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NEW FAUNISTIC AND TAXONOMIC DATA ON ORIBATID MITES (ACARI: ORIBATIDA) OF THAILAND

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This study is based on oribatid mite materials collected from the vicinities of Phatthaya city and the Samet Island in Thailand; 18 species from 14 genera and 11 families are registered, of these, nine species are recorded from the Thai fauna for the first time. A new species of the genus *Dolicheremaeus* (Otocepheidae) – *D. phatthayaensis* sp. n. – is described. The supplementary description of *Galumna paracalcicola* Ermilov et Anichkin, 2014 is presented based on specimens from Thailand. Identification keys to the known representatives of the genera *Dolicheremaeus* from Thailand and *Galumna* from the Oriental region are presented. *Galumna indica* Hafeez Kardar, 1989 and *G. striata* Hafeez Kardar, 1989 are combined in the genus *Setogalumna*.

Key words: mite fauna, new species, record; taxonomy, morphology, *Dolicheremaeus*, *Galumna*, identification key, Oriental region.

INTRODUCTION

The oribatid mites (Acari, Oribatida) of Thailand are insufficiently studied; at present, about 150 species are recorded (Corpuz-Raros & Ermilov 2020, Subías & Shtanchaeva 2021).

Our work is based on materials which were collected during a field trip in Thailand in January 2023. The primary goal of the paper is to present a list of the identified oribatid taxa with notes on new findings.

During taxonomic identification, we found one new species, belonging to *Dolicheremaeus* Jacot, 1938 (family Otocepheidae). The secondary goal of the paper is to describe this new species under the name *D. phatthayaensis* sp. n. The genus *Dolicheremaeus* was proposed by Jacot (1938), with *Dolicheremaeus rubripedes* Jacot, 1938 as type species. It is very large, comprises 180 species and nine subspecies which are distributed in the tropical and subtropical regions (Subías 2022, online version 2023). The main generic characters were summa-

rized by Corpuz-Raros (2000), Weigmann (2014), Subías and Shtanchaeva (2023). The keys to selective representatives of *Dolicheremaeus* were summarized by Aoki (1967), Balogh and Balogh (2002), Corpuz-Raros (2000). Presently, three *Dolicheremaeus* species have been registered from Thailand (Aoki 1965, 1967): *D. oginoi* (Aoki, 1965), *D. orientalis* (Aoki, 1965), *D. siamensis* Aoki, 1967.

The tertiary goal of the paper is to present the supplementary description of *Galumna paracalcicola* Ermilov et Anichkin, 2014 based on the Thai specimens, adding new figures and information about some morphological characteristics and measurements.

Additionally, the systematic placement of two Indian *Galumna* (*Galumna*) species, *G.* (*G.*) *indica* Hafeez Kardar, 1989 and *G.* (*G.*) *striata* Hafeez Kardar, 1989, is discussed, and the identification keys to the known representatives of the genera *Dolicheremaeus* from Thailand and *Galumna* from the Oriental region are provided. A key to the Oriental species of *Galumna* (*Galumna*) was provided by Ermilov and Starý (2017); however, since that time several new species have been described and numerous new findings were recorded, therefore, an updated and revised key is needed.

MATERIAL AND METHODS

Material. Samples were collected from two localities in Thailand: (1) Chonburi province, vicinities of Phatthaya city, 12°44′26.6″N, 100°50′29.0″E, litter in mixed forest near the beach, 31.I.2023 (leg. A. A. Khaustov); (2) Rayong province, Samet Island, rotten wood under the bark of a lying log,12°34′06.9″N, 101°27′50.9″E, 26.I.2023 (leg. A. A. Khaustov).

Observation and documentation. For measurement and illustration, specimens were mounted in lactic acid on temporary cavity slides. All measurements are in micrometers. Body length was measured in lateral view, from the tip of the rostrum to the posterior edge of the notogaster; other structures were oriented to avoid parallax errors. Notogastral width refers to the maximum width in dorsal aspect. Setal lengths were measured perpendicular to their long axes, accounting for curvature. Formulas for leg solenidia are given in square brackets according to the sequence genu-tibia-tarsus. Drawings were made with a camera lucida using a Leica DM 2500 light microscope.

Terminology. Morphological terminology used in this paper mostly follows that of Grandjean: see Travé & Vachon (1975) for references; Norton (1977) for leg setal nomenclature; Ermilov and Klimov (2017) and Norton and Behan-Pelletier (2009) for overview.

Abbreviations. The following morphological abbreviations are used: *Prodorsum*: *cos* = costula; *L* = lamellar line; *S* = sublamellar line; *N* = prodorsal leg niche; *E*, *T* = lateral ridges of body; *ro*, *le*, *in*, *bs*, *ex* = rostral, lamellar, interlamellar, bothridial, and exobothridial setae, respectively; *Ad* = dorsosejugal porose area; *D* = dorsophragma; *P* = pleurophragma; *cpl* = lateral prodorsal condyle. *Notogaster*: *cnl* = lateral notogastral condyle; *c*, *la*, *lm*, *lp*, *h*, *p* = setae; *Aa*, *A1*, *A2*, *A3* = porose areas; *mp* = median pore; *ia*, *im*, *ip*, *ih*, *ips* = lyrifissures; *gla* = opisthonotal gland opening. *Gnathosoma*: *a*, *m*, *h* = subcapitular setae. *Epimeral and lateral podosomal regions*: *1a*, *1b*, *1c*, *2a*, *3a*, *3b*, *3c*, *4a*, *4b*, *4c* = epimeral setae; *PdI*, *PdII* = pedotecta I, II, respectively; *dis* = discidium; *cir* = circumpedal carina. *Anogenital region*: *g*, *ag*, *an*, *ad* = genital, aggenital, anal, and adanal setae, respectively; *vr* = ventral ridge; *iag*, *iad* = aggenital and adanal lyrifissures, respectively; *cvr* = circumventral ridge; *Ap* = postanal porose area; *po* = preanal organ. *Legs*:

Tr, *Fe*, *Ge*, *Ti*, *Ta* = trochanter, femur, genu, tibia, and tarsus, respectively; ω, φ, σ = solenidia; ε = famulus; *d*, *l*, *v*, *bv*, *ev*, *ft*, *tc*, *it*, *p*, *u*, *a*, *s*, *pv*, *pl* = setae; *pa* = porose area.

List of identified oribatid mite taxa

Distribution: mostly from Subías (2023). Ptyctimous mites: not included. All examined specimens (except the holotype of the new species) are deposited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia. References for original descriptions of species are not presented in the References section.

Lohmanniidae

Annectacarus krachan Mahunka, 1995: locality 1 (1 ex.). Distribution: Thailand.

Eremobelbidae

Eremobelba breviseta Balogh, 1968: locality 1 (5 ex.). Distribution: Australasian, Oriental. New record for Thailand.

