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# New species of oribatid mites of the genera *Allogalumna*, *Galumna* and *Heterogalumna* from India

**(Acari, Oribatida, Galumnidae)**

**Sergey G. Ermilov & Stanislav Kalúz**

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Three new species of oribatid mites species of the family Galumnidae, *Allogalumna asetosa* spec. nov., *Galumna paraweni* spec. nov. and *Heterogalumna minima* spec. nov., are described from Indian soils. The genus *Heterogalumna* is recorded for the first time from the Oriental region. *Allogalumna asetosa* is very similar morphologically to *Allogalumna costata* Mahunka, 1996 from Madagascar, however it differs from the latter by the absence of lamellar setae and morphology of genital plates, and the presence of median pore. *Galumna paraweni* is very similar morphologically to *Galumna weni* Aoki & Hu, 1993 from Southern China, however it differs from the latter by the body size and morphology of notogastral and postanal porose areas. *Heterogalumna minima* differs from all species of the genus *Heterogalumna* by the morphology of notogastral porose areas *Aa* and number of postanal porose areas. An identification key to known species of *Heterogalumna* is presented.

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## Introduction

In the course of taxonomic identification of oribatid mites, which were collected by L. Dembický and O. Šauša in 2012 from India, we found three new representatives of the family Galumnidae, belonging to the genera *Allogalumna* Grandjean, 1936, *Galumna* Heyden, 1826 and *Heterogalumna* Balogh, 1960. The main purpose of this paper is to describe and illustrate these new galumnid species.

At present, Galumnidae is insufficiently known in the Indian oribatid mite fauna. Only about 30 identified species of this very large family (more than 450 species) have been found (in particular: Pearce 1906; Ewing 1910; Deb & Raychaudhuri 1975; Trave 1981; Raju et al. 1981; Balakrishnan & Haq 1982; Balakrishnan 1985, 1986, 1989; Sanyal & Bhaduri 1986; Sanyal 1990, 2000, 2009, 2010; Ramani & Haq 1990; Sarkar et al. 2007).

*Allogalumna* is a large genus that was proposed by Grandjean (1936) with *Galumna alamellae* Jacot, 1935 as type species. Currently, this genus comprises more than 30 species, which have a cosmopolitan distribution. The identification keys to many species of the genus have been presented by Balogh & Balogh (2002) and Ermilov & Anichkin (2014). The main generic characters of *Allogalumna* are summarized by Grandjean (1936), Balogh & Balogh (1992) and Ermilov et al. (2013).

*Galumna* is a very large genus that was proposed by Heyden (1826) with *Notaspis alatus* Hermann, 1804 as type species. Currently, this genus comprises more than 170 species, which have a cosmopolitan distribution. An identification key to many species of the genus has been presented by Balogh & Balogh (2002). The main generic characters of *Galumna* are summarized by Engelbrecht (1969), Balogh & Balogh (1992) and Ermilov et al. (2013).

*Heterogalumna* is a small genus that was proposed by Balogh (1960) with *Heterogalumna lineolata* Balogh, 1960 as type species. Currently, this genus comprises three species, which are distributed in the Ethiopian region. Hence, the genus *Heterogalumna* is recorded for the first time in the Oriental region. An identification key to all known species is provided by us below. The main generic characters of *Heterogalumna* are summarized by Balogh (1960), Balogh & Balogh (1992).

## Materials and methods

**Material examined.** *Allogalumna asetosa* spec. nov. (holotype: male; paratype: male), *Galumna paraweni* spec. nov. (holotype: female; paratypes: three males and two females) and *Heterogalumna minima* spec. nov. (holotype: female; paratype: female) were examined: India, 28°19'32"N 95°57'31"E, Arunachal Pradesh, Hunli, 1300 m a.s.l., soil, collected by L. Dembický and O. Šauša during 26.05.–01.06.2012.

Specimens were studied in lactic acid, mounted in temporary cavity slides for the duration of the study, then stored in 70 % alcohol in vials. Body length was measured in lateral view, from the tip of rostrum to the posterior edge of ventral plate. Notogastral width refers to the maximum width in dorsal aspect. General terminology used in this paper follows that summarized by Norton & Behan-Pelletier (2009).

