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Article

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The millipede family Niponiosomatidae new to the fauna of Taiwan, with descriptions of a new genus and two new species (Diplopoda, Chordeumatida)

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Abstract

A new genus and two new species of the millipede order Chordeumatida, family Niponiosomatidae, are described from Taiwan: *Taiwaneuma* **gen. nov.**, *Taiwaneuma crinitum* **sp. nov.** (the type species) and *Taiwaneuma ramuligerum* **sp. nov.** The family Niponiosomatidae is new to the fauna of Taiwan. The distributions of both new species are mapped.

Key words: Millipede, chordeumatidans, new genus, new species, new record, taxonomy, distribution, Taiwan

Introduction

The millipede order Chordeumatida has hitherto been known to be represented in Taiwan by species of the families Diplomaragnidae and Speophilosomatidae (Verhoeff 1936; Takakuwa 1954; Wang 1958; Shear 1990, 1999; Shear *et al*. 1994; Mikhaljova 2000; Korsós 2004; Mikhaljova *et al*. 2010). However, the record of Speophilosomatidae in Taiwan still remains dubious. Wang (1958) referred to an unidentified species of *Speophilosoma* Takakuwa, 1949, found at Yu shan (= Mt Yu Shan, Nantou County), based only on a single female. In turn, Korsós (2004), based on that record, as well as a few new samples from Shiji, Ilan County he had not examined more closely, considered it possible to identify the material from Taiwan as representing *Speophilosoma montanum* Takakuwa, 1949, the type species of the genus originally described from Mt Fuji-san, Honshu, Japan (Takakuwa 1949). Since we have obtained additional material from Ilan County for the present study, we are rather inclined to question the occurrence of Speophilosomatidae, let alone *S. montanum*, in Taiwan altogether (see also below).

Instead, among the samples of small-sized chordeumatidans from Taiwan, kept in the collections of the Taiwan Forestry Research Institute, Taipei, and the Department of Biological Sciences, National Sun Yat-Sen University, Kaohsiung, as well as in the Hungarian Natural History Museum, Budapest, Hungary, a new genus and two new species have been found which appear to belong in the family Niponiosomatidae. This family is new to the fauna of Taiwan.

Material and methods

Material treated here has been shared between the collections of the Taiwan Forestry Research Institute, Taipei, Taiwan (TFRI), Institute of Biology and Soil Science, Far Eastern Branch, Russian Academy of Sciences, Vladivostok, Russia (IBSS), Zoological Museum, State University of Moscow, Russia (ZMUM), Department of Biolog-

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ical Sciences, National Sun Yat-Sen University, Kaohsiung, Taiwan (NSYSUB), National Museum of Natural Sciences, Taichung, Taiwan (NMNS), and Hungarian Natural History Museum, Budapest, Hungary (HNHM), as indicated in the text.

Specimens were collected in 70–75% ethanol. During the study, the gonopods and some other parts were dissected from a limited number of males and mounted in glycerin as temporary micropreparations. Specimens were studied and illustrated using standard stereomicroscopic and drawing equipment. SEM micrographs were prepared at the Centre of collective use "Biotechnology and Gene Engineering" of the IBSS in Vladivostok, Russia using a Zeiss Evo 40 scanning electron microscope. Mounts for SEM were made through air-drying after transfer to acetone via 96% alcohol, mounting on stubs, and coating with gold and platinum. After examination, SEM material was removed from stubs and returned to alcohol, all such samples being kept at IBSS.

Female genitalia were not examined both due to paucity of material and to their presumably dubious taxonomic importance.

Taiwaneuma gen. nov.

Diagnosis. Differs from the other genera of Niponiosomatidae by the anterior gonopods showing far better developed and more complex angiocoxites which are supplied with various outgrowths and branches, coupled with simpler, slender, oblong-coniform, apically flagelliform, soft colpocoxites.

Description. Body with 28 segments, weakly sclerotized. Paraterga small, rounded. Antennae long, slightly clavate. Antennomere 3 longest. Head with genae wider than collum. Mentum poorly sclerotized, not divided. Genae strongly convex. Fore margin of labrum with three median teeth. Prominent spines on labral angles absent. Ocellaria present, subtriangular. Collum not covering head from above. Each metatergite with 3+3 macrochaetae. Tegument of metatergites densely alveolate, short and low ridges running longitudinally and scattered over metatergal surface. Telson without process, posterior margin of telson entire, without excavations, two spinnerets produced behind a declivous caudal margin of epiproct.

Secondary sexual characters of males: Pregonopodal legs normal, neither enlarged nor otherwise modified. Leg pairs 1 and 2 as usual, with tarsal combs. Vas deferens opening through male coxa 2 on a short tube. Male leg pair 7 normal, yet each coxa either slightly excavate or flat. Tarsal papillae absent. Legs 10 and 11 with coxal glands. Coxae 10 with a small outgrowth ventrally.

Gonopods: Anterior gonopods placed on rudimentary sternites. Mesal angiocoxites of anterior gonopods fused into a single structure, with long setae basally, two lateral lobes and several processes distally. Each lateral angiocoxite with long setae proximally, posterolateral process bearing three apical setae at about midway, as well as lobes and outgrowths distally. Colpocoxites with three pairs of flagella and a soft, poorly-sclerotized, slender, elongate, coniform, apically flagelliform structure. Male legs 9 (often termed as posterior gonopods, which seems to be incorrect because they hardly take part in sperm transfer) with both telopodite and coxite parts well-developed, the latter bearing long setae at a lobiform ventral margin.

Type species: *Taiwaneuma crinitum*, new species.

