

Taxonomic data on two species of oribatid mites of the family Galumnidae (Acari, Oribatida), with additions to the fauna of China

Authors: Ermilov, Sergey G., and Leong, Chi-Man

Source: Systematic and Applied Acarology, 23(9) : 1766-1781

Published By: Systematic and Applied Acarology Society

URL: <https://doi.org/10.11158/saa.23.9.4>

The BioOne Digital Library (<https://bioone.org/>) provides worldwide distribution for more than 580 journals and eBooks from BioOne's community of over 150 nonprofit societies, research institutions, and university presses in the biological, ecological, and environmental sciences. The BioOne Digital Library encompasses the flagship aggregation BioOne Complete (<https://bioone.org/subscribe>), the BioOne Complete Archive (<https://bioone.org/archive>), and the BioOne eBooks program offerings ESA eBook Collection (<https://bioone.org/esa-ebooks>) and CSIRO Publishing BioSelect Collection (<https://bioone.org/csiro-ebooks>).

Your use of this PDF, the BioOne Digital Library, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Digital Library content is strictly limited to personal, educational, and non-commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne is an innovative nonprofit that sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Taxonomic data on two species of oribatid mites of the family Galumnidae (Acari, Oribatida), with additions to the fauna of China

SERGEY G. ERMILOV^{1*} & CHI-MAN LEONG^{2,3}

¹Tyumen State University, Tyumen, Russia. E-mail: ermilovacari@yandex.ru

²National Taiwan University, Taipei, Taiwan. E-mail: chimanleo@gmail.com

³Present address: Centre for Macau Studies, University of Macau, Macao SAR, China

*Corresponding author

Abstract

The present study is based on oribatid mite materials (Acari, Oribatida) collected from Macao SAR, southern China during 2016 to 2018. A list of identified taxa, including 25 species from 23 genera and 14 families, is presented; of these, 11 species and 1 genus are recorded for the first time in the fauna of this country, and 1 species is recorded for the first time in the Oriental region. The taxonomic data on two species of the family Galumnidae is provided. A new species, *Dimidiogalumna ilhaverdeensis* Ermilov **sp. nov.** is described; it differs from *Dimidiogalumna comoroensis* Mahunka, 1994 by the presence of four pairs of notogastral porose areas and one strium on genital plates, and the absence of ridges on anal plates. The systematic placement of *Acrogalumna bipartita* Aoki & Hu, 1993 is discussed, resulting in the following taxonomic proposal: *Allogalumna bipartita* (Aoki & Hu, 1993) **comb. nov.**; the supplementary description of this species is presented based on specimens from China.

Key words: galumnid mites, Oriental region, fauna, taxonomy, morphology

Introduction

Oribatid mites (Acari, Oribatida) of China are moderately known (Chen *et al.* 2010). Our work is based on materials collected from Macau Peninsula, Taipa Island and Coloane Island, Macao SAR, China during 2016 to 2018. The primary goal of the paper is to present a list and new findings of identified oribatid taxa.

A second goal of the paper is to present taxonomic data on two species of the family Galumnidae: (a) to describe and illustrate a new species of *Dimidiogalumna* Engelbrecht, 1972. This genus was proposed by Engelbrecht (1972) with *Dimidiogalumna villiersensis* Engelbrecht, 1972 as type species. At present, it comprises five species, which are distributed in the Ethiopian, Oriental and southern Palaearctic regions (Ermilov & Klimov 2017). The main generic traits were summarized by Ermilov and Klimov (2017). An identification key to previously known species of *Dimidiogalumna* was given by Ermilov and Anichkin (2014); (b) to provide the supplementary description of *Allogalumna bipartita* (Aoki & Hu, 1993) **comb. nov.** based on specimens from China, adding new information about some morphological structures and their measurements, identification of leg setae and solenidia, and morphology of the gnathosoma, and to discuss the generic placement of this species.

Material and methods

Material examined

Material was collected by C.-M. Leong in secondary forests from the Macau Peninsula, Taipa Island and Coloane Island, Macao SAR, China during 2016 to 2018 (Fig. 1). The field surveys included two periods: July to August and February to March. Samples were extracted by the two liters of shifted leaf litter and soil, using Winkler extractor into 75% ethanol during seven days in the laboratory conditions. Localities of samples:

- #1—Siu Tam Hill, 22.1622 °N, 113.5463 °E, 97 m a.s.l., 15.II.2018.
- #2—Hac Sa Reservoir, 22.1263 °N, 113.5727 °E, 65 m a.s.l., 12.II.2018.
- #3—Ilha Verde Hill, 22.2116 °N, 113.5380 °E, 30 m a.s.l., 09.II.2018.
- #4—Guia Hill, 22.1967 °N, 113.5502 °E, 74 m a.s.l., 10.II.2018.
- #5—Ka Ho Reservoir, 22.1341 °N, 113.5766 °E, 56 m a.s.l., 27.I.2018.
- #6—Siu Tam Hill, 22.1613 °N, 113.5501 °E, 52 m a.s.l., 18.I.2018.
- #7—Mong Ha Hill, 22.2085 °N, 113.5476 °E, 32 m a.s.l., 18.II.2018.
- #8—Ecological Protection Area I, 22.1425 °N, 113.5538 °E, 0 m a.s.l., 14.II.2018.
- #11—Hac Sa Reservoir, 22.1264 °N, 113.5733 °E, 71 m a.s.l., 29.VII.2017.
- #12—Ilha Verde Hill, 22.2117 °N, 113.5375 °E, 5 m a.s.l., 13.VIII.2017.
- #13—Siu Tam Hill, ca. 22.1608 °N, 113.5466 °E, ca. 75 m a.s.l., 26.VIII.2016.
- #14—Hac Sa Reservoir, ca. 22.1344 °N, 113.5725 °E, ca. 65 a.s.l., 09.I.2017.
- #15—Hac Sa Reservoir, ca. 22.1344 °N, 113.5725 °E, ca. 65 a.s.l., 20.VIII.2016.
- #16—Hac Sa Reservoir, 22.1233 °N, 113.5700 °E, 38 m a.s.l., 02.VIII.2017.
- #17—Guia Hill, 22.1983 °N, 113.5523 °E, 77 m a.s.l., 01.VII.2017.
- #18—Ilha Verde Hill, 22.2117 °N, 113.5375 °E, 41 m a.s.l., 27.VII.2017.
- #19—Siu Tam Hill, 22.1614 °N, 113.5502 °E, 52 m a.s.l., 15.VII.2017.

Except the holotype and two paratypes, specimens examined are deposited in TSUMZ.

Methods

Specimens were mounted in lactic acid on temporary cavity slides for identification of all taxa and for measurement and illustration of the new species. Body length was measured in lateral view, from the tip of the rostrum to the posterior edge of the notogaster. Notogastral width refers to the maximum width of notogaster (behind pteromorphs) in dorsal view. 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 (femulus included). 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 transmission light microscope “Leica DM 2500”. Microscope images were taken with an AxioCam ICc5 digital camera.

Morphological terminology follows that of F. Grandjean (see Ermilov & Klimov 2017 for review and application).