Eremobelba capitata Berlese, 1913: locality 1 (14 ex.). Distribution: Oriental, New Guinea. New record for Thailand.

Oppiidae

Arcoppia hammerae Rodríguez et Subías, 1984: locality 1 (7 ex.). Distribution: Oriental, Palau. New record for Thailand.

Oxyoppia (*Oxyoppiella*) *polynesia* (Hammer, 1972): locality 1 (7 ex.). Distribution: Tropical.

Granuloppiidae

Senectoppia multisulcatum (Berlese, 1913): locality 1 (4 ex.). Distribution: Oriental.

Otocepheidae

Dolicheremaeus phatthayaensis sp. n.: locality 1 (58 ex.). Distribution: Thailand.

Carabodidae

Yoshiobodes irmayi (Balogh et Mahunka, 1969): locality 1 (1 ex.). Distribution: Neotropical, Oriental, southern U.S.A. New record for Thailand.

Microzetidae

Berlesezetes ornatissimus (Berlese, 1913): locality 1 (1 ex.). Distribution: Tropical, Subtropical. New record for Thailand.

Oribatellidae

Oribatella umaetluisorum Ermilov et Anichkin, 2012: locality 1 (1 ex.). Distribution: Vietnam. New record for Thailand.

Scheloribatidae

Scheloribates fimbriatus Thor, 1930: locality 1 (4 ex.). Distribution: Tropical.
Scheloribates praeincisus (Berlese, 1910): locality 2 (1 ex.). Distribution: Tropical, subtropical.

Haplozetidae

Indoribates hauseri (Mahunka, 1997): locality 1 (3 ex.). Distribution: Oriental. New record for Thailand.
Peloribates szirakii Mahunka, 2008: locality 1 (7 ex.). Distribution: Thailand.
Protoribates lophothrichus (Berlese, 1904): localities 1 (132 ex.), 2 (1 ex.). Distribution: Semicosmopolitan. New record for Thailand.

Galumnidae

Galumna flabellifera Hammer, 1958: locality 2 (3 ex.). Distribution: Tropical, Subtropical.
Galumna paracalcicola Ermilov et Anichkin, 2014: locality 1 (2 ex.). Distribution: Vietnam. New record for Thailand.
Galumna sp.: locality 1 (2 ex.).

Thus, we found 18 species from 14 genera and 11 families; of these, one species is new to science, one species not identified and nine species are recorded for the first time from Thailand. According to distribution of identified taxa, one species is Semicosmopolitan; nine species are recorded from two or more geographic regions; four species are Oriental; and three species are known only from Thailand.

TAXONOMY

Family Otocepheidae
Genus *Dolicheremaeus* Jacot, 1938

Type species: *Dolicheremaeus rubripedes* Jacot, 1938

Dolicheremaeus phatthayaensis sp. n.
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(Figs 1, 2)

Material examined – Holotype (female) and eight paratypes (four males and four females): Thailand, Chonburi province, vicinities of Phatthaya city, 12°44′26.6″N, 100°50′29.0″E, litter in mixed forest near the beach, 31.I.2023 (leg. A. A. Khaustov).

Additional (non-type) material: 49 specimens; label as for the type material.

Type deposition – The holotype is deposited in the collection of the Senckenberg Museum of Natural History, Görlitz, Germany; eight paratypes and non-type material are deposited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia. All specimens are preserved in 70% solution of ethanol with a drop of glycerol.

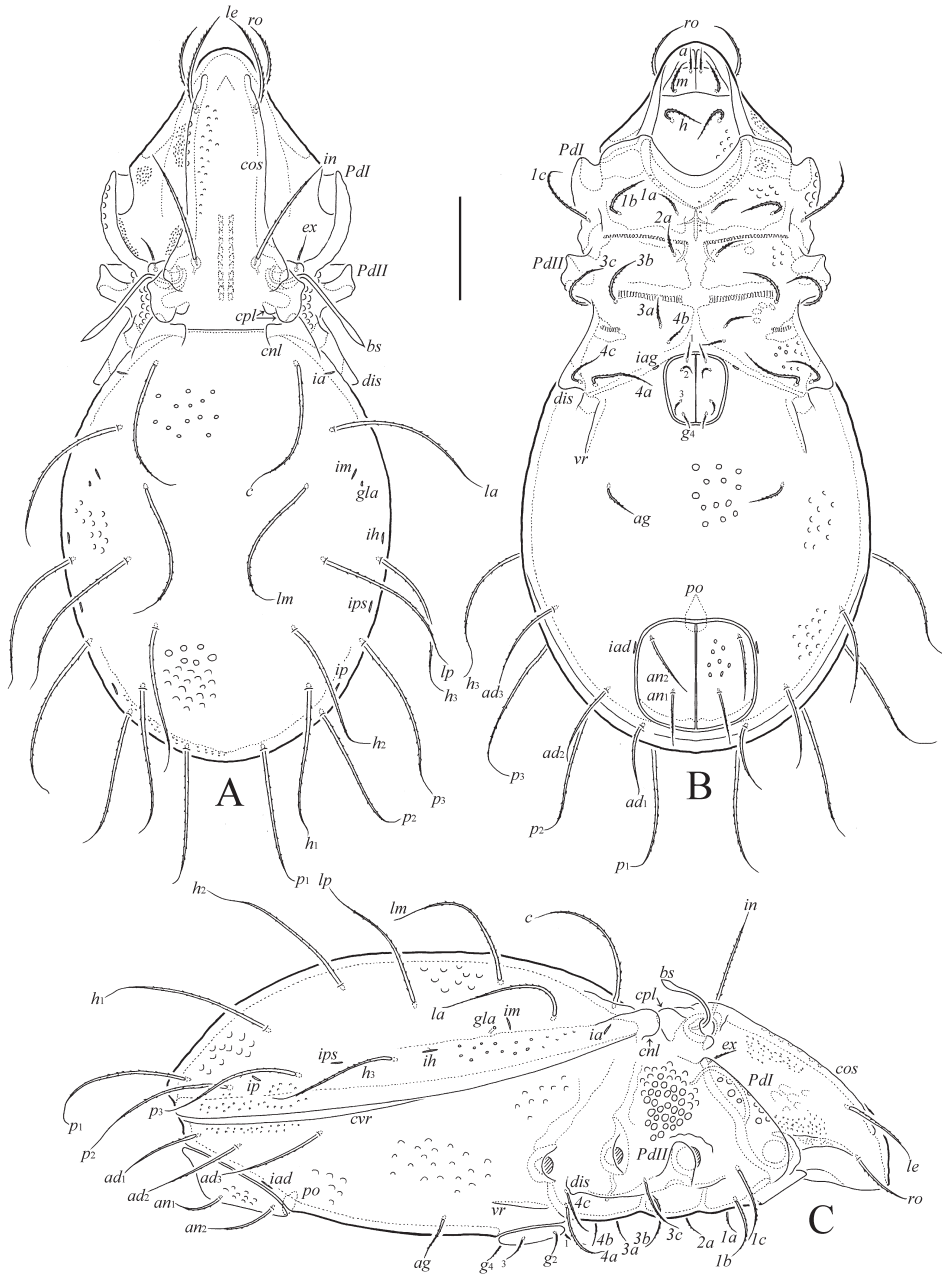

Fig. 1. *Dolicheremaeus phatthayaensis* sp. n., adult (not shown: legs): A = dorsal view; B = ventral view; C = right lateral view. Scale bar: 100 μm

Etymology – The species name *phatthayaensis* refers to the place of origin, vicinities of Phatthaya city.

