

NEW UROPODINA SPECIES AND RECORDS FROM MALAYSIA (ACARI: MESOSTIGMATA)

KONTSCHÁN, J.¹ and STARÝ, J.²

¹*Systematic Zoology Research Group, Hungarian Academy of Sciences
Department of Zoology, Hungarian Natural History Museum
H-1088 Budapest, Baross u. 13. Hungary. E-mail: kotscha@zool.nhmus.hu*
²*Institute of Soil Biology, Na sádkách 7370 05 České Budějovice Czech Republic
E-mail: stary.oriatida@seznam.cz*

Seven Uropodina species were listed from Malaysian soil samples deposited in the Institute of Soil Biology of the Three of them are already known species (*Deraiphorus mirabilis* KONTSCHÁN, 2010, *Depressorotunda (Depressorotunda) malaya* KONTSCHÁN, 2010, *Uroobovella serangensis* HIRAMATSU, 1980). Four species (*Cyllibula ovalis* sp. n.; *Uropoda gigantea* sp. n.; *Phymatodiscus malayicus* sp. n. and *Depressorotunda (Depressorotunda) batuensis* sp. n.) are new to science. Original drawings and description of new species are given. An additional key to the species of the subgenus *Depressorotunda (Depressorotunda)* is presented.

Key words: Acari, Uropodina, new records, new species, Malaysia

INTRODUCTION

The mites of the cohort Uropodina are one of the most diverse groups of mesostigmatid mites, with more than 2000 species described from all regions of the world (WIŚNIEWSKI & HIRSCHMANN 1993). Until recent, only 40 species were recorded from Indo-China (WIŚNIEWSKI 1993). Subsequently one species has been described from Myanmar, two from Cambodia, three from Laos, four from Thailand, 30 from Vietnam and only eight from Malaysia (WIŚNIEWSKI 1993; KONTSCHÁN 2008, 2010a, b, c, KONTSCHÁN & STARÝ 2011).

This paper is the second part of the studies on the Uropodina mites of the soil samples deposited in the Institute of Soil Biology of Biology Centre AS CR (České Budějovice, Czech Republic), which contains new records of three previously described species and descriptions of four new species from Malaysia.

MATERIAL AND METHODS

Specimens were cleared in lactic acid and drawings were made with the aid of a drawing tube. Most specimens are stored in alcohol, other specimens on slides in gelatin-lactic acid mixture, and

deposited in the Soil Zoology Collections of the Hungarian Natural History Museum, Budapest (HNHM), in the Natural History Museum, Geneva (NHMG) and the Biology Centre AS CR, Institute of Soil Biology, České Budějovice (ISB). Abbreviations: St: sternal setae, h: hypostomal setae, v: ventral setae, ad: adanal setae. All measurements are given in micrometers.

LIST OF THE FOUND SPECIES
Eutrachytidae TRÄGARDH, 1944
Deraïophorus mirabilis KONTSCHÁN, 2010

Material examined: one female. MAY-044, West Malaysia, Batu Caves, 30.XII.2010, rain forest on lime-stone bedrock, GPS 03°14'50"N, 101°41'17"E, wet site with rich brushwood, sample of leaf litter, leg. J. FARSKÁ (in HNHM).

Distribution: Thailand and Malaysia.

Cyllibulidae HIRSCHMANN, 1979

Cyllibula ovalis sp. n.
(Figs 1–10)

Material examined. Holotype, female. Malaysia, May 2009, Pahang, Cameron Highlands, Tanan Rata village environs, 04°28.52'N, 101°23.02'E, ca. 1500 m, near Parit Fall, sifting of leaf litter, leg. P. Baňář (in HNHM). Paratypes: Four females, two males (in ISB) and four females, two males (in HNHM), locality and date same as in holotype.

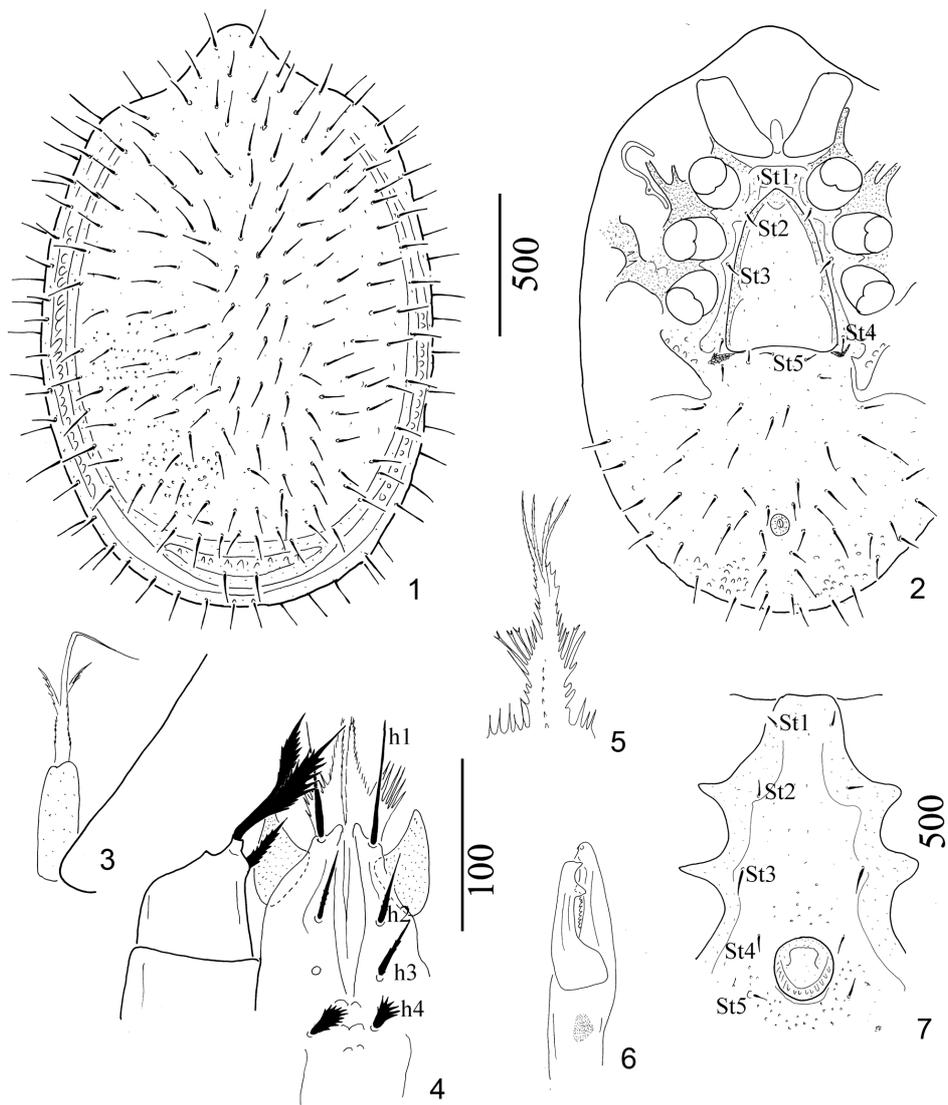
Description. Female. Length of idiosoma 1400–1420 µm, width 920–980 µm (n = 9). Shape oval, anterior margin with small vertex, posterior margin rounded.

