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New species and records of *Galumna* (Acari, Oribatida, Galumnidae) from Peru

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ABSTRACT — Two new species of oribatid mites of the genus *Galumna* (Oribatida, Galumnidae) are described based on specimens from upper soil and leaf litter in a primary evergreen lowland rainforest in Amazonian Peru. *Galumna* (*Galumna*) *parazeucta* n. sp. is morphologically most similar to *Galumna* (*Galumna*) *neonominata* Subías 2004 and *G. (Galumna) pterolineata* Hammer, 1972, but differs by the presence of strongly elongated notogastral porose areas Aa and A3. *Galumna* (*Cosmogalumna*) *ekaterinae* n. sp. is morphologically most similar to *Galumna* (*G.*) *areticulata* Ermilov, Sandmann, Klarner, Widyastuti and Scheu, 2015, but differs by the presence of three pairs of notogastral porose areas and epimeral setae 3c and 4c. The subgenus *Galumna* (*Cosmogalumna*) and species *Galumna* (*Galumna*) *nuda* Engelbrecht, 1972 are recorded in the Neotropical region for the first time; two species – *Galumna* (*G.*) *angularis* Jeleva, Scull and Cruz, 1984 and *Galumna* (*G.*) *laselvae* Balogh 1997 – are recorded in Peru for the first time.

KEYWORDS — mites; *Galumna*; new species; morphology; systematics; new record; Peru

INTRODUCTION

This work is a part of our continuing study of the Peruvian fauna of oribatid mites (Ermilov and Gwiazdowicz 2015; Ermilov and Friedrich 2016) and includes data on the genus *Galumna* Heyden, 1826 (Acari, Oribatida, Galumnidae).

Among the oribatid mite material collected during the German Expedition to Amazonian Peru in 2013 were representatives of six species of *Galumna* (two are new for science) belonging to two subgenera: *Galumna* (*Galumna*) Heyden, 1826 and *G. (Cosmogalumna)* Aoki, 1988. The main goal of this paper is to describe and illustrate two new species and present data on the records and overall known distribution of the registered taxa.

Galumna is a very large genus that was proposed by Heyden (1826) with *Notaspis alatus* Hermann, 1804 as type species. The genus comprises about seven subgenera and 180 species (see different opinions: Subías 2004, online version 2015; Ermilov and Anichkin 2014a; Ermilov and Bayartogtokh 2015) having a cosmopolitan distribution collectively (Subías 2004, updated 2015). Subgeneric diagnoses for *G. (Galumna)* and *G. (Cosmogalumna)* were presented by Ermilov *et al.* (2013) and Ermilov and Corpuz-Raros (2015), respectively. Identification keys to selected species of *Galumna* (*Galumna*) were given by Shaldybina (1975), Balogh and Balogh (2002), Weigmann (2006), Bayartogtokh and Akrami (2014), Ermilov and Anichkin (2014b) and Ermilov *et al.* (2015a, b); an identification key to

all known species of *Galumna* (*Cosmogalumna*) was presented by Ermilov and Corpuz-Raros (2015).

MATERIALS AND METHODS

Material — Mites were collected from: South America, Amazonian Peru, 09°37'S, 74°56'W, Huánuco Department, Puerto Inca Province, Yuyapichis District, Área de Conservación Privada, Panguana (biological field station), nearby Rio Yuyapichis (river), 230 – 260 m a.s.l., upper soil and leaf litter in the primary evergreen lowland rainforest, Winkler extraction, 20.IX.2013 – 07.X.2013 (S. Friedrich and F. Wachtel).

Methods — Specimens were mounted in lactic acid on temporary cavity slides for measurement and illustration. Body length was measured in lateral view, from the tip of the rostrum to the posterior edge of the ventral plate. Notogastral width refers to the maximum width in dorsal aspect. Lengths of body setae were measured in lateral aspect. All body measurements are presented in micrometers. Formulas for leg setation are given in parentheses according to the sequence trochanter-femur-genu-tibia-tarsus (famulus included). Formulas for leg solenidia are given in square brackets according to the sequence genu-tibia-tarsus.

General terminology used in this paper follows that of Grandjean (summarized by Norton and Behan-Pelletier 2009). Drawings were made with a camera lucida using a Carl Zeiss transmission light microscope "Axioskop-2 Plus".

