

TWO NEW SPECIES OF GALUMNIDAE (ACARI, ORIBATIDA) FROM MOZAMBIQUE

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Two new species of the family Galumnidae are described from soil-litter in the riverine forest of Gorongosa National Park (Central Mozambique). *Allogalumna mozambiquensis* Ermilov **sp. n.** differs from all species of the genus by the morphology of bothridial seta (with the head having a long setiform tip). *Neoctenogalumna gorongosaensis* Ermilov **sp. n.** is similar to *N. congoensis* in the bothridial seta with developed head, specific notogastral ornamentation and narrowly elongate postanal porose area, but differs from the latter by the smaller body size, heavily ciliate bothridial seta and diagonal position of adanal lyrifissure.

Key words: galumnid mites, taxonomy, morphology, Afrotropical region, new species, Galumnidae.

INTRODUCTION

The Mozambican oribatid mite (Acari, Oribatida) fauna almost unknown; only a few marine associated species were registered (MARSHALL & PUGH 2000, 2002). During taxonomic identification of representatives of the family Galumnidae collected from Gorongosa National Park (Central Mozambique), we found two new species belonging to the genera *Allogalumna* Grandjean, 1936 and *Neoctenogalumna* Ermilov, Starý, Sandmann, Marian et Maraun, 2013. The primary goal of our paper is to describe and illustrate these new species.

Allogalumna was proposed by GRANDJEAN (1936) with *Galumna alamellae* Jacot, 1935 as type species. At present, the genus comprises two subgenera and more than 50 species, having a cosmopolitan distribution (ERMILOV & KLIMOV 2017). Identification keys to some species of *Allogalumna* are given by BALOGH and BALOGH (2002), AKRAMI (2015), ERMILOV and STARÝ (2020). *Neoctenogalumna* was proposed by ERMILOV *et al.* (2013) with *Ctenogalumna moresonensis* Engelbrecht, 1972 as type species. The genus comprises two subgenera and three species distributed in the Ethiopian and Neotropical regions (ERMILOV & KLIMOV 2017). An identification key to all species of *Neoctenogalumna* is given by ERMILOV *et al.* (2013). The generic and subgeneric diagnoses of *Allogalumna* and *Neoctenogalumna* were summarized by ERMILOV and KLIMOV (2017).

MATERIAL AND METHODS

Specimens. Substrate samples containing oribatid mites were collected by hand method in the Gorongosa National Park (4000 km²), which is located in the southern end of the Great African Rift Valley in central Mozambique, Southeast Africa. Mites were extracted from samples into 75% ethanol using Berlese's funnels with electric lamps (25 W) in laboratory conditions for six days.

Specimens are deposited in two institutions: the Senckenberg Museum of Natural History, Görlitz, Germany (SMNH); and the Tyumen State University Museum of Zoology, Tyumen, Russia (TSUMZ).

Observation and documentation. 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 notogaster. Notogastral width refers to the maximum width of the notogaster in dorsal view (behind pteromorph). Lengths of body setae were measured in the lateral aspect. All body measurements are presented in micrometres. 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. Drawings were made with a camera lucida using a Leica transmission light microscope "Leica DM 2500".

Terminology. Morphological terminology used in this paper follows that of Grandjean (see ERMILOV & KLIMOV 2017 for review and application).

Abbreviations. *Prodorsum*: *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* = dorsosejugal porose area; *D* = dorsophragma; *P* = pleurophragma. *Notogaster*: *so* = specific ornamentation; *c*, *la*, *lm*, *lp*, *h*, *p* = notogastral setae/alveoli; *Aa*, *A1*, *A2*, *A3* = notogastral porose areas; *mp* = median pore; *ia*, *im*, *ip*, *ih*, *ips* = lyrifissures; *gla* = opisthonotal gland opening. *Gnathosoma*: *a*, *m*, *h* = subcapitular setae; *or* = adoral seta; *sup*, *inf*, *d*, *l*, *cm*, *acm*, *ul*, *su*, *vt*, *lt* = palp setae; ω = palp solenidium; *as* = axillary sacculae; *cha*, *chb* = cheliceral setae; *Tg* = Trägårdh's organ. *Epimeral and lateral podosomal regions*: *1a*, *3b*, *4a*, *4b* = epimeral setae; *PdI*, *PdII* = pedotecta I, II, respectively; *dis* = discidium; *cpc* = circumpedal carina. *Anogenital region*: *g*, *ag*, *an*, *ad* = genital, aggenital, anal, and adanal setae, respectively; *iad* = adanal lyrifissure; *Ap* = postanal porose area; *po* = preanal organ. *Legs*: *Tr*, *Fe*, *Ge*, *Ti*, *Ta* = leg trochanter, femur, genu, tibia, and tarsus, respectively; ω , ϕ , σ = leg solenidia; ε = leg famulus; *d*, *l*, *v*, *bv*, *ev*, *ft*, *tc*, *it*, *p*, *u*, *a*, *s*, *pv*, *pl* = leg setae; *pa* = porose area.

