



# Oribatid mites (Acari, Oribatida) from the Oumé region (Côte d'Ivoire): list of taxa, new findings, description of a new species

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## Abstract

The present study is based on oribatid mite material (Acari, Oribatida) collected from the Oumé region (Côte d'Ivoire, West Africa) in 2007. A list of identified taxa, including 67 species from 50 genera and 31 families, is presented; all species, genera and families are registered in this country for the first time; *Kalloia simpliseta*, *Scheloribates latoincisus* and *Pergalumna paraelongata* are recorded in the Ethiopian region for the first time. One new species of the genus *Arcoppia* (Oppiidae) is described; *A. goulikaoensis* Ermilov sp. n. differs from *A. robusta* Mahunka, 1988 by the well-developed bothridial heads (versus not developed), barbed branches on the bothridial setae (versus smooth) and smooth notogaster surface (versus lineolate).

**Keywords** Mites · Fauna · Morphology · Systematics · *Arcoppia* · Ethiopian region

## Introduction

At present, the oribatid mite fauna (Acari, Oribatida) of Côte d'Ivoire is almost unknown. Only one species, *Phyllochthonius aoutii* Trávě, 1967 was described and registered from this country (Trávě 1967). Our work is based on material collected from the Oumé region in 2007. The primary goal of this paper is to present a list of the identified taxa.

During taxonomic identification, we found one new species of the genus *Arcoppia* Hammer, 1977 (Oppiidae). The secondary goal of the paper is to describe this new species.

*Arcoppia* was proposed by Hammer (1977) with *Arcoppia brachyramosa* Hammer, 1977 as type species. The genus comprises 58 species and nine subspecies, which are distributed in the tropics and subtropics (Subías 2004, online version 2018). The generic characters were summarized by Hammer (1977) and Rodríguez and Subías (1984). Identification keys to selective species of *Arcoppia* were given by Rodríguez and Subías (1984), Balogh and Balogh (1986, 2002) and Sanyal et al. (2000).

## Material and methods

### Material

Material was collected by Julien K. N'Dri, precisely in the middle of village of Goulikao of the Oumé region of mid-West Côte d'Ivoire from two localities:

#1: 6°31'N, 5°30'W, 200 m a.s.l., primary forest, ferrallitic soil, June 2007 (rainy season).

#2: 6°31'N, 5°30'W, 199 m a.s.l., 3–5 year old fallow dominated by *Chromolaena odorata* (Asteraceae), ferrallitic soil, September 2007 (rainy season).

### Methods

Soil samples were collected with a steel corer (5 cm diameter) at two extreme layers (0–5 cm and 35–40 cm). Soil mites were extracted with Berlese's funnels using electric lamp (25 W) over the course of 7–10 days in the laboratory.

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 ventral plate. Notogastral width refers to the maximum width of the notogaster. 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

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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”.

Morphological terminology used in this paper follows that of F. Grandjean: see Travé and Vachon (1975) for references, Norton (1977) for leg setal nomenclature, and Norton and Behan-Pelletier (2009), for overview.

The following abbreviations are used: *cos* – costula; *r* – prodorsal lateral ridge; *ro*, *le*, *in*, *bs*, *ex* – rostral, lamellar, interlamellar, bothridial and exobothridial setae, respectively; *c*, *la*, *lm*, *lp*, *h*, *p* – notogastral setae; *ia*, *im*, *ip*, *ih*, *ips* – notogastral lyrifissures; *gla* – opisthonotal gland opening; *h*, *m*, *a* – subcapitular setae; *or* – adoral seta; *v*, *l*, *d*, *cm*, *acm*, *ul*, *sul*, *vt*, *lt* – palp setae;  $\omega$  – palp and leg solenidium; *cha*, *chb* – cheliceral setae; *Tg* – Trägårdh’s organ; *Pd I* – pedotectum I; *1a*, *1b*, *1c*, *2a*, *3a*, *3b*, *3c*, *4a*, *4b*, *4c* – epimeral setae; *dis* – discidium; *g*, *ag*, *an*, *ad* – genital, aggenital, anal and adanal setae, respectively; *iad* – adanal lyrifissure; *p.o.* – preanal organ;  $\sigma$ ,  $\varphi$  – leg solenidia;  $\epsilon$  – leg famulus; *v*, *ev*, *bv*, *l*, *d*, *ft*, *tc*, *it*, *p*, *u*, *a*, *s*, *pv*, *pl* – leg setae.

