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New Uropodina species and records from a bamboo plantation from Taiwan

(Acari, Mesostigmata)

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The first record of *Trigonuropoda sanguinea* Hirschmann & Hiramatsu, 1977 in Taiwan is presented. Two new species are described and illustrated from a *Bambusa dolichoclada* bamboo plantation. *Deraiophorus taiwanica* spec. nov. belongs to the *Deraiophorus hexacornutus* group and differs from the earlier described species in the ornamentation of dorsal, ventral and genital shield. The second species, *Uroobovella bambocola* spec. nov., is placed in the *Uroobovella minima* species group and this species differs from the relatives in shape and ornamentation of female genital shield, smooth surface of dorsal and ventral shields and the shape of peritremes.

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Introduction

Uropodina mites occur very often in the soils and leaf litters of the temperate climate zone, but they can be found in high diversity in the tropical and subtropical areas (Lindquist et al. 2009). During the last decades the South-East Asian subtropical and tropical areas were very intensively studied (Kotschán 2011, 2014, Kotschán & Starý 2011, 2012), but very few information was presented from the agricultural areas, mostly from the different plantations of the South-East Asian region. Last year, only one paper about the Uropodina was presented in Kotschán (2014) in where he investigated a *Cryptomeria japonica* plantation in Taiwan and described three new species from its soil.

Bamboos (Poaceae, Bambusoideae) are also abundant components of the flora of Taiwan. A total of 42 species in 15 genera are either introduced

and cultivated or native to the island. Namely the genera include *Arthrostyliidium*, *Arundinaria*, *Bambusa*, *Chimonobambusa*, *Dendrocalamus*, *Gigantochloa*, *Melocanna*, *Phyllostachys*, *Pseudosasa*, *Schizostachyum*, *Semiarundinaria*, *Shibataea*, *Sinobambusa*, *Thyrsostachys* and *Yushania*. From the larger sized bamboos *Bambusa* is presented by 12 species, 3 varieties and 6 cultivars, *Dendrocalamus* by 4 species, 1 variety and 1 cultivar, *Gigantochloa* by 1 species and *Phyllostachys* by 7 species and 1 cultivar. From these *Bambusa dolichoclada* is endemic and is often planted as a windbreak around farm building and between the fields throughout the island (Lin 2000). Our samples were collected from this bamboo leaf litter.

The present paper is a new contribution to the Uropodina mites collected in plantations of Taiwan, we describe two new species and record for the first time a so far not listed species from this island.

Materials and methods

Bamboo leaf litters were collected in Taiwan, the samples were placed into plastic bags and later transported to Budapest (Hungary) where the leaf litter samples were extracted by Berlese funnels. Specimens of the found species were cleared in lactic acid, investigated on half covered deep slides and illustrations were made with the aid of a drawing tube. All specimens are stored in ethanol and deposited in the Hungarian Natural History Museum, Hungary (HNHM), Natural History Museum in Geneva, Switzerland (NHMG) and Zoologische Staatssammlung in München, Germany (ZSM). Descriptions of the new species follow works of Kotschán (2010) and Kotschán et al. (2012). Width of the idiosoma was taken at the level of coxae IV. Measurements in the description and scale bars are in micrometres.

Results

Trigonuropodidae

Trigonuro-poda sanguinea Hirschmann & Hiramatsu, 1977

Material examined. Two females (HNHM and ZSM). Taiwan, Nantou County, Yuchi, township, Yuchi (魚池), NW slope of the Mt. Maolan (貓嘯山), N23°53.140' E120°54.212', 741 m, giant bamboo group, *Bambusa dolicho-clada* leaf litter, 08.X.2009, leg. L. Dányi and E. Lazányi.

Notes. This species was described originally from Japan, but was found in South-Korea as well (Kotschán, unpublished data).

Eutrachytidae

Deraiphorus taiwanica spec. nov.

Figs 1–18

Material examined. Holotype female (HNHM). Taiwan, Nantou County, Yuchi, township, Yuchi (魚池), NW slope of the Mt. Maolan (貓嘯山), N23°53.140' E120°54.212', 741 m, giant bamboo group, *Bambusa dolicho-clada* leaf litter, 08.X.2009, leg. L. Dányi and E. Lazányi. Paratypes – one male (NHMG) and one deutonymph (ZSM). Same data as holotype.

Description of female

Length of idiosoma 690 µm, width 640 µm (n=1). Shape subtriangular with anterior horns and three pairs of lateral projections. Colour is yellow.

Dorsal aspect of idiosoma (Fig. 1): Anterior horns well developed, with 14 long (ca 96–100 µm), medially pilose setae. Each seta placed on a tubercular base (Fig. 3). Margins bearing three pairs of projections; length of first (anterior) projection ca 38–40 µm,

second (central) ca 40–42 µm, the third (posterior) projections longer (ca 53–55 µm), their margins with long pilose setae, their dorsal bases with short (ca 5–8 µm long) pilose setae. Other marginal setae between lateral projections tree-like, ca 7–8 µm long. Caudal setae long (ca 33–35 µm), with pilose margin (Fig. 4). Dorsal and marginal shields fused anteriorly. Marginal and dorsal shields without ornamentation, except several small oval pits visible on lateral region of dorsal shield. 16 pairs of dorsal setae marginally pilose and ca 82–85 µm long, poroids situated near lateral margins of dorsal shield (Fig. 2). Postdorsal shield present without sculptural pattern and with one pair of marginally pilose setae (ca 50–55 µm).

