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New Oppiidae (Acari, Oribatida) from Chile

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ABSTRACT — Two new species of oribatid mites of the family Oppiidae (Oribatida, Oppioidea), belonging to the genera *Lanceoppia* and *Rhinoppia*, are described from *Sphagnum magellanicum* from a swamp in the vicinity of Punta Arenas in Chile. *Lanceoppia* (*Bicristoppia*) *archicostulata* n. sp. is morphologically similar to *L. (Bicristoppia) bicristata* Hammer, 1962(b), but differs by the well-developed transcostula, the presence of a median indentation on the rostrum and by setae *la* and *lm* being the longest of all notogastral setae. *Rhinoppia* (*Rhinoppia*) *paraundulata* n. sp. is morphologically similar to *R. (Rhinoppia) undulata* (Mahunka and Mahunka-Papp, 2010), but differs by the long notogastral setae, the presence of longitudinal ridges in the interbothridial region, five pairs of genital setae and by the interlamellar setae being distinctly longer than rostral and lamellar setae. An identification key to known species of *Lanceoppia* (*Bicristoppia*) is given.

KEYWORDS — oribatid mites; morphology; systematics; *Lanceoppia*; *Rhinoppia*; key; Neotropical region

INTRODUCTION

This work is a part of the continuing study of the Chilean oribatid mite fauna (Acari, Oribatida) by the author (Ermilov and Khaustov 2015; Ermilov and Weigmann 2015; Ermilov 2016). Mites were collected during a one-month expedition to southern Chile in November 2014, organized by the Tyumen State University (Tyumen, Russia). This paper includes data on new taxa of the family Oppiidae. Two new species, belonging to the genera (subgenera) *Lanceoppia* (*Bicristoppia*) Subías, 1989 and *Rhinoppia* (*Rhinoppia*) Balogh, 1983 were discovered. The aim of this paper is to describe and illustrate these taxa.

Lanceoppia (*Bicristoppia*) was proposed by Subías (Subías and Balogh 1989) with *Oppia bicristata* Hammer, 1962(b) as type species. Currently, the subgenus comprises five species, which are distributed

in the southern subtropics (Súbias 2004, online version 2016). Only one species of this subgenus was recorded in Chile, *L. (Bicristoppia) binodosa* (Hammer, 1962a). The species herein described follows the following subgeneric characters (based on data from Súbias and Balogh 1989; including our additions): *Lanceoppiinae* with rostrum rounded or with median indentation; costulae and/or transcostula present or absent, if present - with quadrangular or arch-like configurations; interbothridial region with one pair of strong tubercles; bothridial setae fusiform, lanceolate or bacilliform; 9 or 10 pairs of notogastral setae, setae *c* minute or represented by alveoli; setae *la* inserted laterally to *lm*; six pairs of genital setae; adanal lyrifissures inverse apoanal.

Rhinoppia (*Rhinoppia*) was proposed by Balogh (1983) with *Oppia nasuta* Moritz, 1965 as type species. Currently, the subgenus comprises 36 species and two subspecies, which have a cos-

mopolitan distribution, except the Antarctic and Oriental regions (Súbias 2004, online version 2016). Some divergences exist in literature as Miko (2006) considers *Rhinoppia* as a subgenus of the genus *Oppiella*, Jacot. Clearly, additional research is needed to clarify the systematic placement of this genus. Thus, the classification of Súbias was herein followed. No species of this subgenus is known from Chile. The species herein described follows the following subgeneric characters (based on data from Balogh 1983; Súbias and Mínguez 1985 - as for *Medioppia* Súbias and Mínguez, 1985; Mahunka 1987 - as for *Kunoppia* Mahunka, 1987; Súbias and Balogh 1989; including our additions): *Medioppiinae* with rostrum rounded, pointed, tripartite or median incision; costulae and transcostula absent; interbothridial region with ridges or tubercles; bothridial setae with dilated heads, ciliate unilaterally; lamellar setae inserted nearer to interlamellar setae than to rostral setae; anterior protruding of notogaster and cristae usually developed; 10 pairs of notogastral setae, *c* not shorter than others; setae *la* inserted antero-laterally or anteriorly to *lm*; four or five pairs of genital setae; adanal setae *ad*₁ in postanal position; adanal lyrifissures paraanal.

In addition to the description of the two new species, an identification key to known species of *Lanceoppia* (*Bicristoppia*) in the world is given.

MATERIALS AND METHODS

Material — The collection locality and habitat for each new species are given in the respective "*Material examined*" section.

Methods — Specimens were mounted in lactic acid on temporary cavity slides for measurement and illustration. The 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 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".

DESCRIPTIONS

Lanceoppia (*Bicristoppia*) *archicostulata* n. sp. (Figures 1-3)

Diagnosis — Body size: 233 – 241 × 131 – 143. Rostrum with median indentation. Costulae and transcostula present, arch-like. Interbothridial and postbothridial tubercles developed, rounded distally. Rostral setae setiform, barbed. Lamellar and interlamellar setae thin, erect, indistinctly barbed. Bothridial setae lanceolate, barbed. Notogastral setae *c* minute, other setae long, *la* and *lm* longest. Anogenital setae thin, setiform, smooth.