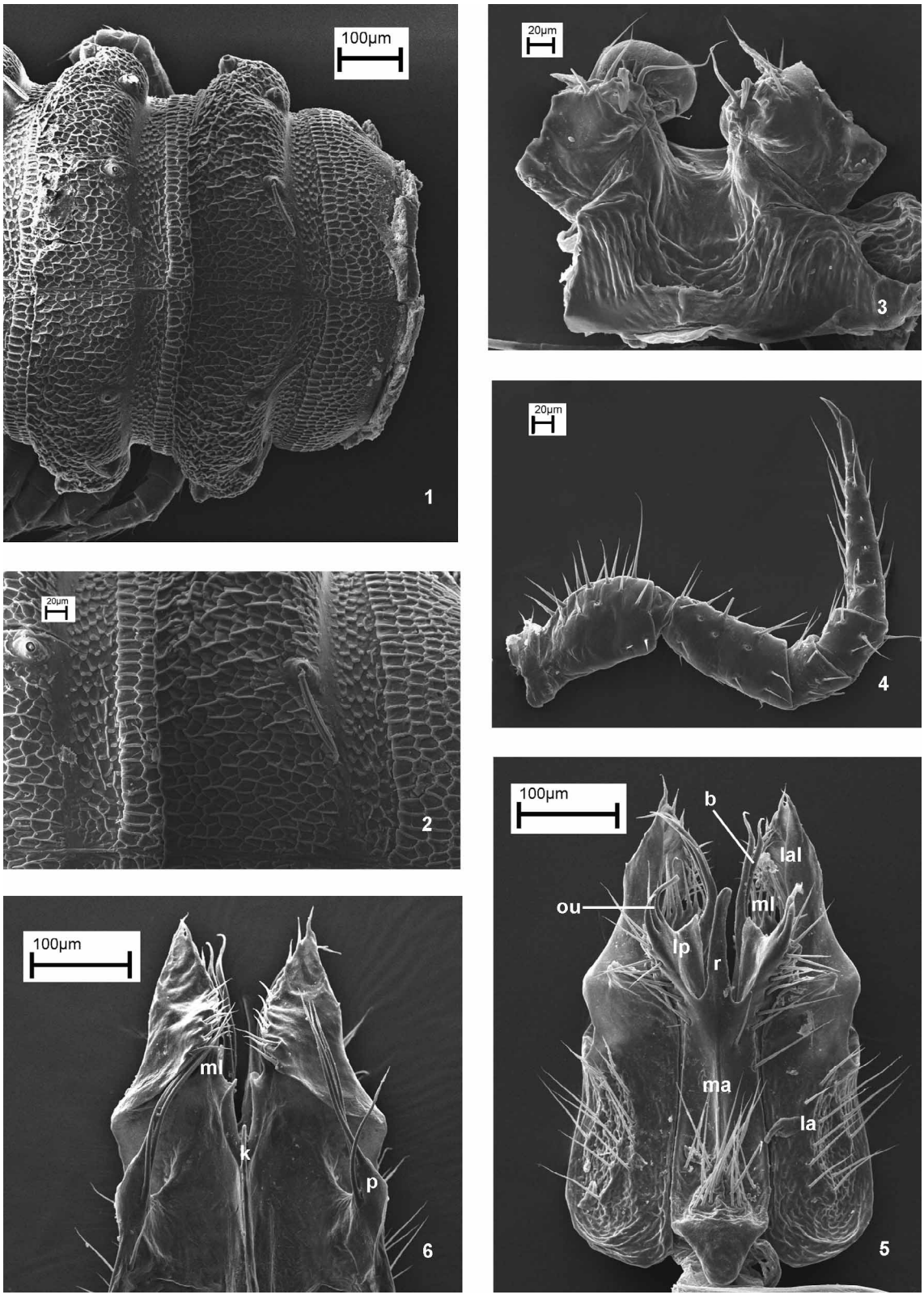
Name. The generic name refers to Taiwan as the locality where the genus is found; gender neuter.

Species included. In addition to the type species *T. crinitum* **sp. nov.**, this genus also contains *T. ramuligerum* **sp. nov.**

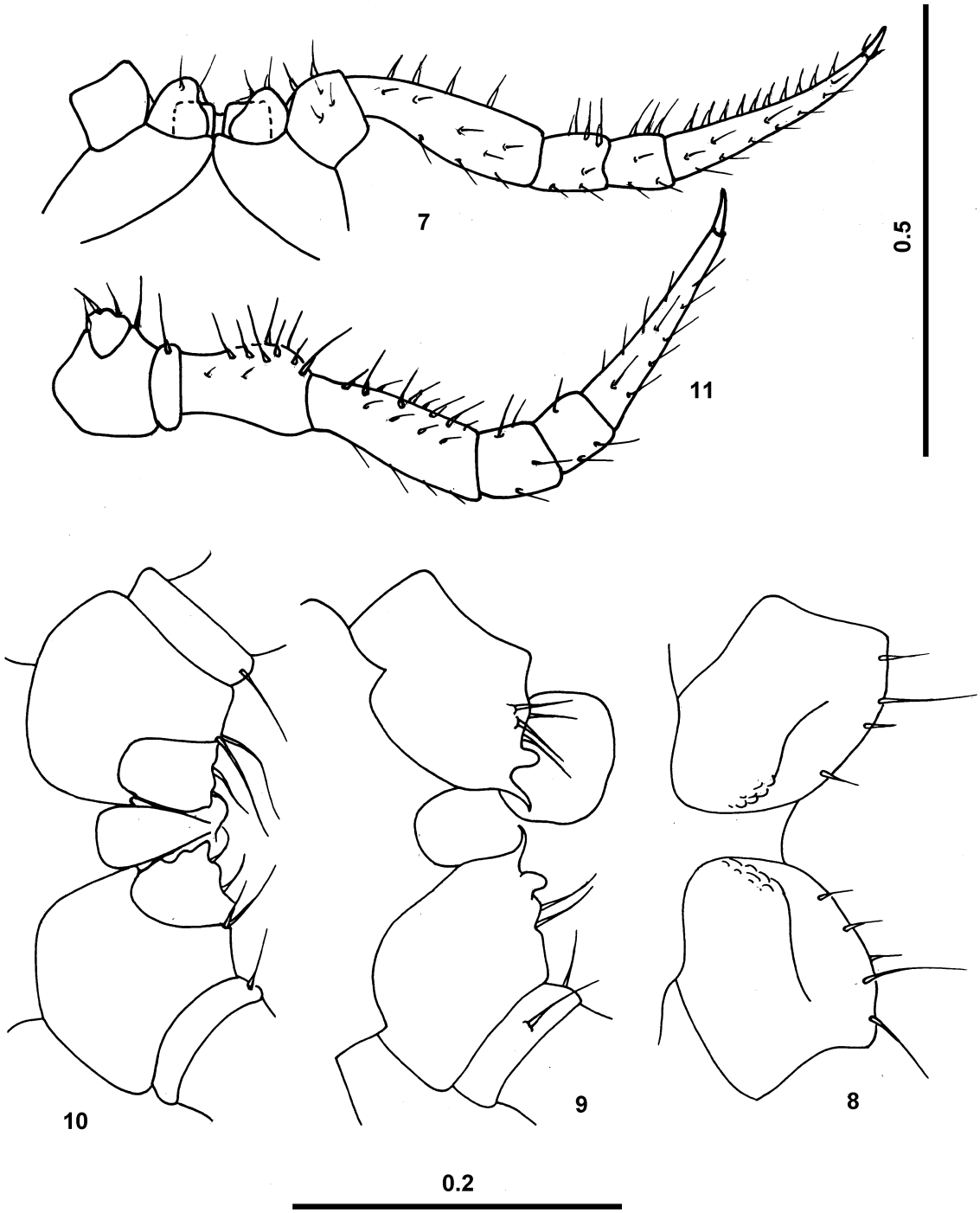
Taiwaneuma crinitum sp. nov.

