

Taxonomic contribution to knowledge of the oribatid mite genus *Mancoribates*

(Acari, Oribatida, Haplozetidae)

Sergey G. Ermilov, Luis S. Subías †, Umukusum Ya. Shtanchaeva & Stefan Friedrich

Ermilov, S. G., Subías, L. S. †, Shtanchaeva, U. Ya. & Friedrich, S. 2024 Taxonomic contribution to knowledge of the oribatid mite genus *Mancoribates* (Acari, Oribatida, Haplozetidae). *Spixiana* 47(1): 121–127.

A new species of *Mancoribates* (Oribatida, Haplozetidae) – *M. peruensis* sp. nov. – is described, based on adults collected from forest soil-litter in primary mountain forests of the Peruvian Andes. The new species differs from *Mancoribates rostopilosus* by the morphology of the bothridial and rostral setae. The generic diagnosis and data on distribution and habitat of *Mancoribates* are provided.

Sergey G. Ermilov (corresponding author), University of Tyumen, Institute of Environmental and Agricultural Biology (X-BIO), Tyumen, Russia;
e-mail: ermilovacari@yandex.ru

Luis S. Subías †, Complutense University, Madrid, Spain;
e-mail: subias@bio.ucm.es

Umukusum Ya. Shtanchaeva, Complutense University, Madrid, Spain;
e-mail: umukusum@mail.ru

Stefan Friedrich, Ludwig-Maximilians-University Munich, Faculty of Biology, Biocenter LMU, Planegg-Martinsried, Germany; e-mail: friedrich@snsb.de

Introduction

Hammer (1961) described the oribatid mite genus *Mancoribates* (Acari, Oribatida, Haplozetidae), with *Mancoribates rostopilosus* Hammer, 1961 as type species from Peru, but she did not provide a clear generic diagnosis and did not include the genus in a certain family.

The diagnosis of *Mancoribates* was given only in 1990 by Balogh & Balogh as follows: “legs tridactyl; four pairs of small sacculi; four pairs of genital setae (exceptionally 5 or 3); ten pairs of notogastral alveoli; rostral setae stiff, straight, diverging, each situated on conical apophysis”. However, this diagnosis is brief and inaccurate. Some distinctive character states of the genus were also noted in keys and comparative tables (Balogh & Mahunka 1967, Balogh 1961, 1972, Balogh & Balogh 1984, 1992). Subías (2004) considered *Mancoribates* as a subgenus of *Indoribates* Jacot, 1929.

Balogh (1961, 1972) and Pérez-Íñigo & Baggio (1980) included *Mancoribates* in Oribatulidae, but later Balogh & Balogh (1984) revised the superfamily Oribatuloidea and placed the genus in Haplozetidae with which we agree.

Presently, *Mancoribates* is monotypic, comprising only the type species recorded in several countries of the Neotropical region. Mortazavi et al. (2011) described *Indoribates (Mancoribates) iranicus* Mortazavi, Akrami & Hajizadeh, 2011, however, its morphological traits clearly does not correspond to *Mancoribates* and apparently belongs to the genus *Haplozetes* Willmann, 1935 (the generic placement is difficult due to the poor original description and figures).

During taxonomic identification of oribatid mite materials from Peru, we found a new species belonging to *Mancoribates*. The main goal of the present paper is to describe this new species under the name *Mancoribates peruensis* sp. nov. Additionally,

we present a detailed generic diagnosis to rectify the incomplete character states by Hammer (1961) and brief diagnosis by Balogh & Balogh (1990) and provide data on distribution and habitat of representatives of the genus.

Methods

Sampling. Samples were collected by sieving upper soil layer and leaf litter. Mites were extracted from samples using Winkler's apparatus in laboratory conditions during 10 days into 75% ethanol.