Diagnosis – Body length: 600–750. Dorsal side of prodorsum and posterior part of notogaster and anogenital plate sparsely tuberculate; notogaster and anogenital region foveolate. Interlamellar seta long, rod-like, barbed; bothridial seta long, lanceolate, slightly roughened. Lateral prodorsal condyles present, each consisting of two tubercle-like parts; medial prodorsal condyles absent. Lateral notogastral condyles present, quadrangular, with depressed anteromedial part; medial notogastral condyles absent. All notogastral setae long (*c*, *lm* reaching insertions of *lm*, h_2, respectively), subflagellate, barbed. Epimeral and anogenital setae setiform, barbed; distance ad_3–ad_3 longer than ad_2–ad_2. Adanal lyrifissure located close and lateral to anal plate. Leg seta *u* on tarsi I setiform, on tarsi II–IV thorn-like.

Description of adult – *Measurements*. Body length: 690 (holotype), 600–750 (paratypes); notogaster width: 330 (holotype), 270–360 (paratypes). No clear differences between males and females in body size. Body length/width ratio: 2.0–2.2.

Integument. Body color light brown, but legs and genital plates dark brown. Body surface covered by densely microgranulate cerotegument; dorsal side of prodorsum (between costulae), posterior part of notogaster and anogenital plate, partially apodeme I and sternal apodeme with sparse tubercles (diameter up to 2); lateral part of prodorsum with dense tubercles (diameter up to 1); notogaster (except posterior part), subcapitular mentum, anogenital region (except posterior part) including anal plate, partially pedotectum I and costula, and lateral part of all epimeres with foveolae (diameter up to 7); lateral part of body (between bothridium and acetabula II, III) with dense tubercles (diameter up to 7).

Prodorsum. Rostrum broadly rounded. Costula long, protruding anteriorly to insertion of rostral seta. Tutorial carina absent. Rostral (71–75) and lamellar (101–105) setae setiform, barbed; interlamellar seta (120–135) rod-like, barbed; bothridial seta (their length out of bothridium: 105–112) with long stalk and short, lanceolate, slightly roughened head; exobothridial seta (30–34) setiform, slightly barbed. Each lateral prodorsal condyle double, represented by two tubercle-like parts; medial prodorsal condyles absent.

Notogaster. One pair of lateral notogastral condyles quadrangular, with depressed anteromedial part; medial notogastral condyles absent. All notogastral setae long (154–176; *c*, *lm* reaching insertions of *lm*, h_2, respectively), subflagellate, barbed. All lyrifissures and opisthonotal gland opening distinct.

Gnathosoma. Typical for Otocepheidae (e.g., Ermilov & Khaustov 2020, Ermilov & Starý 2022). Subcapitulum size: 131–139 × 90–97; subcapitular setae (*a*: 26–30; *m*: 45–49; *h*: 56–60) setiform, *a* roughened, *m* and *h* barbed. Palp (length: 116–120) setation: 0–2–1–3–8(+ω); postpalpal seta (9–11) spiniform, smooth. Chelicera length: 131–139; cheliceral setae (*cha*: 37–41; *chb*: 17–19) setiform, barbed.

Epimeral and lateral podosomal regions. Epimeral setal formula: 3–1–3–3; all setae (*1a*, *2a*, *3a*, *4b*: 30–34; *1b*, *3b*, *3c*: 64–75; *1c*, *4a*: 79–86; *4c*: 52–56) setiform, barbed. Pedotectum I represented by large lamina.

Anogenital region. Aggenital lyrifissure located laterally to genital aperture. Genital (26–30), aggenital (49–56), anal (an_1: 56–64; an_2: 71–75), and adanal (ad_1: 82–90; ad_2, ad_3: 105–

112) setae setiform, barbed; distance ad_3–ad_3 longer than ad_2–ad_2; distance an_1–an_1 shorter than an_2–an_2. Adanal lyrifissure located close and lateral to anal plate.

Legs. Claw of each leg strong, slightly barbed on dorsal side. Dorsal side of all tarsi without teeth. Dorsoparaxial porose area on femora I–IV well visible, on trochanters III, IV

