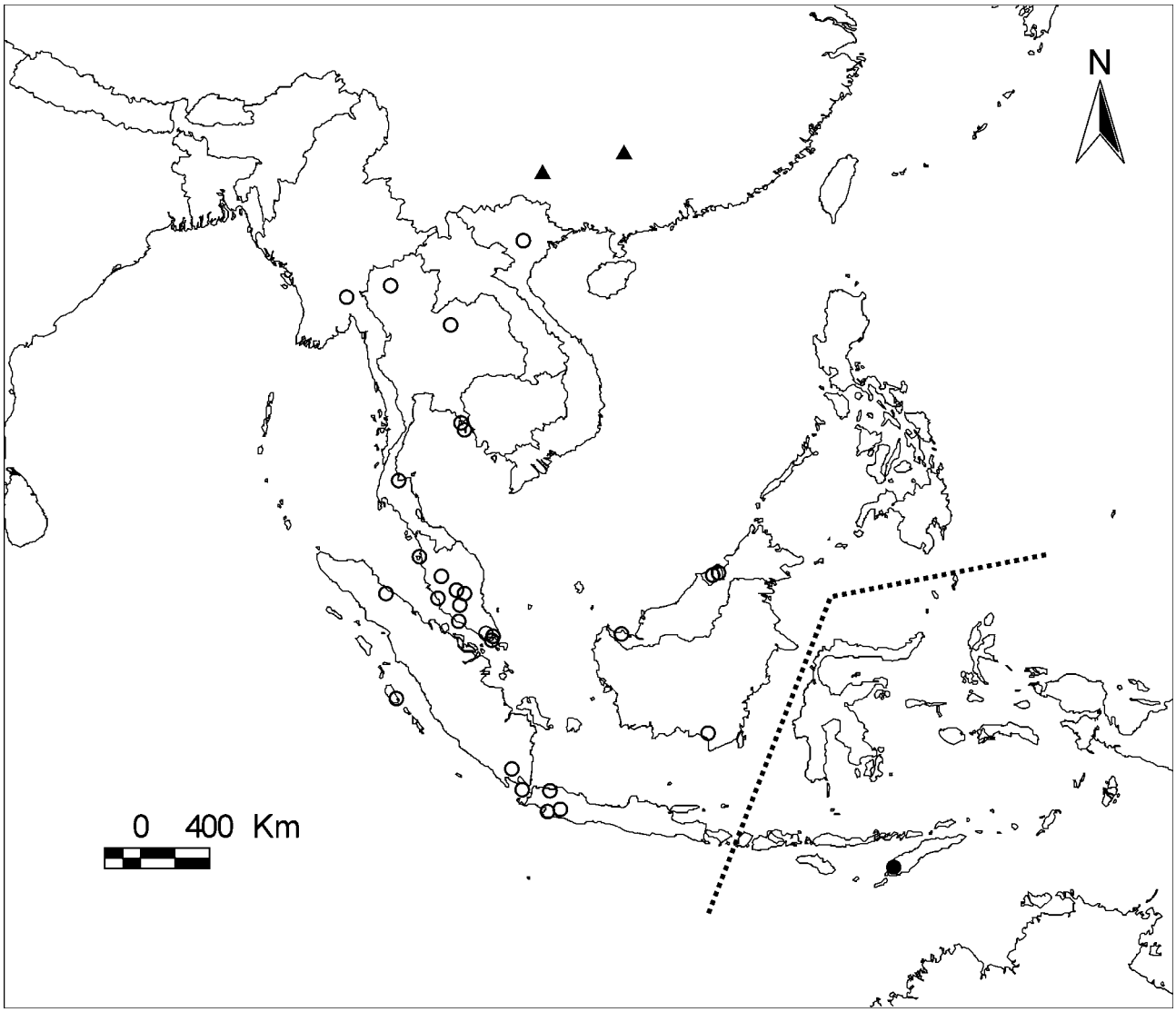

FIGURE 3. Southeast Asia, showing the distribution of species of *Tithaeus* from literature records (open circles), the doubtful record for Timor (black circle) and the records for the new species described here: *Tithaeus drac* (black triangle).