Observation and documentation. For measurement and illustration, specimens were mounted in lactic acid on temporary cavity slides. 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 notogaster; body width refers to the maximum width of the notogaster behind pteromorphs in dorsal aspect; the 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. Drawings were made with a camera lucida using a Leica DM 2500 light microscope.

Terminology. Morphological terminology used in this paper mostly follows that of papers on Haplozetidae (e.g., Ermilov & Behan-Pelletier 2024, Ermilov & Martens 2024); also, Norton (1977) for leg setal nomenclature, and Norton & Behan-Pelletier (2009) for overview.

Abbreviations. Prodorsum: *rc* = rostral carina; *lam* = lamella; *plam* = prolamella; *slam* = sublamella; *Al* = sublamellar porose area; *tu* = tutorium; *ro*, *le*, *in*, *bs*, *ex* = rostral, lamellar, interlamellar, bothridial, and exobothridial setae, respectively; *Ad* = dorsosejugal porose area; *D* = dorsophragma; *P* = pleurophragma. Notogaster: *c*, *la*, *lm*, *lp*, *h*, *p* = setae; *Sa*, *S1*, *S2*, *S3* = saccules; *ia*, *im*, *ip*, *ih*, *ips* = lyrifissures; *gla* = opisthotal gland opening. Gnathosoma: *a*, *m*, *h* = subcapitular setae; *or* = adoral seta; *d*, *l*, *sup*, *inf*, *cm*, *acm*, *ul*, *su*, *vt*, *lt* = palp setae; ω = palp solenidion; *cha*, *chb* = cheliceral setae; *Tg* = Trägårdh's organ. Epimeral and lateral podosomal regions: *1a*, *1b*, *1c*, *2a*, *3a*, *3b*, *3c*, *4a*, *4b* = epimeral setae; *PdI*, *PdII* = pedotecta I, II, respectively; *cir* = circumpedalar carina; *dis* = discidium. Anogenital region: *g*, *ag*, *an*, *ad* = genital, aggenital, anal, and adanal setae, respectively; *iad* = adanal lyrifissure; *Amar* = marginal porose area; *po* = preanal organ. Legs: *Tr*, *Fe*, *Ge*, *Ti*, *Ta* = trochanter, femur, genu, tibia, and tarsus, respectively; ω , φ , σ = solenidia; *d*, *l*, *v*, *bv*, *cv*, *ft*, *tc*, *it*, *p*, *u*, *a*, *s*, *pv*, *pl* = setae; *pa* = porose area.

Taxonomy

Family Haplozetidae

Mancoribates Hammer, 1961

Type species: *Mancoribates rostopilosus* Hammer, 1961

Generic diagnosis (adult). With character states of Haplozetidae (Grandjean 1936, Weigmann 2006). Body size: Medium-sized, length about 450–700. Notogaster longer than wide. Integument: Body without heavy sculpturing and ornamentation. Prodorsum: Rostrum slightly protruding, narrowly rounded, with or without two slight lateral incisions. Rostral region with two longitudinal carinae extending posteriorly from insertions of rostral setae. Lamella long, narrow, positioned submarginally, pair well separated; cusp of lamella absent but small lateral tooth sometimes present; translamella absent or slightly developed; prolamella absent or vestigial; sublamella, sublamellar porose area and tutorium present; keel-shaped-ridge absent. Rostral seta setiform or thickened, medium-sized, inserted dorsally; lamellar and interlamellar setae long, setiform, *le* on end of lamella, *in* in interlamellar region; bothridial seta with well-developed head. Bothridium cup-shaped, with large lateral scale. Dorsosejugal porose area present. Notogaster: Anterior margin of notogaster developed. Pteromorph large, broadly rounded, movable. Octotaxic system as saccules. Ten pairs of short, setiform setae. Gnathosoma: Subcapitulum diarthric. Palp setation: 0–2–1–3–9(+ ω); solenidion of palptarsus connected to eupathidium, pair curved, inserted on tubercle. Chelicera chelate-dentate. Epimeral and lateral podosomal regions: Epimeral setal formula: 3–1–3–2. Pedotecta I and II represented by small lamina. Custodium, discidium and circumpedalar carina present. Humeral region with porose area(s). Anogenital region: Five pairs of genital, one pair of aggenital, two pairs of anal, and three pairs of adanal setae. Adanal lyrifissure located close and parallel to anal plate. Marginal porose area present (true postanal porose area absent). Legs: Tridactylous.

