

**FIRST RECORD OF ATOPOCHTHONIOIDEA FROM NEW ZEALAND,
WITH DESCRIPTION OF *PTEROCHTHONIUS ROYNORTONI* SP. N.
(ACARI, ORIBATIDA, PTEROCHTHONIIDAE)**

M. A. Minor¹ and S. G. Ermilov²

¹Institute of Agriculture and Environment, Massey University, New Zealand; e-mail: m.a.minor@massey.ac.nz

²Tyumen State University, Tyumen, Russia; e-mail: ermilovacari@yandex.ru

ABSTRACT: The oribatid mite superfamily Atopochthonioidea (Acari, Oribatida) is recorded in New Zealand for the first time. A new species of the genus *Pterochthonius* (Pterochthoniidae) is described and illustrated on the basis of adult specimens collected from soil and debris under *Dracophyllum muscoides* cushion plant in the high alpine zone in Central Otago mountains, South Island. *Pterochthonius roynortoni* Ermilov et Minor sp. n. differs from *P. angelus* (Berlese, 1910) by the comparatively short bothridial setae with well-developed head.

KEY WORDS: oribatid mites, *Pterochthonius*, new species, systematics, morphology, alpine fauna, New Zealand

INTRODUCTION

Atopochthonioidea (Acari, Oribatida) is a small superfamily of oribatid mites, comprising three families (Atopochthoniidae, Phyllochthoniidae, Pterochthoniidae)¹, three genera and six species (Schatz et al. 2011), which have a semi-cosmopolitan distribution (Subías 2004, online version 2015).

During taxonomic study of the alpine oribatid fauna in New Zealand (Ermilov and Minor 2015a–d; Ermilov et al. 2015), we found a new atopochthonioid species of Pterochthoniidae. This family comprises one monotypic genus *Pterochthonius* Berlese, 1913, which was proposed by Berlese (1913) with *Cosmochthonius angelus* Berlese, 1910 as type species. The main goal of this paper is to describe and illustrate the new species under the name *Pterochthonius roynortoni* Ermilov et Minor sp. n. This species is the first representative of Atopochthonioidea recorded in New Zealand.

MATERIAL AND METHODS

Material examined. Specimens of *Pterochthonius roynortoni* Ermilov et Minor sp. n. (holotype: female; seven paratypes: all females) were collected: New Zealand, South Island, Central Otago, Pisa Range, 44°52'19"S, 169°10'30"E, 1880 m a.s.l., in soil and debris under dwarf *Dracophyllum muscoides* Hook. f. (Ericaceae) cushion plant, 18 February 2014 (M. Minor).

Methods. Mites 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 poste-

rior 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. General terminology used in this paper follows that of Grandjean (summarized by Norton and Behan-Pelletier 2009). Drawings were made with a drawing tube 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”.

DESCRIPTION

***Pterochthonius roynortoni*
Ermilov et Minor sp. n.**

Figs 1–18

Diagnosis. Body size: 282–315 × 149–182. Prodorsal and notogastral setae phylliform (except setiform p_1, p_3); lamellar setae largest and posterior exobothridial setae smallest on prodorsum, cp largest and h_3 smallest on notogaster. Bothridial setae comparatively short, with well-developed, flattened and barbed head. Epimeral and ano-adanal setae thin, slightly barbed.

Description. Measurements. Body length: 315 (holotype, female), 282–315 (seven paratypes, all females); notogaster width: 166 (holotype), 149–182 (seven paratypes).

¹Subías (2004, online version 2015) includes representatives of Phyllochthoniidae and Pterochthoniidae in Atopochthoniidae.

