ON THE GENUS *HOLONOTHRUS* (ACARI: ORIBATIDA) IN THE AUSTRALIAN REGION

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ACARI
ORIBATIDA
HOLONOTHRUS
AUSTRALIAN REGION
TAXONOMY
ZOOGEOGRAPHY

SUMMARY: Three new species of crotoniid oribatid mites are described from Australian Region: *Holonothrus naskreckii* sp. nov. and *H. gracilis* sp. nov. collected from alpine plant mats, New Zealand and *H. novaecaledoniae* sp. nov. collected from mosses from bark, Mt. Painé, New Caledonia. New records of *H. pulcher* in New Zealand and *H. mitis* and *H. robustus* in Australia are presented. An identification key for adults of eight species of *Holonothrus* of Australian Region is included.

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RÉSUMÉ : Trois nouvelles espèces de *Crotonioidea* (Acari, Oribatida) sont décrites de la Région Australienne : *Holonothrus naskreckii* sp. nov. et *H. gracilis* sp. nov. en Nouvelle Zélande et *H. novaecaledoniae* sp. nov. de la Nouvelle Calédonie. Des nouvelles localités de *H. pulcher* en Nouvelle Zélande et de *H. mitis* et *H. robustus* en Australie sont présentées. Une clef d'identification des adultes de huit espèces d'*Holonothrus* de la Région Australienne est ajoutée.

The oribatid mite genus *Holonothrus* appears to have a so-called "Gondwanan" distribution. Although five of the six species described so far are known from the Australian Region, members of this genus are widely distributed on the continents and islands of the Southern Hemisphere (NORTON & OLSZANOWSKI, 1989).

The purpose of this paper is to propose three new species of *Holonothrus* and to give new records of this genus in the Australian Region. The material on which the present study is based originates from the Field Museum, Chicago, U.S.A., the Hungarian National History Museum, Budapest, Hungary, and the Canadian National Collections of Insects, Arachnids and Nematodes, Centre for Land and Biological Resources Research, Ottawa, Canada. I am indebted to these institutions for the opportunity to study these collections.

Holonothrus naskreckii sp. nov.

Adult. Body length: 510–660 μm; maximum body width: 230–320 μm. Colour light brown. Prodorsal cuticle porose, pores especially distinct in central part; hysterosomal cuticle generally with indistinct reticulate pattern caused by rounded or polygonal raised areas. Body covered by transparent cerotegument, sometimes with adherent dirt or debris.

Prodorsum (Figs. 1, 2, 66–68). Length of prodorsum equal to 1/3 of body length. Two pairs of longitudinal ridges apparent in dorsal aspect; one pair runs anteromediad from near bothridium towards lamellar apophyse and bears setae *in*, the other runs posteromediad from bothridium. Longitudinal fold of cuticle present lateral to bothridium. Tip of rostrum rounded. Rostral setae (*ro*) not situated on apo-

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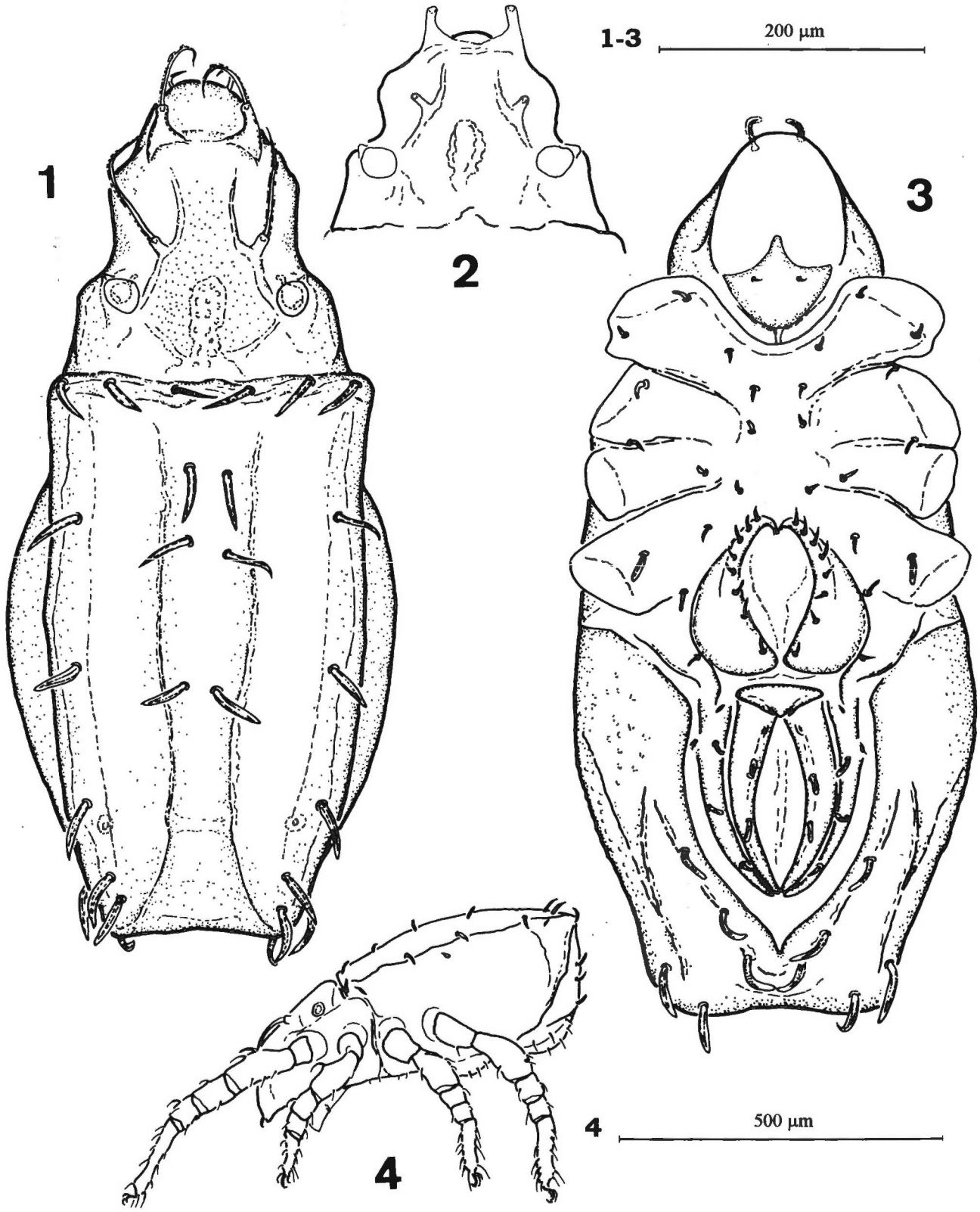

FIG. 1–4: *Holonothrus naskreckii* sp. nov., adult, holotype.
1. — Dorsal view. 2. — Prodorsum in different orientation. 3. — Ventral view. 4. — Lateral view.

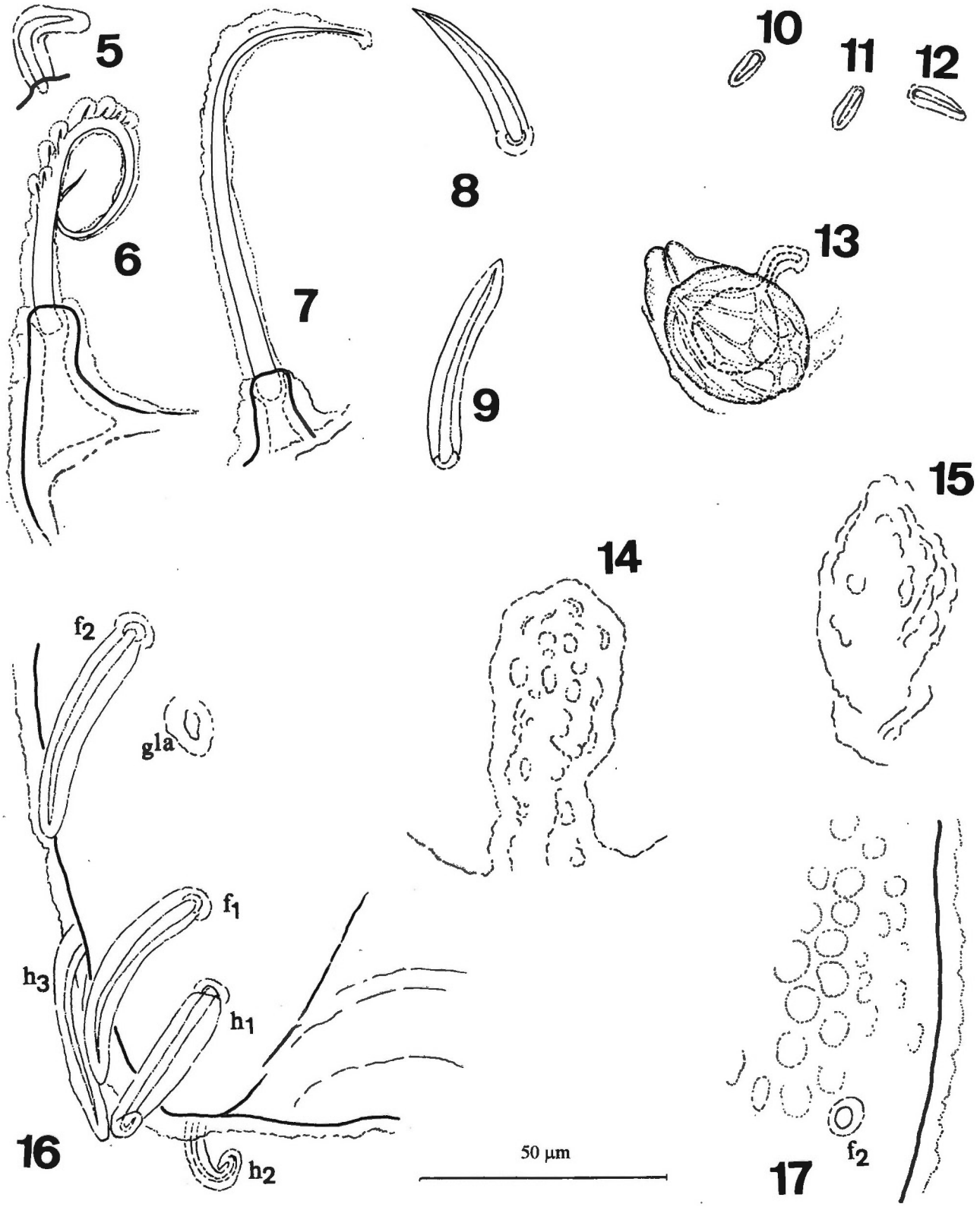

FIG. 5–17: *Holonothrus naskreckii* sp. nov., adult
(Holotype, excluding Fig. 15 which is a paratype).

