

Oribatid Mites from Marine Littoral and Freshwater Habitats in India with Remarks on World Species of *Thalassozetes* (Acari: Oribatida)

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Badamdorj Bayartogtokh and Tapas Chatterjee (2010) Oribatid mites from marine littoral and freshwater habitats in India with remarks on world species of *Thalassozetes* (Acari: Oribatida). *Zoological Studies* 49(6): 839-854. This work deals with 4 species of oribatid mites found in marine coastal and semi-aquatic, freshwater habitats during a flood in India. Species of the small oribatid mite genus, *Thalassozetes* (Ameronothroidea: Selenoribatidae), mostly inhabit and are typical of marine littoral zones in the tropics and subtropics. In the present paper, we propose a newly revised diagnosis for this genus, and describe a new species, *Thalassozetes tenuisetosus* sp. nov., collected from marine coastal areas of western India (Goa, Arabian Sea). The description is based on adult and juvenile specimens. A diagnostic key to adults of known species of *Thalassozetes* in the world is provided along with a summary of their geographical distributions. In addition, supplementary descriptions of 3 known species, *Peloribates kaszabi* Mahunka, 1988, *Scheloribates latipes* (C. L. Koch, 1844), and *Pergalumna* cf. *foveolata* Hammer, 1973 found among weeds and sediments of the Karamana River of Trivanthapuram (Trivandrum), Kerala, India, during a flood are given with respective illustrations. <http://zoolstud.sinica.edu.tw/Journals/49.6/839.pdf>

Key words: Selenoribatidae, Poronota, Freshwater, Littoral habitat.

The majority of oribatid mites are truly soil and litter inhabitants, but there are some groups, such as the Ameronothridae, Fortuyniidae, Limnozetestidae, Selenoribatidae, etc., which have taken advantage of the space and food resources of the littoral fringe. Many such species are simply invaders from the supralittoral, but others are confined to the intertidal zone.

Thus, some groups of oribatid mites have colonized marine littoral habitats, and those species which are restricted to this type of environment have likely physiologically, ecologically, and morphologically adapted. Some of them, e.g., *Fortuynia* species, have morphological adaptations which presumably fit a life entailing periodic inundation, while others adapt their reproductive and feeding behaviors to

the rhythm of the tides. Yet others spend most of their time in narrow crevices, which maintain an atmosphere when covered by water, periodically emerging at low tide to forage. Many algivorous species are small enough to sustain populations in crevices associated with barnacle encrustations, and browse algal sporelings, while they are preyed upon by carnivorous mites (Luxton 1986). They also subsist on marine fungi or detritus, and some may be carnivorous in intertidal habitats of rocky shores, mangroves, etc. (Luxton 1992). This fact could be interpreted as an indication of the existence of high morphological plasticity in these taxa for life in marine environments.

The dominating factor for soil mites in littoral zones is the rhythmical, sometimes arrhythmical overflow by seawater. However, there are

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considerable differences in the tolerances of littoral and terrestrial or soil species to seawater and fresh water. All species which exist only in the marine littoral zones (thalassobionts) are able to survive prolonged overflow with seawater, and moreover, most of them can also withstand fresh water inundation for a long period. Terrestrial or soil species, primarily distributed in terrestrial habitats but also found in littoral habitats, contrarily only show tolerance to freshwater overflow (Schuster 1979). Based on the overflow tolerance to seawater and fresh water, the latter author distinguished 3 main groups of littoral and terrestrial mites, namely thalassobiont, terrestrial, and thalassophilous species.

Another important factor for soil mites in littoral zones is the water salinity, especially during the period of submersion, and littoral species possess the ability of hypertonic regulation in water with lower osmotic values than their hemolymph, while in water with higher osmotic values, they are poikilosmotic (Weigmann 1973, Schulte 1979). However, the mechanism of osmoregulation in soil mites is unknown, but histological and morphological investigations by different authors showed that coxal glands probably have such a function (Woodring 1973, Alberti and Storch 1977).

One of the genera studied here, *Thalassozetes* Schuster, 1963, is a small group of the oribatid mite family Selenoribatidae Grandjean, 1966, comprising 4 species, which are found in marine littoral habitats of southwestern Europe (Croatia), eastern Asia (Japan), and southern Africa (South Africa and Mozambique) as reported by Schuster (1963), Marshall and Pugh (2000), and Karasawa and Aoki (2005).

The combination of the following characters of adults is considered a diagnostic feature of *Thalassozetes*: prodorsum with a pair of weakly developed longitudinal ridges, like costulae, and rarely with a strongly developed transverse ridge anterior to the longitudinal ridges, which separates the rostrum from the rest of the prodorsum; sensilli with short stalks and fusiform or club-shaped heads; prodorsal setae short, thin, and smooth; the anterior margin of the notogaster mostly evenly rounded, rarely with 2 pairs of longitudinal ridges; notogaster with 13-15 pairs of setae; epimeral region IV with 1 or 2 pairs of setae; genital plates with 3 pairs of setae; aggenital setae absent; anal plates with 2 pairs of setae; 2 or 3 pairs of adanal setae; and legs monodactylous.

The other genera, some members of which are studied here, *Peloribates*, *Scheloribates*, and

Pergalumna, are typical inhabitants of soils and litter, but a few species are occasionally found in the littoral as well as freshwater environments (Luxton 1990, Weigmann and Deichsel 2006, Weigmann 2008). These terrestrial inhabitants can occur in aquatic habitats, if they are flushed into the water by rain, flooding, etc. This is the 2nd part of our work on oribatid mites of marine littoral zones of South Asia. In the 1st work, we described new species of the genus *Fortuynia* Hammen, 1960 along with a review of the systematics and a summary of the geographical distributions of all known species (Bayartogtokh et al. 2009). In the present work, we describe 1 new species of the genus *Thalassozetes*, collected from marine littoral habitats of western India, based on both adult and immature-stage materials. Following the description, we provide supplementary descriptions of the adults of the 3 known species, discuss aspects of the systematics and distribution of the genus *Thalassozetes*, and present a diagnostic key to adults of known species in the world.

MATERIALS AND METHODS

Materials examined in the present study were collected from marine coastal areas of southwestern India (Goa, Arabian Sea), among intertidal algae, and from the Karamana River of Trivananthapuram (Trivandrum), Kerala, India, among weeds and sediments, during a flood.

Specimens were cleared in lactic acid, mounted on temporary slides, and preserved in alcohol. Line drawings were made using a camera lucida attached to a PZO SK-14 compound microscope (Biolar Pi, Poland).

Morphological terminology used in this work was mostly based on that developed over many years by Grandjean (1955) and Schuster (1963). Unless otherwise noted, measurements are given as a range, with the mean in parentheses, and the measurements are based on the available materials. Body length was measured in lateral view, from the tip of the rostrum to the posterior edge of the ventral plate, to avoid discrepancies caused by different degrees of notogastral distension. Notogastral length was also measured in the lateral aspect, from the anterior to the posterior edge; notogastral width refers to the maximum width in the dorsal aspect. Setal formulas of the legs are given as numbers per segment for appendages (from the trochanter to the tarsus), and as the number per podosomal

segment (I-IV) for epimeres.

The holotype, 16 paratypes, and all immature specimens of the newly described species, as well as specimens of redescribed taxa are deposited at the Museum of Natural History of Podgorica, Montenegro. Four paratypes of the new species are deposited in the collection of the Department of Zoology, National Univ. of Mongolia, Ulaanbaatar, Mongolia, and 4 other paratypes are in the 2nd author's personal collection.

