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Additional contributions to the knowledge of Philippine predatory mites mainly of the subfamilies Cunaxinae and Cunaxoidinae (Acari: Prostigmata: Cunaxidae)

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Original research

ABSTRACT

A new species of cunaxid mite belonging to the subfamily Cunaxinae, *Cunaxa minidis-condyla* sp. nov., is described from the Philippines. This species is distinctive by the presence of a small disc-shaped apophysis dorsodistally on the palp telofemur, two spine-like setae on the palp genu, a long spine-like seta on the palp tibiotarsus, an ill-defined propodosomal shield, the absence of a median hysterosomal shield, long hysterosomal setae, and basifemoral and telofemoral chaetotaxy of 4-4-3-1 and 5-5-4-4, respectively. The previously unknown female of *Lupaeus longisetus* (Cunaxoidinae) and unknown male of *Dactyloscirus trifidus* (Cunaxinae) are described. A supplementary description is provided for *Scutopalus clavatus* (Cunaxoidinae) which is recorded for the first time in the Philippines on coconut leaves infested with the scale insect, *Aspidiotus rigidus*. New locality and habitat data are given for some species of the aforementioned subfamilies, as well as the subfamilies Bonzinae and Orangescirulinae.

Keywords Acari; biodiversity; Cunaxinae; Cunaxoidinae; Philippines; predatory mites
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Introduction

The cunaxid fauna of the Philippines is relatively well known with 78 species already on record (Corpuz-Raros et al., 2017). Continuing work on oribatids and other soil-inhabiting mites have led to the collection of more cunaxids including a new species of *Cunaxa*, the hitherto unknown female of *Lupaeus longisetus* (Corpuz-Raros, 1996c) (Cunaxoidinae) and unknown male of *Dactyloscirus trifidus* Corpuz-Raros, 2008 (Cunaxinae); these are formally described as primary objective of the present paper. *Scutopalus clavatus* (Shiba 1976) (Cunaxoidinae), previously known only from the type locality in Peninsular Malaysia and South China, was collected on coconut leaves and recorded from the Philippines for the first time; a supplementary description especially of the female leg chaetotaxy is provided as secondary objective. In addition, new locality and habitat data were found for several other previously known species, six belonging to the subfamily Cunaxinae, seven to Cunxoidinae and one species each to Orangescirulinae and Bonziinae. Addition of the new species and the new record brings the Philippine cunaxid fauna to 80 species belonging to 16 genera and five subfamilies, among which the Coleoscirinae is most diverse with 30 species, followed by Cunaxinae (26), Cunaxoidinae (21), Bonziinae (2) and Orangescirulinae (1).

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Materials and methods

Most of the present material belong to the same series of collections in the aforementioned paper that dealt with the subfamily Coleoscirinae. These were extracted with Tullgren funnels from samples of their soil habitats including leaf litter, bark and other organic debris, as well as ant and termite nests, in forested areas. Specimens of *S. clavatus* were brushed off coconut leaves into a vial of ethyl alcohol, along with other plant inhabiting mites. Specimens were mounted on glass slides in Hoyer's medium. These were microscopically studied on a compound microscope, model Zeiss Primostar. Illustrations were initially prepared with the aid of a camera lucida and morphological details finalized manually. Measurements were made with an ocular micrometer and expressed in micrometers (µm). Morphological terms and setal nomenclature follow those of recent cunaxid workers (Den Heyer, 1979, 1981; Castro and Den Heyer, 2009; Den Heyer et al., 2011; Skvarla et al., 2014) and as used recently in Corpuz-Raros et al., 2017. Specifically, the nomenclature for subcapitular or hypognathal setae hg3 and hg4 follows Den Heyer's system where hg3 is the longest seta located near the base of the palp and hg4 is the most posterior pair on the subcapitulum (labelled as such in Fig. 4 of Den Heyer, 1979). This is in contrast to the system of Smiley, 1992 where the names of these two setae are in reverse, and which were adopted by Skvarla, et al., 2014.

The chaetotaxy and types of setae on leg segments are given consecutively from I-II-III-IV. Some setae arising in duplex or triplex on the distal leg segments are enclosed in brackets and counted separately from those of similar types on a given segment. Abbreviations used – asl = attenuate solenidion, bsl = blunt solenidion, dtsl = distal solenidion near tip of leg tarsi, hg = hypognathal or subcapitular seta, hgs = hysterogastral seta, mst = microseta or minute simple tactile seta, pa = paraanal seta, pg = paragenital seta, ppgs = propodogastral seta, spls = spine-like seta, sts = simple tactile seta, T = trichobothrium, tsl = terminal solenidion on distal margin of leg tarsi.

Material Examined

Entries within a range were taken from the same locality on the same date by the same collectors, and differ only by the type of habitat from where they were collected.

1 – 2 — Museum of Natural History grounds, Forestry campus, University of the Philippines Los Baños, Laguna Province, Luzon Island, Philippines, 18 Jan. 2016, collected by R.C. Garcia, J.C. Naredo and H. Klompen: Locality 1, ex material in rotten mahogany (*Swietenia macrophylla*) stump; Locality 2, ex rotten banana (*Musa sapientum*) trunk.

3 – 8 — University of the Philippines Land Grant, Laguna-Quezon provincial border, Luzon Island, Philippines, 21-23 Jan. 2016, collected by R.C. Garcia, J.C. Naredo, and H. Klompen: Locality 3, ex unidentified shelf mushroom on rotten trunk; Locality 4, ex litter inside decomposing unknown tree fern; Locality 5, ex decomposing tree fern; Locality 6, ex unknown habitat; Locality 7, ex litter inside decomposing tree fern; Locality 8, ex unknown habitat.

9 – 14 — Museum of Natural History Hortorium, Lower campus, University of the Philippines Los Baños, Laguna Province, Luzon Island, Philippines, 27-29 Jan. 2016, collected by R.C. Garcia, J.C. Naredo and H. Klompen: Locality 9, ex litter in buttress of tree; Locality 10, ex litter between leaves on top of "kaong" palm (*Arenga pinnata*); Locality 11, ex litter of the same palm as the foregoing; Locality 12, ex termite nest at base of oil palm (*Elaeis guineensis*); Locality 13, ex unknown bamboo litter; Locality 14, ex dry stuff under unknown huge tree.

15 — Museum of Natural History Hortorium, Lower campus, University of the Philippines Los Baños, Laguna Province, Luzon Island, Philippines, 29 Jan. 2016, collected by D. E. General, ex soil with queen of ant, *Vanderhovenia*.

16 – 19 — Phin Garcia's farm, Barangay Anos, Los Baños municipality, Laguna Province, Luzon Island, Philippines, 29 Jan. 2016, collected by R.C. Garcia: Locality 16, ex litter at base of betel nut palm (*Areca catechu*); Locality 17, ex decomposing banana (*Musa sapientum*)

leaves; Locality 18, ex mixture of decomposing banana leaves and grasses; Locality 19, ex decomposing grasses.

20 – 26 — Barangay Pintor, Gamu municipality, Isabela Province, Luzon Island, Philippines, 31 Jan. 2016, collected by R.C. Garcia, J.C. Naredo and H. Klompen: Locality 20, ex flowers of kaong palm (*Arenga pinnata*) on ground; Locality 21, ex litter under narra tree (*Pterocarpus indicus*); Locality 22, ex litter in mixed bamboo (*Bambusa* spp., mainly *B. blumeana, B. merrilliana* and *B. ventricosa*) plantation; Locality 23, ex litter of *Gliricidia sepium*; Locality 24, ex rotting banana trunk; Locality 25, ex rotting log of royal palm (*Roystonea elata*); Locality 26, ex litter from plantation of mahogany.

27 – 28 — Barangay Santa Victoria near cave complex within resort, Ilagan City, Isabela Province, Luzon Island, Philippines, 1 Feb. 2016, collected by R.C. Garcia, J.C. Naredo and H. Klompen; Locality 27, ex litter on side rock cliff under unknown large tree; Locality 28, ex very thick litter of bamboo (*Schizostachyum* sp., locally called "manglaw").

29 — Along highway between Aritao municipality, Nueva Vizcaya Province and Baguio City, Benguet Province, within the Cordillera Mountain Ranges, Luzon Island, Philippines, 2 Feb. 2016, collected by R.C. Garcia, J.C. Naredo and H. Klompen, ex litter under big pine tree (*Pinus kesiya*) on steep slope.

30 — Unknown locality, Pangasinan Province, 2 Feb. 2016, collected by R.C. Garcia, J.C. Naredo and H. Klompen, ex unknown habitat.

31 — Barangay Lumot, Cavinti municipality, Laguna Province, Luzon Island, Philippines, 26 May 2014, collected by A.R. Larona, ex leaf litter from secondary forest within Cavinti underground river and cave complex.

32 – 33 — Mt. Makiling, Barangay Lalakay, Los Banos municipality, Laguna Province, Luzon Island, Philippines, 23 Feb. 2016, collected by R.C. Garcia: Locality 32, ex litter of ayumit (*Ficus minahassae*); Locality 33, ex litter of kawayang tinik (*Bambusa blumeana*).