Dorsal idiosoma (Figs 1 & 8). Dorsal and marginal shields fused close to the anterior margin. All dorsal setae smooth and needle-like (ca. 80–90 µm), dorsal shield covered by oval pits. Pygidial shield present, with some oval pits and bearing one pair of smooth and needle-like setae (ca. 90 µm). Internal margin of marginal shield undulate, setae on marginal shield similar in shape and length to dorsal setae.

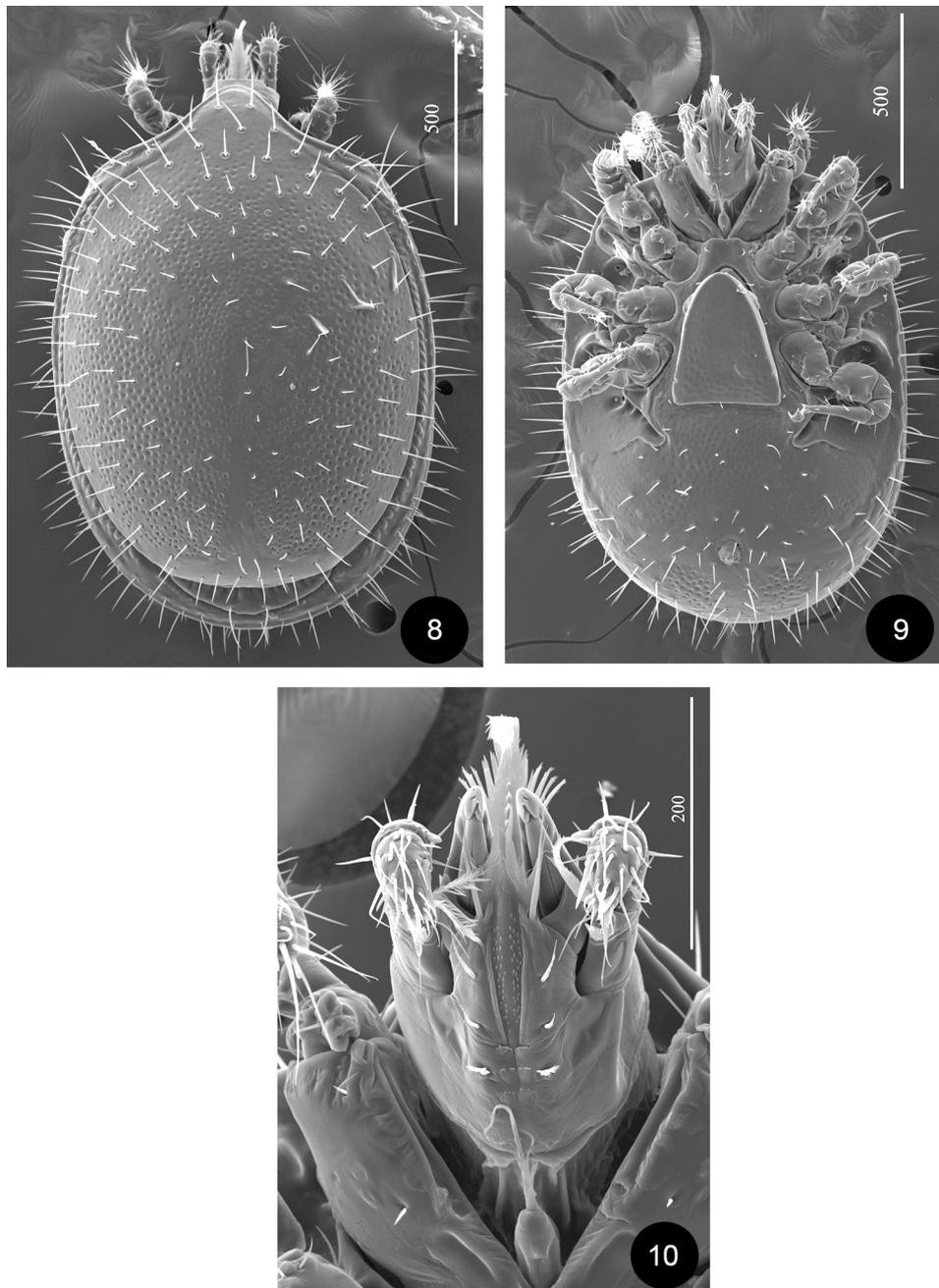
Ventral idiosoma (Figs 2 & 9). Sternal shield without ornamentation, St1 short (ca. 20 µm), needle-like and situated near anterior margin of sternal shield. St2, St3, St4 and St5 long (ca. 50–65 µm), St2 placed on level of posterior margin of coxae II, St3 on level of posterior margin of coxae III, St4 near basal edges of genital shield, St5 near to basal line of genital shield. Ventral shields mostly smooth, but reticulate sculptural pattern present near basal edges of genital shield and ornamented by oval pits in caudal area of ventral shield. Ventral shield neotrichous, ventral setae smooth and needle-like (ca. 80–90 µm). Adanal setae similar in shape and length to ventral setae, postanal seta absent. Stigmata situated between coxae II and III, peritremes hook-shaped. Genital shield wide, linguliform, without sculptural pattern and anterior process. Tritosternum with narrow basis, laciniae with three branches, central one long and smooth, two lateral branches marginally pilose and short (Fig. 3).