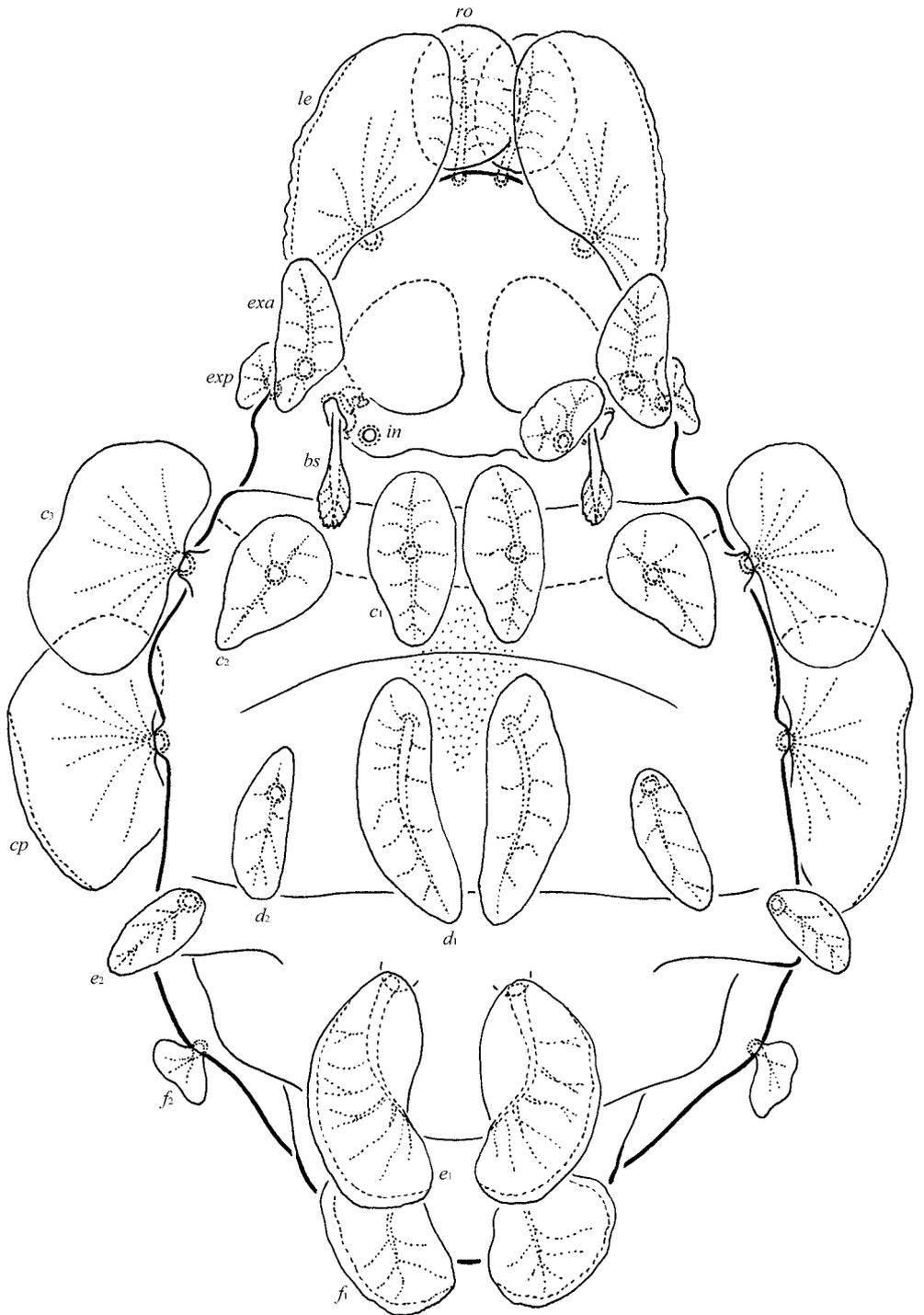


Fig. 1. *Pterochthonius roynortoni* Ermilov et Minor sp. n., adult: dorsal view (not shown: left interlamellar seta). Scale bar 100 μ m.

Integument. Body colorless. Body surface smooth, covered with microgranular cerotegument (visible under high magnification), which forms longitudinal, wave-like lines in ventro-lateral parts of the body.

Prodorsum. Rostrum widely rounded. Rostral (*ro*), lamellar (*le*), interlamellar (*in*) and exobothridial (*exa*, *exp*) setae phylliform; *le* largest, *exp* smallest. Bothridial setae (*bs*, 32–36) with well-developed, flattened and barbed head.

Notogaster. Three transverse scissures distinct. Fourteen pairs of notogastral setae (*c*₁–*c*₃, *cp*, *d*₁, *d*₂, *e*₁, *e*₂, *f*₁, *f*₂, *h*₁, *h*₂, *h*₃, *p*₂) phylliform, out of these, setae *f*₂, *h*₂, *h*₃ and *p*₂ shorter than others. Two pairs of notogastral setae (*p*₁, *p*₃, 28–32) setiform, thickened, smooth. Setae *cp* largest and *h*₃ smallest on notogaster. Only lyrifissures *ip*, *ih* and *ips* visible.