Remarks. Hammer (1961, see p. 103 and fig. 98b) indicated the presence of five pairs of genital setae in *Mancoribates* / *Mancoribates rostopilosus*. However, later authors (e.g., Balogh & Mahunka 1967, Balogh 1972, Balogh & Balogh 1984, 1990), erroneously listed the presence of four pairs (or three pairs) of genital setae.

Hammer (1961) noted that the rostrum of *M. rostopilosus* has two apophyses bearing rostral setae. Later, Balogh (1961, 1972), Balogh and Balogh (1984, 1990, 1992), and Subías & Shtanchaeva (2023) used this character in keys as the main difference for *Man-*



Fig. 1. *Mancoribates peruensis* sp. nov., adult (gnathosoma and legs not shown): A. dorsal view; B. rostral region, dorsal view; C. ventral view; D. right lateral view; E. posterior view (part of left half not shown). Scale bars 100 µm (A, C-E), 20 µm (B).

coribates from other Haplozetidae genera. However, this seems to be an inaccurate interpretation, because in reality the apophyses are absent, and the rostral setae are located on rostral longitudinal carinae, which, in places of contact with setal inserts, create the illusion of the presence of tubercles.

***Mancoribates peruensis* sp. nov.**

Figs 1, 2

Type material. Holotype (female) and six paratypes (three males and three females): South America, Peruvian Andes, 09°42'58"S, 75°05'33"W, Huánuco Department, Carpish, NW Tunel de Caprish, 2770 m a.s.l.,

upper soil and leaf litter in primary mountain rainforest, Winkler extraction, 14.IV.2016 (S. Friedrich, F. Wachtel and D. Hauth).

Type deposition. The holotype is deposited in the collection of the Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima, Peru. – Six paratypes are deposited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia. All specimens are preserved in 70% solution of ethanol with a drop of glycerol.

Additional (non-type) material. Three specimens: South America, Peruvian Andes, 10°01'47" S, 76°08'29" W, Huánuco Department, Pichgacocha, 3800 m a.s.l., upper soil and leaf litter in primary mountain cloud forest, Winkler extraction, 9.IV.2016 (S. Friedrich, F. Wachtel and D. Hauth). – Twenty specimens: South America, Peruvian Andes, 09°43'55" S, 76°11'12" W, Huánuco Department, Churubamba District, Unchog, 3580 m a.s.l., upper soil and leaf litter in primary mountain cloud forest, Winkler extraction, 11.IV.2016 (S. Friedrich, F. Wachtel and D. Hauth). All specimens are preserved in 70% solution of ethanol with a drop of glycerol deposited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia.

Diagnosis. Body length: 525–675. Rostrum with two slight incisions. Prolamella vestigial; translamella completely absent. Rostral seta medium-sized, setiform, barbed; lamellar and interlamellar setae long, setiform, sparsely barbed; bothridial seta short, globose, barbed. All notogastral setae short, setiform, smooth. Epimeral and anogenital setae short, setiform, roughened or slightly barbed; *1a*, *1c*, *2a*, *3a*, *1b*, *3b*, *3c* slightly thicker than *4a*, *4b*. Leg tarsus I with 20 setae (*l'* and *v'* present); genu I, II with three setae (*v'* present).

Description

Measurements. Body length: 645 (holotype), 525–540 (male paratypes), 540–675 (female paratypes); body width: 405 (holotype), 315–330 (male paratypes), 315–450 (female paratypes).