TAXONOMY

Family Galumnidae

Genus *Allogalumna* Grandjean, 1936

Type species: *Galumna alamellae* Jacot, 1935

***Allogalumna (Allogalumna) mozambiquensis* Ermilov sp. n.** (Figs 1–3)

Diagnosis. Body size: 315–332 × 249–257. Rostral seta of medium length, lamellar seta short, both setiform, roughened. Interlamellar seta minute. Bothridial seta long, with unilaterally dilated head having some cilia and well de-

veloped apical setiform tip. Dorsosejugal and postanal porose areas elongate oval. Dorsosejugal suture interrupted medially. Four pairs of porose areas developed, *Aa* transversely elongate triangular, *A1* rounded, *A2* and *A3* elongate oval. Median pore present. Epimeral and anogenital setae short, setiform, roughened. Circumpedal carina absent. Solenidion on tibia IV inserted in the middle part of the segment.

Description of adult. Measurements. Body length: 315 (holotype: male), 315–332 (four paratypes, four males); notogaster width: 249 (holotype), 249–257 (four paratypes).

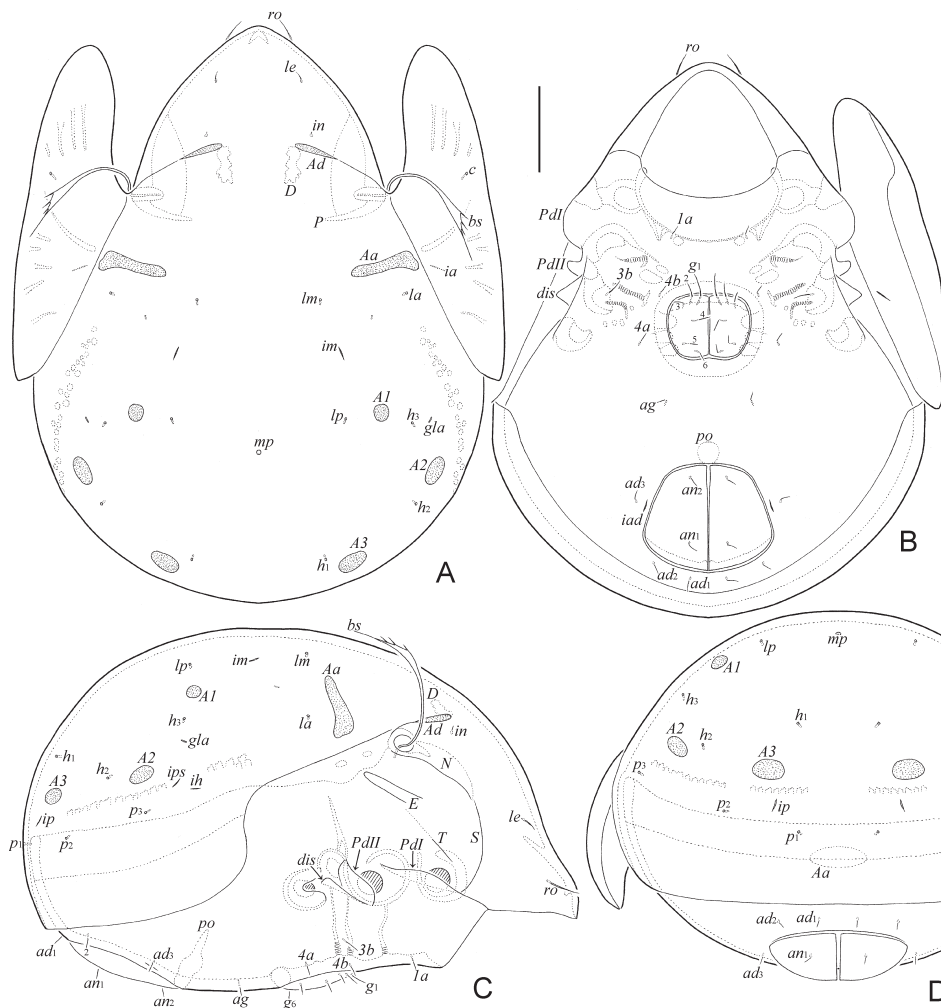


Fig. 1. *Allogalumna mozambiquensis* Ermilov sp. n., adult: A = dorsal view, B = ventral view (gnathosoma, legs and right pteromorph not shown), C = lateral view (gnathosoma, legs and pteromorph not shown), D = posterior view. Scale bar: 50 μ m

Integument. Body color light brown. Body surface microporose (visible under high magnification in dissected specimens, $\times 1000$). Leg femora I–IV and trochanters III, IV partially tuberculate.

Prodorsum (Fig. 1A, C). Rostrum rounded. Lateral structure *N* and ridges *E*, *T* well visible. Rostral (18–20) and lamellar (6–8) setae setiform, roughened; *ro* thicker than *le*. Interlamellar seta (2) setiform, thin, smooth. Bothridial seta (73–77) with longer stalk and shorter, elongate, unilaterally dilated head having three or four cilia and well developed apical setiform tip. Dorsosejugal porose area elongate oval (22–24 \times 6–8), transversely oriented, located posterior to interlamellar seta. Dorsophragma distinctly elongated longitudinally.

