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Additions to the oribatid mite fauna (Acari, Oribatida) of Ethiopia: results of the Joint Russian-Ethiopian Biological Expedition (2014) to the vicinity of Lake Tana

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ABSTRACT — The present study is based on oribatid mite material (Acari, Oribatida) collected in October–December 2014 from the vicinity of Lake Tana, Northwest Ethiopia. A list of identified taxa, including 34 species from 29 genera and 25 families, is provided; of these, ten species, seven genera and three families are recorded in Ethiopia for the first time. A new species of the genus *Haplozetes* (Haplozetidae) is described from the leaf litter of forests with *Coffea arabica* and *Podocarpus gracilor*. *Haplozetes valbehanae* n. sp. is morphologically most similar to *H. triangulatus* Beck, 1964, but differs by the tridentate rostrum and presence of four pairs of genital setae and dense cerotegumental tubercles in the anterior part of the ventral plate.

KEYWORDS — mites; fauna; new species; *Haplozetes*; morphology; systematics; record; Africa

INTRODUCTION

In recent years the Ethiopian oribatid mite fauna has been actively studied (for example, Ermilov *et al.* 2012a; Ermilov and Rybalov 2012b, 2013; Ermilov *et al.* 2014; Miko *et al.* 2014; Niedbała and Ermilov 2014). The present study is based on the material collected during the Russian-Ethiopian expedition in October–December 2014 to the vicinity of Lake Tana (Northwest Ethiopia). The primary goal of the paper is to present a list and new records of the identified taxa.

In the course of taxonomic identification, I found one new species, belonging to the genus *Haplozetes* Willmann, 1935. The secondary goal of the paper is to describe and illustrate this species under the name *Haplozetes valbehanae* n. sp.

The genus *Haplozetes* was proposed by Willmann (1935) with *Peloribates vindobonensis* Willmann, 1935 as type species. I support Bayartogtokh's (2000, 2010) and Weigmann's (2006) classification and diagnosis of this genus. At present, *Haplozetes* s. str. comprises more than 60 species, which have a cosmopolitan distribution. Identification keys for some species of the genus were presented by Balogh and Balogh (2002), Weigmann (2006), and Bayartogtokh (2010).

MATERIALS AND METHODS

Material — Oribatid mites were collected from four sites of the vicinity of Lake Tana (Northwest Ethiopia):

– Et-2014–20: 11°41'36"N, 37°20'49"E, near Lake

Tana, forest dominated by *Coffea arabica* and *Po-dacarpus gracilor*, leaf litter, Winkler extraction, 30.X.2014 (L. Rybalov & I. Vorobeva);

– Et-2014–21: 12°14'41"N, 37°74'94"E, 7 km north-west of Addis-Zemen, forest dominated by *Scheffleria abissinica*, leaf litter, Winkler extraction, 29.X.2014 (L. Rybalov & I. Vorobeva);

– Et-2014–22: 11°41'27"N, 37°20'51"E, near Lake Tana, forest dominated by *Coffea arabica*, leaf litter, Winkler extraction, 30.X.2014 (L. Rybalov & I. Vorobeva);

– Et-2014–23: 11°36,70'N, 37°22,36'E, shore of Lake Tana, territory of the Bahir Dar Fisheries and other Aquatic Life Research Center, leaf litter with numerous ants (*Myrmecaria distincta*), heptane extraction, 5.XII.2014 (A. Prokin).

Methods — 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 in dorsal aspect. 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 (famulus included). Formulas for leg solenidia are given in square brackets according to the sequence genu–tibia–tarsus.

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

Drawings were made with a camera lucida using a Carl Zeiss transmission light microscope "Axioskop-2 Plus". Images were obtained with an AxioCam ICc3 camera using a Carl Zeiss transmission light microscope "Axio Lab.A1".

¹Ptyctimous mites are not included. All specimens are deposited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia.

²See mostly Subías (2004, updated 2016); * – author's personal data.

LIST OF ORIBATID TAXA COLLECTED FROM THE VICINITY OF LAKE TANA¹

This list indicates the specific localities where oribatid mites were collected, and notes new records and general known distribution².