Description — Measurements – Very small species. Body length: 237 (holotype, female), 233, 241 (two paratypes: one female and one male); notogaster width: 135 (holotype), 131, 143 (two paratypes).

Integument — Body color light brownish. Body surface smooth, but lateral sides (between bothridia and pedotecta II and III) with tuberculate cerotegument (diameter of tubercles up to 2).

Prodorsum (Figures 1A, 2A) — Rostrum with median, small, semioval indentation. Costulae (slightly shorter than half of prodorsum) and transcostula well developed, forming arch-like structure. Longitudinal rows, comprising several muscle sigillae, present in front of the bothridia. Interbothridial region with several (four to seven), indistinct muscle sigillae. Interbothridial (*tub*_i) and postbothridial (*tub*_p) tubercles strong, simple. Rostral setae (*ro*, 18-20) setiform, barbed, inserted dorso-laterally, directed antero-medially. Lamellar (*le*, 16) and interlamellar (*in*, 8-10) setae thin, erect, indistinctly barbed; *le* inserted posterior to transcostula. Exobothridial setae (*ex*, 4-6) minute, smooth,

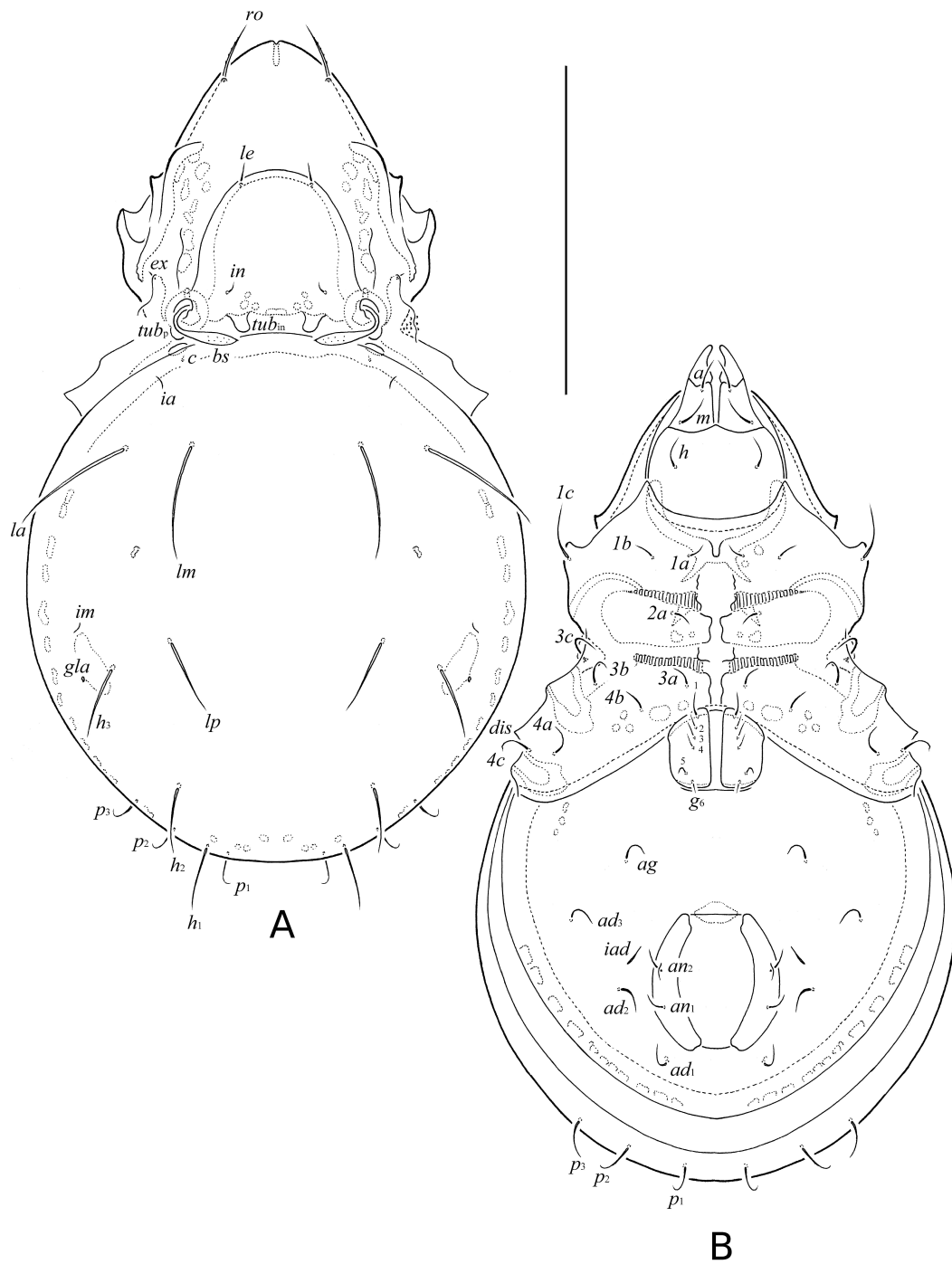


FIGURE 1: *Lanceoppia (Bicristoppia) archicostulata* n. sp., adult: A – dorsal view (legs not illustrated); B – ventral view (legs not illustrated). Scale bar 100 μ m.

