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**Article**

# Two new species of the genus *Phrathicarus* from New Zealand (Acari: Oribatida: Phthiracaridae)

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## Abstract

The genus *Phrathicarus* (Acari: Oribatida: Phthiracaridae) was represented by only one species prior to this work. In this paper, two new species of *Phrathicarus* are described from New Zealand: *Phrathicarus longisensillus* **sp. nov.** from the Red Island, Mercury Islands, and *Phrathicarus hikurangi* **sp. nov.** from Mt. Hikurangi, Northland. A key to all known species of *Phrathicarus* is provided.

**Key words:** Soil mites, Oribatida, Phthiracaridae, *Phrathicarus*, new species, key to species, New Zealand

## Introduction

The genus *Phrathicarus* (Oribatida: Phthiracaridae) was established by Niedbała in 1994 with a new species from New Zealand, *Phrathicarus inflatus*, as its type species. Since then, this genus has remained monotypic (Subías 2013). This genus is characterized by the following features: body surface punctate; dorsal and lateral fields of prodorsum not fused; lateral carinae and posterior furrows of prodorsum absent; interlamellar setae erect; neotrichy of notogastral setae present; nine pairs of genital setae present, setae $g_7$–$g_9$ (or only $g_7$ and $g_9$) displaced towards the paraxial margin, in a row with $g_1$–$g_5$, and setae $g_6$ (or also $g_8$) far away from the margin; four setae ($ad_1$, $an_1$, $an_2$ and $ad_2$) form a row near the paraxial margin of ano-adanal plate; setae *d* on femora I located at the distal end of segment; setae *v'* on femora I and setae *l'* on genua IV present; setae *d* on tibiae IV short, coupled with solenidia; setae *ft"* on tarsi I normal (Niedbała 1994).

During the first author's visit to Landcare Research in Auckland in April 2012, we identified two new species of this genus from New Zealand Arthropod Collection. The purpose of this paper is to give detailed descriptions of the two new species and a key to all known species of *Phrathicarus*.

## Material and methods

Measurements and descriptions are based on specimens mounted in temporary cavity slides that were studied using a light microscope equipped with a drawing attachment.

Terminology generally follows Niedbała (1992, 2000). The unit of measurement is micrometre (μm).

All holotype specimens are deposited in the New Zealand Arthropod Collection, Landcare Research, Auckland (NZAC). Paratype specimens are split between NZAC and Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences, Changchun (NIGA).

## Descriptions of new species

### *Phrathicarus longisensillus* sp. nov.

(Figs. 1–9)

**Material examined**: Holotype: adult (NZAC, in alcohol, 72/227), New Zealand: Red I. Mercury Is. Cl., from mainly Myrsine litter, 24 Nov., 1972, leg. G. W. Ramsay. Paratype: one adult (NIGA, in alcohol, 72/227), same data as holotype.

**Etymology.** Named for its long sensilli on the prodorsum and used here as a noun in apposition.

**Description.** *Measurements*. Holotype: Prodorsum: length 450, width 350, height 130, setae: *ss* 195, *ro* 82, *le* 33, *in* 300, *ex* 75; notogaster: length 1050, width 680, height 660; setae: $c_1$ 360, $d_1$ 80, $e_1$ 200, $h_1$ 350, $ps_1$ 360; ventral region: $g_9$ 50, $ad_1$ 214, $ad_3$ 100; genitoaggenital plate 225×297, anoadanal plate 200×400. Paratype: Prodorsum: length 445, width 350, height 130; notogaster: length 1020, width 670, height 653.

*Integument*. Colour yellowish. Surface of body finely punctate.

*Prodorsum* (Figs. 1−2). Median crista absent; sigillar fields distinct, dorsal field widened towards rostral setae, longer than lateral fields; sensilli (*ss*) long, narrow, rough, gradually tapering; interlamellar setae (*in*) long, stout and rough; lamellar (*le*) and rostral setae (*ro*) short, much thinner than interlamellar setae; exobothridial setae (*ex*) short and fine; comparative length: *in*>*ss*>*ro*>*ex*>*le*, *in*/*le*=9.1; mutual distance of setae: *in*–*in*/*ro*–*ro*=1.74.