Integument. Body brown. Surface nearly smooth; lateral side of body partially with dense microgranulate cerotegument; region between lamella and sublamella with several stria.

Prodorsum. Rostrum slightly protruding, narrowly rounded, bordered by two slight incisions (sometimes partially not observable) directed to insertions of rostral setae. Two rostral longitudinal carinae extend posteriorly from insertions of rostral setae well observable. Lamella about 1/2 the length of prodorsum, distally truncate or with indistinct lateral tooth; prolamella vestigial; translamella completely absent; sublamella lineate; tatorium comparatively long, ridge-like. Sublamellar porose area rounded (9–11). Rostral (71–79) and exobothridial (30) setae setiform, barbed; lamellar (131–146) and interlamellar (169–195) setae setiform, sparsely barbed; bothridial seta (37–45) with minute stalk and longer, globose, barbed head. Dorsosejugal porose area (19–26 × 7–9) narrowly elongate oval.

Notogaster. Anterior notogastral margin distinct, convex medially. Pteromorphical hinge distinct. Ten pairs of notogastral setae (15–19) setiform, smooth. Four pairs of sacculi with small opening and slightly elongate channel. Opisthonotal gland opening and all lyrifissures distinct.

Gnathosoma. Subcapitulum size: 139–154 × 101–112; subcapitular setae (*a*: 26–30; *m*: 30–34; *h*: 37–41) setiform, roughened; *m* thinner than *a* and *h*; both adoral setae (15–19) setiform, barbed. Palp length: 79–90; setation: 0–2–1–3–9 (+ ω); postpalpal seta (7) spiniform, smooth. Chelicera length: 146–165; setae (*cha*: 45–49; *chb*: 32–34) setiform, barbed.

Epimeral and lateral podosomal regions. Epimeral formula: 3–1–3–2; setae *1a*, *1c*, *2a*, *3a* (22–26), *1b*, *3b*, *3c* (36–41) setiform, slightly barbed; *4a*, *4b* (22–26) thinner than others, setiform, roughened. Distinct humeral porose areas *Am* and *Ah* not observable, instead slight porosities present. Pedotectum II triangular distally in ventral aspect. Custodium knife-like. Circumpedal carina long, reaching to pedotectum II. Discidium broadly triangular.

Anogenital region. Anogenital formula: 5–1–2–3; all setae (26) setiform, roughened. Adanal lyrifissure

Table 1. Leg setation and solenidia of adult *Mancoribates peruensis* sp. nov. Note: Roman letters refer to normal setae, Greek letters to solenidia (except ε = famulus); single quotation mark (') designates seta on the anterior and double quotation mark (") seta on the posterior side of a given leg segment; parentheses refer to a pair of setae.

Leg	Tr	Fe	Ge	Ti	Ta
I	<i>v'</i>	<i>d</i> , (l), <i>bv''</i> , <i>v''</i>	(l), <i>v'</i> , σ	(l), (v), φ_1 , φ_2	(ft), (tc), (it), (p), (u), (a), s, (<i>pv</i>), <i>v'</i> , (pl), <i>l''</i> , ε , ω_1 , ω_2
II	<i>v'</i>	<i>d</i> , (l), <i>bv''</i> , <i>v''</i>	(l), <i>v'</i> , σ	(l), (v), φ	(ft), (tc), (it), (p), (u), (a), s, (<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> , (v), φ	(ft), (tc), (it), (p), (u), (a), s, (<i>pv</i>)
IV	<i>v'</i>	<i>d</i> , <i>ev'</i>	<i>d</i> , <i>l'</i>	<i>l'</i> , (v), φ	<i>ft''</i> , (tc), (p), (u), (a), s, (<i>pv</i>)