34 — Santol Cave area, Biak-na-Bato National Park, San Miguel municipality, Bulacan Province, Luzon Island, Philippines, 25 Feb. 2016, collected by J.C. Naredo, ex litter in buttress of 300-year old dao tree (*Dracontomelon dao*).

35 — Panay State Polytechnic College campus, Mambusao Municipality, Capiz Province, Panay Island, Philippines, 12 Oct. 1990, collected by A.M. Almeroda, ex grass litter.

36 — Mt. Malindang range, Oroquieta City, Misamis Occidental Province, Mindanao Island, Philippines, 24 Oct. 2004, collected by W. Sm. Gruezo, ex mixed secondary forest litter and soil.

37 — Benguet State University, Forestry area, Barangay Puguis, La Trinidad municipality, Benguet Province, Luzon Island, Philippines, 15 Feb. 2010, collected by R.C. Garcia, ex duff at cliff.

38 — Barangay Rizal, Tuy municipality, Batangas Province, Luzon Island, Philippines, 16 Sep. 2014, collected by M.V. Navasero and M.M. Navasero, brushed off coconut (*Cocos nucifera*) leaves infested with coconut scale insect, *Aspidiotus rigidus* Reyne.

39 — Barangay Del Carmen, Siargao municipality, Surigao del Norte Province, Siargao Island, Philippines, 5 Oct. 2016, collected by S.A. Yap, ex soil litter.

40 — Base Camp, Mt. Guiting-guiting Natural Park, Sibuyan Island, Romblon Province, Philippines, 27 Mar. 2017, collected by J.C.B. Naredo, ex litter and duff between branches of tree.

41 — Barangay Poblacion, Magdiwang municipality, Sibuyan Island, Romblon Province, Philippines, 30 Jun. 2016, collected by C.L. Lucañas, ex coconut leaves.

The species contained in the samples are listed below from their respective locality numbers, with the number and sex of specimens enclosed in parentheses. Their presently known distribution is compiled with the type country mentioned ahead of other records. Island records (listed from north to south) are provided as a gauge of how widespread a given species is within the Philippines at present.

Deposition of specimens

All material documentations including types of the new species are deposited in the Museum of Natural History, University of the Philippines Los Baños, College, Laguna, Philippines.

Systematics

List of species

Subfamily Bonziinae

Parabonzia marthae (Den Heyer, 1975) — Locality: 14 (one female). Distribution: South Africa, Philippines (Luzon, Polillo).

Subfamily Cunaxinae

Cunaxa capreolus (Berlese, 1889) — Locality: 2 (one female). Distribution: Cosmopolitan, including Philippines (Luzon).

Cunaxa minidiscondyla sp. nov. — Localities: 7 (female holotype), 34 (one tritonymph paratype), 5 (one female partially damaged non-type). Distribution: Philippines (Luzon).

Cunaxa romblonensis Corpuz-Raros and Garcia, 1995 — Locality: 11 (one female). Distribution; Philippines (Luzon, Romblon, Leyte).

Cunaxa womersleyi Baker and Hoffmann, 1948 — Localities: 1 (one female and one male), 2 (one female), 12 (one female), 30 (one female). Distribution: Saipan, Philippines (Luzon, Samar, Biliran, Leyte, Mindanao), India, Taiwan, USA.

Dactyloscirus agricolus Corpuz-Raros, 1995 — Locality: 32 (one male). Distribution: Philippines (Luzon, Panaon, Mindanao).

Dactyloscirus trifidus Corpuz-Raros, 2008 — Locality: 15 (one female and one male). Distribution: Philippines (Luzon).

Rubroscirus lukoschusi (Smiley, 1992) — Localities: 10 (one female), 41 (one female). Distribution: Australia, Dominican Republic, Philippines (Luzon, Romblon as new island record, Mindanao).

Subfamily Cunaxoidinae

Lupaeus dentatus (Corpuz-Raros, 1996c) — Localities: 17 (one female and one male), 18 (five females and one male), 19 (three females), 28 (two females), 31 (three females), 37 (two females). Distribution: Philippines (Luzon, Leyte).

Lupaeus lenis (Corpuz-Raros, 1996c) — Localities: 2 (four females and one male), 10 (five females), 11 (one female), 17 (one female), 21 (three females), 25 (one female), 33 (two females), 39 (one female). Distribution: Philippines (Luzon, Lipata, Polillo, Mindoro, Samar, Leyte, Panaon, Siargao as new island record, Mindanao).

Lupaeus longisetus (Corpuz-Raros, 1996c) — Localities: 9 (one female), 11 (one male), 13 (two females), 23 (five females), 27 (one female), 29 (four females), 30 (three females and two males), 37 (two females). Distribution – Philippines (Luzon, Lipata, Mindoro).

Lupaeus villacarlosae (Corpuz-Raros, 1996c) — 11 (one female), 16 (four females), 19 (four females), 24 (one female), 28 (two females), 30 (three females). Distribution: Philippines (Luzon, Leyte, Mindanao).

Neocunaxoides grandis Corpuz-Raros, 1996a — Localities: 7 (four females), 8 (three females), 35 (one female). Distribution: Philippines (Luzon, Samar, Biliran, Leyte, Panaon, Panay as new island record, Mindanao).

Neocunaxoides mahabaeus Corpuz-Raros, 1996a — Localities: 8 (two females). Distribution. Philippines (Luzon, Samar, Mindanao).

Scutopalus clavatus (Shiba, 1976) — Locality: 38 (two females). Distribution: Malaysia (Peninsular), South China (Fujian), Philippines (Luzon) as new species record.

Scutopalus philippinensis (Corpuz-Raros, 1996a) — Localities: 2 (one female), 3 (one male), 6 (one male), 20 (one female), 21 (seven females and two males), 22 (one male), 26 (one female), 40 (four females). Distribution: Philippines (Luzon, Lipata, Sibuyan as new island record, Biliran, Leyte, Mindanao).

Subfamily Orangescirulinae

Orangescirula filipina Corpuz-Raros, 1996b — Localities: 4 (one female), 8 (one female), 36 (one female). Distribution: Philippines (Luzon, Polillo, Samar, Mindanao).

Cunaxa minidiscondyla sp. nov. (Figs 1 – 4)

Zoobank: 4B17779F-F0C5-4D6C-8DDE-6729B4596189

Diagnosis

Relatively large species, soft-bodied, entirely striated, with an ill-defined propodosomal shield and without hysterosomal shield; palp long and slender, with a small disc-like apophysis dorsoapically on inner margin of telofemur, two spine-like setae dorsally on genu, and one long spine dorsally on inner third of tibiotarsus; long and smooth hysterosomal setae; number of setae on basifemora 4-4-3-1, and on telofemora 5-5-4-4.

Description

Female — Rather large, body length x width 884 x 440; soft-bodied, entirely striate including an ill-defined propodosomal shield. Legs relatively short, IV longest, slightly over ½ of body length.

Gnathosoma (Figure 1a-c) — Subcapitulum (Figure 1a) 204 long, about ¼ of total body length, covered by coarse broken striae running transversely at base and finer striae lengthwise distally; four pairs of subcapitular setae, hg1 24, hg2 37, hg3 68, hg4 37; two pairs of short adoral setae present. Palp (Figure 1b) 262 long and slender, 1¼ times as long as gnathosoma and ends in a very small claw; segments scarcely ornamented with large spinules; basifemur

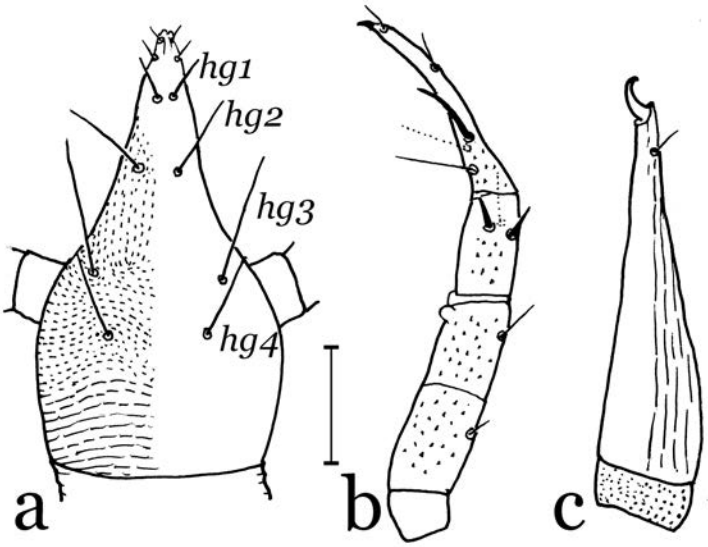

Figure 1 *Cunaxa minidiscondyla* n. sp., female: a – subcapitulum; b – palp; c – chelicera. Scale bar 50 µm.

with one short sts dorsally; telofemur with one short sts dorsally on outer margin and one small (length x width about 3 x 3) disc-shaped apophysis dorsodistally on inner margin, close to its division from the genu; genu with two spls dorsally and one thin sts ventrally; tibiotarsus long and thin, about half the length of palp, with two long and thin sts and one long (22) spls on basal third of segment, and two short sts dorsally on distal third. Chelicera (Figure 1c) 190 long, three-segmented and ends in a strong claw, first segment densely papillate, second segment striate on inner half; cheliceral seta present, arising near base of claw.