5. — Rostral seta. 6. — Lamellar seta. 7. — Interlamellar seta. 8. — Seta *c2*. 9. — Seta *d1*. 10. — Epimeral seta. 11. — Genital seta. 12. — Anal seta. 13. — Bothridium and sensillus. 14, 15. — Muscle sigillae in the center of prodorsum, dorsal view. 16. — Left caudal (posterior) region of notogaster, dorsal view. 17. — Detailed sculpture on notogaster, dorsal view.

physes; thin, distinctly curved, surrounded by smooth, transparent sheaths of cerotegument (Fig. 5). Lamellar setae (*le*) curved, serrated, on strong apophyses; the latter somewhat shorter than distance between their tips. Tips of apophyses reach rostrum or not—according to body orientation (Figs. 1, 2). Interlamellar setae (*in*) on short apophyses (Fig. 68), smooth, bent distally; their tips reach lamellar apophyses. Lamellar and interlamellar setae covered by irregular layer of cerotegument (Figs. 6, 7). Sensillus (Fig. 13) somewhat concave apically, completely contained within bothridium; the latter with narrow, lateral canal.

Notogaster (Fig. 1, 66, 67, 69). Notogaster broadest at level between setae *cp* and *e2*. Upper edges appearing as lateral ridges in dorsal aspect, running

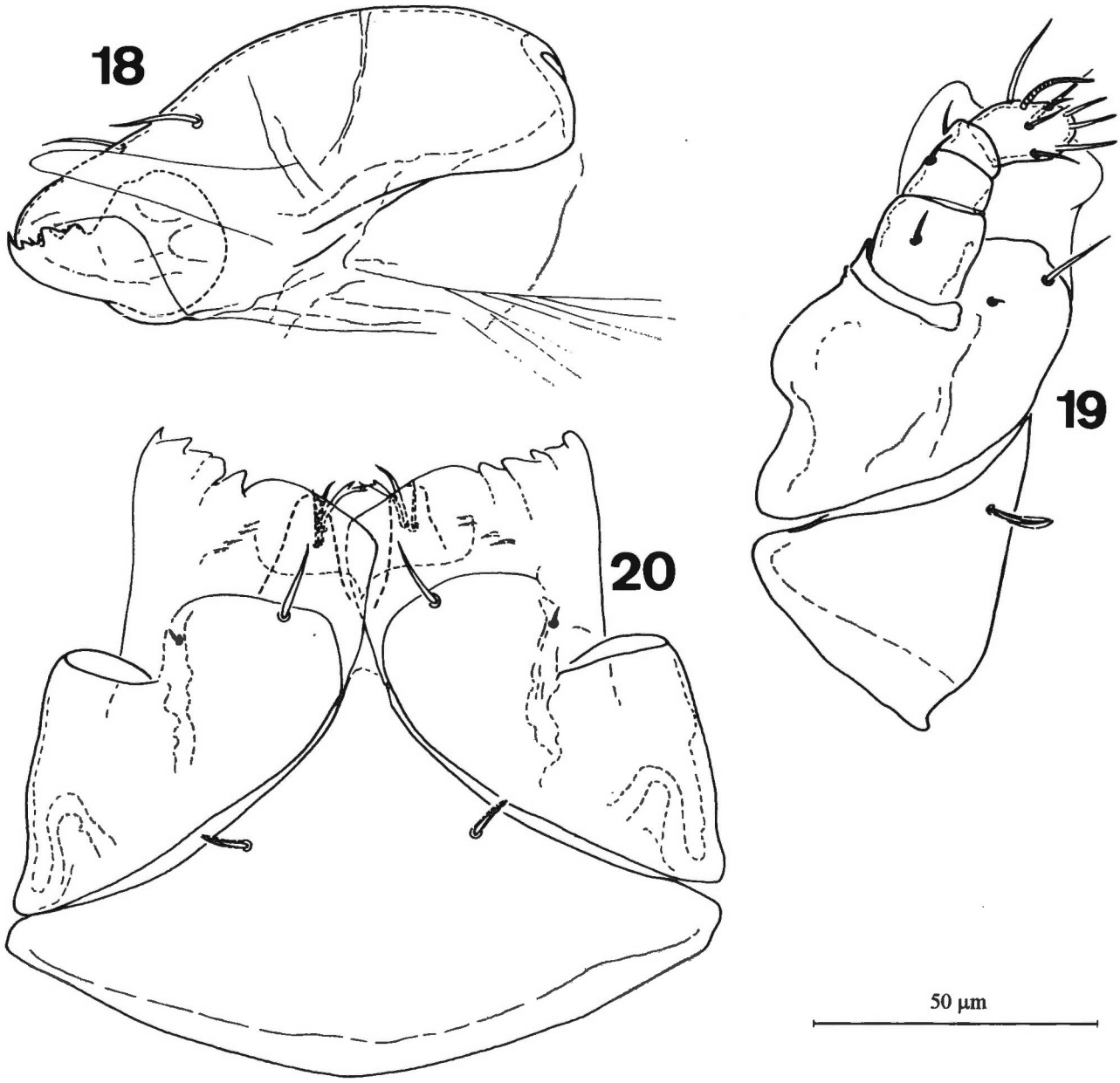

FIG. 18–20: *Holonothrus naskreckii* sp. nov., adult paratype.
18. — Chelicera, paraxial view. 19. — Subcapitulum, lateral view. 20. — Subcapitulum, ventral view.

immediately lateral to setae *cp*, *e2*, and *f2*; ridges merge posteriorly with pair of shallow lobes which delimit a truncate, or somewhat concave, posterior region. Pair of distinct, longitudinal, medial ridges delimits more convex central region of notogaster and connects posteriorly with internal edges of lobes. Second pair of ridges, less distinct (especially in weakly sclerotized specimens) lateral to first pair. Notogaster with 16 pairs of similar setae, smooth, surrounded by distinct, smooth, transparent sheaths of cerotegument (Figs. 8, 9, 67, 69). Three pairs of setae (row *c*) on anterior border, distance *c1–c2* slightly shorter than *c2–c3*; 3 pairs (*d1*, *d2*, and *e1*) in central part of notogaster, between medial ridges, 7 pairs (*cp*, *e2*, *f1*, *f2*, *h1*, *h2*, and *h3*) along lateral ridges and on posterior lobes, and 3 pairs (row *ps*) in ventral position. Setae of rows *ps* and *h* not inserted on tubercles. Opisthosomal gland opening (*gla*) posterior to seta *f2*. Five pairs of lyrifissures (*ia*, *im*, *ip*, *ih*, *ips*) in normal positions for genus.

Ventral region (Fig. 3). Coxisternal pairs fully fused medially. Coxisternal setation 4-3-1-3; setae short and thick. Genital setae all near medial margin, setation variable between 7–10. Two pairs of aggenital setae inserted on medial edge of aggenital plate. Preanal plate distinct, typical of genus. Anal and adanal plates bearing 2 and 3 pairs of similar setae, respectively. All setae on ventral region surrounded by smooth, transparent sheaths (Figs. 10–12).

Gnathosoma. Subcapitulum (Figs. 19, 20) stenarthic. Medial lobe of rutellum large, completely covering adoral region. Mental seta (*h*) rather thin and smooth. Two pairs of genal setae, seta *a* distinctly longer than *m*. Three pairs of adoral setae; *or1* brushed posteriorly, the other two pairs smooth. Palp setation (trochanter to tarsus) 0-1-1-1-8(1). Chelicerae (Fig. 18) with normal two setae.

Legs (Figs. 21–28)

Tarsi tridactylous. Lateral claws with dorsal fringe of hyaline teeth. Setae inserted on small tubercles. Setation (including famulus): I: 1-11-5-6-29, II: 1-11-4-4-25, III: 5-6-4-4-25, IV: 1-4-4-4-25; solenidial formulae: I: 1-2-2, II: 1-1-2, III: 1-1-0, IV: 0-1-0 or 1-1-0 in some specimens.