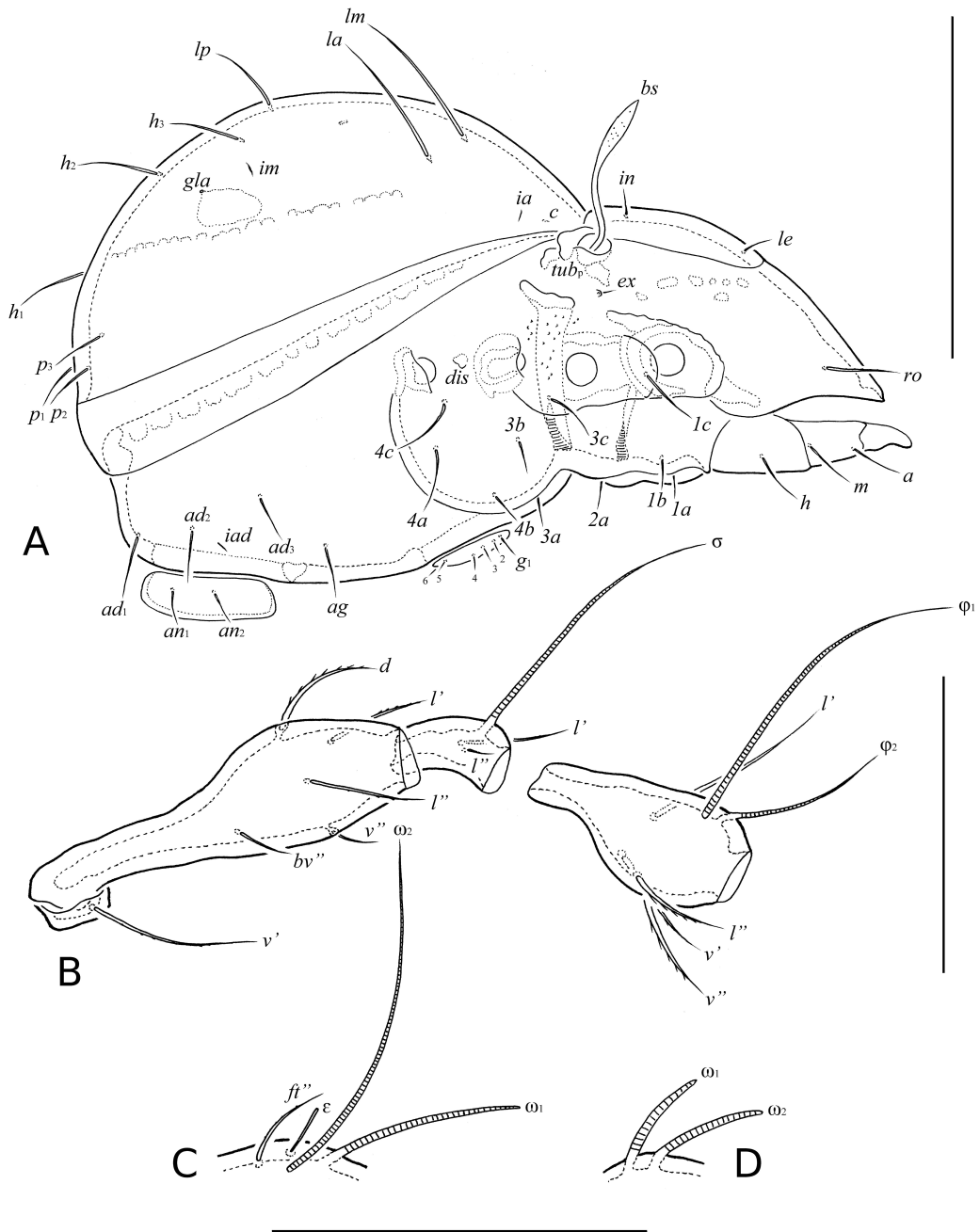


FIGURE 2: *Lanceoppia (Bicristoppia) archicostulata* n. sp., adult: A – lateral view (legs and palp not illustrated); B – leg I, without tarsus, right, antiaxial view; C – solenidia, famulus and seta ft'' on tarsus of leg I, right, antiaxial view; D – solenidia on tarsus of leg II, right, antiaxial view. Scale bar (3) 100 μm , scale bar (4-6) 50 μm .