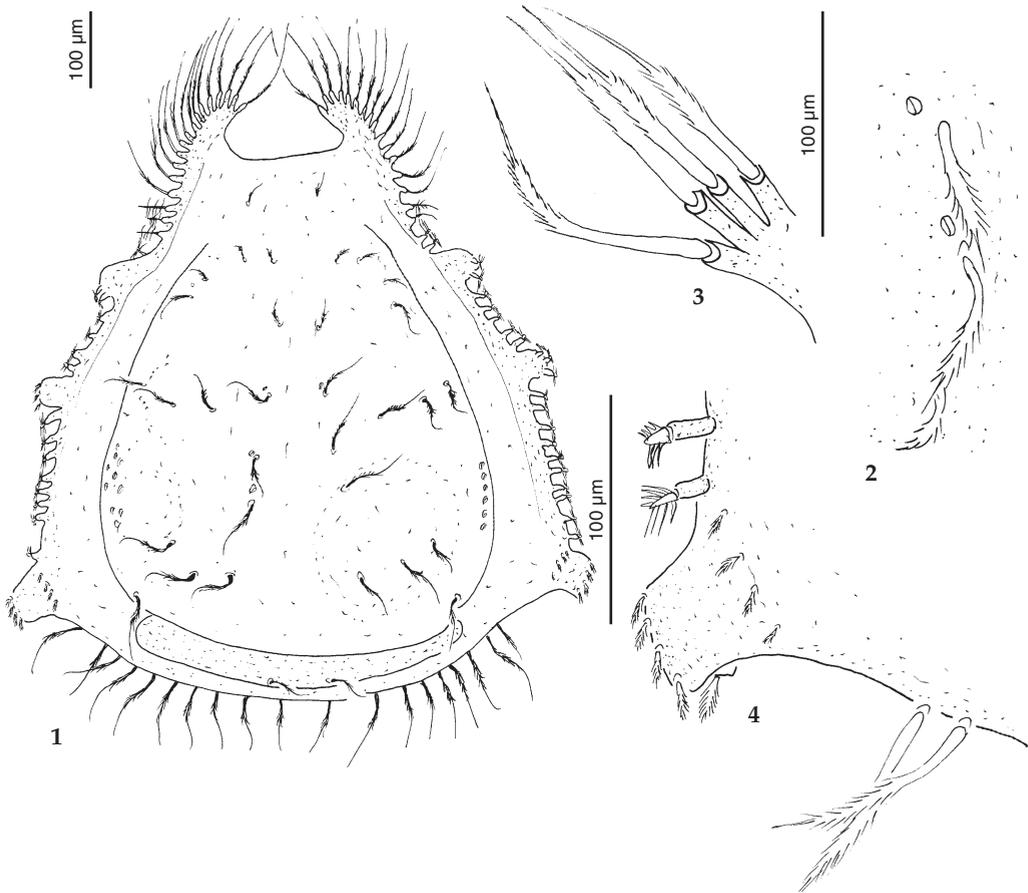
Ventral aspect of idiosoma (Fig. 5): Four pairs of sternal setae short (ca 8–10 µm), smooth and needle-like (Fig. 7). St1 placed near anterior margin of sternal shield, St2 at level of central area of coxae II, St3 at level of central area of coxae III and St4 situated near basal edges of genital shield. Sternal shield smooth, only a few small oval pits visible near basis of coxae III and IV. Ventral shield without ornamentation, most of ventral setae short (ca 10–12 µm) and pilose. Several longer setae (ca 65–75 µm) on same level as anus; these similar in shape to the posterior setae (Fig. 6). Genital shield scutiform, ca 170 µm long and ca 135 µm wide, without process and with small oval pits on lateral areas. Genital shield placed between coxae II and III. Pedofossae absent. Tritosternum (Fig. 9) with narrow basis, tritosternal laciniae trifurcate and with serrate margins. Stigmata situated at level of coxae III, prestigmatid part of peritreme hook-like, poststigmatid part short.

Gnathosoma (Fig. 9): Corniculi horn-like, internal malae finely serrate. Hypostomal setae as follows: h1 long (ca 54 µm), smooth and thick, h2 short (ca 13 µm), robust and spine-like, h3 longer (ca 18 µm) and needle-like, h4 short (ca 12 µm) marginally serrate. Basal part of epistome serrate, apical part with long hairs (Fig. 10). Tibia of palp bearing two serrated setae, other setae on palp smooth and needle-like.

Legs (Figs 11–14): First legs without claws and with elongated apical setae. Coxae and trochanters of legs I–IV bearing needle-like setae, setae on other segments of legs robust, marginally serrate or spatuliform.

