

Checklist of ptyctimous mites (Acari, Oribatida) of New Zealand with descriptions of three new species

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ABSTRACT — An annotated checklist of ptyctimous mites of New Zealand is provided; it includes 74 species, 12 genera and four families. Two new species, *Austrophthiracarus parapulchellus* Niedbala **n. sp.** and *Notophthiracarus minorae* Niedbala **n. sp.**, are described from litter in *Pinus radiata* plantation of the North Island, and one new species, *Notophthiracarus otagoensis* Niedbala **n. sp.** is described from soil and debris under *Dracophyllum muscoides* cushions of the South Island.

KEYWORDS — mites; fauna; morphology; systematics; Australasian region

INTRODUCTION

This work is a part of a continuing study of the New Zealand oribatid mite fauna based on material collected by Dr. Maria A. Minor (Ermilov and Minor 2015 *a-d*, Ermilov *et al.* 2015), and includes data on ptyctimous mites. The goals of the paper are to present data on the taxonomic identification and specific localities of registered taxa, to provide checklist of known ptyctimous mites from New Zealand and to describe three new species: *Austrophthiracarus parapulchellus* Niedbala **n. sp.**, *Notophthiracarus minorae* Niedbala **n. sp.** and *N. otagoensis* Niedbala **n. sp.** Ptyctimous mites of New Zealand are little known (Niedbala 1993; 2000; 2006) even if more actively recently studied (e.g. Liu and Zhang 2013a, 1014a, 2015a); therefore this paper contributes to their faunistic and taxonomic knowledge.

MATERIALS AND METHODS

The mites were cleared in lactic acid and mounted to temporary cavity slides with glycerol for the duration of the study. Body measurements are presented in micrometers. Length of the body setae was measured in lateral aspect. Formulas for leg setation are given in parentheses according to the sequence trochanter-femur-genu-tibia-tarsus. Formulas for leg solenidia are given in square brackets according to the sequence genu-tibia-tarsus. The terminology follows Niedbala (2000). List of collecting sites in New Zealand:

NZ 1 – New Zealand, South Island, 45°3'41"S, 168°48'40"E, 1831 m a.s.l., Central Otago, The Remarkables, in the soil and debris under *Dracophyllum muscoides* cushion, 19.II.2014 (leg. M. Minor).

NZ 2 – New Zealand, North Island, Manawatu-Wananganui region, 39°45'37.218"S, 175°14'24.759"E, 288 m a.s.l., *Pinus radiata* plantation (pines 23 yrs

old), in litter, 29.I.2004 (leg. M. Minor).

NZ 3 – New Zealand, North Island, Manawatu-Wananganui region, 39°49'25.366 S, 175°00'01.502"E, 84 m a.s.l., *Pinus radiata* plantation (pines 15-18 yrs old), in litter, 31.I.2004, (leg. M. Minor).

NZ 4 – New Zealand, North Island, Manawatu-Wananganui region, 39°41'26.716 S, 175°01'56.045"E, 139 m a.s.l., *Pinus radiata* plantation (pines 20 yrs old), in litter, 31.I.2004 (leg. M. Minor).

RESULTS

Checklist of Ptyctimous mites of New Zealand

We herein registered eight species, seven genera and four families of ptyctimous mites collected by Dr. Maria A. Minor. These species are followed by "*" in the checklist of New Zealand ptyctimous mites presented. This fauna presently includes 74 species, 12 genera and four families.

Oribotritiidae

- *Indotritia* (*Zeaotritia*) *aotearoana* Ramsay, 1966
- *Oribotritia bilaminae* Liu and Zhang, 2013
- *Oribotritia brevis* Niedbała and Colloff, 1997
- *Oribotritia contortula* Niedbała, 1993*. Localities: NZ 3 (1 ex.), NZ 4 (4 ex.)
- *Oribotritia incognita* Niedbała, 2000
- *Oribotritia mangamuka* Liu and Zhang, 2013b
- *Oribotritia paraincognita* Niedbała, 2006
- *Oribotritia teretis* Niedbała, 1993
- *Sabacarus corneri* Ramsay and Sheals, 1969