MATERIAL EXAMINED: The holotype and 42 paratypes (adults) were collected from New Zealand: FM (HD) 85-453, South Island, BR., Nelson Lakes National Park, Mt. Robert summit, 1412 m elev., 20 Dec. 1984, A. NEWTON and M. THAYER coll., ex alpine plant mats. The holotype and 36 paratypes are deposited in the Field Museum, Chicago, USA; three paratypes are in the collection of R. A. NORTON and three paratypes in the collection of Z. OLSZANOWSKI.

REMARKS: The species is morphologically most similar to *H. foliatus* Wallwork from Macquarie Island. They differ in that *H. foliatus* has notogastral setae "foliate" and "barbed" (WALLWORK, 1963), whereas in *H. naskreckii* they are smooth, surrounded by distinct, transparent sheaths. Also, setae in the central part of the notogaster in *H. foliatus* are "inserted on inner margins" of grooves, while those of *H. naskreckii* are inserted distinctly between medial ridges.

ETYMOLOGY: The species is named in honour of Dr Piotr NASKRECKI, Polish orthopterist and acarologist in appreciation of discussions on phylogenetic systematics.

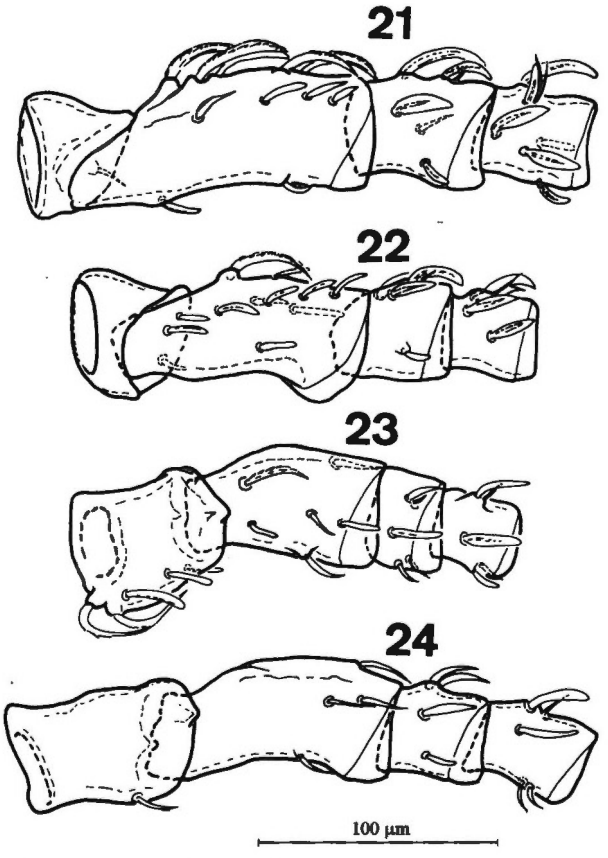

FIG. 21–24: *Holonothrus naskreckii* sp. nov., adult paratype, legs I–IV, trochanter to tibia, antiaxial view.

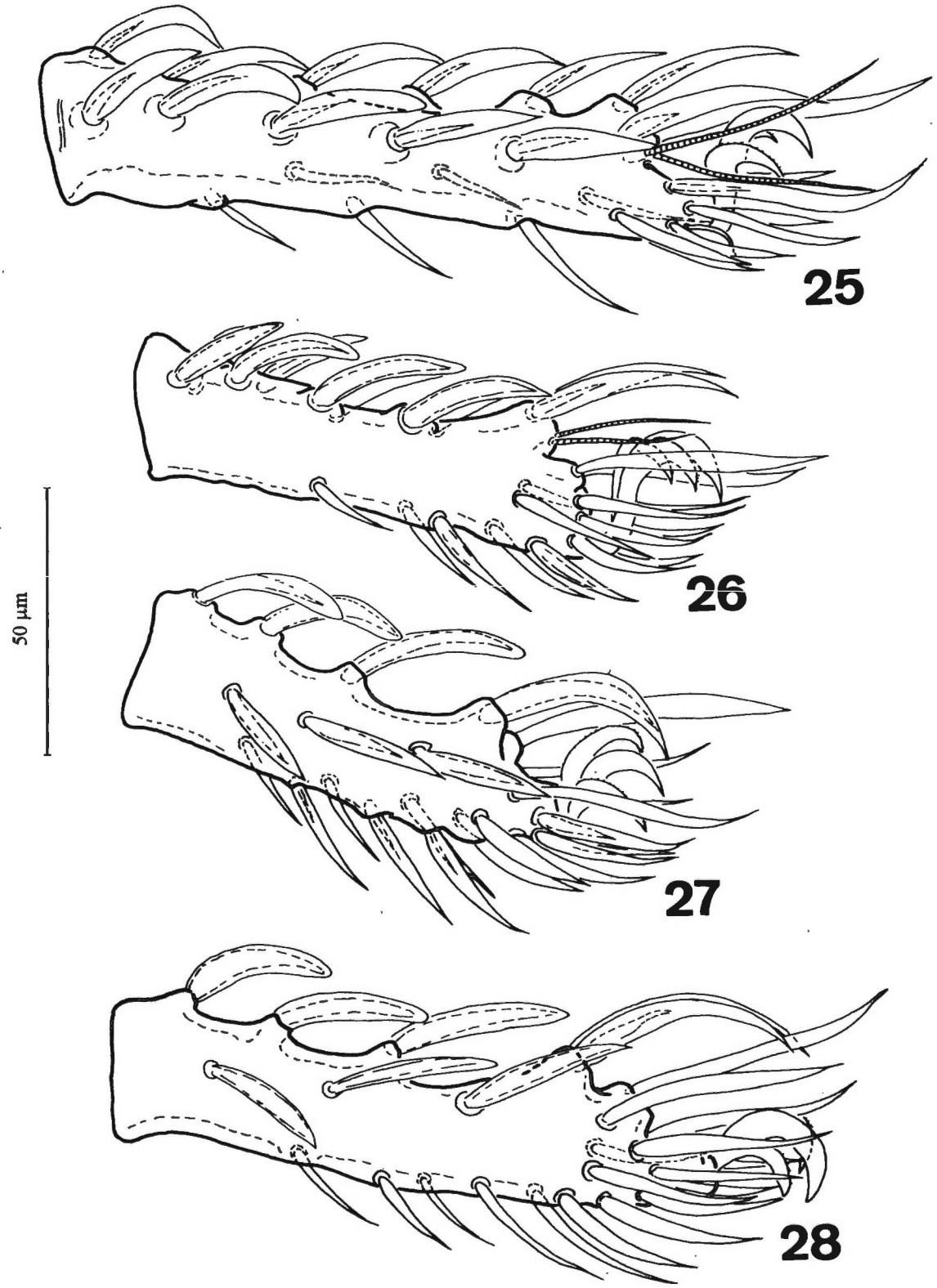

FIG. 25-28: *Holonothrus naskreckii* sp. nov., adult paratype, tarsi of legs I–IV, antiaxial view.

Holonothrus gracilis sp. nov.

Adult. Body length: 740–810 μm; maximum body width: 310–320 μm. Colour brown. Prodorsal cuticle covered by fine porose microsculpture; hysterosomal cuticle, especially in lateral parts, with indistinct reticulate pattern caused by rounded or polygonal raised areas. Body covered by transparent cerotegument.

Prodorsum (Fig. 29). Length of prodorsum equal to 1/3 of body length. Tip of rostrum rounded. Rostral setae (*ro*) not situated on apophyses; thin, curved. Lamellar setae (*le*) curved, serrated, on strong apophyses with broad bases; apophyses distinctly shorter than mutual distance of their tips. Tips of apophyses reaches rostrum. Interlamellar setae (*in*) on short apophyses, smooth, curved; tips reach rostrum. Lamellar and interlamellar setae covered by layer of cerotegument (Figs. 31, 32), very thin in *in*. Sensillus (Fig. 34) completely contained within bothridium. Two pairs of longitudinal ridges seen in dorsal aspect; one runs anteromedial from near bothridium towards lamellar apophyses and bears setae *in*, the other runs posteromedial from bothridium. Longitudinal fold of cuticle present lateral to bothridium.

Notogaster (Fig. 29). Notogaster broadest at level of setae *e2*. Upper edges appearing as lateral ridges in dorsal aspect, running immediately lateral to setae *cp*, *e2*, and *f2*; ridges merge posteriorly with pair of shallow lobes which delimit a somewhat concave posterior region. Pair of indistinct longitudinal medial ridges delimits more convex central region of notogaster and connects posteriorly with internal edges of lobes. Notogaster with 16 pairs of similar setae, smooth, but with delicate transparent sheets of cerotegument, especially distinct and somewhat frayed on posterior notogastral setae (Figs. 35–38). Setal distribution as in *H. naskreckii*, except *cp* lie more posteriorly (nearly at level of *d2*). Setae of rows *ps* and *h* not inserted on tubercles. Opisthosomal gland opening (*gla*) posterior to seta *f2*. Five pairs of lyrifissures (*ia*, *im*, *ip*, *ih*, *ips*) in normal positions for genus.

Ventral region (Fig. 30): Coxisternal pairs fully fused medially. Coxisternal setation 4-2-3-2; setae short and thick. Genital setae all near medial margin, setation variable between 7–10. Two pairs of aggenital setae inserted on medial edge of aggenital plate. Preanal plate typical of genus. Anal and adanal plates bearing 2 and 3 pairs of similar setae, respectively.

Gnathosoma: not studied in detail.

