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The Marine Fauna of New Zealand: Deep-Sea Isopoda Asellota, Family Haploniscidae

by

R.J. LINCOLN

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R.J. LINCOLN

Department of Zoology,
British Museum (Natural History),
Cromwell Road, London SW7 5BD
England

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The Marine Fauna of New Zealand: Deep-Sea Isopoda Asellota, Family Haploniscidae

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R.J. Lincoln

Department of Zoology,
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Cromwell Road, London SW7 5BD
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ABSTRACT

Collections of deep-sea asellotes were made off the New Zealand east coast and from the Tasman Sea during two cruises of the New Zealand Oceanographic Institute's research vessel "Tangaroa". This first paper deals exclusively with the family Haploniscidae. An account of basic haploniscid morphology is given and two new genera — *Chauliodoniscus* and *Mastigoniscus* — and eight new species — *Haploniscus miccus, H. piestus, H. saphos, H. silus, H. tangaroae, Chauliodoniscus tasmanaeus, Mastigoniscus pistus*, and *Hydroniscus lobocephalus* — are described for the New Zealand area. The taxonomy of the family is revised, and a list of all 82 known species and 7 genera, together with geographical and depth distributions, is given. Keys are provided at all levels.

Keywords: Isopoda, Asellota, Haploniscidae, taxonomy, morphology, deep-sea, New Zealand.

INTRODUCTION

This is the first in a proposed series of papers on the benthic deep-sea asellote fauna of New Zealand based on collections made by the author during two cruises, in October/November 1979 and April 1980, onboard the New Zealand Oceanographic Institute's research vessel "Tangaroa". The first of these worked in an area off the east coast of the South Island, the second to the west in the Tasman Sea. Some additional material was also sorted from earlier collections held in the Institute's museum, taken mostly by Menzies trawl from off the east and west coasts of the North Island.

Deep-sea asellotes have not previously been studied in detail from high latitudes of the southern Pacific Ocean. The only other published works from this area stem from the Galathea Expedition in 1950–52 that collected asellotes from about a dozen stations in the Tasman Sea, off the New Zealand east coast, and in

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the Kermadec Trench (Wolff 1962), and a few stations to the east reported by Birstein (1968). The only additional study of deep-sea asellotes from the entire southern Pacific is that of Menzies and George (1972) on the fauna of the Peru-Chile Trench, surveyed during the Anton Bruun Southeast Pacific Expedition, 1965–66.

Preliminary sorting and analysis of the asellote fauna from the New Zealand region has shown that all major deep-sea families and most of the well-known genera are represented. The collections contain in the vicinity of 100 species, the large majority of which will be new to science. This first paper deals exclusively with the Haploniscidae, a well circumscribed family of small ambulatory asellotes that bear a striking superficial resemblance to terrestrial oniscoideans (woodlice), including an ability in some species to roll into a ball (conglobate). Haploniscids were given priority of treatment because they form a highly speciose cosmopolitan group, and one that has not so far been subjected to a modern taxonomic revision as has been the case for several other families over the past decade, for example, the Desmosomatidae (Hessler 1970), Nannoniscidae (Siebenaller and Hessler 1981), Ilyarachnidae (Thistle and Hessler 1976, 1977; Thistle 1980), Eurycopidae (Haugsness and Hessler 1979; Wilson and Hessler 1981), Mesosignidae (Menzies and Frankenberg 1968), Haplomunnidae (Wilson 1976), and Dendrotionidae (Lincoln and Boxshall 1983a).

The descriptive part of this paper is divided into two sections, the first an examination of basic haploniscid morphology, the second a taxonomic study of the New Zealand fauna itself. The initial part has been necessary to place haploniscid descriptive taxonomy on a more satisfactory foundation — to date, far too many species' accounts have stressed only certain aspects of body shape with scant information on appendages, chaetotaxy, and other characters that will be essential in any future discussion of such a potentially highly speciose group exhibiting subtly different morphotypes. Few previously described species can be adequately compared and contrasted with new forms over a wide range of characters.

Two new genera have been established, *Chauliodoniscus* and *Mastigoniscus*, and eight new species described, *Haploniscus miccus, H. piestus, H. saphos, H. silus, H. tangaroae, Chauliodoniscus tasmanaeus, Mastigoniscus pistus*, and *Hydroniscus lobocephalus*. Several previously described species have been realigned in the new genera.

