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New and little known ptyctimous mites (Acari: Oribatida) with a key to known species of *Oribotritia* from the Australasian Region

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Abstract: In this study, a new species, *Austrophthiracarus parabah* sp. n., from New Zealand, is illustrated and described. Some new data, new sites and notes are provided for the species *Microtritia novazealandiensis* Niedbała, 2006 and *Oribotritia parachichijimensis* Niedbała & Penttinen, 2007. A key to known species of *Oribotritia* from the Australasian Region is provided to facilitate the further study on this group.

Key words: soil mites; box mites; *Austrophthiracarus; Microtritia; Oribotritia*

Introduction

Ptyctimous mites, one of the primitive groups of oribatid mites, are typical and important components of the soil fauna. This work is a part of a continuing study of the ptyctimous mite fauna of the Australasian Region.

In the course of a taxonomic study of the ptyctimous mites from the New Zealand Arthropod Collection, Landcare Research, Auckland, three species were found, including a new species of *Austrophthiracarus* Balogh & Mahunka, 1978 (Phthiracaridae), and two known species belonging to the genera *Microtritia* Märkel, 1964 (Euphthiracaridae) and *Oribotritia* Jacot, 1924 (Oribotritiidae).

These three genera have been well reviewed by Liu & Zhang (2016), Liu & Chen (2014) and Liu (2015), respectively. The main goal of the present paper is to describe and illustrate the new species, give new information for the two known species, and provide a key to known species of *Oribotritia* from the Australasian Region to facilitate the further study.

Material and methods

Specimens were mounted in lactic acid on temporary cavity slides for measurement and illustration. Observation and drawing were made with a light microscope equipped with a drawing tube.

Terminology generally follows Niedbała (2000, 2011). The unit of measurement is micrometer (μm).

Specimen depositories are cited using the following abbreviations: NZAC – New Zealand Arthropod Collection, Landcare Research, Auckland; NIGA – Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences, Changchun, China.

Austrophthiracarus parabah sp. n. (Figs 1A–I)

Diagnosis. Surface of body punctate; median crista, posterior furrows and lateral carinae of prodorsum absent; median sigillar field short and forked; sensilli short, club-like with rough and rounded head, other prodorsal setae long, thick, sparsely barbed and erect, except exobothridial setae short and fine; rostral setae situated remote from rostrum; 15 pairs of notogastral setae present, similar in shape with interlamellar setae; setae c_2 little further away from anterior border than setae c_1 and c_3; vestigial setae f_1 posterior of setae h_1; two pairs of lyrifissures *ia* and *im* present; $h < h$–h; formula of genital setae: 5(4+1):4; ano-adanal plates each with five setae, nearly similar in shape as notogastral setae, except setae ad_3 thinner and shorter; setae *d* on femora I inserted slightly remote from distal ends of articles.

Description. *Measurements.* Holotype: Prodorsum: length 371, width 285, height 145, setae: *ss* 40, *ro* 115, *le* 135, *in* 210, *ex* 50; mutual distance: *in*–*in* 76, *ro*–*ro* 45; notogaster: length 750, width 580, height 535; setae: $c_1$190, c_3 115, c_p 90, d_1 175, e_1 210, h_1 235, h_3 108, ps_1 250, ps_2 202, ps_4 100; mutual distance: c_1–d_1 175; ventral region: ad_1 135, ad_2 125, ad_3 65, an_1 110, an_2 95; genito-aggenital plate 150 × 205, ano-adanal plate 135 × 280. Paratypes: Prodorsum: length 295–330, width 215–275, height 110–150; notogaster: length 522–705, width 370–540, height 355–550.

Integument. Colour dark-brown. Surface of body punctate.