DESCRIPTIONS

Galumna (*Galumna*) *parazeucta* n. sp. (Figures 1-2)

Diagnosis — Body size: 514 – 597 × 365 – 415. Body surface striate. Rostral, lamellar and interlamellar setae long, barbed. Bothridial setae lanceolate, stalk smooth, head with minute barbs. Anterior notogastral margin developed. Four pairs of notogastral porose areas present, *Aa* elongated longitudinally, *A1* rounded, *A2* oval, *A3* elongated transversely. Median pore and postanal porose area

present. Genital and aggenital setae longer than anal and adanal setae.

Description — **Measurements** – Body of medium size: length 514 (holotype: male), 531, 597 (two paratypes: both males); notogastral width 365 (holotype), 398, 415 (two paratypes).

Integument — Body brown, covered by dense microgranular cerotegument (diameter of granules less than 1). Surface of dorsal and ventral sides, pteromorphs and subcapitular mentum striate; striae of anogenital region and median part of epimeral region short, those of other body regions long.

Prodorsum — Rostrum broadly rounded. Lamellar (*L*) and sublamellar (*S*) lines parallel, curving backwards; *L* thickened, but not costula-like, *S* thin. Rostral (*ro*, 57 – 61), lamellar (*le*, 69 – 77) and interlamellar (*in*, 82 – 90) setae setiform, barbed; *ro* and *le* directed antero-medially, *in* — upwards erect. Bothridial setae (*bs*, 106 – 118) with long, smooth stalk; head short, lanceolate, with minute barbs. Exobothridial setae and their alveoli absent. Porose areas *Ad* oval, transversely oriented (36 – 38 × 8 – 10).

Notogaster — Anterior notogastral margin developed. Dorsophragmata (*D*) of medium size, elongated longitudinally. Four pairs of porose areas (*Aa*, *A1*, *A2*, *A3*) with distinct borders: *Aa* narrowly triangular (length 82 – 94), elongated, located parallel to and near hinge; *A1* rounded (12 – 16), *A2* oval (16 – 20 × 8 – 12), *A3* elongated (73 – 86 × 8 – 16), transversely oriented. Notogastral setae represented by 10 pairs of alveoli, *la* located medial to *Aa*, *h*₃ – antero-lateral to *A1*. Median pore present, located posterior to virtual line connecting porose areas *A2*. All lyrifissures (*ia*, *im*, *ip*, *ih*, *ips*) distinct, *im* and opisthonotal gland openings (*gla*) located antero-lateral to *A2*.

Gnathosoma — Morphology of subcapitulum, palps and chelicerae typical for *Galumna* (*Galumna*) (e.g. Engelbrecht 1969; Ermilov and Anichkin 2010). Subcapitulum size: 127 – 139 × 118 – 127. Subcapitular setae setiform, indistinctly barbed, *h* (20) longer than *a* (16) and *m* (16); *a* thickest. Two pairs of adoral setae (12) setiform, barbed. Length of palps: 102