Figs 1–18

Material examined. *Holotype*: male (TFRI–40000385), Taiwan, Ilan County, Datong Township, near Lakes Jialuohu, ca 2250 m, 26.XII.2002, leg. Y.M. Chen; *Paratypes*: 1 male (IBSS–40000383), same locality, 14.III.2003, leg. Y.M. Chen; 1 male (NSYSUB–40000386), same locality, 27.IV.2003, leg. Y.M. Chen; 1 male, 1 female (IBSS–40000387, 40000382), 1 male (ZMUM–40000388), 1 female (TFRI–40000389), Taiwan, Taichung County, Shengguang, 25.IV.2003, leg. W.C. Yeh.



FIGURES 1–6. *Taiwaneuma crinitum* **sp. nov.**, male paratype. 1, midbody segments, dorsal view; 2, fragment of metatergal surface; 3, coxae 10, caudal view; 4, leg 10; 5, angiocoxites of anterior gonopods, front view; 6, distal half of angiocoxites of anterior gonopods, caudal view; **ma**, mesal angiocoxites; **r**, rod-like process of mesal angiocoxites of anterior gonopods; **lp**, lateral lobe of mesal angiocoxites of anterior gonopods; **ou**, apical outgrowths of lateral lobe of mesal angiocoxites of anterior gonopods; **b**, posterior branches of mesal angiocoxites of anterior gonopods; **la**, lateral angiocoxite of anterior gonopods; **lal**, lateral lobe of lateral angiocoxites of anterior gonopods; **p**, posterolateral process of lateral angiocoxites of anterior gonopods; **ml**, mesal lobe of lateral angiocoxites of anterior gonopods; **k**, slender process of lateral angiocoxites of anterior gonopods.



FIGURES 7–11. *Taiwaneuma crinitum* **sp. nov.**, male paratype. 7, leg pair 2, front view; 8, coxae 7; 9, coxae 10, caudal view; 10, coxae 11, front view; 11, leg 11. Scale bars in mm.

Diagnosis. Differs from *T. ramuligerum* **sp. nov.**, the only other congener, mainly in the presence of two pairs of very long flagella on the anterior gonopod colpocoxite which are concealed inside a groove formed by the excavated postgonopodal coxae, and in the third pair of flagella which is short, as well as by the structure of male leg pair 9.

Description. Male. Length about 9 mm, width with paraterga about 0.8 mm. Coloration in alcohol grey-brown with three broad, light, longitudinal stripes extending from anterior to posterior ends of body: one stripe axial, both others lateral, level to paraterga so that dorsal halves of the latter light while ventral halves brown. Legs pale with marbled brown distal parts. Venter and lower portions of pleura lighter. Ocellaria black. Antennae marbled brown.

Head with a marbled brown vertex, two transversely oval, marbled straw-coloured spots in occipital part, and marbled straw-coloured front part and genae.

Body with 28 segments. Paraterga small, rounded. Head covered both with relatively long and short setae. Ocellaria subtriangular, each composed of at least 20 ocelli. Antennae long, slightly clavate. Distal margin of antennomere 6 with a corolla of short strong setae.

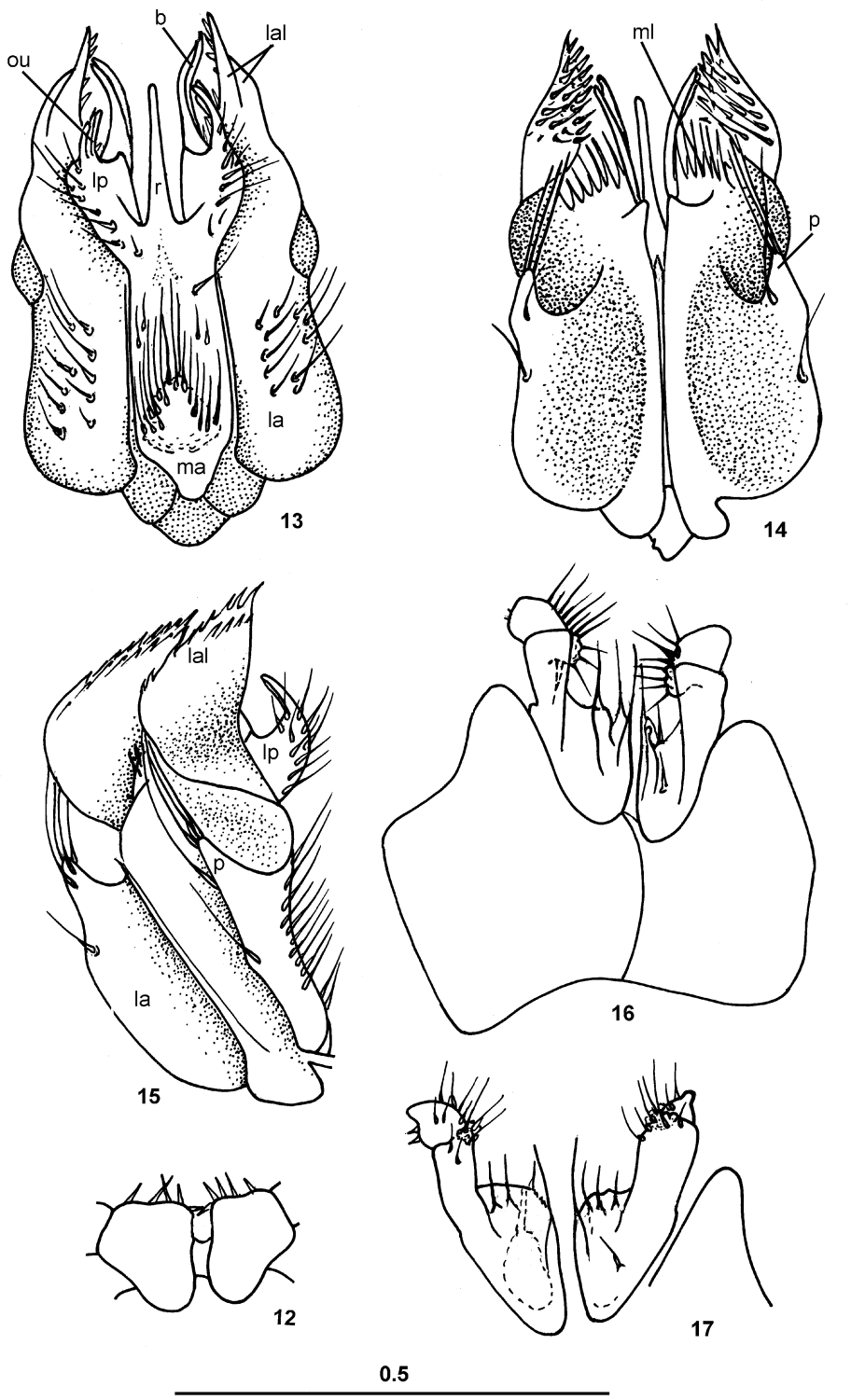
Collum oval. Metatergal setae short, blunt. Posterior body half with both medial and anterolateral tergal setae clavate. Tegument of metatergites alveolate, resembling fish scales with scattered short, low, longitudinal crests (Figs 1, 2). One legless body segment in front of telson. All setae on telson and 1–2 segments in front of it pointed. Spinnerets as usual, each with a long apical seta.