Legs. All segments with simple and smooth setae and claws absent at the tip of leg I.

Gnathosoma (Figs 4 & 10). Corniculi horn-like, internal malae marginally pilose, apically covered by short hairs and longer than corniculi. Hypostomal setae h1 placed near anterior margin of hypostoma, (ca. 70 μm) smooth and needle-like, and h2 (ca. 40 μm), h3 (ca. 35 μm) and h4 (ca. 20 μm) marginally serrate. Trochanter with one short and marginally serrate seta, and other seta long, apically divided into two branches and these branches with serrate margins. Epistome marginally serrate and apically divided into four pilose branches (Fig. 5). Chelicera with one large tooth on movable digit and several short teeth on the fixed digit, internal sclerotized node present (Fig. 6).



Figs 1–7. *Cyllibula ovalis* sp. n.: 1 = female, holotype, dorsal view, 2 = ventral view, 3 = tritosternum, 4 = ventral view of gnathosoma, 5 = epistome, 6 = chelicera, 7 = intercoxal region of male



Figs 8–10. *Cyllibula ovalis* sp. n., scanning micrographs: 8 = dorsal view, 9 = ventral view, 10 = ventral view of gnathosoma

Male. Length of idiosoma 1330–1410 μm , width 920–980 μm ($n = 4$). Shape oval, posterior margin rounded. Dorsal idiosoma. Ornamentation and chaetotaxy as for female.

Ventral idiosoma. Ornamentation and chaetotaxy of ventral shield as for female. Sternal shield bearing small oval pits, all of sternal setae smooth and thorn-like. St1, St2, St4 and St5 short (ca. 25–30 μm), St3 long (ca. 50 μm), St1 situated near anterior margin of sternal shield, St2 placed on level of posterior margin of coxae II, St3 on level of posterior margin of coxae III, St4 near anterior margin of genital shield, St4 near posterior margin of genital shield. Genital shield rounded and placed between coxae IV. Gnathosoma and other appendages similar to that of female.

Nymphs and larva are unknown.

Etymology: The name of the new species refers to the shape of idiosoma.

Remarks. HIRSCHMANN (1977) divided the genus *Cyllibula* into two subgenera and simultaneously sorted the *Cyllibula* species into four species groups on the basis of the shape of fourth hypostomal setae. Some years later BŁOSZYK and ATHIAS-BINCHE (1986) established a new subgenus (*Wagenaaria*) within the genus *Cyllibula* ignoring the previous subgeneric classification of this genus. Following HIRSCHMANN's (1977) subgeneric division (we need to ignore BŁOSZYK and ATHIAS-BINCHE' (1986) concept, because they did not apply their subgeneric system for the whole genus), we placed the new species into *Baloghicyllibula* (based on the shape of chelicerae and setae h4), however, the shape of idiosoma and peritreme, and the presence of pygidial shield is a unique character combination in this subgenus and in the genus. The new species differs from the single species presented from Malaysia (*Cyllibula shibai* HIRAMATSU, 1980) in shape of peritreme (spiral like in known species and hook-shaped in the new species), in the ornamentation of genital shield of female (covered by oval pits in known species and smooth in the new one) and in the presence of pygidial shield (absent in the known species and present in the new one).

Uropodidae KRAMER, 1882

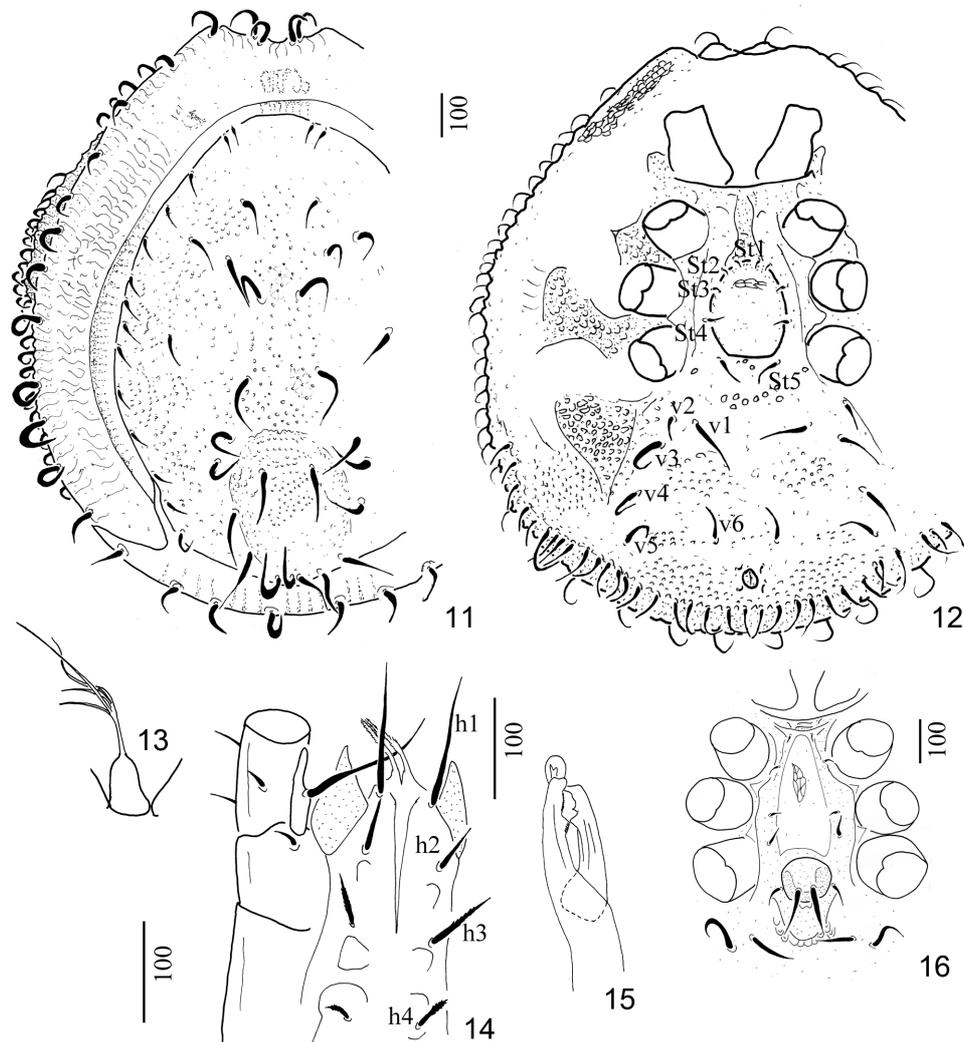
Uropoda gigantea sp. n.