ACKNOWLEDGMENTS

I wish to thank Dr Des Hurley, Director of NZOI, for organising my visit to the Institute, for planning and programming the two deep-sea cruises, and for his kind hospitality throughout my 12-month stay in Wellington. Thanks must also go to the workshop staff who constructed the epibenthic sledge, to Bill Main and Don McKnight the cruise leaders, and to fellow scientists onboard "Tangaroa" who struggled gallantly, and successfully, to tame and restrain the heavy and cumbersome collecting gear.

LIST OF STATIONS

New Zealand Oceanographic Institute

E416 (13 October 1965) 45°21′S, 171°57′E. Isopod dredge. Depth 1225 m.
Haploniscus tangaroae sp. nov.

E709 (21 March 1967) 40°28′S, 177°43′E. Menzies trawl. Depth 1778–1789 m.
Haploniscus tangaroae sp. nov.

F744 (3 April 1966) 41°10′S, 176°58′E. Menzies trawl. Depth 1609 m.
Haploniscus tangaroae sp. nov.

F869 (2 October 1968) 37°24′S, 179°15′E. Menzies trawl. Depth 1368–1397 m.
Haploniscus piestus sp. nov.

F879 (4 October 1968) 37°25.5′S, 177°30′E. Menzies trawl. Depth 1174–1196 m.
Haploniscus tangaroae sp. nov.

F892 (5 October 1968) 36°58.5′S, 176°41′E. Menzies trawl. Depth 1138–1163 m.
Haploniscus piestus sp. nov.

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F910 (10 October 1968) 34°56′S, 175°23′E. Menzies trawl. Depth 1459–1470 m.
Haploniscus tangaroae sp. nov.

P933 (20 April 1980) 41°39.7′S, 165°13.1′E. Menzies trawl. Depth 4419–4421 m.
Haploniscus silus sp. nov.
H. piestus sp. nov.

P934 (20 April 1980) 41°39.1′S, 165°13.6′E. Epibenthic sledge. Depth 4405–4441 m.
Haploniscus silus sp. nov.

P935 (20 April 1980) 41°37.0′S, 165°11.0′E. Menzies trawl. Depth 4439–4441 m.
Haploniscus silus sp. nov.
Chauliodoniscus tasmanaeus gen. et sp. nov.

P937 (21 April 1980) 41°19.2′S, 166°27.9′E. Epibenthic sledge. Depth 3253–3347 m.
Haploniscus tangaroae sp. nov.
H. silus sp. nov.
Chauliodoniscus tasmanaeus gen. et sp. nov.
Hydroniscus lobocephalus sp. nov.

P939 (22 April 1980) 41°20.4′S, 166°54.8′E. Epibenthic sledge. Depth 1760–1799 m.
Haploniscus piestus sp. nov.
H. saphos sp. nov.

P940 (23 April 1980) 41°22.7′S, 166°44.4′E. Epibenthic sledge. Depth 2092–2154 m.
Haploniscus silus sp. nov.

P941 (23 April 1980) 41°15.2′S, 167°07.2′E. Epibenthic sledge. Depth 1457–1463 m.
Haploniscus silus sp. nov.
H. piestus sp. nov.

P969 (15 June 1980) 37°05.5′S, 178°20.9′E. Epibenthic sledge. Depth 2250–2262 m.
Haploniscus tangaroae sp. nov.

P971 (18 June 1980) 41°11.9′S, 177°19.6′E. Epibenthic sledge. Depth 2200–2328 m.
Haploniscus tangaroae sp. nov.

S147 (25 October 1979) 44°30.1′S, 174°18.8′E. Agassiz trawl. Depth 760 m.
Haploniscus miccus sp. nov.

S151 (26 October 1979) 45°45.8′S, 174°30.5′E. Epibenthic sledge. Depth 1586 m.
Haploniscus tangaroae sp. nov.

S153 (27 October 1979) 45°21.1′S, 173°35.8′E. Epibenthic sledge. Depth 1386 m.
Haploniscus tangaroae sp. nov.
H. miccus sp. nov.

S154 (27 October 1979) 45°24.2′S, 173°59.8′E. Epibenthic sledge. Depth 1373 m.
Haploniscus tangaroae sp. nov.