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

## List of identified taxa<sup>1</sup>

### Hypochthoniidae

*Eohypochthonius vilhenarum* (Balogh, 1958). Locality: 1 (1 ex.). Distribution: Ethiopian region, India.

### Epilohmanniidae

*Epilohmannia minuta* Berlese, 1920. Locality: 2 (1 ex.). Distribution: Tropical and Subtropical regions.

*Epilohmannia (Neoepilohmannia) neutricha* Wallwork, 1962. Locality: 1 (2 ex.). Distribution: Ethiopian region.

### Lohmanniidae

*Javacarus jocelynae* Judson, 1991. Locality: 1 (12 ex.). Distribution: Cameroon.

*Meristacarus africanus* Balogh, 1958. Locality: 2 (6 ex.). Distribution: Ethiopian region.

### Trhypochthoniidae

*Allonothrus monodactylus* Wallwork, 1960. Locality: 1 (5 ex.). Distribution: Ethiopian and Oriental regions, Venezuela.

*Allonothrus (pseudonothrus) hirtus* (Balogh, 1958). Locality: 1 (15 ex.). Distribution: Ethiopian region.

*Archeogozetes magnus* (Sellnick, 1925). Locality: 1 (26 ex.). Distribution: Tropical and Subtropical regions.

### Malaconothridae

*Tyrphonostrus heterotrichus* (Mahunka, 1992). Locality: 2 (1 ex.). Distribution: Senegal.

### Nanhermanniidae

*Bicyrthermannia nigeriana* Badejo, Woas & Beck, 2002. Localities: 1 (4 ex.), 2 (1 ex.). Distribution: Ethiopian region.

*Cyrthermannia tuberculata* Balogh, 1958. Locality: 1 (1 ex.). Distribution: Ethiopian region, eastern Mediterranean, Java.

*Masthermannia extrema* (Balogh, 1958). Locality: 2 (1 ex.). Distribution: Ethiopian region.

### Neolioididae

*Neolioides terrestris* (Wallwork, 1963). Locality: 1 (9 ex.). Distribution: Ethiopian, Neotropical, Oriental and southern Palearctic regions.

*Teleolioides ghanensis* Wallwork, 1963. Localities: 1 (14 ex.), 2 (1 ex.). Distribution: Tropical and Subtropical regions.

### Plateremaeidae

*Paralopheremaeus legendrei* (Balogh, 1962). Locality: 2 (1 ex.). Distribution: Ethiopian region, Ceylon.

### Aleurodamaeidae

*Aleurodamaeus africanus* Mahunka, 1984. Locality: 2 (2 ex.). Distribution: Ethiopian region.

### Otocephidae

*Dolicheremaeus borbolai* Mahunka & Mahunka-Papp, 2009. Localities: 1 (3 ex.), 2 (1 ex.). Distribution: Kenya.

*Dolicheremaeus giganticus* (Wallwork, 1962). Localities: 1 (13 ex.), 2 (12 ex.). Distribution: Ghana.

*Dolicheremaeus hirsutus* (Wallwork, 1962). Locality: 1 (14 ex.). Distribution: Ghana.

### Basilobelbidae

*Basilobelba retiaria* (Warburton, 1912). Localities: 1 (9 ex.), 2 (1 ex.). Distribution: Tropical and Subtropical regions, Japan.

### Machadobelbidae

*Machadobelba symmetrica* Balogh, 1958. Localities: 1 (10 ex.), 2 (1 ex.). Distribution: Ethiopian region, India.

### Oppiidae

*Arcoppia goulikaoensis* Ermilov sp. n. Locality: 1 (4 ex.). Distribution: Côte d’Ivoire.

*Lasiobelba gibbosa* (Mahunka, 1985). Locality: 1 (20 ex.). Distribution: Ethiopian region.

*Neoamerioppia africana* (Kok, 1967). Locality: 1 (1 ex.). Distribution: Ethiopian and Subantarctic regions.

*Oppiella nova* (Oudemans, 1902). Locality: 1 (1 ex.). Distribution: Cosmopolitan.

*Ramusella hainardorum* (Mahunka, 1992). Locality: 1 (3 ex.). Distribution: Senegal.