Idiosoma (Figure 2a-b) — Idiosoma 608 long, 440 wide, entirely striated. Propodosomal shield ill-defined, discernible only by the flat broken striae running across the shield; with two pairs of very long, plumose trichobothria vi and sce, and two sts, ve and sci; vi arising closely (distance vi-vi 37) and separated by a distinct membranous lobe, 357 long, slightly over ½ the length of idiosoma; sce 435 long, about ¾ the length of idiosoma, arising at a distance (197) that is about five times that between vi; ve very short, 10 long, arising close to sce; sci much longer (78) and thicker, arising equidistant from each other (distance sci-sci and sci-sce 68) and in the same transverse line as the posterior trichobothria sce. Hysterosoma without median plate, finely striate-papillate up to level of setae f1 and becoming coarser with larger round papillae posteriorly. Hysterosomal setae smooth, their lengths as follows – c1 82, c2 65, d1 61, e1 58, f1 68, h1 61. Distances between median setae decreasing posterad: c1-c1 136, c2-c2 241, d1-d1 143, e1-e1 112, f1-f1 37, h1-h1 24; ratio of their mutual distance to their length: c1 1.7, c2 3.7, d1 2.3, e1 1.9, f1 0.5, h1 0.4. Cupules not readily discernible against striations of hysterosoma.

Venter finely striate-papillate; five pairs of setae on ventral membrane, viz., one propodogas-

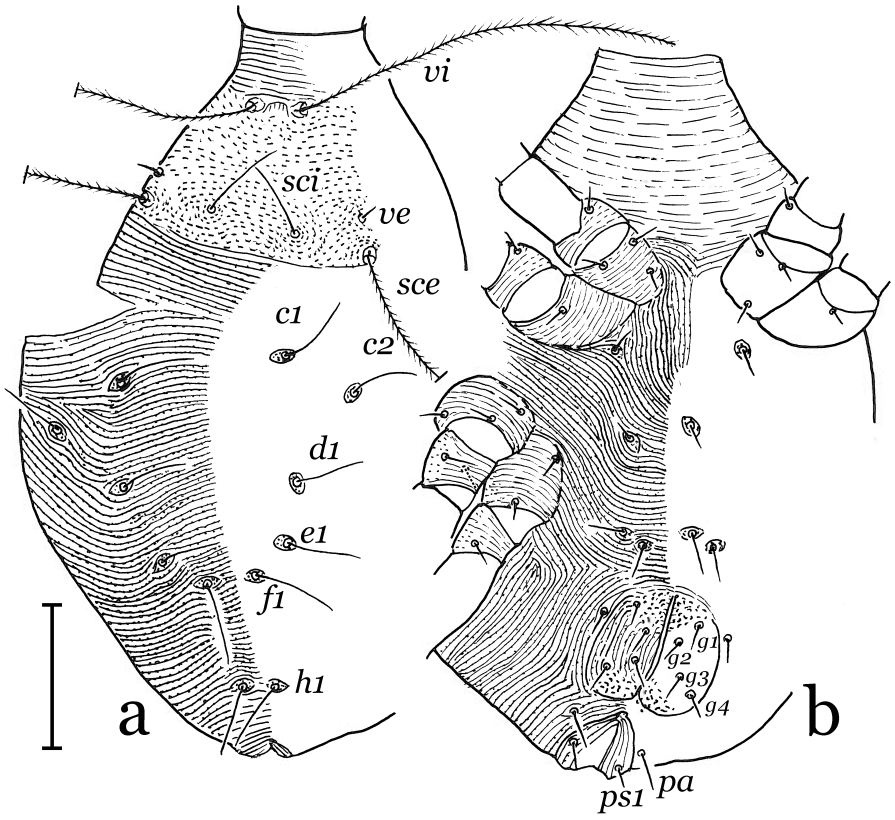

Figure 2 *Cunaxa minidiscondyla* n. sp., female idiosoma: a – dorsum; b – venter. Scale bar 100 µm.

tral, three hysterogastral and one paragenital. Genital plates striate with small papillae on inner side; four pairs of setae present, g1 and g4 arising laterally near outer margin, g2 and g3 near inner margin of shield. Anal plates finely striate-papillate, with one pair of anal (ps1) setae; one pair of paraanal (pa) setae also present, flanking the anal plates.

Legs (Figure 3a-d) — Rather short, femora thick, tarsi very long, almost as long as basal free segments taken together, tapering, without distinct terminal lobes and end in two claws and rayed empodium; femoral segments not clearly separated, basifemora covered with flat, coarse striae, telofemora and other leg segments densely covered with spine-like papillae. Lengths of legs: I 456, II 428, III 469, IV 509. Chaetotaxy of leg segments I-IV: coxae 3-1-3-2; trochantera 1-1-2-1; basifemora 4-4-3-1; telofemora 5-5-4-4; genua 4 sts, [1 asl, 1 sts], [1 bsl, 1 sts], 1asl –

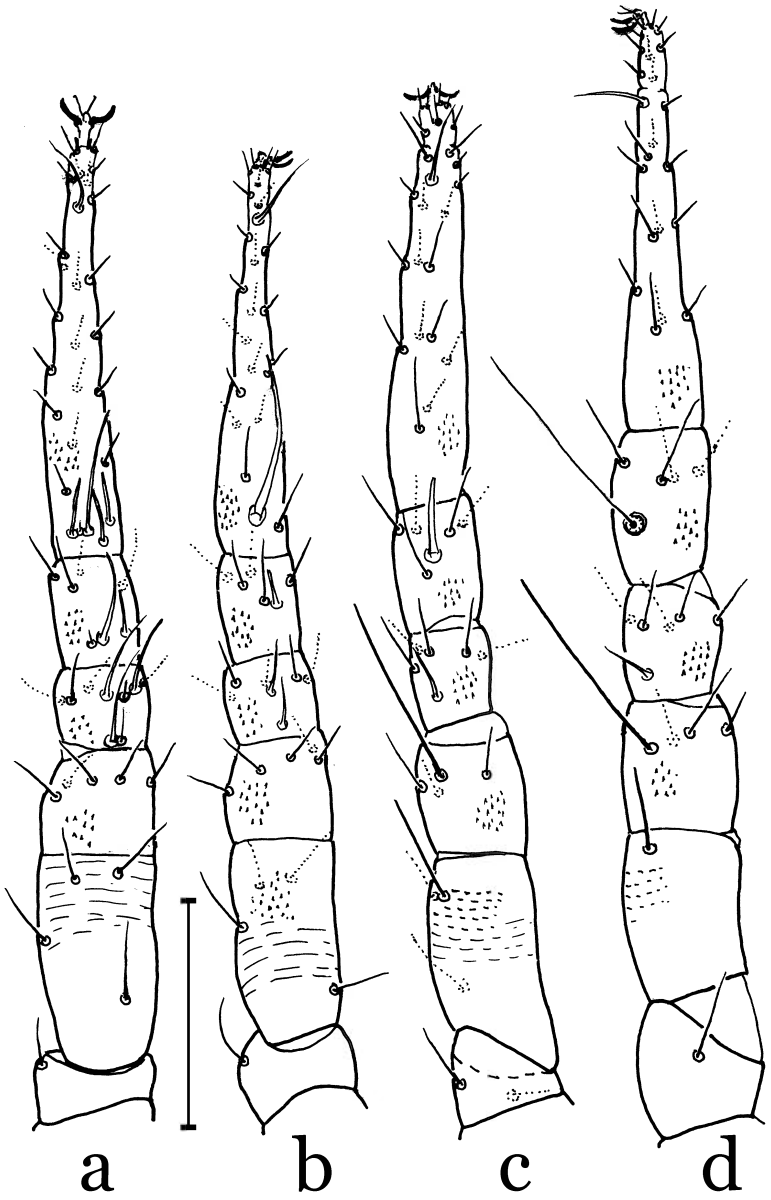

Figure 3 *Cunaxa minidiscondyla* n. sp., female: a – Leg I; b – Leg II; c – Leg III; d – Leg IV. Scale bar 100 µm.

5 sts, 2 asl – 5 sts, 1 asl – 5 sts, 1 asl; tibiae 4 sts, [1 long bsl, 1 mst], 1 short bsl – 5 sts, 1 short bsl – 5 sts, 1 thick bsl – 4 sts, 1T; tarsi 21 sts, [2 bsl, 1 mst], 2 bsl, 1 dtsl, 2 tsl – 21 sts, 1 long basally inflated bsl, 1 dtsl – 23 sts, 1 dtsl – 21 sts, 1 dtsl.

Tritonymph (Figure 4a-e) — Essentially like adult female including the presence of an ill-defined propodosomal shield and entirely striate hysterosoma, chaetotaxy of hysterosomal dorsum and palps, and the presence of a very small, disc-like apophysis dorsoapically on inner margin of palp telofemur. It differs by being smaller (length x width 619 x 272 vs 884 x 440), presence of only three pairs of setae (hysterogastral) on ventral membrane of idiosoma, and the chaetotaxy of some leg segments as detailed below. Measurements: gnathosoma160, palp 172, chelicera 150; propodosomal setae vi 255, ve not observed, sci 54, sce 309; hysterosomal setae c1 78, c2 58, d1 48, e1 34, f1 37, h1 31.