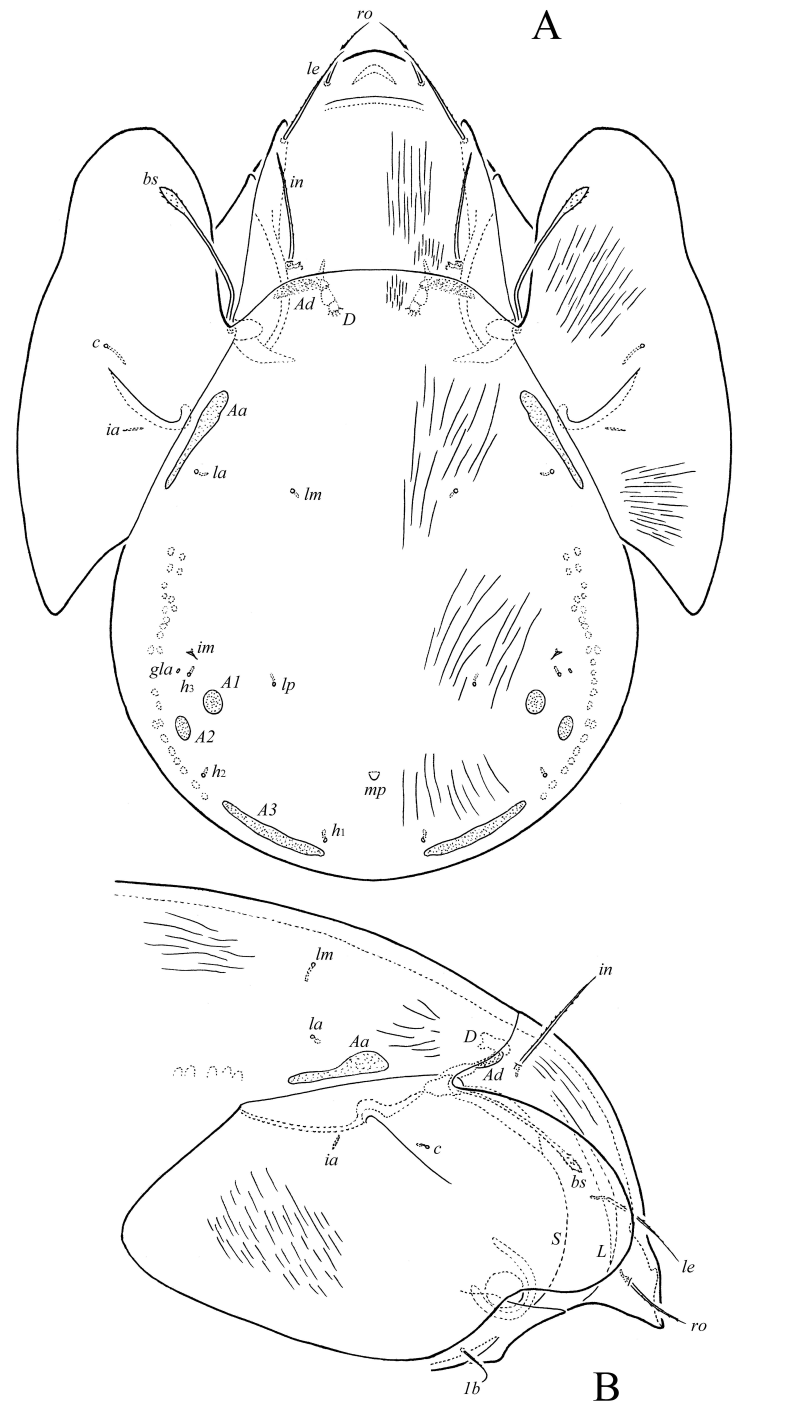


FIGURE 1: *Galumna (Galumna) parazeucta* n. sp.: A – dorsal view; B – anterior part of body, lateral view (gnathosoma and legs not illustrated). Scale bar 200 μm.