*Tectoppia nigricans* Wallwork, 1961. Locality: 1 (1 ex.). Distribution: Ghana, Ecuador.

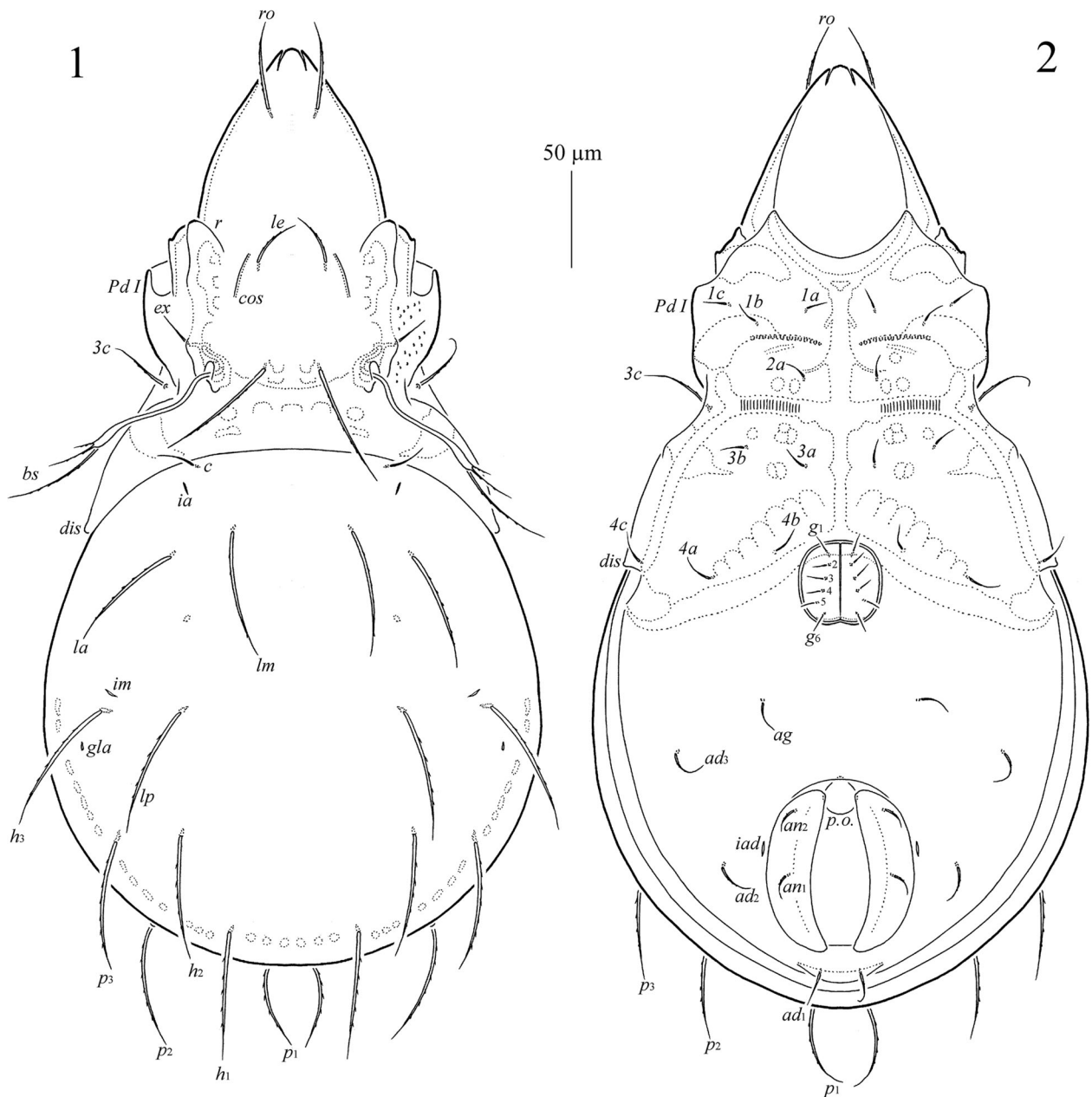
### Granuloppiidae

*Granuloppia conflata* Mahunka, 1974. Locality: 1 (20 ex.). Distribution: Cameroon.