Description of male

Length of idiosoma 670 µm, width 710 µm. Shape of idiosoma, ornamentation and chaetotaxy of dorsal part as in female. Sternal setae short (ca 8–10 µm), smooth and needle-like. St1 placed near anterior margin of sternal shield. St2 situated at level of central area of coxa II, St3 at level of anterior margin of coxae III. Several pilose setae and some oval pits presented



Figs 1-4. *Deraïophorus taiwanica* spec. nov., holotype, female. 1. Dorsal view of body. 2. Dorsal setae. 3. Setae on anterior horns. 4. Region of third lateral projection.

on sternal shield lateral and posterior to genital shield. Genital shield oval and placed between coxae III (Fig. 8). Ventral setae and ornamentation (except for position and number of sternal setae) similar to those of female.

Description of deutonymph

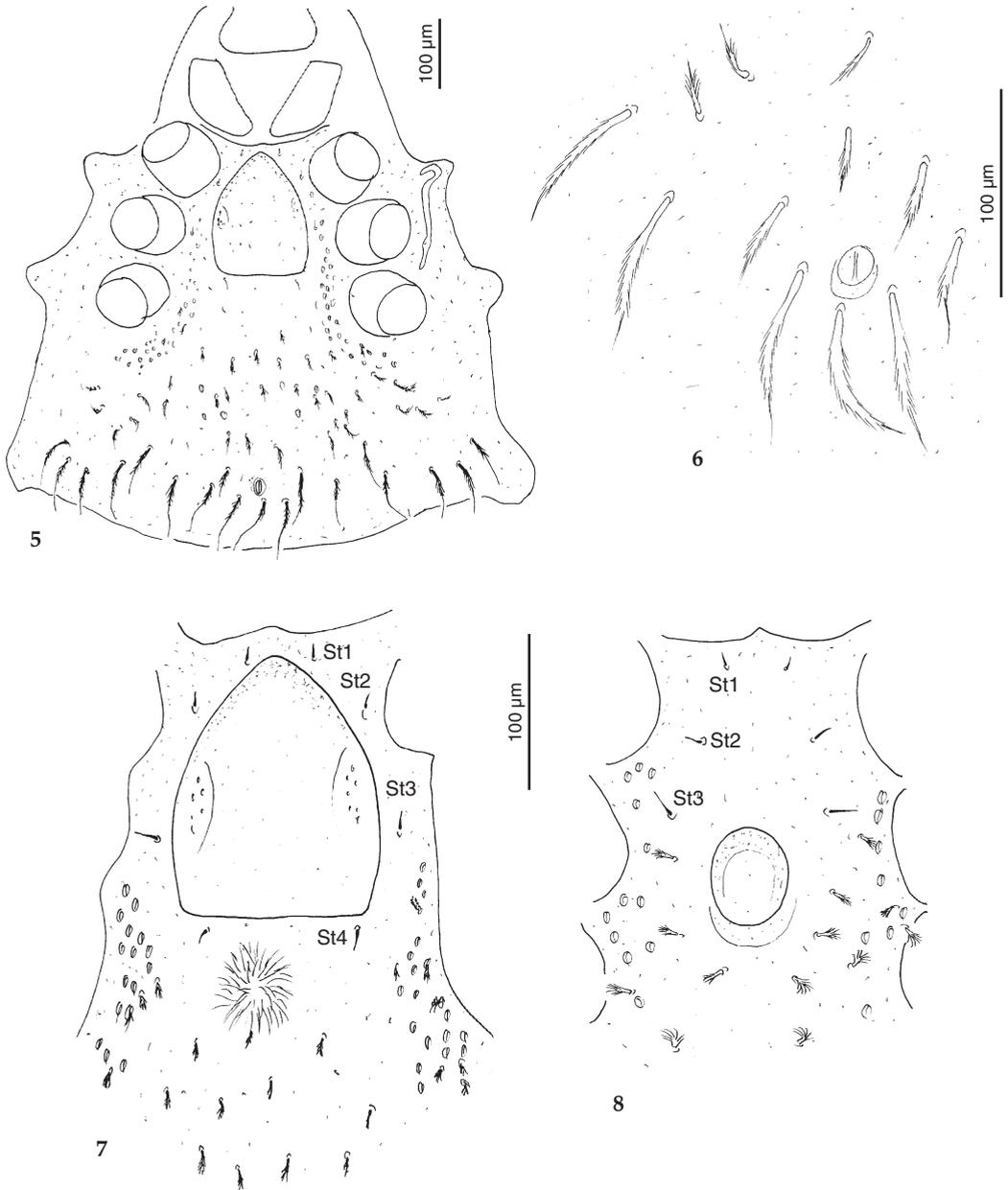
Length of idiosoma 680 µm, width 540 µm (n=1). Shape subtriangular.

Dorsal aspect of idiosoma (Fig. 15): Dorsal shield drop-shaped, ca 500 µm long and ca 325 µm wide, its surface smooth. Nine pairs of visible setae on dorsal shield pilose, ca 26–30 µm long and associated with poroids (Fig. 16), except last one pair, which is longer (ca 88–90 µm), close to caudal margin. Marginal shield completely separated from dorsal shield by wide membranous cuticle. Marginal shield bearing four pairs of long anterior setae (ca 95–100 µm) and caudal area of marginal shield with tree-like setae

(ca 12–14 µm), caudal part bearing 10 pairs of pilose setae (ca 30–32 µm) (Fig. 17).