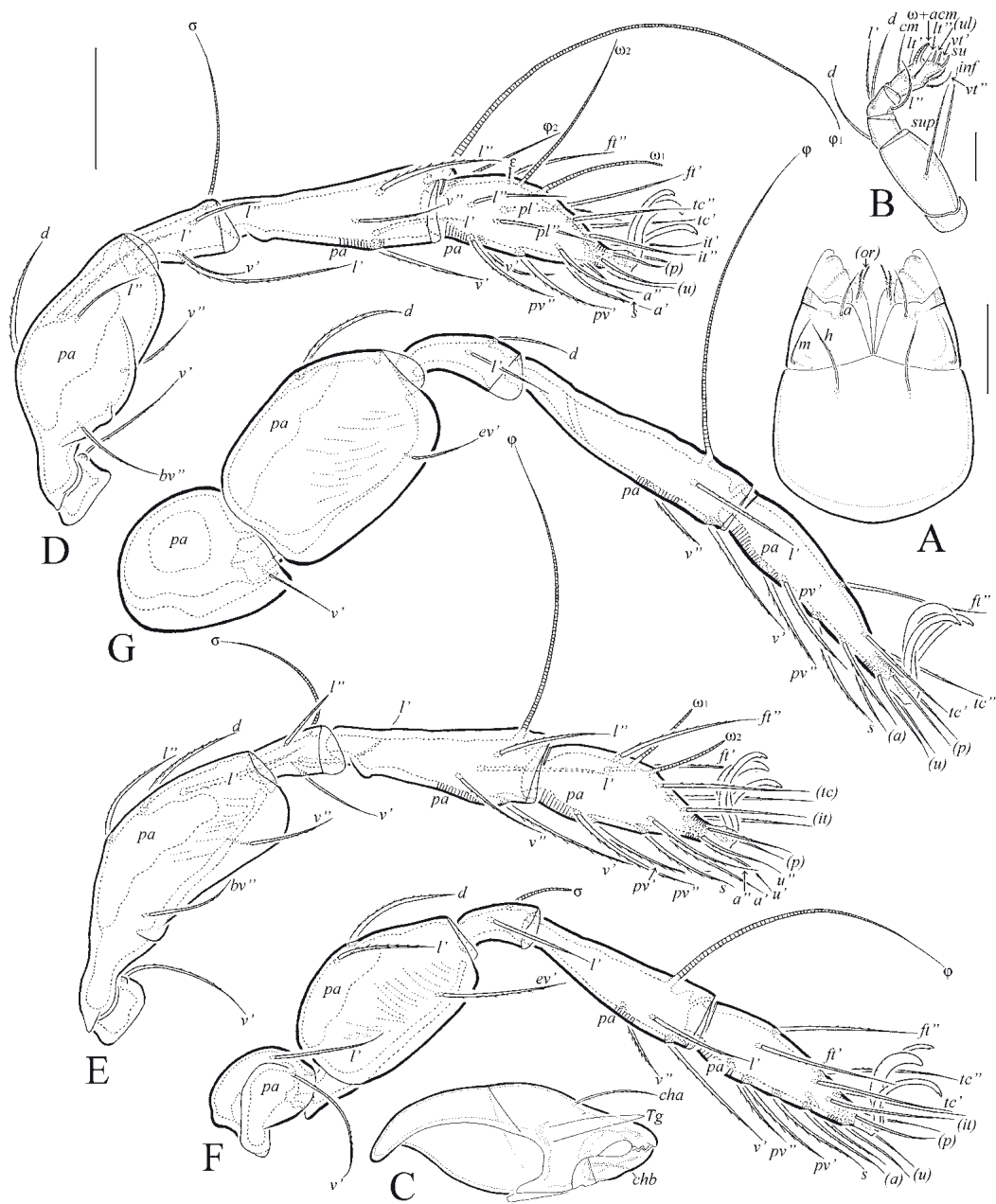


Fig. 2. *Mancoribates peruensis* sp. nov., adult: A. subcapitulum, ventral view; B. palp, right, antiaxial view; C. chelicera, left, paraxial view; D. leg I, right, antiaxial view; E. leg II, right, antiaxial view; F. leg III, left, antiaxial view; G. leg IV, left, antiaxial view. Scale bars 50 μ m (A, C-G), 20 μ m (B).†

distinct, close and parallel to anterior half of anal plate. Marginal porose area complete, band-like.