*Granuloppia kamerunensis* Mahunka, 1974. Localities: 1 (14 ex.), 2 (4 ex.). Distribution: Cameroon, Vietnam.

### Papillonotidae

<sup>1</sup> Distribution: mostly from Subías (2004, updated 2018). All species (except holotype of the new species) are deposited in TSUMZ.



**Figs 1–2** *Arcoppia goulikaensis* Ermilov sp. n., adult. **1** Dorsal view (legs except trochanters I–III not shown) **2** Ventral view (gnathosoma and legs not shown)

*Papillonotus maculatus* Wallwork, 1961. Locality: 1 (1 ex.). Distribution: Ghana.

**Rhynchoribatidae**

*Eurhynchoribates robinsoni* (Balogh, 1962). Localities: 1 (7 ex.), 2 (1 ex.). Distribution: Madagascar.

**Gustaviidae**

*Gustavia aethiopica* Mahunka, 1982. Locality: 1 (1 ex.). Distribution: Ethiopian region.

**Eremulidae**

*Eremulus avenifer* Berlese, 1913. Locality: 1 (3 ex.). Distribution: Palearctic, Oriental and Ethiopian regions, Polynesia.

*Eremulus southafricanensis* Ermilov & Hugo-Coetzee, 2012. Locality: 2 (1 ex.). Distribution: Ethiopian region.

**Damaeolidae**

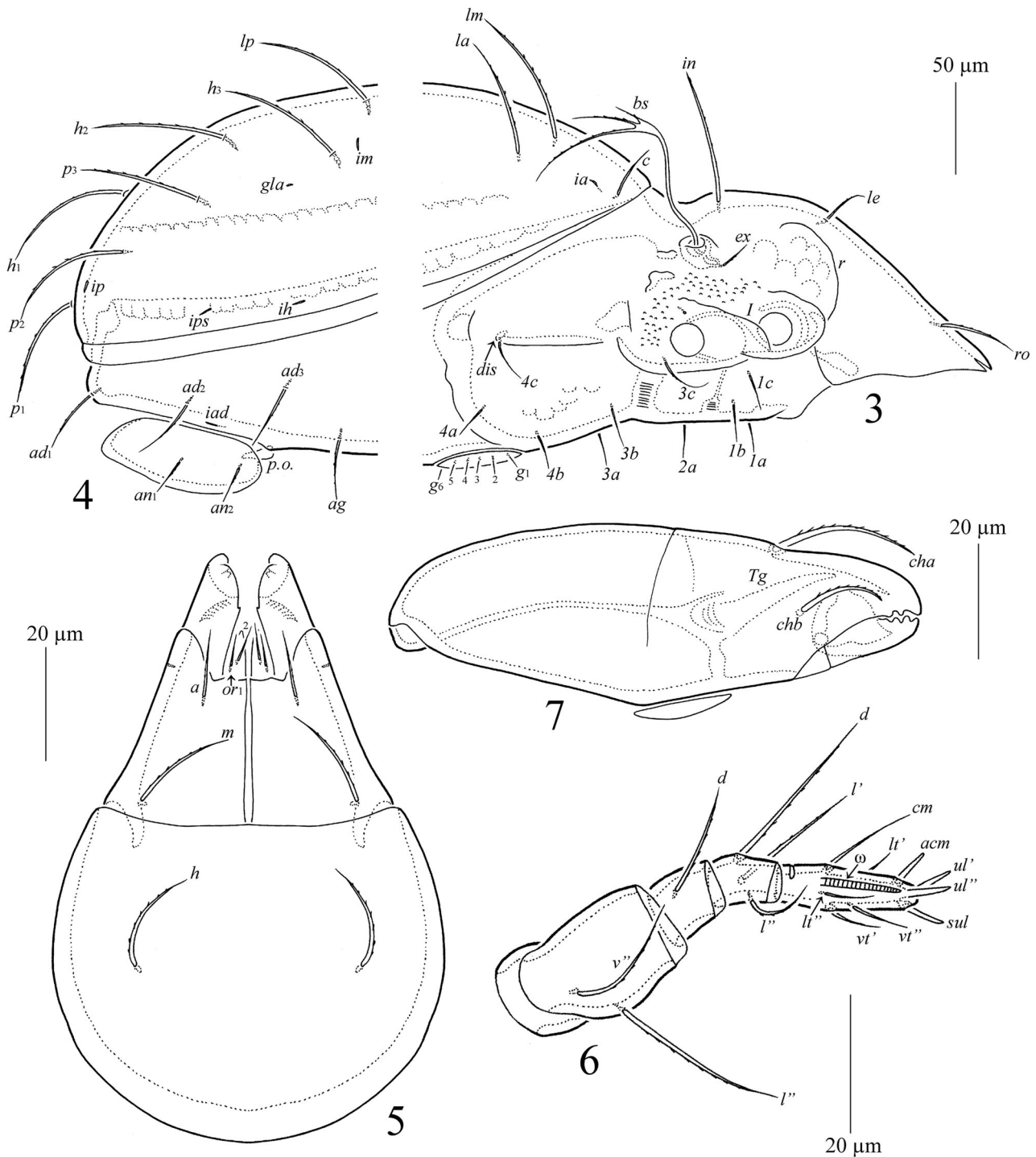
*Fosseremus laciniatus* (Berlese, 1905). Locality: 1 (1 ex.). Distribution: Cosmopolitan.

