

Two new oribatid mite species with auriculate pteromorphs from Southern Vietnam (Acari: Oribatida: Parakalummidae, Galumnidae)

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Abstract. Two new oribatid mite species, *Neoribates spindleformis* sp. nov. and *Globogalumna biporosa* sp. nov. are described from soil and litter of pine and acacias artificial plantations of Dong Nai Culture and Nature Reserve (Southern Vietnam). First new species differs from all other species of *Neoribates* by combination of the following characters; morphology of sensilli, number of leg claws and genital setae. Second new species differs from type-species of *Globogalumna* by the body surface and number of notogastral porose areas. The genus *Globogalumna* is recorded for the first time from the Oriental region.

Keywords. Oribatid mites, new species, *Neoribates*, *Globogalumna*, Vietnam.

INTRODUCTION

This work is a part of our continuing study of Vietnamese oribatid mite fauna (e.g. Ermilov & Anichkin 2010, 2011a, 2012). The present study is based on material collected during Russian–Vietnamese expedition in June–August 2012. In the course of taxonomic identification of oribatids from Dong Nai Culture and Nature Reserve (Dong Nai Province, Southern Vietnam), we found two new species having auriculate pteromorphs; one belonging to the genus *Neoribates* Berlese, 1914 (Parakalummidae) and the other to *Globogalumna* Balogh & Balogh, 1990 (Galumnidae).

Neoribates was proposed by Berlese (1914) with *Oribata roubali* Berlese, 1910 as the type species. Currently, this genus comprises 42 species and one subspecies and has a cosmopolitan distribution (Subías 2004, online version 2012). Earlier, two species of this genus were recorded from Vietnam (Krivolutsky *et al.* 1997): *N. aurantiacus* (Oudemans, 1914) and *N. jacoti* (Balogh & Mahunka, 1967).

Globogalumna was proposed by Balogh & Balogh (1990) with *Allogalumna globulifera* (Balogh & Mahunka, 1978) as the type species. Currently, this genus comprises only the type species, which is distributed in Brazil (Subías 2004, online version 2012). Hence, the new species is the first member of *Globogalumna* recorded for the Oriental region.

MATERIAL AND METHODS

The collection locality and habitat of the new species are given in the "Material examined" sections. Specimens were studied in lactic acid, mounted on temporary cavity slides for the duration of the study, then stored in vials in 70% alcohol. All body measurements are presented in micrometers (µm). 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. General terminology used in this paper follows that of Norton & Behan-Pelletier (2009). Formulae for leg setation

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are given in parentheses according to the sequence trochanter–femur–genu–tibia–tarsus (femulus included). Formulae for leg solenidia are given in square brackets according to the sequence genu–tibia–tarsus.

TAXONOMY

Neoribates spindleformis sp. nov.

(Figures 1–9)

Diagnosis. Body size 481–498 × 332–348. Body surface smooth. Rostral, lamellar and interlamellar setae long. Sensilli spindle-form. Four pairs of genital setae. Leg tarsi I with one claw, leg tarsi II–IV with two claws.

Material examined. The holotype (male) and three paratypes (males) have the following collection data: Southern Vietnam, Dong Nai Province, Dong Nai Culture and Nature Reserve, 11°16', E 107°4', pine needles, branches and cones processed with sifter from pine artificial plantation (*Pinus kesiya* Royle ex Gordon), July 2012, collected by A.E. Anichkin and S.G. Ermilov.

Measurements. Body length: 498 (holotype), 481 (two paratypes), 498 (one paratype). Body width: 348 (holotype), 332 (one paratype), 348 (two paratypes).

Integument (Fig. 1). Body color brown. Body surface smooth. Anterolateral parts of notogaster with radiate impressions. Pteromorphs with thin wrinkles.

Prodorsum (Figs. 1, 2, 4). Rostrum protruding, rounded in dorsal view. Rostral (*ro*, 69–77), lamellar (*le*, 110–114), interlamellar (*in*, 135–143) and exobothridial (*ex*, 8–12) setae setiform, slightly or indistinctly barbed. Sensilli (*ss*, 131–151) spindle-form, smooth or indistinctly barbed, with well developed stalk (69–82), oblong head (20–28) and thin apex (28–41). Porose areas *Ad* absent. Lamellae (*Lam*) thin.