The following abbreviations are used: *irt*—inner rostral tooth; *L*—lamellar line; *S*—sublamellar line; *N*—prodorsal leg niche; *E*, *T*—lateral ridges of prodorsum; *ro*, *le*, *in*, *bs*—rostral, lamellar, interlamellar and bothridial setae, respectively; *Ad*—sejugal porose area; *D*—dorsophragma; *c*, *la*, *lm*, *lp*, *h*, *p*—notogastral setae; *Aa*, *A1*, *A2*, *A3*—notogastral porose areas; *mp*—median pore; *ia*, *im*, *ip*, *ih*, *ips*—notogastral lyrifissures; *gla*—opisthonotal gland opening; *h*, *m*, *a*—subcapitular setae; *or*—adoral seta; *sac*—axillary saccule; *v*, *l*, *d*, *cm*, *acm*, *ul*, *sul*, *vt*, *lt*—palp setae; ω —palp and leg solenidium; *cha*, *chb*—cheliceral setae; *Tg*—Trägårdh’s organ; *Pd I*, *Pd II*—pedotecta I, II, respectively; *1b*, *3a*, *3b*, *3c*, *4a*, *4b*—epimeral setae; *dis*—discidium; *cp*—circumpedal carina; *g*, *ag*,

an, *ad*—genital, aggenital, anal and adanal setae, respectively; *iad*—adanal lyrifissure; *Ap*—postanal porose area; *p.o.*—preanal organ; Tr, Fe, Ge, Ti, Ta—leg trochanter, femur, genu, tibia and tarsus, respectively; *p.a.*—leg porose area; σ , ϕ —leg solenidia; ϵ —tarsus I famulus; *v*, *ev*, *bv*, *l*, *d*, *ft*, *tc*, *it*, *p*, *u*, *a*, *s*, *pv*, *pl*—leg setae.

The following abbreviations of collections are used: NTU—National Taiwan University, Taipei, Taiwan; SMNH—Senckenberg Museum of Natural History, Görlitz, Germany; TSUMZ—Tyumen State University Museum of Zoology, Tyumen, Russia.

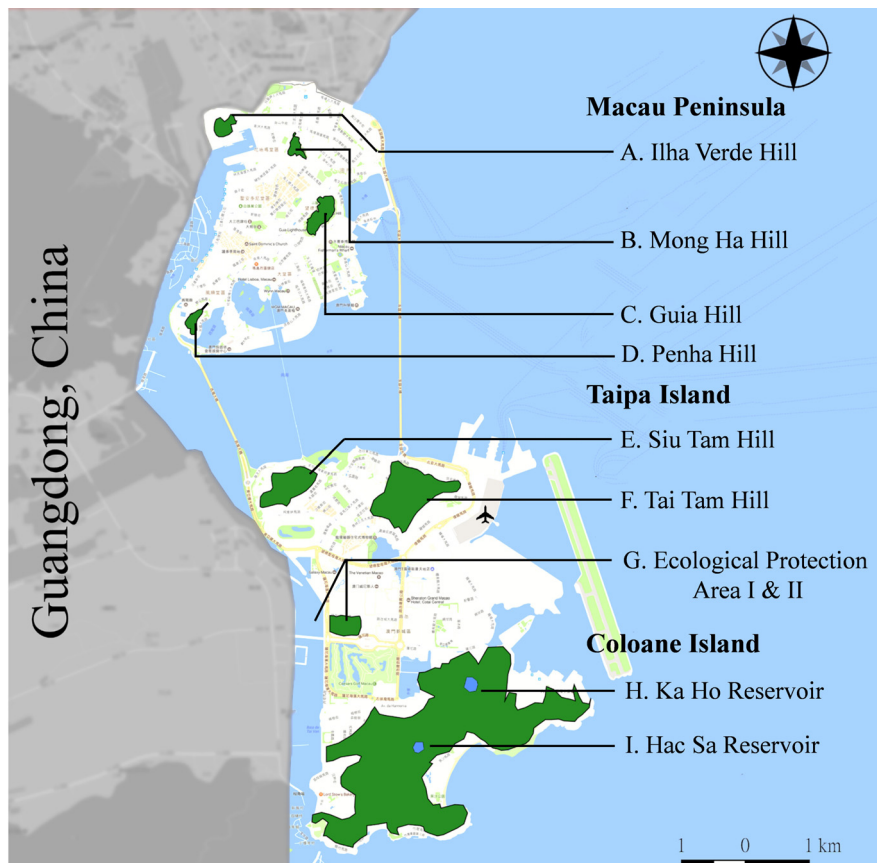


FIGURE 1. Map of localities on the Macau Peninsula, Taipa Island and Coloane Island in China (modified after Google Map 2017).

List of identified taxa¹

The list of identified oribatid mites collected from Macao, China includes 25 species from 23 genera and 14 families. Of these, 11 species and 1 genus are recorded for the first time in the fauna of this country; and 1 species is recorded for the first time in the Oriental region.

Lohmanniidae

Lohmannia corallium Nakatamari, 1982. Locality: 19 (5 ex.). Distribution: Japan. New record of the species in the Oriental region.

1. Distribution: mostly from Subías (2004, updated 2018). Ptyctimous mites: not included.

Javacarus porosus Hammer, 1979. Locality: 11 (1 ex.). Distribution: Tropical and Subtropical regions.

Meristacarus pubescentius Ren, Yang, Liang & Xie, 2018. Locality: 13 (2 ex.). Distribution: China.

Meristolohmannia macaoensis Ermilov, 2018. Locality: 12 (3 ex.). Distribution: China.

Trhypochthoniidae

Archegozetes longisetosus Aoki, 1965. Locality: 19 (5 ex.). Distribution: Oriental and Neotropical regions.

Malaconothridae

Tyrphonothrus crassisetosus (Willmann, 1932). Locality: 4 (1 ex.). Distribution: Oriental, Australian and Ethiopian regions. New record of the species in China.

Nothridae

Nothrus anauniensis Canestrini & Fanzago, 1877. Localities: 4 (1 ex.), 18 (1 ex.). Distribution: Cosmopolitan.

Basilobelbidae

Basilobelba retiaria (Warburton, 1912). Locality: 19 (2 ex.). Distribution: Tropical and Subtropical regions, Japan. New record of the species in China.

Damaeidae

Tectodamaeus armatus Aoki, 1984. Locality: 18 (1 ex.). Distribution: Palaearctic and Oriental regions.

Eremobelbidae

Eremobelba japonica Aoki, 1959. Locality: 19 (1 ex.). Distribution: Palaearctic and Oriental regions.

Dameolidae

Fosseremus laciniatus (Berlese, 1904). Locality: 12 (1 ex.). Distribution: Cosmopolitan.

Otocephidae

Dolicheremaeus baloghi Aoki, 1967. Localities: 1 (1 ex.), 6 (1 ex.), 11 (1 ex.), 15 (1 ex.). Distribution: Palaearctic and Oriental regions. New record of the species in China.

Tectocephidae

Tegeozetes tunicatus Berlese, 1913. Locality: 12 (2 ex.). Distribution: Tropical and Subtropical regions, Hungary.

Mochlozetidae

Gephyrazetes fasciatus Hirauchi, 1999. Localities: 1 (1 ex.), 2 (1 ex.), 6 (1 ex.). Distribution: Japan, Taiwan. New record of the genus and species in China.

Unguizetes keralensis (Balakrishnan, 1989). Locality: 2 (2 ex.). Distribution: Oriental region. New record of the species in China.

Haplozetidae

Peloribates kaszabi Mahunka, 1988. Localities: 4 (3 ex.), 19 (4 ex.). Distribution: Oriental region. New record of the species in China.

Protoribates dentatus (Berlese, 1883). Localities: 8 (2 ex.), 13 (1 ex.). Distribution: Holarctic and Oriental regions, Fiji. New record of the species in China.

Rostrozetes ovulum (Berlese, 1908). Locality: 12 (1 ex.). Distribution: Tropical and Subtropical regions.