S202 (2 November 1979) 42°14.7–42°16.6′S, 175°08.6–175°10.6′E. Epibenthic sledge. Depth 2476–2542 m.
Mastigoniscus pistus gen. et sp. nov.

HISTORICAL ACCOUNT

The genus *Haploniscus* was designated by Richardson (1908) for *bicuspis* Sars, 1877 (as *Nannoniscus*) from the arctic Atlantic and two new species, *H. excisus* and *H. retrospinus*, from the western North Atlantic Ocean. The first evidence of haploniscids in the Southern Hemisphere was provided by Vanhöffen (1914), who described *Haploniscus antarcticus* and *H. curvirostris* from high latitudes of the antarctic Indian Ocean. Hansen (1916) working on the Danish Ingolf-Expedition material from the boreal North Atlantic added two further species, *Haploniscus spinifer* and *H. armadilloides*, and introduced a new genus and species, *Hydroniscus abyssi*. He was the first to separate off the "Haploniscini" as a discrete group within the Asellota. Accounts followed of *Haploniscus dimeroceras* from off Cape Town (later transferred to a new genus *Antennuloniscus* by Menzies (1962)) and *H. unicornis* from the North Atlantic by Barnard (1920) and Menzies (1956) respectively, and Menzies and Tinker (1960) added *H. robinsoni* from the tropical Pacific Ocean off Equador. Thus, at the time of Menzies' Vema Expedition Report (1962) the Haploniscidae comprised just 11 species allocated to two genera.

Menzies (1962) contributed 20 new species to *Haploniscus* from various parts of the Atlantic Ocean (*H. acutus, H. capensis, H. elevatus, H. minutus, H. nondescriptus, H. ovalis, H. parallelus, H. percavix, H. polaris, H. princeps, H. quadrifrons, H. rugosus, H. spatulifrons, H. telus, H. tricornis, H. tricornoides, H. tridens, H. trituberculatus, H. tropicalis*, and *H. tuberculatus*). All were confined to the South Atlantic except *H. tropicalis* from the North Atlantic and *H. percavix* from both the North and South Atlantic. Menzies also added two species of *Hydroniscus, H. ornatus* and *H. quadrifrons*, from the South and North Atlantic respectively, and designated a new genus *Antennuloniscus* for *dimeroceras* Barnard (as *Haploniscus*) and three new South Atlantic species, *A. armatus, A. ornatus*, and *A. rostratus* (the latter later transferred to *Haploniscus* by Menzies and Schultz (1968)). In the same year as Menzies' Vema Report, Wolff (1962) published a major review of deep-sea

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asellote isopods in the scientific results of the circumglobal Danish Galathea Expedition 1950–52. In the Haploniscidae he described as new *Haploniscus helgei* from the Great Australian Bight, *H. kermadecensis* from the Kermadec Trench, *H. ingolfi* from the arctic Atlantic, and a subspecies of *H. bicuspis, H.b. tepidus*, from south-west of Iceland. Wolff also expressed the opinion that *Antennuloniscus* should be relegated to a junior synonym of *Haploniscus*, a move that was not destined to receive general acceptance.

Following the important works of Menzies and Wolff the family contained 39 species: 34 from the Atlantic Ocean, 3 from the Indian Ocean, and just 2 from the Pacific Ocean. In the decade following, work by Russian scientists established the widespread occurrence of haploniscids in the Pacific deep-sea (Birstein 1963a, b, 1968, 1971). In all, Birstein described 12 species of *Haploniscus*, two species of *Hydroniscus*, and a new genus and species *Abyssoniscus ovalis*. Of these, *Haploniscus belyaevi, H. gibbernasutus, H. hydroniscoides, H. inermis, H. intermedius, H. latus, H. menziesi*, and *H. profundicola, Hydroniscus minutus* and *H. vitjazi*, and *Abyssoniscus ovalis* were all taken from the north-west sector of the Pacific. Only four were southerly forms, *Haploniscus ultraabyssalis* from the Bougainville Trench, *H. laticephalus* and *H. similis* from an area well to the east of New Zealand, and *H. oviformis* from the antarctic mid-Pacific. During this period Menzies and Schultz (1968) substantiated the genus *Antennuloniscus* earlier synonymised by Wolff, adding two new species, *A. subellipticus* from off South Africa and *A. quadratus* from the Indian Ocean south of Madagascar. They also described a new genus and species from the Caribbean, *Aspidoniscus perplexus*. Birstein (1969) reported *Haploniscus pygmaeus* from the Romanche Trench in the tropical Atlantic. Further Pacific species were contributed by Menzies and George (1972) working on the Anton Bruun and other material collected in the area of the Peru-Chile Trench (*Haploniscus acutirostris, H. bruuni, H. concavus, H. generalis, H. gratissimus*, and *H. gratus*). Still more recently Chardy (1974, 1975) described seven species of *Haploniscus* (*H. charcoti, H. foresti, H. furcatus, H. monodi, H. myriamae, H. obtusifrons, H. reyssi*) as well as *Antennuloniscus dilatatus* and *Hydroniscus vandeli*, in this instance all from the eastern North Atlantic. Finally, to complete this semichronological history of the haploniscids, Kensley (1978) added *Haploniscus gernekei* from the Indian Ocean off South Africa, bringing the family total to 74 species and five genera.