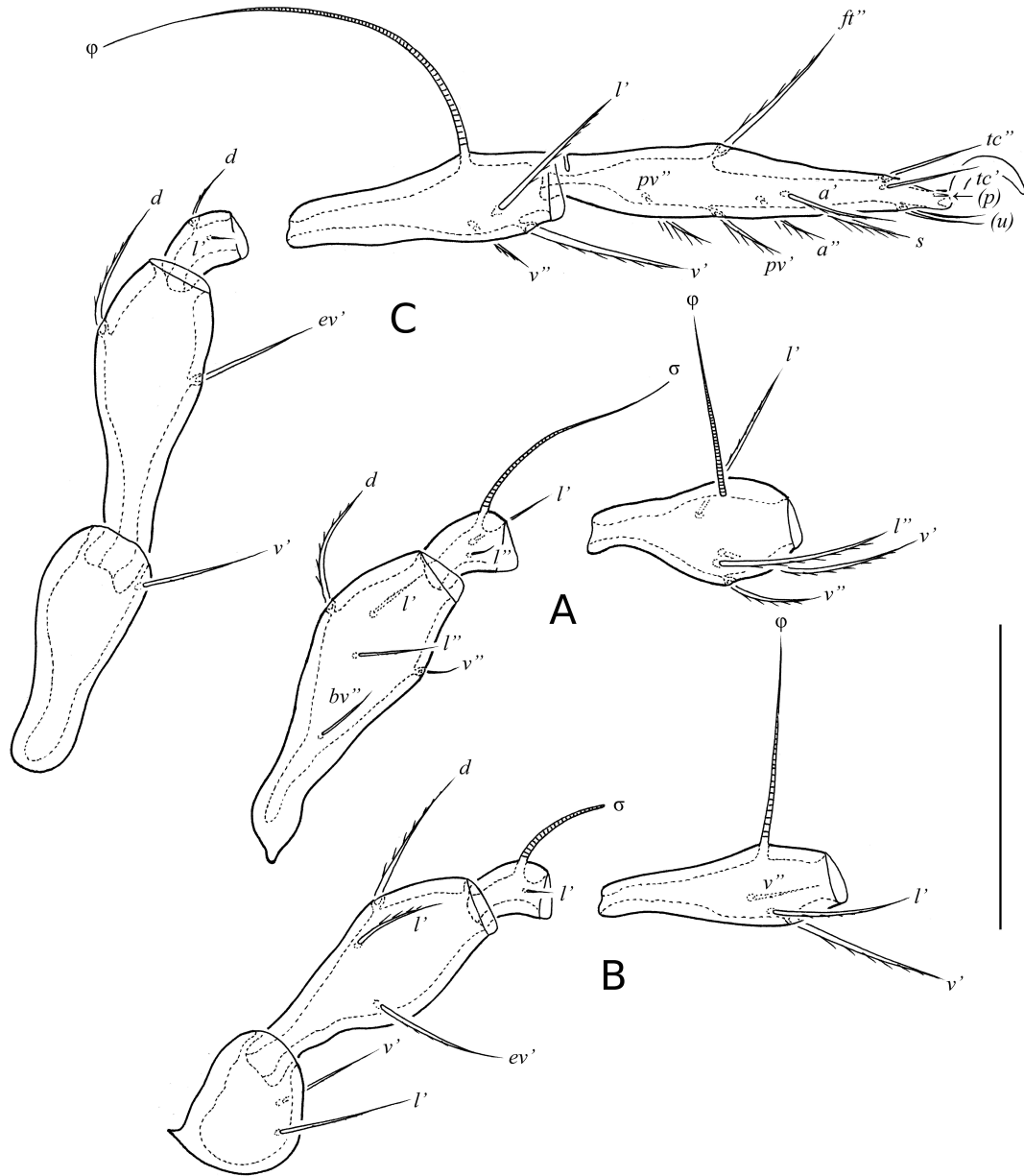


FIGURE 3: *Lanceoppia (Bicristoppia) archicostulata* n. sp., adult: A – femur, genu and tibia of leg II, right, antiaxial view; B – leg III, without tarsus, left, antiaxial view; C – leg IV, left, antiaxial view. Scale bar 50 μ m.

TABLE 1: Leg setation and solenidia of *Lanceoppia (Bicristoppia) archicostulata* n. sp. and *Rhinoppia (Rhinoppia) paraundulata* n. sp.

Leg	Tr	Fe	Ge	Ti	Ta
I	v'	$d, (l), bv'', v''$	$(l), \sigma$	$(l), (v), \varphi_1, \varphi_2$	$(ft), (tc), (it), (p), (u), (a), s, (pv), v', (pl), l'', \varepsilon, \omega_1, \omega_2$
II	v'	$d, (l), bv'', v''$	$(l), \sigma$	$(l), (v), \varphi$	$(ft), (tc), (it), (p), (u), (a), s, (pv), l'', \omega_1, \omega_2$
III	l', v'	d, l', ev'	l', σ	$l', (v), \varphi$	$(ft), (tc), (it), (p), (u), (a), s, (pv)$
IV	v'	d, ev'	d, l'	$l', (v), \varphi$	$ft'', (tc), (p), (u), (a), s, (pv)$

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. Tr – trochanter, Fe – femur, Ge – genu, Ti – Tibia, Ta – tarsus.

inserted on tubercles. Bothridial setae (bs , 44-48) with long stalks and shorter, lanceolate, barbed heads.

Notogaster (Figures 1A, 2A) — Anterior border convex medially. One pair of tubercles located anterior to border, directed to postbothridial tubercles. Ten pairs of notogastral setae: c minute (2), other long (la, lm , 41 – 49; lp, h_1-h_3 , 24 – 26; p_1-p_3 , 16), setiform, smooth. Setae la inserted laterally to lm . Lyrifissures ia, im and ip and opisthonotal gland openings (gla) well visible, lyrifissures ih and ips not visible.

Gnathosoma (Figures 1B, 2A) — Subcapitulum longer than wide (53 – 57 × 41 – 43). Subcapitular setae (a, m, h) similar in length (18 – 20), setiform, smooth. Palps (45) with setation 0-2-1-3-8(+ ω). Postpalpal setae (4) spiniform. Chelicerae (53 – 57) with two setiform, barbed setae; cha (20) longer than chb (12). Trägårdh's organ tapered.