Notogaster (Figs. 1, 4, 5). Anterior notogastral margin present, convex. Notogastral setae represented by 10 pairs of alveoli. Four pairs of sacculi

(*Sa*, *S1–S3*) and all lyrifissures located typical for genus. Median pore absent.

Gnathosoma. Morphology typical for *Neoribates* (e.g. Travé 1972, Grishina & Vladimirova 2009, Nakamura, 2009).

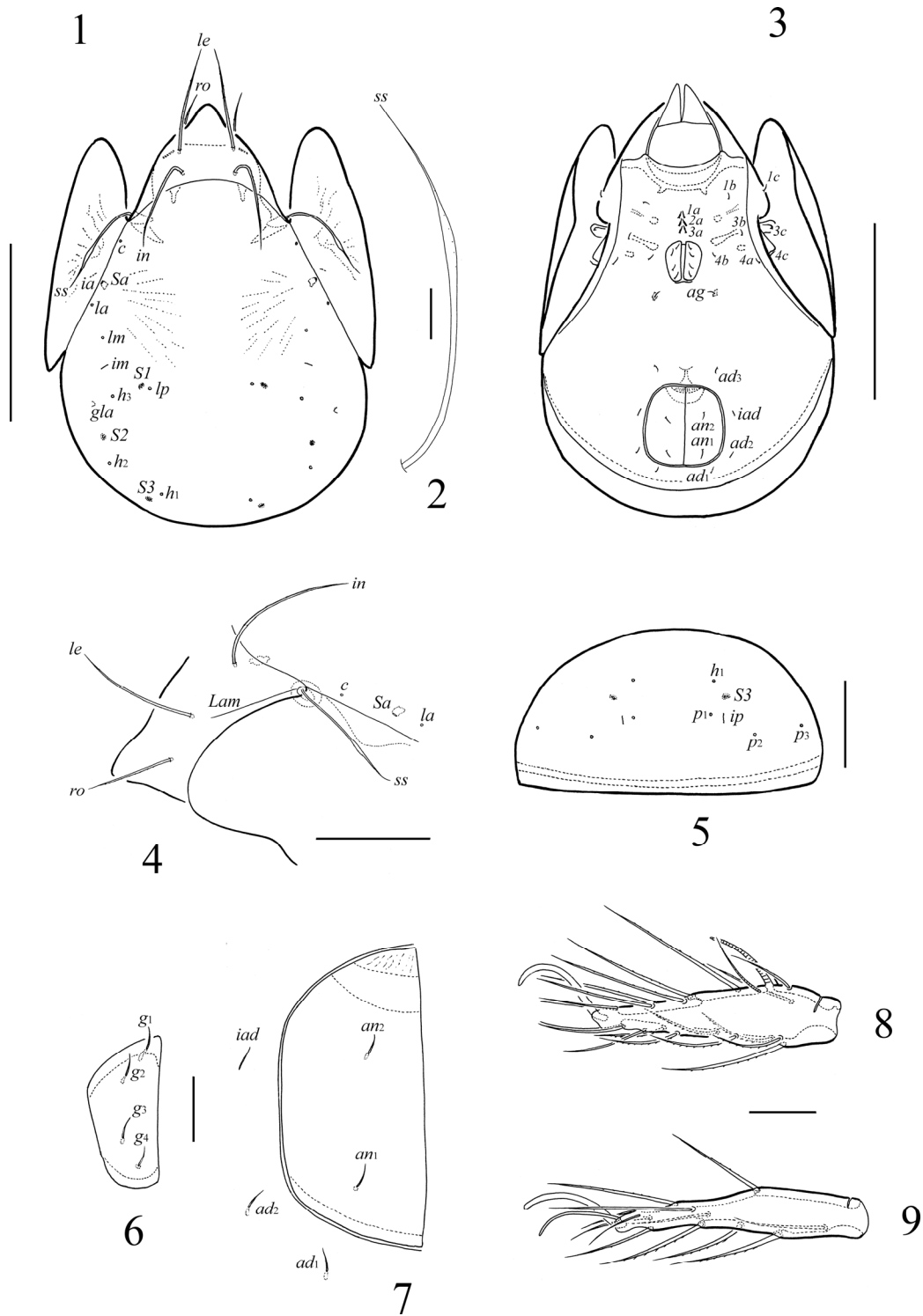
Epimeral region (Fig. 3). Apodemes 1, 2, sejugal and 3 well visible. Epimeral setal formula: 3–1–3–3. All setae setiform. Centroepimeral setae *1a*, *2a*, *3a* (12–20) straight, thicker and more strongly barbed than others. Setae *3c* inserted on pedotectae II, longest (24), slightly barbed. Setae *1b*, *1c*, *3b*, *4a*, *4b*, *4c* short (4–8), thin.