Prodorsum (Figs 1A–C). Median crista, posterior furrows and lateral carinae absent; sigillar fields short and distinct, median field short, narrow and bifurcate

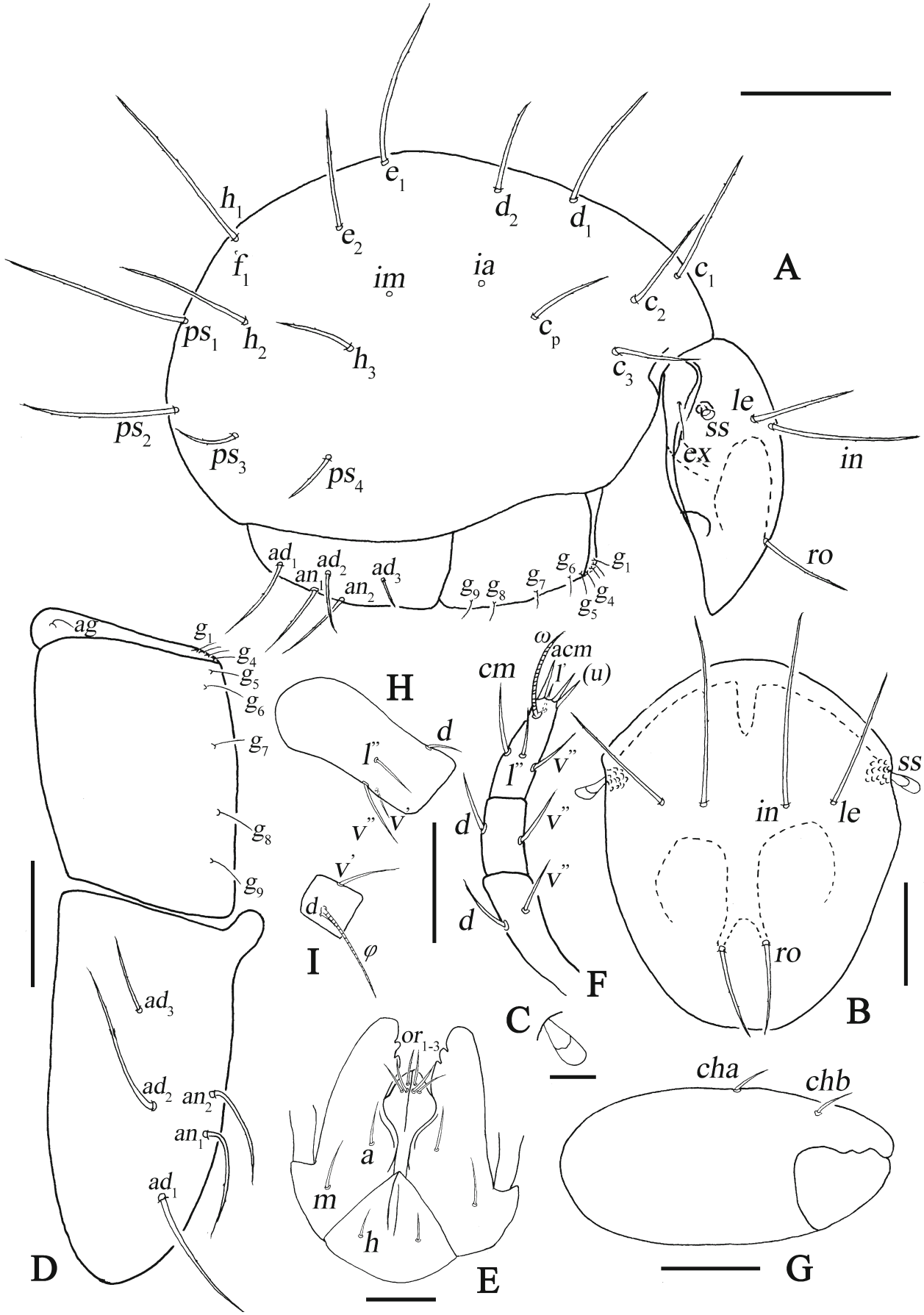

Fig. 1. *Austrophthiracarus parabah* sp. n. A – lateral view of body (legs removed); B – prodorsum, dorsal view; C – sensillus, dorsal view; D – right side of ventral plate; E – subcapitulum, palpi removed; F – palp, antiaxial view; G – chelicera, antiaxial view; H – femur I; I – tibia IV. Scales 200 μm (A), 100 μm (B, D), 50 μm (E–I), 25 μm (C).