Chaetotaxy of leg I-IV segments — as in female except for basifemora 4-4-3-0 (vs 4-4-3-1); genu I with only one duplex of 1 bsl and 1 sts (vs. two duplexes of asl-sts and bsl-sts); tarsus I with one duplex of bsl-sts (vs. triplex of 2 bsl-1 sts); and the number of sts on tarsi I-IV unknown-20-18-15 (vs. 21-21-23-21).

Material — Holotype female, locality 7; paratype: one tritonymph, locality 34; non-type: one female, locality 5.

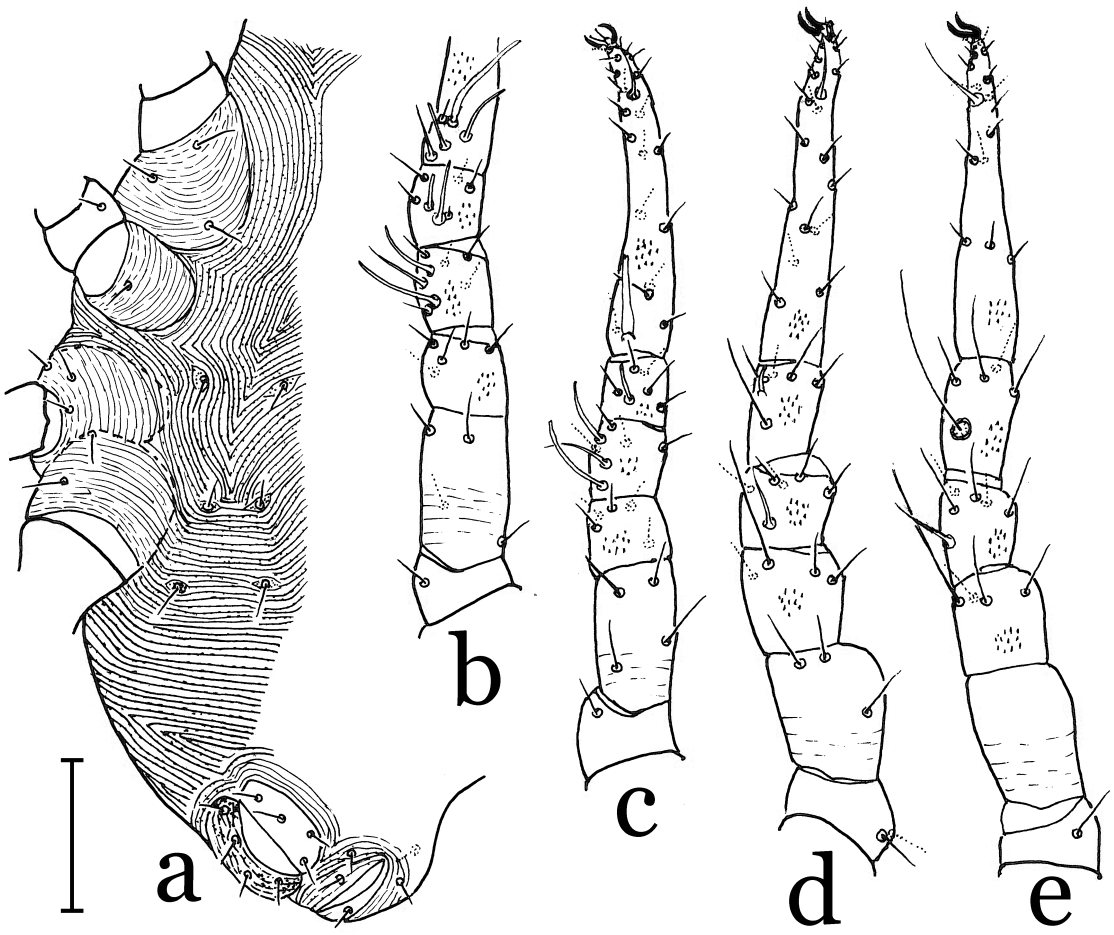

Figure 4 *Cunaxa minidiscondyla* n. sp., tritonymph: a – venter of idiosoma; b – leg I (trochanter to base of tarsus); c – leg II; d – leg III; e – leg IV. Scale bar 100 μm.

Etymology — The specific name denotes the small, disc-like apophysis or condyle on the palp telofemur which readily separates this species from its congeners.

Remarks — The new species resembles some *Cunaxa* species with short and non-pointed apophysis on the palp telofemur, viz., *C. carina* Den Heyer, 1979 (South Africa) where this apophysis is truncated, *C. magee* Smiley, 1992 where it is broadly conical with acutely rounded tip, and *C. neogazella* Smiley, 1992 (USA) where it is blunt and fingerlike (vs. disc-like in *C. minidiscondyla*). In all these species, leg basifemoral chaetotaxy is 4-4-3-1; *C. minidiscondyla* differs in having 5-5-4-4 setae on the telofemur, vs. 4-4-4-4 in the named non-Philippine species.

The new species also resembles *Cunaxa setirostris* (Hermann, 1804) (as per redescription of the species based on the neotype designated by Den Heyer and Sergeyenko, 2009) by the presence of two spls on palp genu and one spls on palp tibiotarsus but the palp telofemoral apophysis is pointed and spine-like in the latter species. In addition, *C. minidiscondyla* has 4-4 sts on basifemora I-II or a total of 8-8 for the basi- and telofemur taken together as one femoral segment I-II. On the other hand, Den Heyer and Sergeyenko (2009) indicated a 7-7 femoral I-II chaetotaxy for *C. setirostris* and later, in a study of Iranian Cunaxinae, Den Heyer, et al. (2011) showed 3-3 sts on basifemora I-II, separate from the telofemora with 4-4 sts (Figs. 2E & F). The presence of 3 sts on basifemur I is one of the main key characteristics used by Skvarla et al. (2014) to separate *C. setirostris* from other species of *Cunaxa*.

Dactyloscirus trifidus Corpuz-Raros (Figures 5 – 6)

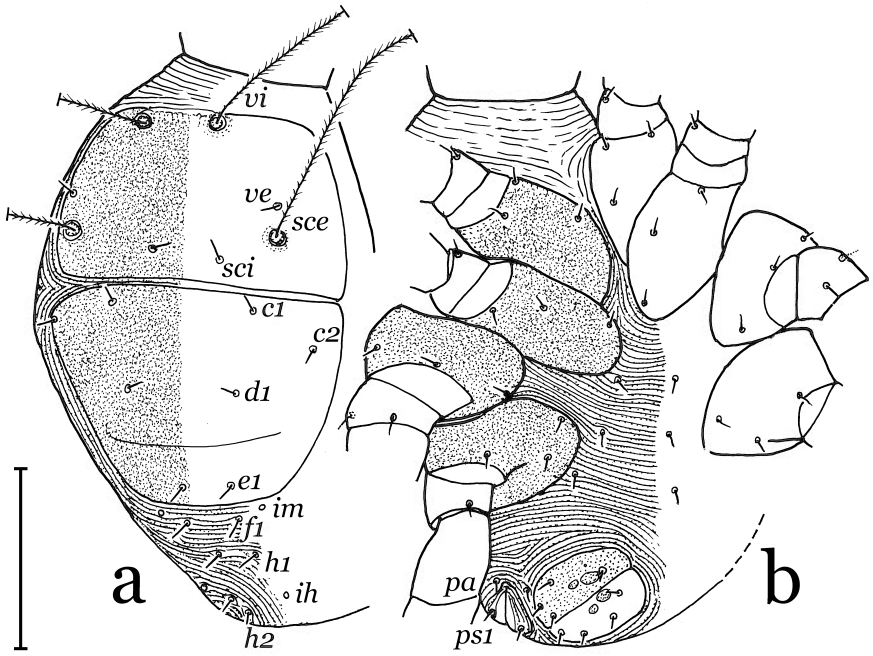

Figure 5 *Dactyloscirus trifidus* Corpuz-Raros, male idiosoma – a. dorsum; b. venter. Scale bar 100 µm.

Dactyloscirus trifidus Corpuz-Raros, 2008: 83 [Type: Female, Mudspring area, Mt. Makiling, Los Baños, Laguna, Luzon Is., Philippines, ex woody part of decomposing log].