**Carabodidae**

*Congocephus heterotrichus* Balogh, 1958. Locality: 2 (8 ex.). Distribution: Ethiopian region.

*Kalloia simpliseta* Mahunka, 1985. Locality: 1 (12 ex.). Distribution: Neotropical region.

*Machadocephus leoneae* Fernández, Theron, Rollard & Leiva, 2014. Locality: 1 (4 ex.). Distribution: Ethiopian region.



**Figs 3–7** *Arcoppia goulikaensis* Ermilov sp. n., adult. **3** Anterior part of body, lateral view (gnathosoma and legs not shown) **4** Posterior part of body, lateral view **5** Subcapitulum, ventral view **6** Palp, right, antiaxial view **7** Chelicera, right, antiaxial view

**Tectocephidae**

*Tegezotes tunicatus* Berlese, 1913. Locality: 1 (1 ex.). Distribution: Tropical and Subtropical regions, Europe.

**Microzetidae**

*Berlesezetes ornatissimus* (Berlese, 1913). Locality: 1 (1 ex.). Distribution: Cosmopolitan.

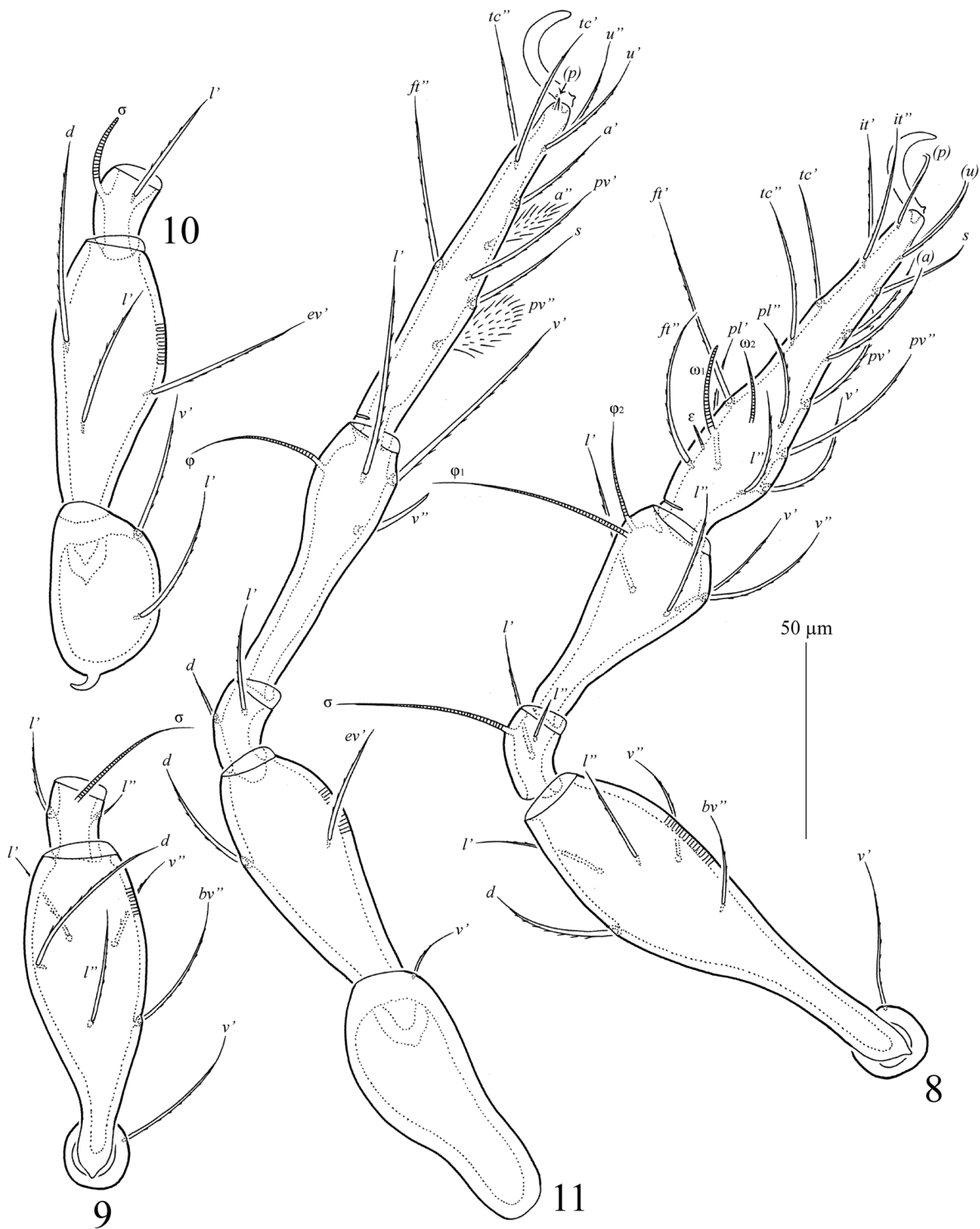
**Caloppiidae**

*Zetorchella* sp. Localities: 1 (10 ex.), 2 (1 ex.).

**Punctoribatidae**

*Allozetes africanus* Balogh, 1958. Locality: 1 (3 ex.). Distribution: Paletropical region.

*Lamellobates molecula* (Berlese, 1916). Locality: 1 (4 ex.). Distribution: Tropical and Subtropical regions.