Discussion of the familial assignment of the genus *Tithaeus*

The genus *Tithaeus* was placed in the subfamily Phalangodinae of Phalangodidae by Roewer (1910, 1912, 1923, 1949), based on morphological characters such as scutal region with five areas, palpus relatively short and thick, femur I without spines, tarsi III and IV without scopula and distitarsus I with two tarsalia. Roewer ignored other valuable diagnostic characters, such as the male penis, as important criteria. Suzuki (1969a, 1969b, 1972, 1985) conserved this placement. It was not until the work of Kury (1993, 2003) that the genus was transferred into Epedanidae.

Epedanidae was founded by Sørensen (1886) and included numerous genera, most of which belong to the Biantidae and Podoctidae as now conceived. Pocock (1903) considered Epedanidae to be a junior synonym of the family Phalangodidae Simon, 1879. Rower (1923) followed Pocock and recognized the following 12 subfamilies under Phalangodidae: Samoinae, Phalangodinae, Tricommatinae, Biantinae, Stygnommatinae, Ibaloniinae, Podoctinae, Erecananinae, Acrobuninae, Sarasinicinae, Epedaninae and Dibuninae. However, numerous taxa of this family have been removed to other families or promoted to family status by later authors (e.g. Mello-Leitão 1949). Roewer's system overemphasized the importance of easily visible somatic characters, such as variations in the tarsal count, in defining genera (Ubick & Briggs 1989). However, four subfamilies, Acrobuninae, Sarasinicinae, Epedaninae and Dibuninae, were removed from the Phalangodidae and grouped together to form the Epedanidae by Kury (1993, 2003), based mainly on the presence of a well developed immovable sac (which he called 'follis') and the absence of complex introverting structures in the penis. According to these characters, *Tithaeus* was transferred to Epedanidae, but a detailed discussion is still needed. The members of this family are predominantly Southeast Asian, with a few others being found in Japan, China and Nepal.

It is not obvious to assign *Tithaeus* to the Epedanidae because it lacks the striking features of typical members of the family, e. g., the greatly elongate pedipalps, high erect spine on eye tubercle, fused scutal areas I–II, specialized side-branches in posterior claws and well developed cheliceral fingers with stout dentition. The external morphology of *Tithaeus* species is very conservative, probably close to the groundplan of the Grassatores. However, the male genitalia offers some evidence of an epedanid relationship.

In Figure 2, the male genitalia of *Tithaeus similis* Suzuki, 1985 is compared with a representative of each Phalangodid and Epedanid, respectively *Texella bilobata* Ubick & Briggs, 1992 and *Kilungius insulanus* (Hirst, 1911). The penis of *T. bilobata* (Fig. 2C) features a movable inflatable basal sac, and a complicated distal glans with many external sclerites, which include a bifurcate basal knob (BK), a broad middle lobe (ML), a basal fold (BF), a compressed stylus (S), two stylar apophyses (SA) and a complicated parastylar lobe (PSL). All the terms and abbreviations used here for the male genitalia follow Ubick & Briggs (1992). In sharp contrast, the penis of *Kilungius insulanus* (Fig. 2A) is far simpler than that of *T. bilobata*: the glans has only an inflatable basal sac (BS) partly sinking into the truncus, an upturned stylar lobe (SL) protects the simple stylus, and the tip of stylus is slightly expanded. Evidently, the penis of *Tithaeus similis* (Fig. 2B) shows closer relationship to *Kilungius insulanus* than to *Texella bilobata*.

In addition to *T. similis*, three other species of *Tithaeus*—*T. watanabei* Suzuki, 1969, *T. kokutnus* Suzuki, 1985 and *T. drac* **sp. nov.**—also show great similarity to *K. insulanus*. Of the more than 30 species included in *Tithaeus*, only a few have been described and illustrated in detail. However, the genital morphology of all those species is consistent with an epedanid affinity of the genus *Tithaeus*. To reinforce this assignment, it will be necessary to examine the type species and carry out a systematic revision combining somatic and genital characters.

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