Diagnosis — The possession of a trifid palp tarsal claw distinguishes this species from its congeners and among cunaxids in general. The presence of a flat, plowshare-like (uncinated as

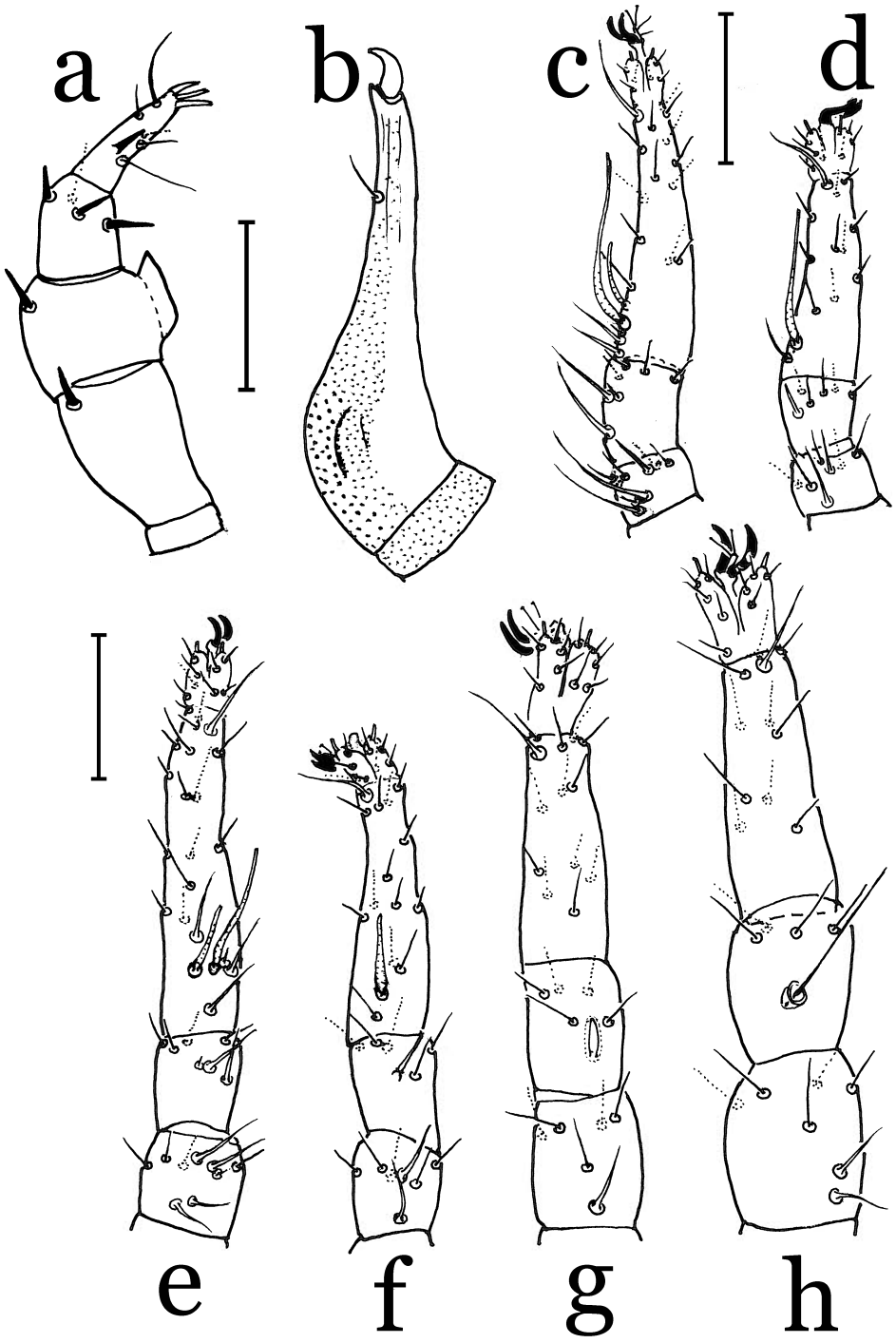

Figure 6 *Dactyloscirus trifidus* Corpuz-Raros, male: a – palp; b – chelicera; c – leg I, genu to tarsus; d – leg II, genu to tarsus. Female, genu to tarsus of all legs: e – leg I; f – leg II; g – leg III, h – leg IV. Scale bar 50 µm.

originally described) apophysis on inner margin of palp telofemur (Figure 5a), dorsoapical spls on palp basi- and telofemur, three spls on palp genu, and one spls on palp tibiotarsus are also distinctive.

Description (Figures 5a-b, 6a-d)

Male — Similar to female, differing essentially in being smaller (length x width 476 x 238, vs. 645 x 262), having a reticulate hysterosomal shield bearing setae c1, c2, d1 and e1, and in the chaetotaxy of some leg segments. Measurements – gnathosoma 187, idiosoma 306, chelicera 160, palp 153; leg I 272, II 231, III 269, IV 272; dorsal propodosomal setae vi 184, ve 10, sci 10, sce 238; dorsal hysterosomal setae c1 10, c2 10, d1 7, e1 10, f1 10, h1 10, h2 7. Distances between setae: vi-vi 37, sce-sce 102, ve-ve 95, sci-sci 41, c1-c1 68, c2-c2 126, d1-d1 44, e1-e1 17, f1-f1 27, h1-h1 22, h2 12. Ratio of the mutual distance between hysterosomal setae to their length: c1 6.8, c2 12.6, d1 6.3, e1 1.7, f1 2.7, h1 2.2, h2 1.7.

Chaetotaxy of leg segments I-IV (Figs 6c-d)— coxae 3-3-3-3; trochantera 1-1-2-1; basifemora 5-6-4-0; telofemora 5-6-4-4; genua 5 sts, [2 long asl, 1 sts], 1 asl – 5 sts, 2 asl – 5 sts, 1 asl – 5 sts, 2 asl; tibiae 4 sts, [1 asl, 1 sts], 1 asl – 5 sts, 1 short bsl – 5 sts, 1 short and thick bsl – 4 sts, 1T; tarsi 19 sts, [1 long basally thick and striated bsl, 1 sts, 1 asl], 1 short bsl, 1 asl, 1 dtsl, 2 tsl – 18 sts, 1 long, basally thick and striated bsl, 1 dtsl, 2 tsl – 16 sts, 1 dtsl, 2 tsl – 13 sts, 1 dtsl, 2 tsl.

Female (Figure 6e-h)

Chaetotaxy of leg segments — Details of the types of solenidia were not given in original description of the female and some discrepancies in counts of sts were also found in present work. A revised chaetotaxy of female leg segments is hereby provided as follows: coxae 3-3-3-3; trochantera 1-1-2-1; basifemora 5-6-4-2; telofemora 5-5-4-4; genua 4 sts, [1 asl, 1 sts], 3 asl – 5 sts, 2 asl – 5 sts, 1 asl – 5 sts, 2 asl; tibiae 4 sts, [1 asl, 1 sts], 1 asl – 5 sts, 1 thin bsl – 5 sts, 1 short and thick bsl – 4 sts, 1T; tarsi 23 sts, [1 long and striated bsl, 1 sts,1 asl], 1 short, thick and striated bsl, 2 asl, 1 dtsl, 2 tsl – 20 sts, 1 long basally thickened and striated bsl, 1 dtsl, 2 tsl – 22 sts, 1 dtsl, 2 tsl – 19 sts, 1 dtsl, 2 tsl.

Material — One female and one male, locality 15.

Lupaeus longisetus (Corpuz-Raros) (Figures 7 – 10)

Pulaeus longisetus Corpuz-Raros, 1996c: 130 [Type: Male, Mt. Makiling, National Arts Center area, Los Baños, Laguna, Luzon Is., Philippines, ex bikal bamboo litter; UPLBMNH].
Lupaeus longisetus — Castro & Den Heyer, 2009: 28; Skvarla, et al., 2014: 29.

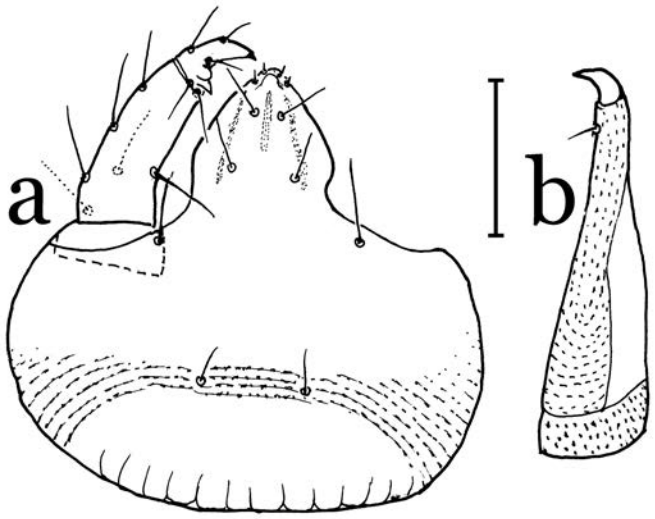

Figure 7 *Lupaeus longisetus* (Corpuz-Raros), female: a – gnathosoma; b – chelicera. Scale bar 50 µm.

Diagnosis — Idiosoma abruptly tapered posteriorly from shoulder; dorsal shield long, tapered like idiosoma, posterior margin straight, sparsely but distinctly foveolate, bears setae c1, c2, d1 and el; e1 and f1 longest of dorsal setae, slightly thickened and sparsely barbed, other setae smooth; coxal plates I+II separate, not fused medially as a sternal shield; basifemoral I-IV setae 4-6-3-1, telofemoral I-IV setae 5-5-4-3.

Description

Female (Figures 7, 8, 9) — Medium-sized, body length 496 – 558 (520.7, n = 6), greatest width at shoulders 211 – 255 (236.8, n = 6). Legs short and rather thick, leg II shortest, leg IV longest and only about half as long as body.