Ventral aspect of idiosoma (Fig. 18): First pair of sternal setae (St1) smooth and needle-like and others (St2–St5) pilose (ca 8–10 µm) and situated on sternal shield. Sternal shield without sculptural pattern, only some poroids situated between St1 and St2 and St2 and St3. Ventrianal shield trapezoid, bearing one pair of smooth and needle-like (ca 27–28 µm) setae, one pair of short (ca 32–33 µm) and one pair of long (ca 63–65 µm) pilose setae on caudal margin. One pair of adanal (ca 40–41 µm) and one postanal (ca 30 µm) setae situated around anal opening. Three pairs of long (ca 69–73 µm) and pilose setae placed on small platelets situated lateral to ventrianal shield. Ventrianal shield with some oval pits close to apical margin. Stigmata situated between coxae II and III, peritremes with a V-shaped bend.

Larva and protonymphs unknown.

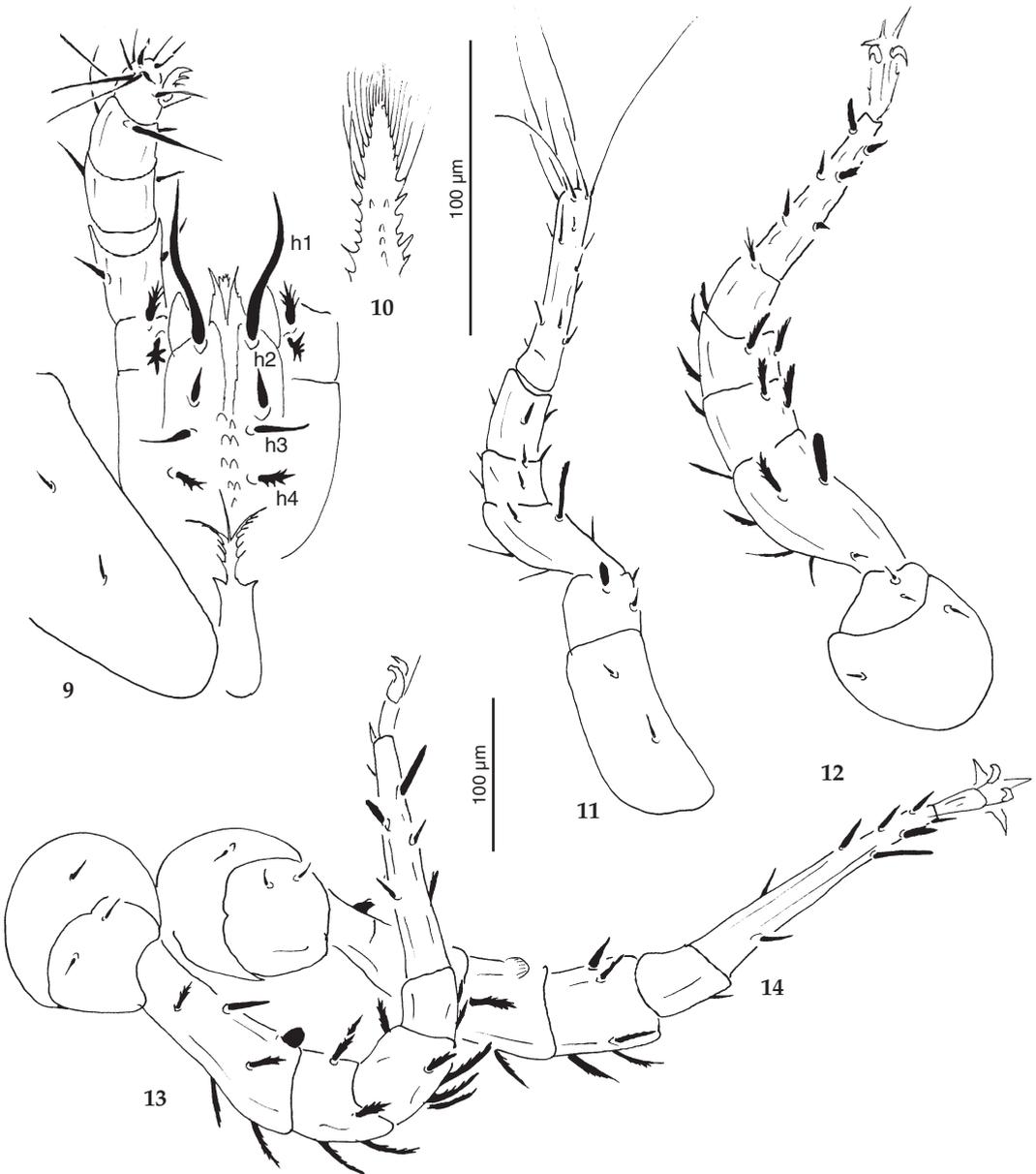


Figs 5-8. *Deraiphorus taiwanica* spec. nov., holotype, female. 5. Ventral view of body. 6. Setae around anal opening. 7. Intercoxal area. 8. Intercoxal area of male paratype.