DESCRIPTION OF SPECIES

Family Selenoribatidae Grandjean, 1966

Genus *Thalassozetes* Schuster, 1963

***Thalassozetes tenuisetosus* Bayartogtokh et Chatterjee, sp. nov.**

Adult

(Figs. 1-3)

Diagnosis: Medium-sized species with general characters of *Thalassozetes*. Rostrum demarcated from rest of prodorsum by transverse ridge, with trapezoidal anterior rim; tip of rostrum distinctly projecting anteroventrally in lateral view, but rounded in dorsal view; prodorsal ridges *cl* strongly developed; interlamellar setae well-developed; exobothridial setae vestigial, represented by their alveoli; sensilli with densely barbed club-shaped head and medium-long, narrow stalk; notogastral setae medium-long, thin, smooth; genital setae well-developed; epimeral setal formula 1-0-1-2.

Measurements: Body length 334-346 (338) μm , length of notogaster 236-255 (248) μm , width of notogaster 220-232 (227) μm .

Integument: Dark brown to almost black. Surface of body and leg segments with thick cerotegument which is very finely punctate on dorsal and ventral plates, and with rather large granules on prodorsum and notogaster, and around leg acetabula.

Prodorsum (Figs. 1A, B, C, 2A, B): Shape of prodorsum nearly triangular. Rostrum demarcated from rest of prodorsum by strongly developed transverse ridge, with trapezoidal anterior rim; tip of rostrum rounded in dorsal view, but distinctly projecting anteroventrally in lateral view, its tip not sharp, but blunt (Figs. 1C, 2B). Rostral seta (*ro*) 11-14 μm long, thin, smooth, inserted anterior to lamellar seta. Lamellar seta (*le*) 13-17 μm long, inserted on dorsal side of prodorsum, at some distance posterior to seta *ro*. Interlamellar (*in*) seta 15-19 μm long, thin, smooth. Exobothridial (*ex*)

seta vestigial, only its alveolus visible. Sensillus (*ss*) with densely barbed club-shaped head and narrow stalk, its exposed portion 18-24 μm long. Bothridium (*bo*) irregularly funnel-shaped, not concealed under anterior margin of notogaster. Prodorsal ridge (*cl*) strongly developed, running longitudinally on prodorsum, converging anteriorly and its anterior end connected to transverse ridge.

Notogaster (Figs. 1A, 2A, D): Nearly round in dorsal aspect, about 1.1-times as long as wide; lenticulus-like light spot absent. Anterior margin of notogaster conspicuously arched anteriorly, sometimes incomplete (Fig. 2D). Fourteen pairs of notogastral setae thin, smooth, 6-12 μm long, seta *c*₁ longest; setae *p*₂ and *p*₃ situated on lateroventral side of notogaster, other setae inserted dorsally. Lyrifissures *im* well-developed, inserted laterally at level between setae *la* and *lm*, other lyrifissures not evident. Opisthosomal gland opening (*gla*) situated adjacent and anterolateral to seta *la*.

Gnathosoma (Fig. 1B): Subcapitular mentum wider than long, with a few weakly developed microtubercles. Hypostomal seta *h* about 8 μm long, setae *a* about 4 μm long and *m* about 6 μm long, all of them thin, smooth. Chelicerae chelate, moderately strong, with a few small blunt teeth; setae *cha* and *chb* thin, smooth; Trägårdh's organ inconspicuous. All setae of palp thin, smooth; anteroculminal euphathidium *acm* not fused to tarsal solenidion ω , but separate; formula of palpal setation: 0-2-1-3-9 including solenidion ω .

Epimeral region (Figs. 1B, C): Surface of epimeral region nearly smooth, finely punctate; epimeral borders well-developed. Epimeral setae medium to long, thin, smooth; seta *1b* about 42 μm long, other setae 10-12 μm long; epimeral setal formula: 1-0-1-2. Discidium well-developed, clearly visible in lateral view; pedotectum I large, pedotectum II small.

Anogenital region (Figs. 1B, 3A, B): Anal aperture distinctly longer than genital one; genital plates granulated and with foveate ornamentation; anal plates smooth; preanal plate well-developed, nearly triangular. Three pairs of genital setae about 6 μm long, aggenital seta absent. Two pairs of anal and 3 pairs of adanal setae thin, smooth, about 5-8 μm long. Adanal lyrifissure (*iad*) placed almost transversely and situated in preanal position, anterior to seta *ad*₁.

Legs (Figs. 3C-F): Monodactylous, claws of all legs rather thick, dorsal edge sclerotized and brown, claw of leg IV with a tiny ventral tooth. Trochanter IV with distinct dorsodistal projection. Most leg setae smooth, except barbed setae on

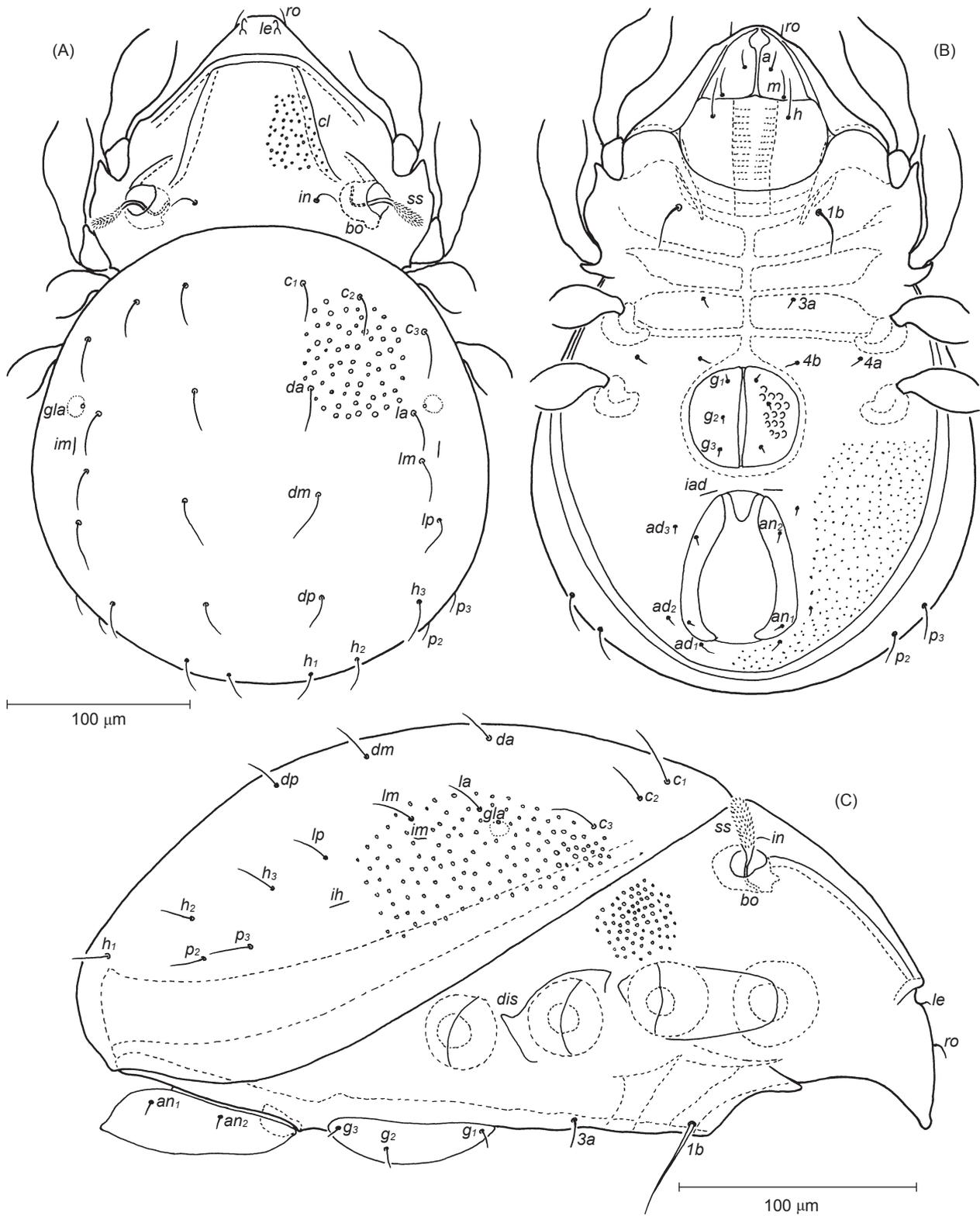


Fig. 1. *Thalassozetes tenuisetosus* sp. nov. (adult, female). (A) Dorsal view; (B) ventral view; (C) lateral view.