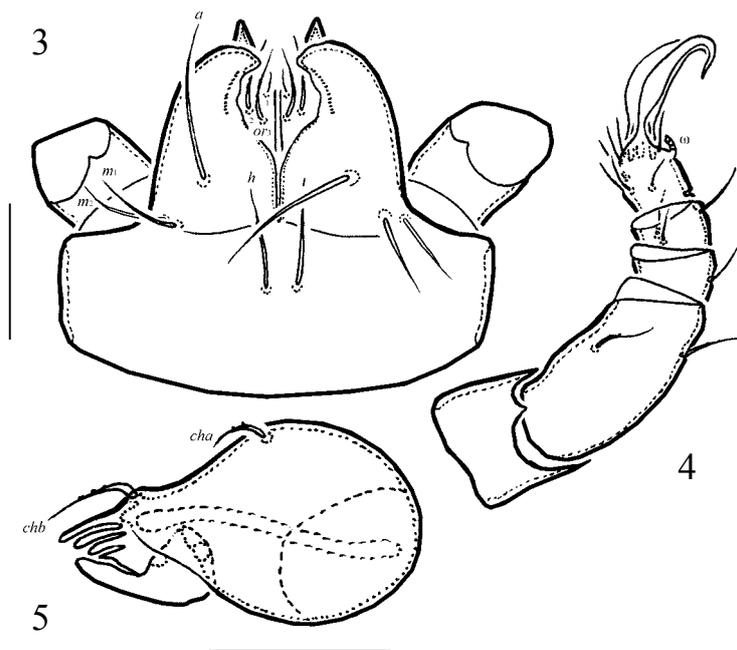
Gnathosoma. Morphology of subcapitulum, palps and chelicerae is generally similar to *P. angelus* (Grandjean 1950). Subcapitulum a little



Fig. 2. *Pterochthonius roynortoni* Ermilov et Minor sp. n., adult: ventral view (not shown: rostral setae, lamellar setae, notogastral setae c_3 and cp , gnathosoma, legs). Scale bar 100 μ m.

shorter than wide ($57 \times 61-65$). Subcapitular setae setiform, smooth; *a* (20–24) longer than m_1 , m_2 and *h* (all 16). Adoral setae thin, smooth; or_1 (4) shorter than or_2 and or_3 (12). Palps (61–56) with

setation 0–2–1–3–11(+ ω). Solenidion on palptarsi thickened, blunt-ended. Four distal setae long, ribbon-like. Chelicerae (41) with two setiform, barbed setae; *cha* (8) shorter than *chb* (12).



Figs 3–5. *Pterochthonius roynortoni* Ermilov et Minor sp. n., adult: 3 — subcapitulum, ventral view; 4 — palp, left, antiaxial view; 5 — chelicera, left, antiaxial view. Scale bars 20 μm.

Table 1.
Leg setation and solenidia of *Pterochthonius roynortoni* Ermilov et Minor sp. n.

Leg	Tr	Fe	Ge	Ti	Ta
I	–	<i>d</i> , (<i>l</i>), <i>bv</i> '', <i>v</i> ''	<i>d</i> , (<i>l</i>), (<i>v</i>)	<i>d</i> , (<i>l</i>), <i>l</i> ₂ '', (<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>), <i>m</i> , (<i>pl</i>), (<i>l</i>), ε, ω ₁ , ω ₂ , ω ₃
II	<i>v</i> '	<i>d</i> , <i>l</i> '', <i>bv</i> '', <i>v</i> ''	<i>d</i> , (<i>l</i>)	<i>d</i> , (<i>l</i>), <i>l</i> ₂ '', (<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>), <i>m</i> , <i>l</i> ', ω
III	<i>v</i> '	<i>d</i> , <i>ev</i> '	<i>d</i> , <i>l</i> ', <i>v</i> '	<i>d</i> , <i>l</i> ', (<i>v</i>)	(<i>ft</i>), (<i>tc</i>), (<i>p</i>), (<i>u</i>), (<i>a</i>), <i>s</i> , (<i>pv</i>), <i>m</i>
IV	<i>v</i> '	<i>d</i> , <i>ev</i> '	<i>d</i> , <i>l</i> ', <i>v</i> '	<i>d</i> , <i>l</i> ', (<i>v</i>)	(<i>ft</i>), (<i>tc</i>), (<i>p</i>), (<i>u</i>), (<i>a</i>), <i>s</i> , (<i>pv</i>), <i>m</i>

Roman letters refer to normal setae, Greek letters refer to solenidia (except ε — famulus). One apostrophe (') marks setae on anterior and double apostrophe (") 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.