Legs long and slender, ventral setae on all podomeres except tarsi with stronger and sharper setae, especially on midbody coxae where these setae spiniform. Tarsal papillae absent. Claw normal, at base with only a tiny setoid structure dorsally. Pregonopodal legs normal, neither enlarged nor otherwise modified. Each vas deferens opening through coxa 2 on a short tube surrounded by a cup-shaped structure open anteriorly and sparsely setose (Fig. 7). Claws of leg pair 2 at base with a tiny additional claw dorsally and a short filament ventrally. Leg pair 7 normal, but each coxa slightly excavate mesally (Fig. 8); claw with a tiny setoid structure dorsally and a short filament ventrally. Postgonopodal legs until about those on body segment 13 or 14 with coxae excavate mesally (Fig. 12), all these excavations forming a special groove for accommodation of long flagella of anterior gonopod colpocoxites; those flagella kept inside the canal also with the help of the spiniform, partly curved setae. Legs 10 and 11 with coxal glands. Each coxa 10 with a small outgrowth ventrally (Figs 3, 9). Coxae 11 unmodified (Fig. 10). Claws of legs 10 and 11 at base with neither dorsal additional small claws nor ventral filaments. Prefemora 10 and 11 swollen ventrally (Figs 4, 11).

Anterior gonopods bipartite: (1) angiocoxite part consisting of two pairs of angiocoxites, i.e. two mesal angiocoxites fused into a single plate and two lateral angiocoxites, and (2) colpocoxite part containing three pairs of flagella, i.e. two pairs of very long and one pair of short and particularly slender flagella, and a soft, poorly-sclerotized, elongate, coniform structure flagelliform apically. Gonopods partly sunken into body lumen and strongly inclined caudad, leaving exposed only angiocoxites (Figs 5–6, 13–15) and covering remaining parts of gonopods from below. Angiocoxite part in front view (Figs 5, 13) with fused mesal angiocoxites (**ma**), these being swollen at base and carrying on this swelling a knob beset with long setae. Distal part of fused **ma** with a long, median, rod-like process (**r**), two lateral lobes (**lp**) beset with long setae laterally, as well as apically on each side with a compact group consisting of three outgrowths (**ou**) and two long caudal branches (**b**). Each lateral angiocoxite (**la**) in front view (Figs 5, 13) alveolate at base, with long setae in proximal half, as well as lateral lobe (**lal**) curved caudally and densely setose on caudal face (in front view, only tips of the setae visible). Lateral angiocoxites (**la**) in caudal view (Figs 6, 14) with a slender median outgrowth (**k**) in distal part (Fig. 6), this outgrowth also serving as a site of **la** fusion. Each **la** in caudal view at about midway bearing a lateral process (**p**) with three long apical and one basal seta. Distal half of each **la** not only with a **lal** beset with rather long setae, but also with a mesal lobe (**ml**), the latter evidently fringed and carrying several long and strong processes and a small outgrowth at base.

Colpocoxite part (Fig. 18) containing three pairs of flagella (**A**, **B**, **C**) and a soft structure (**s**) in the form of a long, slender, coniform sac with a flagelliform distal half. Flagella located somewhat behind and lateral to **s**. Flagella **A** slender and short, whereas both **B** and **C** thicker, very long, reaching in length about midbody coxae, **C** also being finely spiculate subapically. Colpocoxital flagella *in situ* placed inside a special groove formed by medially excavate coxae (Fig. 12) and kept there with spiniform, often curved setae located on ventral and mesal parts of coxae. Hence, flagella of colpocoxites can remain invisible in a non-dissected male.

Legs 9, removed and studied in two paratype males, one from Ilan County (40000383) (Fig. 16), the other from Taichung County (40000387) (Fig. 17), placed on large, mesally fused, flexible, subtriangular, sternal plates. Each plate supporting a coxite or coxoprefemorite (no clear division being visible between a broadened basal and a slender distal part) and superficially a 1-segmented acropodite, both segments being strongly setose distomesally. Acropodite varying in shape even within a single individual (Fig. 17), with (Fig. 17) or without (Fig. 16) a bare apical knob. Coxoprefemorite supplied with a caudomesal outgrowth in its distal part. Basal part (coxite proper?) rounded basally, thin-walled and setose ventrally, with mesalmost seta being strongest, subtended laterally with a rounded ventral part of sternite; right coxite of Taichung County paratype showing a structure resembling a coxal gland and its canal (Fig. 17), only something like a canal being traceable in coxites of Ilan County paratype (Fig. 16).



FIGURES 12–17. *Taiwaneuma crinitum* **sp. nov.**, male paratype. 12, coxae of legs of midbody segment; 13, angiocoxites of anterior gonopods, front view; 14, angiocoxites of anterior gonopods, caudal view; 15, angiocoxites of anterior gonopods, lateral view, slightly skewed frontally; 16, leg pair 9 and its sternite of male from Ilan County; 17, leg pair 9 and part of sternite of male from Taichung County; **ma**, mesal angiocoxites; **r**, rod-like process of mesal angiocoxites of anterior gonopods; **lp**, lateral lobe of mesal angiocoxites of anterior gonopods; **ou**, apical outgrowths of lateral lobe of mesal angiocoxites of anterior gonopods; **b**, posterior branches of mesal angiocoxites of anterior gonopods; **la**, lateral angiocoxite of anterior gonopods; **lal**, lateral lobe of lateral angiocoxites of anterior gonopods; **p**, posterolateral process of lateral angiocoxites of anterior gonopods; **ml**, mesal lobe of lateral angiocoxites of anterior gonopods. Scale bar in mm.