Notogaster (Fig. 1A, C, D). Dorsosejugal suture interrupted medially. Ten pairs of setal alveoli present. Four pairs of porose areas developed: *A1* transversely elongate triangular (length 10–14); *A1* rounded (12–16); *A2* and *A3* elongate oval (16–20 \times 12). Porose area *Aa* located close to pteromorphal hinge, anterior to setal alveolus *la*. Median pore represented by one fovea located posterior to virtual line connected porose areas *A1*. Opisthonthal gland opening and all lyrifissures distinct: *gla* located lateral to *A1* and removed from it; *im* between *lm* and *A1* (equal removed from them); *ip* posterior to *A3*; *ih* and *ips* close to each other, anterior to *p*₃ and removed from it.

Gnathosoma (Fig. 2A–C). Size of subcapitulum: 86–90 \times 73–77. Subcapitular setae (*a*: 14–16; *m*: 12–14; *h*: 6–8) setiform, slightly barbed; *h* thinnest. Adoral seta (10–12) setiform, barbed. Length of chelicera: 102–106. Cheliceral setae (*cha*: 36–38; *chb*: 20–24) setiform, barbed. Length of palp: 65–69. Postpalpal seta (4) spiniform, smooth.

Epimeral and lateral podosomal regions (Fig. 1B, C). Epimeral setal formula: 1–0–1–2. Setae (*3b*: 8–10; *1a*, *4a*, *4b*: 4) setiform, thin, roughened. Pedotectum II rounded in ventral aspect. Discidium triangular. Circumpedial carina completely absent.

Anogenital region (Fig. 1B–D). Genital (*g*₁: 10–12; *g*₂: 8; *g*₃–*g*₆: 4), aggenital (4), anal (4), and adanal (4) setae setiform, thin, roughened. Anterior edge of genital plate with three setae. Aggenital seta located between genital and anal apertures, slightly closer to the former. Adanal lyrifissure located close and parallel to anal plate. Adanal setae *ad*₁ and *ad*₂ posterior, *ad*₃ lateral to anal plate and *iad*. Distance *ad*₁–*ad*₂ shorter than *ad*₂–*ad*₃. Unpaired postanal porose area elongate oval (24–28 \times 12).

Legs (Figs 2D, 3A–C). Median claw distinctly thicker than lateral claws, 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. Famulus of tarsus I mini-stickform, slightly swollen and blunt-ended apically, inserted anterior to solenidion ω ₁. Seta *s* of tarsus I eupathidial, located before setae *a*. Solenidia ω ₁ and ω ₂ on tarsus II and σ on genu III bacilliform, other solenidia setiform. Solenidion on tibia IV inserted in the middle part of the segment.