Scheloribatidae

Scheloribates praeincisus (Berlese, 1910). Localities: 12 (1 ex.), 18 (3 ex.), 19 (3 ex.). Distribution: Tropical and Subtropical regions.

Galumnidae

Allogalumna bipartita (Aoki & Hu, 1993). Localities: 5 (2 ex.), 7 (3 ex.). Distribution: Oriental region.

Dimidiogalumna ilhaverdeensis Ermilov **sp. nov.** Localities: 12 (4 ex.), 18 (5 ex.). Distribution: China.

Galumna acutirostrum Ermilov & Anichkin, 2010. Locality: 19 (3 ex.). Distribution: Vietnam. New record of the species in China.

Pergalumna cattienica Ermilov & Anichkin, 2011. Localities: 2 (1 ex.), 5 (1 ex.), 11 (1 ex.), 13 (3 ex.), 16 (2 ex.). Distribution: Vietnam. New record of the species in China.

Pergalumna kunsti Ermilov & Starý, 2017. Localities: 3 (1 ex.), 4 (1 ex.), 5 (1 ex.), 6 (3 ex.), 7 (2 ex.), 12 (1 ex.), 14 (1 ex.), 17 (1 ex.), 18 (2 ex.), 19 (1 ex.). Distribution: Vietnam. New record of the species in China.

Pergalumna paraelongata Ermilov & Anichkin, 2012. Localities: 7 (3 ex.), 11 (4 ex.). Distribution: Vietnam, Cameroon. New record of the species in China.

Taxonomy

Dimidiogalumna ilhaverdeensis Ermilov **sp. nov.**

(Figs 2–13)

Diagnosis

Body size: 315–348 × 249–265. Rostral setae long, setiform, barbed, lamellar and interlamellar setae short, setiform, thin, smooth; *ro* thickest, *in* shortest. Bothridial setae clavate, barbed distally. Anterior parts of pteromorphs striate. With 10 pairs of notogastral microsetae and four pairs of porose areas, *Aa* transversely elongate, slightly triangular, *A1*, *A2* and *A3* rounded. Median pore present. Anterior margin of ventral plate dentate. Circumpedial carinae long, directed to pedotecta I. Genital plates with one longitudinal strium in medial parts. Epimeral and anogenital setae short, setiform, thin, smooth. Anterior edges of genital plates with one seta. Postanal porose area elongate oval. Solenidion of tibiae IV located in middle of the segments.

Description

Measurements. Body length: 315 (holotype, male), 315–348 (eight paratypes, four females and four males); notogaster width: 249 (holotype), 249–265 (eight paratypes). No clear differences between females and males in body size.

Integument (Figs 3, 13, 17). Body color brown. Body surface microfoveolate (visible in dissected specimens under high magnification, × 1000). Anterior parts of pteromorphs striate. Genital plates with one longitudinal strium in medial parts. All leg femora and trochanters III, IV with elongate tubercles antiaxially.

Prodorsum (Figs 2, 4). Rostrum rounded. Lamellar lines thin, distinct, directed backwards at ventral ends. Prodorsal leg niches and lateral ridges of prodorsum well-developed. Rostral setae (32–36) setiform, barbed. Lamellar (8–10) and interlamellar (4) setae setiform, thin, smooth. Bothridial setae (57–65) clavate, with long, smooth stalks and short, rounded and barbed distally heads. Exobothridial setae and their alveoli absent. Sejugal porose areas (12–20 × 6–10) elongate oval, transversely orientated, posterolateral to interlamellar setae. Dorsophragmata long, elongated.

Notogaster (Figs 2, 4–6). Dorsejugal suture complete, well visible. With 10 pairs of microsetae (*c*, 2; others 1) and four pairs of porose areas; *Aa* transversely elongate (length 32–41), slightly triangular, *A1*, *A2*, *A3* (all 12–20) rounded. Microsetae *la* located close to the pteromorphal hinges, posterior to *Aa*. Median pore present in females and males, represented by one part, located between *A2*. All lyrifissures distinct, *im* located between *lm* and *lp*, *ip* between *p*₁ and *p*₁, *ih* anterior to *p*₃, *ips* lateral to *p*₃. Opisthonotal gland openings located lateral to *A1*.

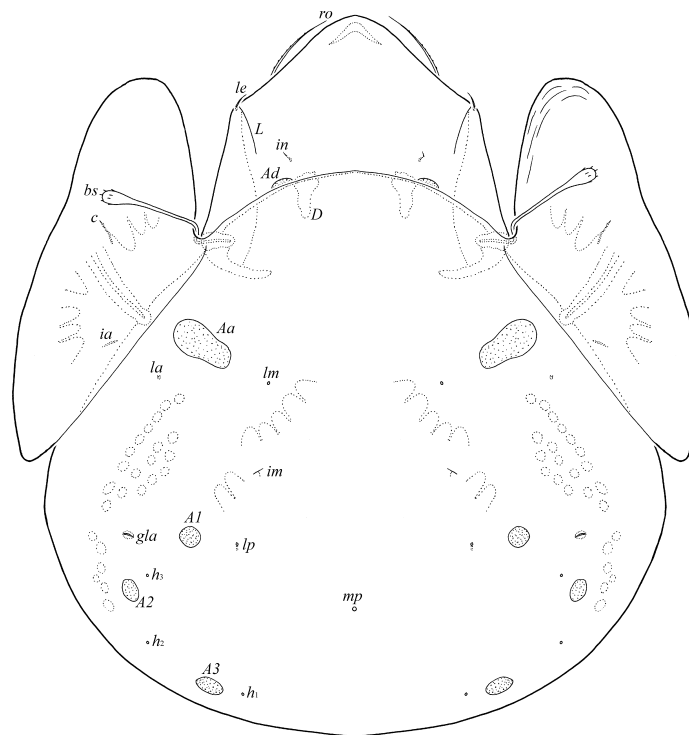


FIGURE 2. *Dimiodiagalumna ilhaverdeensis* Ermilov **sp. nov.**, adult: dorsal view. Scale bar 50 μ m.