(Figs 11–19)

Material examined. Holotype, female. MAY-004, Malaysia, Pahang, Cameron Highlands, Tanan Rata village environs, altitude ca. 1470–1550 m, near Parit Fall, sifting of leaf litter and rotten wood, 25.IV–15.V.2009, leg. P. Baňar (in HNHM). Paratypes: One female and two males (in ISB), one female and one male (in NHMG) and two females and two male (in HNHM), locality and date same as in holotype.

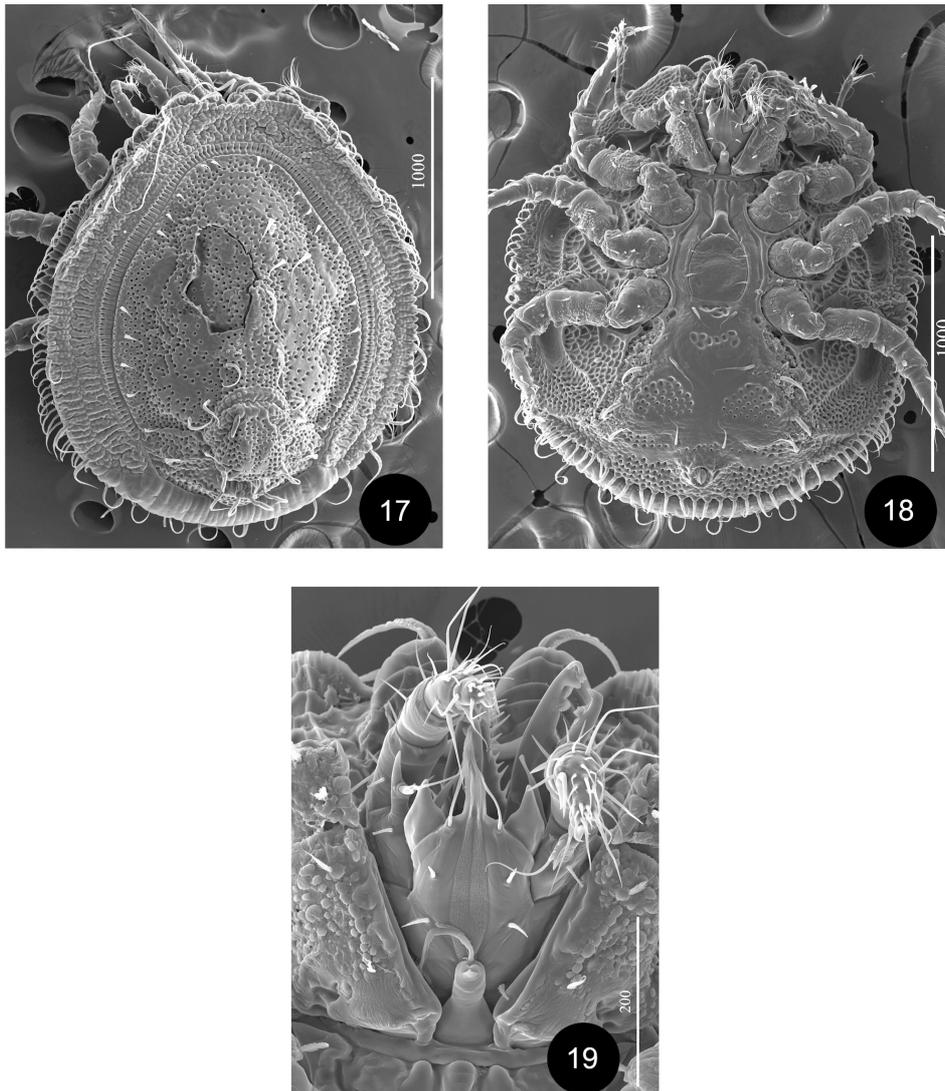
Description. Female. Length of idiosoma 1930–1950 μm , width 1640–1660 μm ($n = 9$). Shape oval, anterior margin with a wide indentation, posterior margin rounded.

Dorsal idiosoma (Figs 11 & 17). Dorsal and marginal shields separated completely. All dorsal setae strongly curved, smooth and needle-like, central area bearing longer setae (ca. 130–160 μm) than lateral area of dorsal shield (ca. 47–50 μm). Caudal region of dorsal shield emended from surface, this area bearing long and smooth setae (ca. 150 μm). Dorsal shield covered by small oval pits. Marginal shield reduced on caudal area, marginal shield covered by characteristic sculptural pattern (Fig. 16), and bearing long (ca. 150–170 μm) and smooth setae. Caudal area of dorsal idiosoma bearing four pairs of long (ca. 120–130 μm) and smooth setae which situated on membranous cuticle.



Figs 11–16. *Uropoda gigantea* sp. n.: 11 = female, holotype, dorsal view, 12 = ventral view, 13 = tritosternum, 14 = ventral view of gnathosoma, 15 = chelicera, 16 = intercoxal region of male

Ventral idiosoma (Figs 12 & 18). Sternal shield without ornamentation with two deep, longitudinal furrows situated between anterior margin of sternal shield and anterior margin of genital shield. Setae St1 and St2 short (ca. 22–24 μm), needle-like and situated near anterior margin of genital shield. St3 short (ca. 30 μm) and placed on level of central region of coxae III, St4 (ca. 50 μm) on level of posterior margin of coxae III, St4 (ca. 65 μm) near basal edges of genital shield. Ventral shield covered by small oval pits on caudal area, several large oval pits present near basal line of genital shield and irregular pits situated on pedofossae. Ventral setae smooth and needle-like, V1, V3, V4,



Figs 17–19. *Uropoda gigantea* sp. n., scanning micrographs: 17 = dorsal view, 18 = ventral view, 19 = ventral view of gnathosoma

V5 and V6 ca. 140–160 μm , V2 ca. 70 μm , their position illustrated on Fig. 12. Setae ad1 and ad2 smooth, needle-like and short, postanal seta absent. Several smooth and needle-like setae (ca. 130–140 μm) situated near caudal margin of ventral shield. Stigmata situated between coxae II and III, peritremes hook-shaped. Genital shield placed between coxae III and IV, its shape rounded, with reticulate sculptural pattern and without anterior process. Tritosternum with narrow basis, laciniae divided into four smooth branches (Fig. 13).