## Descriptions

### *Allogalumna asetosa* spec. nov.

Figs 1–6

**Diagnosis.** Body size: 564–581 × 415 µm. Rostral setae developed, lamellar and interlamellar setae represented by alveoli. Sensilli setiform. Anterior notogastral margin not developed medially. Four pairs of notogastral porose areas rounded. Anal plates striate. Adanal setae $ad_3$ inserted laterally to lyrifissures *iad*. Postanal porose area absent.

### Description

Measurements. Body length: 581 µm (holotype), 564 µm (paratype); notogaster width: 415 µm (holotype and paratype).

Integument. Body colour brown. Body surface smooth. Pteromorphs with indistinct wrinkles. Anal plates with several long, longitudinal striae.

Prodorsum. Rostrum narrowly rounded. Rostral setae (*ro*, 24–28 µm) setiform, thin, indistinctly barbed. Lamellar (*le*) and interlamellar (*in*) setae represented by alveoli. Sensilli (*ss*) long (188–192 µm), setiform, slightly barbed. Exobothridial setae not evident. Sublamellar lines (*S*) well developed. Porose areas *Ad* present, rounded (8–12 µm).

Notogaster. Anterior notogastral margin not developed medially. Notogastral setae represented by 11 pairs of alveoli (a pair of additional alveoli *lx* present). Four pairs of rounded porose areas developed: *Aa* (diameter: 16–20 µm) larger than *A2*, *A3* (diameter: 12 µm) and *A1* (diameter: 8 µm). Alveoli of setae *la* inserted posteriorly to *Aa*. Median pore (*mp*) small, located little posteriorly to horizontal level of arrangement of *A2*. Lyrifissures *im* located anteriorly to *A1*. Others lyrifissures located typical for Galumnidae. Opisthonotal gland openings distinct, located latero-posteriorly to *A1*.

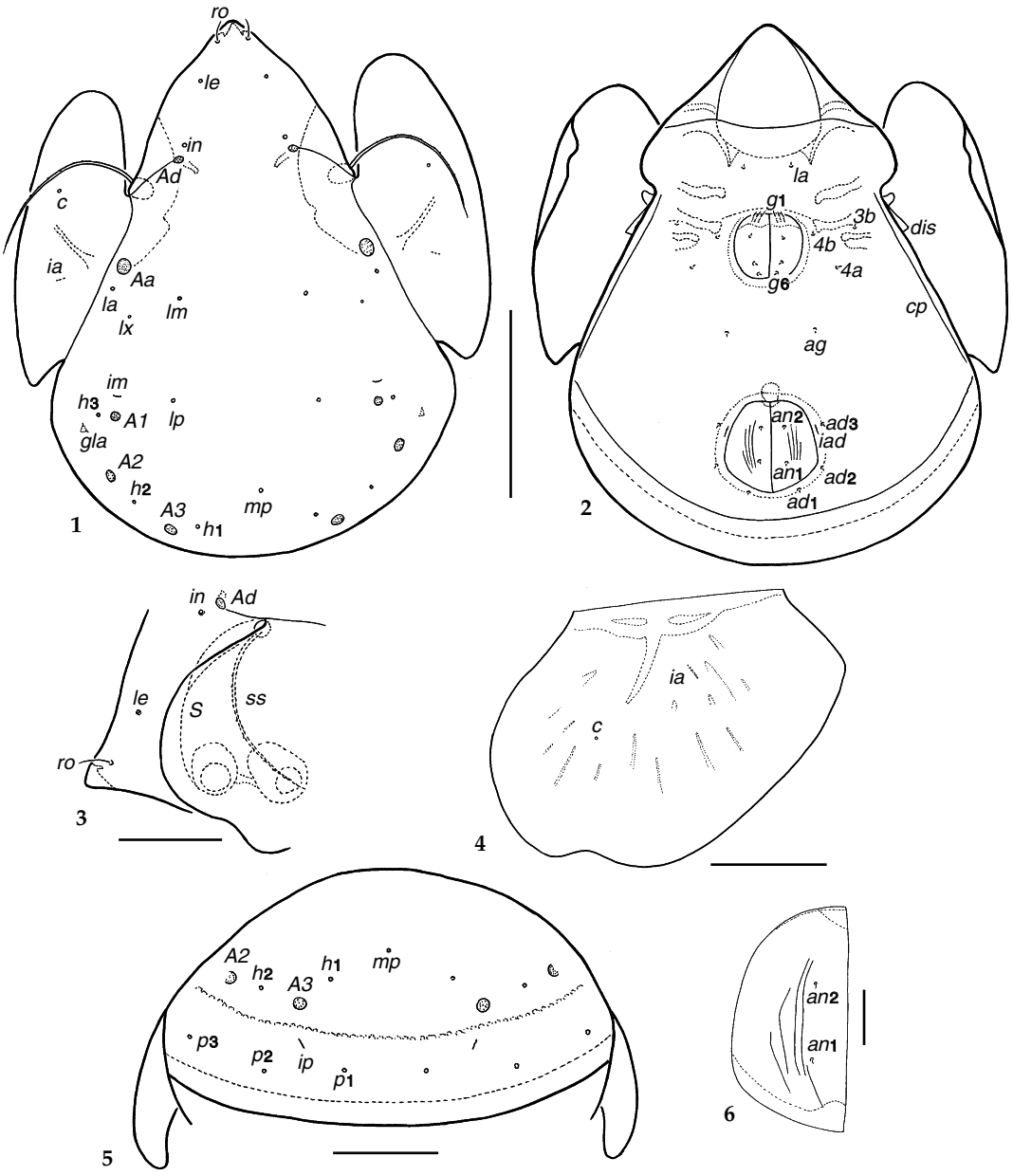
Gnathosoma. Morphology of subcapitulum, palps and chelicerae typical for Galumnidae (for example: Engelbrecht 1972; Ermilov & Anichkin 2011a, 2011b).