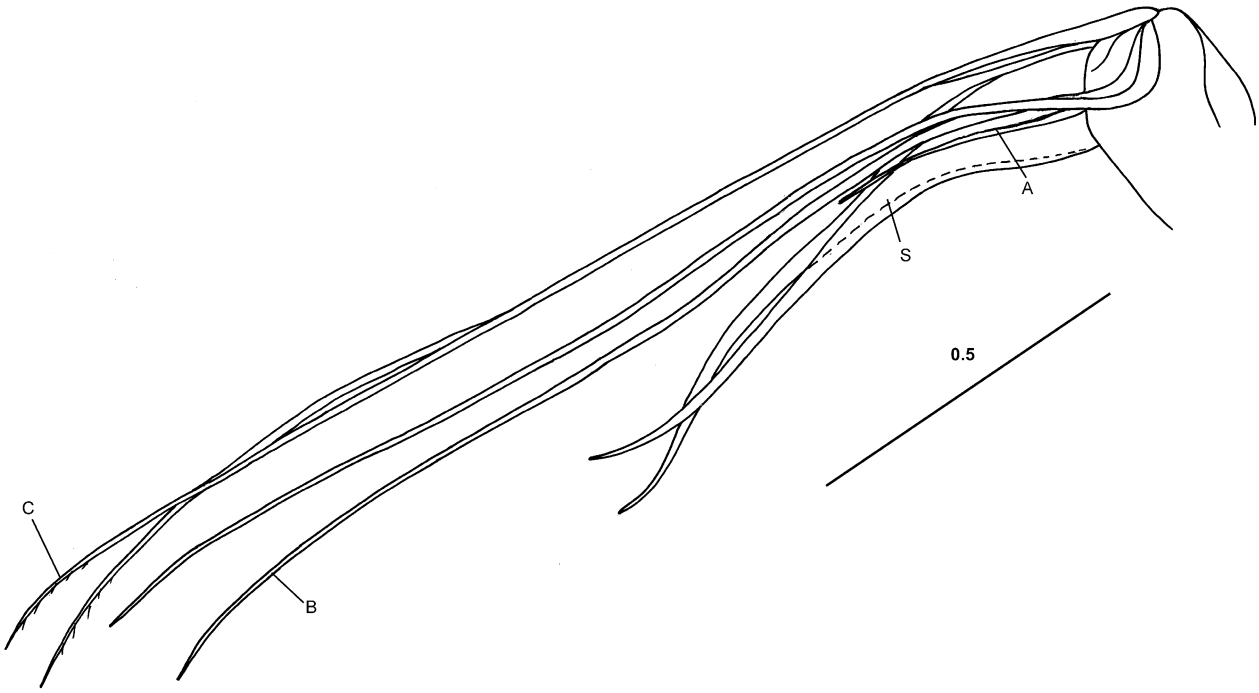


FIGURE 18. *Taiwaneuma crinitum* **sp. nov.**, male paratype. Colpocoxites of anterior gonopods, lateral view; **A**, **B**, **C**, flagella of colpocoxites of anterior gonopods; **s**, soft structure of colpocoxites of anterior gonopods. Scale bar in mm.

Female. Length about 9.0 mm, width with paraterga about 0.8 mm. Body with 28 segments. Leg pair 2 normal. Other nonsexual characters as in male.

Name. The specific epithet refers to the two pairs of very long, hair-like flagella of the anterior gonopods.

Remarks. Korsós (2004), in his checklist of the Diplopoda of Taiwan, referred to 4 males and 3 females from Ilan County, kept in TFRI. He assigned them to *Speophilosoma montanum* or a closely related congener. Even though we have failed to trace this sample in the TFRI collection, based on provenance and a similarly small size, we believe that Korsós, without precise study, misidentified our *Taiwaneuma crinitum* **sp. nov.** In any event, no *Speophilosoma* species has hitherto been reliably documented in Taiwan.

Taiwaneuma ramuligerum sp. nov.

Figs 19–31

Material examined. *Holotype*: male (NMNS 6639–001), Taiwan, Taichung County, Mt Da-Shue-Shan, SE slope of Mt Shaolai Shan, 24°13.734'N, 120°58.738'E, ca 2000 m, primary broad-leaved forest, 24.X.2009, leg. L. Dányi & E. Lazányi; *Paratypes*: 1 female (NMNS 6639–002), 2 females (HNHM, T09–59), same locality, together with holotype, 24.X.2009, leg. L. Dányi & E. Lazányi.