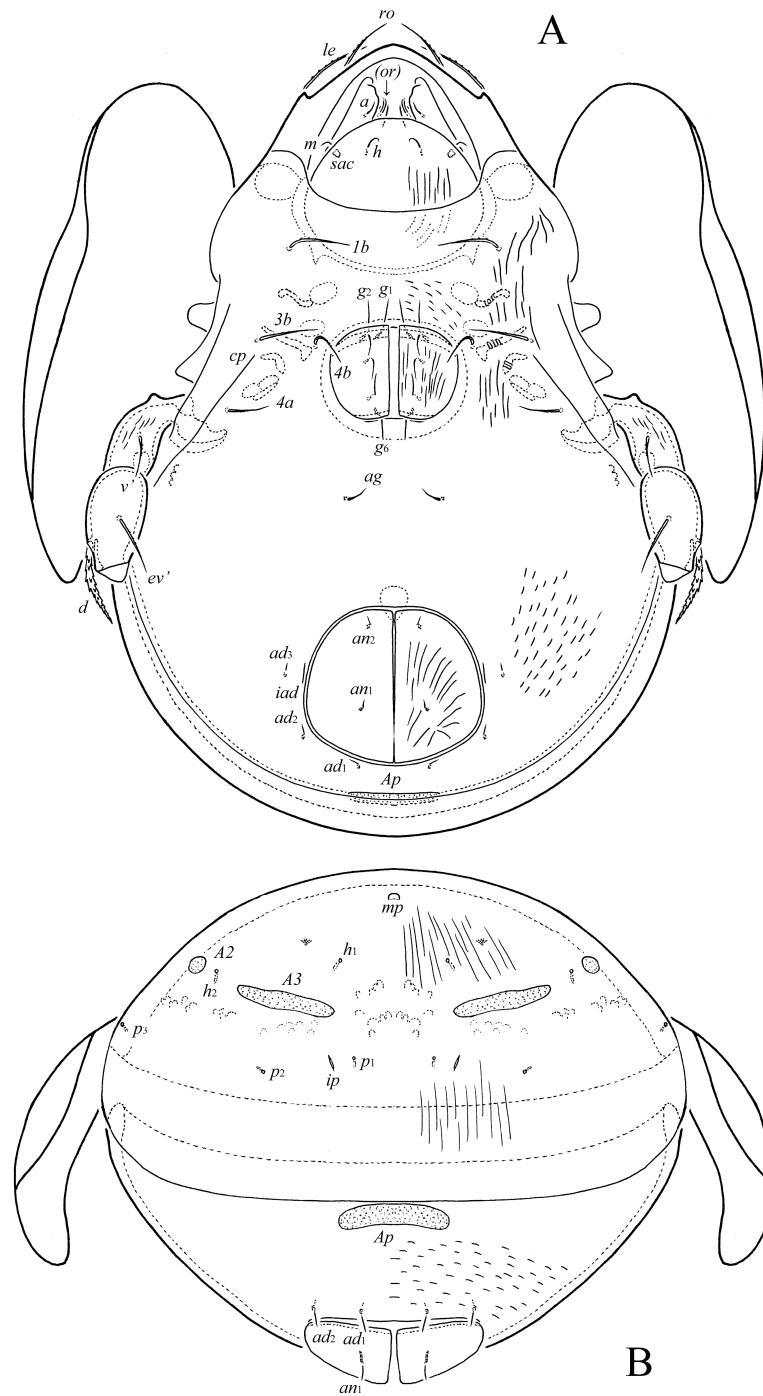


FIGURE 2: *Galumna (Galumna) parazeucta* n. sp.: A – ventral view (gnathosoma and legs except basal parts IV not illustrated); B – posterior view. Scale bar 200 µm.

TABLE 1: Leg setation and solenidia of adult *Galumna* (*Galumna*) *parazeucta* n. sp. and *Galumna* (*Cosmogalumna*) *ekaterinae* n. sp.

Leg	Tr	Fe	Ge	Ti	Ta
I	<i>v'</i>	<i>d</i> , (<i>l</i>), <i>bv''</i>	(<i>l</i>), <i>v'</i> , σ	(<i>l</i>), (<i>v</i>), φ_1 , φ_2	(<i>ft</i>), (<i>tc</i>), (<i>it</i>), (<i>p</i>), (<i>u</i>), (<i>a</i>), <i>s</i> , (<i>pv</i>), <i>v'</i> , (<i>pl</i>), <i>l''</i> , ϵ , ω_1 , ω_2
II	<i>v'</i>	<i>d</i> , (<i>l</i>), <i>bv''</i>	(<i>l</i>), <i>v'</i> , σ	(<i>l</i>), (<i>v</i>), φ	(<i>ft</i>), (<i>tc</i>), (<i>it</i>), (<i>p</i>), (<i>u</i>), (<i>a</i>), <i>s</i> , (<i>pv</i>), ω_1 , ω_2
III	<i>v'</i>	<i>d</i> , <i>ev'</i>	<i>l'</i> , σ	<i>l'</i> , (<i>v</i>), φ	(<i>ft</i>), (<i>tc</i>), (<i>it</i>), (<i>p</i>), (<i>u</i>), (<i>a</i>), <i>s</i> , (<i>pv</i>)
IV	<i>v'</i>	<i>d</i> , <i>ev'</i>	<i>d</i> , <i>l'</i>	<i>l'</i> , (<i>v</i>), φ	<i>ft''</i> , (<i>tc</i>), (<i>p</i>), (<i>u</i>), (<i>a</i>), <i>s</i> , (<i>pv</i>)

Note: Roman letters refer to normal setae, Greek letters to solenidia (except ϵ = famulus). Single prime (') marks setae on the anterior and double prime (") setae on the posterior side of a given leg segment. Parentheses refer to a pair of setae. Tr – trochanter, Fe – femur, Ge – genu, Ti – Tibia, Ta – tarsus.

– 110. Axillary sacculi (*sac*) distinct, slightly elongated. Length of chelicerae: 143 – 151. Cheliceral setae setiform, barbed, *cha* (61 – 65) longer than *chb* (32 – 36).