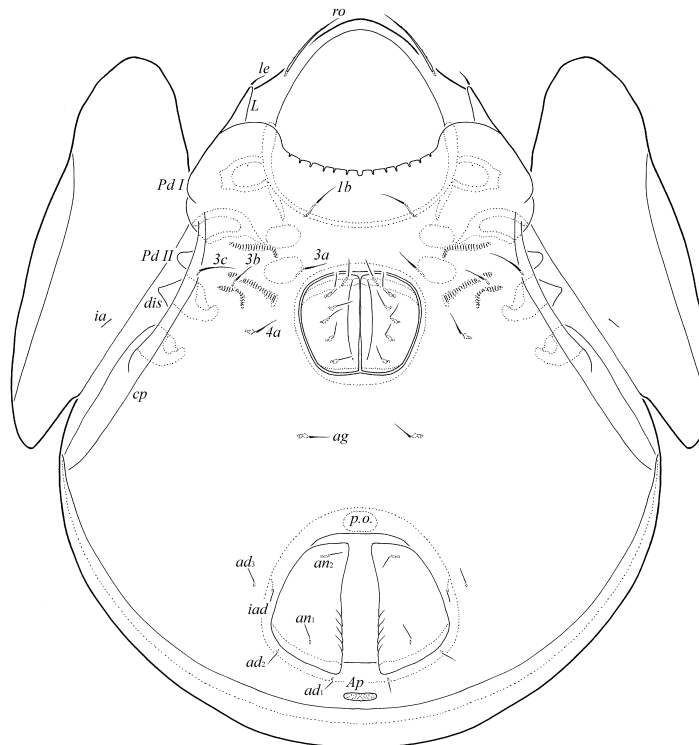
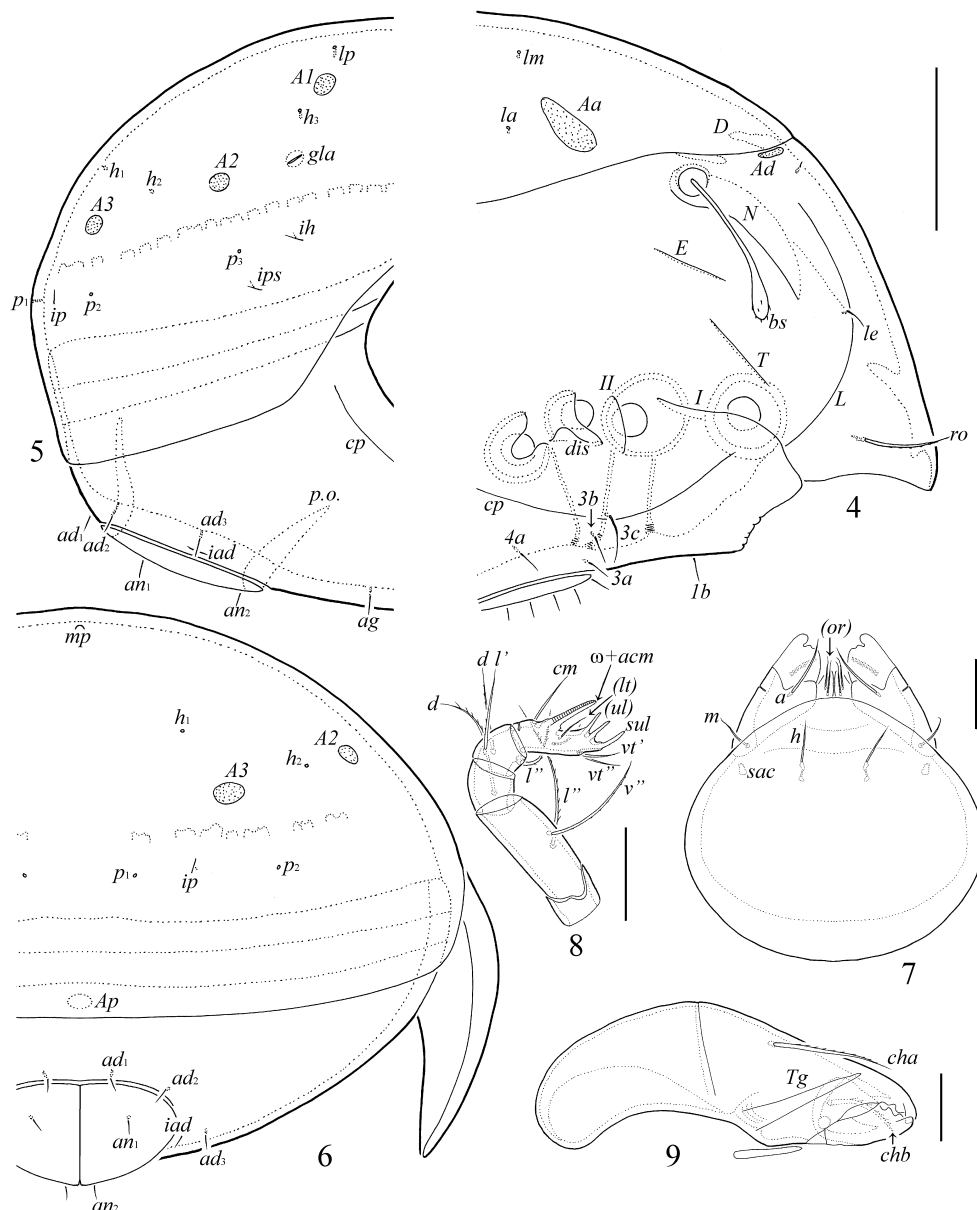


FIGURE 3. *Dimiodiagalumna ilhaverdeensis* Ermilov **sp. nov.**, adult: ventral view (gnathosoma and legs not shown). Scale bar 50 μ m.



FIGURES 4–9. *Dimiodiagalumna ilhaverdeensis* Ermilov **sp. nov.**, adult: 4—anterior part of body (gnathosoma and legs not shown), lateral view; 5—posterior part of body, lateral view; 6—posterior view, right half; 7—subcapitulum, ventral view; 8—palp, left, paraxial view; 9—chelicera, left, paraxial view. Scale bar 50 μm (4–6), 20 μm (7–9).

Gnathosoma (Figs 7–9). Subcapitulum longer than wide (90–98 × 77–86). Subcapitular setae setiform, smooth, *a* (18–20) longer and thicker than *m* (14–16) and *h* (14–16). Adoral setae (10) setiform, smooth. Palps (65–69) with typical setation 0-2-1-3-9(+1 solenidion). Postpalpal setae (4) spiniform, smooth. Chelicerae (102–110) with two setiform, barbed setae, *cha* (32–36) longer than *chb* (20–24). Trägårdh's organ of chelicerae elongate triangular.

Epimeral region (Figs 3, 4). Anterior tectum of epimere I dentate. Pedotecta I and II rounded in ventral view. Discidia triangular. Epimeral setal formula: 1-0-3-1. Epimeral setae (*3c*, 12–16; *1b*, *3a*, *3b*, *4a*, 8–10) setiform, thin, smooth. Circumpedal carinae long, thin, directed to pedotecta I.

Anogenital region (Figs 3–6). Six pairs of genital, one pair of aggenital, two pairs of anal and three pairs of adanal setae similar in length (6–8), setiform, thin, smooth. Anterior edges of genital plates with one seta. Aggenital setae located between genital and anal apertures, equal distanced from them. Adanal lyrifissures located close and parallel to anal plates. Adanal setae *ad*₁ and *ad*₂ postanal, *ad*₃ paraanal and lateral to adanal lyrifissures. Distance *ad*₁–*ad*₂ slightly shorter than *ad*₂–*ad*₃. Unpaired postanal porose area elongate oval (12–16 × 6–10). Ovipositor elongated (151 × 32), blades (69) shorter than length of distal section (beyond middle fold; 82). Each of the three blades with four smooth setae, $\psi_1 \approx \tau_1$ (53–57) setiform, longer than thorn-like $\psi_2 \approx \tau_a \approx \tau_b \approx \tau_c$ (24–28). Six coronal setae (4) spiniform, smooth.

Legs (Figs 10–13). Median claw distinctly thicker than laterals, all serrate on dorsal side. Dorsoparaxial porose areas on all femora and on trochanters III, IV well visible. 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]; homologies of setae and solenidia indicated in Table 1. Solenidion of tibiae IV located in middle of the segments. Famulus of tarsi I inserted posterolateral to solenidion ω_1 .

TABLE 1. Leg setation and solenidia of adult *Dimiodiagalumna ilhaverdeensis* Ermilov **sp. nov.** and *Allogalumna bipartita* (Aoki & Hu, 1993).

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 anterior and double prime (') setae on posterior side of the given leg segment. Parentheses refer to a pair of setae.

