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Previous volumes (2010-2021): 250 € / year (4 issues)
Acarologia, CBGP, CS 30016, 34988 MONTFERRIER-sur-LEZ Cedex, France
ISSN 0044-586X (print), ISSN 2107-7207 (electronic)

The digitalization of Acarologia papers prior to 2000 was supported by Agropolis Fondation under the reference ID 1500-024 through the « Investissements d’avenir » programme (Labex Agro: ANR-10-LABX-0001-01)

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Allogalumna rugata, a new species of oribatid mite from China (Acari, Oribatida, Galumnidae)

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(Received 20 April 2015; accepted 27 May 2015; published online 30 September 2015)

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ABSTRACT — The genus Allogalumna Grandjean, 1936 is reported for the first time from China, and a new species Allogalumna rugata n. sp. is described from Qinghai Province. This species is distinguishable from other species of the genus by the combination of the following character states: bothridial setae setiform, slightly barbed at the end, four pairs of oval notogastral porose areas present; surface of genital and anal plates with dense thin wrinkle; postanal porose area absent.

KEYWORDS — Oribatida; Galumnidae; Allogalumna; new species; new record; China

INTRODUCTION

The family Galumnidae (Acari: Oribatida) is one of the large groups of oribatid mites. This family includes 34 genera with more than 470 species and 33 subspecies. Allogalumna is a genus of Galumnidae that was proposed by Grandjean (1936) with Galumna alamellae Jacot, 1935 as type species. Currently, it comprises 34 species having a cosmopolitan distribution collectively (data summarized by Subías (2004, updated 2015)).

In the present work, we propose a new species of the genus Allogalumna collected from Qinghai Province (northwest China), based on adult specimens. In the Chinese fauna, this genus is reported for the first time. The main characters of the genus as given in Grandjean (1936), Balogh and Balogh (1992) and Ermilov et al. (2013) includes the following: lamellar lines absent, sublamellar lines developed; notogastral setae represented by 10 (rarely 11) pairs of alveoli or microsetae; notogaster with porose areas, Aa represented by one pair; median pore usually present, represented by one alveolus (in females and males) or rarely absent (in females and males); notogastral tubercles behind level of pteromorphs absent; adanal lyrifissures located nearly to anal aperture; postanal porose area of normal form (not very long, semi-circular); leg tarsi with three claws.

According to characters of the genera Acrogalumna and Allogalumna, we should note that these two genera could be distinguished by presence of median pore or pores in males (if one pore – it is a genus Allogalumna, if several pores – it is a genus Acrogalumna). However the question has not been solved, for example the species having females and
males without median pore should be included in which genus? Until 2013, Ermilov et al. pointed out if males and females have one median pore or not to have median pore absolutely these species should be included in *Allogalumna*. It is logical and correct. Thus, for correct identification of the genera *Allogalumna* and *Acrogalumna* it is necessary to have and females and males of each species.

**MATERIALS AND METHODS**

The collection locality and habitat of the new species are given in the "Material examined" section. Specimens were mounted in lactic acid on temporary cavity slides for measurement and illustration, and then stored in vials in 75 % alcohol. Measurements are presented in micrometers. The body length was measured in lateral view, from the tip of the rostrum to the posterior edge of the ventral plate, to avoid discrepancies caused by different degrees of notogastral distension. Notogastral width refers to the maximum width in dorsal aspect. Lengths of body setae were measured in lateral aspect. 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).

**Scanning Electron Microscope**

Fresh specimens were cleaned with a fine brush in normal saline and placed in 5 % glutaraldehyde for 3 h, and then gently washed three times using phosphate buffer. Specimens were then dehydrated in a graded ethanol series of 70, 75, 80, 85, 90, 95, and 100 % with three changes at each concentration, and 10 min between steps. Finally, samples were placed in fresh 100 % ethanol for 30 min, and then critically point dried in CO$_2$ for 2h. After that, put specimens fixed on sample holder with double faced adhesive tape under TEM, and then dried in Vacuum Turbo Evaporator for 3 – 4h. Specimens were coated film by used rotation gold-plated — palladium alloy membrane with acceleration voltage of 20 keV, observed under the KYKY — 1000B scanning electron microscopy.

**RESULTS**

**Description of species**

*Allogalumna rugata* n. sp.

*(Figures 1-4)*


Measurement — Body length 660 (holotype: female), 650 – 720 (twelve paratypes, eight females, four males); width 460 (holotype), 440 – 475 (twelve paratypes).

Integument — Body colour brown to dark brown. Surface of body smooth, genital plates with dense longitudinal stria.

Prodorsum — Rostrum rounded in dorsal view. Rostral (ro, 40 – 45) and lamellar (le, 30 – 36) setae setiform, smooth; interlamellar (in, 53 – 57) setae setiform, slightly barbed. Bothridial setae (ss, 125 – 130) slenderly setiform, slightly barved distally, pointed distally in lateral view. Exobothridial setae and their alveoli absent. Porose areas Ad small, elongate oval, transversally oriented (8 – 10 × 28 – 32). Sublamellar (S) lines distinct, curving backwards.