Epimeral region. Epimeral plates I fused medially, plates II and III fused posteromedially, plates IV separated. Epimeral setal formula (from 1 to 4): 3–1–3–3. Epimeral setae similar in length (12–16), thin, slightly barbed.

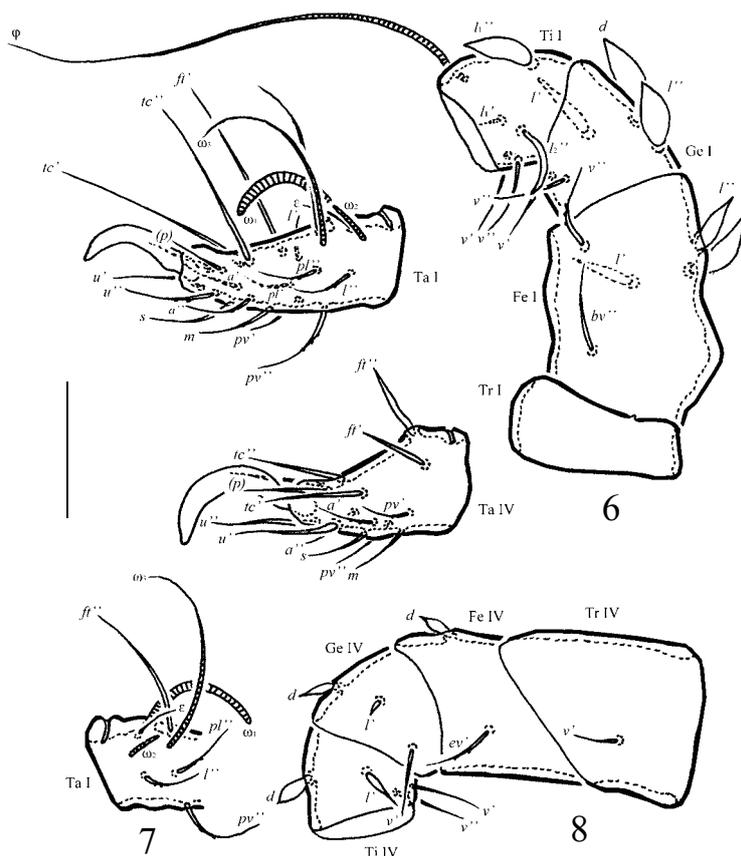
Anogenital region. Eight pairs of genital (*g*_{1–8}, 12–16), four pairs of adanal (*ad*_{1–4}, 8–12), three pairs of anal (*an*_{1–3}, 8–12) and one pair of peranal (*pa*, 8–12) setae thin, slightly barbed.

Legs. Morphology of leg segments, setae and solenidia is generally similar to *P. angelus* (Grandjean 1950). Formulas of leg setation and solenidia: I (0–5–5–5–19) [0–1–3], II (1–4–3–5–15) [0–1–1], III (1–2–3–4–14) [0–1–0], IV (1–2–3–4–14) [0–0–0]; homology of setae and solenidia indicated in Table 1. Famulus of tarsi setiform, inserted between solenidia ω₁ and ω₂. Solenidion ω₃ on tarsi I and φ on tibiae I setiform, with attenuate tip; other solenidia thickened, blunt-ended.

Type deposition. The holotype and two paratypes are deposited in the New Zealand National Arthropod Collection, Auckland, New Zealand; two paratypes are deposited in the collection of the Senckenberg Institution, Frankfurt, Germany; three paratypes are deposited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia.

Etymology. This species is named in honour of Prof. Roy A. Norton (State University of New York, College of Environmental Science and Forestry, Syracuse, NY, USA), to acknowledge his extensive contributions to our knowledge of oribatid mites, and his invaluable mentorship.