Epimeral and lateral podosomal regions — Anterior tectum of epimere I smooth. Epimeral setal formula: 1-0-1-2; setae thin, barbed, *1b* and *3b* (45 – 53) longer than *4a* and *4b* (32 – 36). Pedotecta II trapezoid, rounded distally in ventral view. Discidia sharply triangular. Circumpedial carinae (*cp*) directed to pedotecta I.

Anogenital region — Six pairs of genital (*g*₁–*g*₆, 20 – 24), one pair of aggenital (*ag*, 20 – 24), two pairs of anal (*an*₁, *an*₂, 10) and three pairs of adanal (*ad*₁–*ad*₃, 10) setae thin, indistinctly barbed; *g*₁–*g*₂ on anterior edge of genital plate. Adanal lyrifissures (*iad*) located close and parallel to anal plates. Setae *ad*₃ inserted lateral to *iad*. Postanal porose area elongated, transversely oriented (86 – 98 × 12 – 16).

Legs — Morphology of leg segments, setae and solenidia typical for *Galumna* (*Galumna*) (e.g. Engelbrecht 1969; Ermilov and Anichkin 2010). Median claw slightly thicker than laterals, all indistinctly serrate on dorsal side. Formulas of leg setation and solenidia: I (1-4-3-4-20) [1-2-2], II (1-4-3-4-15) [1-1-2], III (1-2-1-3-15) [1-1-0], IV (1-2-2-3-12) [0-1-0]; homology of setae and solenidia indicated in Table 1. Solenidium φ of tibiae IV inserted dorsally at about 2/3 length of segment.

Material examined — Holotype (male) and two

paratypes (both males): see "Material and methods" section.

Type deposition — The holotype is deposited in the collection of the Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima, Peru; two paratypes are deposited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia.

Etymology — The specific name *parazeucta* refers to the similarity between the new species and the species *Erogalumna zeucta* Grandjean, 1964.

Remarks — The new species is morphologically most similar to *Galumna* (*Galumna*) *neonominata* Subías 2004 (= *Galumna clavata* Pérez-Íñigo and Baggio 1991)¹ from Brazil (see Pérez-Íñigo and Baggio 1991) and *G. (Galumna) pterolineata* Hammer, 1972 from Tahiti (see Hammer 1972) in having a striate body surface. However, it differs from both by the presence of strongly elongated (vs. oval) notogastral porose areas *Aa* and *A3*.

The new species also is morphologically similar to *Erogalumna zeucta* Grandjean, 1964 from the Neotropical region (see Grandjean 1964, 1966) in the striate body surface, relatively long prodorsal setae, bothridial setae with small head, well-developed anterior notogastral margin, presence of a postanal porose area and four pairs of notogastral porose areas and the position of setal alveoli *la* medial to areas *Aa*. It differs from *E. zeucta* by the absence of modified leg setae in males (vs. present; this is a

¹Subías (2004, online version 2015) included *Galumna* (*G.*) *neonominata*, *Galumna* (*G.*) *pterolineata* and *Galumna* (*G.*) *rasilis* Pérez-Íñigo, 1987 in the subgenus *Galumna* (*Indogalumna*) Balakrishnan, 1985. However, all representatives of *Indogalumna* (see Balakrishnan 1985) have adanal lyrifissures distanced from anal plates (vs. located close to anal plates in *Galumna* (*Galumna*) and also in three listed species). Hence, we support the initial placement of these species.

generic character of *Erogalumna*) and the presence of strongly elongated postanal porose area and notogastral porose areas *Aa* and *A3* (vs. *Aa* slightly elongated, *A3* oval).

***Galumna (Cosmogalumna) ekaterinae* n. sp.**
(Figures 3-4)

Diagnosis – Body size: 266 – 315 × 221 – 265. Anterior part of notogaster with narrow, transversely oriented reticulate cells. Surface of anogenital region and medio-posterior part of notogaster with cerotegumental ridges not forming clear reticulate pattern. Transversely striate band located anterior to genital aperture. Bothridial setae fusiform, truncate distally, smooth. Three pairs of small, round porose areas developed on notogaster, *A2* absent. Setal alveoli *c* located in posterior half of pteromorph. Median pore and postanal porose area present. Aggenital setae absent.