Euphthiracaridae

- *Acrotrititia vestita* (Berlese, 1913)*. Localities: NZ 2 (1 ex.), NZ 3 (1 ex.), NZ 4 (1 ex.)
- *Microtrititia contraria* Niedbała, 1993
- *Microtrititia fusa* Niedbała, 2000
- *Microtrititia novazealandiensis* Niedbała, 2006. Localities: NZ 2 (8 ex.), NZ 3 (2 ex.)
- *Microtrititia stria* Liu and Zhang, 2014a

Steganacaridae

- *Arphthicaricus heterotrichus* Niedbała, 2000
- *Arphthicaricus minimus* Liu and Zhang, 2015c
- *Atropacaricus* (*Atropacaricus*) *controversus* Niedbała, 2000
- *Atropacaricus* (*Atropacaricus*) *niedbalai* Liu and Zhang, 2013a

— *Austrophthiracaricus aureus* Niedbała, 2000

— *Austrophthiracaricus bah* Liu and Zhang, 2015a

— *Austrophthiracaricus cronadun* Liu and Zhang, 2013d

— *Austrophthiracaricus daimonios* Niedbała, 2000

— *Austrophthiracaricus hiore* Liu and Zhang, 2014c

— *Austrophthiracaricus karioi* Liu and Zhang, 2014d

— *Austrophthiracaricus kirikiri* Liu and Zhang, 2015a

— *Austrophthiracaricus matuku* Liu and Zhang, 2014d

— *Austrophthiracaricus neotrichus* (Wallwork, 1966)

— *Austrophthiracaricus notoporus* Liu and Zhang, 2014d

— *Austrophthiracaricus pulchellus* Niedbała, 1993

— *Austrophthiracaricus tawhai* Liu and Zhang, 2013d

— *Austrophthiracaricus parapulchellus* Niedbała n. sp.*
Locality: NZ 2 (2 ex.)

— *Austrophthiracaricus waitere* Liu and Zhang, 2015a

— *Hoplophthiracaricus bisulcus* (Niedbała, 1993)*. Localities: NZ 2 (14 ex.), NZ 4 (3 ex.)

— *Hoplophthiracaricus lividus* Niedbała, 2000

— *Plonaphacarus aitu* Liu and Zhang, 2015c

— *Plonaphacarus dikros* Niedbała, 2000

— *Plonaphacarus insolens* Niedbała, 2000

Phthiracaridae

— *Notophthiracaricus aquilus* Niedbała, 2000

— *Notophthiracaricus ater* Niedbała, 2000

— *Notophthiracaricus atratus* Niedbała, 2000

— *Notophthiracaricus australis* Ramsay, 1966

— *Notophthiracaricus brachys* Niedbała, 2006

— *Notophthiracaricus caliginosus* Niedbała, 1989

— *Notophthiracaricus chatham* Liu et Zhang, 2015b

— *Notophthiracaricus claviger* Niedbała, 1993

— *Notophthiracaricus comatus* Niedbała, 2000

— *Notophthiracaricus conspicuus* Niedbała, 1989

— *Notophthiracaricus dugdalei* Liu and Zhang, 2013c

— *Notophthiracaricus fecundus* Niedbała, 2000

— *Notophthiracaricus incomparabilis* Niedbała, 2000

— *Notophthiracaricus matatitipu* Liu and Zhang, 2013c

— *Notophthiracaricus maurus* Niedbała, 2000

— *Notophthiracaricus minorae* Niedbała n. sp.*
Locality: NZ 2 (2 ex.)

— *Notophthiracaricus motumuka* Liu and Zhang, 2014b

— *Notophthiracaricus otagoensis* Niedbała n. sp.*
Locality: NZ 1 (140 ex.)