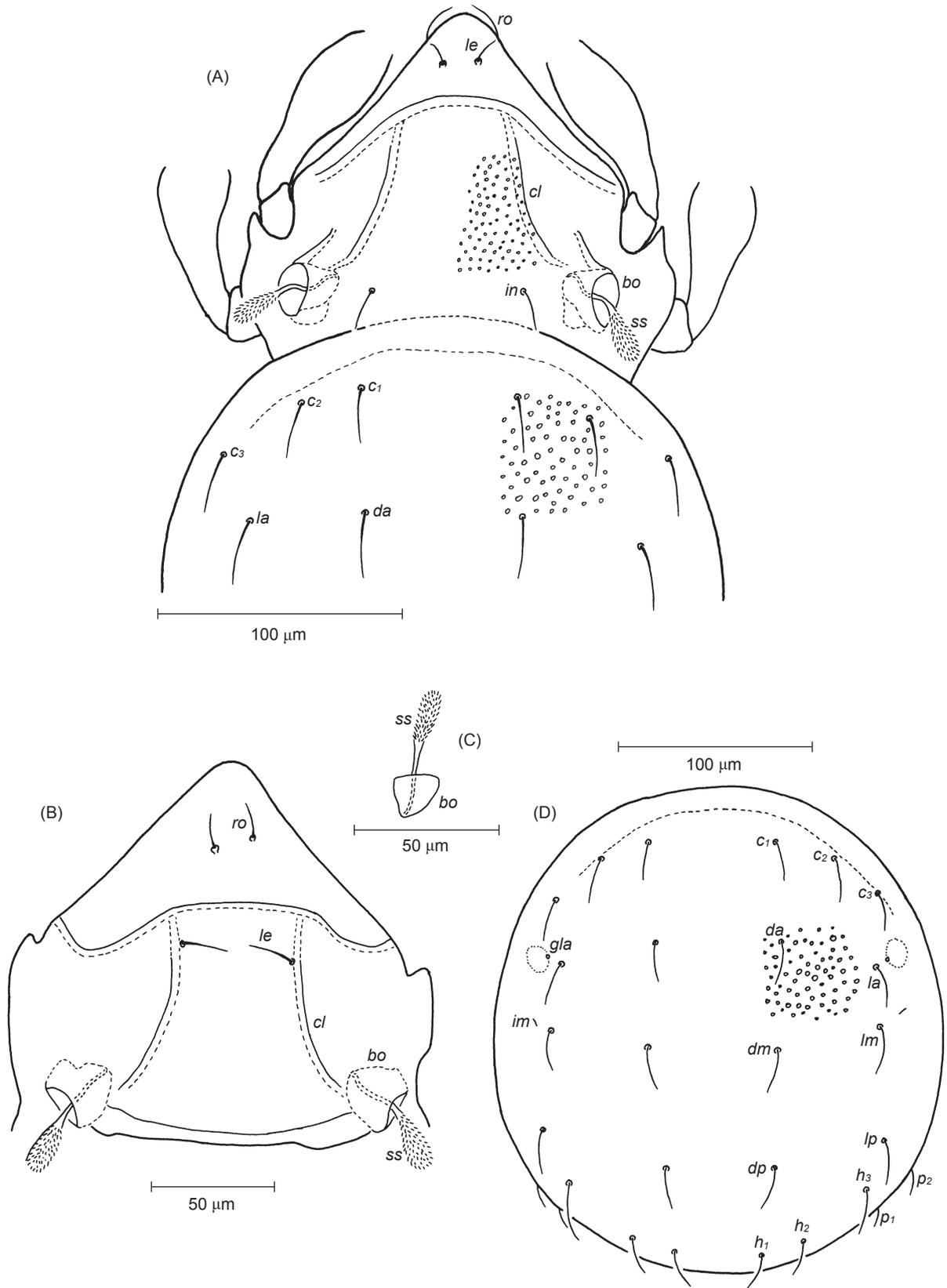


Fig. 2. *Thalassozetes tenuisetosus* sp. nov. (adult, female). (A) Prodorsum and anterior part of notogaster; (B) prodorsum (dorso-frontal view); (C) sensillus and bothridium (lateral view); (D) notogaster.