Legs: Tarsi tridactylous. Claws as in *H. naskreckii*. Setae inserted on small tubercles. Setation not studied in detail. Solenidial formulae: I: 1-2-2, II: 1-1-2, III: 1-1-0, IV: 1-1-0.

MATERIAL EXAMINED: The holotype and 1 paratype (adult) were collected from the same site as *H. naskreckii*. They are deposited in the Field Museum, Chicago, USA.

REMARKS: This species is morphologically similar to *H. naskreckii* sp. nov. and *H. pulcher* Hammer, from which it differs by the shape of setae *h2* and the body shape.

ETYMOLOGY: The specific epithet is from Latin, meaning slim or slender, and refers to the elongate shape of the body.

Holonothrus novaecaledoniae sp. nov.

Adult. Body length: 740 μm; maximum body width: 320 μm. Colour brown. Cuticle porose, especially distinct on prodorsum. Body covered by clear, transparent cerotegument.

Prodorsum (Fig. 39). Prodorsum elongated, distinctly longer than 1/3 of body length. Tip of rostrum rounded. Rostral setae (*ro*) not situated on apophyses; thin, smooth and curved. Lamellar setae (*le*) curved, indistinctly serrated, on strong apophyses (Fig. 41); the latter distinctly shorter than distance between their tips. Tips of apophyses not reaching rostrum. Interlamellar setae (*in*) on short apophyses, smooth, bent medially (Fig. 42). Their tips not reaching lamellar apophyses. Sensillus (Fig. 44) completely contained within bothridium. Two pairs of longitudinal ridges present in dorsal aspect; one runs anteromedial from near bothridium, reaches lamellar apophyses and bears setae *in*, the other runs posteromedial from bothridium.

Notogaster (Fig. 39). Notogaster broadest at level of setae *e2*, then tapered posteriorly to distinctly convex posterior margin. Upper edges appearing as lateral ridges in dorsal aspect, running lateral to setae *cp*, *e2*, and *f2*; ridges merge posteriorly with pair of

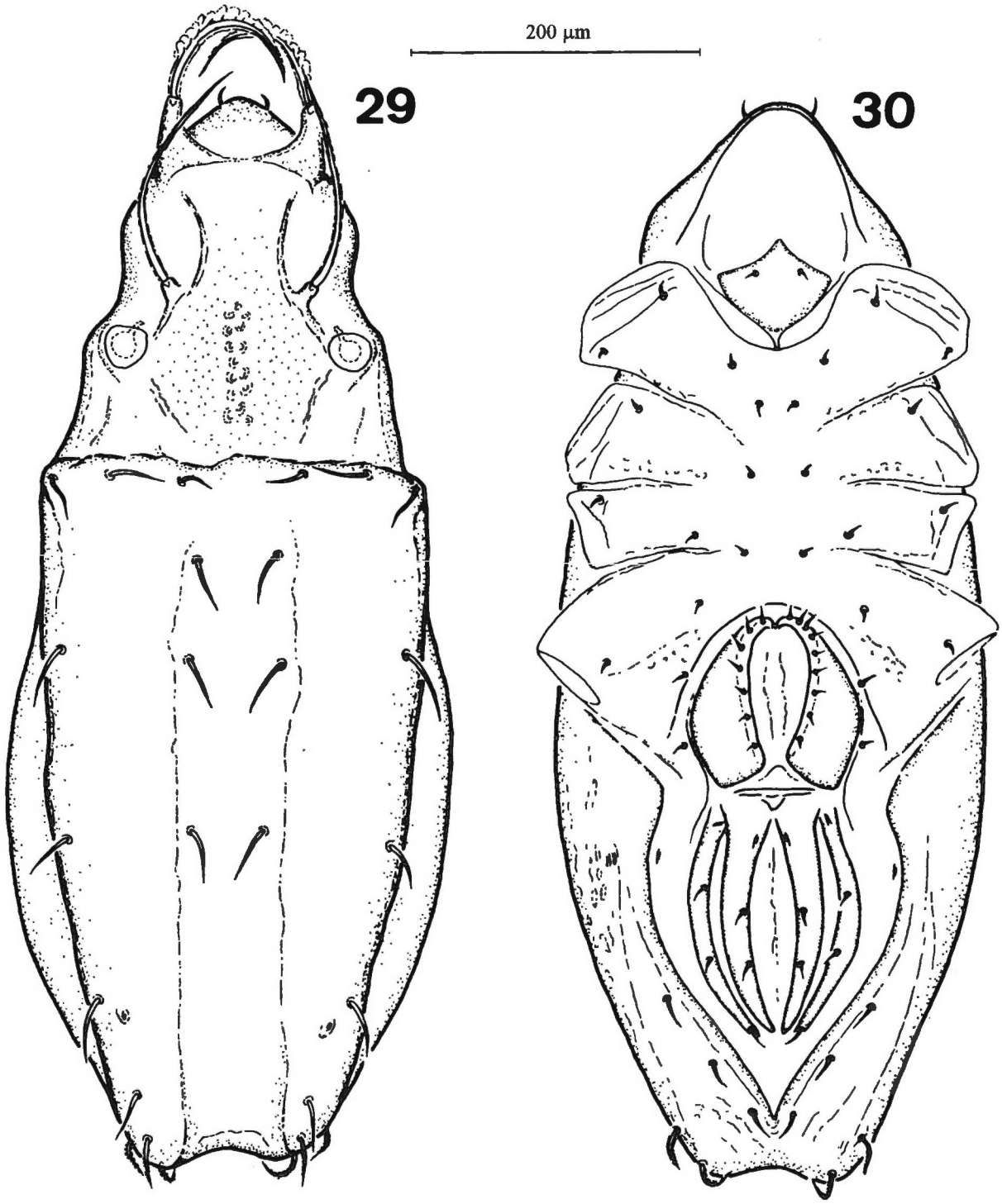

FIG. 29–30: *Holonothrus gracilis* sp. nov., adult holotype, dorsal view (29) and ventral view (30).

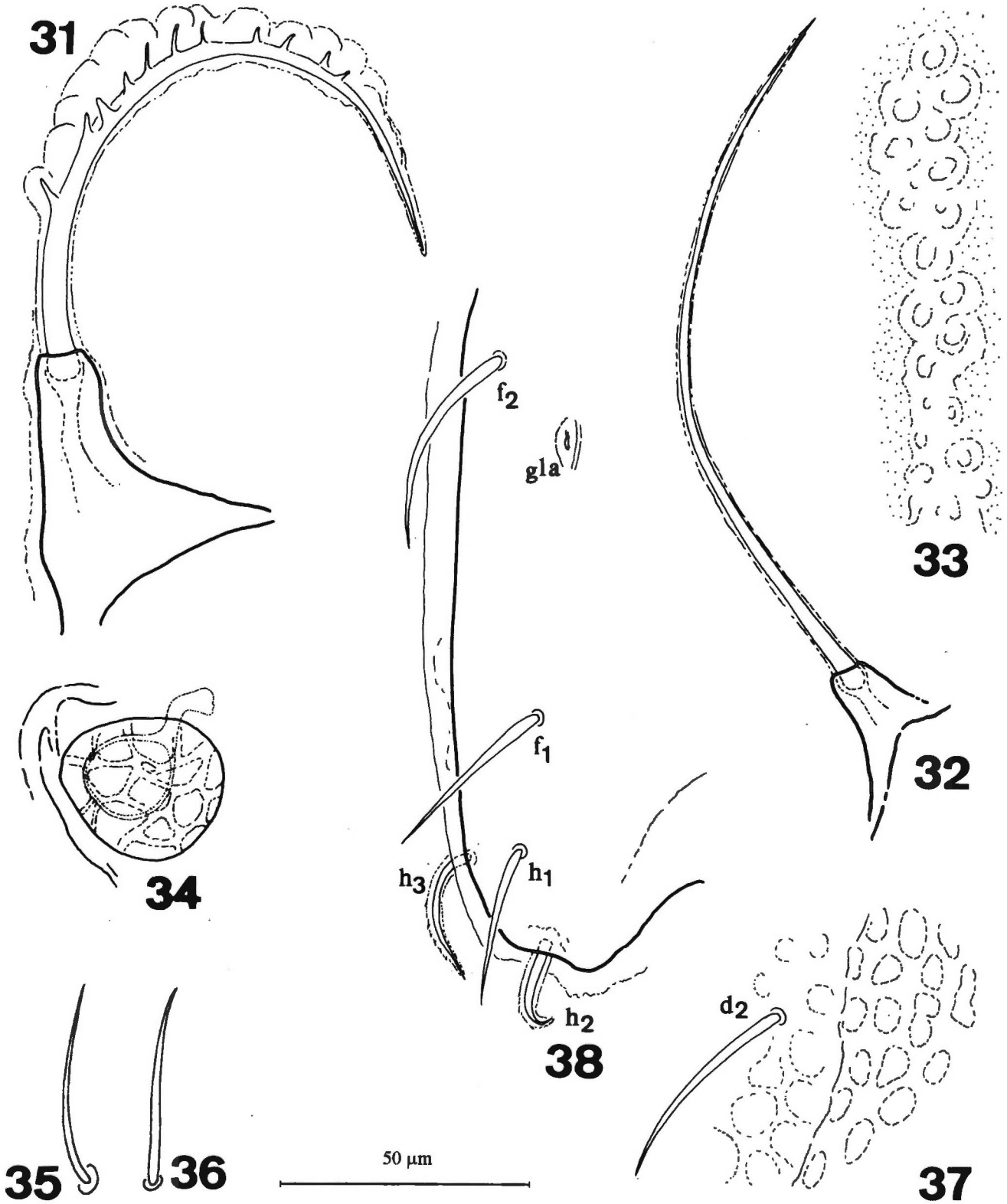

FIG. 31–38: *Holonothrus gracilis* sp. nov., adult holotype.