— *Notophthiracaricus paracapillatus* Niedbała, 2006

— *Notophthiracaricus perlucundus* Niedbała, 2000

- *Notophthiracarus quietus* Niedbała, 1989
- *Notophthiracarus repostus* Niedbała, 1989
- *Notophthiracarus rimi* Liu and Zhang, 2014b
- *Notophthiracarus rotoitiensis* Niedbała, 2006
- *Notophthiracarus sensifus* Liu and Zhang, 2015b
- *Notophthiracarus sigifurcatus* Liu and Zhang, 2015b
- *Notophthiracarus tamaki* Liu and Zhang, 2014b
- *Notophthiracarus tripartitus* Niedbała, 1989
- *Notophthiracarus uncinulus* Niedbała, 2000
- *Notophthiracarus unicarinatus* Niedbała, 2000
- *Notophthiracarus whakau* Liu and Zhang, 2013c
- *Phthiracarus anonymus* Grandjean, 1933*. Locality: NZ 4 (8 ex.)
- *Phthiracarus banksi* Niedbała, 1987
- *Phthiracarus hikurangi* Liu and Zhang, 2013e
- *Phthiracarus inflatus* Niedbała, 1994
- *Phthiracarus longisensillus* Liu and Zhang, 2013e
- *Phthiracarus pellucidus* Ramsay, 1966

DESCRIPTIONS

Austrophthiracarus parapulchellus Niedbała n.sp. (Figure 1)

Measurement of holotype — Prodorsum: length 273, width 197, height 116. Setae of prodorsum: rostral 40, lamellar 13, sensilli 35. Notogaster: length 520, width 369, height 333. Setae of notogaster: c_1 88, $c_1/c_1-d_1=0.6$, c_3 45, h_1 and ps_1 91. Genitoaggenital plate 131×94 , anoadanal plate 190×114 .

Integument — Colour light brown. Body surface densely punctated.

Prodorsum — With well discernible long sigillar fields. Lateral carinae and posterior furrows absent. Sensilli short, with narrow pedicel and globular, roughened head. Interlamellar and exobothridial setae vestigial, lamellar setae minute, rostral setae semierect, roughened.

Notogaster — With neotrichy of notogastral setae; 19 pairs of rigid, slightly recurved setae, covered with small spines in distal half. Setae c_3 about once shorter than other setae of row c . Additional setae, one in rows h and three in row ps . Setae c_1 and c_3 situated near anterior margin, setae c_2 far from margin. One of posterior setae of row ps (ps_3') situ-

ated above a row. Vestigial setae f_1 situated posterior of h_1 setae. Two pairs of lyrifissures ia and im present.

Ventral region — Setae h of mentum vestigial. Arrangement of genital setae: 9(4+5): 0. With neotrichy of adanal setae. Anoadanal plate with 6 pairs of setae, 2 anal and 4 adanal. Two posterior adanal setae longer than anal setae, two anterior adanal setae shortest.

Chaetome of legs — Complete. Formulas of leg setation and solenidia: I (1-4-2-5-17) [2-1-3], II (1-3-2-3-12) [1-1-2], III (2-2-1-2-10) [1-1-0], IV (2-1-1-2-10) [0-1-0]. Setae d on femora I long, situated almost in the middle of article.

Material examined — Holotype and one paratype: New Zealand, North Island, Manawatu-Wananganui region, $39^\circ 45' 37.218''$ S, $175^\circ 14' 24.759''$ E, 288 m a.s.l., *Pinus radiata* plantation (pines ~ 23 yrs old), in litter, 29.I.2004 (leg. M. Minor).

Type deposition — The holotype (ethanol) is deposited in the New Zealand National Arthropod Collection, Auckland, New Zealand; paratype (ethanol) is deposited in the collection of the Department of Animal Taxonomy and Ecology, Adam Mickiewicz University, Poznań, Poland.

Etymology — The prefix *para* is Latin meaning "near" and refers to the similarity of new species with *Austrophthiracarus pulchellus* Niedbała, 1993.

Comparison — The new species is morphologically very similar to *Austrophthiracarus pulchellus* Niedbała, 1993 (see Niedbała 1993). It is distinguishable from the latter by setae c_3 shorter than other setae of row c (versus not shorter), presence of 19 pairs of notogastral setae (versus 18 pairs), vestigial setae of subcapitular mentum (versus well developed), presence of complete chaetome of femora I (versus absence of setae v'').