Remarks. *Pterochthonius roynortoni* Ermilov et Minor sp. n. is morphologically very similar to *P. angelus* (Berlese, 1910) (see Berlese 1913; Grandjean 1950; Norton and Behan-Pelletier 2009), however, the new species differs from *P.*



Figs 6–8. *Pterochthonius roynortoni* Ermilov et Minor sp. n., adult: 6 — leg I, left, antiaxial view; 7 — basal part of leg I, right, dorso-antiaxial view; 8 — leg IV, right, antiaxial view. Scale bar 20 μ m.

angelus in having comparatively short bothridial setae with well-developed head (versus very long and setiform in *P. angelus*).

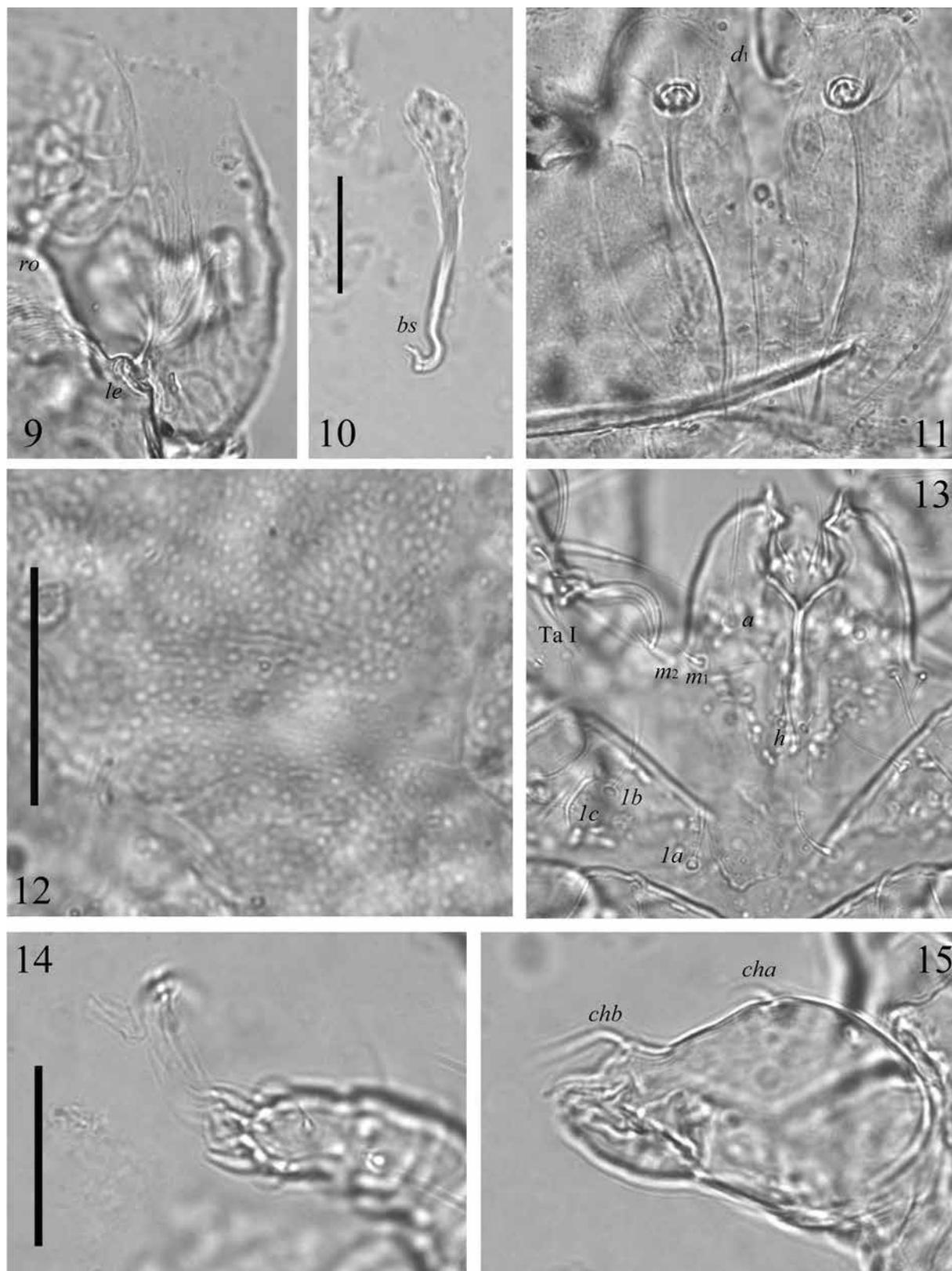
Habitat. The new species was found in the high alpine zone (1600–1900 m a.s.l.) of three mountain ranges in the Central Otago region of the South Island of New Zealand: Old Man's Range, Pisa Range and The Remarkables. In Pisa Range, the mean density of *Pterochthonius roynortoni* Ermilov et Minor sp. n. in cushion fields was 1500 ind. m⁻². The alpine cushion fields of Central Otago are characterized by low mean annual temperatures (ca. 2 degrees C), a relatively small annual temperature range and frequent freeze-thaw cycles; freezing occurs in every month of the year (Mark and Bliss 1970). There is a complex surface pattern of cryogenic earth hummocks and stripes 15–30 cm in height, with furrows in between. The crests of hummocks and stripes are vegetated by ultra-dwarf cushion shrubs such as *Dracophyllum muscoides* and *Raoulia* spp.; bare soil, some herbaceous plants, and lichens are found in furrows (Mark and Bliss 1970). The new species was present both under cushion plants, and in the soil in furrows.