Material examined

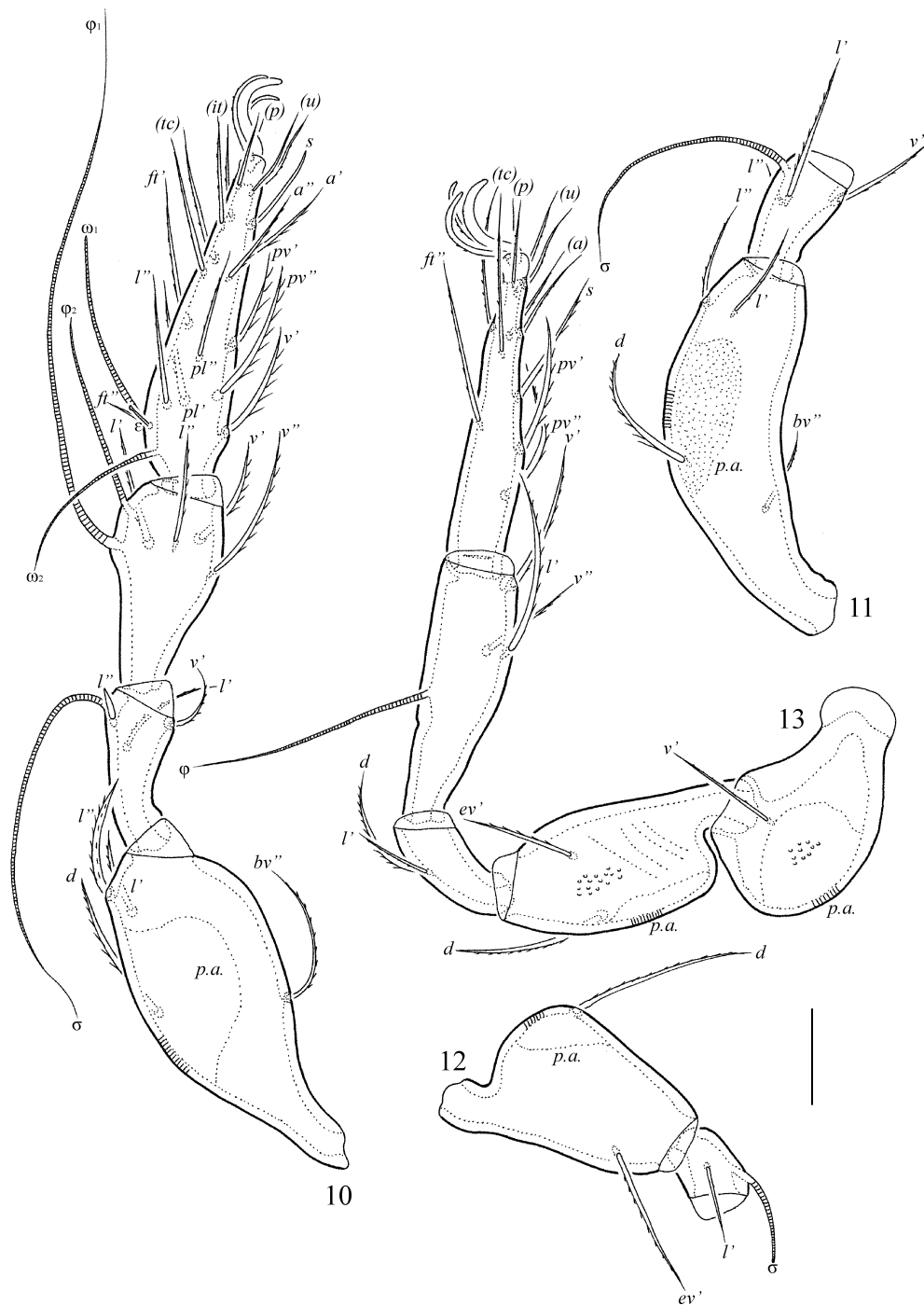
Holotype (male) and three paratypes (two females and one male): China, Macau Peninsula, Ilha Verde Hill, 22.2117 °N, 113.5375 °E, 5 m a.s.l., locality #12, leaf litter and soil, 13.VIII.2017 (collected by C.-M. Leong). Five paratypes (two females and three males): China, Macau Peninsula, Ilha Verde Hill, 22.2117 °N, 113.5375 °E, 41 m a.s.l., locality #18, leaf litter and soil, 27.VII.2017 (collected by C.-M. Leong).

Type deposition

The holotype (ethanol with drop of glycerol) is deposited in NTU. Two paratypes (ethanol with drop of glycerol) are deposited in SMNH. Six paratypes (ethanol with drop of glycerol) are deposited in TSUMZ.

Etymology

The specific name *ilhaverdeensis* refers to the locality of the new species, Ilha Verde, Macao SAR, China.



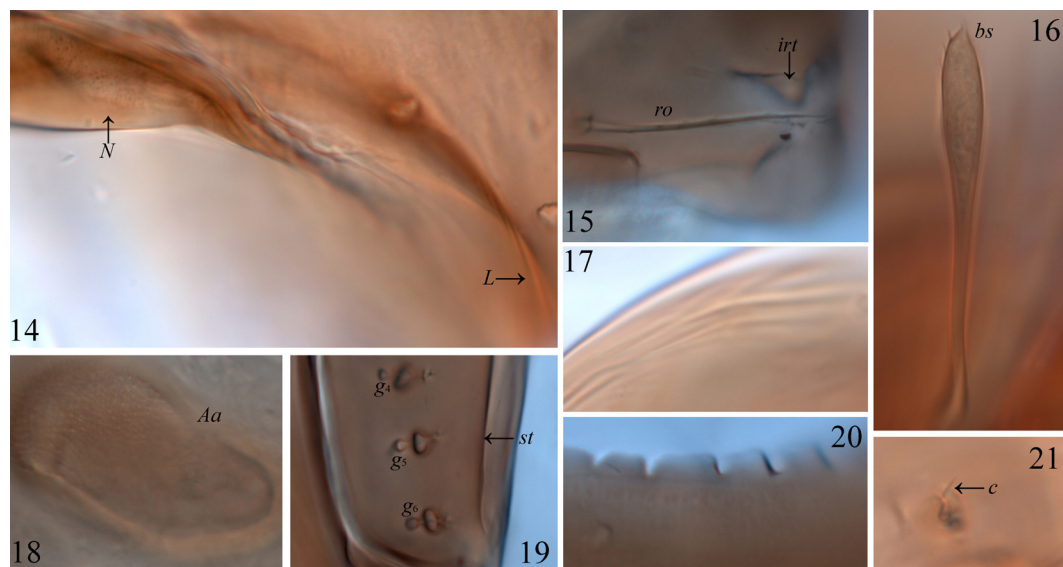
FIGURES 10–13. *Dimidiogalumna ilhaverdeensis* Ermilov **sp. nov.**, adult: 10—leg I, without trochanter, right, antiaxial view; 11—femur and genu of leg II, left, paraxial view; 12—femur and genu of leg III, left, antiaxial view; 13—leg IV, left, antiaxial view. Scale bar 20 μ m.

Differential diagnosis

Dimidiogalumna ilhaverdeensis Ermilov **sp. nov.** differs from the other species of the genus by the dentate anterior margin of ventral plate (versus smooth). The new species is morphologically most similar *Dimidiogalumna comoroensis* Mahunka, 1994 from the Comoro Islands in having sejugal suture and transversely elongate (slightly triangular) notogastral porose areas *Aa*, but differs by the presence of four pairs of notogastral porose areas including *AI* (versus three pairs, *AI* absent) and one strium on genital plates (versus several stria), and the absence of ridges on anal plates (versus one longitudinal ridge present on each anal plate).