Epimeral and lateral podosomal regions (Figures 1B, 2A) — Apodemes 4 semioval (forming a weak ridge in lateral view). Epimeral setal formula: 3-1-3-3; setae setiform, indistinctly barbed; $1c, 3c, 4a$ and $4c$ (20 – 24) longer than others (10 – 14). Pedotecta I represented by small laminae. Discidia (dis) well developed, triangular, pointed distally.

Anogenital region (Figures 1B, 2A) — Six pairs of genital ($g_1, 10-12$; $g_2-g_6, 4-6$), one pair of aggenital ($ag, 16-18$), three pairs of adanal ($ad_1-ad_3, 16-18$) and two pairs of anal ($an_1, an_2, 12-14$) setae setiform, smooth. Adanal lyrifissures (iad) distinct, inverse apoanal.

Legs (Figures 2B-3) — Claw of each leg smooth. Trochanters III with one dorso-anterior 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. Solenidia ω_1 on tarsi I, ω_1 and ω_2 on tarsi II and σ on genua III thickened, blunt-ended, solenidia φ on tibia II and III stick-like, erect, other solenidia setiform. Famuli (ε) thickened, straight, inserted posteriorly to solenidia ω_1 .

Material examined — Chile, vicinity of Punta Arenas, 53°38'02.8"S, 65°31'01.6"W, swamp, in *Sphagnum magellanicum*, 18.XI.2014 (V.A. Stolbov and S.A. Ivanov).

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

Etymology — The specific name *archicostulata* refers to the costulae and transcostula, which form the arch-like structure on the prodorsum.

Remarks — *Lanceoppia (Bicristoppia) archicostulata* n. sp. is morphologically most similar to *L. (Bicristoppia) bicristata* (Hammer, 1962(b)) from Argentina in having costulae, long notogastral setae and lanceolate bothridial setae. However, the new species differs from the latter by the well-developed transcostula (*vs.* transcostula absent), the presence of a median indentation on the rostrum (*vs.* rostrum rounded) and by setae la and lm being the longest

on the notogaster (*vs.* dorsal notogastral setae similar in length).

Key to known species *Lanceoppia* (*Bicristoppia*)

1. Costulae and transcostula both always present; notogastral setae *la* and *lm* distinctly longer than other dorsal notogastral setae 2
— Costulae and transcostula absent, or only costulae or only transcostula present; notogastral setae *la* and *lm* similar to other dorsal notogastral setae in length.....3
2. Rostrum with median indentation; costulae and transcostula form arch-like structure; bothridial setae of medium size, lanceolate; body size: 233 – 241 × 131 – 143.....
.....*Lanceoppia* (*Bicristoppia*) *archicostulata* n. sp.
Distribution: Chile.
— Rostrum rounded; costulae and transcostula form trapezoid-like structure; bothridial setae very long, weakly thickened, almost setiform; body size: 285 – 327 × 184 – 202
...*Lanceoppia* (*Bicristoppia*) *kalalao* Mahunka, 1997.
Distribution: Madagascar.
3. Notogastral setae short, length similar to diameter of bothridia approximately 4
— Notogastral setae long, distinctly longer than diameter of bothridia.....5
4. Costulae absent; interbothridial tubercles narrowly triangular; body size: 438 – 517 × 258 – 320...
Lanceoppia (*Bicristoppia*) *cucheana* Mahunka, 1994.
Distribution: Madagascar.
— Costulae present; interbothridial tubercles rounded distally; body length: 270
...*Lanceoppia* (*Bicristoppia*) *feideri* (Hammer, 1968).
Distribution: New Zealand.
5. Costulae absent; lamellar setae minute; body length: 330
Lanceoppia (*Bicristoppia*) *binodosa* (Hammer, 1962(a)). Distribution: Chile.
— Costulae present; lamellar setae of medium size; body length: 330
Lanceoppia (*Bicristoppia*) *biscristata* (Hammer,

1962(b)). Distribution: Argentina.

***Rhinoppia* (*Rhinoppia*) *paraundulata* n. sp.
(Figures 4-6)**

Diagnosis — Body size: 398 × 232 – 265. Rostrum with inverse trapezoid indentation. Interbothridial region with one pair of short, longitudinal ridges. Rostral and lamellar setae short, thin, erect, smooth. Interlamellar and exobothridial setae long, setiform, indistinctly barbed. Bothridial setae with dilated unilaterally heads having four to five cilia. Notogastral setae long, setiform, smooth, *la* inserted antero-laterally to *lm*. Five pairs of genital setae. Anogenital setae thin, setiform, smooth.

Description — Measurements – Small species. Body length: 398 (holotype, female), 398 (two paratypes: two males); notogaster width: 265 (holotype), 232, 248 (two paratypes).

Integument — Body color light brownish. Body surface smooth, but lateral sides (between bothridia and pedotecta II and III) with tuberculate cerotegument (diameter of tubercles up to 4).

