

## A new species of oribatid mites of the subgenus *Lanceoppia* (*Bicristoppia*) (Acari: Oribatida: Oppiidae) from South Africa

## Новый вид панцирных клещей подрода *Lanceoppia* (*Bicristoppia*) (Acari: Oribatida: Oppiidae) из Южной Африки

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**Abstract.** The oribatid mite subgenus *Lanceoppia* (*Bicristoppia*) Subías, 1989 (Oribatida: Oppiidae) is recorded in South Africa for the first time. A new species of this subgenus is described from soil of Hogsback State Forest (South Africa). *Lanceoppia* (*Bicristoppia*) *capensis* sp. nov. is similar to *L. (B.) cucheana* Mahunka, 1994 in having long, clavate bothridial seta with spines apically, but differs from the latter by the presence of broadly rounded rostrum, well developed costula, medium length of interlamellar and notogastral setae, and semi-quadrangular interbothridial tubercle. Summarized data on distribution and habitat of all known species of *Lanceoppia* (*Bicristoppia*) are presented.

**Резюме.** Подрод панцирных клещей *Lanceoppia* (*Bicristoppia*) Subías, 1989 (Oribatida: Oppiidae) впервые зарегистрирован в Южной Африке. Новый вид этого подрода описан из почвы государственного леса Хогсбэк (Южная Африка). *Lanceoppia* (*Bicristoppia*) *capensis* sp. nov. схож с видом *L. (B.) cucheana* Mahunka, 1994 по наличию длинной, дубинкообразной трихоботрии с сильными шипиками апикально, но отличается от него наличием широко закругленного рострума, хорошо развитой костулой, межламеллярными и ногогастральными щетинками средней длины и интерботридиальной туберкулой прямоугольной формы. Суммированы данные по распространению и обитанию всех известных видов *Lanceoppia* (*Bicristoppia*).

**Key words:** oppiid mites, *Lanceoppia*, taxonomy, morphology, Afrotropical region, new species

**Ключевые слова:** панцирные клещи-оппииды, *Lanceoppia*, таксономия, морфология, Афротропическая область, новый вид

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## Introduction

The oribatid mite genus *Lanceoppia* (Acari: Oribatida: Oppiidae) was proposed by Hammer (1962a) with *Lanceoppia hexapili* Hammer, 1962

as type species. At present, the genus comprises six subgenera [*L. (Lanceoppia)* Hammer, 1962; *L. (Baioppia)* Luxton, 1985; *L. (Bicristoppia)* Subías, 1989; *L. (Convergoppia)* Balogh, 1983; *L. (Hamoppia)* Hammer, 1968; and *L. (Lancelalmop-*

*pia*) Subías, 1989] with 63 species which are distributed in the Afrotropical, Antarctic, Australasian, and Neotropical regions, and The British Isles, with the most species from New Zealand (35 species) (Subías, online version 2020).

During taxonomic identification of Oppiidae from South Africa, we found a new species belonging to *Lanceoppia* (*Bicristoppia*). The main goal of our paper is to describe and illustrate this new species based on adults.

*Lanceoppia* (*Bicristoppia*) was proposed by Subías (in Subías & Balogh 1989) with *Oppia bicristata* Hammer, 1962 as type species. At present, the subgenus comprises six species which are distributed in Argentina, Chile, Madagascar, and New Zealand (Subías, online version 2020); hence, it is the first record of this taxon in South Africa. Subgeneric traits and an identification key to known species of *Lanceoppia* (*Bicristoppia*) were presented by Ermilov (2016b). The additional goal of our paper is to present data on distribution and habitats of representatives of the subgenus.