Legs. All segments with simple and smooth setae and claws absent at the tip of leg I.

Gnathosoma (Figs 14 & 19). Corniculi horn-like, internal malae long, narrow and apically pilose. Hypostomal setae h1 smooth and needle-like (ca. 105 μm), placed near anterior margin of hypostoma, h2 (ca. 20 μm) smooth and needle-like, h3 (ca. 27 μm) and h4 (ca. 20 μm) marginally serrate. Palp trochanter with one short and smooth, and one long and smooth setae situated on a long and projecting bases. Epistome marginally pilose (lateral part illustrated on Fig. 19). Chelicerae with two teeth on movable digit and one tooth on the fixed digit, internal sclerotized node absent, a bulbiform apical process present on fixed digit (Fig. 15).

Male. Length of idiosoma 1900–1920 μm , width 1560–1570 μm (n = 4). Shape oval, posterior margin rounded. Dorsal idiosoma. Ornamentation and chaetotaxy as for female.

Ventral idiosoma. Ornamentation and chaetotaxy of ventral shield as for female. Sternal shield ornamented by reticulate sculptural pattern, all sternal setae smooth and needle-like. St1, St2 and St3 short (ca. 28 μm), St3 and St5 long (ca. 42 μm), St1 situated near anterior margin of sternal shield, St2 placed at level of central region of coxae II, St3 at level of central region of coxae III, St4 at level of anterior margin of coxae IV, St5 near lateral margins of genital shield. Genital shield bearing one pair of smooth setae (ca. 100 μm), its shape oval and placed between coxae IV (Fig. 16). Gnathosoma and other appendages same as in female.

Nymphs and larva are unknown.

Etymology: The name of new species refers to the large size of idiosoma.

Remarks. The new species belongs to the *Uropoda splendida*-group (common character is the strongly sclerotized dorsal lines), the new species is closely related to *Uropoda shibai* HIRAMATSU, 1980, because the other species from this group have either strongly sclerotized E-shaped line on dorsal shield or bear pilose caudal setae which cannot be found in the new one. The most important differences are the followings: female of the new species has oval pits on ventral shield near the basal line of genital shield; this character is missing in the known species. The new species has six pairs of ventral setae; in contrast, the known species bears only five pairs of ventral setae. Anterior margin of genital shield of female is serrate in the known species, but smooth in the new one. The sternal shield of male is covered by reticulate sculptural pattern, contrary, the sternal shield of the new species is smooth.

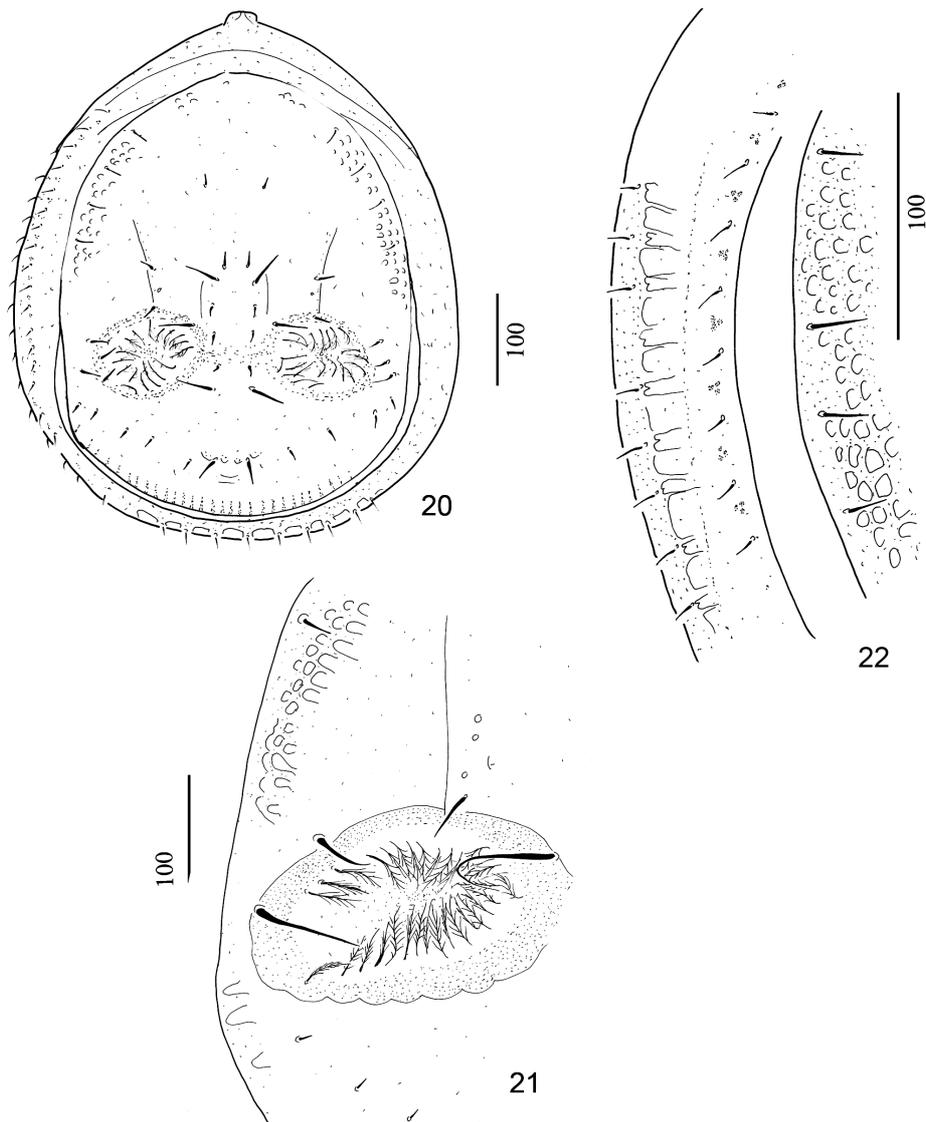
Phymatodiscus malayicus sp. n.