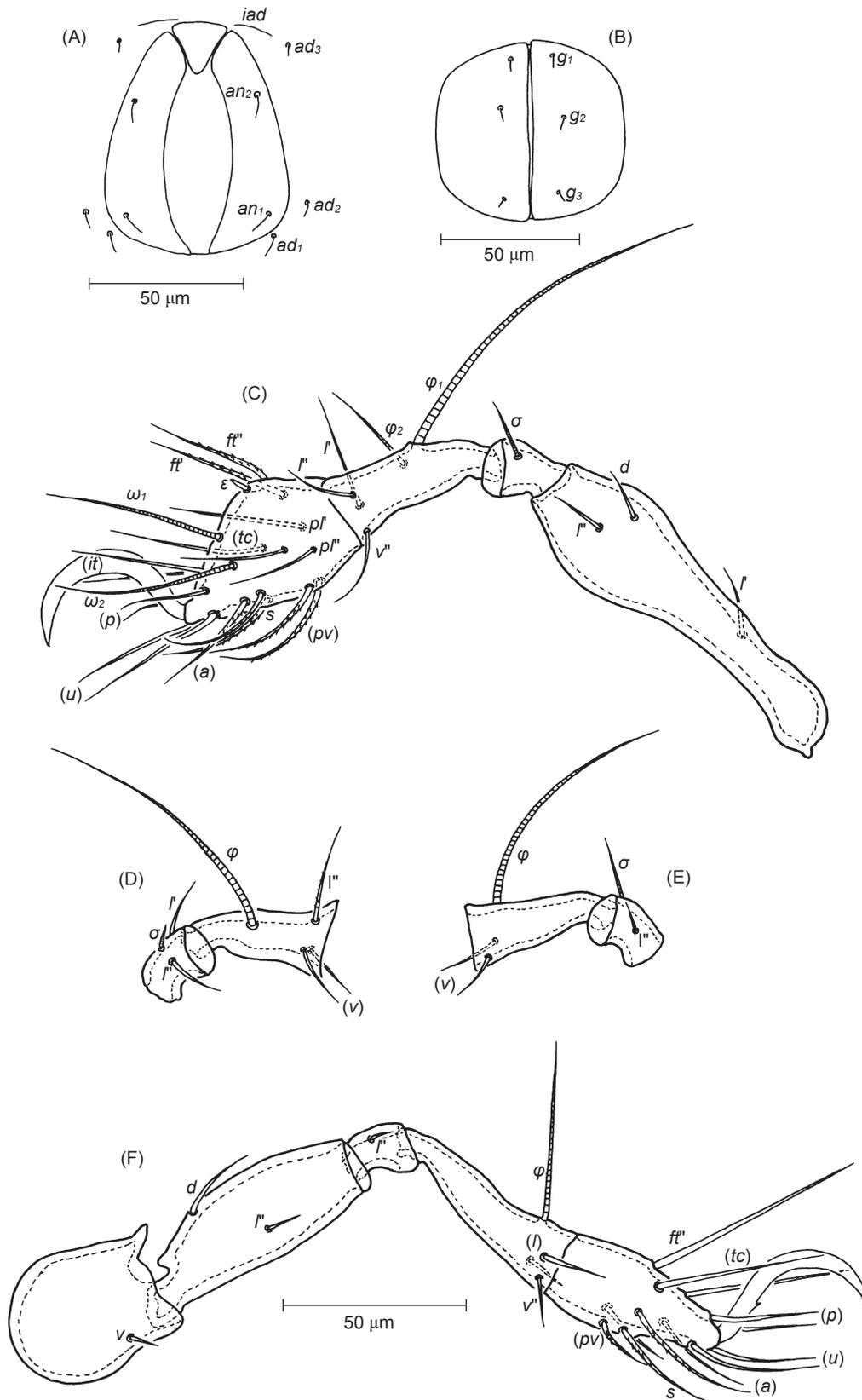


Fig. 3. *Thalassozetes tenuisetosus* sp. nov. (adult, female). (A) Anal region; (B) genital plates; (C) leg I (left, antiaxial view); (D) genu and tibia II (right, antiaxial view); (E) genu and tibia III (right, antiaxial view); (F) leg IV (left, antiaxial view). Scale bar is the same for C-F.

tarsi I-IV.

Material examined. Holotype (♀): Vagatoor Beach, Goa, India (Arabian Sea) among intertidal algal sediments, 15°35'33"N, 73°44'67"E; 24 paratypes (♀ ♀) same data as for holotype. Coll. T. Chatterjee and B. Ingole, June 2007.

Tritonymph

(Fig. 4)

Measurements: Body length 276-337 (314) µm; width of notogaster 189-232 (211) µm.

Integument: Light-yellowish to yellowish-brown, dorsal and ventral plates and leg segments covered with small granules.

Prodorsum (Fig. 4A): Rostral and lamellar setae about 11 µm long, both inserted dorsolaterally on prodorsum. Interlamellar and exobothridial setae 4-6 µm long. Sensillus with roughly barbed clavate head and short stalk; bothridium small, irregularly funnel-shaped. Prodorsal ridge (*cl*) strongly developed, running longitudinally on prodorsum, converging anteriorly, without transverse ridge at anterior end.

Gastronotic region (Figs. 4A, C): Slightly longer than wide; dorsosejugal suture complete, arched anteriorly. Fourteen pairs of notogastral setae thin, smooth; setae *c*₁ longest, about 11 µm long, other setae similar in length, 6-8 µm long. Lyrifissures and opisthosomal gland opening absent.

Gnathosoma (Fig. 4B): Hypostomal setae *h*, *a*, and *m* moderately long, smooth. Chelicerae chelate, with a few blunt teeth; setae *cha* and *chb* thin, smooth; Trägårdh's organ inconspicuous. Palpal setae thin, smooth; anteroculminal euphathidium *acm* not fused to tarsal solenidion ω; formula of palpal setation: 0-2-1-3-9 including solenidion ω.

Epimeral region (Fig. 4B): Epimeral borders conspicuously developed; surface of epimeral plates nearly smooth; only very long epimeral seta *1b* developed.

Anogenital region (Fig. 4B): Anal aperture much larger than genital one; genital plates incompletely developed. Genital papillae rounded; 3 pairs of genital setae minute; aggenital setae absent. Transversely oriented, undulating border situated posterior to genital region. Anal plates well-developed; broad triangular line present anterior to anal aperture. Two pairs of anal and 2 pairs of adanal setae; seta *an*₁ about 4 µm long, other setae represented by their alveoli. Adanal lyrifissure not evident.

Legs: Claws of all legs thick, blunt at tip. Trochanter IV with distinct dorsodistal projection. All leg setae thin, pointed distally and most ventral setae conspicuously barbed; some setae vestigial.

Material examined: Four specimens: same data as for adults.

Deutonymph

(Fig. 5)

Measurements: Body length 263 µm; width of notogaster 143 µm.

Integument: Dark brown, body and leg segments covered with thick, granulated cerotegument.

Prodorsum (Figs. 5A, B): Rostral and lamellar setae about 3-5 µm long, thin and smooth. Interlamellar and exobothridial setae vestigial. Sensillus with roughly barbed clavate head and short stalk; bothridium large, irregularly funnel-shaped.

Gastronotic region (Figs. 5A, G): Oval in dorsal aspect, about 1.3 times as long as wide; dorsosejugal suture complete, broadly rounded anteriorly. Only 10 pairs of notogastral setae (some of which were broken); setae *c*₁, *c*₂, *da*, and *dp* absent; setae *c*₃ and *dm* about twice as long as posterior notogastral setae; alveolus of seta *p*₂ situated on ventral side of notogaster. Lyrifissures and opisthosomal gland opening absent.

Gnathosoma: Hypostomal setae *h* and *a* short, smooth; seta *m* minute. Chelicerae chelate, with a few blunt teeth; setae *cha* and *chb* thin, smooth; Trägårdh's organ inconspicuous. Palpal setae thin, smooth; anteroculminal euphathidium *acm* not fused to tarsal solenidion ω; formula of palpal setation: 0-2-1-3-9 including solenidion ω.

Epimeral region: Sejugal and 4th epimeral borders well-developed; other epimeral borders incomplete. Epimeral seta *1b* long, thin; other epimeral setae absent.

Anogenital region: Anal aperture larger than genital one; genital plates incompletely developed. Three pairs of minute genital setae irregularly situated. Anal plates well-developed; 2 pairs of anal and 3 pairs of adanal setae, some setae vestigial. Adanal lyrifissure *iad* situated at level anterior to anal aperture.

Legs (Figs. 5C-F): Claws of leg II rather thick, blunt at tip. Most setae of legs thin, smooth. Trochanter IV with distinctly developed dorsodistal projection.

Material examined: One specimen: same data as for adults.