## Material and methods

**Specimens.** Substrate samples containing oribatid mites were collected in Hogsback State Forest, a centuries-old indigenous Afro-montane forest near the village of Hogsback (32°35'S, 26°57'E), situated in the Amathole mountains, Eastern Cape Province, South Africa. Mites were extracted from samples into 75% ethanol using Berlese's funnels with electric lamps in laboratory conditions during five days. Specimens are distributed among two institutions: the National Museum Bloemfontein, South Africa (NMB); 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 gastronotum. Notogastral width refers to the maximum width of the notogaster in dorsal view. 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 includ-

ed). 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 transmission light microscope.

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

**Abbreviations.** Prodorsum: *cos* = costula; *tcos* = transcostula; *ro*, *le*, *in*, *bs*, *ex* = rostral, lamellar, interlamellar, bothridial, and exobothridial seta, respectively; *exv* = vestige of second exobothridial seta; *bo* = bothridium; *ms* = muscle sigilla; *ibt* = interbothridial tubercle; *lc* = lateral carina. Notogaster: *c*, *la*, *lm*, *lp*, *h*, *p* = notogastral setae; *ia*, *im*, *ip*, *ih*, *ips* = notogastral lyrifissures; *gla* = opisthonotal gland opening. Gnathosoma: *a*, *m*, *h* = subcapitular setae; *or* = adoral seta; *d*, *l*, *sup*, *inf*, *cm*, *ul*, *sul*, *vt*, *lt* = palp setae;  $\omega$  = palp solenidion; *cha*, *chb* = cheliceral setae; *Tg* = Trägårdh's organ. Epimeral and lateral podosomal regions: *1a-c*, *2a*, *3a-c*, *4a-c* = epimeral setae; *PdI* = pedotectum I; *dis* = discidium. Anogenital region: *g*, *ag*, *an*, *ad* = genital, aggenital, anal, and adanal setae, respectively; *iad* = adanal lyrifissure; *po* = preanal organ. Legs: *Tr*, *Fe*, *Ge*, *Ti*, *Ta* = leg trochanter, femur, genu, tibia, tarsus, respectively;  $\omega$ ,  $\varphi$ ,  $\sigma$  = leg solenidia;  $\epsilon$  = leg famulus; *d*, *l*, *v*, *bv*, *ev*, *ft*, *tc*, *it*, *p*, *u*, *a*, *s*, *p<sub>v</sub>*, *pl* = leg setae; *pa* = porose area.