Epimeral and lateral podosomal regions. Four pairs of short (6 µm), thin epimeral setae observed on ventral plate; setal formula: 1–0–1–2. Discidia (*dis*) triangular. Circumpedal carinae (*cp*) distinct. Anogenital region. Six pairs of genital ($g_1$–$g_3$, 8 µm; $g_4$–$g_6$, 4 µm), one pair of aggenital (6 µm), two pairs of anal (6 µm) and three pairs of adanal (6 µm) setae short, thin, smooth. Anterior part of genital plates with three setae. Adanal setae $ad_3$ inserted laterally to lyrifissures *iad*. Postanal porose area absent.

Legs. Three claws of each leg smooth. Homology of setae and solenidia indicated in Table 1. Morphology of leg segments, setae and solenidia typical for

**Table 1.** Leg setation and solenidia of *Allogalumna asetosa* spec. nov. (same data for *Galumna paraweni* spec. nov. and *Heterogalumna minima* spec. nov.). Roman letters refer to normal setae (*e*–famulus), Greek letters refer to solenidia. One apostrophe (') marks setae on anterior and double apostrophe (") setae on posterior side of the given leg segment. Parentheses refer to a pair of setae.

| Leg | Trochanter | Femur | Genu | Tibia | Tarsus |
|---|---|---|---|---|---|
| I | *v'* | *d*, (*l*), *bv"* | (*l*), *v'*, σ | (*l*), (*v*), $\phi_1$, $\phi_2$ | (*ft*), (*tc*), (*it*), (*p*), (*u*), (*a*), *s*, (*pv*), *v'*, (*pl*), *l"*, *e*, $\omega_1$, $\omega_2$ |
| II | *v'* | *d*, (*l*), *bv"* | (*l*), *v'*, σ | (*l*), (*v*), φ | (*ft*), (*tc*), (*it*), (*p*), (*u*), (*a*), *s*, (*pv*), $\omega_1$, $\omega_2$ |
| III | *v'* | *d*, *ev'* | *l'*, σ | *l'*, (*v*), φ | (*ft*), (*tc*), (*it*), (*p*), (*u*), (*a*), *s*, (*pv*) |
| IV | *v'* | *d*, *ev'* | *d*, *l'* | *l'*, (*v*), φ | *ft"*, (*tc*), (*p*), (*u*), (*a*), *s*, (*pv*) |




**Figs 1–6.** *Allogalumna asetosa* spec. nov. **1.** Body dorsally. **2.** Body ventrally (gnathosoma and legs not illustrated). **3.** Prodorsum laterally (legs I, II not illustrated). **4.** Pteromorpha. **5.** Notogaster posteriorly. **6.** Anal plate, right. Scale bars: 1, 2 = 200 µm, 3–5 = 100 µm, 6 = 20 µm.

Galumnidae (for example: Engelbrecht 1972; Ermilov & Anichkin 2011a, 2011b).

**Type deposition.** The holotype (alcohol) is deposited in the collection of the Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia; paratype (alcohol) is in the personal collection of the first author.