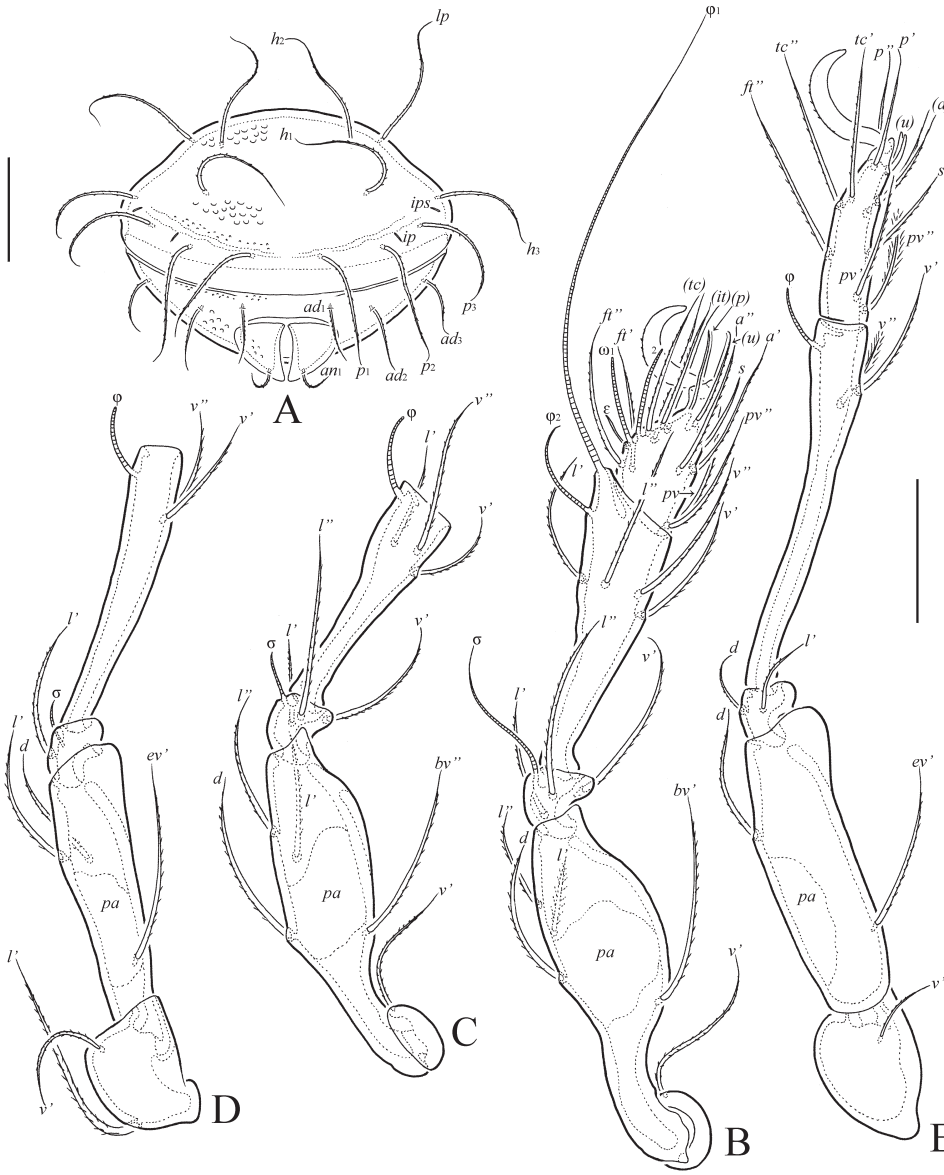

Fig. 2. *Dolicheremaeus phatthayaensis* sp. n., adult: A = posterior view; B = leg I, right, antiaxial view; C = leg II (not shown: tarsus), right, antiaxial view; D = leg III (not shown: tarsus), left, antiaxial view; E = leg IV, left, antiaxial view. Scale bars: 100 μm (A), 50 μm (B–E)

Table 1. Leg setation and solenidia of adult *Dolicheremaeus phatthayaensis* sp. n.

Leg	Tr	Fe	Ge	Ti	Ta
I	*v′*	*d, (l), bv″*	*(l), v′,* σ	*(l), (v),* φ_1, φ_2	*(ft), (tc), (it), (p), (u), (a), s, (pv),* ε, ω_1, ω_2
II	*v′*	*d, (l), bv″*	*(l), v′,* σ	*l′, (v),* φ	*(ft), (tc), (it), (p), (u), (a), s, (pv),* ω_1, ω_2
III	*v′, l′*	*d, l′, ev′*	*l′,* σ	*(v),* φ	*(ft), (tc), (it), (p), (u), (a), s, (pv)*
IV	*v′*	*d, ev′*	*d, l′*	*(v),* φ	*ft″, (tc), (p), (u), (a), s, (pv)*

Note: Roman letters refer to normal setae; Greek letters to solenidia (except ε = famulus). Single quotation mark (′) designates seta on the anterior and double quotation mark (″) seta on the posterior side of a given leg segment. Parentheses refer to a pair of setae.

not observed. Formulas of leg setation and solenidia: I (1–4–3–4–16) [1–2–2], II (1–4–3–3–15) [1–1–2], III (2–3–1–2–15) [1–1–0], IV (1–2–2–2–12) [0–1–0]; homology of setae and solenidia indicated in Table 1. Solenidion φ_1 on tibia I very long, subflagellate, other solenidia medium-sized, thickened, rounded distally. Seta *u* on tarsi I setiform, on tarsi II–IV thorn-like.

Remarks – *Dolicheremaeus phatthayaensis* sp. n. is morphologically most similar to *D. perisi* Pérez-Íñigo, 1969 from Equatorial Guinea and *D. wangi* Aoki et Hu, 1993 from Southeast China in having lanceolate bothridial seta and long, subflagellate notogastral setae, and in the absence of medial prodorsal and medial notogastral condyles. However, the new species differs from both species by the presence of double (versus single) each prodorsal lateral condyle and long (versus medium-sized) notogastral setae in anterior part of the notogaster, and the morphology of lateral notogastral condyle (quadrangular, with depressed anteromedial part versus tubercle-like).

Family Galumnidae
Genus *Galumna* Heyden, 1826
Subgenus *Galumna* (*Galumna*) Heyden, 1826

Type species: *Notaspis alatus* Hermann, 1804

Galumna (*Galumna*) *paracalcicola* Ermilov et Anichkin, 2014 (Figs 3, 4)

Remarks – *Galumna paracalcicola* was described by Ermilov and Anichkin (2014**c**) from Southern Vietnam. Specimens of this species from Thailand are morphologically similar in all main morphological traits, e.g.: rostrum rounded; lamellar line nearly straight, without developed distal part; rostral, lamellar and interlamellar setae long, *ro* shortest, *in* longest, *ro* and *le* slightly barbed, *in* smooth; bothridial seta long, with lanceolate head; dorsosejugal suture and porose present; four pairs of rounded/oval notogastral

porose areas; median pore present; lyrifissure *im* located close and anteriorly to porose area *A1*; epimeral and anogenital setae comparatively short; epimeral setal formula: 1–0–1–2; circumpedal carina short, distinctly not reaching insertion of seta *3b*; aggenital seta located between genital and anal apertures; postanal porose area present, rounded; leg claws smooth.