distally; sensilli (*ss*) short, club-like with rough and broad rounded head; interlamellar, lamellar and rostral setae (*in*, *le*, *ro*) long, erect, sparsely barbed and nearly straight; rostral setae situated remote from anterior margin of prodorsum; exobothridial setae (*ex*) short and fine; comparative lengths: $in > le > ro > ex > ss$, in–in/ro–$roa \approx 1.69$.

Notogaster (Fig. 1A). 15 pairs of notogastral setae present (c_1/c_1–d_1 ≈1.09), similar in shape with interlamellar setae, dorsal setae much longer than laterals, setae c_p shortest; setae $c_2$little further away from anterior border than setae c_1 and c_3; vestigial setae f_1 posterior of setaeh_1; two pairs of lyrifissures *ia* and *im* present.

Ventral region (Figs 1D–G). Setae *h* shorter than distance between them. Nine pairs of genital setae (*g*) arranged with formula: 5(4+1):4; ano-adanal plates each with five setae (*ad*, *an*) with formula 3:2, nearly similar in shape as notogastral setae, except setae ad_3 thinner and shorter; comparative length: $ad_1 > ad_2 > an_1 > an_2 > ad_3$.

Legs (Figs 1H, I). Setal counts for leg segments: I: 1-4-2(2)-4(1)-18(3); II: 1-3-2(1)-3(1)-13(2), III: 2-2-1(1)-2(1)-11, IV: 2-1-1-2(1)-10; setae *d* on femora I inserted slightly remote from distal ends of articles; setae a'' on tarsi I and setae *ft"* on tarsi II straight; setae a'' on tarsi II straight distally; setae *s* and *pv'* on tarsi IV present; setae *s* on tarsi I and II present.

Material examined. Holotype: adult (NZAC, in alcohol, 73/146), New Zealand, Mid Sisters Island Chatham Islands (geographical co-ordinates 44°02′ S; 176°26′ E), in sedge on rock face on main dome, 24 Nov. 1973, leg. C.J. Robertson and A. Whittiker. Paratypes: 2 adults (NIGA, in alcohol, 73/146), same data as holotype.
Type deposition. Holotype is deposited in NZAC. Paratypes are deposited in NIGA.

Etymology. The prefix "para" is Latin meaning "near" and refers to the similarity of the new species to *Austrophthiracarus bah* Liu & Zhang, 2015.

Remarks. This new species is close to *Austrophthiracarus bah* Liu & Zhang, 2015 from New Zealand in sharing following features: median crista, posterior furrows and lateral carinae absent; median sigillar field short and forked; long and thick lamellar and rostral setae; rostral setae situated remote from rostrum; $in > le > ro > ex > ss$; 15 pairs of notogastral and three pairs of adanal setae present; setae ps_3 and ps_4 distinctly shorter than other notogastral setae; similar length and arrangement of anal and adanal setae; $h < h$–h; similar positions of setae *d* on femora I. However, this new species can be distinguished by following characters: (1) sensilli shorter (*ss* 40), club-like with rough and broad rounded head (versus *ss* 57, narrow spindle-shaped with pointed and spinulose head in *A. bah*); (2) prodorsal (*in*, *le* and *ro*) and dorsal notogastral setae erect (versus prodorsal setae strongly curved backwards, and notogastral setae strongly curved forwards); (3) dorsal notogastral setae much longer: c_1/c_1–$d_1 \approx 1.09$ (versus shorter: c_1/c_1–$d_1 \approx 0.82$); (4) setae c_2 little further away from anterior border than setae c_1 and c_3 (versus much further); (5) two pairs of lyrifissures *ia* and *im* present (versus only *im* present); (6) formula of genital setae: 5(4+1):4 (versus 6(4+2):3); (7) setae v'' on femora I inserted at same level of setae l'' (versus inserted posterior to insertion level of setae l'').