Prodorsum (Figures 4A, 5A) — Rostrum with inverse trapezoid indentation. Costulae and transcostula absent. Longitudinal rows, comprising several muscle sigillae, developed in front of the bothridia. Interbothridial region with one pair of short, parallel, longitudinal ridges (*r*). Postbothridial tubercles strong, simple. Rostral and lamellar setae similar in length (12 – 14), thin, erect, smooth. Interlamellar and exobothridial setae also similar in length (61 – 65), but long, setiform, indistinctly barbed, *ex* inserted on distinct tubercles. Bothridial setae (65 – 69) with long stalks and shorter, dilated heads having four to five cilia unilaterally.

Notogaster (Figures 4A, 5A) — Anterior border with one pair of short cristae and a trapezoid protruding. Ten pairs of notogastral setae long (*p*₁–*p*₃, 34 – 36; others 53 – 57), setiform, smooth. Setae *la* inserted antero-laterally to *lm*. Lyrifissures *ia*, *im*, *ip*, *ih* and *ips* and opisthonotal gland openings well visible.

Gnathosoma (Figures 4B, 5A) — Subcapitulum longer than wide (110 – 114 × 61 – 65). Subcapitular setae setiform, smooth, *m* (24) longer than *a* and

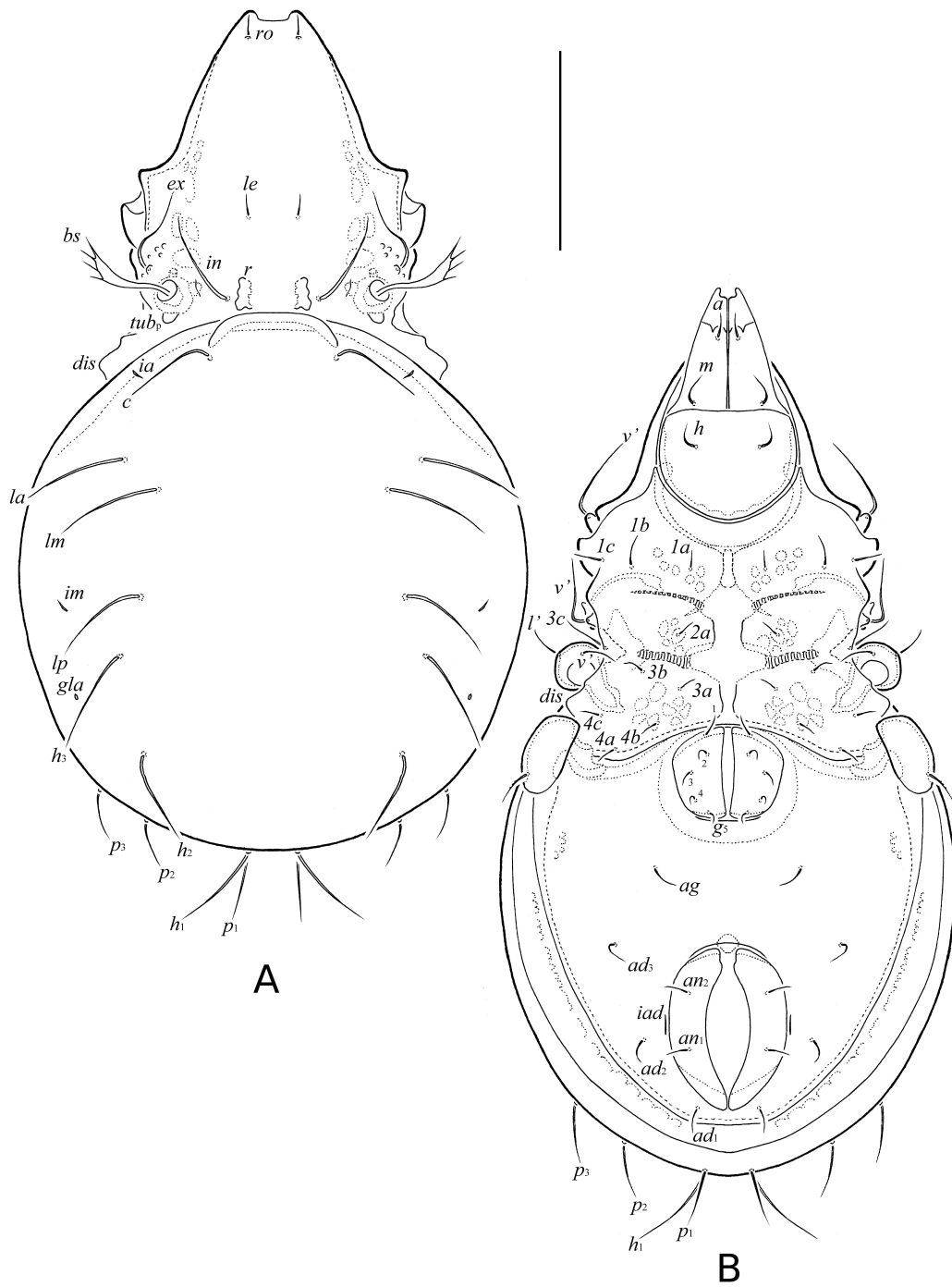


FIGURE 4: *Rhinoppia (Rhinoppia) paraundulata* n. sp., adult: A – dorsal view (legs not illustrated); B – ventral view (legs except trochanters not illustrated). Scale bar 100 μ m.