ACKNOWLEDGEMENTS

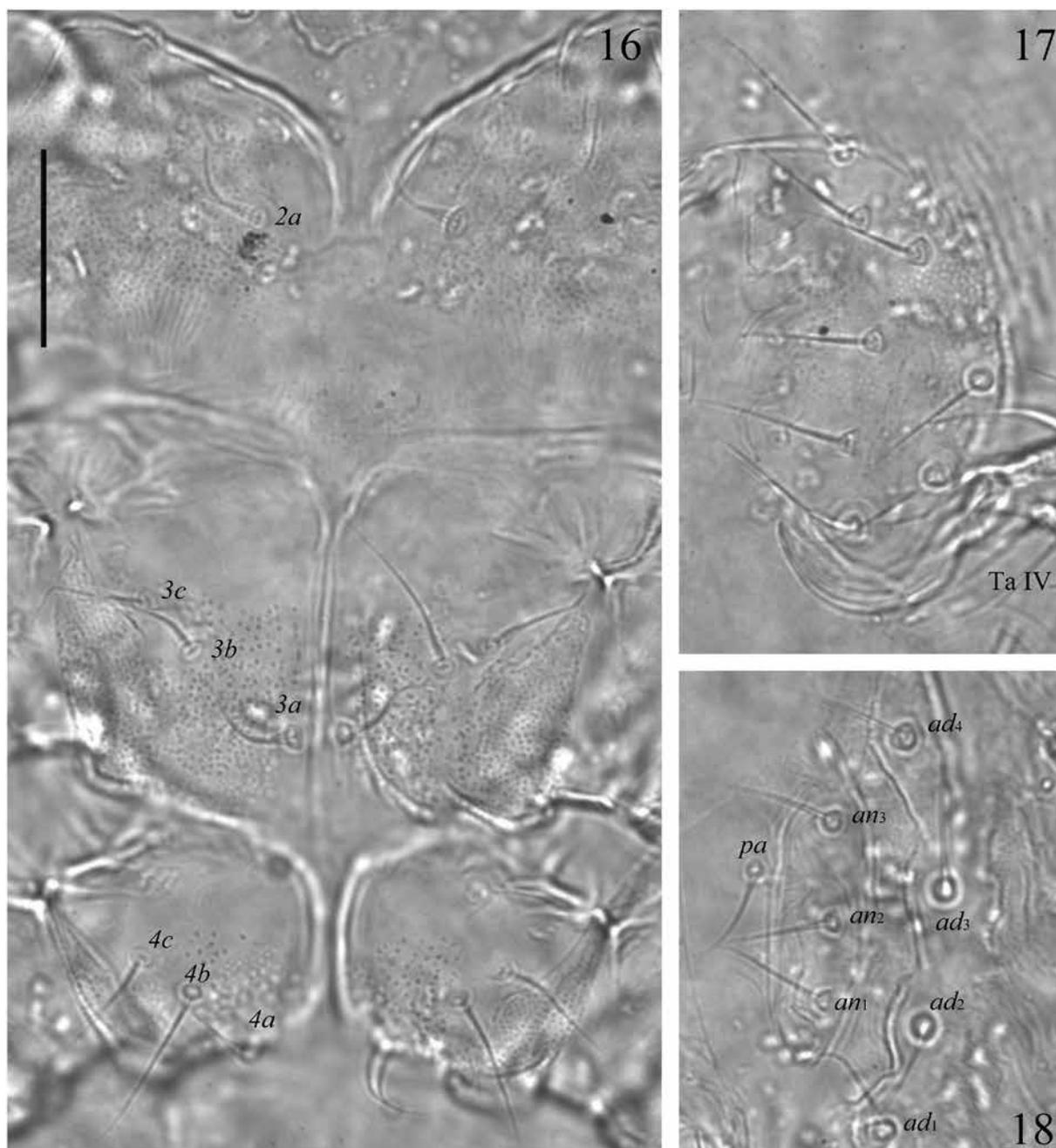
We cordially thank Dr. Alastair Robertson (Institute of Agriculture & Environment, Massey University, NZ) for help with fieldwork, the staff of the Snow Farm (Cardrona, NZ) for help with access, and the New Zealand Department of Conservation for sampling permit (national authorization # 38116-GEO). The project was supported by the Massey University Research Fund.