Known species identified from the Australasian Region

Microtritia novazealandiensis Niedbała, 2006 (Figs 2A–H)

Measurements. Prodorsum: length 320–345, width 250–275, height 110–135, setae: *ss* 130, *ro* 25, *le* 5, *in* 30; notogaster: length 680–699, width 440–480, height 430–500; setae: $c_1$50, d_1 30, e_1 30, h_1 35, ps_1 30; genito-aggenital plate 75 × 175, ano-adanal plate 110 × 300.

Material examined. New localities in New Zealand: 3 adults (NZAC, in alcohol, 73/13), Redmans CK. Capleston, BR., B. F. U. P., (geographical co-ordinates 42.6° S; 171.4° E), from litter, 10 Jan. 1973, leg. J. C. Watt; 1 adult (NZAC, in alcohol, 73/9), New Zealand, Capleston Bio. Res., BR., B. F. U. P., (geographical co-ordinates 42.6° S; 171.4° E), from litter, 12 Jan. 1973, leg. J. C. Watt; 1 adult (NZAC, in alcohol, 72/232), New Zealand, Red Island Mercury Islands C. L., (geographical co-ordinates 36°35′ S; 175°55′ E), from litter, 24 Nov. 1972, leg. G. W. Ramsay; 1 adult (NZAC, in alcohol, 79/1), New Zealand, GB, Mt. Hikurangi, (geographical co-ordinates 37°55′1.49″ S; 178°3′36.20″ E), 1372 m a.s.l., from litter, 14 Jan. 1979, leg. A. K. Walker and R. A. Galbreath; 2 adults (NZAC, in alcohol, 82/7), New Zealand, ND, Hen & Chickens Island, (geographical co-ordinates 35°56′ S; 174°44′ E), Lady Alice Island, Main Ridge above Grave Bay, from litter, 1 Jan. 1982, leg. R. Hay.

Notes. Compared with description of type specimens (Niedbała 1993, 2006), these specimens slightly differs by $in > ro > le$ (versus $in < le = ro$ in paratype), sensilli not slightly broader in the middle (versus broader in the middle in holotype), setation of legs I 1-2-2(2)-5(2) (versus l-2-3(2)-5(2)). These differences are probably subject to intraspecific variability.

Oribotritia parachichijimensis Niedbała & Penttinen, 2007 (Figs 3A–H)

Measurements. Prodorsum: length 610, width 490, height 180, setae: *ss* 135, *ro* 130, *le* 85, *in* 70, *ex* 155; mutual distance: *in*–*in* 125, *ro*–*ro* 145; notogaster: length 1120, width 650, height 775; setae: c_1 215, c_3 45, h_1 260, ps_1 225, ps_2 200; mutual distance: c_1–d_1 275; ventral region: g_1 26, g_2 30, g_3 30, g_7 50, ad_3 25; genito-aggenital plate 155 × 275, ano-adanal plate 120 × 545.

Material examined. New localities in Australia: 1 adult (NZAC, in alcohol, 79/111), Queensland, Lamington, NP, (geographical co-ordinates 28°8′32″ S; 153°6′55″ E), 1160 m a.s.l., from sifted litter, 8 Oct. 1979, leg. G. Kuschel.