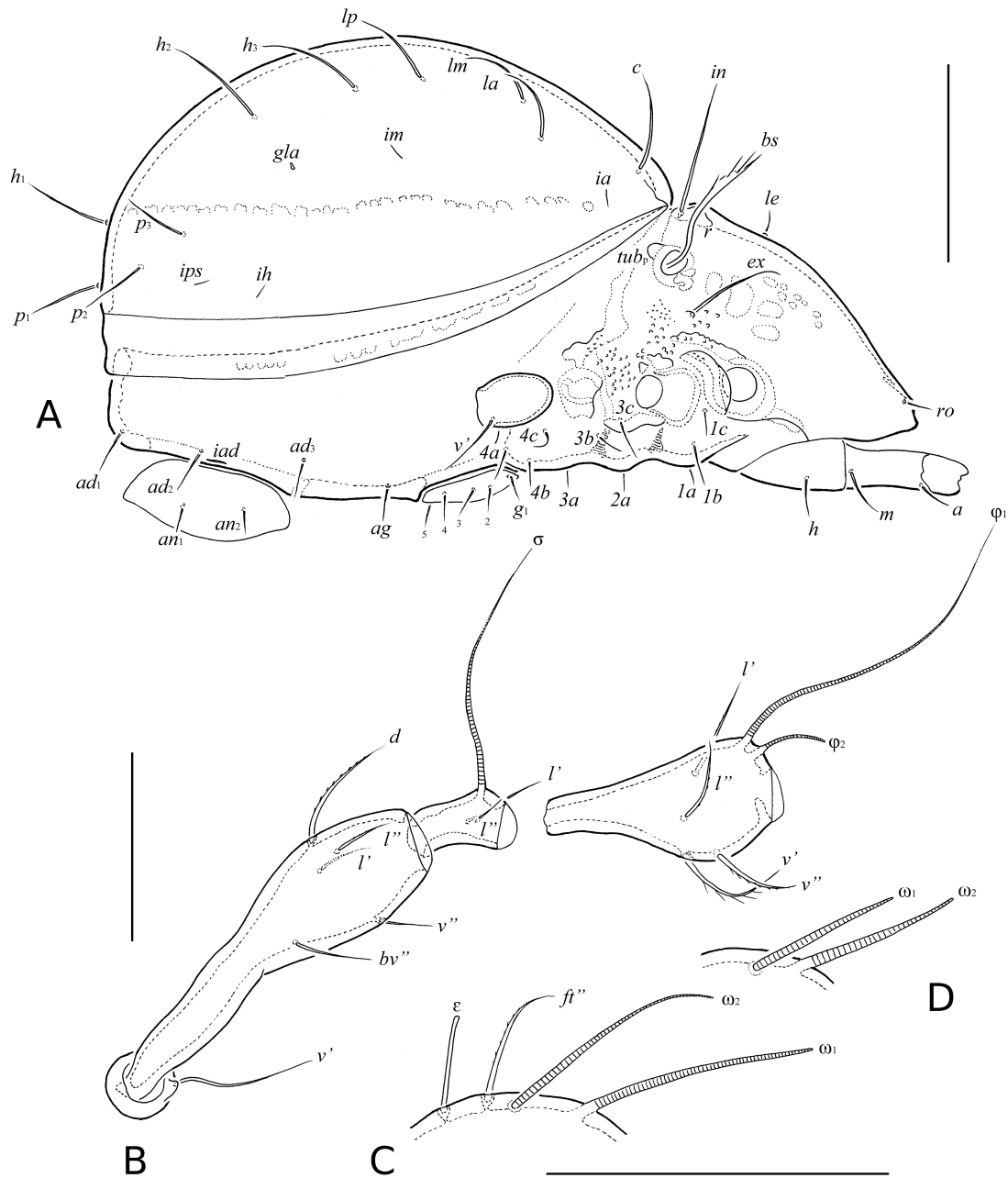


FIGURE 5: *Rhinoppia (Rhinoppia) paraundulata* n. sp., adult: A – lateral view (legs except trochanter IV and palp not illustrated); B – leg I, without tarsus, right, antiaxial view; C – solenidia, famulus and seta ft'' on tarsus of leg I, right, antiaxial view; D – solenidia on tarsus of leg II, right, antiaxial view. Scale bar (12) 100 μm , scale bar (13-15) 50 μm .