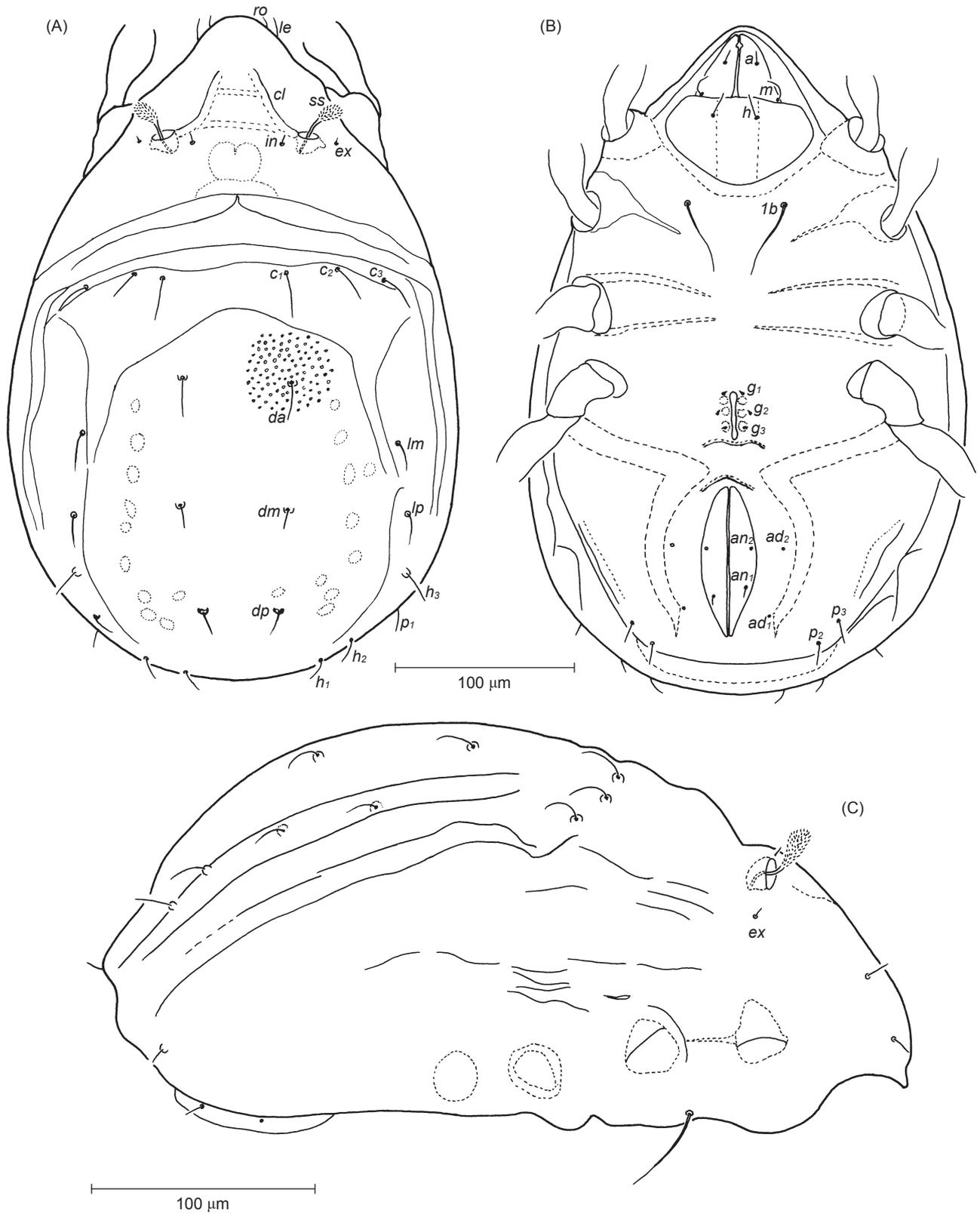


Fig. 4. *Thalassozetes tenuisetosus* sp. nov. (tritonymph). (A) Dorsal view; (B) ventral view; (C) lateral view.



Fig. 5. *Thalassozetes tenuisetosus* sp. nov. (deutonymph). (A) Dorso-lateral view; (B) sensillus and bothridium (lateral view); (C) femur I (left, antiaxial view); (D) femur II (left, antiaxial view); (E) trochanter, femur and genu III (left, antiaxial view); (F) trochanter and femur IV (right, antiaxial view); (G) gastronotic seta.

Remarks: The adult of *Thalassozetes tenuisetosus* sp. nov. is easily distinguishable from type species of the genus, *T. riparius* (Schuster 1963) by 1) the presence of 14 pairs of thin notogastral setae as opposed to 13 pairs of thick setae in the type species; 2) the presence of a strongly developed transversal ridge anterior to the longitudinal ridge of the prodorsum in contrast to the lack of a transversal ridge in *T. riparius*; 3) a nearly round shape of the notogaster, covered with round granular cerotegument in the new species as opposed to an oval and smooth notogaster in the compared species; 4) the presence of 2 pairs of setae on epimeral region IV in contrast of only 1 pair of setae in *T. riparius*; 5) much anteriorly and nearly transversely situated adanal lyrifissures *iad* as opposed to the posteriorly and longitudinally oriented *iad* in *T. riparius*; and 6) the far-larger body size.

The Japanese species, *T. shimojanai* described by Karasawa and Aoki (2005) from the Ryukyu Is., differs from *T. tenuisetosus* sp. nov. in the 1) absence of prodorsal ridges *le* as opposed to strongly developed ridges in the new species; 2) vestigial lamellar and interlamellar setae in contrast to well-developed setae in the new species; 3) the presence of only 1 pair of setae on epimeral region IV in contrast of 2 pairs in the new species; and 4) vestigial genital, anal, and adanal setae as opposed to well-developed anogenital setae in the new species.

Two other species, *T. ugraseni* and *T. melanomerus*, described by Marshall and Pugh (2000) from the marine shores of southern Africa clearly differ from the new species in the 1) presence of only 2 pairs of adanal setae as opposed to 3 pairs in *T. tenuisetosus* sp. nov.; 2) the presence of only 1 pair of setae on epimeral region IV in contrast of 2 pairs in the new species, and 3) the absence of prodorsal ridges *le* as opposed to strongly developed ridges in the new species.

Etymology: The species name "*tenuisetosus*" refers to the very thin notogastral setae.

Family Haplozetidae Grandjean, 1936

Genus *Peloribates* Berlese, 1908

***Peloribates kaszabi* Mahunka, 1988**

(Fig. 6)

Peloribates kaszabi Mahunka 1988: 242, figs. 70-74.

Diagnosis: Medium in size, with typical

characters of *Peloribates*. Rostrum strongly projected in lateral view, but trapezoidal in dorsal view; lamellae relatively wide, but distinctly narrowed distally; all prodorsal setae, except *ex*, moderately long and finely barbed; sensilli with minutely barbed club-shaped head and long, narrow stalk. Prodorsum, pteromorphs, and genital plates with foveolae; notogastral setae long, finely barbed; ventral setae medium-long, barbed; 5 pairs of genital setae.

Supplementary description: Yellowish-brown. Surface of body and leg segments with relatively thick cerotegument possessing small granules on lateral part of prodorsum and around leg acetabula. Prodorsum and pteromorphs with foveolae. Body length 617 μm ; width of notogaster 478 μm ; length of notogaster 467 μm . Rostrum trapezoidal in dorsal view, but strongly projected in lateral view. Rostral seta moderately long, finely barbed, inserted laterally at end of tutorium. Lamella wide, but distinctly narrowed distally; length of lamella nearly 1/2 of total length of prodorsum as seen in dorsal view. Tutorium well-developed, moderately long, but narrow (Fig. 6C). Lamellar seta about 1.5 times as long as *ro*, finely barbed. Interlamellar seta nearly as long as *le*, finely barbed throughout its length. Sensillus long, with minutely barbed club-shaped head and narrow stalk (Fig. 6B). Bothridium directed anterolaterally, with large opening, its posterior part concealed under anterior margin of notogaster. Notogaster oval, about 1.1 times as long as wide, its anterior margin slightly arched, while posterior margin circularly rounded. Notogastral setae long, finely barbed, nearly equal in length to one another. Sacculi small, round to oval. Lyrifissures *ia*, *im*, and *ih* well-developed; other lyrifissures and opisthosomal gland opening not evident (Fig. 6A). Subcapitular mentum wider than long, without noticeable microtubercles. Hypostomal setae *a*, *m*, and *h* medium-long, thin, smooth. Chelicera and palp normal for genus. Epimeral region nearly smooth, apodemes *apo.1*, *apo.2*, *apo.sj*, and *apo.3* aligned obliquely. Epimeral setae short, finely barbed, setal formula: 3-1-3-3. Circumpedal carina well-developed, reaching lateral border of ventral plate. Custodium well-developed, projected anteriorly. Pedotecta I and II small, their surfaces smooth. Ventral plate nearly smooth except for foveolate genital plates. Five pairs of genital setae; all anogenital setae finely barbed. Adanal lyrifissures *iad* situated at level of setae *an₂* adjacent and parallel to lateral margins of anal aperture (Fig. 6D). All tarsi heterotridactylous, with