FIGURE 1: Allogalumna rugata n. sp. (female): A – dorsal view; B – ventral view (legs not shown). Scale bar 100 μm.
FIGURE 2: *Allogalumna rugata* n. sp. (female): A – dorso-lateral view of prodorsum; B – posterior view of notogaster; C – pteromorph; D – subcapitulum; E – bothridial setae; F – palp; G – chelicera. Scale bar: (A-C) 100 µm, (D-G) 50 µm.
FIGURE 3: *Allogalumna rugata* n. sp. SEM micrographs of adult, macerated in lactic acid, some cero-tegument removed, some of the setae are broken. A – dorsal view; B – ventral view; C – lateral view.
FIGURE 4: Allogalumna rugata n. sp. SEM micrographs of adult, macerated in lactic acid, some cero-tegument removed, some of the setae are broken. A – detail of prodorsum in dorsal view; B – bothridial seta and part of pteromorph; C – inter-lamellar seta; D – adanal seta; E – detail of genital plates; F – detail of anal plates.
Table 1: Leg setation and solenidia of adult Allogalumna rugata n. sp.

<table>
<thead>
<tr>
<th>Leg</th>
<th>Trochanter</th>
<th>Femur</th>
<th>Genu</th>
<th>Tibia</th>
<th>Tarsus</th>
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<tr>
<td>I</td>
<td>(v')</td>
<td>(d, (l), bv'')</td>
<td>(l, v', \sigma)</td>
<td>(l, (v), \varphi_1, \varphi_2)</td>
<td>(ft)) (1-2), (it) (1), (p) (1), (u) (1), (a) (1), (s) (1), (pv) (1), (v'') (1), (l'') (1), (e), (\omega_1), (\omega_2)</td>
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<tr>
<td>II</td>
<td>(v')</td>
<td>(d, (l), bv'')</td>
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<td>(ft)) (1-2), (it) (1), (p) (1), (u) (1), (a) (1), (s) (1), (pv) (1), (\omega_1), (\omega_2)</td>
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<td>III</td>
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<td>(ft') (1-2), (it) (1), (p) (1), (u) (1), (a) (1), (s) (1), (pv)</td>
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Roman letters refer to normal setae (e–famulus), Greek letters refer to solenidia. A prime (′) marks anterolateral setae and a double prime (″) posterolateral setae of the given leg segment. Parentheses refer to a pair of setae.

Gnathosoma — Morphology of subcapitulum, palps and chelicerae typical for Galumnae (Engelbrecht 1972; Ermilov and Anichkin 2011). Subcapitulum wider than long: 124 – 135 × 115 – 125. Hypostomal setae \(a, m, h\) setiform, thin, smooth. \(h\) (35 – 40) longer than \(a\) (28 – 32) and \(m\) (22 – 24). Two pairs of short adoral (5 – 10) setae, setiform, curved. Palp (length 143) with setation of 0-2-1-3-9 (+1 solenidion \(\omega\)). All setae (except on tarsus) barbed. Chelicera (length 183) with few blunt teeth on fixed and movable digits. Cheliceral setae long, setiform, barbed: \(cha\) (56) longer than \(chb\) (35).

Epimeral region — Epimeres smooth. Four pairs of epimeral setae visible ventrally; \(1a, 3a, 3b\) and \(4a\) (18 – 26), thin, smooth. Discidia triangular, circumpedal carinae distinct.

Anogenital region — Six pairs of genital setae present, anterior two setae (\(g1, g2\), 18 – 24) longest; genital and anal plates with densely longitudinal stria. Two pairs of anal (\(an1, an2\) setal alveoli, three pairs of adanal (\(ad1-ad3\), 8 – 16), one pair of aggenital setae (\(ag\)) short, short, thin, smooth. Adanal lyrifissures \(iad\) short, thin, located anterior to adanal setae \(ad3\). Postanal porose area (\(Ap\)) absent.

Legs — Morphology of leg segments, setae and solenidia generally typical for Galumnidae (Engelbrecht 1972; Ermilov & Anichkin 2011). All legs tridactylous, lateral claws slightly thinner than median claw. Formulae 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 as indicated in Table 1.


Etymology — The specific name “rugata” is from Latin, and refers to the stria of the genital plates.

Types deposited — The type specimens are deposited in the Institute of Entomology, Guizhou University, Guiyang, Guizhou, China (GUGC).

Remarks — In having the combination of main morphological characters (bothridial setae setiform, slightly barbed; interlamellar setae setiform, longer than rostral and lamellar setae; anterior notogastrial margin not developed; notogaster with four pairs of rounded porose areas; median pore absent in females and males), Allogalumna rugata n. sp. is similar to Allogalumna ampla Ermilov, 2013 from Ecuador (see Ermilov 2013), however it clearly differs from the latter by the smaller body size (650 – 720 × 440 – 475 versus 448 – 464 × 332 – 365 in A. ampla), interlamellar setae setiform, longer than rostral and lamellar setae (versus represented by alve-
oli or minute in *A. ampla*), numbers of striae on genital plates (versus one longitudinal stria in *A. ampla*) and the absence of postanal porose area (versus present in *A. ampla*).

**ACKNOWLEDGEMENTS**

We would like to express our gratitude to Dr. Lixia Xie (College of Plant Protection, Shandong Agricultural University, Tai’an, Shandong, China) for help with collecting specimens, Dr. Sergey G. Ermilov (Tyumen State University, Tyumen, Russia) for consultations and help with collecting literature, Prof. Jun Chen (Key Laboratory of Zoological Systematics and Evolution, Institute of Zoology, Chinese Academy of Sciences, Beijing, China) for help with collecting literature. This project was supported by the Innovation Team Program for Systematic and Applied Acarology ([2014]33) and the Program of Science and Technology Innovation Talents Team, Guizhou Province (No. 2014001). This project was also supported by a Program of Ministry of Science and Technology of the People’s Republic of China (2015FY210300); the Innovation Team Program for Systematic and Applied Acarology ([2014]33) and the Natural Science Foundation of Guizhou (No. Qian-ke-he [2015]2085)

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