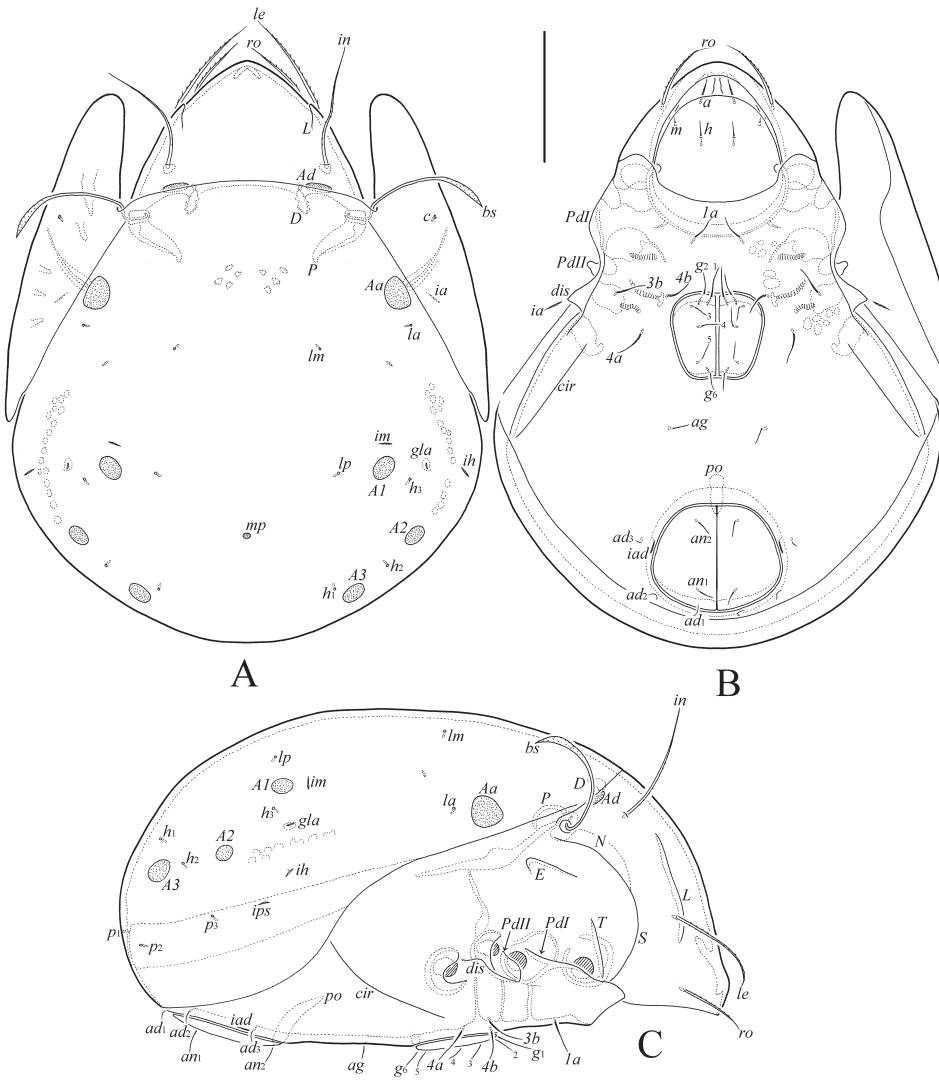

Fig. 3. *Galumna paracalcicola* Ermilov et Anichkin, 2014, adult (not shown: legs): A = dorsal view; B = ventral view (not shown: right pteromorph); C = right lateral view (not shown: pteromorph). Scale bar: 100 μm

However, there are some morphological differences between the Thai and Vietnamese specimens: (a) Thai specimens larger than Vietnamese specimens (body length: 443–450 versus 398–415); (b) head of bothridial seta in Thai specimens has short apical spike versus head distally narrowed but without distal spike in Vietnamese specimens; (c) epimeral setae in Thai specimens is 6–8 micrometers longer than those in Vietnamese specimens. We believe these

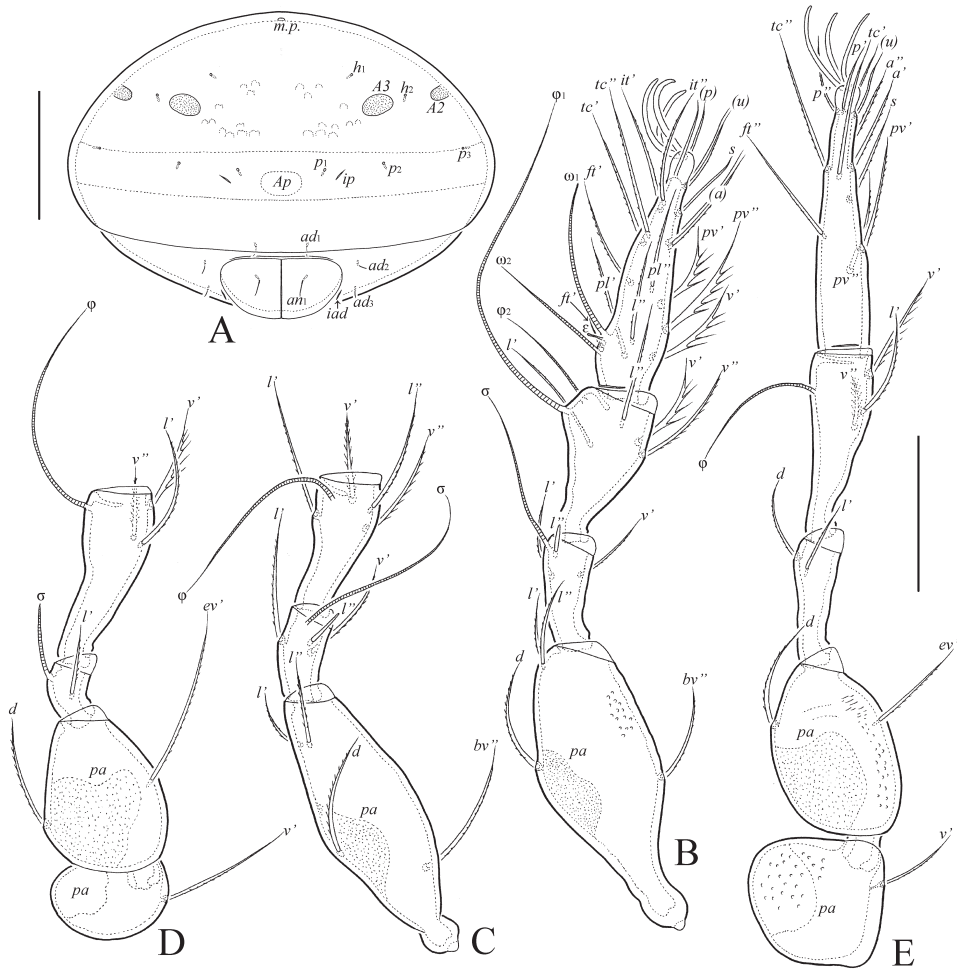

Fig. 4. *Galumna paracalcicola* Ermilov et Anichkin, 2014, adult: A = posterior view; B = leg I (not shown: trochanter), right, antiaxial view; C = leg II (not shown: trochanter and tarsus), right, antiaxial view; D = leg III (not shown: tarsus), left, antiaxial view; E = leg IV, left, antiaxial view. Scale bars: 100 μm (A), 50 μm (B–E)

differences represent intraspecific variability, therefore, listed above traits must be used when identifying *G. paracalcicola* in the future.

DISCUSSION

The analysis of literature on *Galumna* (*Galumna*) species has revealed an incorrect systematic placement of two Indian species, *G.* (*G.*) *indica* Hafeez Kardar, 1989 and *G.* (*G.*) *striata* Hafeez Kardar, 1989. Based on main morphological traits (e.g., well visible notogastral setae and insertion of lamellar setae between lamellar and sublamellar lines), these species should be combined in the genus *Setogalumna* Balogh, 1985 (see generic diagnosis in Ermilov & Klimov 2017).