Etymology. The name of the new species refers to the island where it was collected.

Remarks. On the basis of the three pairs of lateral projections and the well-developed anterior horns, we placed the new species into the *Deraiphorus hexacornutus* group (Hirschmann 1973). The well-

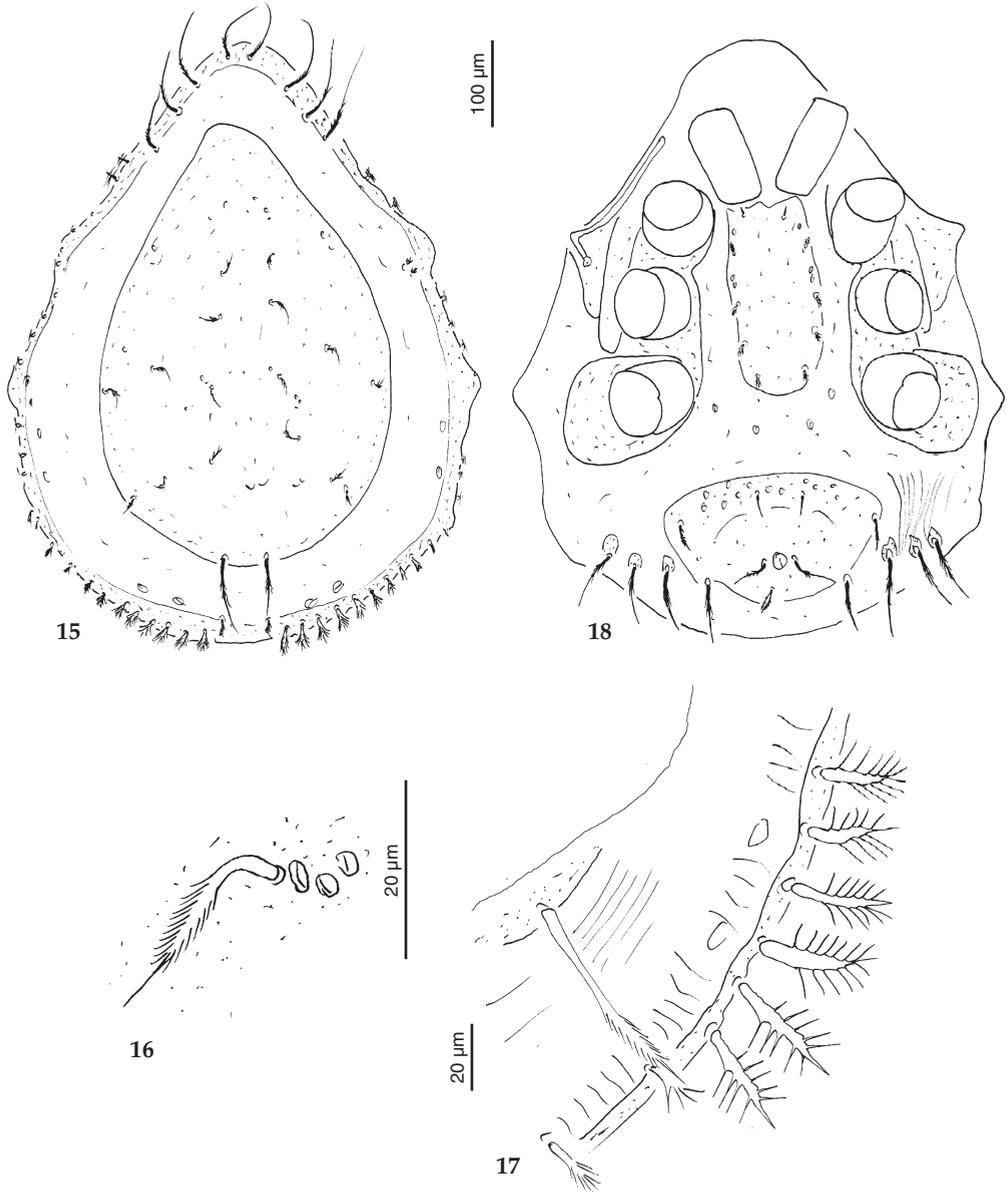
developed lateral projections and the box-like of the third lateral projection can be observed on three species in the *Deraiphorus hexacornutus* group. This character combination can be seen in *D. hexacornutus* Hirschmann, 1973, *D. penicillatus* Hirschmann, 1973 and *D. matskasii* Hirschmann, 1981. Two species



Figs 9–14. *Deraiphorus taiwanica* spec. nov., holotype, female. 9. Ventral view of gnathosoma, palp, tritosternum and coxae I. 10. Epistome. 11. Ventral view of leg I. 12. Ventral view of leg II. 13. Ventral view of leg III. 14. Ventral view of leg IV.