Gnathosoma (Figure 7a, b) — Short and thickset, about as long as wide at basal margin, 136-156 (145.2, n = 7). Rostrum short and thick, with two pairs of minute adoral setae. Subcapitulum (Figure 7a) with four pairs of setae, hg3 longest, about twice the length of other pairs; ventrally with a band of striae across setae hg4 near posterior margin. Palps (Figure 7a) short and thick, 85 – 102 (94.2, n = 7), 3-segmented; trochanter short, without setae; femurogenu longest, 2.5 times as long as wide, with 6 pairs of rather long sts; tibiotarsus short

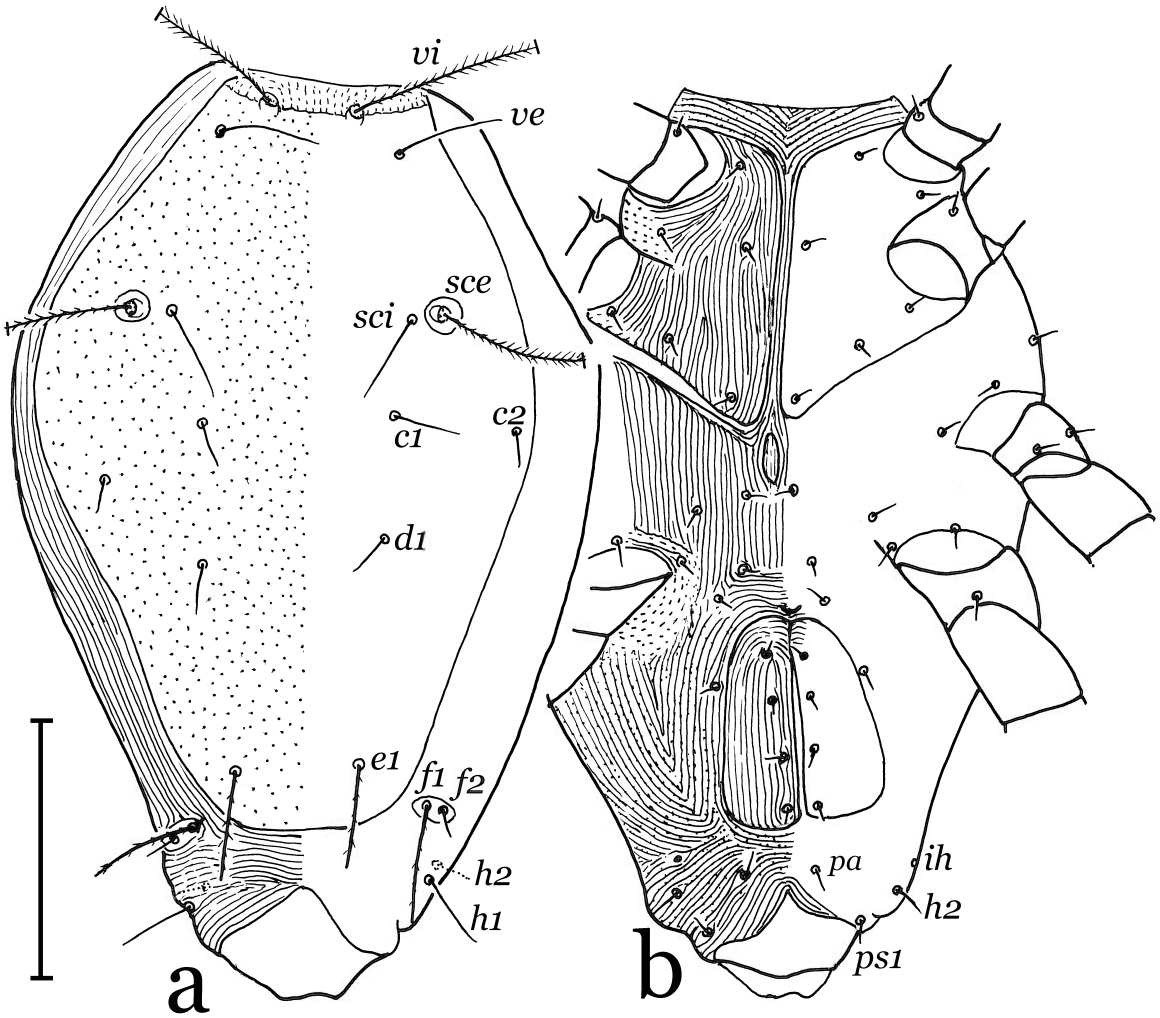

Figure 8 *Lupaeus longisetus* (Corpuz-Raros), female idiosoma: a – dorsum; b – venter. Scale bar 100 µm.

and thick, ending in a small claw, inner basal margin with one triangular and one rounded lobe, and with 5 setae consisting of 3 thin sts basally near the lobes, and two sts dorsoapically on outer margin. Chelicera (Figure 7b) 126 – 153 (139.0, n = 6), 1.4 times longer than palp, 2-segmented and end in a short and thick claw; a short seta present near base of claw; first segment densely covered with strong pointed to blunt papillae, second segment striate-papillate running lengthwise on inner 2/3, outer 1/3 smooth and membranous.

Idiosoma (Figure 8a, b) — Elongate, broadest at shoulders between legs II and III and tapering abruptly from there; length 343 – 408 (373.4, n = 6), width 211 – 255, n = 6). Dorsal shield extensive, follows contour of body, posterior margin straight, posterior corners rounded; bears propodosomal setae and hysterosomal setae c1, c2, d1, and e1; surface sparsely ornamented with small, round foveolae. Setae f1 and f2 arising closely on a small platelet posteriorly on each side of the main shield, f1 3.4 times as long as f2. Trichobothria vi (177) and sce (146) rather short, about half as long as idiosoma; tactile setae of propodosoma equal in length and arise close to their respective associated trichobothria, i.e., ve to vi and sci to sce; mutual distances between propodosomal setae: vi-vi 37, ve-ve 78, sci-sci 102, sce-sce 122. Lengths of hysterosomal setae: c1 17, c2 13, d1 17, e1 41, f1 48, f2 14, h1 34, h2 12;

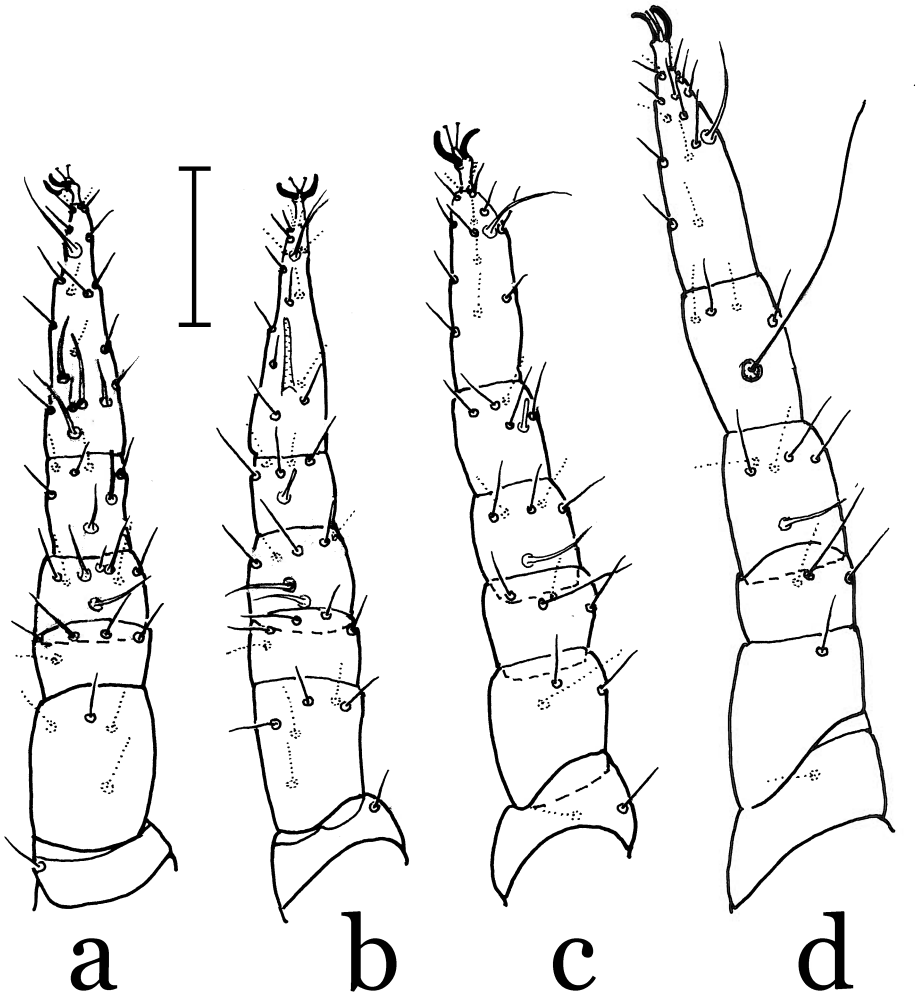

Figure 9 *Lupaeus longisetus* (Corpuz-Raros), female legs: a – I; b – II; c – III; d – IV. Scale bar 50 µm.

e1 and f1 about twice as long as anterior setae and lightly barbed, the others smooth; mutual distance between hysterosomal setae: c1-c1 78, c2-c2 180, d1-d1 71, e1-e1 54, f1-f1 92, f2-f2 102, h1-h1 88, h2-h2 88; proportion of their mutual distance to their length: c1 4.6, c2 13.8, c2 12.8, d1 4.2, e1 1.3, f1 1.9, f2 7.3, h1 2.6, h2 7.3.