31. — Lamellar seta. 32. — Interlamellar seta. 33. — Muscle sigillae in the center of prodorsum. 34. — Bothridium and sensillus. 35. — Seta *c2*. 36. — Seta *d1*. 37. — Detailed sculpture on notogaster. 38. — Left caudal (posterior) region of notogaster.

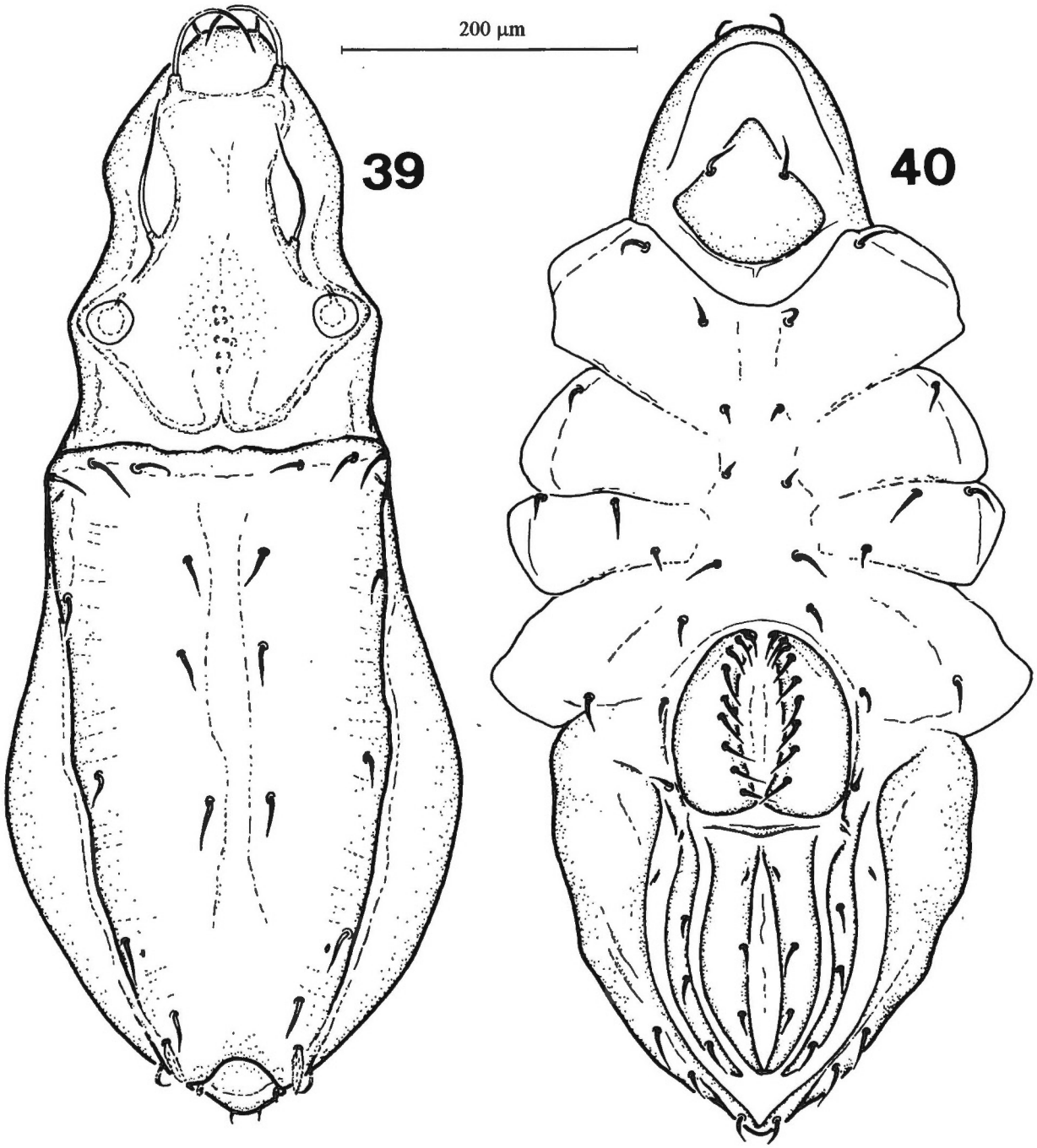

FIG. 39–40: *Holonothrus novaecaledoniae* sp. nov., adult holotype, dorsal view (39) and ventral view (40).

shallow lobes. Pair of indistinct longitudinal, medial ridges delimits central region of notogaster. Notogaster with 16 pairs of setae. Three pairs of setae (row *c*) on anterior border, distance *c1–c2* slightly shorter than *c2–c3*; 3 pairs (*d1*, *d2*, and *e1*) in central part of notogaster, lateral to medial ridges, 7 pairs (*cp*, *e2*, *f1*, *f2*, *h1*, *h2*, and *h3*) along lateral ridges and on posterior lobes, and 3 pairs (row *ps*) in ventral position. Setae of *h* row surrounded by barbed transparent sheaths (Figs. 45, 46) especially distinct on setae *h1*. Setae of rows *ps* and *h* not inserted on tubercles. Opisthosomal gland opening (*gla*) posterior to seta

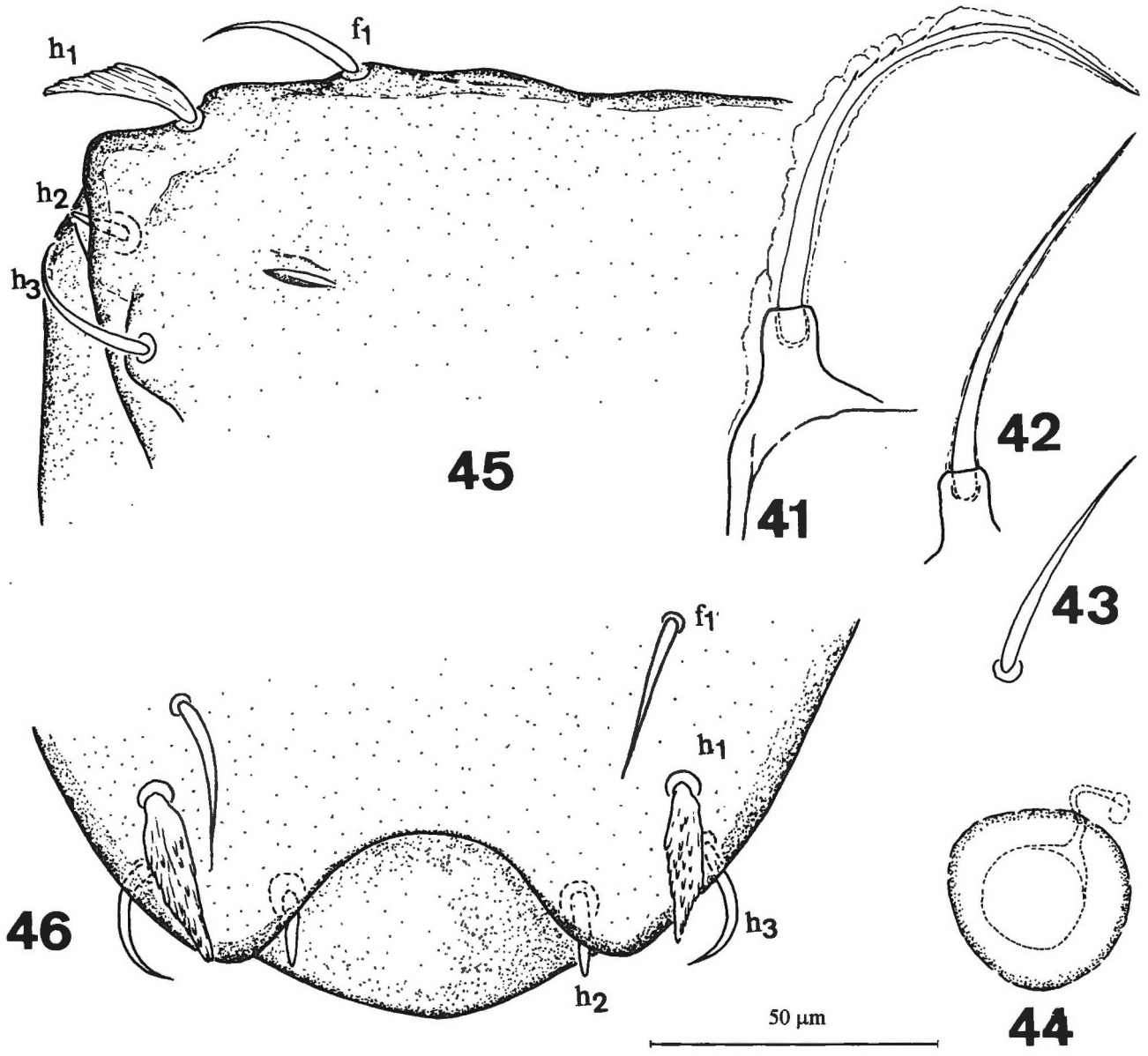

FIG. 41–46: *Holonothrus novaecaledoniae* sp. nov., adult holotype.