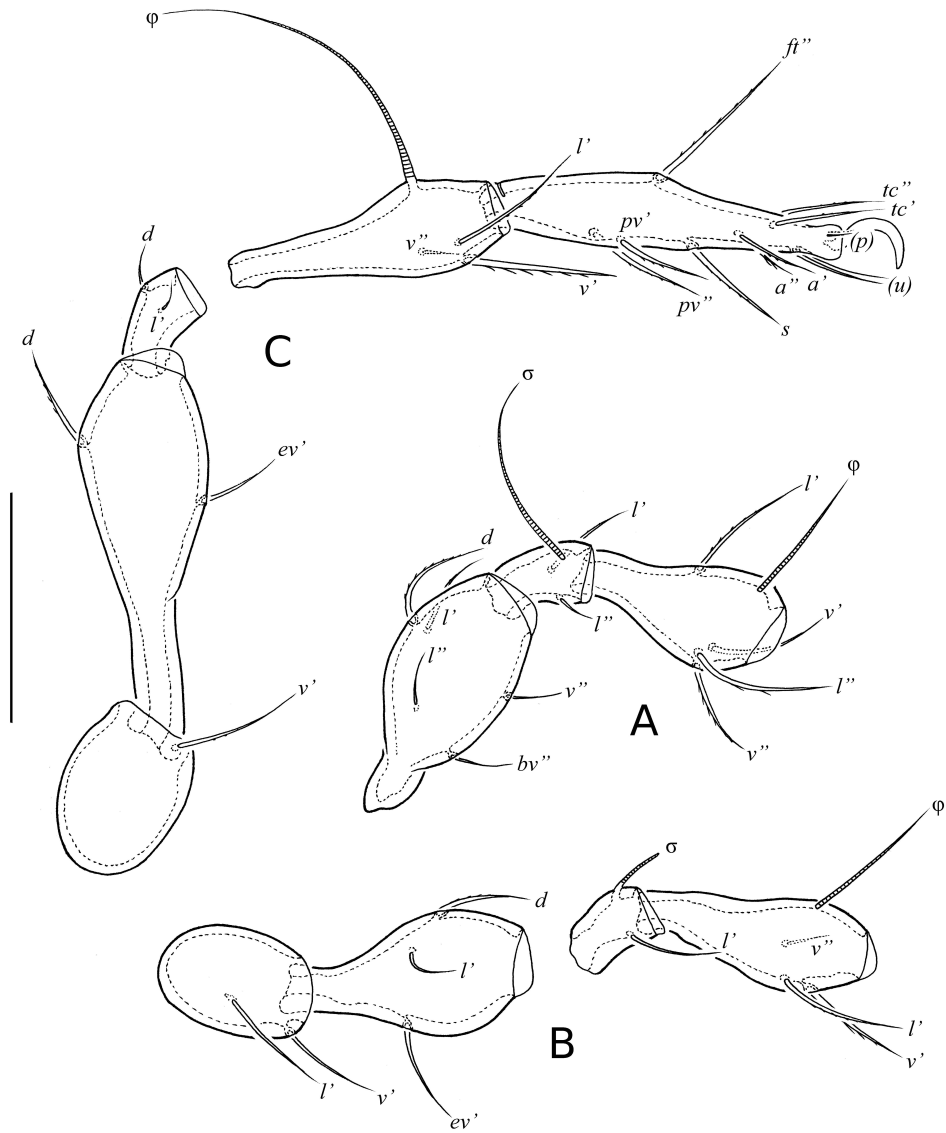


FIGURE 6: *Rhinoppia (Rhinoppia) paraundulata* n. sp., adult: A – femur, genu and tibia of leg II, right, antiaxial view; B – leg III, without tarsus, left, antiaxial view; C – leg IV, left, antiaxial view. Scale bar 50 μ m.

h (14 – 16). Palps (53 – 57) with setation 0-2-1-3-8(+ ω). Postpalpal setae (6) spiniform. Chelicerae (114 – 118) with two setiform, barbed setae; *cha* (32) longer than *chb* (20). Trägårdh's organ tapered.

Epimeral and lateral podosomal regions (Figures 4B, 5A) — Apodemes 4 slightly semioval (forming a weak ridge in lateral view). Epimeral setal formula: 3-1-3-3; setae setiform, indistinctly barbed; *1b* and *3c* (24 – 28) longer than others (12). Pedotecta I represented by small laminae. Discidia well developed, triangular, rounded distally.

Anogenital region (Figures 4B, 5A) — Five pairs of genital (g_1 - g_5 , 16 – 20), one pair of aggenital (16 – 20), three pairs of adanal (16 – 20) and two pairs of anal (16 – 20) setae setiform, smooth. Adanal lyrifissures distinct, paraanal.

Legs (Figures 5B-6) — Claw of each leg smooth. 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, thin on tarsi II-IV. Solenidia ω_1 on tarsi I and II, φ_2 on tibiae I and σ on genua III thickened, blunt-ended, solenidia ω_2 on tarsi I slightly blumnt-ended, solenidia φ on tibia II and III stick-like, erect, other solenidia setiform. Famuli (ϵ) thickened, straight, inserted posteriorly to solenidia ω_1 .

Material examined — Holotype (female) and two paratypes (two males): Chile, vicinity of Punta Arenas, 53°38'02.8"S, 65°31'01.6"W, swamp, in *Sphagnum magellanicum*, 18.XI.2014 (V.A. Stolbov and S.A. Ivanov).

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

Etymology — The specific name *paraundulata* refers to the similarity between the new species to the species *Rhinoppia* (*Rhinoppia*) *undulata* (Mahunka and Mahunka-Papp 2010).

Remarks — *Rhinoppia* (*Rhinoppia*) *paraundulata* n. sp. is morphologically most similar to *R. (Rhinoppia) undulata* (Mahunka and Mahunka-Papp 2010)

from Hungary in having an inverse trapezoid indentation of the rostrum. However, the new species differs from the latter by the long notogastral setae (*vs.* short), the presence of longitudinal ridges in the interbothridial region (*vs.* ridges transversely oriented) and five pairs of genital setae (*vs.* six pairs), and by the interlamellar setae distinctly longer than rostral and lamellar setae (*vs.* interlamellar, lamellar and rostral setae similar in length).

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