Venter of idiosoma entirely covered with flat striae including coxal and genital plates. Coxae I and II fused as a large rectangular plate on each side but not fused medially as a single sternal plate; coxae III and IV also fused on each side but anterior margins not clearly demarcated from ventral membrane. Three pairs of hysterogastral and one pair of paragenital setae on hysterosomal membrane. Four short setae on each genital plate where they are all aligned along inner margin. One pair of anal (ps1) and one pair of paraanal (pa) setae also present. Only cupule ih observed.

Legs (Figure 9a-d) — Relatively short and thick, the longest fourth pair about half the length of body or 2/3 of idiosomal length, all ending in a pair of claws and rayed empodium. Lengths of legs (all based on 5 specimens): I 218 – 258 (240.0), II 194 – 238 (213.5), III 228 – 255 (238.0), IV 245 – 289 (263.8). Dorsal surfaces of leg segments sparsely ornamented with flat striae running across segment; ventral surfaces distad from telofemur densely papillate, the papillae roundish on telofemora and genua, more elongate, spinulose on tibiae and tarsi.

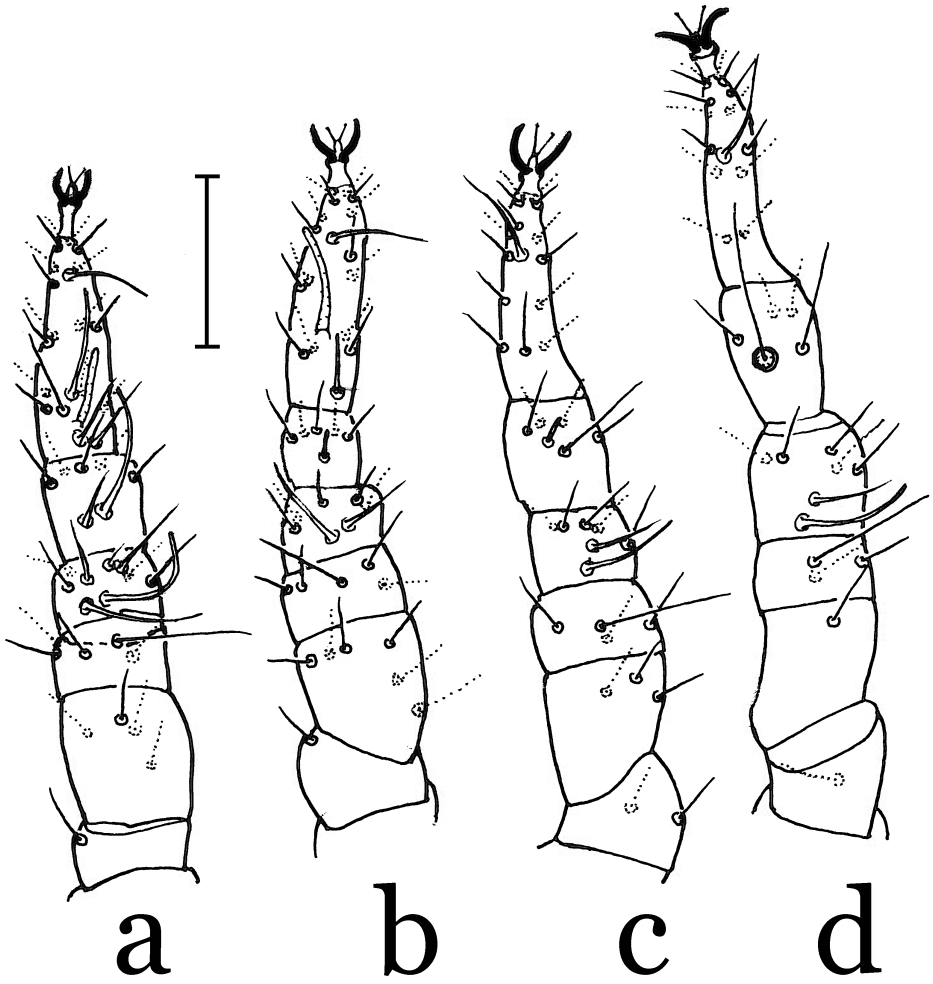

Figure 10 *Lupaeus longisetus* (Corpuz-Raros), male legs: a – I; b – II; c – III; d – IV. Scale bar 50 µm.

Chaetotaxy of leg segments — coxae 3-3-3-3; trochantera 1-1-2-1; basifemora 4-6-3-1; telofemora 5-5-4-3; genua 4 sts, [1 asl, 1sts], 2 asl – 5 sts, 2 asl – 5 sts, 1 asl – 5 sts, 1 asl; tibiae 5 sts, 1 bsl, 1 asl – 5 sts, 1 bsl – 5 sts, 1 bsl – 4 sts, 1T; tarsi 15 sts, [1 bsl, 1 sts], 2 asl, 1 bsl, 1 dtsl – 15 sts, 1 thick striated bsl, 1 dtsl – 14 sts, 1 dtsl -14 sts, 1 dtsl.

Male — Apart from being smaller and the difference related to sexual dimorphism of the genitoanal region, the male is similar to female in most respects, except for 1) having more conspicuously foveolate dorsal shield; 2) only hysterosomal seta e1 thicker and conspicuously longer than the rest of hysterosomals (vs. both e1 and f1 longer than the other pairs); and 3) only two pairs of hysterogastral setae between the more extensively sclerotized area between coxal plates III+IV. Measurements of one male specimen: body length 449, width 204; gnathosoma 122, chelicera 122, palp 78; leg I 211, II 187, III 218, IV 231; dorsal setae vi 133, ve 41, sci 37, sce 112, c1 24, c2 14, d1 20, e1 54, f1 27, f2 12, h1 17, h2 14.

Chaetotaxy of leg segments (Figure 10a-d) — similar to female in the number of sts in all segments, but differs in the number of solenidia on genua, tibiae and tarsi, to wit: genua [1asl-1sts], 2 asl, 1 long bsl – 1 asl, 1 bsl, 2 asl) – 1 asl, 1 bsl – 1 asl, 1 bsl; tibiae 1 asl, 1 long bsl – 2 asl – 1 asl, 1 bsl – 1 asl, 1 bsl – 1 T; tarsi 1 thick striated bsl, 1 long and thin bsl, 2 asl, 1 dtsl – 1 thin bsl, 1 thick, striated bsl, 1 dtsl – 1 dtsl – 1 dtsl.

Material — One female, locality 9; one male, locality 11; two females, locality 13; five females, locality 23; one female, locality 27; four females, locality 29; three females and two males, locality 30; two females, locality 37.

Scutopalus clavatus (Shiba) (Figures 11 – 13)

Neocunaxoides clavatus Shiba, 1976: 117 [Type: Female, Pasoh Forest, N of Plot 1, Negeri Sembilan, Malaysia (Malay Peninsula)].
Neocunaxoides clathratus (sic) — Smiley, 1992: 282.
Scutopalpus clavatus — Rocha, et al., 2013: 43; Skvarla, et al., 2014: 40.

Diagnosis — The clavate dorsal idiosomal setae (except for propodosomal ve and hysterosomal h1), readily distinguish this species from others of the genus *Scutopalus*.

Supplementary description

Female — Body including gnathosoma 449 long, 279 wide.

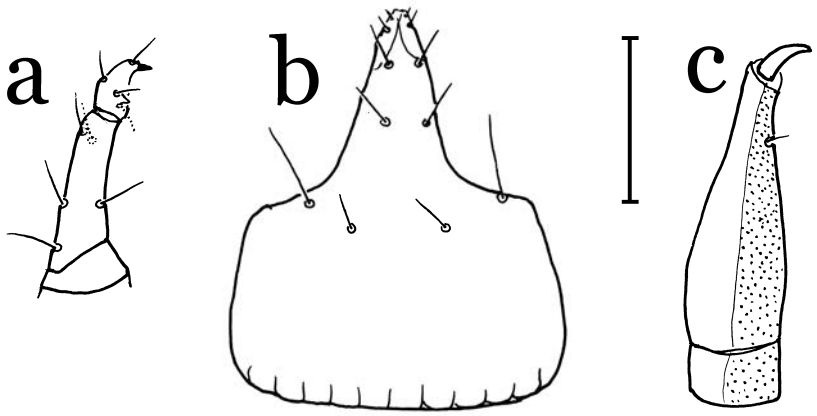

Figure 11 *Scutopalus clavatus* (Shiba), female: a – palp; b – subcapitulum; c – chelicera. Scale bar 50 μm.

Gnathosoma (Figure 11a-c) — Short and thick, 126 long. Subcapitulum (Figure 11b) with 4 pairs of hg setae and 2 pairs of minute adoral setae. Palp (Figure 11a) short, 75 long, thin and end in a small claw; second segment or femurogenu about four times as long as wide and bears 5 rather long setae; third segment or tibiotarsus short, with 4 setae and one small triangular lobe. Chelicera (Figure 11c) 2-segmented, longer than palp, 112 long, ending in a rather strong claw, inner half densely covered with small rounded papillae; a minute seta arises distally near base of claw.