41. — Lamellar seta. 42. — Interlamellar seta. 43. — Seta *c1*. 44. — Bothridium and sensillus. 45. — Left caudal (posterior) region of notogaster, lateral view. 46. — *Idem*, dorsal view.

f2. Five pairs of lyrifissures (*ia*, *im*, *ip*, *ih*, *ips*) in normal positions for genus.

Ventral region (Fig. 40). Coxisternal pairs fully fused medially. Coxisternal setation 3-2-3-3; setae curved, as long as genital ones. Nine pairs of genital setae, all near medial margin of genital plates. Two pairs of aggenital setae inserted on medial edge of aggenital plate. Preanal plate typical of genus. Anal and adanal plates bearing 2 and 3 pairs of similar setae, respectively.

Gnathosoma: not studied in detail.

Legs. Tarsi tridactylous. Claws as in *H. naskreckii*. Setae inserted on small tubercles. Setation not studied in detail. Solenidial formulae: I: 1-2-2, II: 1-1-2, III: 1-1-0, IV: 1-1-0.

MATERIAL EXAMINED: One adult specimen (the

Feature	Type specimens (after HAMMER, 1966)	Specimens studied in present work
Body length	about 550 μm	790–930 μm
Length of lamellar apophyses	apophyses a little longer than distance between their tips	apophyses shorter than distance between their tips
Arrangement of medial notogastral setae	distance *d1–d2* twice shorter than *d2–e1*	distance *d1–d2* less than twice shorter than *d2–e1*
Position of setae *h3*	setae visible only in ventral view	setae visible in both ventral and dorsal views
Longitudinal rows in central part of notogaster	absent	present

TABLE 1.: Differences in some characters of *Holonothrus pulcher* Hammer between type specimens and specimens studied here.

holotype) was collected from New Caledonia: MP-4, Mt. Painé, wet and dry moss from bark, 7–9.10.1977, J. BALOGH col. The holotype is deposited in the Zoology Department of the Hungarian National Museum, Budapest, Hungary.

REMARKS: This species is morphologically similar to *H. pulcher* Hammer, from which it differs by the distribution and the shape of the setae of the *h* row, proportion of the length of prodorsum: notogaster and the length of the body.

ETYMOLOGY: The specific epithet refers to the island containing the type locality of this species.

Holonothrus pulcher Hammer, 1966

Adult (Figs. 47–61). The specimens studied by me differed in some features from the type specimens described and illustrated by HAMMER (Table 1). It seems, however, that these differences can be recognized as the effect of individual variability.

Leg setation (including famulus) of specimen from Punaiki: I: 1-11-5-6-29, II: 1-11-5-(5-6)-26, III: 5-(8-9)-4-5-26, IV: 1-6-4-5-26; solenidial formulae: I: 1-2-2, II: 1-1-2, III: 1-1-0, IV: 1-1-0.

Tritonymph. Body length: 860 μm; width: 370 μm. Colour light brown.

Prodorsum (Fig. 62). Features similar to those of adult; interlamellar setae and their apophyses very short. Sensillus and bothridium as in adult.

Hysterosoma (Fig. 62). Hysterosoma strongly bilobed posteriorly, lobes bearing setae *f1* and *h* row. Six pairs of porose plates dorsally, setae *c1* and *c2* together on one, four others bearing setae *c3*, *cp*, *e2*, *f2*, respectively, the last one on lobes, bearing both setae *f1* and *h1*. Setae *d1*, *d2*, and *e1* not on plates, inserted on small tubercles. Setae *h1* with indistinct sheath of cerotegument. Setae *h2* both broken from specimen (probably different in shape and length from other notogastral setae). Except for plates, cuticle irregularly striate.

Ventral region (Fig. 65). With 6 pairs of genital and full adult complement of aggenital, adanal and anal setae.

Legs: monodactylous, not studied in detail.

MATERIAL EXAMINED: New Zealand: BR, Punakaiki, Dec. 28, 1983, L. MASNER, s.s. (4 adults); ND, Waipoua Kauri Forest, Dec. 11 & 12, 1983, L. MASNER, s.s. (2 adults); MC, Arthur's Pass, 900 m, Dec. 31, 1983, L. MASNER, s.s (3 adults); MC, Banks Peninsula, Prices Valley, Dec., 26, 1983, L. MASNER, s.s. (1 adult and 1 tritonymph). Material is deposited in the Canadian National Collections of Insects, Arachnids and Nematodes, Centre for Land and Biological Resources Research, Ottawa, Canada.

Holonothrus mitis Olszanowski, 1991

Australia: NSW, New England N.P., 1300–1500 m, Feb. 13, 1984, L. MASNER, s.s. (1 adult). Material is deposited in the Canadian National Collections of Insects, Arachnids and Nematodes, Centre for Land and Biological Resources Research, Ottawa, Canada.

Holonothrus robustus Olszanowski, 1991

Australia: NSW, Monga State Forest, 1984, Lush ferns in *Eucalyptus* forest (1 adult); NSW, New England N.P., 1600 m, Feb. 12, 1984, *Nothofagus moorei* forest, ferns, L. MASNER, s.s. (8 adults). Mate-

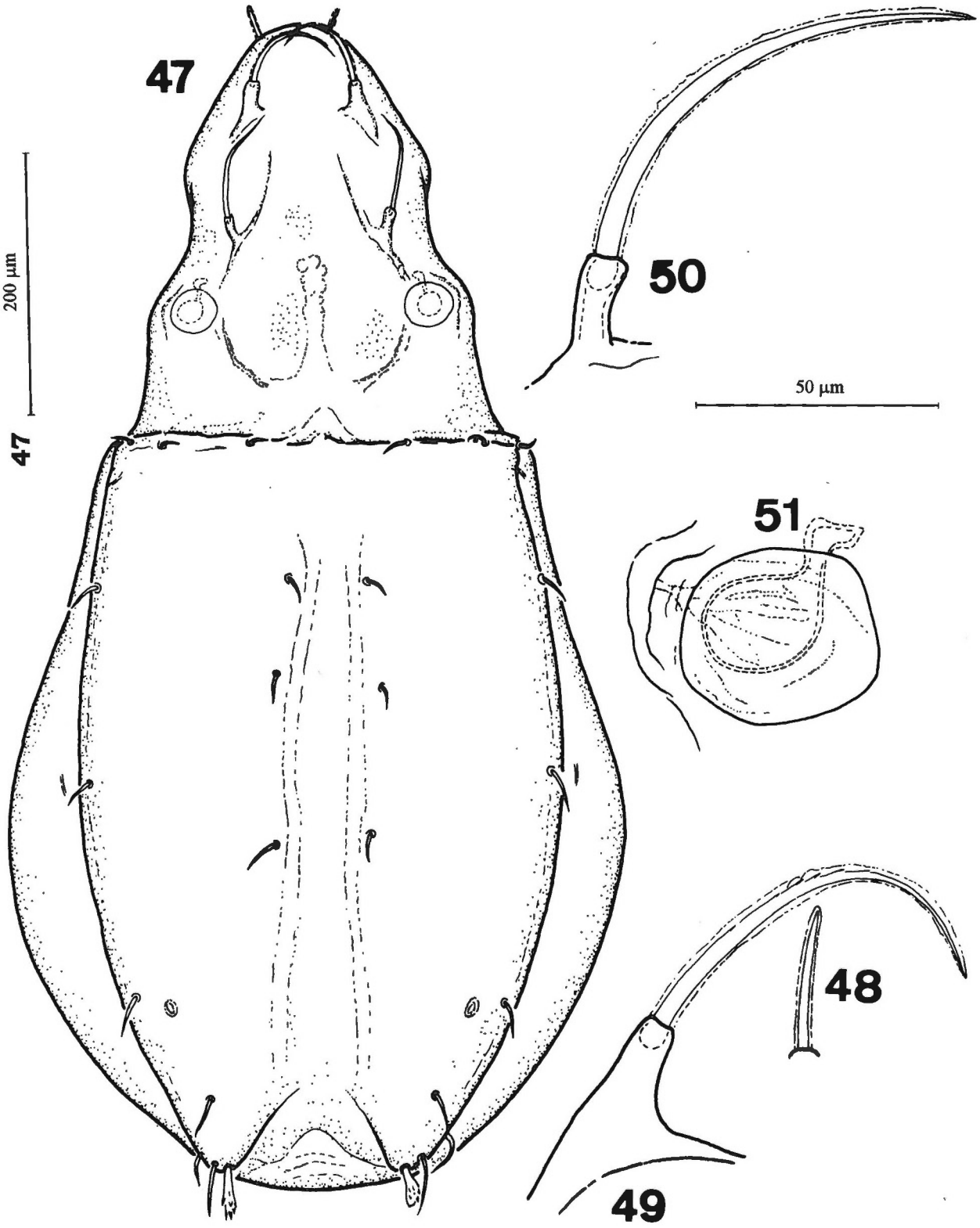

FIG. 47–51: *Holonothrus pulcher* Hammer, adult from Punakaiki.
47. — Dorsal view. 48. — Rostral seta. 49. — Lamellar seta. 50. — Interlamellar seta. 51. — Bothridium and sensillus.