REFERENCES

- Berlese, A. 1913. Acari nuovi. Manipulus 7–8. *Redia*, 9: 77–111.
- Ermilov, S.G. and Minor, M.A. 2015a. The genus *Scapheremaeus* (Acari, Oribatida, Cymbaeremaeidae) in the oribatid mite fauna of New Zealand, with description of two new species. *ZooKeys*, 508: 69–83.
- Ermilov, S.G. and Minor, M.A. 2015b. The oribatid mite genus *Macrogena* (Acari, Oribatida, Ceratozetidae), with description of two new species from New Zealand. *ZooKeys*, 506: 13–26.
- Ermilov, S.G. and Minor, M.A. 2015c. Two new species of *Dicrotegaeus* (Acari, Oribatida, Cercopehidae) from New Zealand. *Systematic and Applied Acarology*, 20 (7): 757–768.



Figs 9–15. *Pterochthonius roynortoni* Ermilov et Minor sp. n., dissected adult: 9 — rostral and lamellar setae, left, ventral view; 10 — bothridial seta; 11 — notogastral setae d_1 ; 12 — surface of latero-ventral part of body; 13 — ventral view of subcapitulum, epimere I and claw of left tarsus I; 14 — anterior part of palp, left, antiaxial view; 15 — chelicera, left, antiaxial view. Scale bars 20 μm , the following groups to same scale: 9–11; 12; 13–15.



Figs 16–18. *Pterochthonius roynortoni* Ermilov et Minor sp. n., dissected adult: 16 — epimeres II–IV; 17 — left genital plate and claw of left tarsus IV; 18 — left ano-adanal region. Scale bar 20 μ m.

- Ermilov, S.G. and Minor, M.A. 2015d. New Oppiidae (Acari, Oribatida) from New Zealand. *Zootaxa*, 4007 (2): 181–194.
- Ermilov, S.G., Minor, M.A. and Behan-Pelletier, V.M. 2015. Description of *Zealandozetes southensis* gen. nov., sp. nov. (Acari, Oribatida, Maudsheimiidae) from New Zealand. *Zootaxa*, 4027 (1): 42–66.
- Grandjean, F. 1950. Les Enarthronota (Acariens) (3^e série). *Annales des Sciences Naturelles, Zoologie, 11^e série*, 12: 85–107.
- Mark, A.F. and Bliss, L.C. 1970. The high-alpine vegetation of Central Otago, New Zealand. *New Zealand Journal of Botany*, 8: 381–451.
- Norton, R.A. and Behan-Pelletier, V.M. 2009. Oribatida. In: Krantz, G.W. and Walter, D.E. (eds.). *A Manual of Acarology* (TX): Lubbock, Texas University Press. Chapter 15: 430–564.
- Schatz, H., Behan-Pelletier, V.M., OConnor, B.M. and Norton, R.A. 2011. Suborder Oribatida van der Hammen, 1968. In: Zhang, Z.-Q. (ed.). *Animal biodiversity: an outline of higher-level classification and survey of taxonomic richness*. *Zootaxa*, 3148: 141–148.
- Subías, L.S. 2004. Listado sistemático, sinonímico y biogeográfico de los ácaros oribátidos (Acari-formes: Oribatida) del mundo (excepto fósiles). *Graellsia*, 60 (número extraordinario): 3–305.