Key to *Dolicheremaeis* of Thailand

1. Medial prodorsal and medial notogastral condyles absent 2

– Medial prodorsal and medial notogastral condyles present 3

2. Each prodorsal lateral condyle double; lateral notogastral condyle broadly quadrangular, with depressed anteromedial part; all notogastral setae long (*c*, *lm* reaching insertions of *lm*, h_2, respectively), subflagellate; body length: 600–750 *D. phatthayaensis* sp. n.
Distribution: Thailand.

– Each prodorsal lateral condyle single; lateral notogastral condyle tubercle-like; all notogastral setae medium-sized (*c*, *lm* not reaching insertions of *lm*, h_2, respectively), rod-like; body length: 569–675 *D. oginoi* (Aoki, 1965).
Distribution: Oriental.

3. Prodorsal medial condyles connected medially; head of bothridial seta long, narrowly fusiform; notogaster and anogenital region without striae; all notogastral setae long (*c*, *lm* reaching insertions of *lm*, h_2, respectively); adanal lyrifissure parallel to anal plate; body length: 852–1015 *D. orientalis* (Aoki, 1965).
Distribution: Oriental, Japan.

– Prodorsal medial condyles well separated; head of bothridial seta short, slightly lanceolate; notogaster and anogenital region partially striate; all notogastral setae medium-sized (*c*, *lm* not reaching insertions of *lm*, h_2, respectively); adanal lyrifissure oblique to anal plate; body length: 515–590 *D. siamensis* Aoki, 1967.
Distribution: Thailand.

Key to *Galumna* of the Oriental region

We exclude *G.* (*G.*) *appressala* (Ewing, 1910), *G.* (*G.*) *major* (Pearce, 1906), *G.* (*G.*) *nilgiria* (Ewing, 1910), *G.* (*G.*) *tessellatala* (Ewing, 1910) (all from India), *G.* (*G.*) *atomaria* (Berlese, 1914) (see also Mahunka 1992*b*) from Java, *G.* (*G.*) *colossus* Oudemans, 1915 from Sri Lanka, and *G.* (*G.*) *fuscata* Kishida, 1921 (see Aoki 1966) from Taiwan in the key because these species have been poorly described. We also exclude *G. parascaber* Deb et Raychaudhuri, 1975, because this species has notogastral sacculi instead of porose areas (presence of notogastral porose areas is the generic trait of *Galumna* – see Ermilov & Klimov 2017), therefore, it isn't a representative of this genus.

1. Octotaxic system represented by porose areas and sacculi simultaneously; body length: 332–365 *G.* (*Atypicogalumna*) *corpuzrarosae* Ermilov, Sandmann, Klarner, Widyastuti et Scheu, 2015
   Distribution: Indonesia.

– Octotaxic system represented by porose areas (sacculi absent) 2

2. Adanal lyrifissure distinctly distanced from anal aperture 3

– Adanal lyrifissure located close to anal aperture 8

3. Interlamellar seta short 4

– Interlamellar seta medium-sized or long 6

4. Two pairs of notogastral porose areas *Aa* developed; genital plate with one longitudinal stria; body length: 398 *G.* (*Neogalumna*) *eusebioi* Ermilov et Corpuz-Raros, 2022.
   Distribution: Philippines.

– One pair of notogastral porose areas *Aa* developed; genital plate with numerous longitudinal striae 5

5. Notogastral setal alveolus *la* present; rostral and lamellar setae similar in length; postanal porose area oval; body length: 381–415 *G.* (*Neogalumna*) *tolstikovi* Ermilov et Anichkin, 2014 (see Ermilov & Anichkin 2014*b*). Distribution: Oriental region.

– Notogastral setal alveolus *la* absent; rostral seta distinctly longer than lamellar seta; postanal porose area elongate oval; body length: 498–531 *G.* (*Neogalumna*) *specifica* Ermilov, Sandmann, Klarner, Widyastuti et Scheu, 2015
   Distribution: Indonesia.

6. Notogastral porose area *Aa* boomerang-like; head of bothridial seta lanceolate; body length: 510 *G.* (*Neogalumna*) *curviporosa* (Balakrishnan, 1986)
Distribution: southern India.

– Notogastral porose area *Aa* not boomerang-like; bothridial seta setiform 7

7. Lamellar line short, its distal part not developed; additional notogastral setal alveolus absent anteriorly to porose area *Aa*; body length: 381–398 *G.* (*Neogalumna*) *seniczaki* (Ermilov et Anichkin, 2010)
Distribution: Vietnam.

– Lamellar line long, its distal part developed; additional notogastral setal alveolus present anteriorly to porose area *Aa*; body length: 431–448 *G.* (*Neogalumna*) *longilineata* Ermilov et Anichkin, 2014
(see Ermilov & Anichkin 2014*b*). Distribution: Vietnam.

8. Anterior tectum of epimere I dentate 9

– Anterior tectum of epimere I smooth 11

9. Pteromorph heavily granulate; body length: 376 *G.* (*Galumna*) *crenata maharastraensis* Subías, 2022
(see also Sarkar *et al.* 2013). Distribution: India.

– Pteromorph not heavily granulate 10

10. Head of bothridial seta barbed; body length: 319–390 *G.* (*Galumna*) *crenata crenata* Deb et Raychaudhuri, 1975
(see also Ermilov, Corpuz-Raros *et al.* 2014). Distribution: Oriental.

– Head of bothridial seta smooth; body length: 370 *G.* (*Galumna*) *crenata uttarkashii* Sarkar, Sanyal et Chakrabarti, 2007
Distribution: India.

11. Rostrum bidentate; body length: 564–664 *G.* (*Galumna*) *bidentatirostris* Ermilov, Sandmann, Klarner, Widyastuti et Scheu, 2015
Distribution: Indonesia.

– Rostrum not bidentate 12

12. Rostrum distinctly pointed 13

– Rostrum rounded (if strongly narrowed, then without a clear point) 21

13. Two pairs of notogastral porose areas *Aa* developed; interlamellar seta represented by alveolus; body length: 913–979 *G.* (*Galumna*) *tetraporosa* Ermilov, Martens et Tolstikov, 2014
Distribution: Nepal.

– One pair of notogastral porose areas *Aa* developed; interlamellar seta medium-sized or long 14

14. Bothridial seta setiform; rostral and lamellar setae short; body length: 547–581 *G.* (*Galumna*) *kebangica* Ermilov et Vu, 2012
Distribution: Vietnam.

– Bothridial seta with slightly or well developed head; rostral and lamellar setae medium-sized or long 15

15. Dorsosejugal suture interrupted medially 16

– Dorsosejugal suture complete 17

16. Basal part of lamellar seta covered by tooth; median pore and postanal porose area present; notogastral lyrifissure *im* located lateral to porose area *A1*; body length: 747–846 *G.* (*Galumna*) *acutirostrum* Ermilov et Anichkin, 2010
(see also Ermilov & Starý 2017). Distribution: Oriental, New Caledonia.