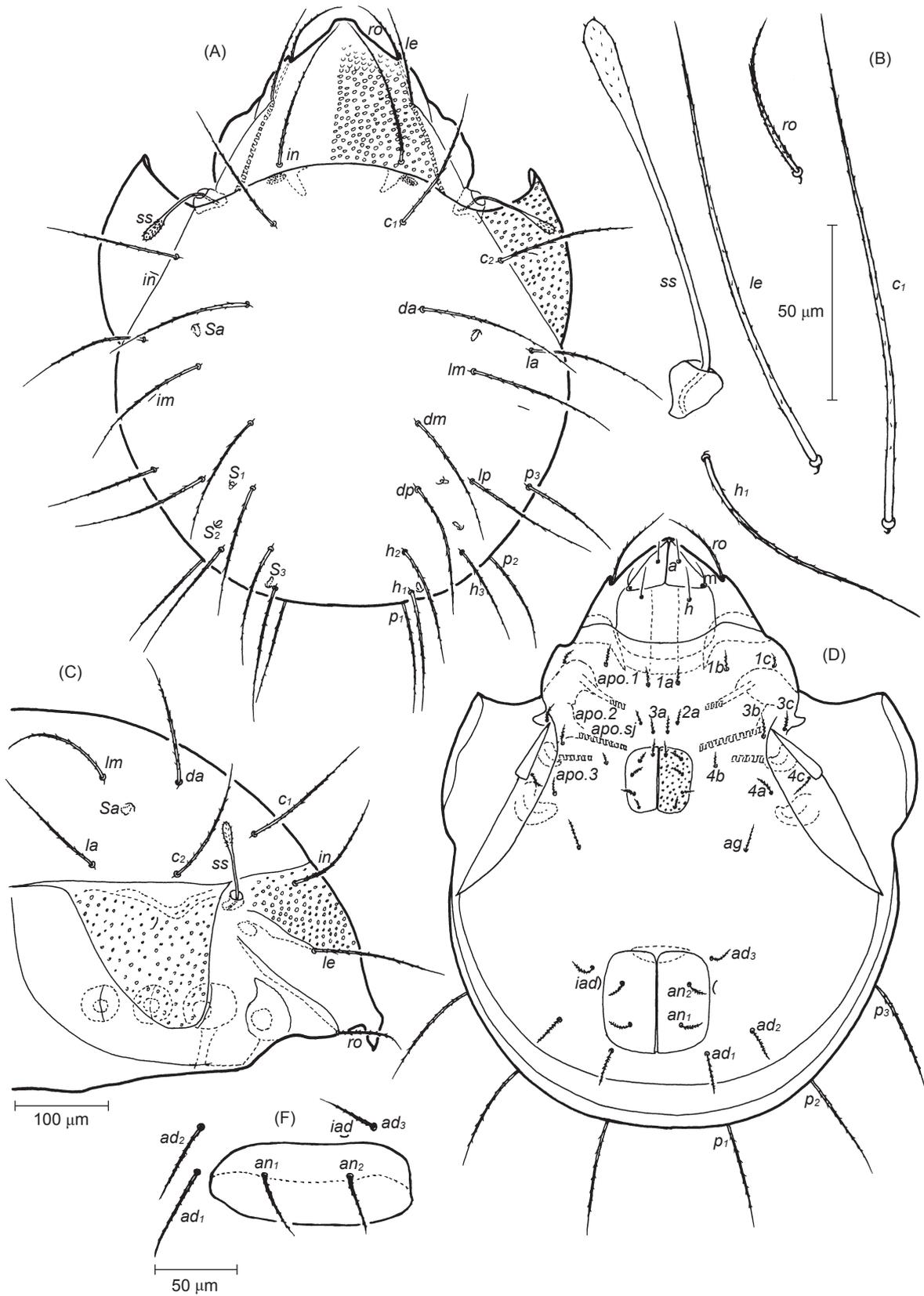


Fig. 6. *Peloribates kaszabi* Mahunka, 1988 (adult, female). (A) Dorsal view; (B) sensillus, prodorsal and notogastral setae; (C) lateral view of proterosoma; (D) ventral view; (E) anal region. Scale bar is the same for A, C, and D.

lateral claws much thinner than empodial claw. Femora II-IV with distinct, complete ventral keels or blades. Femur I with a short, relatively small keel on its proximal part. Femora I-IV and trochanters III and IV with large porose areas. Setation of legs typical for genus.

Material examined: One specimen (♀): Trivananthapuram (Trivandrum), Kerala, India, Karamana River, among weeds and sediments during flood, Coll. T. Chatterjee, Aug. 2005.

Remarks: The character states of the present material accord well with those of specimens studied by Mahunka (1988). The only observed differences were the foveolate surface of the notogaster and the smooth ventral setae in Vietnamese specimens, in contrast to the nearly smooth notogaster and finely barbed ventral setae in the Indian material. The species was first discovered in decaying plant debris collected from terrestrial habitats in Vietnam. The species seems to be a typical soil-litter inhabitant, but probably occasionally occurs in semi-aquatic habitats due to flooding.

Family Scheloribatidae Grandjean, 1933

Genus *Scheloribates* Berlese, 1908

Scheloribates latipes (Koch, 1844)

(Fig. 7)

Zetes latipes C. L. Koch 1844: 38(14).

Scheloribates latipes Sellnick 1928: 16, fig. 30.

Diagnosis: Medium size; rostrum rounded anteriorly, but projected in lateral view; lamellae wide; prolamellae well-developed, extending beyond alveoli of rostral setae; sublamellae well-developed; sensilli with finely barbed club-shaped head; notogaster relatively wide, lateral ends of dorsosejugal suture curved posteriorly and not joined to anteromedian margin of pteromorphs; all notogastral setae well-developed.

Supplementary description: Yellowish to deep reddish-brown. Cerotegument rather thick, lateral region of podosoma and epimeral region with very small granules; integument nearly smooth. Body length 517-600 (543) μm ; width of notogaster 337-418 (376) μm ; length of notogaster 403-479 (435) μm . Rostrum rounded in dorsal view, but projected in lateral view. Prodorsal setae moderately long, weakly barbed, only exobothridial seta short, smooth. Lamella wide, converging in anterior direction, narrowing anteriorly. Prolamella well-developed, extending beyond alveolus of rostral seta; sublamella well-developed, almost