Remarks

The generic diagnosis of *Dimidiogalumna* was presented by Ermilov and Klimov (2017). One of the morphological characters of the genus is the presence of 10 pairs of notogastral alveoli. However, *Dimidiogalumna ilhaverdeensis* Ermilov **sp. nov.** has 10 pairs of microsetae instead alveoli. The presence of alveoli and microsetae in representatives of the same genus is generic trait of some superspecies taxa in the family Galumnidae (for example, *Allogalumna* Grandjean, 1936, *Flagellozetes* (*Cosmogalumna*) Aoki, 1988, *Pergalumna* Grandjean, 1936), therefore, this character state should be included in diagnosis of *Dimidiogalumna*.



FIGURES 14–21. *Dimidiogalumna ilhaverdeensis* Ermilov **sp. nov.**, adult, light microscope images: 14—lamellar line and prodorsal leg niche, dorsolateral view; 15—rostral seta and inner rostral tooth; 16—bothridial seta; 17—stria in anterior part of pteromorph; 18—notogastral porose area *Aa*; 19—posterior part of right genital plate; 20—teeth of anterior margin of ventral plate; 21—notogastral seta *c* on pteromorph.

Allogalumna bipartita (Aoki & Hu, 1993) **comb. nov.** (Figs 22–33)

Supplementary description

Measurements. Body length: 531–713 (five specimens, three females and two males); notogaster width: 431–564 (five specimens). Females larger than males: 531–564 × 431–448 versus 680–713 × 531–564.

Integument. Body color brown. Body surface microfoveolate (visible in dissected specimens under high magnification, $\times 1000$).

Prodorsum (Figs 22, 24). Rostrum rounded. Sublamellar lines thin, distinct, directed backwards at ventral ends. Prodorsal leg niches and lateral ridges of prodorsum well-developed. Rostral (32–41), lamellar (41–49) and interlamellar (176–205) setae setiform, slightly barbed. Bothridial setae (90–94) lanceolate, with long, smooth stalks and short, pointed and smooth distally heads. Exobothridial setae and their alveoli absent. Sejugal porose areas (16–24 $\times$ 6–10) elongate oval, transversely orientated, posterior to interlamellar setae. Dorsophragmata short, slightly elongated.

Notogaster (Figs 22, 24–26). Dorsosejugal suture interrupted medially. With 10 pairs of vestigial microsetae (1 or shorter) and five pairs of rounded porose areas; *Aal* (16) smaller than *Aam*, *A1*, *A2*, *A3* (all 20–24). Microsetae *la* located close to the pteromorphal hinges, posterior to *Aal* and *Aam*. Median pore absent in females and males. All lyrifissures distinct, *im* located between *lm* and *A1*, *ip* between *p*₁ and *p*₁ and closer to *p*₁, *ih* and *ips* anterior to *p*₃, Opisthonotal gland openings located lateral to *A1*.

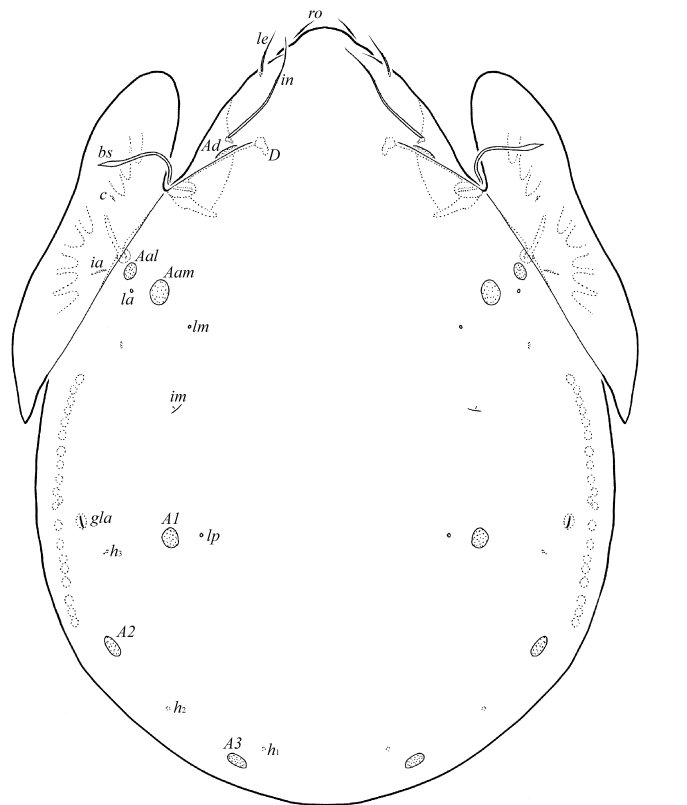


FIGURE 22. *Allogalumna bipartita* (Aoki & Hu, 1993), adult: dorsal view. Scale bar 100 μ m.

Gnathosoma (Figs 27–29). Subcapitulum longer than wide (139–143 $\times$ 114–123). Subcapitular setae setiform, barbed, *a* (28–32) and *h* (28–32) longer than *m* (16–20). Adoral setae (16) setiform, barbed. Palps (90–94) with typical setation 0-2-1-3-9(+1 solenidion). Postpalpal setae (6) spiniform, smooth. Chelicerae (160–164) with two setiform, barbed setae, *cha* (49–53) longer than *chb* (32–36). Trägårdh's organ of chelicerae elongate triangular.

Epimeral region (Figs 23, 24). Anterior tectum of epimere I smooth. Pedotecta I and II rounded in ventral view. Discidia triangular. Epimeral setal formula: 1-0-2-2. Epimeral setae (*3b*, 20–24; *1b*,

3a, 4a, 4b, 16–20) setiform, thin, smooth. Circumpedal carinae short, thin, not reaching the acetabula IV.

Anogenital region (Figs 23–26). Six pairs of genital, one pair of aggenital, two pairs of anal and three pairs of adanal setae similar in length (12–16), setiform, thin, smooth. Anterior edges of genital plates with two setae. Aggenital setae located between genital and anal apertures, closer to genital aperture. Adanal lyrifissures located close and diagonally to anal plates. Adanal setae ad_1 and ad_2 postanal, ad_3 paraanal and posterior to adanal lyrifissures. Distance $ad_1-ad_2=ad_2-ad_3$. Unpaired postanal porose area elongate oval (41–55 × 16–20).

Legs (Figs 30–33). Median claw distinctly thicker than laterals, all serrate on dorsal side. Dorsoparaxial porose areas on all femora and on trochanters III, IV well visible. 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]; homologies of setae and solenidia indicated in Table 1. Solenidion of tibiae IV located in anterior part of the segments. Famulus of tarsi I inserted anterolateral to solenidion ω_1 .