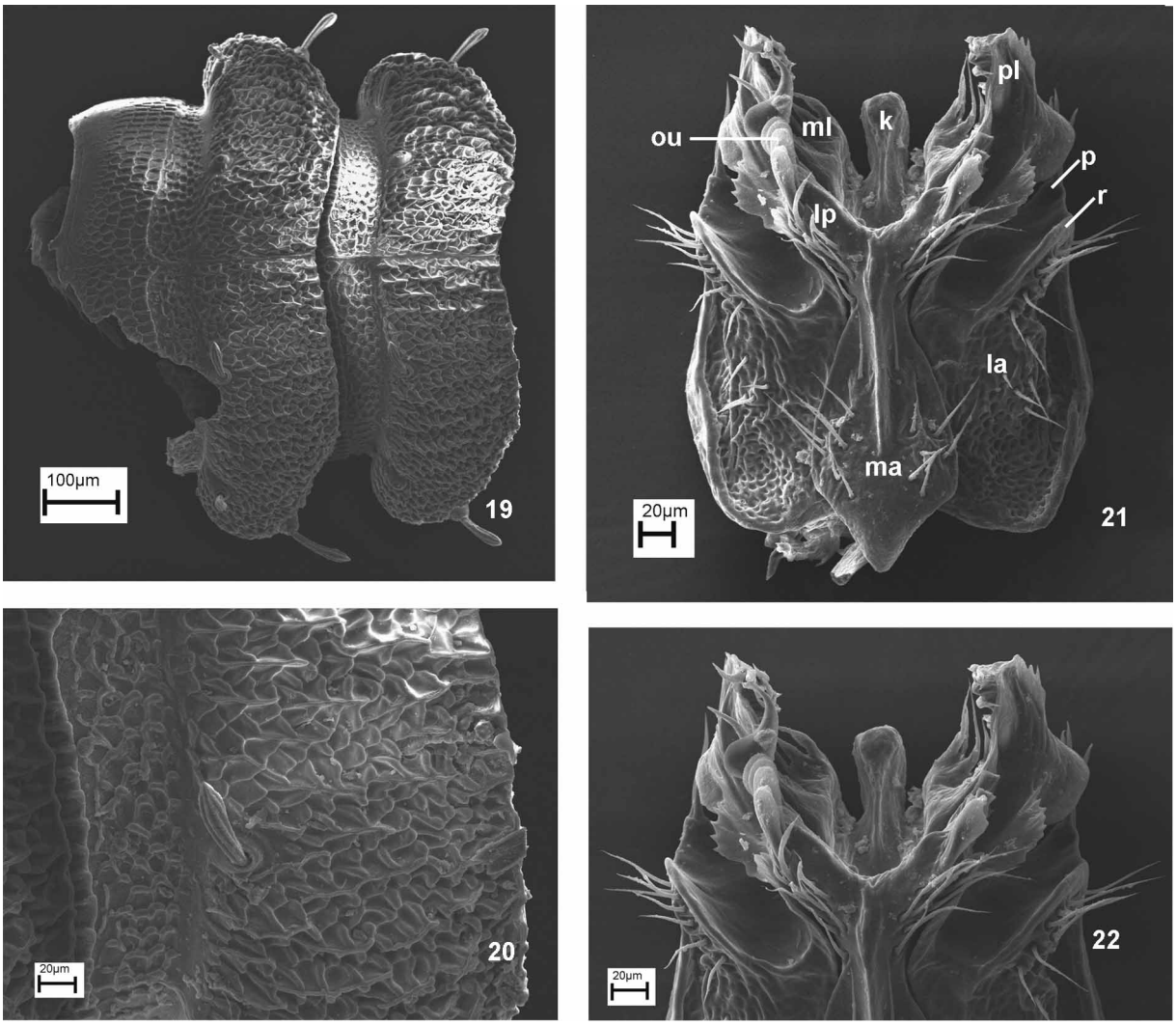
Diagnosis. Differs from *T. crinitum* **sp. nov.**, the only other congener, by the nearly 5 times shorter, subequal flagella of the anterior gonopod colpocoxite supplied with a small, dendroid, intercalary branch, as well as in the structure of male leg pair 9.

Description. Male. Length 6.5 mm, width with paraterga about 0.7 mm. Coloration in alcohol brown with a broad, beige, axial stripe. Paraterga with light spots around macrochaetae. Collum with two large spots resembling eyes. Venter and two segments immediately in front of telson beige. Legs pale beige with marbled brown distal parts. Ocellaria black. Antennae marbled brown. Head marbled light brown with a light anterior portion.

Body with 28 segments. Paraterga small, rounded. Head excluding vertex setose. Ocellaria as in *T. crinitum.* Antennae as in *T. crinitum*, except for a corolla of short strong setae on antennomere 6.

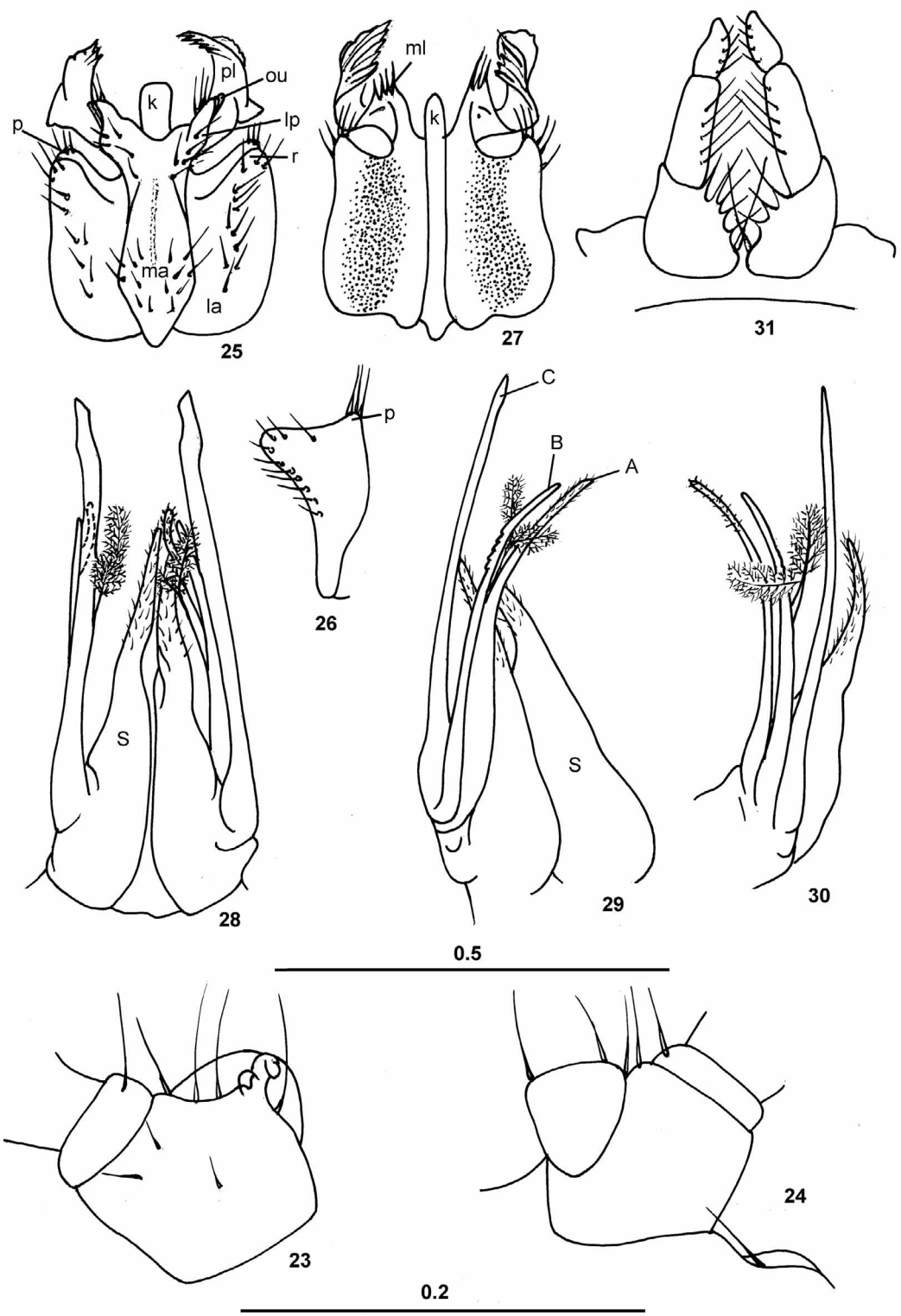
Collum oval. Metatergal macrochaetae short and clavate, tegument deeply alveolate with uneven and curved edges, as well as with longitudinal, low and short crests scattered all over (Figs 19, 20). One legless body segment in front of telson, all setae on the latter pointed. Spinnerets devoid of apical setae (apparently, broken off), rod-like.