Description — Measurements – Body small: length 274 (holotype: female), 266 – 315 (11 paratypes: six females and five males); notogastral width 225 (holotype), 221 – 265 (11 paratypes). Without sexual dimorphism.

Integument — Body brown, covered by dense microgranular cerotegument (diameter of granules less than 1). Anterior part of notogaster with reticulate pattern, cells very narrow, transversely oriented. Surface of anogenital region and medio-posterior part of notogaster with cerotegumental ridges forming vaguely reticulate pattern, but complete cells rarely formed. Cerotegument on pteromorphs represented by short, separated ridges. Transverse bands of striae located anterior to genital aperture and posterior to anal aperture.

Prodorsum — Rostrum slightly protruding, broadly rounded. Lamellar and sublamellar lines thin, parallel, curving backwards. Rostral (24 – 26) and lamellar (10 – 12) setae setiform, indistinctly barbed, directed antero-medially; *ro* thicker than *le*. Interlamellar setae (2) minute, inconspicuous. Bothridial setae (53 – 57) smooth, fusiform, with long, smooth stalk and shorter, distally truncate head. Exobothridial setae and their alveoli absent. Porose areas *Ad* not found.

Notogaster — Anterior notogastral margin developed. Dorsophragmata short, slightly elongated longitudinally. Three pairs of porose areas (*Aa*, *A1*, *A3*) small (8 – 10), rounded, with distinct borders, *A2* absent. Notogastral setae represented by 10 pairs of alveoli, *c* located in posterior half of pteromorphs, *la* located postero-lateral to *Aa*, *h*₃ anterior to *A1*. Median pore present, located posterior to virtual line connecting porose areas *A1*. All lyrifissures distinct, *im* anterior to *A1*. Opisthonotal gland openings located lateral to *A1*.

Gnathosoma — Morphology of subcapitulum, palps and chelicerae typical for *Galumna (Cosmogalumna)* (see Ermilov *et al.* 2011; Ermilov and Anichkin 2013). Subcapitulum size: 69 – 77 × 57 – 69. Subcapitular setae thin, smooth, *a* (8) longer and slightly thicker than *m* (6) and *h* (6). Two pairs of adoral setae (4) minute. Length of palps: 45 – 49. Axillary sacculi small, slightly elongated. Length of chelicerae: 73 – 86. Cheliceral setae setiform, barbed, *cha* (28) longer than *chb* (16).

Epimeral and lateral podosomal regions — Anterior tectum of epimere I smooth. Setal formula: 2-0-2-3; setae short, smooth, *3c* and *4c* (8) longer than *3b* (6) and *1a*, *1c*, *4a* and *4b* (2 – 4). Pedotecta II trapezoid, rounded distally in ventral view. Discidia sharply triangular. Circumpedal carinae directed to pedotecta I.

Anogenital region — Six pairs of genital (*g*₁-*g*₂, 6; *g*₄-*g*₆, 4), two pairs of anal (4) and three pairs of adanal (4) setae thin, smooth; *g*₁-*g*₂ on anterior edge of genital plate. Aggenital setae and their alveoli absent. Adanal lyrifissures located close and parallel to anal plates. Setae *ad*₃ inserted lateral to *iad*. Postanal porose area elongated, transversely oriented (16 × 4 – 6).

Legs — Morphology of subcapitulum, palps and chelicerae typical for *Galumna (Cosmogalumna)* (see Ermilov *et al.* 2011; Ermilov and Anichkin 2013). Median claw thicker than laterals, all smooth. Formulas of leg setation and solenidia: I (1-4-3-4-20) [1-2-2], II (1-4-3-4-15) [1-1-2], III (1-2-1-3-15) [1-1-0], IV (1-2-2-3-12) [0-1-0]; homology of setae and solenidia indicated in Table 1. Solenidion φ of tibiae IV inserted dorsally at about 2/3 length of segment.