Notophthiracarus minorae Niedbała n. sp. (Figure 2)

Measurement of holotype — Prodorsum: length 363, width 247, height 141. Setae of prodorsum: rostral 106, lamellar 177, interlamellar 253, sensilli 50, exobothridial 51. Notogaster: length 717, width 505, height 515. Setae of notogaster: c_1 177, c_2 152, c_3 45,

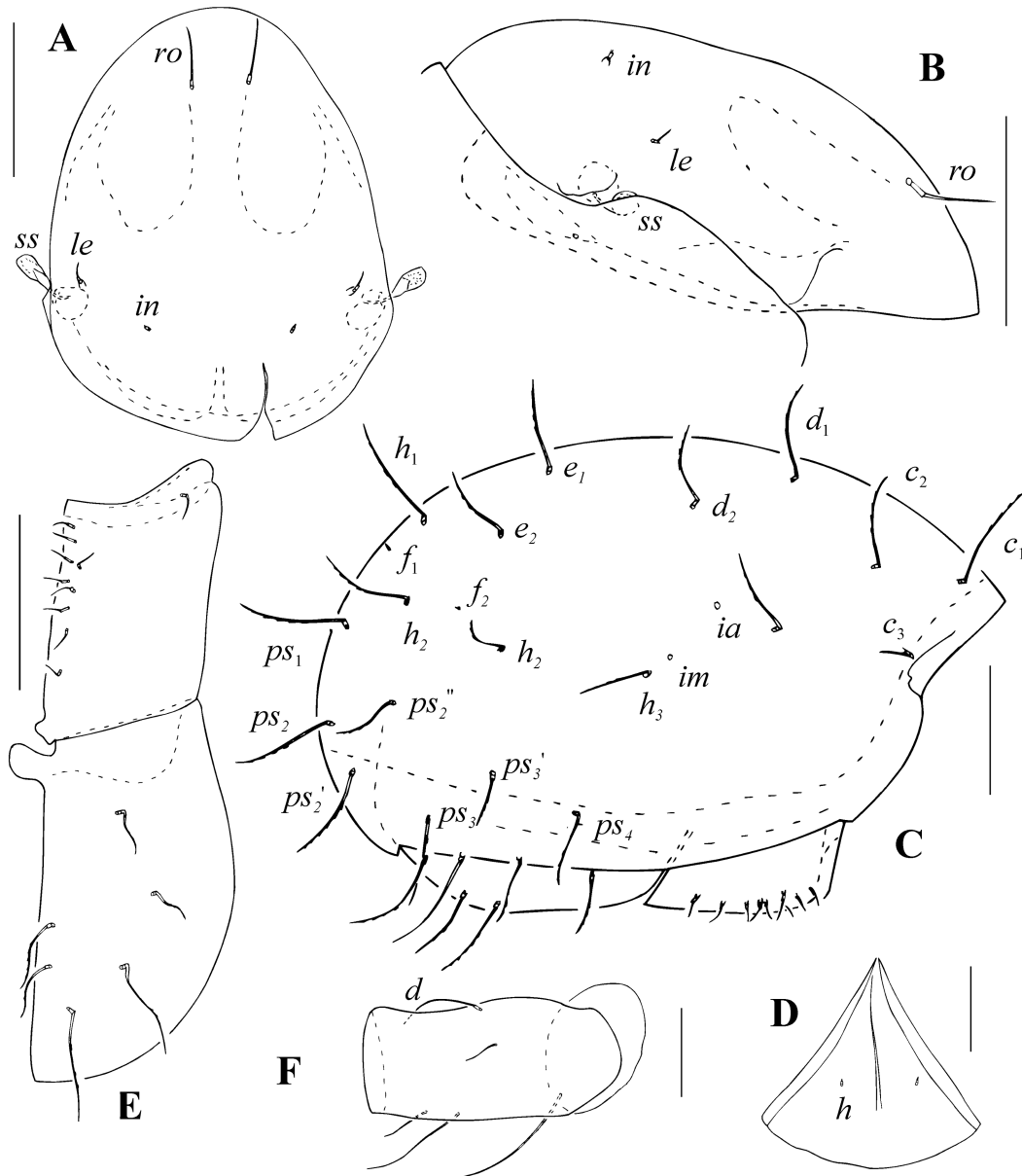


FIGURE 1: *Austrophthiracarus parapulchellus* Niedbała n. sp. (holotype): A – prodorsum, dorsal view; B – prodorsum, lateral view; C – opisthosoma, lateral view; D – mentum of subcapitulum; E – left genitoaggenital and ano-adanal plates; F – trochanter and femur of leg I. Scale bars (A-C, E) 100 μ m, scale bars (D, F) 50 μ m.