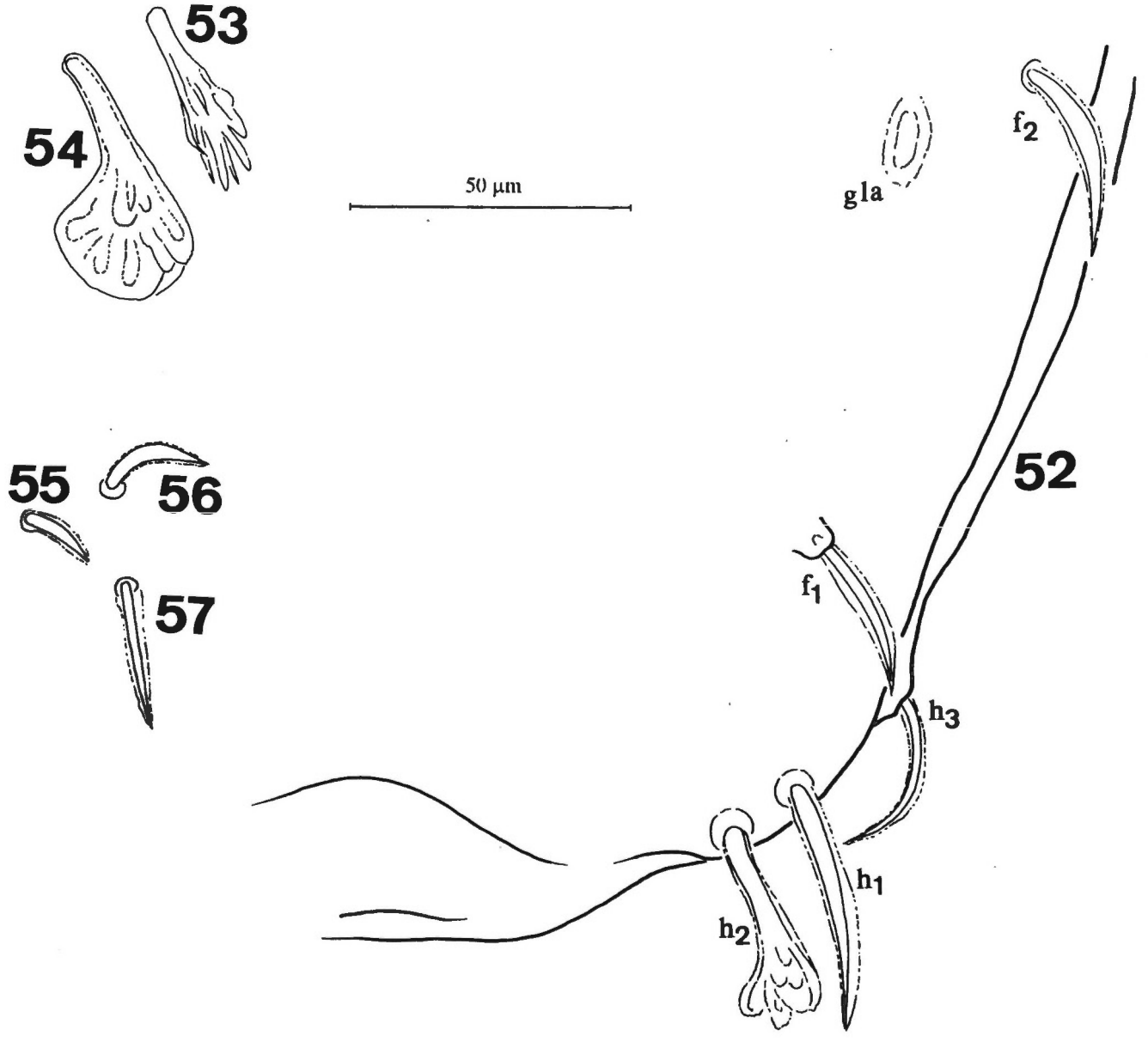

FIG. 52–57: *Holonothrus pulcher* Hammer, adults from Punakaiki

52. — Right caudal (posterior) region of notogaster, dorsal view. 53, 54. — Setae *h2* in two different specimens. 55. — Seta *c1*. 56. — Seta *c2*. 57. — Seta *d2*.

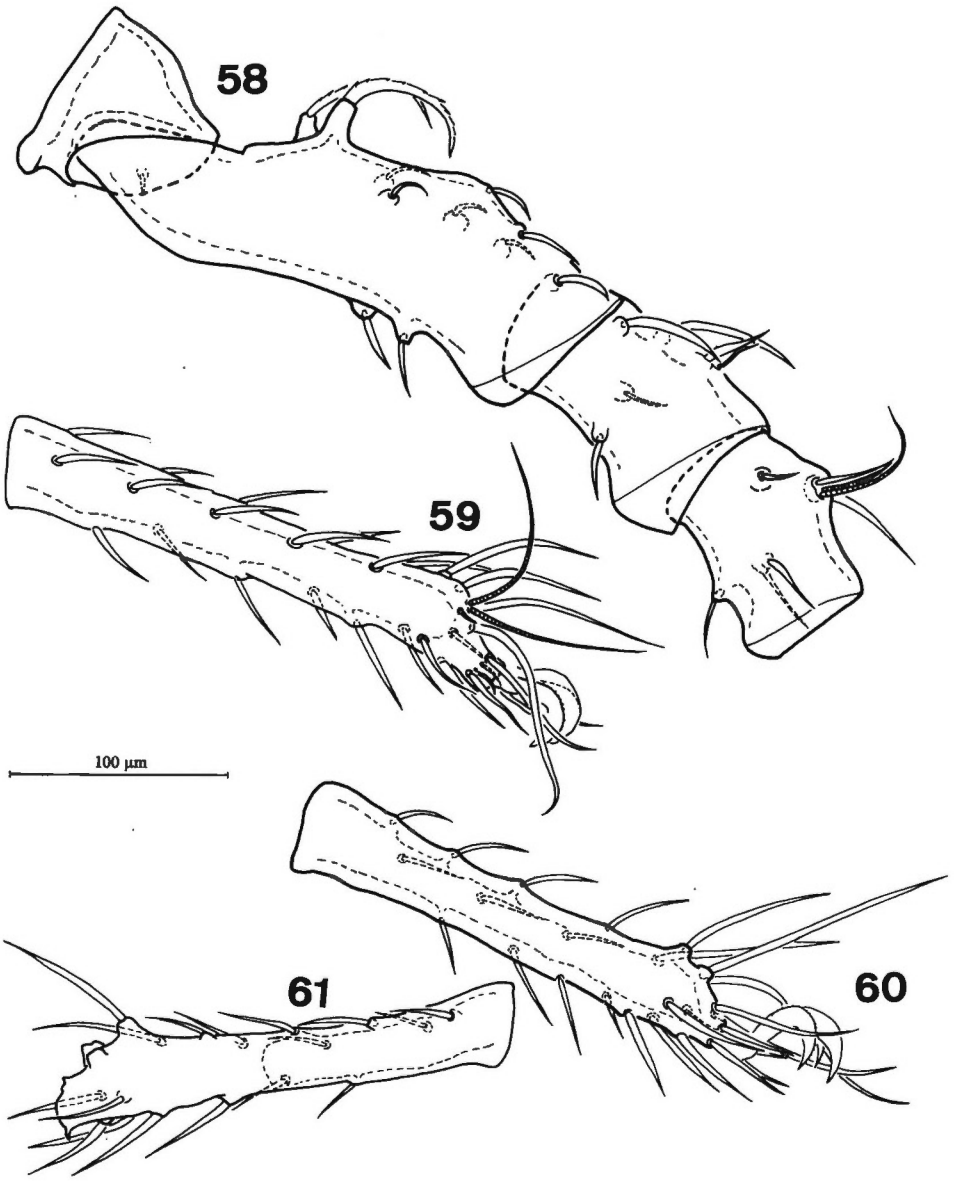

FIG. 58–61: *Holonothrus pulcher* Hammer, adult from Punakaiki.

58. — Leg I, trochanter to tibia, antiaxial view. 59. — Tarsus of leg I, antiaxial view. 60. — Tarsus of leg III, antiaxial view. 61. — Tarsus (deformed) of leg III, antiaxial view.