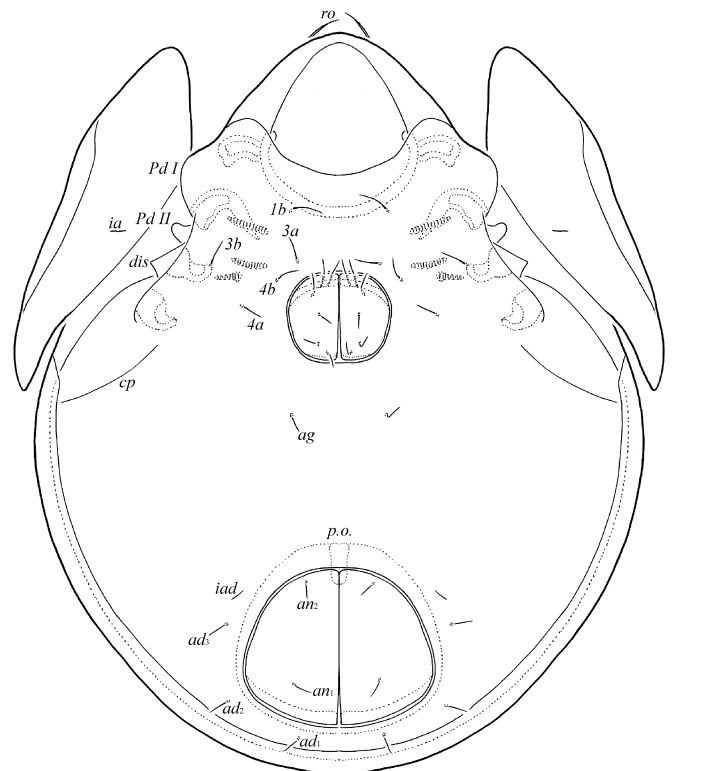
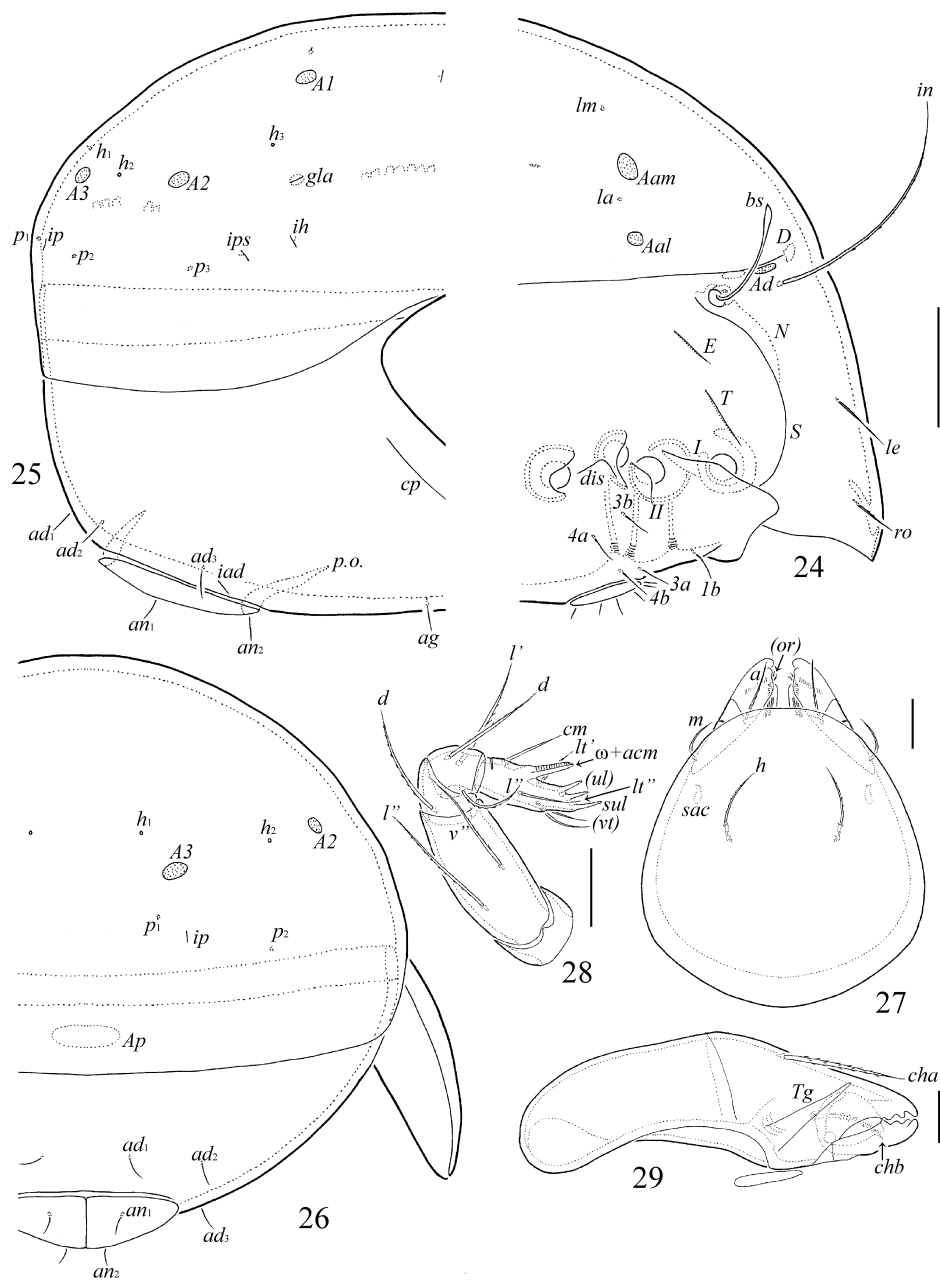


FIGURE 23. *Allogalumna bipartita* (Aoki & Hu, 1993), adult: ventral view (gnathosoma and legs not shown). Scale bar 100 μ m.

Material examined

Two specimens (two females): China, Coloane Island, Ka Ho Reservoir, 22.1341 °N, 113.5766 °E, 56 m a.s.l., locality #5, leaf litter and soil, 27.I.2018 (collected by C.-M. Leong). Three specimens (one female and two males): China, Macau Peninsula, Mong Ha Hill, 22.2085 °N, 113.5476 °E, 32 m a.s.l., locality #7, leaf litter and soil, 18.II.2018 (collected by C.-M. Leong).