**Figs 8–11** *Arcoppia goulikaoensis* Ermilov sp. n., adult. **8** Leg I, right, antiaxial view **9** Trochanter, femur and genu of leg II, right, antiaxial view **10** Trochanter, femur and genu of leg III, left, antiaxial view **11** Leg IV, left, antiaxial view

**Dryobotatidae**

*Dryobotatoides insignis* (Balogh, 1962). Locality: 1 (3 ex.).

Distribution: Ethiopian region.

**Mochlozetidae**

*Gephyrazetes* sp. Locality: 1 (8 ex.).

**Haplozetidae**

*Magyaria annobonica* Pérez-Íñigo, 1982. Localities: 1 (9 ex.), 2 (1 ex.). Distribution: Ethiopian region.

**Table 1** Leg setation and solenidia of adult *Arcoppia goulikaoensis* Ermilov sp. n

Leg	Trochanter	Femur	Genu	Tibia	Tarsus
I	v'	d, (l), bv'', v''	(l), σ	(l), (v), φ <sub>1</sub> , φ <sub>2</sub>	(ft), (tc), (it), (p), (u), (a), s, (pv), v', (pl), l'', ε, ω <sub>1</sub> , ω <sub>2</sub>
II	v'	d, (l), bv'', v''	(l), σ	(l), (v), φ	(ft), (tc), (it), (p), (u), (a), s, (pv), l'', ω <sub>1</sub> , ω <sub>2</sub>
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'	l', (v), φ	ft'', (tc), (p), (u), (a), s, (pv)

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

*Magyaria ornata* Balogh, 1963. Locality: 1 (8 ex.).  
Distribution: Congo.

*Protoribates aethiopicus* Ermilov & Rybalov, 2013.  
Locality: 2 (1 ex.). Distribution: Ethiopia.

*Protoribates paracapucinus* (Mahunka, 1988). Localities:  
1 (1 ex.), 2 (1 ex.). Distribution: Semicosmopolitan.

*Protoribates punctatus* (Grobler, 1991). Locality: 2 (1 ex.).  
Distribution: South Africa, India.