– Basal part of lamellar seta not covered by tooth; median pore and postanal porose area absent; notogastral lyrifissure *im* located anterior to porose area *A1*; body length: 820–870 *G.* (*Galumna*) *wuzhishanensis* Liang, Yang et Ren, 2018
Distribution: Southern China.

17. Notogastral porose area *Aa* boomerang-like; body length: 647–680 *G.* (*Galumna*) *makilingensis* Ermilov, Corpuz-Raros et Tolstikov, 2014
Distribution: Philippines.

– Notogastral porose area *Aa* not boomerang-like 18

18. Notogastral porose area *Aa* boot-shaped or elongate triangular, transversely oriented 19

– Notogastral porose area *Aa* rounded/oval 20

19. Notogastral porose area *Aa* boot-shaped; head of bothridial seta lanceolate; body length: 825 *G.* (*Galumna*) *dispar* Willmann, 1932
Distribution: Java.

– Notogastral porose area *Aa* elongate triangular; head of bothridial seta clavate or fusiform; body length: 664–713 *G.* (*Galumna*) *tsengi* Ermilov et Liao, 2017
(see also Ermilov 2019). Distribution: Taiwan.

20. Head of bothridial seta clavate; prodorsum longitudinally striate, pteromorph reticulate; notogastral lyrifissure *im* located anterior to porose area *A1*; body length: 531–564 *G.* (*Galumna*) *perakensis* Ermilov et Kalúz, 2019
Distribution: Malaysia.

– Head of bothridial seta fusiform; prodorsum not striate, pteromorph not reticulate; notogastral lyrifissure *im* located anterolateral or lateral to porose area *A1*; body length: 381–625 *G.* (*Galumna*) *alata* (Hermann, 1804) (see also Grandjean 1936, Pérez-Íñigo 1993, Ermilov 2019). Distribution: Semicosmopolitan.

21. Two pairs of notogastral porose areas *Aa* developed; body length: 531–564 *G.* (*Galumna*) *paratetraporosa* Ermilov, Khaustov et Joharchi, 2020 Distribution: Sri Lanka.

– One pair of notogastral porose areas *Aa* developed 22

22. Lamellar line short, its distal part not developed 23

– Lamellar line long, its distal part developed 25

23. Bothridial seta setiform; rostral, lamellar and interlamellar setae short; body length: 298–332 *G.* (*Galumna*) *paramastigophora* Ermilov, 2015 Distribution: Vietnam.

– Bothridial seta with developed head; rostral, lamellar and interlamellar setae medium-sized or long 24

24. Head of bothridial seta long, slightly dilated unilaterally; dorsosejugal suture interrupted medially; median pore absent; body length: 284–288 *G.* (*Galumna*) *calcicola* (Aoki et Hu, 1993) Distribution: Southern China.

– Head of bothridial seta short, lanceolate; dorsosejugal suture present; median pore present body length: 398–450 *G.* (*Galumna*) *paracalcicola* Ermilov et Anichkin, 2014 (see Ermilov & Anichkin 2014*c*; data from this paper). Distribution: Oriental.

25. Lamellar line directed to insertion of rostral seta 26

– Lamellar line directed backward (to acetabula I) or to lateral part of prodorsum 27

26. Bothridial seta setiform; interlamellar seta medium-sized; dorsosejugal suture present; body length: 498–531 *G.* (*Galumna*) *indonesica* Ermilov, Sandmann, Klarner, Widyastuti et Scheu, 2015 Distribution: Indonesia.

– Bothridial seta with developed head; interlamellar seta represented by microseta; dorsosejugal suture interrupted medially; body length: 338–413 *G.* (*Galumna*) *aba* Mahunka, 1989 (see also Ermilov 2015). Distribution: Vietnam.

27. Notogaster and anogenital region foveolate; anal plate, subcapitular mentum and posterior part of notogaster striate; body length: 258–287 *G.* (*Galumna*) *mikoi* Ermilov, Sandmann, Klarner, Widyastuti et Scheu, 2015
Distribution: Indonesia.

– Notogaster and anogenital region not foveolate; anal plate, subcapitular mentum and posterior part of notogaster not striate 28

28. Dorsosejugal suture interrupted medially or completely absent 29

– Dorsosejugal suture complete 43

29. Interlamellar seta minute or represented by alveolus 30

– Interlamellar seta medium-sized or long 35

30. Bothridial seta setiform; median pore absent; body length: 1120–1140 *G.* (*Galumna*) *microfissum* Hammer, 1968
Distribution: New Zealand, Vietnam.

– Bothridial seta with developed head; median pore present 31

31. Notogastral porose area *Aa* rounded/oval 32

– Notogastral porose area *Aa* elongate triangular, transversely oriented 33

32. Interlamellar seta short; rostral and lamellar setae medium-sized; body length: 680–730 *G.* (*Galumna*) *chujoi* Aoki, 1966
Distribution: Holarctic, India.

– Interlamellar seta represented by alveolus; rostral and lamellar setae short or represented by alveoli; body length: 330 *G.* (*Galumna*) *exigua* Sellnick, 1925
Distribution: Oriental.

33. Head of bothridial seta clavate; body length: 591–616 *G.* (*Galumna*) *coronata* Mahunka, 1992
(see Mahunka 1992*a*). Distribution: Senegal, Vietnam.

– Head of bothridial seta lanceolate 34

34. Notogastral porose area *A3* elongate oval; distance between notogastral porose areas *A1–A2* smaller than *A2–A3*; body length: 480–600 *G.* (*Galumna*) *calva* Starý, 1996
Distribution: Australia, Indonesia.

– Notogastral porose area *A3* oval; distance between notogastral porose areas *A1–A2* larger than *A2–A3*; body length: 400–425 *G.* (*Galumna*) *longisensilla* Liang, Yang et Ren, 2018
Distribution: Southern China.

35. Bothridial seta setiform 36

– Bothridial seta with developed head 37

36. Notogastral porose area *Aa* elongate triangular, transversely oriented; body length: 647–664
G. (*Galumna*) *parakazakhstani* Ermilov et Anichkin, 2014
(see Ermilov & Anichkin 2014*a*). Distribution: Vietnam.

– Notogastral porose area *Aa* triangularly-oval; body length: 498–531
G. (*Galumna*) *pseudokhoii* Ermilov et Anichkin, 2011
Distribution: Oriental.

37. Notogastral porose area *Aa* elongate triangular, transversely oriented 38

– Notogastral porose areas *Aa* rounded/oval or triangularly-oval 41

38. Lamellar seta shorter than rostral seta; body length: 531–581
G. (*Galumna*) *dkrivolutskyi* Ermilov et Starý, 2017
Distribution: Oriental.