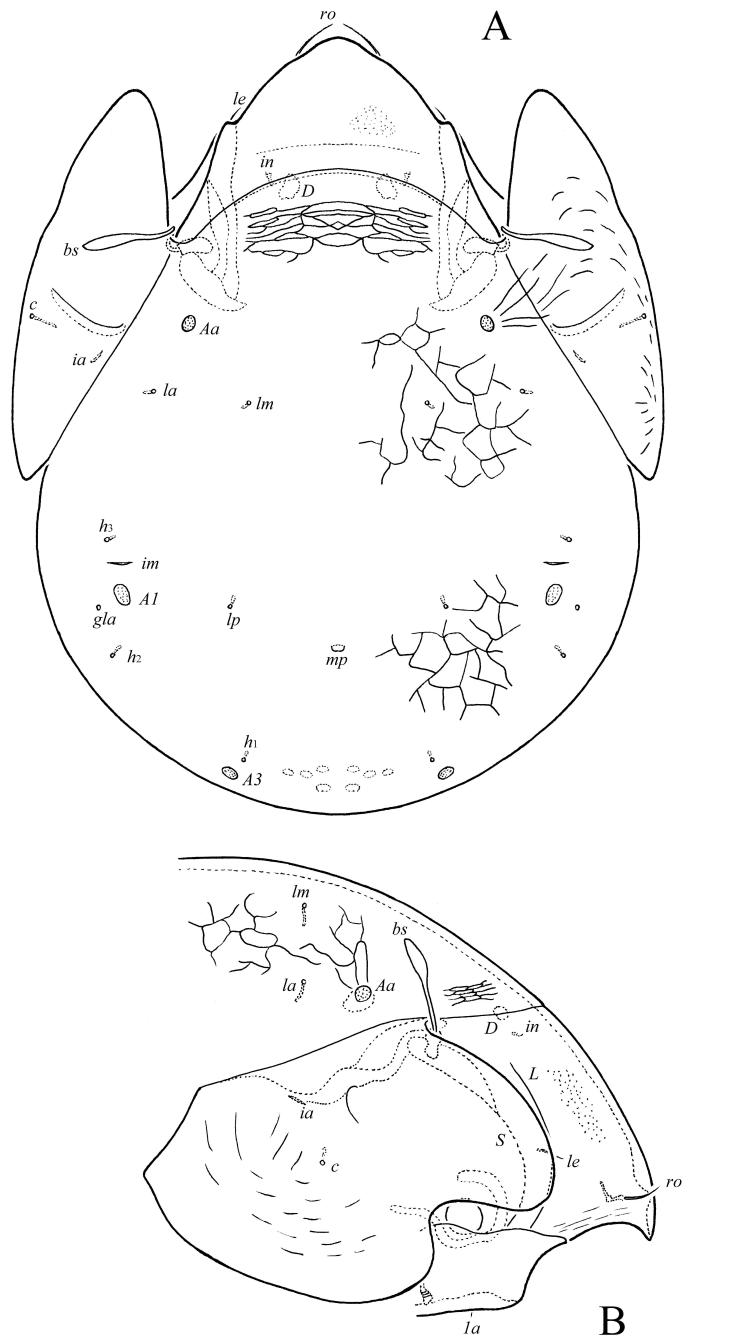


FIGURE 3: *Galumna* (*Cosmogalumna*) *ekaterinae* n. sp.: A – dorsal view; B – anterior part of body, lateral view (gnathosoma and legs not illustrated). Scale bar 100 μ m.