Legs as in *T. crinitum*. Tarsal papillae absent. Claws normal, with neither additional dorsal claws nor distinct ventral setiform filaments. Only claws of leg pairs 1 and 2 each with a ventral, short, setoid filament. Pregonopodal legs normal, neither enlarged nor otherwise modified. Vas deferens as in *T. crinitum*, except for the presence of a cup-shaped structure. Leg pair 7 normal. Leg pairs 10 and 11 with coxal glands. Each coxa 10 with a ventral, bifurcate, curved, cylindrical process (Figs 23, 24). Coxae 11 without modifications. Prefemora 10 and 11 swollen ventrally.



FIGURES 19–22. *Taiwaneuma ramuligerum* **sp. nov.,** male holotype. 19, midbody segments, dorsal view; 20, fragment of metatergal surface; 21, angiocoxites of anterior gonopods, front view; 22, distal part of angiocoxites of anterior gonopods, front view; **ma**, mesal angiocoxites; **lp**, lateral lobe of mesal angiocoxites of anterior gonopods; **ou**, apical outgrowths of lateral lobe of mesal angiocoxites of anterior gonopods; **la**, lateral angiocoxite of anterior gonopods; **pl**, large mesal lobe of lateral angiocoxites of anterior gonopods; **r**, subtransverse crest of lateral angiocoxites of anterior gonopods; **p**, laterocaudal process of lateral angiocoxites of anterior gonopods; **k**, linguiform process of lateral angiocoxites of anterior gonopods; **ml**, small mesal lobe of lateral angiocoxites of anterior gonopods.

Gonopods mostly exposed (likely only an individual variation due to a different fixation condition in alcohol). Angiocoxite part in front view (Figs 21, 22, 25) with fused mesal angiocoxites (**ma**) bearing an axial crest at midway and being setose at a swollen base. Distal part of fused mesal angiocoxites with two lateral lobes (**lp**), both beset with setae laterally, divided fringe-like apically into outgrowths (**ou**). Each lateral angiocoxite (**la**) in front view (Figs 21, 25) alveolate at base, carrying longitudinally arranged setae and a subtransverse crest (**r**), the latter showing a small, caudally directed, apically setose process (**p**) (Fig. 26). Each **la** with a large, distomesal, somewhat helicoid lobe (**pl**) supplied with a fringed apex, as well as a small, evidently fringed lobe (**ml**) (Figs 21, 25, 27). Lateral angiocoxites in caudal view (Fig. 27) with a median linguiform outgrowth in distal part (**k**), this outgrowth also serving as a site of **la** fusion.



FIGURES 23–31. *Taiwaneuma ramuligerum* **sp. nov.,** male holotype. 23, coxa 10, caudal view; 24, coxa 10, front view (coxal outgrowth concealed by an everted coxal gland); 25, angiocoxites of anterior gonopods, front view; 26, lateral angiocoxite of anterior gonopods, lateral view, distal lobes omitted; 27, angiocoxites of anterior gonopods, caudal view; 28, colpocoxite part of anterior gonopods, caudal view; 29, colpocoxite part of anterior gonopods, right lateral view, slightly skewed behind; 30, colpocoxite part of anterior gonopods, left lateral view; 31, leg pair 9; **ma**, mesal angiocoxites; **lp**, lateral lobe of mesal angiocoxites of anterior gonopods; **ou**, apical outgrowths of lateral lobe of mesal angiocoxites of anterior gonopods; **la**, lateral angiocoxite of anterior gonopods; **pl**, large mesal lobe of lateral angiocoxites of anterior gonopods; **r**, transverse ridge of lateral angiocoxites of anterior gonopods; **p**, laterocaudal process of lateral angiocoxites of anterior gonopods; **k**, linguiform process of lateral angiocoxites of anterior gonopods; **ml**, small mesal lobe of lateral angiocoxites of anterior gonopods; **A**, **B**, **C**, flagella of colpocoxites of anterior gonopods; **s**, soft structure of colpocoxites of anterior gonopods. Scale bars in mm.

Colpocoxite part (Figs 28–30) with three pairs of flagella (**A**, **B**, **C**) and a soft structure (**s**) in the form of a long, slender, coniform sac with an elongate, finely hairy, distal part. Flagella curved and located somewhat behind and lateral to **s**. Flagella **A** very finely setose distally, whereas **B** rugulose posteriorly in middle part. Flagella **C** longest. A small, dendroid, distally bifurcate branch between **A** and **B**.

Legs 9 (Fig. 31) with 2-segmented telopodites strongly setose mesally. Terminal segment attenuating toward tip. Coxite also with long mesal setae, basalmost of which strongest.

Female. Length about 6.5 mm, width with paraterga about 0.7 mm. Body with 28 segments. Leg pair 2 normal. Other nonsexual characters as in male.

Name. The specific epithet refers to the small, dendroid, distally bifurcate branch lying between flagella **A** and **B** of the anterior gonopod colpocoxite.

Discussion

Both of the new species described above appear to be confined to the northern mountainous part of Taiwan (Map). They seem to be fully allopatric and high-montane, being encountered only at ≥ 2000 m a.s.l. Such a pattern strongly recalls that observed in the family Diplomaragnidae, known to dominate the fauna of Chordeumatida of the island. Most of the species of *Tokyosoma*, the sole diplomaragnid genus reliably documented in Taiwan (the presence there of a second genus, *Diplomaragna* Attems, 1907, still requires confirmation), are likewise very local in distribution and tend to be both high-montane and allopatric (Mikhaljova *et al.* 2010).