## Taxonomy

Suborder **Oribatida** Duges, 1834

Superfamily **Oppioidea** Sellnick, 1937

Family **Oppiidae** Sellnick, 1937

Subfamily **Lanceoppiinae** Balogh, 1983

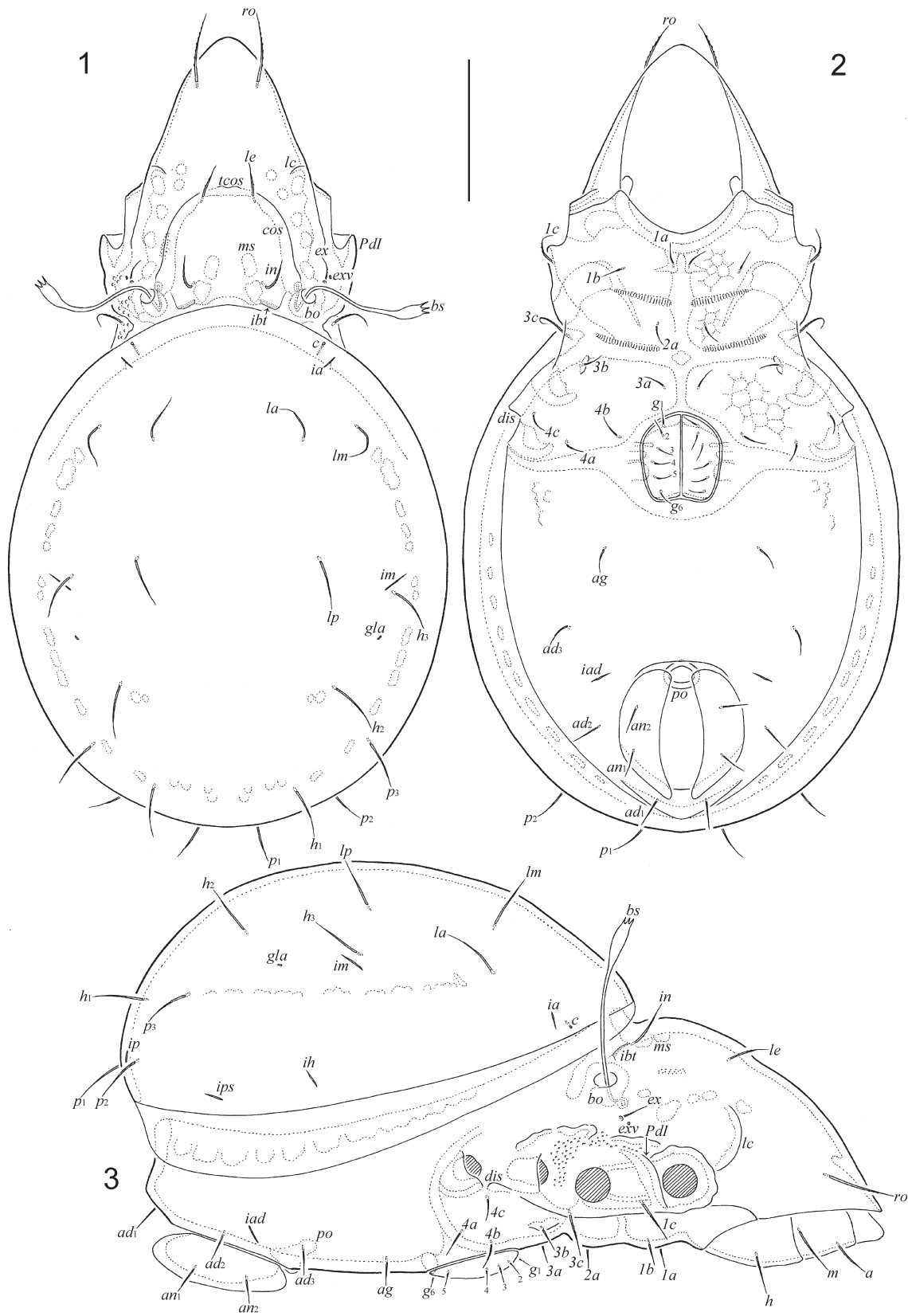
Genus ***Lanceoppia*** Hammer, 1962

Subgenus ***Lanceoppia* (*Bicristoppia*)** Subías, 1989

***Lanceoppia* (*Bicristoppia*) *capensis* sp. nov.**

(Figs 1–10)

**Holotype.** Male (in ethanol with a drop of glycerol), **South Africa**, *Eastern Cape Prov.*, Amathole mountains, Hogsback State Forest at the village of



**Figs 1–3.** *Lanceoppia (Bicristoppia) capensis* sp. nov., adult. **1**, dorsal view; **2**, ventral view (gnathosoma and legs not shown); **3**, lateral view (legs not shown). Scale bar: 50  $\mu$ m.



**Table 1.** Leg setation and solenidia of adult *Lanceoppia* (*Bicristoppia*) *capensis* sp. nov.

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> ), $\sigma$	( <i>l</i> ), ( <i>v</i> ), $\varphi_1$ , $\varphi_2$	( <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> "', $\varepsilon$ , $\omega_1$ , $\omega_2$
II	<i>v</i> '	<i>d</i> , ( <i>l</i> ), <i>bv</i> "', <i>v</i> "	( <i>l</i> ), $\sigma$	( <i>l</i> ), ( <i>v</i> ), $\varphi$	( <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>l</i> "', $\omega_1$ , $\omega_2$
III	<i>v</i> ', <i>l</i> '	<i>d</i> , <i>l</i> ', <i>ev</i> '	<i>l</i> ', $\sigma$	<i>l</i> ', ( <i>v</i> ), $\varphi$	( <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> ), $\varphi$	<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  $\varepsilon$  = famulus). Single quotation mark (') designates setae on the anterior and double quotation mark (") setae on the posterior side of a given leg segment. Parentheses refer to a pair of setae.