Legs. Median claw thicker than lateral ones; all claws slightly barbed on dorsal side; lateral claws

with slight tubercle ventrodistally. Tibiae I, II with tubercle proximoventrally. Dorsoparaxial porose area on femora I-IV and on trochanters III, IV, ventrodistal porose area on tibiae I-IV and proximoventral

porose area on tarsi I–IV well observable; distal part of tarsi I–IV (posteriorly to setae *p* and *u*) porose. Formulas 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(1–2–2–3–12)[0–1–0]; homology of setae and solenidia indicated in Table 1; seta *s* on tarsus I eupathidial, located between paired setae (*u*) and (*a*); solenidia ω_1 on tarsus I, ω_1 and ω_2 on tarsus II and σ on genua III slightly thickened, rounded apically versus other solenidia setiform.

Comparison. *Mancoribates peruensis* sp. nov. differs from the type species – *M. rostopilosus* Hammer, 1961 (see Hammer 1961, Pérez-Iñigo & Baggio 1980) – by the morphology and length of the bothridial seta and the morphology of the rostral seta: bothridial seta comparatively short, with stalk shorter than head, head globose in *M. peruensis* versus bothridial seta medium-sized, with stalk distinctly longer than head, head elongate clavate/fusiform in *M. rostopilosus*; rostral seta setiform in *M. peruensis* versus thickened in *M. rostopilosus*. Also, *M. rostopilosus* has slightly observable translamellar line (versus absent in *M. peruensis*).

Etymology. The species name *peruensis* refers to the country of origin, Peru.

Discussion

Mancoribates differs from other genera of Haplozetidae by the combination of character states, e.g.: body without heavy sculpturing and ornamentation; rostral region with a pair of longitudinal carinae; rostral seta inserted dorsally; lamella comparatively long, without cusp; translamella absent or represented by slight translamella; tutorium present; keel-shaped ridge absent; 10 pairs of short, simple notogastral setae; four pairs of notogastral sacculae; anogenital formula: 5–1–2–3; legs tridactylous.

The genus *Haplozetes* is the closest to *Mancoribates* in main character states, but morphology of the rostral region (absence of rostral incisions and carinae in *Haplozetes* versus presence of rostral incisions and carinae in *Mancoribates*) and position of the rostral setae (usually laterally on rostrum in *Haplozetes* versus dorsally on rostrum in *Mancoribates*) clearly separate them.

Also, the genus *Araguazetes* Ermilov & Behan-Pelletier, in press is similar to *Mancoribates* in the presence of the unusual morphology of the rostral region (presence of narrowly rounded rostrum, two rostral incisions, two carinae extending posteriorly from rostral setae, and the dorsally located rostral setae), but the genera clearly differs in some impor-

tant character states (e.g., presence of keel-shaped ridge in *Araguazetes* versus absence of keel-shaped ridge in *Mancoribates*; absence of tutorium and custodium in *Araguazetes* versus presence of tutorium and custodium in *Mancoribates*; number of genital setae – four pairs in *Araguazetes* versus five pairs in *Mancoribates*; number of leg claws – one in *Araguazetes* versus three in *Mancoribates*).

Thus, we preliminary support the generic status of *Mancoribates*, but recognize that subgeneric status within *Haplozetes* sensu lato may be justified in the future, following a comprehensive analysis of the genera in Haplozetidae.