(Figs 20–27)

Material examined. Holotype, female. MAY-044, West Malaysia, Batu Caves, 30.XII.2010, rain forest on lime-stone bedrock, GPS 03°14'50"N, 101°41'17"E, wet site with rich brushwood,

sample of leaf litter, leg. J. FARSKÁ. Paratypes: six females, (two females deposited in ISB, two females in NHMG and two females in HNHM), locality and date same as for holotype.

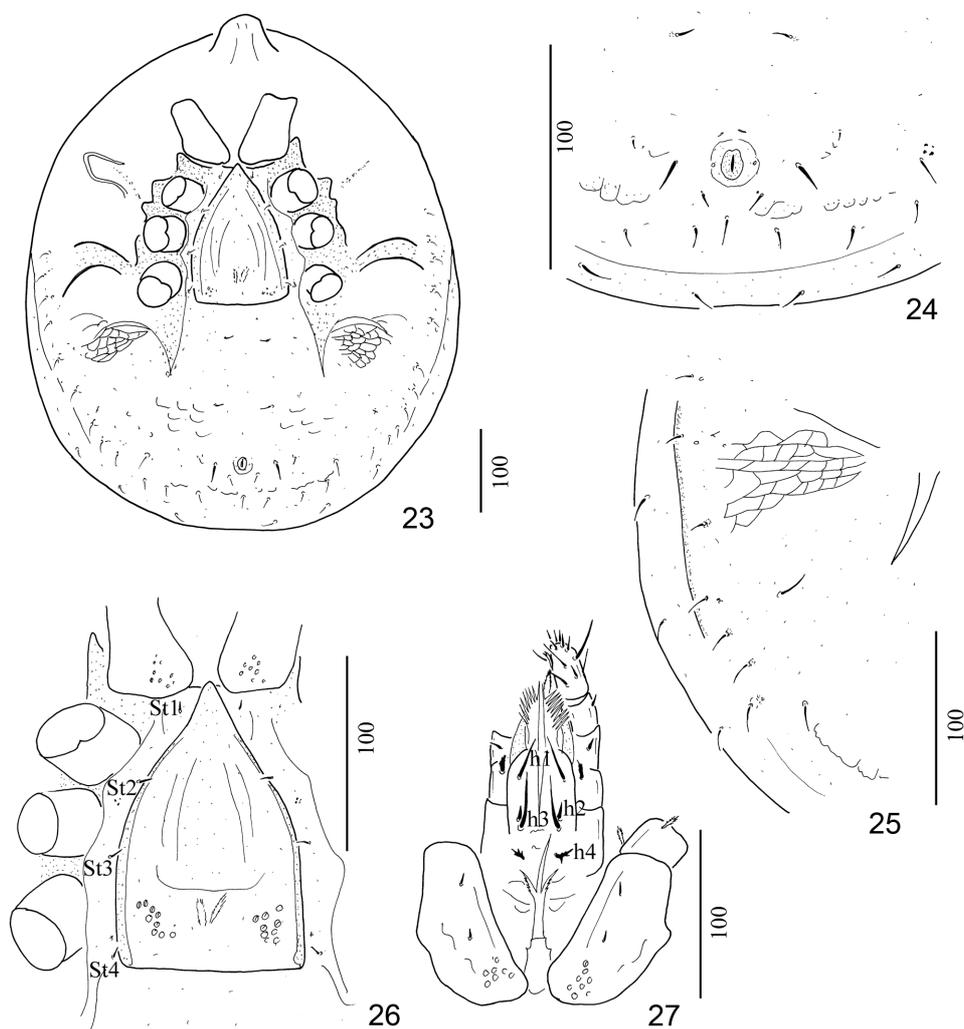
Description. Female. Length of idiosoma 600–620 μm , width 500–510 μm ($n = 7$). Shape oval.



Figs 20–22. *Phymatodiscus malayicus* sp. n.: 20 = female, holotype, dorsal view, 21 = eye-like transversal furrow, 22 = setae and ornamentation on margin of idiosoma

Dorsal idiosoma (Fig. 19). Marginal and dorsal shields separated completely. Dorsal shield bearing short (ca. 10–15 μm) smooth setae and four pairs of long (ca. 38–42 μm) setae on row J. One pair of deep, eye-like transversal furrows situated at level of coxae IV, bordered with long, marginally pilose and smooth setae (Fig. 21). Dorsal shield laterally covered by irregular pits (Fig. 20), central surface smooth. Marginal setae short (ca. 18–20 μm), smooth and needle-like. Marginal shield without sculptural pattern (Fig. 20), its caudal section with undulate posterior margin.