Anogenital region (Figs. 3, 6, 7). Four pairs of genital (*g*_{1–g}₄, 8–10), one pair of aggenital (*ag*, 8–10), three pairs of adanal (*ad*_{1–ad}₃, 10–12) and two pairs of anal (*an*₁, *an*₂, 8) setae thin and smooth. Aggenital setae inserted on rhombus-like cuticular structures. Lyrifissures *iad* located in inverse apoanal position. Adanal setae *ad*₃ inserted preanally. Postanal porose area absent.

Legs (Figs. 8, 9). Morphology of leg segments, setae and solenidia typical for *Neoribates* (e.g. Travé 1972, Grishina & Vladimirova 2009, Nakamura 2009). Leg tarsi I with one claw, leg tarsi II–IV with two claws (one thicker than the other). Formulae of leg setation and solenidia: I (1–5–3–4–20) [1–2–2], II (1–5–3–4–15) [1–1–2], III (2–3–1–3–15) [1–1–0], IV (1–2–2–4–12) [0–0–0]; homology of setae and solenidia indicated in Table 1.

Comparative analysis. In general morphology (medium body size; spindle-form sensilli; long rostral, lamellar and interlamellar setae; short openings of notogastral sacculi) *Neoribates spindleformis* sp. nov. is most similar to *Neoribates gracilis* Travé, 1972 from Southern Europe, but it clearly differs from the latter by the following characters: sensilli with longer apex (versus shorter in *N. gracilis*); leg tarsi I with one claw, leg tarsi II–IV with two claws (versus all leg tarsi with three claws in *N. gracilis*); genital plates with four pairs of genital setae (versus five pairs in *N. gracilis*).

Type deposition. The holotype is deposited in the collection of the Zoological Institute of the Russian Academy of Sciences, St. Petersburg,



Figures 1–9. *Neoribates spindleformis* sp. nov. 1 = dorsal view of body, 2 = sensillus, 3 = ventral view of body, legs, palps and subcapitular setae not shown, 4 = lateral view of prodorsum, exobothridial seta not shown, 5 = posterior view of notogaster, 6 = right genital plate, 7 = right anal plate with adanal setae ad_1 , ad_2 and lyrifissure iad , 8 = left leg tarsus I, antiaxial view, 9 = right leg tarsus IV, antiaxial view. Scale bars (1, 3) 200 μm , (2, 6–9) 20 μm , (4, 5) 100 μm .

Russia; two paratypes are deposited in the collection of Siberian Zoological Museum Novosibirsk, Russia; one paratype is in the collection of the first author.

Etymology. The specific name “*spindleformis*” refers to the morphology of sensilli (spindle-form).

***Globogalumna biporosa* sp. nov.**

(Figures 10–18)

Diagnosis. Body size 250 × 159–164. Body surface with granular cerotegument. Notogaster characteristically ornamentation by a thickened longitudinal line with thin lateral branches. Rostral and lamellar setae short. Interlamellar setae represented by alveoli. Sensilli clavate, with spines bilaterally. Two pairs of porose areas (*Aa*, *Al*) developed. Median pore and postanal porose area present.

Material examined. Holotype (female) and paratype (female) have the following collection data: Southern Vietnam, Dong Nai Province, Dong Nai Culture-Nature Reserve, 11°18', E 107° 3', soil from acacias artificial plantation (*Acacia auriculiformis* A.Cunn. ex Benth), July 2012, collected by A.E. Anichkin and S.G. Ermilov.

Measurements. Body length: 250 (holotype and paratype). Body width: 164 (holotype), 159 (paratype).

Integument (Figs. 10, 12–14). Body color brown. Body surface covered by granular cerotegument; granules very small (up to 1). Centro-anterior part of notogaster with specific ornamentation: thickened longitudinal line with thin lateral branches.