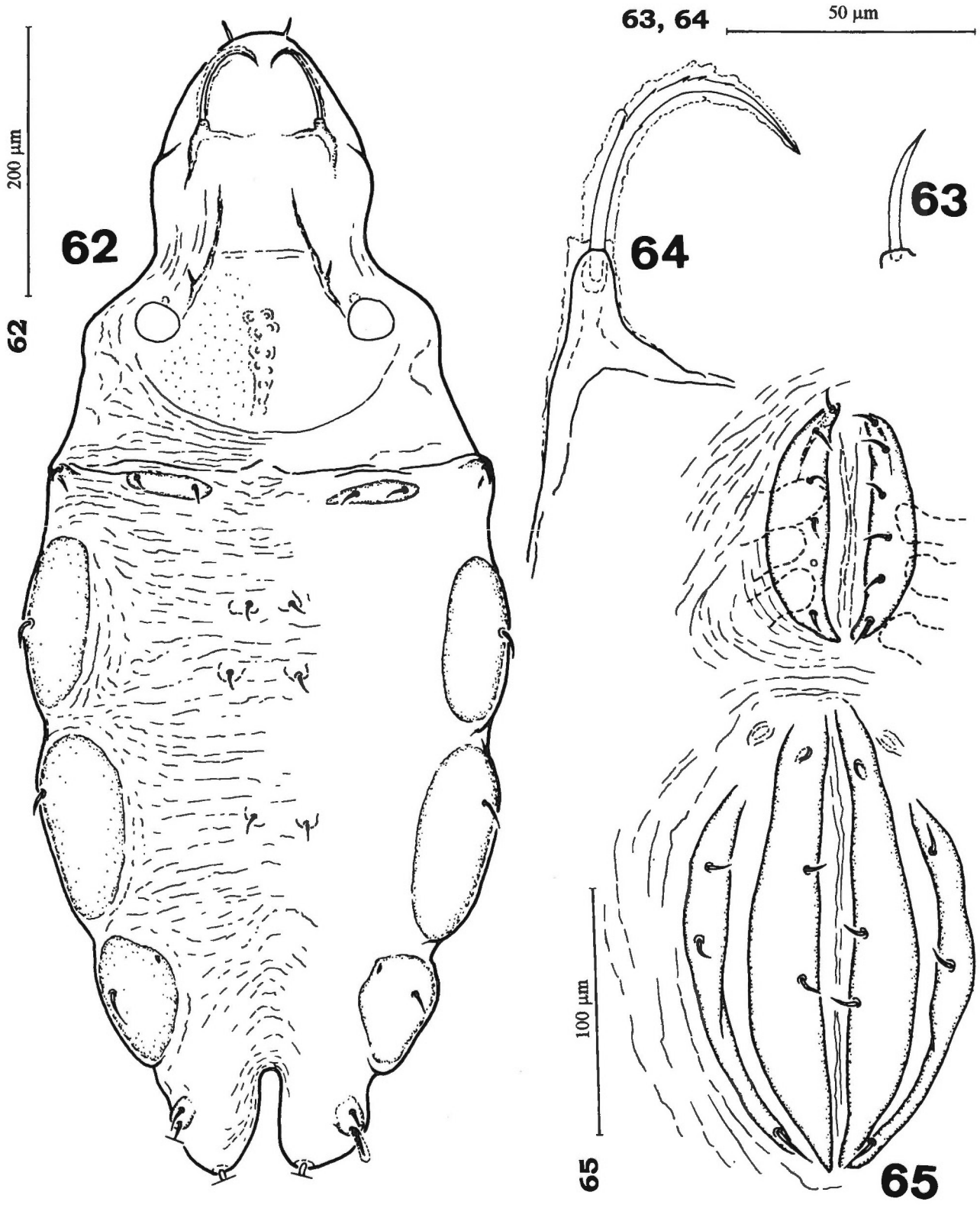

FIG. 62–65: *Holonothrus pulcher* Hammer, tritonymph from Banks Peninsula.
62. — Dorsal view. 63. — Rostral seta. 64. — Lamellar seta. 65. — Genito-anal region, ventral view.

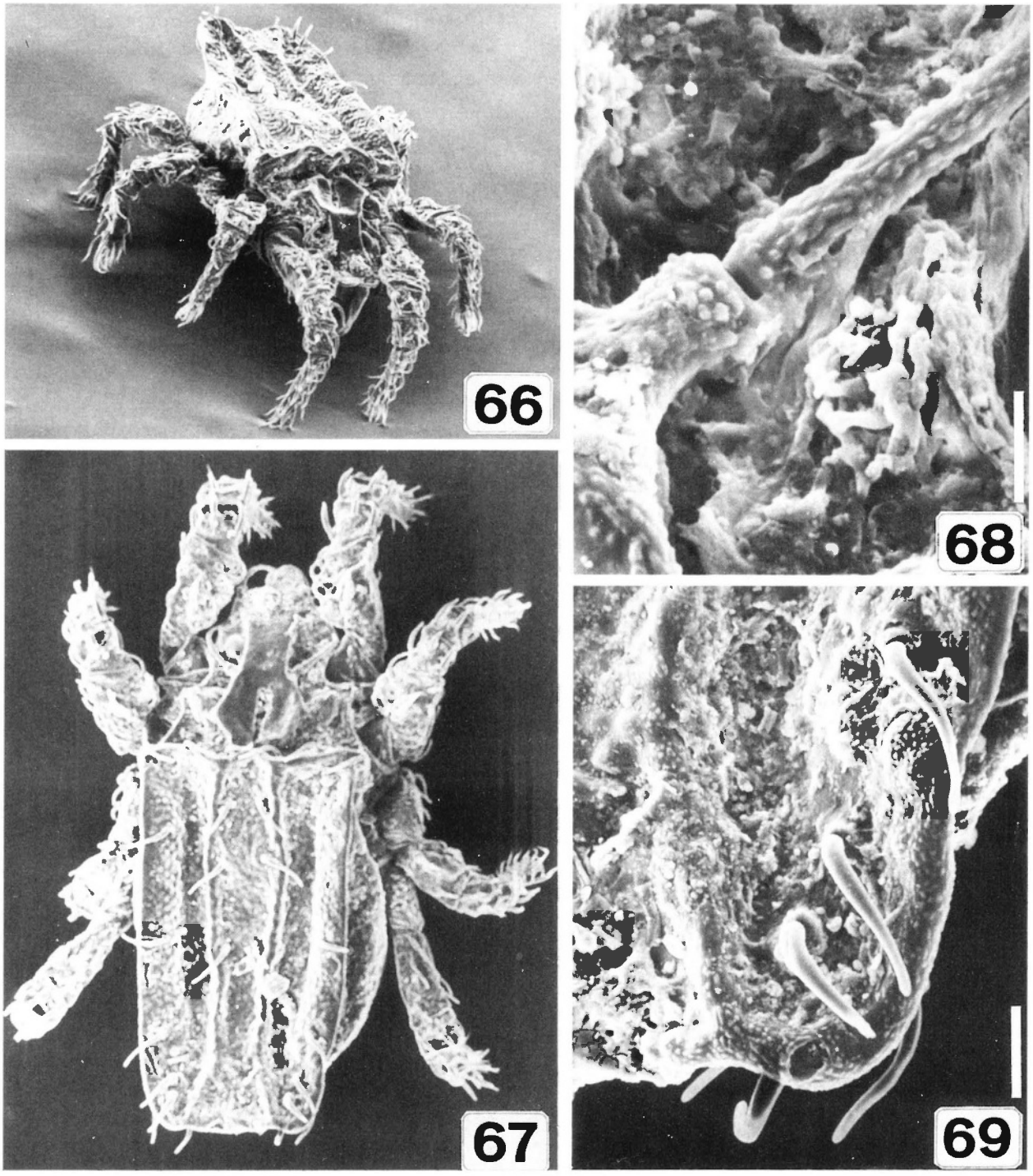

FIG. 66–69: *Holonothrus naskreckii* sp. nov., adult paratype.

66. — Frontal view, scale bar = 100 μm. 67. — Dorsal view, scale bar = 200 μm. 68. — Apophyse and base of interlamellar seta, dorsal view, scale bar = 5 μm. 69. — Right caudal (posterior) region of notogaster, dorsal view, scale bar = 10 μm.

rial is deposited in the Canadian National Collections of Insects, Arachnids and Nematodes, Centre for Land and Biological Resources Research, Ottawa, Canada.

KEY TO ADULTS OF AUSTRALIAN REGION SPECIES OF *HOLONOTHRUS*

1 Interlamellar setae longer than the distance between their bases 2
– Interlamellar setae distinctly shorter than the distance between their bases 6
2(1) Notogastral setae foliate and barbed..... ..... *H. foliatus* Wallwork
– Notogastral setae smooth, sometimes surrounded by transparent sheaths..... 3
3(2) Notogastral setae surrounded by distinct, transparent sheaths (Fig. 1, 8, 9, 16) .... ***H. naskreckii*** sp. nov.
– Notogastral setae without distinct sheaths.. 4
4(3) Setae *h1* and/or *h2* similar in shape to other notogastral setae (Fig. 29, 38) .... ***H. gracilis*** sp. nov.
– Setae *h1* and/or *h2* differ in shape from other notogastral setae..... 5
5(4) Setae *h2* small, smooth; setae *h1* with tubercles (Fig. 39, 46) ..... ***H. novaecaledoniae*** sp. nov.
– Setae *h2* large, with tubercles; setae *h1* smooth (Fig. 47, 52)..... *H. pulcher* Hammer
6(1) Setae *h1* and *h2* ciliate, similar to other notogastral setae ..... *H. mitis* Olszanowski
– Setae *h1* and/or *h2* foliate, differ in shape from other notogastral setae..... 7
7(6) Both *h1* and *h2* setae foliate, differ in shape from other notogastral setae .... *H. robustus* Olszanowski
– Setae *h2* foliate, *h1* smooth, similar in shape from other notogastral setae..... ..... *H. concavus* Wallwork

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REFERENCES

HAMMER (M.), 1966. — Investigations on the oribatid fauna of New Zealand. Part I. — Biol. Skr., Danske Vidensk. Selsk., **15** (2): 1-108.

NORTON (R. A.) & OLSZANOWSKI (Z.), 1989. — A new *Holonothrus* (Oribatida: Crotoniidae) from Zaïre, with notes on the distribution of crotoniid mites. — J. Afr. Zool., **103**: 405-412.

OLSZANOWSKI (Z.), 1991. — New mites of *Holonothrus* from Tasmania (Oribatida: Crotoniidae). — Genus, **2** (4): 337-348.

WALLWORK (J. A.), 1963. — The Oribatei (Acari) of Macquarie Island. — Pacific Insects, **5** (4): 721-769.