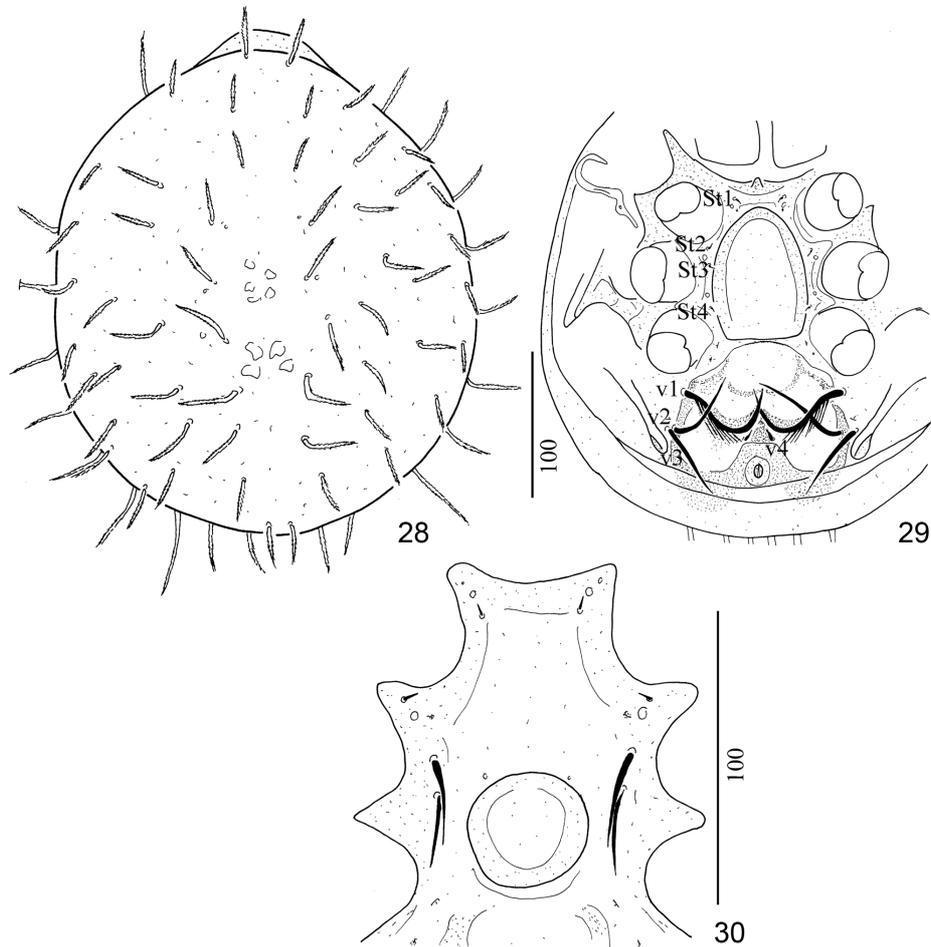
Ventral idiosoma (Fig. 22). Ornamentation on sternal shield absent. Sternal setae short (ca. 6–7 μm), smooth and needle-like. St1 situated near anterior margin of sternal shield, St2 and St3 at



Figs 23–27. *Phymatodiscus malayicus* sp. n.: 23 = female, holotype, ventral view, 24 = caudal area of ventral idiosoma, 25 = marginal area of ventral idiosoma, 26 = genital shield, 27 = ventral view of gnathosoma, palp, tritosternum and coxae I

level of posterior margin of coxae II, St3 at level of posterior margin of coxae III, near posterior corners of genital shield (Fig. 25). Ventral setae smooth, needle-like (ca. 8–13 μm), except one pair of setae at level of anal opening, which long and needle-like (ca. 20 μm). Caudal margin of ventral idiosoma with several pairs of long setae (ca. 8–10 μm) (Fig. 24). Ventral shield without ornamentation, except metapodal area, which covered by reticulate sculptural pattern (Fig. 23). Stigmata situated between coxae II and III, peritremes hook-shaped. Genital shield scutiform, covered by alveolar pits basally and without process on its apical margin (Fig. 25). Base of tritosternum narrow, tritosternal laciniae subdivided into three serrate branches (Fig. 26).

Gnathosoma (Fig. 26). Corniculi horn-like, internal malae longer than corniculi, their margins pilose. Hypostomal setae h1 (ca. 30 μm) long, smooth h2 short (ca. 27 μm), smooth, h3 long (ca. 32 μm), smooth and situated near insertion of h2, h4 short (ca. 8–11 μm), apically serrate. Epistome apically pilose. Chelicerae not clearly visible.



Figs 28–30. *Depressorotunda (Depressorotunda) batuensis* sp. n.: 28 female, holotype, dorsal view, 29 = ventral view, 30 = intercoxal region of male

Table 1. Distinguishing characters between *Phymatodiscus* species with one pair of deep, eye-like transversal furrow.

	<i>Ph. kuni</i>	<i>Ph. oculatus</i>	<i>Ph. aokii</i>	<i>Ph. haradai</i>	<i>Ph. malayicus</i>
Length of dorsal setae	diverse	uniform	uniform	diverse	diverse
Setae on the deep, eye-like transversal furrow	smooth	smooth	smooth	smooth	smooth and marginally pilose
Surface of female genital shield	with oval pits basally	web-like ornamentation anteriorly	smooth	smooth	with a few oval pits basally
Setae on ventral shield	short, medium sized and long	uniform	uniform	uniform	short, medium sized and long
Additional setae on ventral shield	absent	absent	present	absent	absent
Oval pits near pedofossae of leg IV	present	absent	absent	absent	absent
Setae h1	serrate	smooth	smooth	smooth	smooth

Nymphs, larvae and male unknown.

Etymology. This new species is named after the country where the specimens were collected.

Remarks. Eleven species of *Phymatodiscus* have been described from New Guinea, Japan, Indonesia (WIŚNIEWSKI & HIRSCHMANN 1993) and Vietnam (KONTSCHÁN & STARÝ 2011). Four (*Ph. oculatus* HIRSCHMANN, 1977; *Ph. aokii* HIRAMATSU, 1985; *Ph. haradai* HIRAMATSU, 1985; *Ph. kuni* KONTSCHÁN & STARÝ, 2011) described species have a pair of deep, eye-like, transversal furrows, bordered with long, setiform setae at level of coxae IV. The distinguishing characters between the three mentioned and the new species are summarized in Table 1.

Urodinychidae BERLESE, 1917

Uroobovella serangensis HIRAMATSU, 1980

Material examined: six females, MAY-044, West Malaysia, Batu Caves, 30.XII.2010, rain forest on lime-stone bedrock, GPS 03°14'50"N, 101°41'17"E, wet site with rich brushwood, sample of leaf litter, leg. J. FARSKÁ (three in ISB, three in HNHM).

Distribution: Indonesia and Malaysia.

Rotundabaloghiidae HIRSCHMANN, 1979

Depressorotunda (Depressorotunda) malaya KONTSCHÁN, 2010

Material examined. One female and two males. MAY-044, West Malaysia, Batu Caves, 30.XII.2010, rain forest on lime-stone bedrock, GPS 03°14'50"N, 101°41'17"E, wet site with rich brushwood, sample of leaf litter, leg. J. FARSKÁ (one male in ISB, one male and female in HNHM).