Material examined. Holotype (male) and four paratypes (four males): Mozambique, 18°29'00.1"S; 34°02'34.6"E, Sofala Province, Gorongosa District, Gorongosa National Park, 842 m a.s.l., soil-litter in riverine forest near Murombodzi Waterfall, 14.05.2019 (collected by Marek Bąkowski).

Type deposition. The holotype is deposited in the collection of the SMNH; four paratypes are deposited in the collection of the TSUMZ. All specimens are preserved in 70% solution of ethanol with a drop of glycerol.

Etymology. The specific name *mozambiquensis* refers to the country of origin, Mozambique.

Remarks. *Allogalumna mozambiquensis* Ermilov **sp. n.** differs from all species of the subgenus (and genus) by the bothridial seta with head having long setiform tip (versus setiform tip absent).

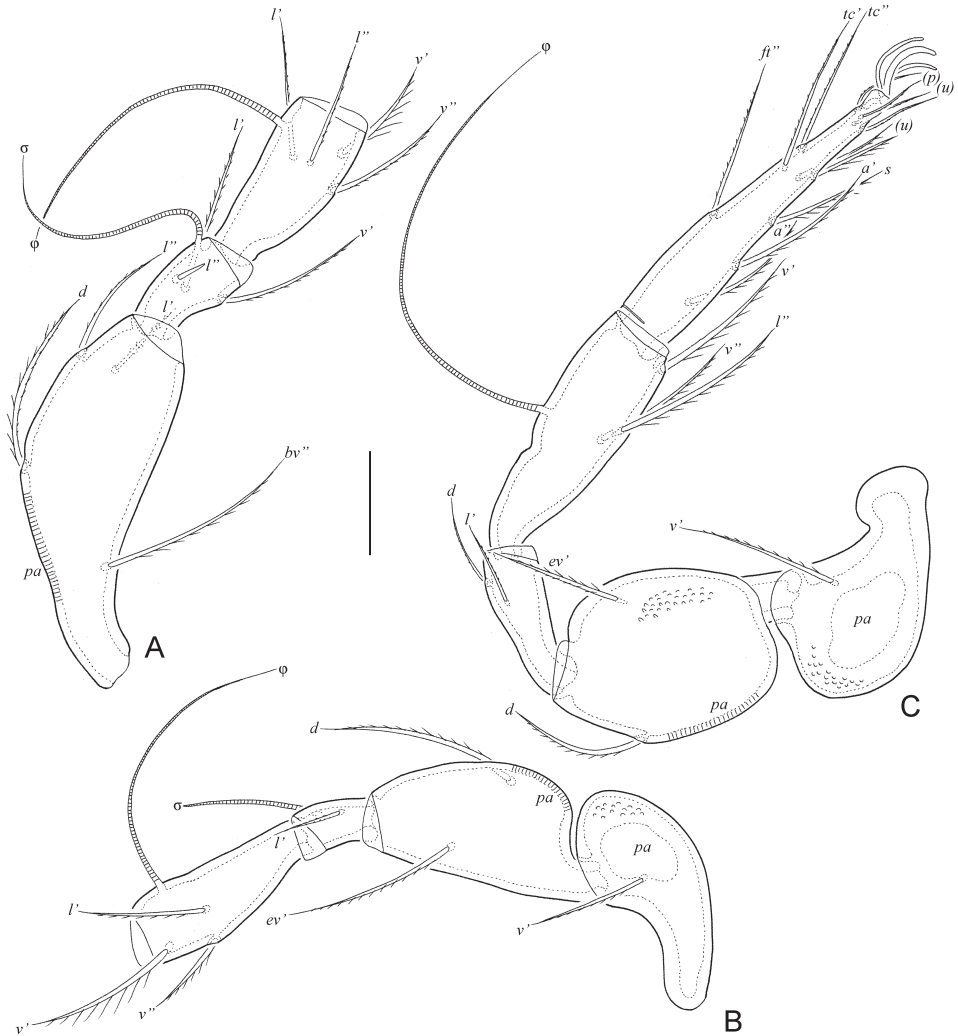


Fig. 3. *Allogalumna mozambiquensis* Ermilov **sp. n.**, adult: A = leg II, without trochanter and tarsus, right, antiaxial view, B = leg III, without tarsus, right, antiaxial view, C = leg IV, left, antiaxial view. Scale bar: 20 μ m