Hogsback, 32°35'21.6"S, 26°57'38.5"E, indigenous Afro-montane mixed forest (Mucina & Geldenhuys 2006), consisting of tall trees (dominant species, e.g. *Afrocarpus falcatus* (yellowwood), *Celtis africana* (white stinkwood), *Calodendrum capense* (Cape chestnut) and *Vepris lanceolata* (white ironwood)) and a dense understorey of shrubs, herbs and moss, in soil, 14.IX.2019, V.A. Khaustov, S.G. Ermilov, E.A. Hugo-Coetzee, and A.A. Khaustov leg. (NMB).

*Paratypes.* Five males and six females (in ethanol with a drop of glycerol), same data as for holotype (TSUMZ).

*Diagnosis.* Body size: 249–265 × 132–149. Rostrum broadly rounded. Costula and transcostula forming arch-like structure; costula clearly stronger developed than transcostula. Rostral, lamellar and interlamellar setae of medium length, setiform, slightly barbed; *ro* longest, *le* shortest. Bothridial seta long, clavate, with three spines apically. Interbothridial tubercle semi-quadrangular. Notogastral setae of medium length, setiform, smooth; *c* represented by alveolus. Epimeral seta *3b* located on ridge. Discidium present.

*Description.* Measurements. Very small species. Body length 249 (holotype), 249–265 (11 paratypes); body width 132 (holotype), 132–149 (11 paratypes). No distinct difference between males and females in body size.

*Integument.* Body color light brown. Body surface microporose (visible under high magnification in dissected specimens, × 1000). Several granules (diameter of granule up to 1) located nearly median part of costula. Lateral part of body between bothridium and acetabula I–III partially tuberculate (diameter of tubercle up to 2).

*Prodorsum.* Rostrum broadly rounded. Costula and transcostula forming arch-like structure (not observed in lateral view); costula strong,

transcostula slightly visible. Rostral (22–24), lamellar (14–16), interlamellar (18–20), and exobothridial (10–12) setae setiform, slightly barbed. Insertion of lamellar seta located closer to insertion of interlamellar seta than to rostral seta. Bothridial seta (49–57) with long stalk and short, clavate head having three distinct spines apically. Interbothridial region with two pairs of muscle sigillae. Interbothridial tubercle semi-quadrangular, often poorly visible. Postbothridial tubercle absent. Longitudinal row, comprising several muscle sigillae, present in front of the bothridium. Lateral carina present, arch-like.

*Notogaster.* Anterior border convex medially. Nine pairs of notogastral setae (18–20) setiform, smooth; *c* represented by alveolus. All notogastral lyrifissures, opisthonotal gland opening, circumgastric scissure, and circumgastric sigillar band distinct; lyrifissure *im* located close to insertion of *h*<sub>3</sub>.

*Gnathosoma.* Subcapitulum longer than wide (57–61 × 45–53). Subcapitular setae (*a* and *h*, 14–16; *m*, 18–20) setiform, slightly barbed. Adoral seta (4) setiform, thin, smooth. Palp (41–45) with setation 0-2-1-3-9 (+1 solenidion). Solenidion short, thick, bacilliform, located in distal part of tarsus and pressed to its surface. Postpalpal seta (4) spiniform, smooth. Chelicera (57–61) with two setiform, barbed setae (*cha*, 18–20; *chb*, 12).

Epimeral and lateral podosomal regions. Epimeral setae *1c* and *3c* (16–24) setiform, barbed, others (*1b* and *4a*, 12; *1a*, *2a*, *3a*, *3b*, *4b*, *4c*: 10–12) setiform, roughened; *3b* located on short, longitudinal ridge. Discidium triangular.