Sphaerochthoniidae

Sphaerochthonius splendidus (Berlese, 1904) (see Berlese 1904b). Localities: Et-2014–20, Et-2014–21. Distribution: Tropics and Subtropics.

Epilohmanniidae

Epilohmannia minuta Berlese, 1920. Locality: Et-2014–20. Distribution: Tropics and Subtropics.

Malaconothridae

Tyrphonothrus ensifer (Mahunka, 1982). Localities: Et-2014–20, Et-2014–21. Distribution: Ethiopia and Congo.

Nothridae

Nothrus crassisetus Mahunka, 1982. Locality: Et-2014–20. Distribution: Ethiopia.

Hermanniellidae

Hermanniella congoensis Balogh, 1958. Localities: Et-2014–20, Et-2014–21, Et-2014–22. Distribution: Ethiopian region.

Nanhermanniidae

Masthermannia mammillaris (Berlese, 1904) (see Berlese 1904a). Locality: Et-2014–20. Distribution: Tropics and Subtropics.

Plasmobatidae

Plasmobates foveolatus Ermilov, Sidorchuk and Rybalov, 2011. Locality: Et-2014–20. Distribution: Ethiopia.

Licnodamaeidae

Pedrocortesella africana Pletzen, 1963. Localities: Et-2014–20, Et-2014–21. Distribution: Ethiopian region.

Gymnodamaeidae

Arthrodamaeus johanni Hugo, 2010. Locality: Et-2014–21. Distribution: South Africa and Zambia.

Aleurodamaeidae

Aleurodamaeus recenfesevpi Ermilov and Rybalov,

2012a. Localities: Et-2014–20, Et-2014–21, Et-2014–22. Distribution: Ethiopia.

Damaeidae

Metabelba (Pateribelba) glabriseta Mahunka, 1982. Localities: Et-2014–20, Et-2014–21, Et-2014–22. Distribution: Ethiopia and Angola.

Astegistidae

Cultroribula bicuspidata Mahunka, 1978. Localities: Et-2014–20, Et-2014–21. Distribution: Ethiopian, Neotropical and Oriental regions.

Microzetidae

Berlesezetes glaber Mahunka, 1982. Localities: Et-2014–20, Et-2014–21. Distribution: Ethiopia.

Oppiidae

Arcoppia rugosa (Mahunka, 1973). Localities: Et-2014–20, Et-2014–22. Distribution: Zimbabwe and Ethiopia.

Condylloppia pilosella (Balogh, 1959). Locality: Et-2014–20. Distribution: Congo and Chad.

Lasiobelba (Antennoppia) capilligera (Berlese, 1916) (see Berlese 1916b). Locality: Et-2014–21. Distribution: Ethiopian region.

Neoamerioppia polygonata (Mahunka, 1982). Locality: Et-2014–20. Distribution: Ethiopia.

Ramuloppia ramiseta (Balogh, 1959). Locality: Et-2014–20. Distribution: Angola, Ghana and Caucasus.

Suctobelbidae

Suctobelbella (Ussuribata) spirochaeta Mahunka, 1983. Locality: Et-2014–20. Distribution: Ethiopian region and Japan.

Carabodidae

Austrocarabodes (Uluguroides) arboreus Ermilov, Sidorchuk and Rybalov, 2010. Locality: Et-2014–21. Distribution: Ethiopia.

Austrocarabodes (Uluguroides) kluttzi Ermilov, Winchester, Lowman and Wassie, 2012b. Localities: Et-2014–20, Et-2014–22. Distribution: Ethiopia.

Tectocephidae

Tectocephus velatus sarekensis Trägårdh, 1910. Locality: Et-2014–20. Distribution: Cosmopolitan.

Hydrozetidae

Hydrozetes gueyeae Mahunka, 1990. Locality: Et-2014–23. Distribution: Senegal.

Caloppiidae

Zetorchella vargai (Balogh, 1959). Localities: Et-2014–20, Et-2014–21, Et-2014–22. Distribution: Tanzania and South Africa*.

Zetorchella pedestris Berlese, 1916 (see Berlese 1916a). Locality: Et-2014–21. Distribution: Ethiopian region.