Genus *Neoctenogalumna*

Ermilov, Starý, Sandmann, Marian et Maraun, 2013

Type species: *Ctenogalumna moresonensis* Engelbrecht, 1972***Neoctenogalumna (Neoctenogalumna) gorongosaensis* Ermilov sp. n.**
(Figs 4–6)

Diagnosis. Body size: 298–332 × 190–207. Rostral and lamellar setae of medium length, setiform, roughened. Interlamellar seta minute. Bothridial seta clavate, heavily ciliate. Dorsosejugal porose area absent. Dorsosejugal suture slightly concave medially. Notogaster with specific ornamentation. Three pairs of rounded porose areas developed, *A2* not observed. Median pore present. Epimeral and anogenital setae short, setiform, roughened. Circumpedal carina present. Postanal porose area narrowly elongate oval. Solenidion on tibia IV inserted in anterior part of the segment.

Description of adult. Measurements. Body length: 315 (holotype: female), 298–332 (paratypes: one male and three females); notogaster width: 199 (holotype), 190–207 (four paratypes).

Integument. Body color light brown. Body surface microgranulate (visible under high magnification in dissected specimens, × 1000). Pteromorph partially slightly striate. Leg femora I–IV and trochanters III, IV partially tuberculate and striate.

Prodorsum (Fig. 4A, C). Rostrum rounded. Lateral structure *N* and ridges *E*, *T* well visible. Rostral and lamellar setae (14–16) setiform, roughened. Interlamellar seta (2) setiform, thin, smooth. Bothridial seta (45–49) with longer stalk and shorter, clavate head having numerous cilia. Dorsosejugal porose area absent. Dorsophragma distinctly elongated longitudinally.

Notogaster (Fig. 4A, C, D). Dorsosejugal suture complete, slightly concave medially. Anterior part of notogaster with slight median specific ornamentation represented by longitudinal ridge and some lateral branches. Ten pairs of short (2), setiform, thin, smooth setae present. Three pairs of rounded porose areas developed (10–12); *A2* not observed. Porose area *Aa* located close to pteromorph hinge, anterior to seta *la*. Median pore represented by one fovea located posterior to virtual line connected porose areas *A1*. Opisthonotal gland opening and all lyrifissures distinct: *gla* and *im* located close to each other, anterolateral to *A1* and removed from it; *ip* between *p*₁ and *p*₂; *ih* and *ips* close to each other, anteromedial to *p*₃ and removed from it.

Gnathosoma (Fig. 5A–C). Size of subcapitulum: 73–77 × 65–69. Subcapitular setae (*a*: 14–16; *m*: 10–12; *h*: 6) setiform, roughened; *h* thinnest. Adoral seta (10–12) setiform, barbed. Length of chelicera: 86–90. Cheliceral setae (*cha*: 30–32; *chb*: 18–20) setiform, barbed. Length of palp: 53–57. Postpalpal seta (4) spiniform, smooth.

Epimeral and lateral podosomal regions (Fig. 4B, C). Epimeral setal formula: 1–0–1–2. Setae (*3b*: 8; *1a*, *4a*, *4b*: 4) setiform, thin, smooth. Pedotectum II rounded in ventral aspect. Discidium triangular. Circumpedal carina of medium length, directed to insertion of *3b*, but distinctly no reaching of it.

Anogenital region (Fig. 4B–D). Genital, aggenital, anal, and adanal setae (4) setiform, thin, smooth. Anterior edge of genital plate with two setae. Aggenital seta located between genital and anal apertures, equal removed from them. Adanal lyrifissure located close and diagonal to anal plate. Adanal setae ad_1 and ad_2 posterior, ad_3 lateral to anal plate and posterior to iad . Distance ad_1 – ad_2 slightly shorter than ad_2 – ad_3 . Unpaired postanal porose area narrowly elongate oval (32×8).