Idiosoma (Figure 12a-b) — Oval, rather well sclerotized, dorsally with an extensive anterior shield, an ill-defined posterior shield (subscutum in Shiba, 1978), and ventrally with a sternal plate made of the fusion of coxal plates I+II and large but separate coxal plates III+IV. Dorsal plates ornamented with small roundish foveolae; anterior shield bears propodosomal setae vi, ve, sci and sce, and hysterosomals c1, c2, d1 and e1; hysterosomals f1 and h1 arising on posterior membrane; trichobothria vi and sce plumose cut (102 and 99 long, respectively in Shiba, 1978), arise close to their respective associated tactile setae ve and sci, respectively. Dorsal setae clavate except for ve and h1; lengths of setae: ve 72, sci 37; c1 34, c2 24, d1 27, e1 27, f1 37, h1 14; distances between setae: vi-vi 34, ve-ve 71, sci-sci 92, sce-sce 122, c1-c1 102, c2-c2 167, d1-d1 85, e1-e1 65, f1-f1 34 (posterior integument bearing h1-h1 torn); ratio of the mutual distance between hysterosomal setae to their length: c1 3.0, c2 6.0, d1 3.1, e1 2.4, f1 0.9. Venter entirely striate including coxal plates and genital plates; coxal plates III+IV large, extending posteriorly on each side to almost level of posterior margin of genital plates,

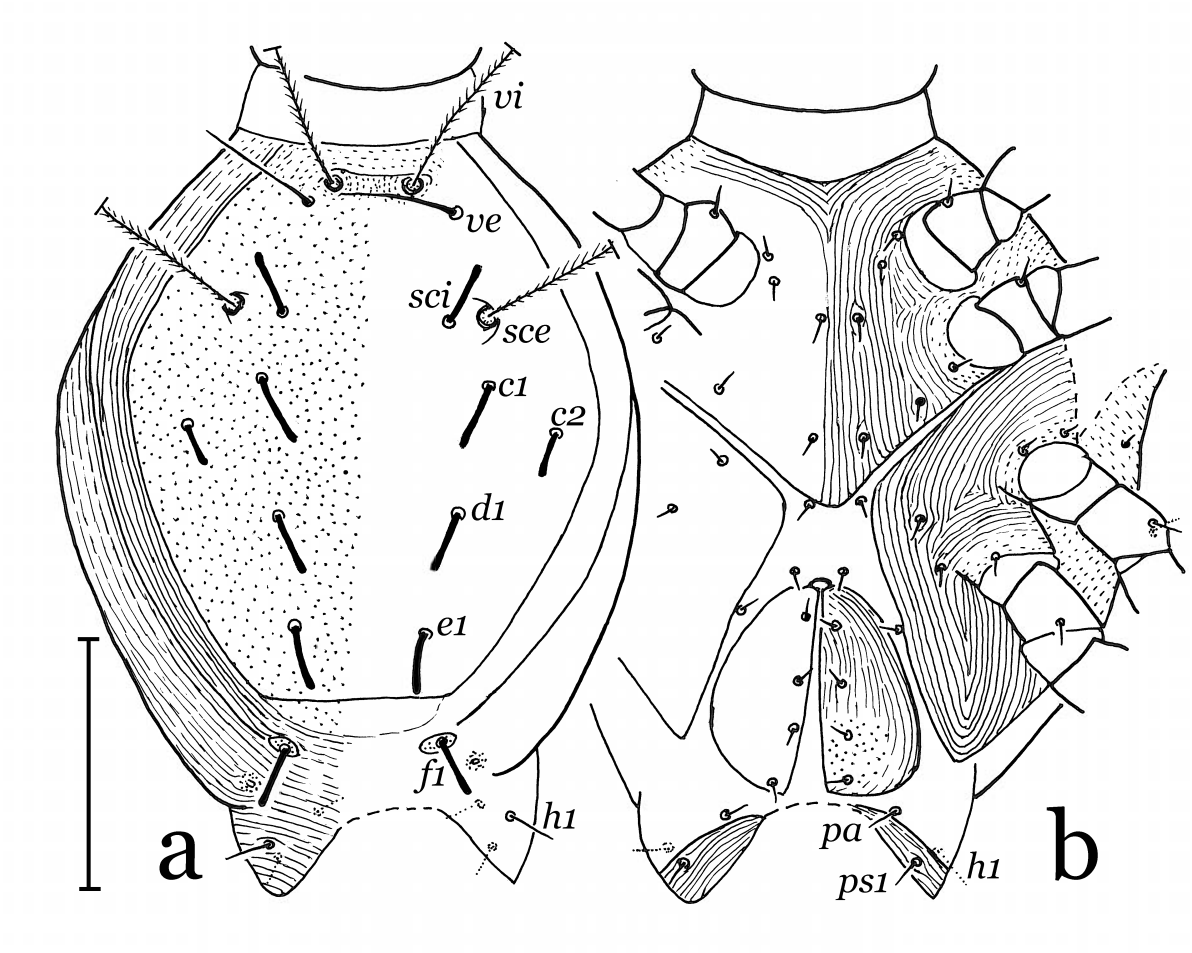

Figure 12 *Scutopalus clavatus* (Shiba), female idiosoma: a – dorsum; b – venter. Scale bar 100 µm.

separated by a narrow strip of membrane bearing two pairs of hysterogastral, four pairs of genital and one pair of paragenital setae present. One pair anal (ps1) and one pair paraanal (pa) setae also present.

Leg chaetotaxy (Figure 13 a-d) — Shiba's original description of the legs did not show the ventral setae and so Smiley's (1992) counts "based on the literature" appear underestimated, compared to other cunaxids, or to members of the Cunaxoidinae in particular. In a Philippine specimen, the number of setae on segments of legs I-IV are as follows: coxae 3-3-3-3; trochanter 1-1-2-1; basifemora 4-5-3-1; telofemora 4-4-3-1; genua 4 sts [l asl, 1 sts], 3 asl – 4 sts, 3 asl – 5 sts, 1 asl – 5 sts, 1 asl; tibiae 4 sts, 1 asl – 4 sts, 1 short bsl – cut – 4, 1 T; tarsi 14 sts, 1 short bsl, 1 long striated bsl, 1 asl, 1 dtsl – 13 sts, [1 asl, 1sts], 1 thin bsl, 1 long striated bsl, 1 dtsl – cut – 11 sts, 1 dtsl.

Material — Two females, locality 38.

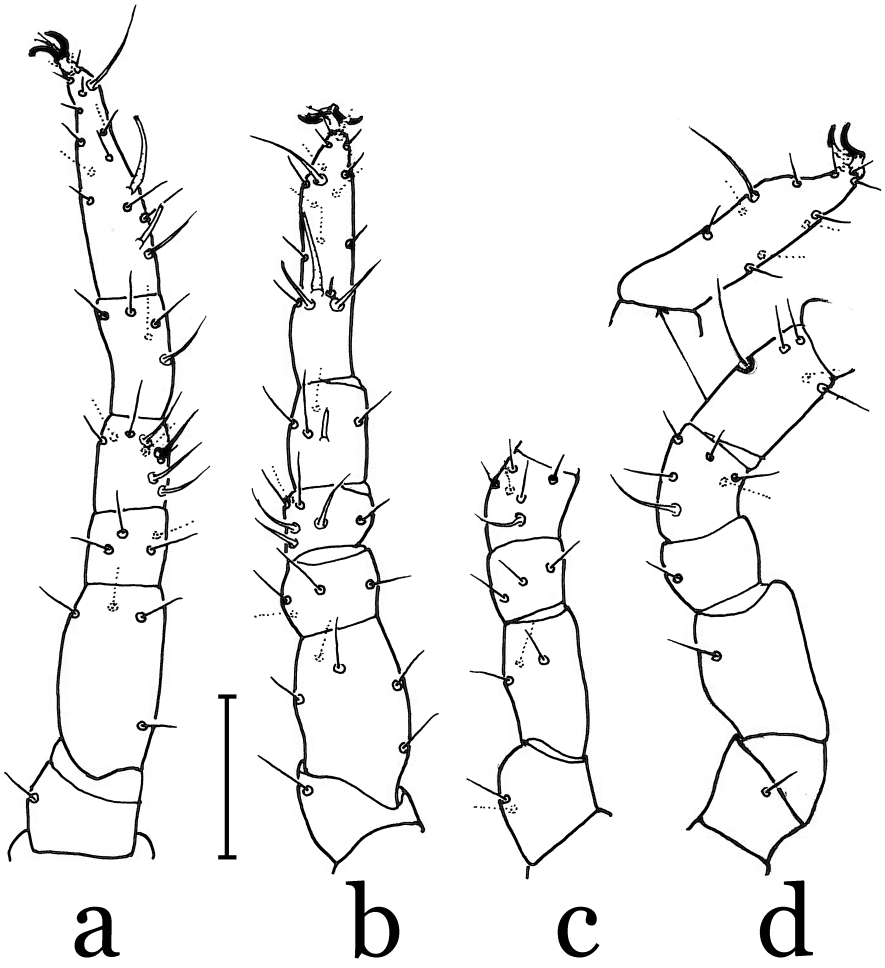

Figure 13 *Scutopalus clavatus* (Shiba), female: a – leg I; b – leg II; c – leg III (trochanter to genu); d – leg IV (tarsus separated to top). Scale bar 50 µm.

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