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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 Niedbala 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 (Niedbala 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 Niedbala (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, anoanal 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: $in-in/ro-ro = 1.74$.

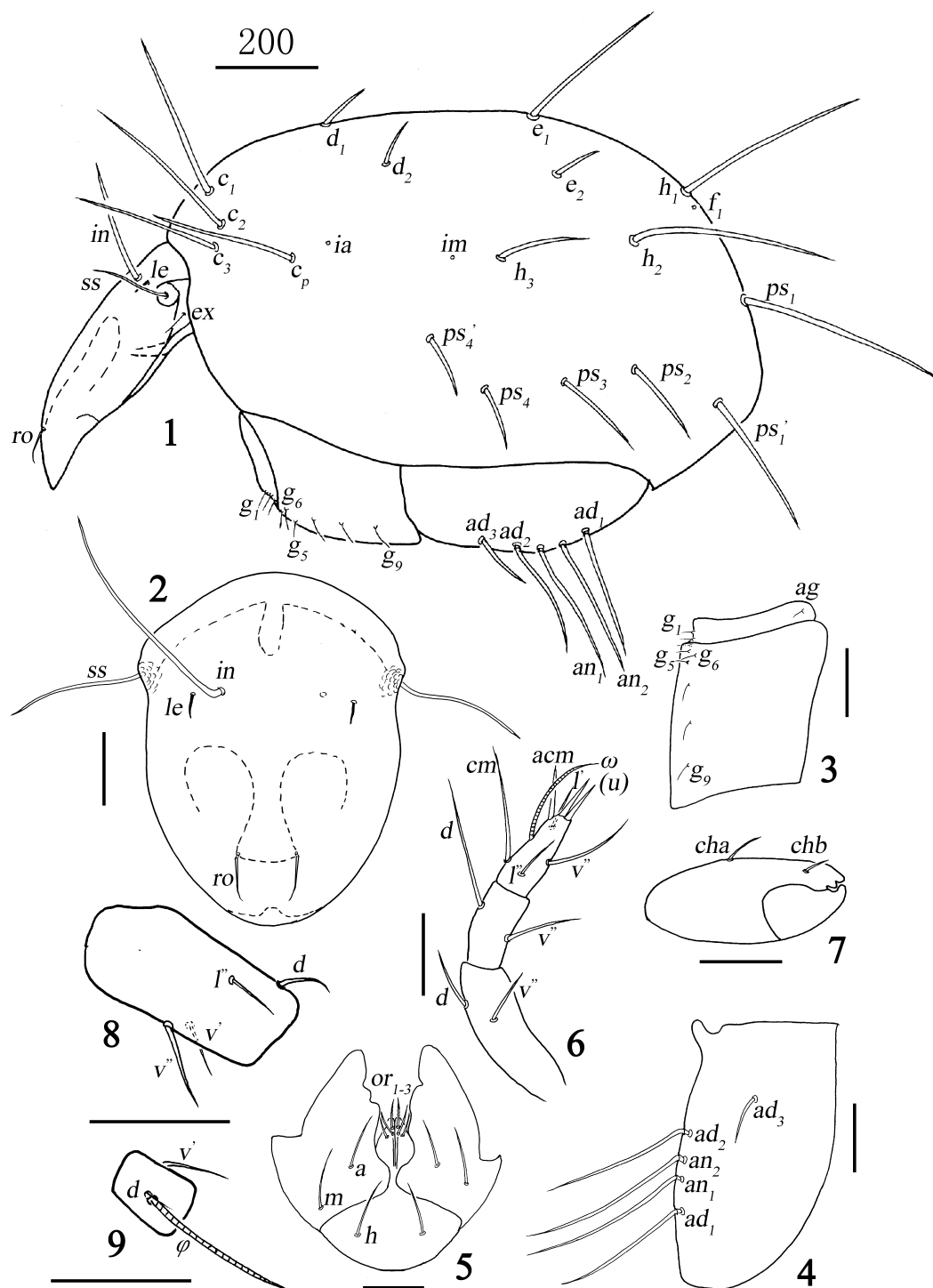
Notogaster (Fig. 1). 17 pairs of setae in different length ($c_1 > c_1-d_1 = 1.25$), robust and rough; setae h_3 , ps_{2-4} and ps_4 medium long; setae d_{1-2} and e_2 much shorter than other setae; setae c_{1-3} far away from anterior border, setae c_1 and c_2 more so than c_3 ; additional setae present 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; anoanal 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* Niedbala, 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 μ m; 2–4, 7–9=100 μ m; 5–6=50 μ m.