**Etymology.** The specific name *"asetosa"* refers to the absence of lamellar and interlamellar setae.

**Remarks.** In having the combination of main morphological characters (anal plates striate; sensilli setiform; interlamellar setae represented by alveoli; anterior notogastral margin not developed; notogaster with four pairs of rounded porose areas; postanal porose areas absent), *Allogalumna asetosa* spec. nov. is similar to *Allogalumna costata* Mahunka, 1996 from Madagascar (see Mahunka 1996), however it clearly differs from the latter by the absence of striae on genital plates (versus present in *A. costata*), the absence of lamellar setae (versus present in *A. costata*) and the presence of median pore (versus absent in females and males in *A. costata*).

### *Galumna paraweni* spec. nov.
Figs 7–16

**Diagnosis.** Body size: 647–697 × 498–564 µm. Rostrum rounded. Prodorsal setae of medium size. Sensilli with long stalk and weakly developed, lanceolate head. Anterior notogastral margin not developed medially. Four pairs of notogastral porose areas developed, *Aa* wedge-shaped or boot-shaped, others rounded, elongate oval or strongly elongated. Median pore present. Adanal setae $ad_3$ inserted latero-posteriorly to lyrifissures *iad*. Postanal porose area strongly elongated.

**Description**

Measurements. Body length: 680 (holotype), 647–697 (mean 670; five paratypes); notogaster width: 531 (holotype), 498–564 (mean 518; five paratypes).

Integument. Body colour brown. Body surface smooth. Pteromorphs with poorly developed wrinkles.

Prodorsum. Rostrum widely rounded. Rostral (49–57 µm), lamellar (49–57 µm) and interlamellar (57–65 µm) setae setiform, slightly barbed. Sensilli (127–139 µm) with long stalk and weakly developed, barbed and distally pointed head. Exobothridial setae not evident. Lamellar (*L*) and sublamellar lines distinct, parallel. Porose areas *Ad* present, elongate oval (16–24 × 4–8 µm).

Notogaster. Distinct anterior notogastral margin not developed medially. Notogastral setae represented by 10 pairs of alveoli. Four pairs of porose areas developed: *Aa* wedge-shaped or boot-shaped (length: 57–90 µm); *A1* rounded (diameter: 16–28 µm) or elongate oval (24–49 × 10–20 µm); *A2* elongate oval (32–53 × 10–20 µm); *A3* strongly elongated (61–73 × 12–20 µm). Sometimes A1 and A2 fused into one porose area (90–98 × 12–20 µm). Alveoli of setae *la* inserted posteriorly to *Aa*. Median pore (*mp*) located little posteriorly to horizontal level of arrangement of *A2*. Lyrifissures *im* located nearly and anteriorly to *A1*. Others lyrifissures located typical for Galumnidae. Opisthonotal gland openings distinct, located latero-anteriorly to *A1*.

Gnathosoma. Morphology of subcapitulum, palps and chelicerae typical for Galumnidae (for example: Engelbrecht 1972; Ermilov & Anichkin 2011a, 2011b).

Epimeral and lateral podosomal regions. Four pairs (12 µm) thin epimeral setae observed on ventral plate; setal formula: 1–0–1–2. Discidia triangular. Circumpedal carinae distinct.