Distribution and habitat

Mancoribates rostopilosus was described from the Andes, Peru (in wet moss on a vertical cliff; in wet *Selaginella* sp. on the ground below high vegetation; in high wet moss on the upper side of big boulders – Hammer 1961). Later, the species was also recorded in Argentina (in forest soil of *Cupressus macrocarpa* – Peralta & Martínez 2013; in forest soil of *Celtis ehrenbergiana* – Fredes 2016), Brazil (pasture, dry soil, grasses; humid, shaded, leafy soil, next to the fence; humid soil, exposed to the sun and covered by grass; wet soil, completely covered by tall grass, next to bushes; moist soil, covered by grasses and shaded – Pérez-Iñigo & Baggio 1980; exposed wet herb; dried herb exposed to sunlight and to industrial contamination; moist soil exposed to industrial contamination; moist grass, shaded, wooded area; damp and shaded grass at the edge of the artificial lake; cattle pasture, humid soil without tree; clayey-sandy soil, very humid, shaded; litter under primitive wood; clayey soil, very humid, little exposure to the sun, marsh vegetation; clayey soil, very humid, exposed to the sun, near an Atlantic-type forest; fine mountain grass; sandy soil, humid, exposed to the sun, aboriginal herbaceous vegetation – Pérez-Iñigo & Baggio 1991; in natural Amazonian forest, on the banks – Pérez-Iñigo & Baggio 1997) and Chile (without habitat – Martínez & Casanueva 1993; under superficial leaf litter of *P. radiata*; Martínez & Casanueva 1995a,b).

Mancoribates peruensis is known only from several locations of the Peruvian Andes (in upper soil and leaf litter in primary mountain forests; present data).

Acknowledgements

We thank two anonymous reviewers for valuable comments, Franz Wachtel (Grünwald, Germany) and David Hauth (Fürstenfeldbruck and Marburg, Germany) for

expertise and assistance in the field, Dr. Gerardo Lamas Müller and Dra. Diana Silva Dávila (both Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima, Peru) for cooperation, and the Servicio Nacional Forestal y de Fauna Silvestre (SERFOR) for issuing a collecting permit (# 007-2014-SERFOR-DGGSPFFS) and export permit (# 003052-SERFOR). This study was supported by the Ministry of Science and Higher Education of the Russian Federation within the framework of the Carbon Measurement Test Area in Tyumen Region (FEWZ-2024-0016).