Prodorsum (Figs. 10, 11, 13, 15). Rostrum rounded in dorsal view. Rostral and lamellar setae similar in length (6–8), setiform, thin and smooth. Interlamellar setae absent, represented only by alveoli. Sensilli (36–40) with well developed stalk (16) and head (20–24). Sensillar head is oblong disk-like, with strong spines bilaterally. Porose areas *Ad* not evident. Sublamellar line (*S*) poorly visible.

Notogaster (Figs. 10, 14, 16). Anterior notogastral margin present, straight. Notogastral setae

represented by 10 pairs of alveoli. Only two pairs of porose areas visible: *Aa* (6–8) and *Al* (3–4). All lyrifissures located as typical for majority of Galumnidae. Median pore (*mp*) large, inserted little below of level the localization of porose areas *Al*.

Gnathosoma. Morphology typical for Galumnidae (e.g. Engelbrecht 1972, Ermilov & Anichkin 2010, 2011b).

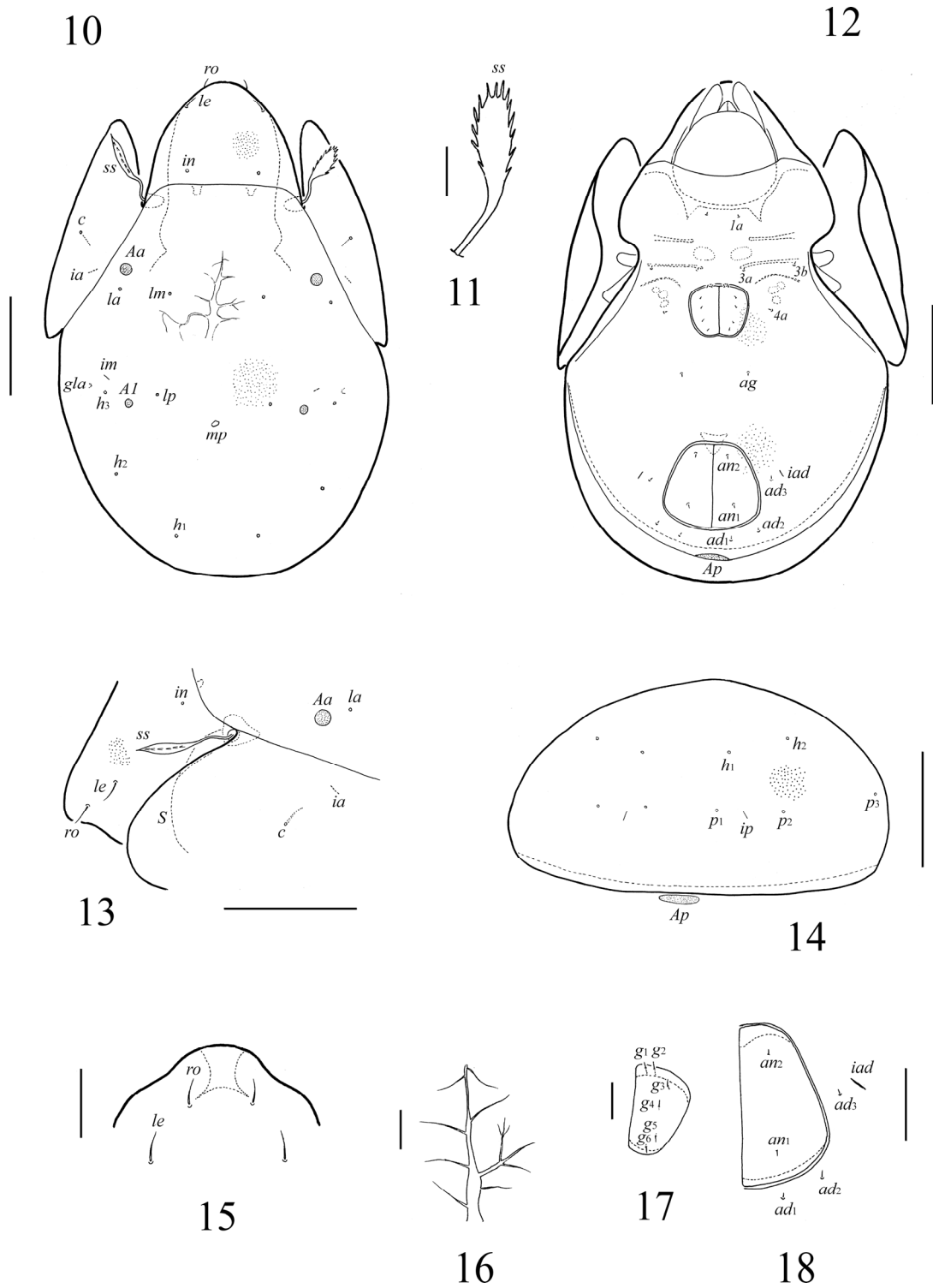
Epimeral region (Fig. 12). Apodemes 1, 2, sejugal and 3 well visible. Epimeral setal formula: 1–0–2–1. All setae minute (1–2), thin.