Scheloribatidae

Scheloribates (Scheloribates) aethiopicus Mahunka, 1982. Localities: Et-2014–20, Et-2014–21, Et-2014–22. Distribution: Ethiopian region and Canary Islands.

Scheloribates (Scheloribates) discifer Balogh, 1959. Locality: Et-2014–23. Distribution: Ethiopian region.

Scheloribates (Scheloribates) praeincisus (Berlese, 1910). Localities: Et-2014–20, Et-2014–21, Et-2014–22. Distribution: Tropics and Southern Holarctic region.

Haplozetidae

Haplozetes valbehanae n. sp. Localities: Et-2014–20, Et-2014–22.

Zetomotrichidae

Zetomotrichus lacrimans Grandjean, 1934. Localities: Et-2014–20, Et-2014–21. Distribution: Tropics and Subtropics.

Mochlozetidae

Unguizetes atypicus (Mahunka, 1982). Localities: Et-2014–20, Et-2014–21, Et-2014–22. Distribution: Ethiopian region.

Punctoribatidae

Allozetes africanus Balogh, 1958. Locality: Et-2014–20. Distribution: Tropics.

Galumnidae

Galumna incisa Mahunka, 1982. Localities: Et-2014–20, Et-2014–21, Et-2014–22. Distribution: Ethiopia.

Galumna nuda Engelbrecht, 1972. Localities: Et-2014–20, Et-2014–22. Distribution: South Africa.

Thus, in the course of taxonomic identification I found 34 species from 29 genera and 25 families; of these, one species is new for science, and ten species (*Sphaerochthonius splendidus*, *Epilohmannia minuta*, *Masthermannia mammillaris*, *Arthrodamaeus johanni*, *Condylloppia pilosella*, *Lasiobelba (Antennoppia) capilligera*, *Ramuloppia ramiseta*, *Zetorchella vargai*, *Hydrozetes gueyeae* and *Galumna nuda*), seven gen-

era (*Sphaerochthonius*, *Epilohmannia*, *Masthermannia*, *Condylloppia*, *Ramuloppia*, *Hydrozetes* and *Haplozetes*) and three families (*Sphaerochthoniidae*, *Epilohmanniidae* and *Hydrozetidae*) are recorded in Ethiopia for the first time.

DESCRIPTION

Haplozetes valbehanae n. sp. (Figures 1–5)

Diagnosis — Body size: 282 – 348 × 166 – 190. Body surface mostly foveolate. Anterior part of ventral plate with cerotegumental tubercles. Rostrum tridentate. Tutoria with one distal tooth. Rostral setae slightly dilated basally, ciliate unilaterally, inserted under tutorial teeth. Lamellar setae setiform, barbed, inserted on lamellar ends. Interlamellar setae short, erect, barbed. Bothridial setae fusiform, barbed. Notogaster with 10 pairs of short, thin setae. Notogastral saccules with elongated channels basally swollen. Subcapitular setae setiform, barbed. Epimeral setae short, barbed. Circumpedial carinae long, directed to anterior margin of ventral plate. Anogenital setae short, indistinctly barbed. Genital plates with four pairs of setae. Tridactylous. Ventro-posterior parts of femora I and antiaxial parts of genua I with one trapezoid apophysis. Tarsi I with 19 setae.

Description — Measurements – Small species. Body length: 315 (holotype: female), 282 – 348 (14 paratypes: five females and nine males); notogaster width 166 (holotype), 166 – 190 (14 paratypes). No differences between females and males in the body sizes.

Integument (Figs 1A, 1B, 2A, 2B, 4C, 4I, 5C) — Body color yellow brownish. Body surface punctate. Notogaster, subcapitular mentum, anogenital region, genital and anal plates, medio-dorsal part of prodorsum and antero-lateral parts of epimeral region sparsely foveolate (diameter of foveolae up to 4). Pteromorphs, subcapitular mentum, pedotecta I, discidia, epimeral region, anal plates, posterior part of anogenital region, leg femora and tibiae III and IV slightly striate. Anterior part of ventral plate, which covers base of subcapitular mentum, with

dense cerotegumental tubercles (their diameter up to 4).