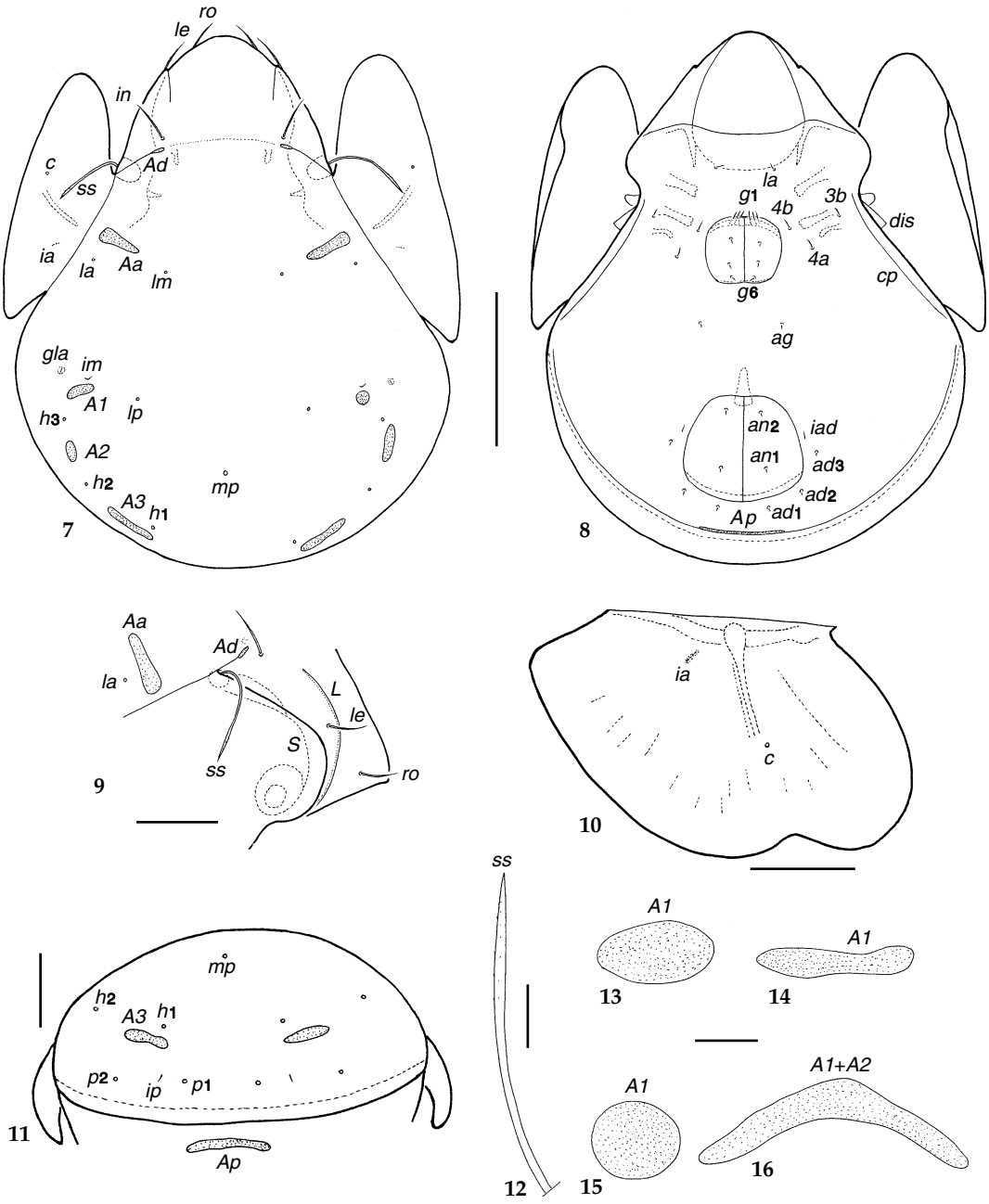
Anogenital region. Six pairs of genital ($g_1$–$g_3$, 8–10 µm; $g_4$–$g_6$, 4–6 µm), one pair of aggenital (4–6 µm), two pairs of anal (4–6 µm) and three pairs of adanal (4–6 µm) setae short, thin, smooth. Anterior part of genital plates with three setae. Adanal setae $ad_3$ inserted latero-posteriorly to lyrifissures *iad*. Postanal porose area present, strongly elongated (94–114 × 12–20 µm).

Legs. Three claws of each leg smooth. Homology of setae and solenidia indicated in Table 1. Morphology of leg segments, setae and solenidia typical for Galumnidae (for example: Engelbrecht 1972; Ermilov & Anichkin 2011a, 2011b).

**Type deposition.** The holotype (alcohol) is deposited in the collection of the Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia; three paratypes are in the collection of the Siberian Zoological Museum, Novosibirsk, Russia; two paratypes (alcohol) are in the personal collection of the first author.

**Etymology.** The prefix *para* is Latin meaning "near" and refers the similarity between the new species and the species *Galumna weni* Aoki & Hu, 1993.

**Remarks.** In having the combination of main morphological characters (sensilli with poorly developed head; prodorsal setae of medium length; anterior notogastral margin not developed medially; notogaster with four pairs of porose areas, *Aa* wedge-shaped or boot-shaped; postanal porose areas elongated), *Galumna paraweni* spec. nov. is similar to *Galumna weni* Aoki & Hu, 1993 from Southern China (see Aoki & Hu 1993), however it clearly differs from the latter by the larger body size (647–697 × 498–564 versus 515–520 × 362–370 in *G. weni*), elongate porose areas *A2* and *A3* (versus oval in *G. weni*), and more elongate postanal porose area (versus less elongate in *G. weni*).