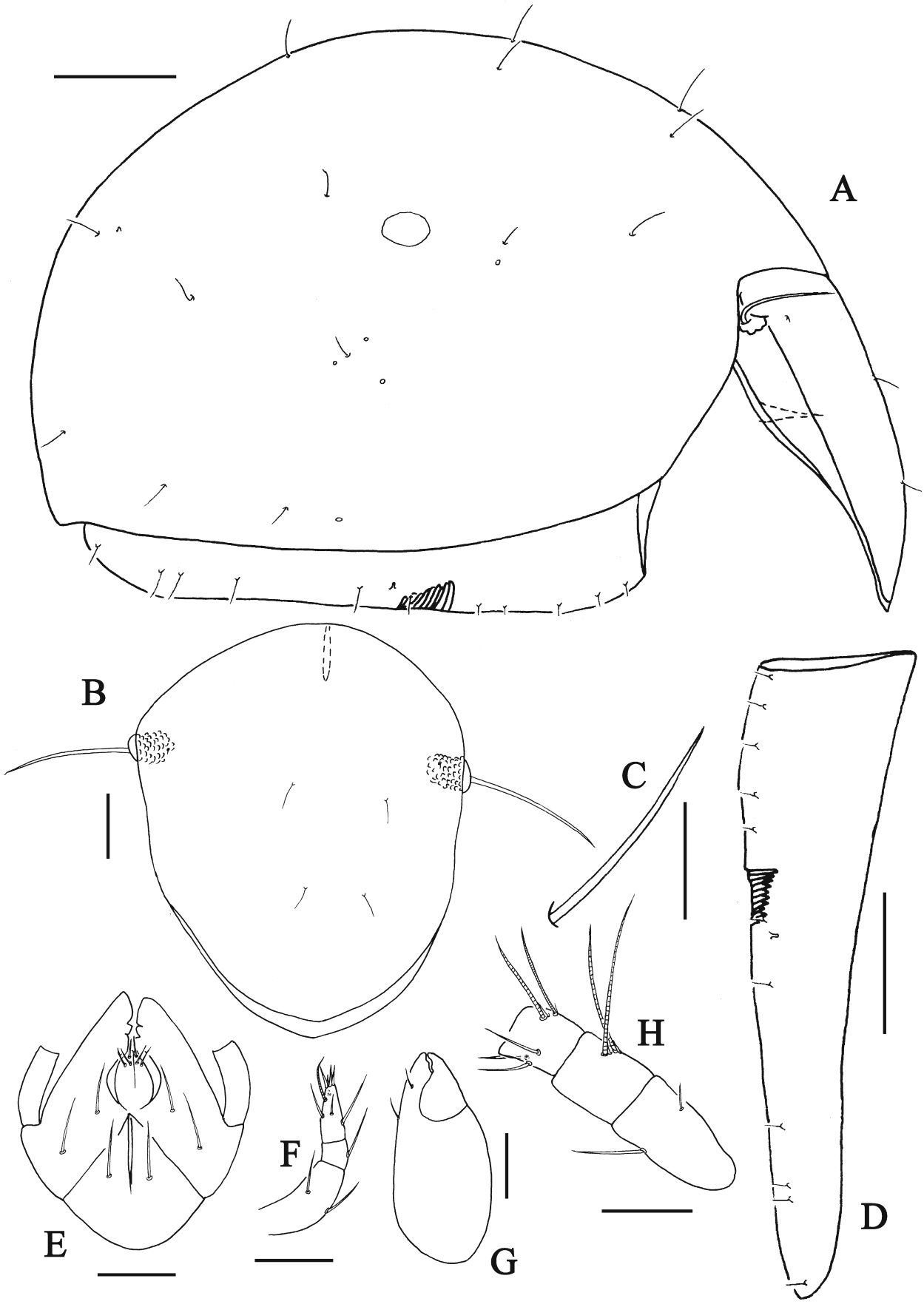

Fig. 2. *Microtritia novazealandiensis* Niedbała, 2006. A – lateral view of body (legs removed); B – prodorsum, dorsal view; C – sensillus, dorsal view; D – left side of ano-genital region; E – subcapitulum, palpi removed; F – palp, antiaxial view; G – chelicera, antiaxial view; H – femur, genu and tibia I. Scales 100 μm (A, D), 200 μm (B, C), 50 μm (E–H).