Prodorsum (Figs 1A, 1B, 2A, 4A–D) — Rostrum tridentate. Lamellae (*lam*) two thirds as long as prodorsum (measured in lateral view), with one very small outer tooth, located dorso-laterally. Pro-lamellae absent. Sublamellae (*slam*) about one third the length of lamellae, lineate. Sublamellar porose areas (*Al*, 10 – 12 × 6 – 8) oval, located near to sublamellae. Tutoria (*tu*) similar to lamellae in length, with one strong distal tooth. Parietal carinae (*car*) present, parallel to tutoria. Rostral setae (*ro*, 28) setiform, slightly dilated basally, ciliate unilaterally, inserted laterally on prodorsum under tutorial teeth. Lamellar setae (*le*, 36 – 41) setiform, barbed, inserted on lamellar ends. Interlamellar setae (*in*, 16–18) setiform, erect, barbed. Bothridial setae (*bs*, 49 – 57) fusiform, with long, smooth stalks and heads shorter, barbed. Exobothridial setae (*ex*, 8–10) thin, indistinctly barbed. Sejugal porose areas (*Ad*) diffuse, located posterior to interlamellar setae, transversely elongated.

Notogaster (Figs 1A–C, 2A, 4E–H) — Anterior notogastral margin convex medially. Dorsophragmata (*D*) elongated, longitudinally oriented. Pteromorphs triangular, with distinct hinges. Ten pairs of notogastral setae short (8 – 10), thin, smooth to indistinctly barbed. Four pairs of saccules (*Sa*, *S1*, *S2* and *S3*) with elongated channels basally swollen. Opisthonotal gland openings (*gla*) and lyrifissures (*ia*, *im*, *ip*, *ih* and *ips*) clearly visible.

Gnathosoma (Figs 2B–D) — Subcapitulum longer than wide (77 – 82 × 57 – 61). Subcapitular setae similar in length (14 – 18) and thickness, setiform, barbed. Two pairs of adoral setae (*or*₁, *or*₂, 6 – 8) setiform, barbed. Palps (length 49 – 53) with setation 0–2–1–3–9(+ω). Solenidia of palptarsi attached to eupathidia (*acm*). Postpalpal setae (*ep*, 8) spiniform. Chelicerae (length 86 – 90) with two barbed setae, *cha* (28 – 30) longer than *chb* (16 – 20). Trägårdh's (*Tg*) organ narrowly triangular, smooth.

Epimeral and lateral podosomal regions (Figs 1B, 2A, 4I, 5A, 5B) — Sejugal apodemes (*apoj*) long, almost reaching genital aperture, longer than apodemes 2 (*apo2*) and 3 (*apo3*). Epimeral setal formula: 3–1–3–2; setae (8–10) setiform, thin, slightly

FIGURE 1: *Haplozetes valbehanae* n. sp.: A – dorsal view (legs not illustrated); B – ventral view (gnathosoma and legs not illustrated); C – posterior view. Scale bar 100 μ m.

FIGURE 2: *Haplozetes valbehanae* n. sp.: A – lateral view (gnathosoma and legs not illustrated); B – subcapitulum, ventral view; C – palp, right, antiaxial view; D – chelicera, left, paraxial view. Scale bar (A) 100 μ m, scale bar (B, D; C) 16 μ m.

FIGURE 3: *Haplozetes valbehanae* n. sp.: A – leg I, right, antiaxial view; B – leg II, except trochanter and tarsus, right, antiaxial view; C – leg III, except tarsus, right, paraxial view; D – leg IV, except tarsus, right, paraxial view. Scale bar 20 μ m.

FIGURE 4: *Haplozetes valbehanae* n. sp., dissected adult, microscope images: A – rostrum, ventral view; B – rostral seta and medio-distal part of rostrum, right, antiaxial view; C – lamellar seta and medio-distal part of lamella, left, dorsal view; D – medio-distal part of bothridial seta, right, paraxial view; E–H – notogastral saccules *Sa*, *S1*, *S2* and *S3*, respectively; I – cerotegumental tubercles on anterior part of ventral plate; J – distal part of leg I, left, paraxial view. Scale bar 20 μ m.