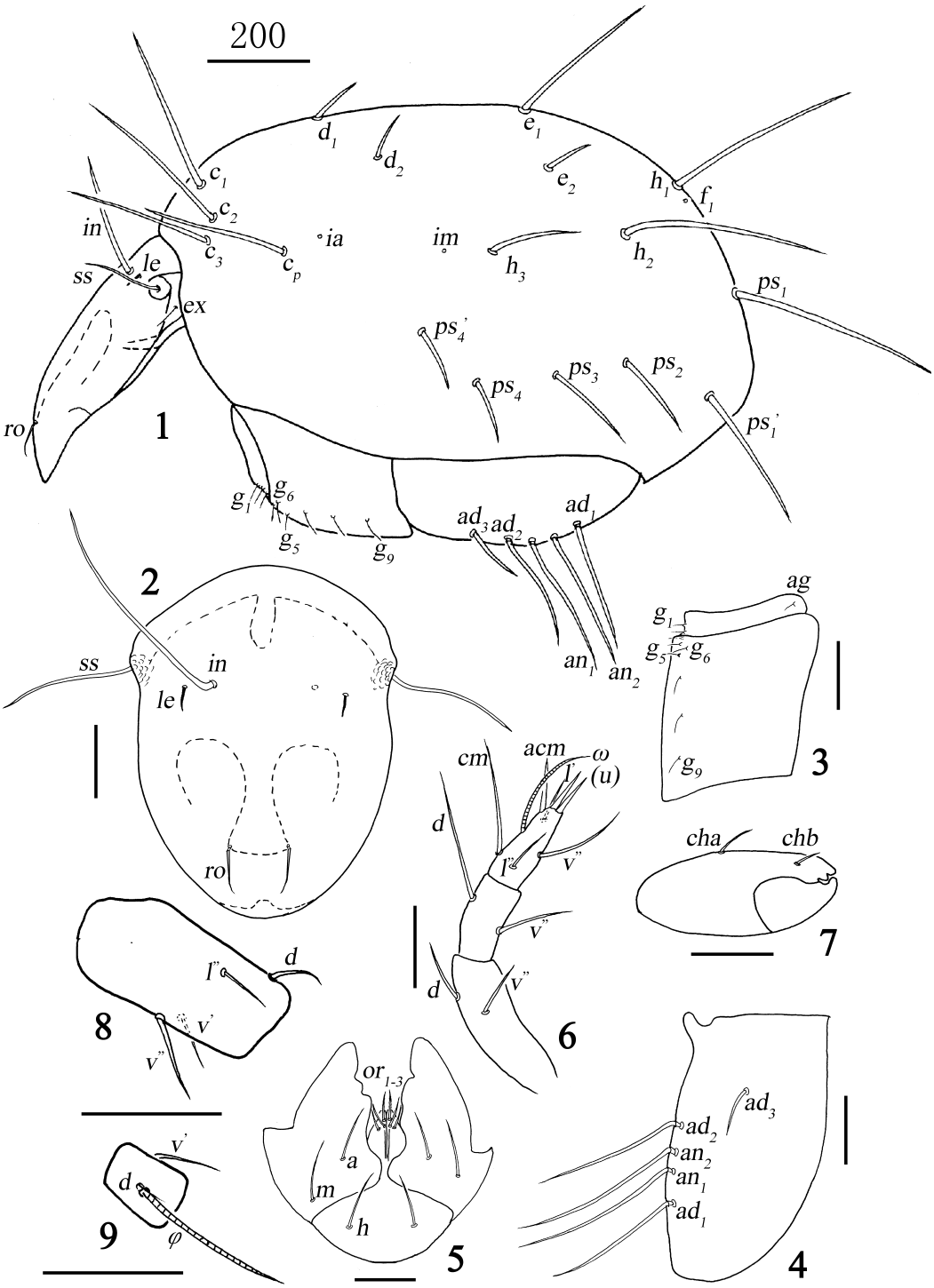
*Notogaster* (Fig. 1). 17 pairs of setae in different length ($c_1$>$c_1$–$d_1$=1.25), robust and rough; setae $h_3$, $ps_{2–4}$ and $ps_4$' medium long; setae $d_{1–2}$ and $e_2$ much shorter than other setae; setae $c_{1–3}$ far away from anterior border, setae $c_1$ and $c_2$ more so than $c_3$; additional setae present in *ps* or (and) *h* series; two pairs of lyrifissures *ia* and *im* present.