Legs (Figs 5D, 6A–C). Median claw distinctly thicker than lateral claws, 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],

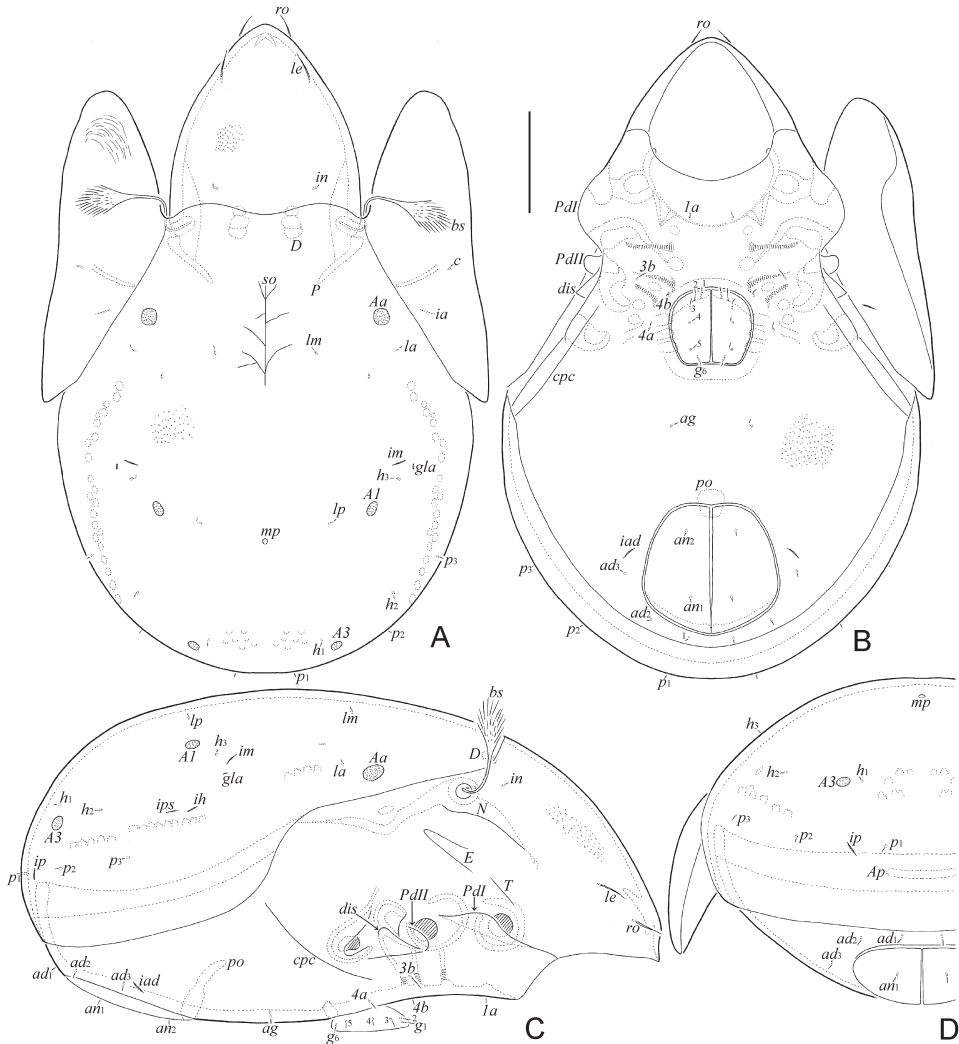


Fig. 4. *Neoctenogalumna gorongosaensis* Ermilov sp. n., adult: A = dorsal view, B = ventral view (gnathosoma, legs and right pteromorph not shown), C = lateral view (gnathosoma, legs and pteromorph not shown), D = posterior view. Scale bar: 50 μ m

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. Famulus of tarsus I mini-stickform, slightly swollen and blunt-ended apically, inserted between solenidia ω_1 and ω_2 . Seta *s* of tarsus I eupathidial, located before