– Lamellar seta not shorter than rostral seta 39

39. Notogastral porose area *A3* elongate oval; postanal porose area as long as width of two anal plates; body length: 647–697
G. (*Galumna*) *paraweni* Ermilov et Kalúz, 2014
Distribution: India.

– Notogastral porose area *A3* oval; postanal porose area shorter than width of two anal plates 40

40. Interlamellar seta longer than lamellar seta; body length: 530–670
G. (*Galumna*) *lanceata* (Oudemans, 1900)
(see also Shaldybina 1975, Weigmann 2006, Bayartogtokh 2010) Distribution: Palaearctic, Vietnam.

– Interlamellar seta shorter than lamellar seta; body length: 515–520
G. (*Galumna*) *weni* Aoki et Hu, 1993
Distribution: Southern China.

41. Notogastral porose area *Aa* rounded/oval; postanal porose area represented by three parts (rounded median part and two oval lateral parts); body length: 532–566 *G.* (*Galumna*) *triops* Balogh, 1960
Distribution: Afrotropical, Vietnam.

– Notogastral porose area *Aa* triangularly-oval; postanal porose area single or double 42

42. Postanal porose area represented by two elongate oval parts; body length: 469–540 *G.* (*Galumna*) *triquetra* Aoki, 1965
Distribution: Oriental, Australasian.

– Postanal porose area single. Two very similar species:
1) *G.* (*Galumna*) *khoii* Mahunka, 1989
(body length: 425–482; distribution: Oriental);
2) *G.* (*Galumna*) *virginiensis* Jacot, 1929
(see also Jacot 1934) (body length: 570; distribution: USA, Southern China).

43. Interlamellar seta minute or represented by alveolus 44

– Interlamellar seta medium-sized or long 53

44. Notogastral porose area *Aa* boot-shaped or elongate triangular, transversely oriented 45

– Notogastral porose area *Aa* rounded/oval 46

45. Pteromorph striate; postanal porose area oval; body length: 413–454 *G.* (*Galumna*) *sabahna* Mahunka, 1995
(see Mahunka 1995*b*). Distribution: Oriental.

– Pteromorph not striate; postanal porose area elongate oval; body length: 705–898 *G.* (*Galumna*) *obvia* (Berlese, 1914)
(see also Shaldybina 1975, Weigmann 2006, Bayartogtokh 2010, Ermilov *et al.* 2013).
Distribution: Semicosmopolitan.

46. Head of bothridial seta with dilated unilaterally head 47

– Head of bothridial seta clavate or fusiform 49

47. Head of bothridial seta broadly dilated, densely ciliate; body length: 270–348 *G.* (*Galumna*) *flabellifera* Hammer, 1958
(see also Aoki 1964, 1965 (as *G. flabellifera orientalis* Aoki, 1965), 1982, Engelbrecht 1972 (as *G. nuda* Engelbrecht, 1972), Mahunka 1978, Bayartogtokh & Shimano 2019).
Distribution: Tropical, subtropical.

– Head of bothridial seta narrowly dilated, sparsely ciliate 48

48. Lamellar seta medium-sized, interlamellar seta short; postanal porose area oval; body length: 348–365 *G.* (*Galumna*) *divergens* Mahunka, 1995
(see Mahunka 1995*b*). Distribution: Borneo, Iran.

– Lamellar and interlamellar setae represented by alveoli; postanal porose area elongate oval; body length: 336 *G.* (*Galumna*) *comparabilis* Engelbrecht, 1972
Distribution: Afrotropical, India.

49. Bothridial seta nearly bacilliform, with slightly developed head; median pore absent; body length: 376
G. (*Galumna*) *parviporosa* Balogh et P. Balogh, 1983
Distribution: Australia, India.

– Head of bothridial seta well developed 50

50. Pteromorph striate 51

– Pteromorph not striate 52

51. Prodorsum heavily granulate; head of bothridial seta lanceolate; notogastral lyrifissure *im* located lateral to notogastral porose area *A1*; body length: 629–684 *G.* (*Galumna*) *innexa* Pérez-Íñigo et Baggio, 1986
Distribution: Neotropical, India.

– Prodorsum not heavily granulate; head of bothridial seta clavate; notogastral lyrifissure *im* located anterior to notogastral porose area *A1*; body length: 600 *G.* (*Galumna*) *similis* Pérez-Íñigo et Baggio, 1980
Distribution: Neotropical, USA (Texas), India.

52. Head of bothridial seta barbed; pteromorph with grain-shaped tubercles; body length: 310–464 *G.* (*Galumna*) *granalata* Aoki, 1984
(see also Ermilov, Corpuz-Raros *et al.* 2014). Distribution: Japan, Oriental.

– Head of bothridial seta smooth; pteromorph without tubercles; body length: 295–365 *G.* (*Galumna*) *levisensilla* Ermilov et Anichkin, 2010
(see also Ermilov 2015). Distribution: Oriental.

53. Notogastral porose area *Aa* boomerang-like; body length: 666
G. (*Galumna*) *cuneata* Aoki, 1961
Distribution: Eastern Palearctic, India.

– Notogastral porose area *Aa* not boomerang-like 54

54. Notogastral porose area *Aa* rounded/oval 55

– Notogastral porose area *Aa* elongate triangular, transversely oriented 56

55. Head of bothridial seta lanceolate; three pairs of notogastral porose areas (*A2* absent), *A3* band-like; body length: 714
G. (*Galumna*) *longiporosa* Fujikawa, 1972
Distribution: Japan, India.

– Head of bothridial seta clavate; four pairs of notogastral porose areas (*A2* present), *A3* rounded/oval; body length: 256–448
G. (*Galumna*) *discifera* Balogh, 1960
(see also Engelbrecht 1969, Ermilov & Starý 2017). Distribution: Afrotropical, Oriental, Iran.

56. Lamellar seta shorter than rostral seta; body length: 415–464
G. (*Galumna*) *pseudotriquetra* Ermilov, 2015
Distribution: Vietnam.

– Lamellar seta not shorter than rostral seta 57

57. Notogastral porose areas *A2* and *A3* band-like; bothridial seta nearly bacilliform, with slightly developed head; body length: 680–713
G. (*Galumna*) *paravaria* Ermilov et Martens, 2021
Distribution: Nepal.

– Notogastral porose areas *A2* and *A3* rounded/oval; bothridial seta with well developed head
Two very similar species: 1) *G.* (*Galumna*) *media* (Berlese, 1914) (see also Mahunka 1992*b*) (body length: 430; distribution: Java);

2) *G.* (*Galumna*) *varia* Mahunka, 1995 (see Mahunka 1995*a*) (body length: 548–592; distribution: Thailand).

*

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