FIGURE 5: *Haplozetes valbehanae* n. sp., dissected adult, microscope images: A – part of left podosomal region with pedotectum II, discidium and trochanter III, ventral view; B – left genital plate and part of left epimeral region, ventral view; C – part of left ano-adanal region, ventral view; D – antero-dorsal tooth on leg tibia I; E – ventro-posterior apophysis on leg femur I; F – ventro-anterior tooth on leg femur II. Scale bar 20 μ m.

TABLE 1: Leg setation and solenidia of adult *Haplozetes valbehanae* n. sp.

Leg	Tr	Fe	Ge	Ti	Ta
I	<i>v'</i>	<i>d</i> , (<i>l</i>), <i>bv''</i> , <i>v''</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>), ε , ω_1 , ω_2
II	<i>v'</i>	<i>d</i> , (<i>l</i>), <i>bv''</i> , <i>v''</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>l'</i> , <i>v'</i>	<i>d</i> , <i>l'</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 the anterior and double prime (") setae on the posterior side of a given leg segment.

Parentheses refer to a pair of setae. Tr – trochanter, Fe – femur, Ge – genu, Ti – Tibia, Ta – tarsus.

barbed, 2*a* and 3*a* thicker, heavily barbed. Setae 4*c* and their alveoli absent. Pedotecta II trapezoid, rounded apically, with indistinct ventral tooth (in ventral view). Discidia (*dis*) rounded apically, with large medial expansion. Circumpedal carinae (*cp*) long, directed to anterior margin of ventral plate. A pair of strong podosomal teeth (*t_{pod}*) well-developed.

Anogenital region (Figs 1B, 1C, 2A, 5B, 5C) — Four pairs of genital (*g*_{1–4}, 6–8), one pair of aggenital (*ag*, 6–8), two pairs of anal (*an*₁, *an*₂, 6–8) and three pairs of adanal (*ad*_{1–3}, 6–8) setae, all setiform, thin, indistinctly barbed. Setae *ad*₃ in preanal position. Adanal lyrifissures (*iad*) located close and parallel to anal plates. Postanal porose areas (*Ap*) present, poorly visible, band-like, transversely oriented.

Legs (Figs 3A–D, 4J, 5D–F) — Tridactylous, median claw strong, lateral claws thin, all smooth. Antero-dorsal tooth (*t*) present on tibia I (small) and on tibia II (large). Vento-basal triangular tublerble present on tibiae I and II. Vento-posterior parts of femora I and antiaxial part of genua I with one trapezoid apophysis, bearing setae *bv''* and *l''*, respectively. Vento-anterior parts of femora II with one broad tooth. Porose areas on femora and trochanters III and IV well visible. Formulas of leg setation and solenidia: I (1–5–3–4–19) [1–2–2], II (1–5–3–4–15) [1–1–2], III (2–3–1–3–15) [1–1–0], IV (1–2–2–3–12) [0–1–0]; homology of setae and solenidia indicated in Table 1. Solenidia ω_1 on tarsi I, ω_1 and ω_2 on tarsi II and σ on genua III thickened, blunt-ended, other solenidia thinner, setiform.

Material examined — Holotype (male) and nine

paratypes (three females and six males): Et-2014–20; five paratypes (two females and three males): Et-2014–22.

Type deposition — The holotype is deposited in the collection of the Senckenberg Museum, Görlitz, Germany; 14 paratypes are deposited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia.

Etymology — This species is named in honour of Dr. Valerie Behan-Pelletier (Agriculture and Agri-Food Canada, Ottawa, Canada), to acknowledge her extensive contributions to our knowledge of oribatid mites.

Remarks — The new species is morphologically most similar to *Haplozetes triungulatus* Beck, 1964 from El Salvador in having long, fusiform bothridial setae, small body size, foveolate surface, short interlamellar setae, localization of rostral setae (under tutorial teeth) and tridactylous legs. However, it differs from the latter by the tridentate rostrum (vs. rounded) and presence of four pairs of genital setae (vs. five pairs) and dense cerotegumental tubercles in anterior part of ventral plate (vs. absent).

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Ermilov S.G.

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