Anogenital region. Genital seta (8) setiform, smooth. Aggenital, adanal and anal setae (10–12) setiform, roughened. Adanal lyrifissure distinct. Preanal organ caecum-like.

Leg. Leg claw smooth. Porose area on all femora well visible, but not observed on trochanters. 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 tarsus I short, erect, slightly swollen apically, inserted posterolateral to  $\omega_1$ . Solenidion  $\omega_1$  on tarsus I,  $\omega_1$  and  $\omega_2$  on tarsus II,  $\phi$  on tibiae II, III, and  $\sigma$  on genua III rod-like, rounded apically, other solenidia setiform.

**Comparison.** *Lanceoppia* (*Bicristoppia*) *capensis* sp. nov. is morphologically most similar to *L. (B.) cucheana* Mahunka, 1994 from Madagascar (see Mahunka, 1994) in having long, clavate bothridial seta with spines apically. However, the new species differs from the latter by the presence of smaller body size (249–265 × 132–149 versus 438–517 × 258–320), broadly rounded rostrum (versus nasiform), well developed costula (versus absent), medium length in interlamellar and notogastral setae (versus short), and semi-quadrangular interbothridial tubercle (versus elongate triangular).

**Etymology.** The species name *capensis* refers to the South African Eastern Cape Province, where the new species was collected.

## Distribution and habitat of *Lanceoppia* (*Bicristoppia*)

At present, representatives of *Lanceoppia* (*Bicristoppia*) have been recorded only in the Southern Hemisphere, in the Afrotropical, Neotropical and Australasian regions. All species have a highly circumscribed geographic distribution, i.e. are endemic, to a single country.

**Afrotropical region** (three species). *Lanceoppia* (*Bicristoppia*) *cucheana* and *L. (B.) kalalao* Mahunka, 1997 were described from Madagascar: *L. (B.) cucheana* was recorded from soil under Lauraceae in a primary forest in eastern Madagascar (Mahunka, 1994), from wet samples under ferns, palms and *Pandanus* ssp. in lowland rainforest of Mananara-Nord Biosphere Reserve in north-eastern Madagascar [Mahunka & Mahunka-Papp, 2012, mistakenly identified as *Aethioppia cucheana* (Mahunka, 1994)] and from

litter in primary forest of Andasibe-Mantadia National Park in eastern Madagascar (Ermilov & Starý, 2020); *L. (B.) kalalao* Mahunka, 1997 from soil in primary Kalalao forest on Nosy Boraha Island off the east coast of Madagascar (Mahunka, 1997). Data on the new species from South Africa are presented above.

**Neotropical region** (three species). *Lanceoppia* (*Bicristoppia*) *archicostulata* Ermilov, 2016 and *L. (B.) binodosa* (Hammer, 1962) are known from Chile: *L. (B.) archicostulata* was collected from moss (*Sphagnum magellanicum*) in southern Chile (Ermilov, 2016a, b); *L. (B.) binodosa* on the wall of a small cave covered by fern and liverwort above Puerto Montt, central-southern Chile (Hammer, 1962a); from soil with native *Gomortega keule* trees, in the Biobío region, Chile (Martínez & Casaneuva, 1995). *Lanceoppia* (*Bicristoppia*) *bicristata* was found in low fern-like moss and liverworts on moist wet soil in deep shadows under tall trees at Puerto Blest, southwest Argentina (Hammer, 1962b).

**Australasian region** (one species). *Lanceoppia* (*Bicristoppia*) *feideri* (Hammer, 1968) was described from liverworts and *Leucobryum* on a log in a native forest, Waitakere Range, New Zealand; from moist to wet moss on a slope, on the ground and on a log, and from wet moss and liverworts above a small brook, all in *Nothofagus* forest at Lake Rotoiti, New Zealand (Hammer, 1968).

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