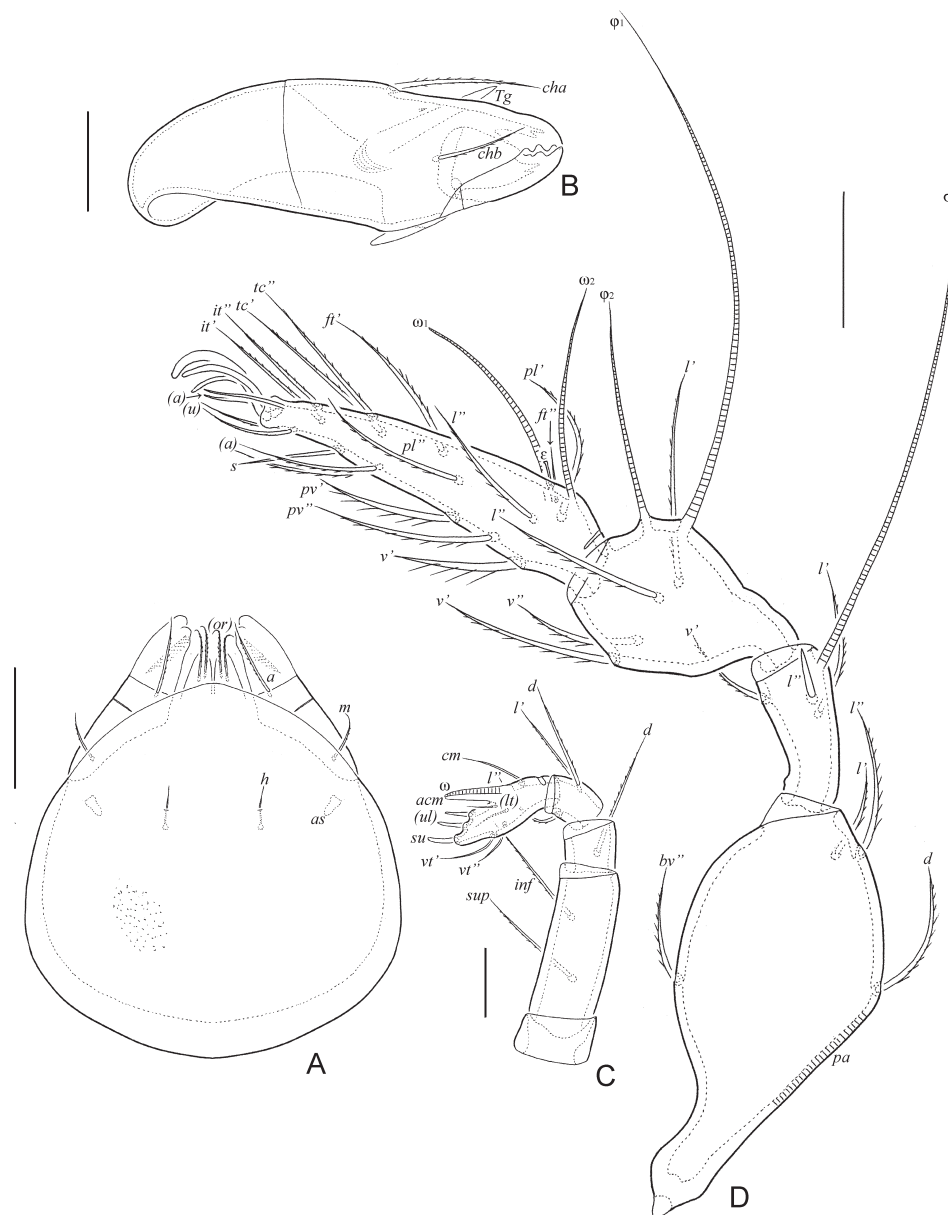


Fig. 5. *Neoctenogalumna gorongosaensis* Ermilov **sp. n.**, adult: A = subcapitulum, ventral view, B = chelicera, right, antiaxial view, C = palp, right, paraxial view, D – leg I, without trochanter, left, antiaxial view. Scale bar: 20 μm (A, B, D), 10 μm (C)

setae *a*. Solenidia ω_1 on tarsus I, ω_1 and ω_2 on tarsus II and σ on genu III bacilliform, other solenidia setiform. Solenidion on tibia IV inserted in anterior part of the segment.

Material examined. Holotype (female) and four paratypes (one male and three females): Mozambique, 18°29'00.1"S; 34°02'34.6"E, Sofala Province, Gorongosa District, Gorongosa National Park, 842 m a.s.l., soil-litter in riverine forest near Murombodzi Waterfall, 14.05.2019 (collected by Marek Bąkowski).

Type deposition. The holotype is deposited in the collection of the SMNH; four paratypes are deposited in the collection of the TSUMZ. All specimens are preserved in 70% solution of ethanol with a drop of glycerol.