*Rostrozetes ovulum* (Berlese, 1908). Localities: 1 (3 ex.), 2  
(1 ex.). Distribution: Tropical and Subtropical regions.

#### Schelorbitatidae

*Schelorbitates latoincisus* Hammer, 1973. Locality: 1 (3 ex.).  
Distribution: Polynesia, Oriental region, Galapagos Islands.

*Schelorbitates praeincisus* (Berlese, 1910). Localities: 1 (17  
ex.), 2 (11 ex.). Distribution: Tropical, Subtropical and  
Holarctic regions.

*Schelorbitates* sp. Locality: 1 (4 ex.).

*Similobates* sp. Localities: 1 (31 ex.), 2 (7 ex.).

*Tuberemaeus areolatus* Balogh & Mahunka, 1967.  
Localities: 1 (7 ex.), 2 (1 ex.). Distribution: Ethiopian region.

#### Parakalummidae

*Neoribates (Perezinigokalumma) afrum* (Pérez-Íñigo,  
1969). Locality: 1 (2 ex.). Distribution: Equatorial  
Guinea.

#### Galumnidae

*Allogalumna vojnitsi* Mahunka, 1993. Locality: 1 (2 ex.).  
Distribution: Ethiopian region.

*Pergalumna frater* Balogh, 1960. Locality: 2 (6 ex.).  
Distribution: Congo, Japan.

*Pergalumna grebennikovi* Ermilov & Starý, 2018.  
Locality: 2 (7 ex.). Distribution: Cameroon.

*Pergalumna jenoii* Ermilov & Starý, 2018. Localities: 1 (18  
ex.), 2 (11 ex.). Distribution: Cameroon.

*Pergalumna longisetosa* Balogh, 1960. Locality: 1 (12  
ex.). Distribution: Ethiopian, Neotropical and Oriental  
regions.

*Pergalumna nasifera* Mahunka, 2011. Localities: 1 (6 ex.),  
2 (1 ex.). Distribution: Madagascar.

*Pergalumna paraelongata* Ermilov & Anichkin, 2012.  
Locality: 1 (14 ex.). Distribution: Vietnam.

*Pergalumna tanzanica* Mahunka, 1984. Locality: 2 (3 ex.).  
Distribution: Tanzania.

*Pilizetes dudichi* Balogh, 1966. Localities: 1 (21 ex.), 2 (6  
ex.). Distribution: Ethiopian region.

#### Galumnellidae

*Galumnella apiculata* Mahunka, 1992. Localities: 1 (25  
ex.), 2 (8 ex.). Distribution: Ethiopian region.

The list of identified oribatid mites includes 67 species from  
50 genera and 31 families. All taxa are registered in Côte  
d'Ivoire for the first time. Three species (*Kalloia simpliseta*,  
*Schelorbitates latoincisus*, *Pergalumna paraelongata*) are  
recorded in the Ethiopian region for the first time.

## Description of new species

*Arcoppia goulikaoensis* Ermilov sp. n. (Figs 1–11).

**Diagnosis.** Body size: 448–481 × 232–249. Rostrum  
tridentate, median tooth trapezoid, lateral teeth narrowly  
triangular. Costulae short, poorly visible. Transcostula  
absent. Rostral, lamellar and interlamellar setae setiform,  
barbed; *le* shortest and thinnest, *in* longest and thickest.  
Bothridial setae with well-developed head, having three  
barbed branches of different length and thickness. Notogaster  
with ten pairs of setiform, barbed setae; *c*  
short, thin, other setae thicker, long. Epimeral and  
anogenital (except smooth genital setae) setae setiform,  
slightly barbed. Trochanters III with posterior tooth.

**Description.** *Measurements.* Body length: 448 (holotype,  
male), 448–481 (three paratypes, three males); notogaster  
width: 232 (holotype), 232–249 (three paratypes).

*Integument* (Figs 1, 3). Body color light brown. Body sur-  
face smooth, lateral parts of body between bothridia and ace-  
tabula I–III tuberculate (diameter of tubercles up to 4).