reaching level of seta *ex* (Fig. 7E). Sensillus with weakly barbed club-shaped head and short stalk. Bothridium rather large, its posterior scale well-developed (Fig. 7G). Notogaster relatively wide, length to width ratio 1.15:1; its surface nearly smooth, muscle sigillae scattered along lateral and posterior margins. Dorsosejugal suture arched medially, its lateral ends curved posteriorly and not joined to anteromedian margin of pteromorph (Fig. 7F). Pteromorph smooth, its anterior border almost perpendicular to body axis and almost reaching anterior margin of notogaster. Notogastral setae minute, but well discernable. Sacculi *Sa*, *S*₁, *S*₂, and *S*₃ oval, subequal in size. Lyrifissures *ia*, *im*, *ip*, *ih*, and *ips* well-developed, but small. Opisthosomal gland opening (*gla*) situated posterior to lyrifissure *im* (Fig. 7E). Hypostomal surface smooth, setae *h* and *m* finely barbed, seta *a* smooth. Subcapitulum, chelicerae, and palps typical for genus. Palpal setal formula: 0-2-1-3-10 including both ventral setae and solenidion ω of tarsus. Epimeral region nearly smooth. Apodemes *apo.2*, *apo.sj*, and *apo.3* well-developed; epimeral setae medium-long, smooth. Discidium relatively short and narrow, bearing epimeral seta *4c*. Circumpedal carina poorly developed. Pedotecta I and II large, with smooth surface. Surface of anogenital region and both anal and genital plates smooth. All anogenital setae smooth, medium-long. Adanal lyrifissure (*iad*) situated adjacent and parallel to anterolateral margin of anal aperture (Fig. 7D). Lateral claws of tarsi much thinner than empodial claw; dorsal surface of claws with a few serrations. Setation of legs typical as shown by Bayartogtokh (2000).

Material examined: 10 specimens (4 ♂♂ and 6 ♀♀): Trivananthapuram (Trivandrum), Kerala, India, Karamana River, among weeds and sediments during a flood, Coll. T. Chatterjee, Aug. 2005.

Remarks: The character states of specimens examined here are well in accord with those reported by other authors (Bayartogtokh 2000). This is a very widely distributed semicosmopolitan species, and it is an inhabitant of soil and litter of different habitats, but it also occurs in semi-aquatic environments such as bogs, moors, wet meadows, as well as in flooded habitats.

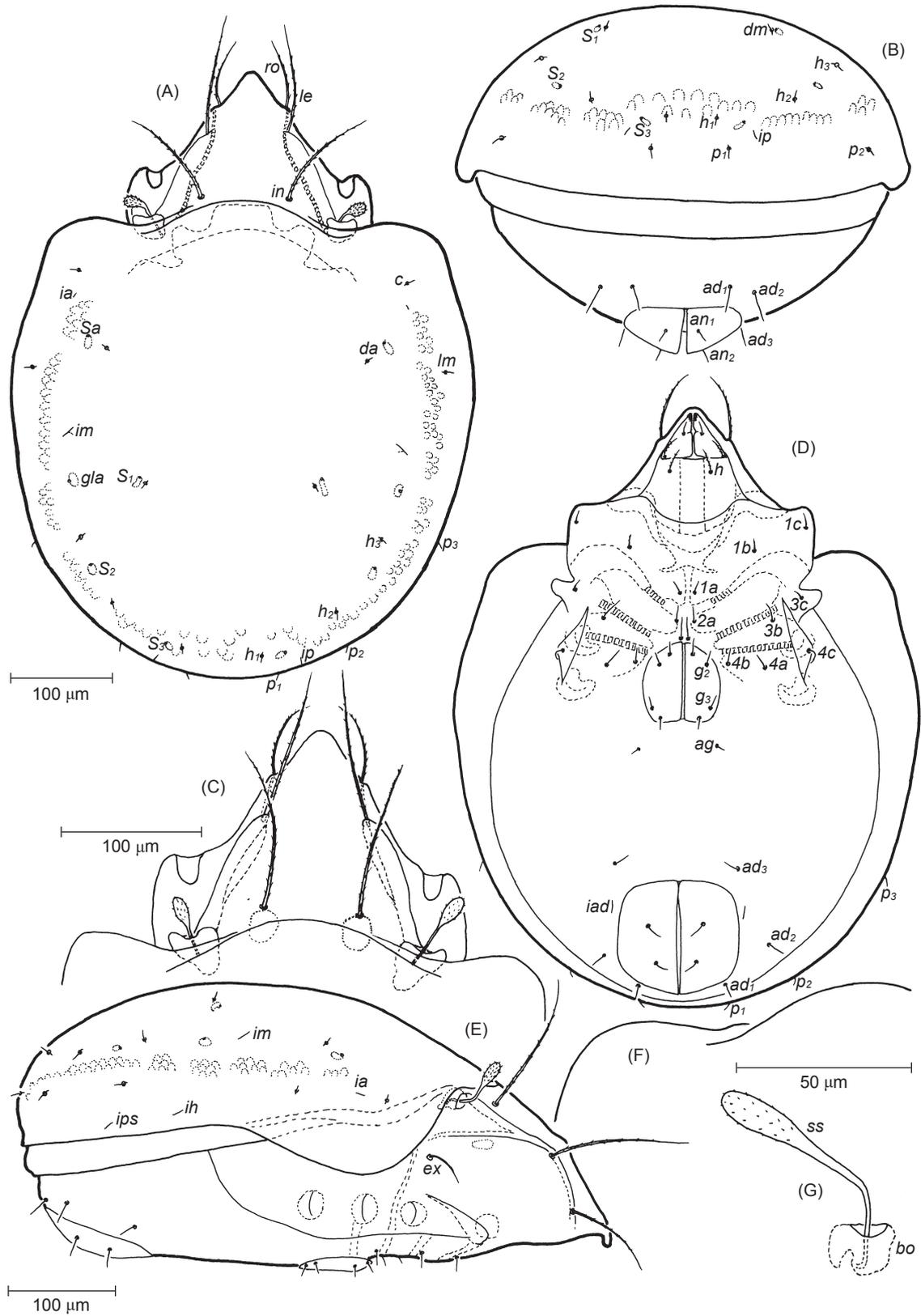


Fig. 7. *Schelorbates latipes* (C. L. Koch, 1844) (adult, female). (A) Dorsal view; (B) posterior view of opisthosoma; (C) prodorsum and anterior part of notogaster; (D) ventral view; (E) lateral view; (F) anterior margin of notogaster; (G) sensillus and bothridium (lateral view). Scale bar is the same for A, B, and D.

***Pergalumna cf. foveolata* Hammer, 1973**

(Fig. 8)

Pergalumna foveolata Hammer 1973: 54, fig. 54.

Diagnosis: Lamellar lines present, sublamellar lines absent; interlamellar setae relatively short, smooth; prodorsal setae medium-long, setiform, smooth or finely barbed; sensillus moderately long, setiform, smooth or finely barbed; porose areas A_2 , A_1 , and A_3 oval, legs tridactylous.

Supplementary description: Body dark brown to yellowish-brown. Surface of body and legs nearly smooth. Body length 676 μm ; width of notogaster 502 μm ; length of notogaster 578 μm . Lamellar line well-developed; sublamellar line absent. Lamellar line terminating at level of alveolus of lamellar seta (Fig. 8C). Rostral and lamellar setae thin, smooth, of moderate length, *le* slightly longer than *ro*. Interlamellar seta smooth, as long as *ro*. Sensillus moderately long, setiform, smooth (Fig. 8C). Porose area *Ad* situated posterolaterally to alveolus of each interlamellar seta (Figs. 8A, C). Dorsosejugal suture complete, notogastral setae minute, some of them not evident. Notogastral porose areas A_2 , A_1 , and A_3 large, oval; A_2 not evident. Structure of ventral region and legs typical of family; legs tridactylous.

Material examined: One specimen (φ): Trivananthapuram (Trivandrum), Kerala, India, Karamana River, among weeds and sediments during a flood, Coll. T. Chatterjee, Aug. 2005.