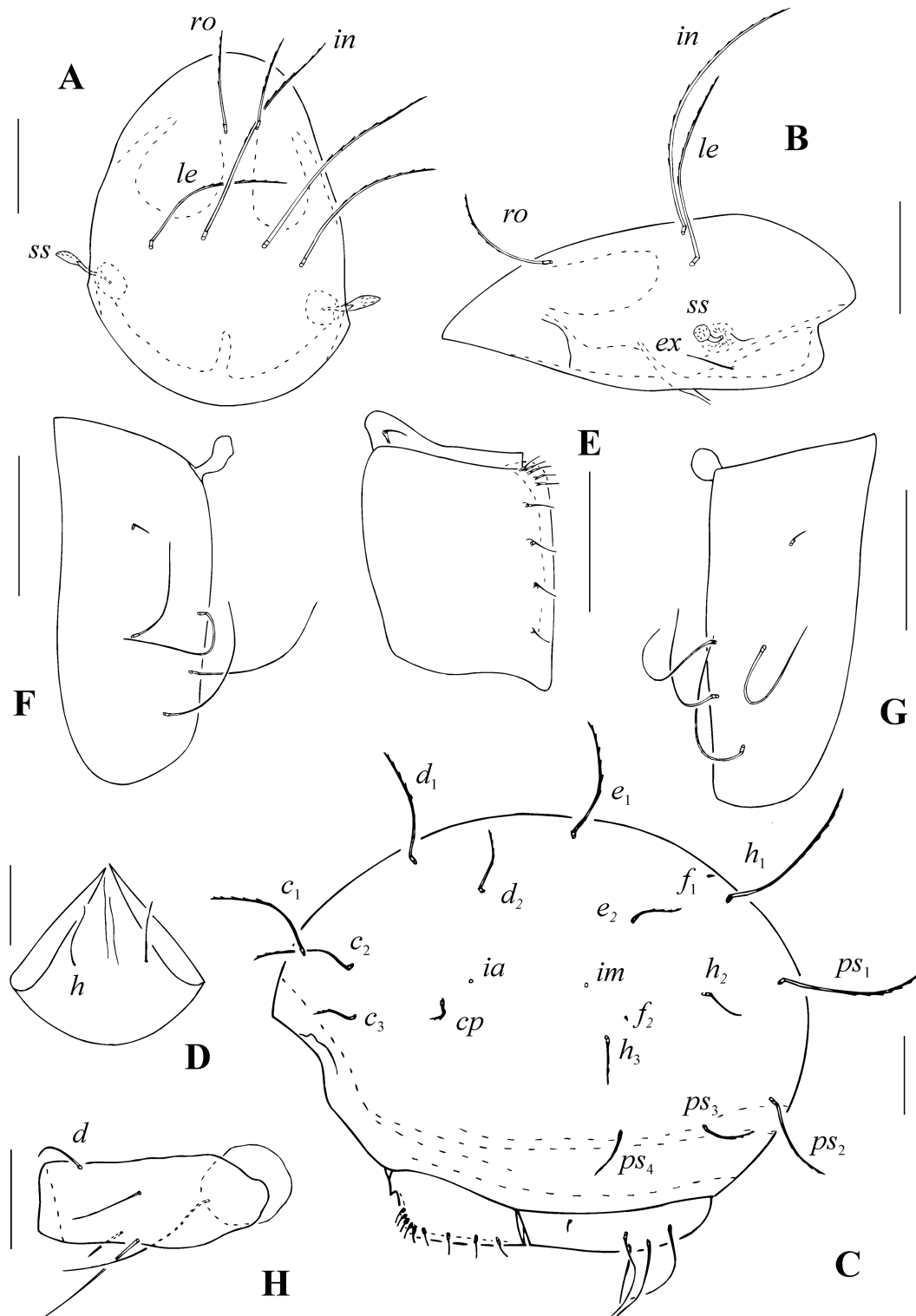


FIGURE 2: *Notophthiracarus minorae* Niedbala n. sp. (holotype.): A – prodorsum, dorsal view; B – prodorsum, lateral view; C – opisthosoma, lateral view; D – mentum of subcapitulum; E – right genitoaggenital plate; F – right anoadanal plate; G – left anoadanal plate; H – trochanter and femur of leg I. Scale bar 100 μ m.

$c_1/c_1-d_1=0.9$, d_1 172, e_1 185, h_1 253, h_3 53, ps_1 215, ps_2 126, ps_3 71, ps_4 63. Genitoaggenital plate 172×146 , anoadanal plate 252×111 .

Measurements of paratype — Prodorsum: length 333, width 237, height 197. Notogaster: length 626, width 424, height 465.

Integument — Colour dark brown, almost black. Body surface punctated.

Prodorsum — With narrow sigillar fields well visible. Lateral carinae and posterior furrows absent. Sensilli short, with narrow pedicel and fusiform, rounded, roughened head. Interlamellar and lamellar setae very long, rigid, erect, bent backwards, tapering, covered with spines in distal half, similar to dorsal notogastral setae. Rostral setae similar in shape, but shorter, semierect; $in > le > ro > ex > ss$.

Notogaster — With 15 pairs of tapering setae, rigid covered with small spines in distal half, dorsal setae considerably longer (but c_1 slightly shorter than distance between c_1-d_1) than laterals. Setae c_1-c_3 remote from anterior margin, setae c_2 more than other. Vestigial setae f_1 situated anterior of setae h_1 . Lyrifissures ia and im present.

Ventral region — Setae h of mentum slightly shorter than distance between them ($h/h-h=0.8$). Genitoaggenital plates with 9 pairs of unusual long setae with formula: 4: 5. Anoadanal plates with 5 pairs of setae, long, filiform, smooth, except minute setae ad_3 .

Chaetome of legs — Complete. Formulas of leg setation and solenidia: I (1-4-2-5-17) [2-1-3], II (1-3-2-3-12) [1-1-2], III (2-2-1-2-10) [1-1-0], IV (2-1-1-2-10) [0-1-0]. Setae d on femora I long and remote from anterior margin.