*Gnathosoma* (Figs. 5–7). Subcapitulum normal (Fig. 5); setae *h*, *m*, and *a* simple and smooth; setae *h* equal to distance between them; adoral seta $or_1$ apparently flat with barbs; $or_{2–3}$ simple and smooth; palp (Fig. 6) 4-segmented, with femur and genu fused; palpal setation: 0-2-2-7(1); supracoxal seta simple and smooth; chelicera (Fig. 7) with two smooth setae (*cha*, *chb*).

*Ano-genital region* (Figs. 1, 3–4). Nine pairs of genital setae (*g*) present with formula: 6(4+2): 3; anoadanal plates each with five pairs of stout and rough setae (*an* and *ad*), setae $ad_3$ shortest.

*Legs* (Figs. 8–9). Setal counts for leg segments (without tarsi): I: 1-4-2(2)-4(1); II: 1-3-2(1)-3(1), III: 2-2-1(1)-2(1), IV: 2-1-1-2(1); setae *ft''* on tarsi II straight distally; setae *s* and *pv'* on tarsi IV present; setae *s* on tarsi I and II present.

**Remark.** Comparing with the species *P. inflatus* Niedbała, 1994, the new species can be easily distinguished by the following five characters (a versus b): in *P. longisensillus* sp. nov., (1a) dorsal sigillar field longer than lateral fields; (2a) interlamellar, rostral and notogastral setae not flagellate distally; (3a) comparative length of prodorsal setae: *in*>*ss*>*ro*>*ex*>*le*; (4a) 17 pairs of notogastral setae present, additional setae present only in *ps* series; (5a) two pairs of lyrifissures *ia* and *im* present; in *P. inflatus*, (1b) dorsal sigillar field short, not longer than lateral fields; (2b) interlamellar, rostral and some notogastral setae flagellate distally; (3b) comparative length of prodorsal setae: *in*>*ro*>*ss*>*le*>*ex*; (4b) 19 pairs of notogastral setae present, additional setae present in *c* and *ps* series; (5b) only one pair of lyrifissures *im* present.




**FIGURES 1–9.** *Phrathicarus longisensillus* **sp. nov.**: 1, lateral view of body (legs removed); 2, prodorsum, dorsal view; 3, left side of genitoaggenital plate; 4, left side of anoadanal plate; 5, subcapitulum, palpi removed; 6, palp, antiaxial view; 7, chelicera, antiaxial view; 8, femur I; 9, tibia IV. Scale bars: 1=200 μm; 2–4, 7–9=100 μm; 5–6=50 μm.

***Phrathicarus hikurangi* sp. nov.**
(Figs. 10–18)

**Material examined**: Holotype: adult (NZAC, in alcohol, 79/1), New Zealand: GB, Mt. Hikurangi, 1372m, from litter in subalpine bush dominated by *Nothofagus menziesii* and *Olearia colensoi*, 14 Jan., 1979, leg. A. K. Walker and R. A. Galbreath. Paratypes: three adults (NZAC, in alcohol, 79/1), same data as holotype; one adult (NIGA, in alcohol, 79/1), same data as holotype.

**Etymology.** Named after type locality and used here as a noun in apposition; Mt. Hikurangi (1754 metres) is the highest peak in the rugged Raukumara Range in the North Island and is recognised as the first point on the New Zealand mainland to greet the morning sun.

**Description.** *Measurements*. Holotype: Prodorsum: length 530, width 365, height 230, setae: *ss* 200, *ro* 175, *le* 450, *in* 555, *ex* 45; notogaster: length 1030, width 740, height 780; setae: $c_1$ 650, $d_1$ 95, $e_1$ 370, $h_1$ 770, $ps_1$ 600; ventral region: $g_9$ 70, $g_8$ 50, $g_1$ 25; genitoaggenital plate 270×230, anoadanal plate 215×400. Paratypes: Prodorsum: length 501–600, width 360–410, height 208–220; notogaster: length 1020–1200, width 720–880, height 750–900.