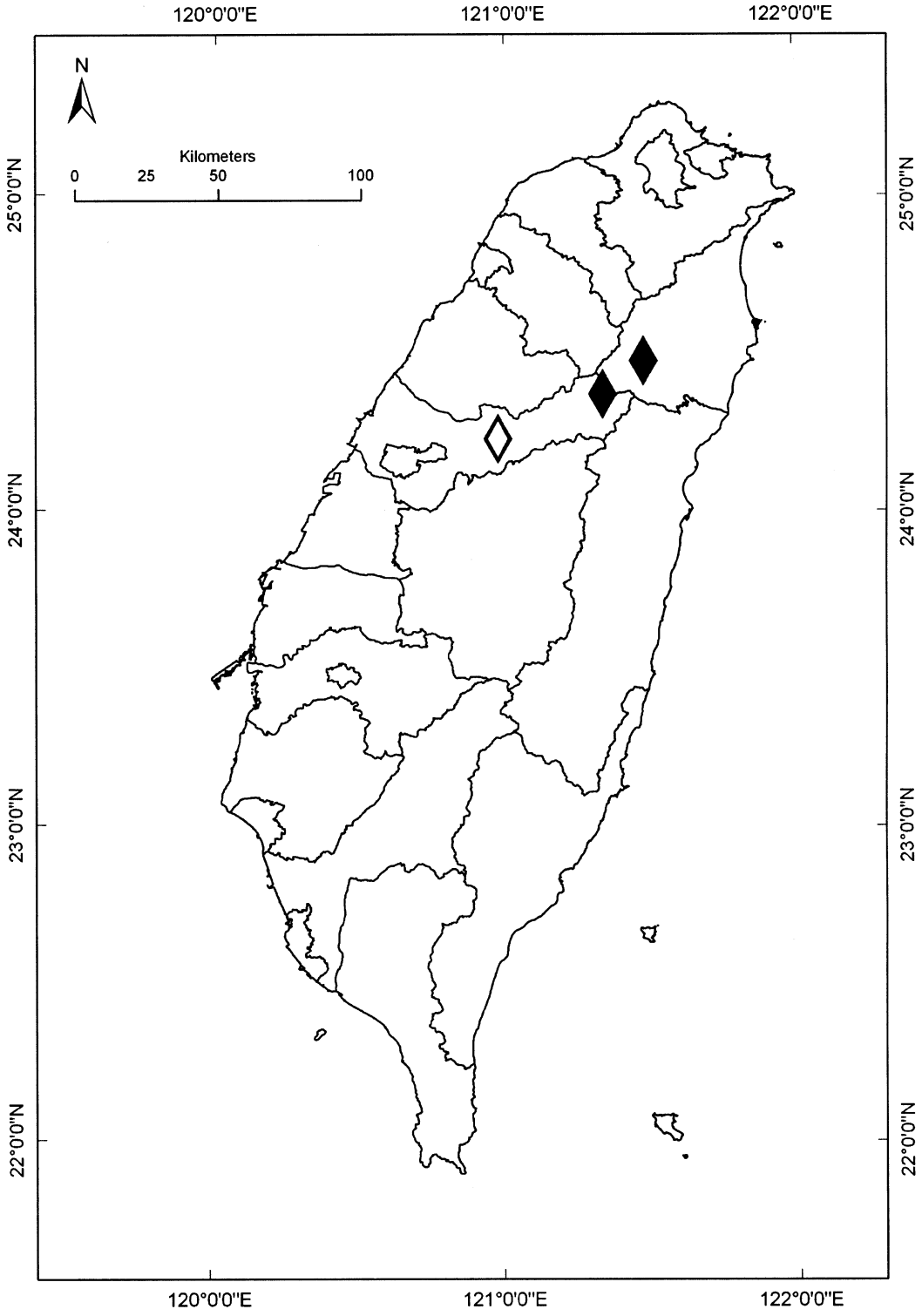
Both new species share a lot of important characters: 28 body segments, small size and paraterga, a nearly identical tegument texture, the presence of ocellaria, of a prementum, of coxal glands on male legs 10 and 11, of a small ventral outgrowth on male coxa 10, the absence of apparent modifications on pregonopodal legs and on male legs 7 and 11 etc. The gonopods are also quite similar: the anterior gonopods with fused and complex mesal angiocoxites, the colpocoxites are supplied with three pairs of flagella and a soft, coniform, distally strongly elongate structure etc. The differences are deemed to be only species-specific: *T. crinitum* **sp. nov.** shows the anterior gonopods with only two pairs of very long flagella located in a special groove formed between the following coxae, while male legs 9 lie on a large sternum, versus short flagella with small, intercalary, dendroid branches and a small sternum of male legs 9 observed in *T. ramuligerum* **sp. nov.**

Taiwaneuma **gen. nov.** seems to be especially similar to the monotypic genera *Calochaeteuma* Miyosi, 1958, from Shikoku Island, Japan (Miyosi 1958), and *Macrochaeteuma* Verhoeff, 1914, from Hokkaido Island, Japan (Verhoeff 1914). Both latter genera were originally described in the mainly European family Brachychaeteumatidae. Shear (1988) left *Macrochaeteuma* assigned to Brachychaeteumatidae, but showed *Calochaeteuma* to be only a junior synonym of still another monobasic Japanese genus, *Niponiosoma* Verhoeff, 1941, described from near Tokyo (Verhoeff 1941). This latter genus was initially proposed as the type of the family Niponiosomidae (see Verhoeff 1941), later rectified as Niponiosomatidae by Jeekel (1971).

According to Shear (1988), one of the main features to distinguish the Niponiosomatidae from the Tingupidae lies in the smooth and subcylindrical body segments devoid of sculpture on the metaterga. This condition, however, is characteristic of the type genus *Niponiosoma* alone. Also, according to Miyosi (1958), small paraterga are present in *Calochaeteuma*. The same concerns *Macrochaeteuma* as well (Verhoeff 1914). Our new genus is similar to both *Calochaeteuma* and *Macrochaeteuma* in this trait, as well as in the presence of ocellaria and 28 body segments, but differs from *Niponiosoma* which is devoid of ocelli and shows 30 body segments. In addition, *Taiwaneuma* **gen. nov.** is mainly distinguished from the above trio of genera in the more complex angiocoxites and in the simpler soft structures of the colpocoxites of the anterior gonopods, as well as in the conformation of male legs 9 (*T. crinitum* **sp. nov.** especially strongly so).

It is only with further progress in our knowledge of the Brannerioidea, very likely with further constituent taxa to be revealed, that the group's classification and phylogenetic relationships can be refined. It still remains to properly evaluate if Niponiosomatidae are indeed distinct at the family level from the Nearctic Tingupidae which Shear (1988) considered so close to Niponiosomatidae that he suspected, yet not formalized, their synonymy.

To summarize, a more sound comparative analysis is necessary to better allocate *Taiwaneuma* **gen. nov.** This will only become possible when more material is amassed and studied.



MAP. Distribution of *Taiwaneuma* species in Taiwan. Filled diamond: *Taiwaneuma crinitum* **sp. nov.**; open diamond: *Taiwaneuma ramuligerum* **sp. nov.**

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