(*D. hexacornutus* and *D. matskasii*) from these three are ornamented by oval pits on majority of surface of the dorsal shield, contrary with the new one, where the dorsal shield has a few oval pits on lateral parts of dorsal shield. The surface of dorsal shield is smooth in the species *D. penicillatus*, but this species

is described on the basis of males and nymphs. The new species differs in several characters from the male *D. penicillatus*. The already known species is bearing needle-like setae on sternal shield at level of genital opening, where only pilose setae are situated in the case of the new one. Smooth setae are



Figs 15–18. *Deraioophorus taiwanica* spec. nov., paratype, deutonymph. 15. Dorsal view of body. 16. Dorsal setae. 17. Setae on lateral margin. 18. Ventral view of body.

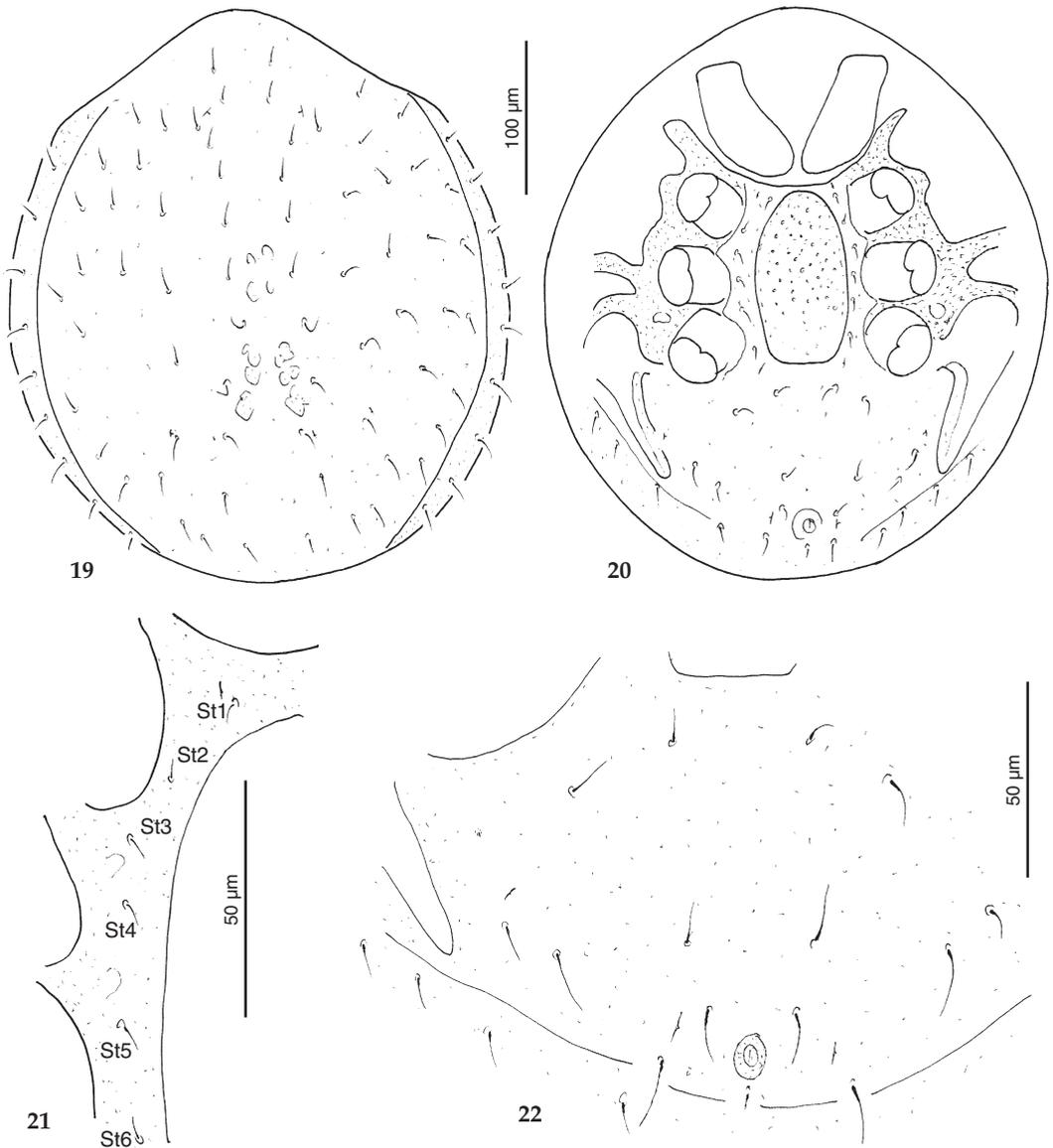
situated near caudal margin of dorsal shield, but the new species has pilose setae on this regions. Setae on pygidial shield are smooth in the *D. penicillatus*, but smooth in the new species. Gnathosomal setae h2 and h3 are smooth in the new species, in contrast with the known species where these setae are marginally serrate.

Urodinychidae

Urobovella bambocola spec. nov.

Figs 19–31

Material examined. Holotype female. Taiwan, Nantou County, Yuchi, township, Yuchi (魚池), NW slope of the Mt. Maolan (貓嘯山), N23°53.140' E120°54.212', 741 m, giant bamboo group, *Bambusa dolichoclada* leaf litter,



Figs 19–22. *Uroobovella bambocola* spec. nov., holotype, female. **19.** Dorsal view of body. **20.** Ventral view of body. **21.** Sternal shield and setae. **22.** Ventral shield and setae.