*Prodorsum* (Figs 1, 3). Rostrum tridentate, incisions very  
narrow, median tooth trapezoid, lateral teeth narrowly triangu-  
lar. Costulae short, not reaching bothridia, slightly developed.  
Transcostula absent. Lateral ridges distinct, semi-oval. Rostral  
(41–45), lamellar (24–28) and interlamellar (69–73) setae  
setiform, barbed; *le* thinnest, *in* thickest. Exobothridial setae  
(16–20) setae setiform, thin, slightly barbed. Bothridial setae  
(82–86) with long stalk and short, fusiform head, having three  
barbed branches of different length and thickness. Postbothridial  
tubercles, longitudinal rows of muscle sigillae

anteriad to bothridia and two pairs of interbothridial muscle sigillae poorly visible.

*Notogaster* (Figs 1, 3, 4). Ten pairs of setiform setae present, located on small tubercles; *c* short (28–32), thin, slightly barbed, other setae long (69–77), thicker than *c*, barbed. All lyrifissures distinct; *ia* located posterolateral and close to *c*, *im* anterolateral and close to *h*<sub>3</sub>, *ip* between *p*<sub>1</sub> and *p*<sub>2</sub>, *ih* and *ips* in lateral positions close to circumgastric furrow. Opisthonotal gland openings located posterolateral to *h*<sub>3</sub>.

*Gnathosoma* (Figs 5–7). Subcapitulum longer than wide: 94–102 × 61–69. Three pairs of subcapitular setae setiform, slightly barbed; *h* (20) and *m* (20) longer than *a* (12). Two pairs of adoral setae (6) thin, erect, smooth. Length of palps: 53–61. Palpal setation: 0–2–1–3–9(+ $\omega$ ). Solenidion (2/3 length of palptarsi) bacilliform, pressed to the palptarsi surface. Postpalpal setae (4) spiniform, smooth. Length of chelicerae: 94–102. Cheliceral setae setiform, barbed; *cha* (28–32) longer than *chb* (16–20). Trägårdh's organ of chelicerae narrowly triangular, rounded distally.

*Epimeral and lateral podosomal regions* (Figs 2, 3). Epimeral setal formula: 3–1–3–3. Setae setiform, slightly barbed; *3c* (28–36) located on small tubercles, longer than others (20). Discidia elongate triangular.

*Anogenital region* (Figs 2–4). Six pairs of genital setae (8) located in one longitudinal row on each genital plate, thin, smooth. One pair of aggenital (24–32), three pairs of adanal (28–36) and two pairs of anal (20) setae setiform, slightly barbed. Adanal lyrifissures distinct, located parallel and close to anal plates.

*Legs* (Figs 8–11). Claw of each leg smooth. Femora with indistinct porose areas ventrally. Trochanters III with strong, curved posterior tooth. Formulas of leg setation and solenidia: I (1–5–2–4–20) [1–2–2], II (1–5–2–4–16) [1–1–2], III (2–3–1–3–15) [1–1–0], IV (1–2–2–3–12) [0–1–0]; homology of setae and solenidia indicated in Table 1. Setae *p* setiform on tarsi I, and very short, conical on tarsi II–IV. Famulus of tarsi I short, erect, blunted inserted between  $\omega_1$  and *ft*".

**Material examined.** Holotype (male) and three paratypes (all males): Côte d'Ivoire, Oumé region, precisely in the middle of village of Goulikao, 6°31'N, 5°30'W, 200 m a.s.l., primary forest, ferrallitic soil, June 2007 (rainy season), collected by Julien K.N'Dri.

**Type deposition.** The holotype (in ethanol with drop of glycerol) is deposited in the collection of SMNH. Three paratypes (all in ethanol with drop of glycerol) are deposited in the collection of TSUMZ.

**Etymology.** The specific name *goulikaoensis* refers to the village of Goulikao (Oumé region, Côte d'Ivoire), where the type material was collected.

**Remarks.** *Arcoppia goulikaoensis* Ermilov sp. n. is morphologically most similar to *Arcoppia robusta* Mahunka, 1988 (Mahunka 1988) from the Oriental

region in having bothridial setae with three branches of different length, lamellar setae shorter than rostral and interlamellar setae, long and barbed notogastral setae, and the absence of transcostula. However, the new species differs from the latter by the well-developed bothridial heads (versus not developed), barbed branches on the bothridial setae (versus smooth) and smooth notogaster surface (versus lineolate).

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## Compliance with ethical standards

**Conflict of interests** No potential conflict of interest was reported by the authors.

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