Remarks: Among more than 100 species of the genus *Pergalumna*, the Southeast Asian species, *P. foveolata* described by Hammer (1973) from Western Samoa, is most similar to the present material. Differences observed between these 2 materials are the smooth prodorsal setae and sensilli in the present specimens in contrast to finely barbed prodorsal setae and sensilli in the description by Hammer (1973). The body size of the Indian specimen was relatively larger than the Samoan specimen. Due to only having a single specimen for examination here, it was difficult to definitively determine its specific status, and therefore; we refer to Hammer's species, *P. foveolata*, as being most similar to the present material.

DISCUSSION

The genus *Thalassozetes* was erected by Schuster (1963) with the type species, *T. riparius*

Schuster, 1963 from the Adriatic Sea coastal area of Croatia. It is a member of the small family Selenoribatidae Grandjean, 1966, which has a transoceanic distribution, and members of this family are found in littoral areas of southwestern Europe, Central and South America, eastern Africa, and South and Southeast Asia (Schuster 1977 1989).

Members of *Thalassozetes* are mostly known from southern Africa, and East and South Asia. Marshall and Pugh (2000) described 2 species from southern Africa, namely *T. ugraseni* from the South African seashore, and *T. melanomerus* from mangroves of Mozambique. These 2 species were originally assigned to the genus *Schusteria* Grandjean, 1968.

Karasawa and Aoki (2005) described another species of this genus, *T. shimojanai* from the marine littoral of Okinawa I., Japan. They erected a new genus, *Rhizophobates* for this species and transferred the 2 southern African species to their newly established genus. Later, Subías (2008) considered *Rhizophobates* a junior synonym of *Thalassozetes*, and transferred all of these species to the latter genus.

The new species, *T. tenuisetosus* is found in marine littoral habitats of western India, and it is the 1st member of this genus from southern Asia. Thus, the geographical ranges of the genus *Thalassozetes* mainly cover coastal areas of the Indo-Pacific Oceans.

In conclusion, the following key can be used to identify adults of all known species of this genus.

A key to adults of the world species and sub-species of the genus *Thalassozetes*

- 1 Three pairs of adanal setae; sensilli with a relatively short stalk 2
- Two pairs of adanal setae; sensilli with a relatively long stalk 4
- 2 Genital, aggenital, anal, and adanal setae well-developed; genital setae situated apart from median margin of genital plates 3
- Genital, aggenital, anal, and adanal setae represented by their alveoli; insertion pores of genital setae situated very close to median margin of genital plates *T. shimojanai* (Karasawa et Aoki 2005)
- 3 Notogaster with 14 pairs of thin setae; strongly developed transverse ridge present anterior to longitudinal ridge of prodorsum; 2 pairs of setae on epimeral region IV; adanal lyrifissures *iad* situated transversely and anteriorly to anal aperture; large species *T. tenuisetosus* sp. nov.
- Notogaster with 13 pairs of thick setae; strongly developed transverse ridge absent anterior to longitudinal ridge of prodorsum; 1 pair of setae on epimeral region IV; adanal lyrifissures *iad* situated obliquely and parallel to anal

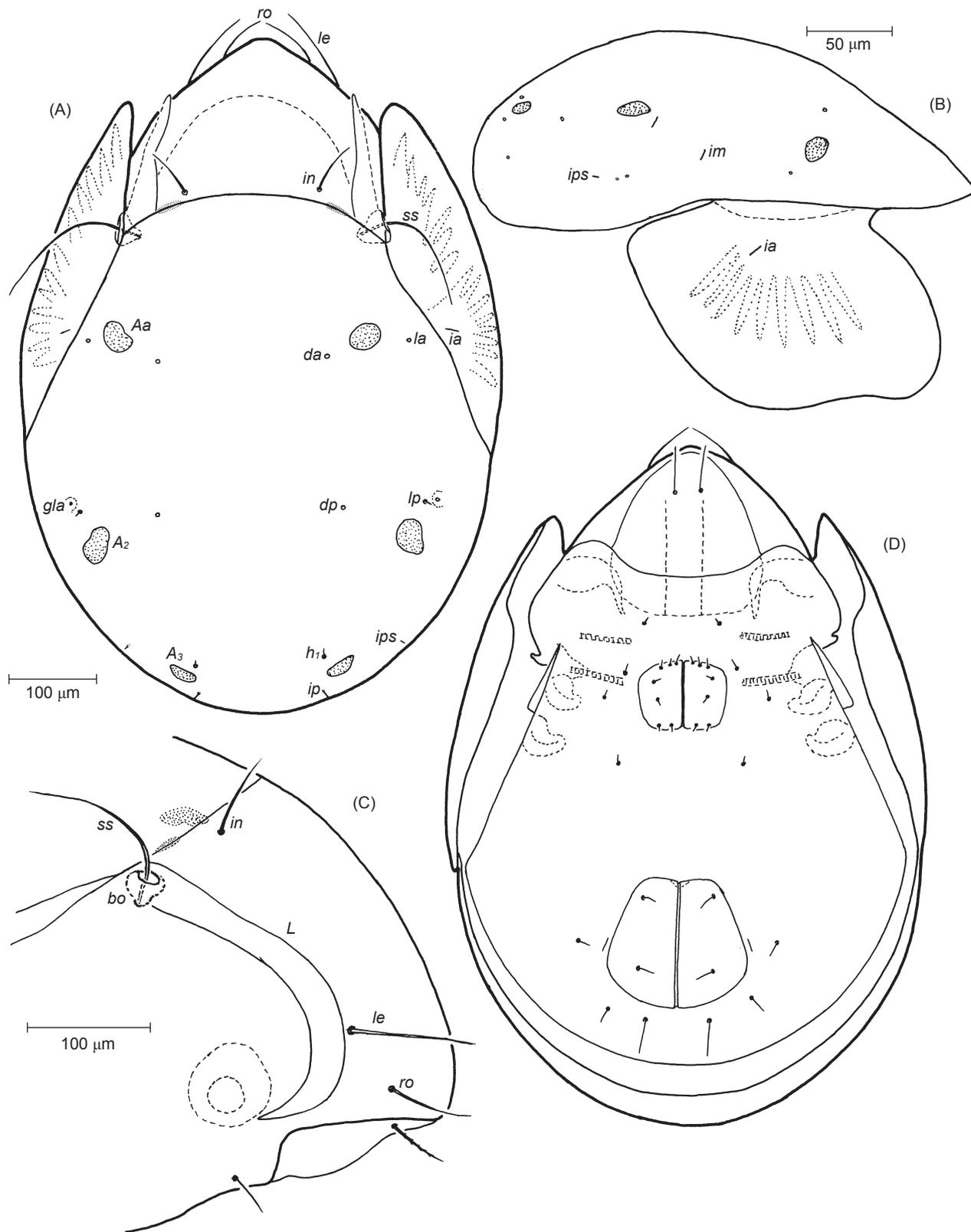


Fig. 8. *Pergalumna* cf. *foveolata* Hammer, 1973 (adult, female). (A) Dorsal view; (B) lateral view of notogaster and pteromorph; (C) lateral view of proterosoma; (D) ventral view. Scale bar is the same for A and D.

- aperture; small species..... *T. riparius* Schuster, 1963
- 4 Notogaster with 15 pairs of setae; adanal lyrifissures *iad* obliquely aligned; anal setae *an₁* situated apart from posterior end of anal plate
- *T. ugraseni* (Marshall et Pugh 2000)
- Notogaster with 14 pairs of setae; adanal lyrifissures *iad* longitudinally aligned; anal setae *an₁* situated very close to posterior end of anal plate
- *T. melanomerus* (Marshall et Pugh 2000)

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