Material examined — Holotype and one paratype: New Zealand, North Island, Manawatu-Wananganui region, $39^{\circ}45'37.218''S$, $175^{\circ}14'24.759''E$, 288 m a.s.l., *Pinus radiata* plantation (pines ~ 23 yrs old), in litter, 29.I.2004 (leg. M. Minor).

Type deposition — The holotype (ethanol) is deposited in the New Zealand National Arthropod Collection, Auckland, New Zealand; paratype (ethanol) is deposited in the collection of the De-

partment of Animal Taxonomy and Ecology, Adam Mickiewicz University, Poznań, Poland.

Etymology — The specific name is dedicated to the well-known soil zoologist and ecologist Dr. Maria A. Minor (Institute of Agriculture and Environment, Massey University, New Zealand).

Comparison — Three similar species are known from the Australasian Region, by the presence of long, similar in shape interlamellar and lamellar setae, very short, globular sensilli and setae ad_3 of anoadanal plates minute. The most similar is species *Notophthiracarus calugarae* Niedbała, 1987 from Victoria State of Australia (see Niedbała 1987) but it is distinguishable by the shape of rostral setae, very short, thick, rough, location of f_1 setae posterior of h_1 setae, setae h of mentum longer than distance between them, and incomplete chaetome of femora of legs I. Both other similar species originate from South Island of New Zealand. *Notophthiracarus ater* Niedbała, 2000 is distinguishable by the presence of vestigial exobothridial setae, vestigial setae f_1 situated posterior of h_1 setae, setae h of mentum longer than distance between them, and especially by longer ad_3 setae (almost half of length of anal setae). *Notophthiracarus fecundus* Niedbała, 2000 is distinguishable by the slightly shorter dorsal, notogastral setae, setae h of mentum longer than distance between them, and also by setae f_1 situated posterior of h_1 setae and especially by longer ad_3 setae (almost half the length of anal setae).