Distribution: Malaysia.

***Depressorotunda (Depressorotunda) batuensis* sp. n.**

(Figs 28–30)

Material examined. Holotype. female, MAY-044, West Malaysia, Batu Caves, 30.XII.2010, rain forest on lime-stone bedrock, GPS 03°14'50"N, 101°41'17"E, wet site with rich brushwood, sample of leaf litter, leg. J. FARSKÁ (in HNHM). Paratypes, two males (in ISB), one male (in NHMG), one male (in HNHM), locality and date same as in holotype.

Description. Female. Length of idiosoma 340 µm, width 280 µm (n = 1). Shape circular, posterior margin rounded.

Dorsal idiosoma (Fig. 28). Marginal and dorsal shields fused. Dorsal setae smooth, needle-like, ca. 28–32 µm long. Surface of dorsal idiosoma smooth.

Ventral idiosoma (Fig. 29). Sternal and ventral shields without sculptural pattern. Sternal setae smooth, short (ca. 4–5 µm) and needle-like. St1 at level of anterior margin of genital shield, St2 and St3 at level of posterior margin of coxae II, St4 at level of posterior margin of coxae III. All sternal setae smooth and needle-like. Sternal shield with two pairs of lyrifissures, first pair of them near to St1, second pair near posterior corners of genital shield. Ventral setae V1, V2 and V3 placed on margin of ventral cavity, V1 marginally pilose (ca. 75 µm), V2 (ca. 55 µm) and V3 (ca. 50 µm) smooth and needle-like. V4 situated near posterior margin of ventral cavity, smooth and short (ca. 8 µm) and placed in ventral cavity, near posterior edges of genital shield. One pair of lyrifissures situated near insertions of V2 and V3. Stigmata situated between coxae II and III. Peritremes hook-shaped. Genital shield linguliform, its surface smooth. Tritosternum and gnathosoma not clearly visible (covered by coxae I).

Legs. Leg I with ambulacral prolongation.

Male. Length of idiosoma 330–340 µm, width 270–280 µm (n = 4). Shape circular, posterior margin rounded. Dorsal idiosoma. Ornamentation and chaetotaxy of dorsal shield as for female. Ventral idiosoma. Four pairs of sternal setae situated anterior to genital shield, these setae smooth, needle-like, St1 and St2 short (ca. 4–5 µm), St1 placed near anterior margin of sterna shield, St2 at level of posterior margin of coxae II, St3 and St4 long (ca. 25–27 µm) and situated anteriorly to genital opening (Fig. 30). Surface of sternal shield smooth. Surface of ventral shield and shape and size of ventral setae similar to that of female. Genital shield circular, placed between coxae IV.

Etymology. The name of the new species refers to the Batu cave where the new species was found.

KEY TO THE *DEPRESSOROTUNDA* (*DEPRESSOROTUNDA*)
SPECIES

- 1 Genital shield of female, sternal shield of male ornamented by oval pits
D. (D.) alveolata KONTSCHÁN et STARÝ, 2011
- Genital shield of female and sternal shield of male without ornamentation 2
- 2 All ventral setae smooth 3
- One of ventral setae marginally pilose **D. (D.) batuensis** sp. n.
- 3 Peritreme R-shaped, posteriormost dorsal setae conspicuously longer than those with anterior position *D. (D.) seticaudata* KONTSCHÁN, 2010
- Peritreme hook-shaped, most of dorsal setae equal in length 4
- 4 V3 as long as V2 and V4 5
- V3 two times longer than V2 and V4 *D. (D.) mirifica* KONTSCHÁN, 2010
- 5 Male ventral cavity conspicuously enlarged, reaching sternal region, with genital shield in medial part; most of dorsal setae with distal pilosity
D. (D.) malayana KONTSCHÁN, 2010
- Male ventral cavity smaller, not reaching sternal region, genital shield situated outside of cavity; most of dorsal setae smooth
D. (D.) thailandica KONTSCHÁN, 2010

ZOOGEOGRAPHICAL NOTES

We presented seven Uropodina species from Malaysia, which were collected in two parts of the country, on the Malay Peninsula.

The genus *Phymatodiscus* seems to be endemic in the Australasian and Oriental regions. With the new species, twelve species are recorded from Java, Borneo, New Guinea, Vietnam and Malaysia (WIŚNIEWSKI 1993, KONTSCHÁN & STARÝ 2011). Some years ago VÁZQUEZ and KLOMPEN (2007) presented five *Phymatodiscus* species (identified only to generic level) from the Neotropical region, which suggest an interesting Amphipacific distribution type or the result of misidentification. Unfortunately they did not give description or illustration of the five species; hence the exact identification of those is questionable. The subgenus *Depressorotunda* (*Depressorotunda*) seems to be endemic in this region; species of them are described from Vietnam, Thailand and Malaysia (KONTSCHÁN 2010b,

KONTSCHÁN & STARÝ 2011). *Uroobovella serangensis* HIRAMATSU, 1980 is situated in the *Uroobovella elegans*-group according to HIRSCHMANN's (1989) classification currently we know 11 species from SE Asia, New Guinea and South America (WIŚNIEWSKI & HIRSCHMANN 1993), which is an interesting Amphipacific distribution. These species of the *elegans*-group are well characterized by the triangular marginal setae, which is unique in the genus *Uroobovella* (HIRSCHMANN, 1989) hence this species group maybe a separated line within the genus *Uroobovella*. The genus *Deraiphorus* G. CANESTRINI, 1897 has similar distribution type, species of this genus occur in the Neotropical region, in Australia, in the Indo-Malay region and Oceania. Up to now, no species have been recorded from Africa and other Afrotropical areas (e.g. Madagascar) (WIŚNIEWSKI & HIRSCHMANN 1993). The species of the genus *Cyllibula* BERLESE, 1916 occur in South and Central America, only one species is known from Polynesia and another one was found in Malaysia (*Cyllibula shibai* HIRAMATSU, 1980) (WIŚNIEWSKI & HIRSCHMANN 1993).

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