**Figs 7–16.** *Galumna paraweni* spec. nov. **7.** Body dorsally. **8.** Body ventrally (gnathosoma and legs not illustrated). **9.** Prodorsum dorso-laterally (legs I not illustrated). **10.** Pteromorpha. **11.** Notogaster posteriorly. **12.** Sensillus, medio-distal part. **13–15.** Forms of porose areas A1. **16.** Fused porose areas A1+A2. Scale bars: 7, 8 = 200 µm, 9–11 = 100 µm, 12–16 = 20 µm.

### *Heterogalumna minima* spec. nov.
Figs 17–22

**Diagnosis.** Body size: 215–232 × 157 µm. Prodorsal setae very short. Sensilli of medium size, clavate. Anterior notogastral margin straight. Notogastral porose areas *Aa* wedge-shaped. Median pore absent. Two postanal porose areas present.

**Description**

Measurements. Body length: 215 µm (holotype), 232 µm (paratype); notogaster width: 157 µm (holotype and paratype).

Integument. Body colour brown. Body surface smooth.

Prodorsum. Rostrum widely rounded. Rostral, lamellar and interlamellar setae represented by microsetae (2 µm). Sensilli (36–41 µm) with long stalk and clavate, indistinctly barbed and rounded distally head. Exobothridial setae not evident. Lamellar and sublamellar lines distinct, parallel. Porose areas *Ad* absent.

Notogaster. Anterior notogastral margin well developed, straight, indistinctly concave medially. Notogastral setae represented by 10 pairs of alveoli. Only pairs of wedge-shaped porose areas clearly visible – *Aa* (12–16 × 6 µm). Alveoli of setae *la* inserted posteriorly to *Aa*. Median pore absent. Lyrifissures *im* located anteriorly to *A1*. Others lyrifissures located typical for Galumnidae. Opisthonotal gland openings not evident.

Gnathosoma. Morphology of subcapitulum, palps and chelicerae typical for Galumnidae (for example: Engelbrecht 1972; Ermilov & Anichkin 2011a, 2011b).

Epimeral and lateral podosomal regions. Four pairs of microsetae (2 µm) observed on ventral plate; setal formula: 1–0–1–2. Discidia triangular. Circumpedal carinae distinct, long.

Anogenital region. Six pairs of genital, one pair of aggenital, two pairs of anal and three pairs of adanal setae represented by microsetae (2 µm). Anterior part of genital plates with three setae. Adanal setae $ad_3$ inserted laterally to anal aperture. Lyrifissures *iad* not founded. Postanal porose area represented two oval, separate areas (10–12 × 4 µm).

Legs. One claw of leg tarsi I–III and three claws of leg tarsi IV small, smooth. Homology of setae and solenidia indicated in Table 1. Morphology of leg segments, setae and solenidia typical for Galumnidae (for example: Engelbrecht 1972; Ermilov & Anichkin 2011a, 2011b).

**Type deposition.** The holotype (alcohol) is deposited in the collection of the Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia; paratype (alcohol) is in the personal collection of the first author.

**Etymology.** The specific name *"minima"* refers to the small body size of the species.

**Remarks.** *Heterogalumna minima* spec. nov. differs clearly from all species of the genus *Heterogalumna* by the wedge-shaped notogastral porose areas *Aa* (versus rounded or oval) and two postanal porose areas (versus one).

### Key to known species of *Heterogalumna*

1. Notogastral porose areas *Aa* large, wedge-shaped; two postanal porose areas present; body size: 215–232 × 157. ..... ..... *Heterogalumna minima* spec. nov. (see data of this paper). Distribution: India
– Notogastral porose areas *Aa* small, rounded or oval; one postanal porose area present. ..... 2
2. Interlamellar setae of medium length; sensilli longer than hinge; body size: 250 × 203. ..... ..... *Heterogalumna monticola* Balogh, 1962 (see Balogh 1962). Distribution: Tanzania
– Interlamellar setae very short; sensilli shorter than hinge. ..... 3
3. Prodorsum and notogaster surface punctate; genital plates striate; body size: 258 × 185. ..... ..... *Heterogalumna lineolata* Balogh, 1960 (see Balogh 1960). Distribution: Congo
– Prodorsum and notogaster surface smooth; genital plates not striate; body size: 250 × 185. .. ..... *Heterogalumna pygmaea* (Balogh, 1958) (see Balogh 1958, 1960). Distribution: Angola