Notophthiracarus otagoensis Niedbała n. sp.
(Figure 3)

Measurement of holotype — Prodorsum: length 303, width 212, height 111. Setae of prodorsum: rostral 56, lamellar 28, interlamellar 177, sensilli 38, exobothridial 40. Notogaster: length 596, width 384, height 343. Setae of notogaster: c_1 152, $c_1/c_1-d_1=1.2$, d_1 and h_1 114, ps_1 104. Genitoaggenital plate 144×94 , anoadanal plate 253×104 . Length of ano-adanal setae: anal 76, ad_1 131, ad_2 111, ad_3 91.

Measurements of all paratypes — Prodorsum: length 252 – 325, height 101 – 121. Notogaster: length 465 – 687, height 303 – 454.

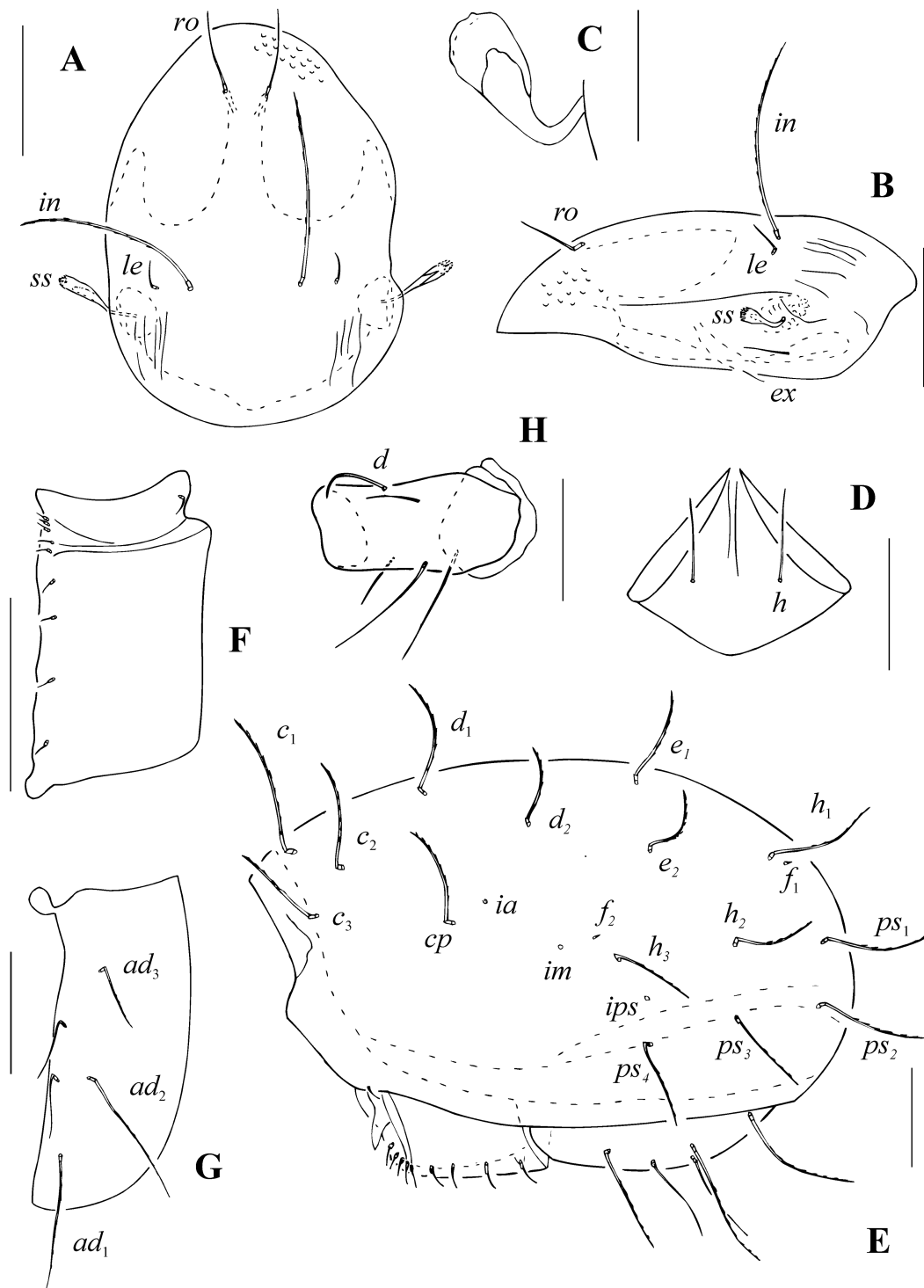


FIGURE 3: *Notophthiracarus otagoensis* Niedbala **n. sp.** (holotype): A – prodorsum, dorsal view; B – prodorsum, lateral view; C – sensillus, lateral view; D – mentum of subcapitulum; E – opisthosoma, lateral view; F – left genitoaggenital plate; G – left anoadanal plate; H – trochanter and femur of leg I. Scale bars (A, B, D-H) 100 μ m, scale bars (C) 25 μ m.

Integument — Colour brown. Microsculpture of integument punctuated, only anterior part of prodorsum slightly foveolate.

Prodorsum — With posterior furrows and sigillar fields feebly marked. Lateral carinae well marked. Sensilli short, more or less regular club-like with head covered with small spines. Interlamellar setae rigid, erect covered with small spines in whole length, similar to notogastral setae. Lamellar setae spiniform, smooth. Rostral setae longer, spiniform, rough. Exobothridial setae formed like a needle similar in length to sensilli; $in > ro > ex > ss > le$.

Notogaster — With 15 pairs of medium size, $c_1 > c_1-d_1$, but other setae shorter. Setae rigid covered with small spines in whole length. Setae c_3 situated close to anterior margin, setae c_1 slightly remote, setae c_2 far from anterior margin. Vestigial setae f_1 situated posteriorly of h_1 setae. Three pairs of lyrifissures (*ia*, *im* and *ips*) present.