08.X.2009, leg. L. Dányi and E. Lazányi. Paratypes – one female (NHMG) and four males (one in ZSM, one in NHMG, two in HHNM). Same data as holotype.

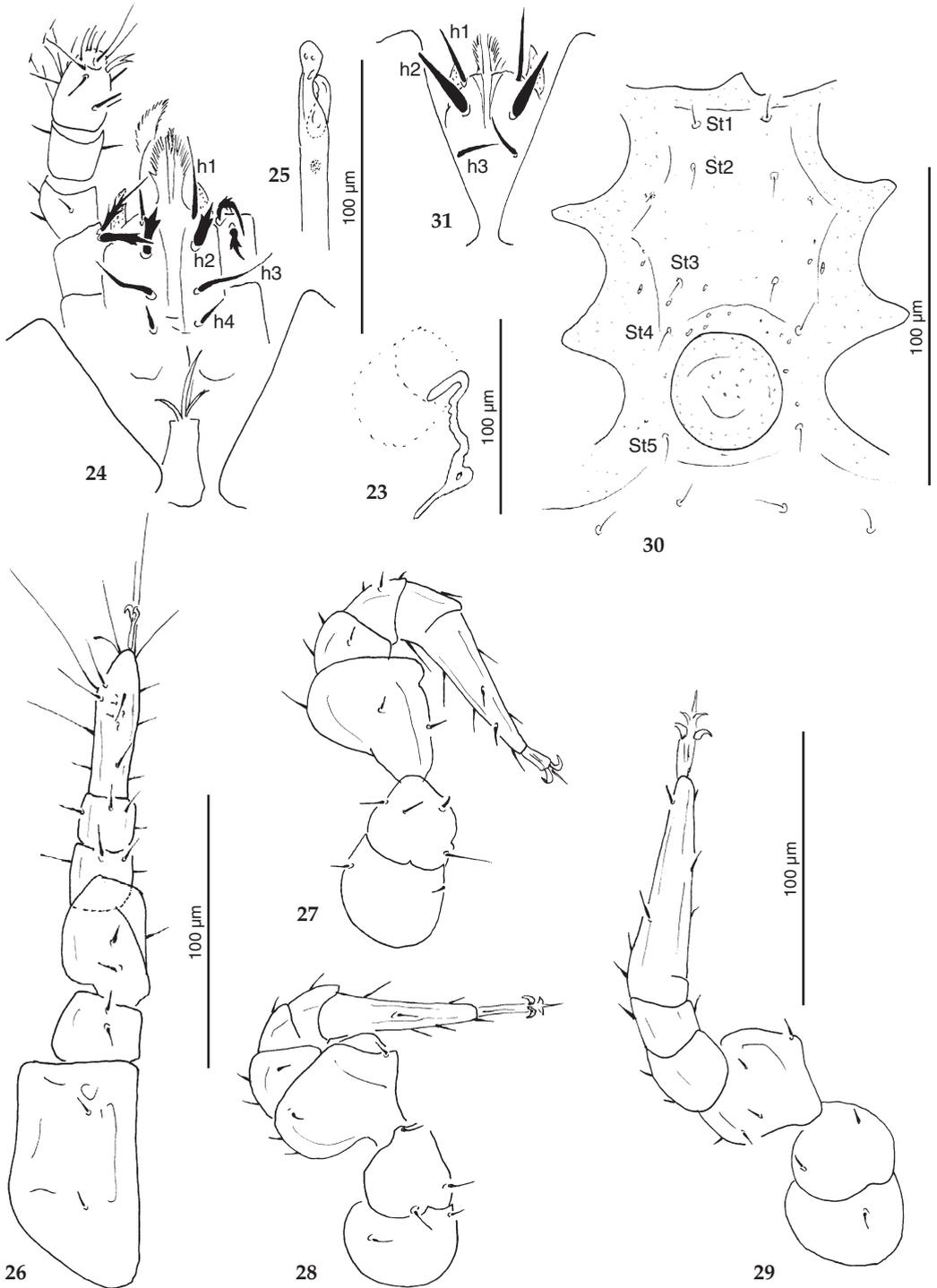
Description

Female. Length of idiosoma 370–380 µm, width 270–300 µm (n=2). Body shape oval, colour reddish brown.

Dorsal aspect of idiosoma (Fig. 19): Dorsal and marginal shields fused anteriorly. Dorsal shield ne-

otrichous. All dorsal setae smooth and needle-like (ca 11–14 µm), some lyriform fissures present on central area. Marginal shield smooth and bearing similar setae (nine pairs) in shape and length to dorsal setae. Dorsal shield smooth, muscle scars present on central area.