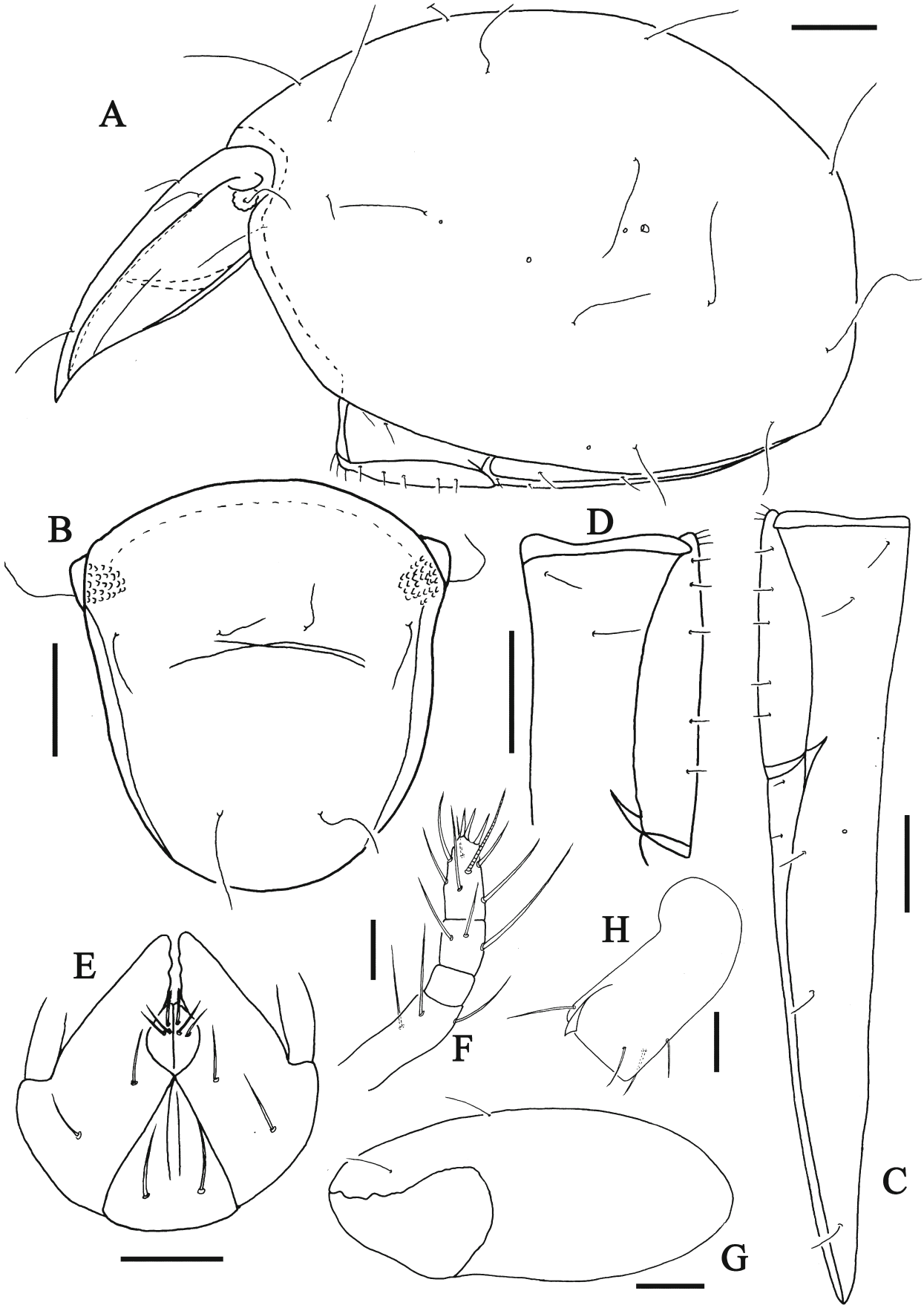

Fig. 3. *Oribotritia parachichijimensis* Niedbała & Penttinen, 2007. A – lateral view of body (legs removed); B – prodorsum, dorsal view; C – left side of ano-genital region; D – right side of genito-aggenital plate; E – subcapitulum, palpi removed; F – palp, antiaxial view; G – chelicera, antiaxial view; H – femur I. Scales 200 μm (A), 100 μm (B–D), 50 μm (E–H).