Ventral region — Setae h of mentum longer than distance between them. Arrangement of genital setae 4: 5. Anoadanal plates with 5 pairs of flexible setae, adanal setae ciliated and longer than rough anal setae.

Chaetome of legs — Complete. Formulas of leg setation and solenidia: I (1-4-2-5-17) [2-1-3], II (1-3-2-3-12) [1-1-2], III (2-2-1-2-10) [1-1-0], IV (2-1-1-2-10) [0-1-0]. Setae d on femora I long, considerably remote from distal end of article.

Material examined — Holotype and 139 paratypes: New Zealand, South Island, 45°3'41"S, 168°48'40"E, 1831 m a.s.l., Central Otago, The Remarkables, in the soil and debris under *Dracophyllum muscoides* cushion, 19.II.2014 (leg. M. Minor).

Type deposition — The holotype (ethanol) and two paratypes are deposited in the New Zealand National Arthropod Collection, Auckland, New Zealand; 137 paratypes (ethanol) are deposited in the collection of the Department of Animal Taxonomy and Ecology, Adam Mickiewicz University, Poznań, Poland.

Etymology — The specific epithet refers to the Central Otago Region of South Island.

Comparison — The new species is characterized by the presence of long ad_3 setae of anoadanal plate, longer than anal setae. Some species from the Australasian region with these long setae have a long sensillus without a rounded head. The similar species are: *Notophthiracarus hammeni* Niedbala, 1987 from New South Wales (see Niedbala 1987), *N. abstemius* Niedbala and Colloff, 1997 (see Niedbala and Colloff 1997). *Notophthiracarus hammeni* has rigid and longer rostral setae, absence of lateral carinae of prodorsum and lyrifissures *ips* of notogaster. *Notophthiracarus abstemius* has adanal setae ad_3 slightly shorter than anal setae, setae d of femora I situated in proximal half of article, vestigial setae f_1 situated anterior of setae h_1 and lateral carinae of prodorsum and lyrifissures *ips* absent.

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