*Integument*. Colour brown. Surface of body finely punctate.

*Prodorsum* (Figs. 10−12). Median crista absent; sigillar fields distinct, dorsal field widened towards rostral setae, longer than lateral fields; sensilli long, narrow, rough, gradually tapering; interlamellar and lamellar setae long, stout, erect and rough, flagellate distally; rostral setae stout and rough, exceeding the end of rostrum; exobothridial setae short and fine; comparative length: *in*>*le*>*ss*>*ro*>*ex*, *in*/*le*=1.2; mutual distance of setae: *in*−*in*/*ro*−*ro*≈1.65.

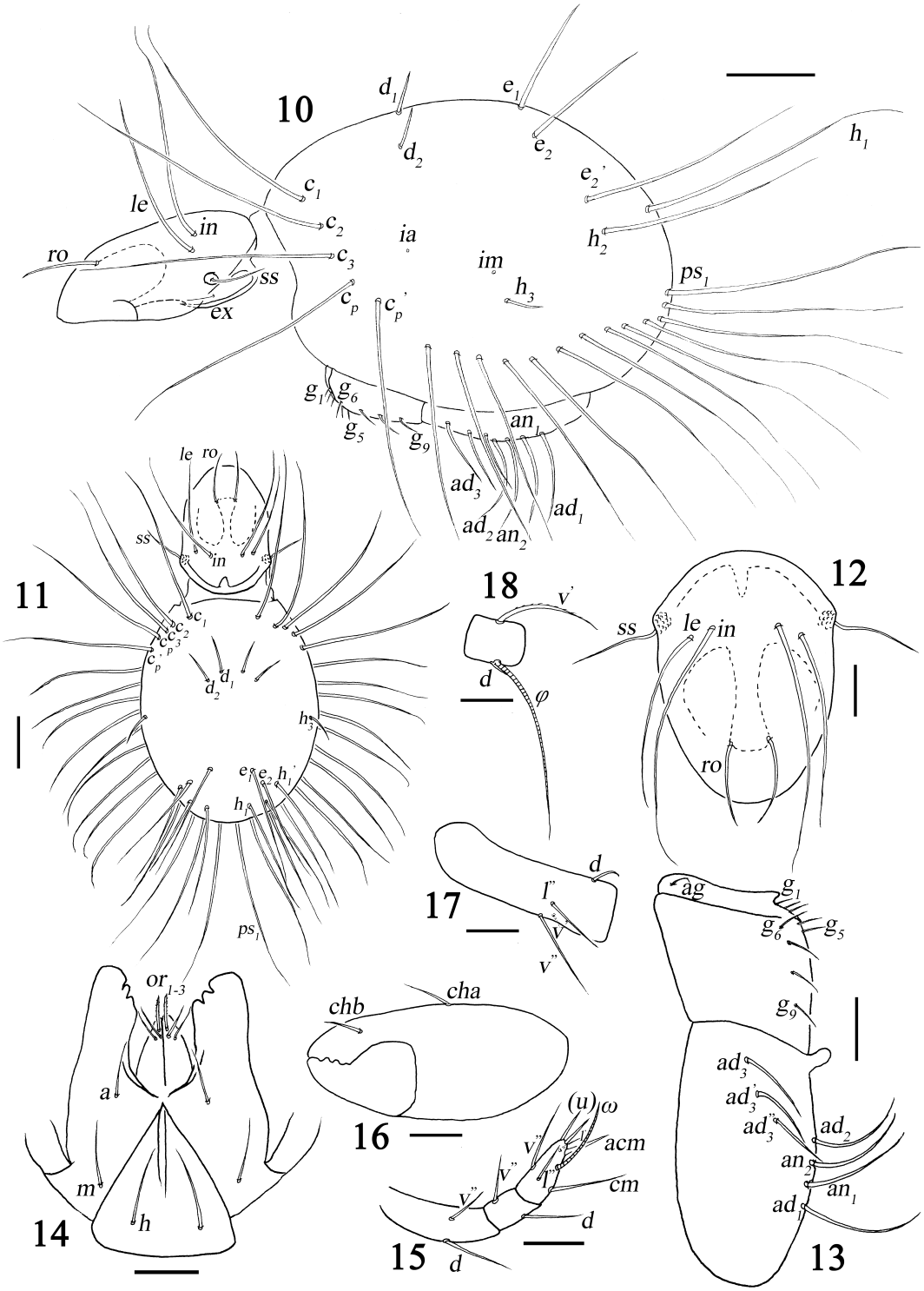
*Notogaster* (Fig. 10−11). 26 pairs of setae in different length present; setae $d_{1–2}$ and $h_3$ robust, rough, very short; setae $e_1$ and $e_2$ medium long; other setae long ($c_1$>$c_1$–$d_1$), robust, rough and flagellate distally; setae $c_{1–3}$ situated nearly in same level, setae $c_p$ close to $c_3$; additional setae present in *c*, *e* and *ps* series; vestigial setae $f_1$ not observed; two pairs of lyrifissures *ia* and *im* present.