Notes. Compared with description of holotype (Niedbała & Penttinen 2007), the Queensland specimen differ by shorter inferior lateral carinae (versus longer in holotype), interlamellar setae shorter than lamellar setae (versus longer), different formula of genital setae (left side 5:3 and right side 4:3 versus 5:4). In my opinion, these features are subject to intraspecific variability.

Key to species of *Oribotritia* known from the Australasian Region

Keys to known species of *Microtritia* in the world and species of *Austrophthiracarus* known from Australasian Region refer to Liu & Chen (2014) and Liu & Zhang (2016), respectively.

1 Interlamellar setae more than two times longer than lamellar setae 2
– Interlamellar setae shorter or less than two times longer than lamellar setae 5
2 Lateral carinae of prodorsum consisting of two laminae .... ***O. paracorporaali*** Niedbała & Penttinen, 2007 (Australia, New Caledonia)
– Lateral carinae of prodorsum consisting of a single lamina 3
3 Notogastral setae minute, except setae ps_2 and ps_3 normal in length; three pairs of anal setae present ***O. samoaensis*** Niedbała, 1998 (Samoa, Solomon Islands)
– Notogastral setae normal in length; one or two pairs of anal setae present 4
4 Two pairs of anal and two pairs of adanal setae present; setae c_1 and c_2 much longer than other notogastral setae ..... ***O. hawaiiensis*** (Jacot, 1929) (Hawaii)
– One pair of anal and three pairs of adanal setae present; all notogastral setae nearly similar in length ..... ***O. contraria*** Niedbała, 1993 (Australia, New Zealand)
5 Sensilli bar like and obtuse distally ..... ***O. pulla*** Niedbała, 1998 (Hawaii)
– Sensilli setiform and pointed distally 6
6 Sensilli spinose; anal plates without setae ..... ***O. incognita*** Niedbała, 2000 (New Zealand)
– Sensilli smooth; anal plates with setae 7
7 Lateral carinae of prodorsum consisting of two laminae 8
– Lateral carinae of prodorsum consisting of a single lamina 10
8 One pair anal setae present ..... ***O. bilaminae*** Liu & Zhang, 2013 (New Zealand)
– Two pairs anal setae present 9
9 Three pairs of setae on subcapitulum genua and four pairs of setae on palp femora ..... ***O. duplex*** Niedbała, 2000 (Australia)
– Two pairs of setae on subcapitulum genua and three pairs of setae on palp femora ..... ***O. parachichijimensis*** Niedbała & Penttinen, 2007 (Australia)
10 Three or two pairs of anal setae present 11
– One pair of anal setae present 13
11 Three pairs of anal setae present ..... ***O. ampla*** Niedbała, 1991 (Fiji, Samoa)
– Two pairs of anal setae present 12
12 Distance between interlamellar setae more than three times longer than that between rostral setae; lyrifissures *iad* situated laterally anterior of setae ad_3 ..... ***O. mangamuka*** Liu & Zhang, 2013 (New Zealand)
– Distance between interlamellar setae less than two times longer than that between rostral setae; lyrifissures *iad* situated laterally posterior of setae ad_3 ..... ***O. contortula*** Niedbała, 1993 (Australia, New Zealand, New Caledonia)
13 Exobothridial setae vestigial; lyrifissures *iad* situated laterally anterior of setae ad_3 14
– Exobothridial setae well developed; lyrifissures *iad* situated laterally posterior of setae ad_3 15
14 *ss=ro> in=le*; nine genital setae present ..... ***O. teretis*** Niedbała, 1993 (New Zealand)
– *in > ro > le > ss*; eight genital setae present ..... ***O. lepteces*** Niedbała, Corpuz-Raros & Gruèzo, 2006 (Australia, Philippines)
15 Sensilli shorter than lamellar setae; eight pairs of genital setae present ..... ***O. brevis*** Niedbała & Colloff, 1997 (Australia, New Zealand)
– Sensilli longer than lamellar setae; nine pairs of genital setae present ..... ***O. paraincognita*** Niedbała, 2006 (New Zealand)

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References

Balogh J. & Mahunka S. 1978. Data to the oribatid fauna of Australia (Acari), I. Opuscula Zoologica, Budapest **15 (1–2):** 31–49.