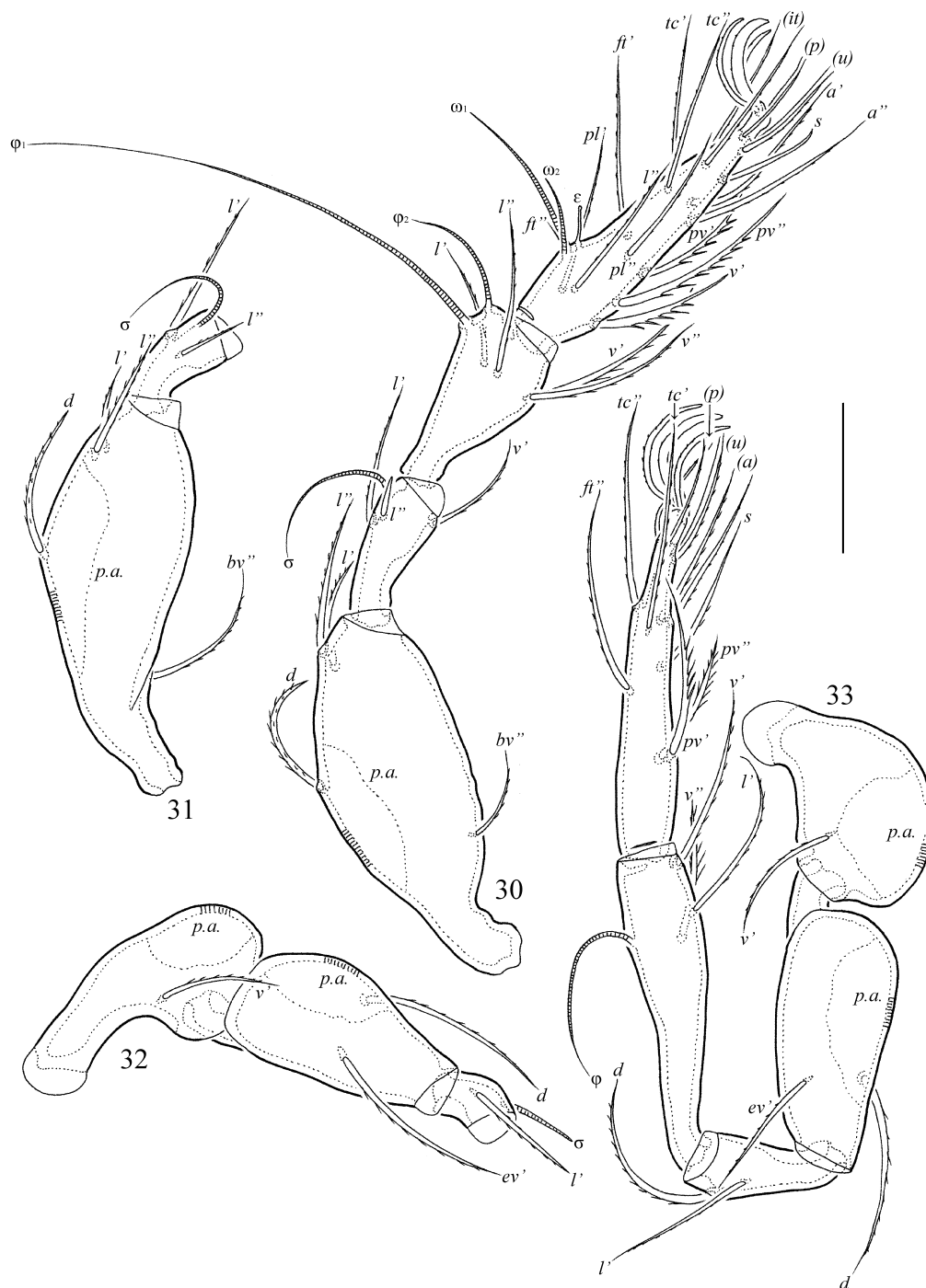


FIGURES 24–29. *Allogalumna bipartita* (Aoki & Hu, 1993), adult: 24—anterior part of body (gnathosoma and legs not shown), lateral view; 25—posterior part of body, lateral view; 26—posterior view, right half; 27—subcapitulum, ventral view; 28—palp, right, antiaxial view; 29—chelicera, left, paraxial view. Scale bar 100 μ m (24–26), 20 μ m (27–29).

Remarks

1. *Allogalumna bipartita* was described by Aoki and Hu (1993) as the representative of the genus *Acrogalumna* Grandjean, 1956. The main generic trait of *Acrogalumna* is the absence of median pore in females and its presence (represented numerous parts) in males. However, this

species has no median pore in females and males, and all other morphological character (see Ermilov & Klimov 2017) corresponds to the genus *Allogalumna* Grandjean, 1936, therefore, this species should be combined: *Allogalumna bipartita* (Aoki & Hu, 1993) **comb. nov.**



FIGURES 30–33. *Allogalumna bipartita* (Aoki & Hu, 1993), adult: 30—leg I, without trochanter, right, antiaxial view; 31—femur and genu of leg II, right, antiaxial view; 32—femur and genu of leg III, left, antiaxial view; 33—leg IV, left, antiaxial view. Scale bar 50 μ m.

2. Specimens of *Allogalumna bipartita* from southern China are morphologically very similar to the original description (Aoki & Hu 1993), and we did not observe clear differences, except for two points: (a) Chinese specimens with vestigial notogastral setae versus setal alveoli in Japanese specimens; (b) Chinese specimens slightly smaller than Japanese specimens ($531\text{--}713 \times 431\text{--}564$ versus $760\text{--}765 \times 600\text{--}610$). We believe these differences represent intraspecific variability.

3. Based on the original description (Aoki & Hu 1993) and supplementary description of *Allogalumna bipartita* from China, we propose the following diagnostic morphological traits for this species: body size: $531\text{--}765 \times 431\text{--}610$; rostral, lamellar and interlamellar setae setiform, barbed; *ro* shortest, *in* longest. Bothridial setae lanceolate, smooth. With 10 pairs of notogastral alveoli or microsetae and five pairs of rounded porose areas, *Aa* divided into two parts. Median pore absent. Circumpedal carinae short, not reaching the acetabula I. Epimeral and anogenital setae short, setiform, thin, smooth. Postanal porose area elongate oval. Solenidion of tibiae IV located in anterior part of the segments.

Acknowledgements

We cordially thank two anonymous reviewers for the valuable comments. We are grateful for the assistance of Chi-Man Leong's family and friends (e.g., Mr. Ken Kwan, Mr. Eric Kwan, Mr. Chi-Keong Chan, Mr. Martinho G. Oxalá, Dr. Feng-long Jia, Mr. Zhen-Yu Yang, Mr. Man-Cheng Choi, Ms. Ying-Cong Lin, Mr. Si-Chong Leong, Mr. Kai-Leung Kwok, Ms. Weng-I Leong, and Mr. Alexander WK Leung) in Macao SAR, China. The field work was supported by the crowdfunding project (DOI: 10.18258/10715) as well as Dr. Shiuh-Feng Shiao (National Taiwan University) and Dr. Benoit Guénard (University of Hong Kong), and the support of Direcção dos Serviços de Educação e Juventude, Gabinete de Apoio ao Ensino Superior, and Fundação Macau.

This study partially was funded by the Russian Foundation for Basic Research (RFBR) according to the research project № 18-04-00097.

References

- Aoki, J. (1988) Oribatid mites (Acari: Oribatida) from the Tokara Islands, Southern Japan—II. *Bulletin of the Biogeographical Society of Japan*, 43(6), 31–33.
- Aoki, J. & Hu, S. (1993) Oribatid mites from tropical forests of Yunnan Province in China. II. Families Galumnidae and Galumnellidae. *Zoological Science*, 10(5), 835–848.
- Chen, J., Liu D. & Wang, H.-F. (2010) Oribatid mites of China: a review of progress, with a checklist. *Zoosymposia*, 4, 186–224.
- Engelbrecht, C.M. (1972) *Dimidiogalumna villiersensis* (Galumnidae: Oribatei), a new South African galumnid genus and its type species. *Acarologia*, 14(1), 141–149.
- Ermilov, S.G. & Anichkin, A.E. (2014) A new species of *Dimidiogalumna* (Acari: Oribatida: Galumnidae) from Vietnam, including a key to all species of the genus. *Systematic & Applied Acarology*, 19(1), 67–72. <https://doi.org/10.11158/saa.19.1.5>
- Ermilov, S.G. & Klimov, P.B. (2017) Generic revision of the large-winged mite superfamily Galumnoidea (Acari, Oribatida) of the world. *Zootaxa*, 4357(1), 1–72. <https://doi.org/10.11646/zootaxa.4357.1.1>
- Grandjean, F. (1936) Les Oribates de Jean Frédéric Hermann et de son père. *Annales de la Société Entomologique de France*, 105, 27–110.
- Grandjean, F. (1956) Galumnidae sans carènes lamellaires (Acariens, Oribates). 1^{re} série. *Bulletin de la Société Zoologique de France*, 81(2–3), 134–150.
- Google Map (2017) Available from <https://www.google.com/maps/place/Macau/> (Accessed on February 19th 2017).

- Mahunka, S. (1994) Further oribatid species from the Comoro Islands (Acari: Oribatida). *Acta Zoologica Academiae Scientiarum Hungaricae*, 40(3), 273–288.
- Subías, L.S. (2004) Listado sistemático, sinonímico y biogeográfico de los ácaros oribátidos (Acariformes: Oribatida) del mundo (excepto fósiles). *Graellsia*, 60(número extraordinario), 3–305. Online updated version accessed in January 2018, 605 pp.; http://bba.bioucm.es/cont/docs/RO_1.pdf

Submitted: 16 Jul. 2018; accepted by Marut Fuangarworn: 20 Aug. 2018; published: 31 Aug. 2018