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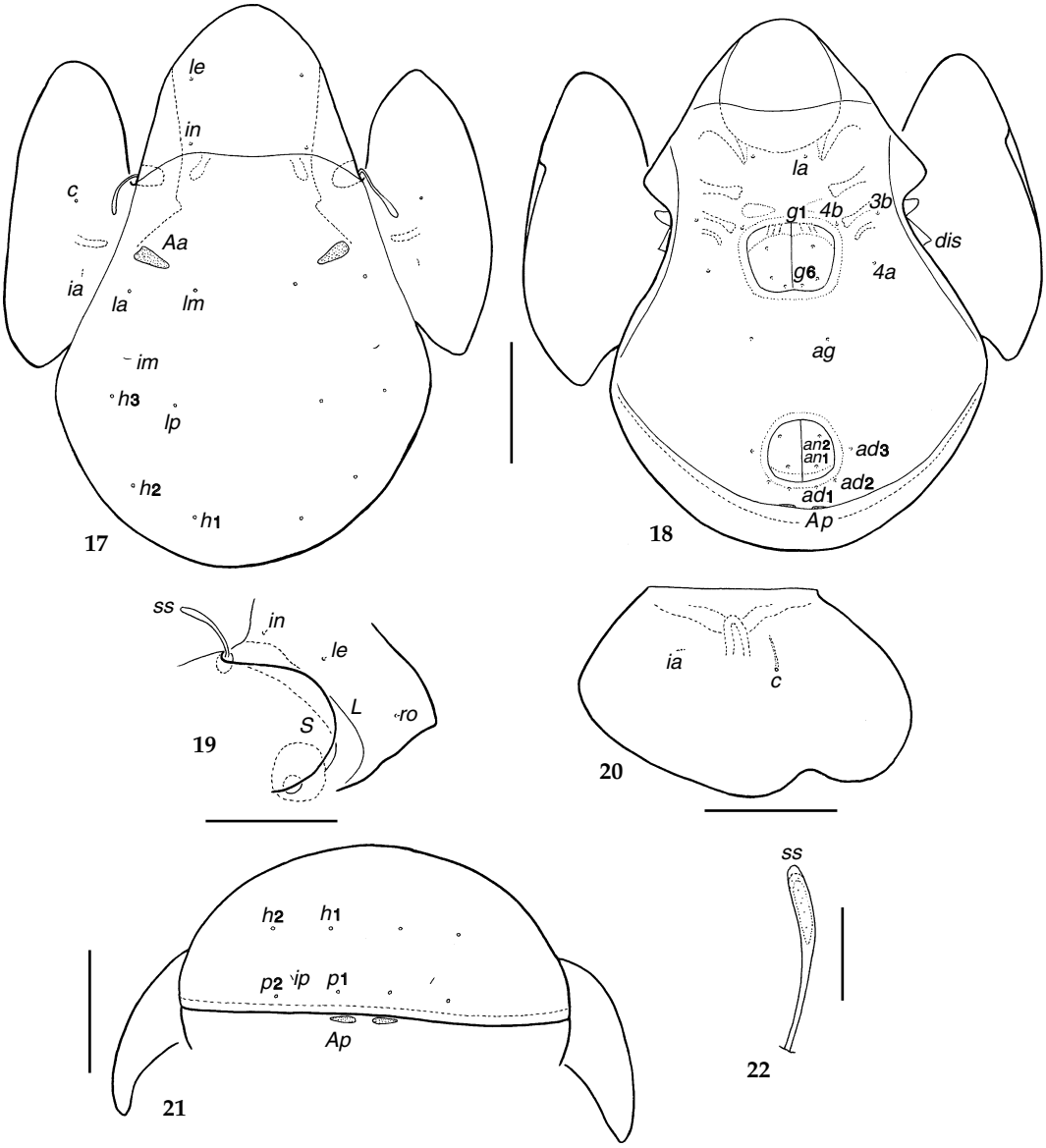


**Figs 17–22.** *Heterogalumna minima* spec. nov. **17.** Body dorsally. **18.** Body ventrally (gnathosoma and legs not illustrated). **19.** Prodorsum dorso-laterally (legs I not illustrated). **20.** Pteromorpha. **21.** Notogaster posteriorly. **22.** Sensillus. Scale bars: 17–21 = 50 µm, 22 = 20 µm.


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