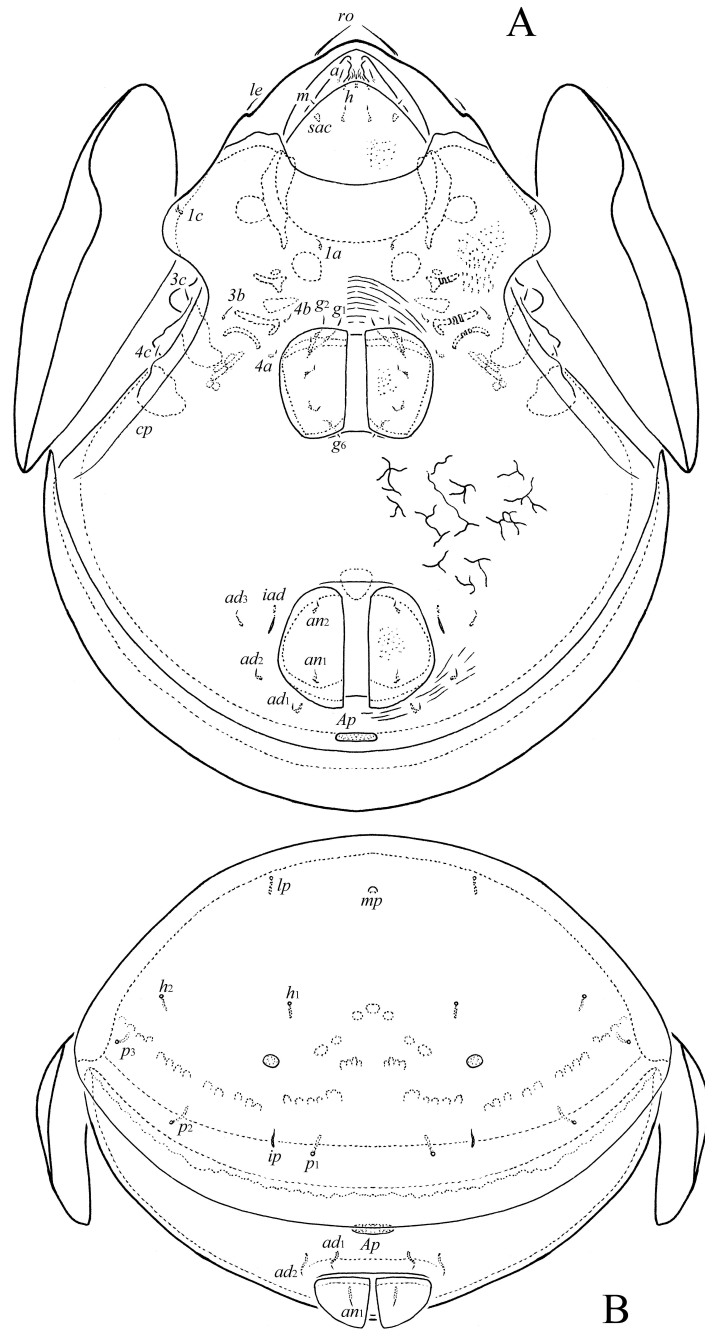


FIGURE 4: *Galumna (Cosmogalumna) ekaterinae* n. sp.: A – ventral view (gnathosoma and legs not illustrated); B – posterior view. Scale bar 100 μ m.

Material examined — Holotype (female) and 11 paratypes (six females and five males): see "Material and methods" section.

Type deposition — The holotype is deposited in the collection of the Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima, Peru; three paratypes are deposited in the collection of the Bavarian State Collection of Zoology, Munich, Germany; three paratypes are deposited in the collection of the Senckenberg Institution Frankfurt, Germany; five paratypes are deposited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia.

Etymology — The specific name is dedicated to our friend and colleague, acarologist, Dr. Ekaterina A. Sidorchuk (Paleontological Institute, Russian Academy of Sciences, Moscow, Russia).

Remarks — The new species differs from all other representatives of *Galumna* (*Cosmogalumna*) by the truncate (vs. rounded) head of the bothridial setae, setal alveoli *c* located in posterior half of pteromorphs (vs. in anterior half) and the absence (vs. presence) of aggenital setae.

The new species is morphologically most similar to *Galumna* (*Cosmogalumna*) *areticulata* Ermilov, Sandmann, Klarner, Widyastuti and Scheu, 2015 from Indonesia (see Ermilov *et al.* 2015) in the absence of distinct reticulate ornamentation on the notogaster and anogenital region, however, it differs from the latter (in addition to characters listed above) by the presence of three pairs (vs. four) of notogastral porose areas and the presence (vs. absence) of epimeral setae 3*c* and 4*c*.

RECORDS²

Galumna (*Galumna*) *angularis* Jeleva, Scull and Cruz, 1984 (see Jeleva *et al.* 1984; Mahunka 1985; Pérez-Íñigo and Baggio 1994), 1 specimen. Distribution: Neotropical region. New record for Peru.

Galumna (*Galumna*) *flabellifera* Hammer, 1958 (see Hammer 1958; Aoki 1964, 1982; Mahunka 1978), 1 specimen. Distribution: Tropical region.

Galumna (*Galumna*) *laselvae* Balogh 1997 (see Balogh 1997), 18 specimens. Distribution: Neotropical region. New record for Peru.

Galumna (*Galumna*) *nuda* Engelbrecht, 1972 (see Engelbrecht 1972), 8 specimens. Distribution: Ethiopian region. New record for the Neotropical region.

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