***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: $in-in/ro-ro \approx 1.65$.

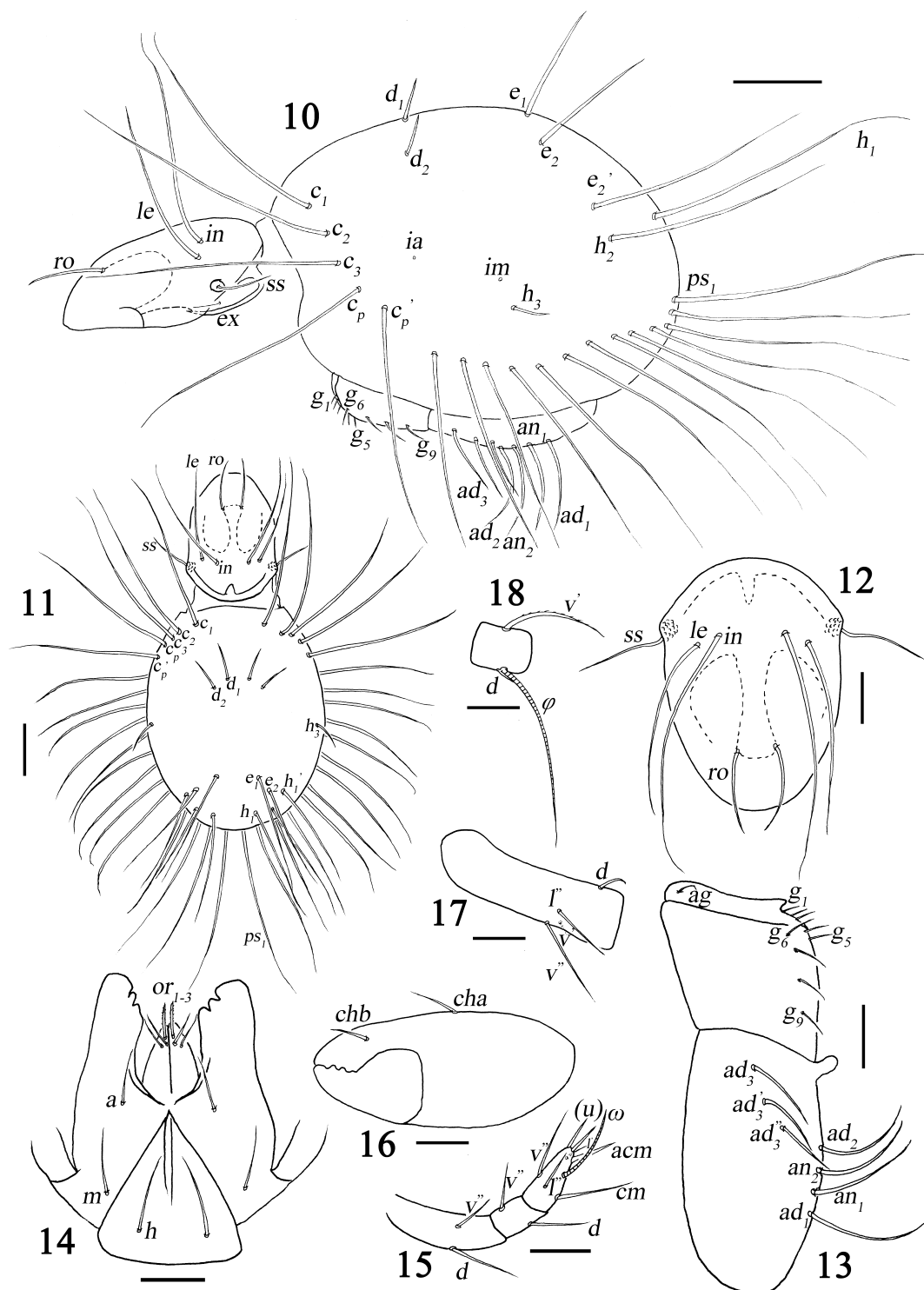
Notogaster (Fig. 10–11). 26 pairs of setae in different length present; setae d_{1-2} and h_3 robust, rough, very short; setae e_1 and e_2 medium long; other setae long ($c_1 > c_1-d_1$), robust, rough and flagellate distally; setae c_{1-3} situated nearly in same level, setae c_p close to c_3 ; additional 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 p_v' 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 μ m; 12–13=100 μ m; 14–18=50 μ m.

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* Niedbala, 1994

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References

- Niedbala, W. (1992) *Phthiracaroida (Acari, Oribatida). Systematic Studies*. PWN-Polish Scientific Publishers, Warszawa, 612 pp.
- Niedbala, W. (1994) Supplement to the classification of Phthiracaroida, with redescrptions and descriptions of some species (Acari, Oribatida, Euptyctima). *Genus*, 5 (1–2), 1–152.
- Niedbala, W. (2000) The ptyctimous mites fauna of the Oriental and Australian Regions and their centres of origin (Acari: Oribatida). *Genus*, supplement, 1–493.
- Subías, L.S. (2013) Listado sistemático, sinonímico y biogeográfico de los ácaros oribátidos (Acariformes: Oribatida) del mundo (Excepto fósiles). *Graellsia*, 60 (número extraordinario): 3–305 (2004) (Actualizado en junio de 2006, en abril de 2007, en mayo de 2008, en abril de 2009, en julio de 2010, en febrero de 2011 y en abril de 2012). Available from: <http://www.ucm.es/info/zoo/Artropodos/Catalogo.pdf> (accessed 1 Sept. 2013).

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