Ventral aspect of idiosoma (Fig. 20): Base of tritosternum longer than wide, its laciniae smooth and apically divided into two short lateral and two long central branches (Fig. 24). Sternal shield smooth,



Figs 23–31. *Uroobovella bambocola* spec. nov., holotype, female. 23. Peritreme. 24. Ventral view of gnathosoma, palp, tritosternum and coxae I. 25. Chelicera. 26. Ventral view of leg I. 27. Ventral view of leg II. 28. Ventral view of leg III. 29. Ventral view of leg IV. 30. Intercoxal area of male paratype. 31. Ventral view of gnathosoma of male paratype.

all sternal setae needle-like and short (ca 5–6 µm). St1 situated near anterior margin of genital shield, St2 at level of central area of coxae II, St3 at level of anterior margin of coxae II, St4 at level of central area of coxae III, St5 at level of anterior margin of coxae IV, St6 at level of central area of coxae IV. Ventral shield smooth, postanal line present. Ventral setae smooth and needle-like, five pairs of ventral setae situated anterior to postanal line, four pairs of setae situated posterior to postanal line (ca 9–14 µm). Adanal setae needle-like and longer (ca 9–10 µm) than postanal seta (ca 5–6 µm). Four pairs of lyriform fissures present, first pair near setae St1 (Fig. 21), second pairs near basal edges of genital shield, third pairs near pedofossae, fourth pairs between adanal setae (Fig. 22). Stigmata situated between coxae II and III. Peritremes with hook-shaped prestigmatid part, poststigmatid part short (Fig. 23). Genital shield of female scutiform (116 µm long and 59 µm wide), placed between coxae II and IV, without anterior process and covered by small oval pits. Pedofossae deep, their surface smooth, with separate furrows for tarsi IV, metapodal lines absent. Base of tritosternum narrow, its laciniae smooth and apically divided into two short lateral and two long central branches (Fig. 24).

Gnathosoma (Fig. 24): Corniculi horn-like, internal malae pilose and longer than corniculi. Hypostomal setae: h1 long (ca 30 µm), smooth and needle-like; h2 short (ca 16 µm), robust and marginally serrate; h3 long (ca 30 µm) and smooth; h4 short (ca 11 µm), smooth and needle-like. Epistome apically pilose. Palp trochanter with two long and serrate setae, other setae on palp smooth and needle-like. Chelicerae with internal sclerotized node, fixed digit with three pit-like apical sensory organs and longer than movable digit, movable digit bearing a single central tooth (Fig. 25).

Legs (Figs 26–29): All legs bear claws on tip of tarsi and have needle-like setae.

Male. Length of idiosoma 370–390 µm, width 300–320 µm (n=4). Shape of idiosoma, ornamentation and chaetotaxy of dorsal parts as in female. Sternal setae

short (ca 7–8 µm) and needle-like, St1–St4 situated around margins of genital opening, St5 at level of anterior margin and St6 at level of posterior margin of genital shield. Sternal shield with some oval pits near anterior margin of genital shield and bearing two pairs of lyriform pores between of St2 and St3. Genital shield oval and located between coxae IV (Fig. 30). Ventral setae and ornamentation similar to those of female.

Gnathosoma (Fig. 31): Similar to females, but setae h2 long, robust and smooth (ca 27 µm). Other parts and processes similar to those of female.

Remarks. The new species is placed in the *Uroobovella minima* group (Hirschmann 1989) on the basis of the shape of the idiosoma and peritremes, number of sternal setae, and the presence of claws on the tip of leg I. Up until now, 24 species have been described in this group (Kontschán et al. 2012), the hook-like peritremes, the smooth surface of dorsal and ventral shields, and the linguiform and ornamented genital shield can be observed in only one species [*Uroobovella minima* (C. L. Koch, 1841)] of this group (see Kontschán et al. 2012). The distinguishing characters are summarized in Table 1.

Discussion

The Uropodina mites of Taiwan are scarcely investigated, the number of the known Taiwanese Uropodina now totals 12 including the three species mentioned in this paper. From the twelve, six other species were described from natural habitats (Wiśniewski 1993), three species were recorded from *Cryptomeria japonica* plantation (Kontschán 2014) and these three species from a bamboo plantation. The species of the genus *Deraioophorus* occur in Europe, South-East Asia, South-America and Australo-Asia as well. Close to Taiwan, several species were collected in Japan as well (Wiśniewski 1993), but in Taiwan this genus was not recorded earlier. The genus *Trigonuropoda* has similar occurrence to *Deraioophorus*, but some species can be found in Afrotropical areas

Table 1. Most important differences between *Uroobovella minima* (C. L. Koch, 1841) and *Uroobovella bambocola* spec. nov.

	<i>U. minima</i>	<i>U. bambocola</i>
Length of idiosoma	440–470	370–390
Shape of genital shield	wider (L:W = 1:0.65)	narrower (L:W = 1:0.5)
Number of sternal setae	8	6
Shape of peritreme	with two bends	with one bend
Length of second pairs of ventral setae	longer than the first pairs	as long as first pairs
Small apical triangular projection on sterna shield	present	absent

as well. The newly found species, *T. sanguine* has an East Asian distribution, this species lives in Taiwan, Japan and South Korea as well. This is the first record of the species and also genus in Taiwan. The species from the *Uroobovella minima* group can be found in all regions of the world, therefore the first finding in Taiwan was no surprise.

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