Anogenital region (Figs. 12, 17, 18). Six pairs of genital, one pair of aggenital, three pairs of adanal and two pairs of anal setae similar, minute (1–2), thin. Postanal porose area oval (12 × 4).

Legs. Morphology of leg segments, setae and solenidia typical for Galumnidae (e.g. Engelbrecht 1972, Ermilov & Anichkin 2010, 2011b). Leg heterotridactylous. 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 indicated in Table 2.

Comparative analysis. *Globogalumna biporosa* sp. nov. is clearly differs from the type-species, *G. globulifera* by the presence of specific ornamentation on notogaster (absent in *G. globulifera*), presence only of two pairs of notogastral porose areas (four pairs in *G. globulifera*), absence transverse line anteriorly to interlamellar setae (present in *G. globulifera*).

Also, in having the combination of specific notogastral ornament and clavate sensilli, *Globogalumna biporosa* sp. nov. is similar to *Allogalumna congoensis* (Starý, 2005) from the Ethiopian region, *Allogalumna exigua* Popp, 1960 from Egypt, *Allogalumna gedaii* Mahunka, 1995 from Thailand and *Allogalumna pellucida* (Wallwork, 1965) also from the Ethiopian region, but it differs from these listed species by the localization of lyrifissures *iad* (far from anal plates in *G. biporosa* sp. nov. versus close to anal plates in the other species), presence of two pairs of notogastral porose areas (versus three to four in the other species) and sensillar head with strong spines (versus with cilia or barbs in the other species).



Figures 10–18. *Globogalumna biporosa* sp. nov. 10 = dorsal view of body, 11 = sensillus, 12 = ventral view of body, legs, palps and subcapitular setae not shown, 13 = lateral view of prodorsum, 14 = posterior view of notogaster, 15 = dorso-anterior view of rostrum, 16 = notogastral ornament, 17 = left genital plate, 18 = left anal plate with adanal setae and lyrifissure *iad*. Scale bars (10, 12–14) 50 μ m, (11, 16, 17) 10 μ m, (15, 18) 20 μ m.

Table 1. Leg setation and solenidia of *Neoribates spindleformis* sp. nov.

Leg	Trochanter	Femur	Genu	Tibia	Tarsus
I	v'	d, (l), bv'', v''	(l), v', σ	(l), (v), φ ₁ , φ ₂	(ft), (tc), (it), (p), (u), (a), s, (pv), v', (pl), l'', e, ω ₁ , ω ₂
II	v'	d, (l), bv'', v''	(l), v', σ	(l), (v), φ	(ft), (tc), (it), (p), (u), (a), s, (pv), ω ₁ , ω ₂
III	l', v'	d, l', ev'	l', σ	l', (v), φ	(ft), (tc), (it), (p), (u), (a), s, (pv)
IV	v'	d, ev'	d, l'	d, l', (v)	ft'', (tc), (p), (u), (a), s, (pv)

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.

Table 2. Leg setation and solenidia of *Globogalumna biporosa* sp. nov.

Leg	Trochanter	Femur	Genu	Tibia	Tarsus
I	v'	d, (l), bv''	(l), v', σ	(l), (v), φ ₁ , φ ₂	(ft), (tc), (it), (p), (u), (a), s, (pv), v', (pl), l'', e, 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'	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)

See Table 1 for explanations.

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

Etymology. The specific name “*biporosa*” refers to the presence of only two pairs of notogastral porose areas.

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