Jacot A.P. 1924. Oribatoidea Sinensis III. Journal of the North China British Asiatic Society **55:** 78–83.

Jacot A.P. 1929. New oribatoid mites. Psyche: A Journal of Entomology **35:** 213–215.

Liu D. 2015. Review of *Oribotritia* (Acari, Oribatida, Oribotritiidae) with a world checklist and description of a new species from China. Zootaxa **4007 (2):** 217–241. DOI: 10.11646/zootaxa.4007.2.5

Liu D. & Chen J. 2014. *Microtritia* species (Acari, Oribatida, Euphthiracaridae) from China, with description of a new species and a world key to species of the genus. Int. J. Acarol. **40 (5):** 402–409. DOI: 10.1080/01647954.2014.925969

Liu D. & Zhang Z.Q. 2013. New Zealand species of *Oribotritia* (Acari: Oribatida: Oribotritiidae): descriptions of two new species and a key to eight species. Syst. Appl. Acarol. **18 (2):** 153–162. DOI: doi:10.11158/saa.18.2.8

Liu D. & Zhang Z.Q. 2015. New Zealand *Austrophthiracarus* (Acari: Oribatida: Phthiracaridae): three new species from North Island and offshore islands. Syst. Appl. Acarol. **20 (3):** 263–272. DOI: doi:10.11158/saa.20.3.4

Liu D. & Zhang Z.Q. 2016. Review of the genus *Austrophthiracarus* (Acari, Oribatida, Phthiracaridae) with a description of a new species from Australia, a key to known species of the Australian Region and a world checklist. Int. J. Acarol. **42 (1):** 41–55. DOI: 10.1080/01647954.2015.1109709

Märkel K. 1964. Die Euphthiracaridae Jacot, 1930, und ihre Gattungen (Acari, Oribatei). Zool. Verhand. **67:** 1–78.

Niedbała W. 1991. Description of two new euphthiracaroid species (Acari, Oribatida). Genus **2 (1):** 33–44.

Niedbała W. 1993. New species of Euptyctima (Acari, Oribatida) from New Zealand. N. Z. J. Zool. **20 (3):** 137–159. DOI: 10.1080/03014223.1993.10422856

Niedbała W. 1998. Ptyctimous mites of the Pacific Islands. Recent knowledge, origin, descriptions, redescriptions, diagnoses and zoogeography. Genus **9 (4):** 431–558.

Niedbała W. 2000. The ptyctimous mites fauna of the Oriental and Australian Regions and their centres of origin (Acari: Oribatida). Genus **10** (**Suppl.):** 1–493.

Niedbała W. 2006. Supplement to the knowledge of ptyctimous mites (Acari: Oribatida) from Australian Region. Annal. Zool. **56 (Suppl. 1):** 99–156. DOI: doi:10.3161/00034540677 8553364

Niedbała W. 2011. Ptyctimous mites (Acari, Oribatida) of the Palaearctic Region. Systematic part. Fauna Mundi 4, Natura optima dux Foundation, Warszawa, 472 pp. ISBN: 978-83-930773-2-8

Niedbała W. & Colloff M.J. 1997. Euptyctime oribatid mites from Tasmanian rainforest (Acari: Oribatida). J. Nat. Hist. **31:** 489–538. DOI: 10.1080/00222939700770261

Niedbała W., Corpuz-Raros L.A. & Gruezo W.S.M. 2006. Ptyctimous mites mainly from Samar Island of the Philippines (Acari: Oribatida). Genus **17 (3):** 449–470.

Niedbała W. & Penttinen R. 2007. New species of ptyctimous mites (Acari: Oribatida: Oribotritiidae, Steganacaridae) with some new records from Australasian Region. Annal. Zool. **57 (3):** 517–532.

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