References

- Balogh, J. 1961. Identification keys of world oribatid (Acari) families and genera. *Acta Zoologica Academiae Scientiarum Hungaricae* 7: 243–344.
- 1972. The oribatid genera of the World. 188 pp., Budapest (Akadémiai Kiadó).
- & Balogh, P. 1984. A review of the Oribatuloidea Thor, 1929 (Acari: Oribatei). *Acta Zoologica Hungarica* 30: 257–313.
- & Balogh, P. 1990. Oribatid mites of the Neotropical region. II. 333 pp., Budapest (Akadémiai Kiadó Press).
- & Balogh, P. 1992. The oribatid mite genera of the World, Vol. 1. 263 pp., Budapest (Hungarian National Museum Press).
- & Mahunka, S. 1967. The scientific results of the Hungarian soil zoological expedition to the Brazzaville-Congo. 30. The oribatid mites (Acari) of Brazzaville-Congo, II. *Opuscula Zoologica Budapest* 7: 35–43.
- Ermilov, S. G. & Behan-Pelletier, V. M. 2024. *Araguazetes luisi* gen. nov., sp. nov. (Acari, Oribatida, Haplozetidae) from Henri Pittier National Park, Venezuela. *Zootaxa*, in press.
- & Martens, J. 2024. Two new species of Oripodoidea (Acari, Oribatida) from Nepal. *Systematic and Applied Acarology* 29: 294–304. <https://doi.org/10.11158/saa.29.2.9>
- Fredes, N. A. 2016. Estudio de la comunidad de oribátidos (Acari, Oribatida) en dos parches de tala (*Celtis ehrenbergiana*) del sudeste bonaerense. *Ecología Austral* 26: 275–285.
- Grandjean, F. 1936. Observations sur les Oribates (10e série). *Bulletin du Museum Nationale d'Histoire Naturelle* (2), 8: 246–253.
- Hammer, M. 1961. Investigations on the oribatid fauna of the Andes Mountains. II. Peru. *Det Kongelige Danske Videnskabernes Selskab Biologiske Skrifter* 13: 1–157.
- Jacot, A. P. 1929. Genera of pterogasterine Oribatidae (Acarina). *Transactions of the American Microscopical Society* 48: 416–431. <https://doi.org/10.2307/3222059>
- Martínez, R. I. & Casanueva, M. E. 1993. Oribatid mites from the Alto Bio-Bio, Chile: diversity and relative abundance (Acari: Oribatida). *Gayana Zoologica* 57: 7–19.
- & Casanueva, M. E. 1995a. Comparación cuali-cuantitativa de la fauna oribatológica de suelo (Acari: Oribatida) de bosques nativos y *Pinus radiata*. *Revista Chilena de Entomología* 22: 25–34.
- & Casanueva, M. E. 1995b. Fauna Oribatológica de Chile: Nuevos registros de especies húmicas en las regiones VIII y IX, Chile (Acari: Oribatida). *Boletín de la Sociedad de Biología de Concepción* 66: 43–51.
- Mortazavi, S., Akrami, M. A. & Hajizadeh, J. 2011. A new oribatid mite of the subgenus *Mancoribates* Hammer, 1961 (Oribatida: Haplozetidae) from Iran. *Journal of the Acarological Society of Japan* 20: 27–31.
- Norton, R. A. 1977. A review of F. Grandjean's system of leg chaetotaxy in the Oribatei (Acari) and its application to the family Damaeidae. Pp. 33–61 in: Dindal, D. L. (ed.). *Biology of oribatid mites*. Syracuse (SUNY College of Environmental Science and Forestry).
- & Behan-Pelletier, V. M. 2009. Suborder Oribatida. Chapter 15. Pp. 430–564 in: Krantz, G. W. & Walter, D. E. (eds.). *A manual of acarology*. Lubbock (Texas Tech University Press).
- Peralta, L. & Martínez, P. A. 2013. Ensamblajes de ácaros oribátidos en hormigueros de *Acromyrmex* spp. (Hymenoptera, Formicidae). *Ecología Austral* 23: 209–217.
- Pérez-Íñigo, C. & Baggio, D. 1980. Oribátidos edáficos do Brasil. I. *Boletín de Zoologia da Universidade de São Paulo* 5: 111–147.
- & Baggio, D. 1991. Oribates édaphiques du Brésil (VI). Oribates de l'État de São Paulo (troisième partie). *Acarologia* 32: 79–92.
- , Baggio, D. 1997. Oribates édaphiques du Brésil (X). Quelques Oribates de l'État de Pará. *Acarologia* 38: 403–413.
- Subías, L. S. 2004. Listado sistemático, sinonímico y biogeográfico de los ácaros oribátidos (Acari-formes, Oribatida) del mundo (1758–2002). *Graellsia* 60: 3–305.
- & Shtanchaeva, U. Ya. 2023. Claves de familias, géneros y subgéneros de ácaros oribátidos del mundo (Acari, Oribatida). *Monografías Electrónicas Sociedad Entomológica Aragonesa* 13: 1–290.
- Weigmann, G. 2006. Hornmilben (Oribatida). *Die Tierwelt Deutschlands*. Teil 76. 520 pp., Keltern (Goetze & Evers).
- Willmann, C. 1935. IV. Die Milbenfauna. Oribatei. Pp. 331–344 in: Jaus, I. (ed.). *Faunistisch-ökologische Studien im Anningergebiet, mit besonderer Berücksichtigung der xerothermen Formen*. *Zoologische Jahrbücher (Systematik)* 66.