*Gnathosoma* (Figs. 14–16). Subcapitulum normal (Fig. 14); setae *h*, *m*, and *a* simple and smooth; setae *h* longer than distance between them; adoral seta $or_1$ apparently flat with barbs; $or_{2–3}$ simple and smooth; palp (Fig. 15) 4-segmented, with femur and genu fused; palpal setation: 0-2-2-7(1); supracoxal seta simple and smooth; chelicera (Fig. 16) with two smooth setae (*cha*, *chb*).

*Ano-genital region* (Figs. 10, 13). Nine pairs of genital setae present with formula: 6(4+2): 3, setae $g_{6–9}$ longer than other genital setae; anoadanal plates each with five to seven pairs of stout and rough setae (e.g. holotype: left side of anoadanal plates with six setae, right side of anoadanal plates with seven setae; one of paratypes: left side of anoadanal plates with six setae, right side of anoadanal plates with five setae); setae $ad_3$, $ad_3$' and $ad_3$" shortest.

*Legs* (Figs. 17–18). Setal counts for leg segments (without tarsi): I: 1-4-2(2)-4(1); II: 1-3-2(1)-3(1), III: 2-2-1(1)-2(1), IV: 2-1-1-2(1); setae *ft*'' on tarsi II straight distally; setae *s* and *pv*' on tarsi IV present; setae *s* on tarsi I and II present.

**Remark.** This new species is unique in having 26 pairs of notogastral setae, because none of species of this group has been reported in having more than 19 pairs of notogastral setae. In addition, this new species can be easily distinguished from other species of this genus by the combination of following characters: (1) dorsal sigillar fields longer than lateral regions; (2) interlamellar, lamellar and some notogastral setae long and flagellate distally, rostral setae without flagellate distal ends; (3) *in*>*le*>*ss*>*ro*>*ex*, *in*/*le*=1.2; (4) two pairs of lyrifissures *ia* and *im* present; (5) 1–2 additional setae present on each anoadanal plate in some specimens.




**FIGURES 10–18.** *Phrathicarus hikurangi* **sp. nov.**: 10, lateral view of body (legs removed); 11, dorsal view of body (legs removed); 12, prodorsum, dorsal view; 13, right side of ventral plate; 14, subcapitulum, palpi removed; 15, palp, antiaxial view; 16, chelicera, antiaxial view; 17, femur I; 18, tibia IV. Scale bars: 10–11=200 μm; 12–13=100 μm; 14–18=50 μm.

**Key to species of *Phrathicarus***

1 26 pairs of notogastral setae present. . . . . *P. hikurangi* **sp. nov.**
- Less than 20 pairs of notogastral setae present . . . . . 2
2 17 pairs of notogastral setae present; comparative length of prodorsal setae: *in>ss>ro>ex>le* . . . . . *P. longisensillus* **sp. nov.**
- 19 pairs of notogastral setae present; comparative length of prodorsal setae: *in>ro>ss>le>ex* . . . . . *P. inflatus* Niedbała, 1994

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