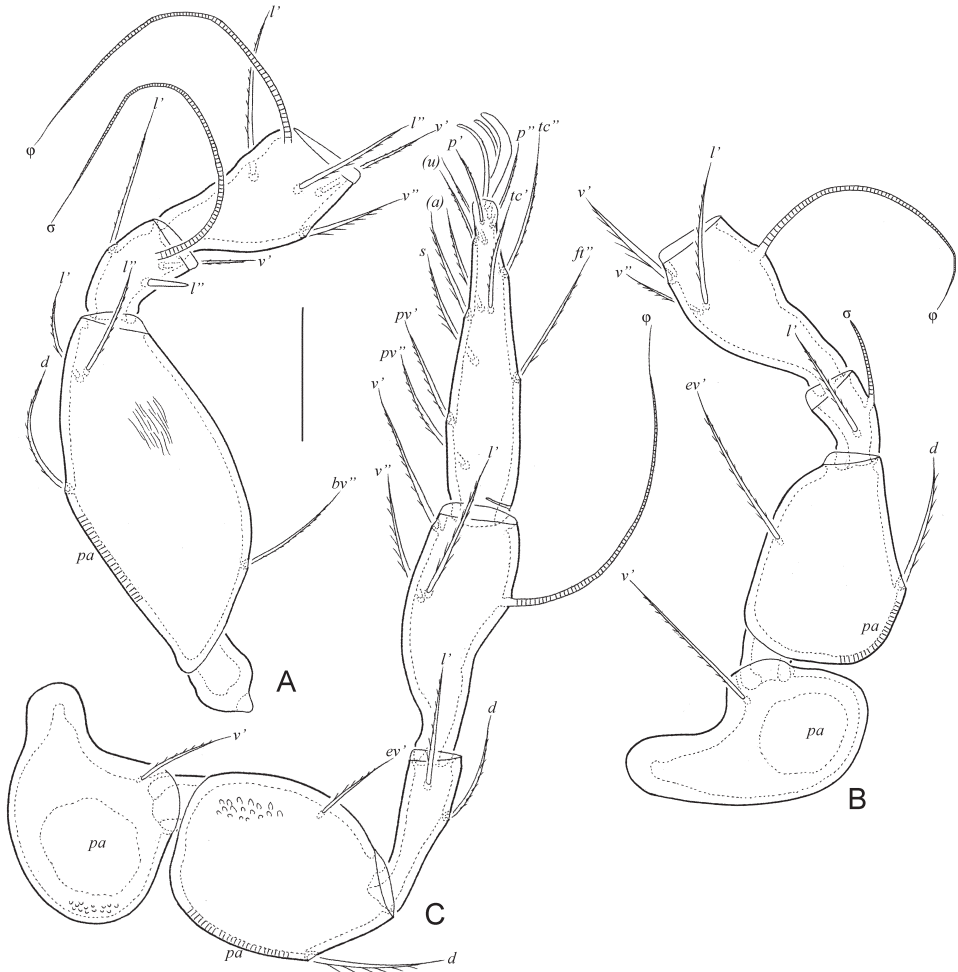


Fig. 6. *Neostenogalumna gorongosaensis* Ermilov **sp. n.**, adult: A = leg II, without trochanter and tarsus, right, antiaxial view, B = leg III, without tarsus, right, antiaxial view, C = leg IV, left, antiaxial view. Scale bar: 20 μ m

Table 1. Leg setation and solenidia of adult *Allogalumna mozambiquensis* Ermilov sp. n. and *Neoctenogalumna gorongosaensis* Ermilov sp. n.

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>f''</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

Etymology. The specific name *gorongosaensis* refers to the place of origin, Gorongosa National Park.

Remarks. *Neoctenogalumna gorongosaensis* Ermilov sp. n. is morphologically most similar to *N. congoensis* (Starý, 2005) in the bothridial seta with developed head, specific notogastral ornamentation and narrowly elongate postanal porose area, but differs from the latter by the smaller body size (298–332 × 190–207 versus 388–403 × 232–245), heavily ciliate bothridial seta (versus bothridial seta barbed) and diagonal position of adanal lyrifissure (versus *iad* longitudinal).

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Acknowledgements – The research carried out by the junior author in Gorongosa National Park was made possible through the financial support received from the Gorongosa Restoration Project and the logistical support provided by Dr. Piotr Naskręcki. Our special thanks go to Dr. Marc Stalmans for granting us research permits and for his extensive assistance provided during visits to GNP; and two anonymous reviewers for their valuable comments. Official permits to collect and transport invertebrates from Mozambique were prepared by E. O. Wilson Biodiversity Laboratory, Chitengo, GNP, 19/2019. This research was partially supported by a grant from the Russian Science Foundation, project No. 19-14-00004, to P. B. Klimov.

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Received February 11, 2021, accepted May 9, 2021, published August 16, 2021