In the context of the New Zealand fauna only *Haploniscus kermadecensis* Wolff, *H. laticephalus* Birstein, *H. similis* Birstein, and perhaps *H. helgei* Wolff were collected from stations sufficiently close to be worthy of immediate consideration. These species have been incorporated into the *Haploniscus* key although none of them was actually found in the present material.

MORPHOLOGY

The following section outlines the basic morphology of the Haploniscidae and details some of the structural novelty exhibited by members of the group. Important taxonomic characters are emphasised to help expand new species' descriptions. Earlier work too often presents a simplistic account of overall body form with scant information on the structure and chaetotaxy of the appendages.

Compared with many of the other deep-sea asellote families that offer a wide range of fascinating, at times bizarre, morphologies, the family Haploniscidae appears outwardly conservative, lacking obvious structural diversity. Examined more closely, however, the group encompasses many subtle variations of form, the most evident evolutionary innovations affecting the rostral configuration, pereonite architecture in relation to conglobation, fusion of the pleotelson and posterior pereonites, shape of the posterolateral pleotelsonic processes, and structure of male pleopods 1 and 2.

Body shape

The body is typically elongate-oval, dorsoventrally flattened, superficially resembling a terrestrial oniscoidean (woodlouse). Adult size is always small — the range of maximum recorded body length for *Haploniscus* is 0.9 mm (*H. minutus, H. pygmaeus*) to 8.9 mm (*H. helgei*), for *Hydroniscus* is 2.3 mm (*H. vandeli*) to 11.0 mm (*H. vitjazi*), for *Antennuloniscus* is 1.5 mm (*A. quadratus*) to 2.6 mm (*A. armatus*), for *Aspidoniscus* is 2.1 mm (*A. perplexus*), for *Abyssoniscus* is 2.9 mm (*A. ovalis*), for *Chauliodoniscus* is 1.3 mm (*C. reyssi*) to 2.6 mm (*C. trituberculatus*), and for *Mastigoniscus* is 1.9 mm (*M. generalis*) to 4.9 mm (*M. gratus*). Tagmosis of the body into cephalon, pereon, and pleotelson is often indistinct with the segments tending to fall within a generally smooth body outline, although some species of *Chauliodoniscus* have lateral processes produced as anteriorly directed extensions of the pereonite margins. In all specimens examined during the present study the body possessed a strongly

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mineralised cuticle giving a pearly-white coloration. The appendages are normally devoid of calcification, or at best weakly calcified, except for the operculate second pleopod of the female and the first and second pleopods of the male. On the ventral surface of the pleotelson the anal valves are conspicuously non-calcified. Mineralised cuticle is pearly-white, very brittle (at least in alcohol preserved material, especially propanol) and opaque to transmitted light, whilst non-mineralised cuticle is flexible and translucent.

As with their oniscoidean analogues, all haploniscids have some propensity for conglobation. In forms such as *Haploniscus helgei* and all *Hydroniscus* and *Chauliodoniscus* species the body can be fully enrolled, although the resulting ball tends to be eccentric rather than spherical because the body has a line of maximum articulation between pereonites 4 and 5 with less mobile segments fore and aft (*see*, for example, Fig. 16c, and Wolff 1962, pl.1G). This eccentricity is especially pronounced in *Hydroniscus* species because the posterior pereonal segments are solidly fused with the pleotelson into a single inflexible unit, and in *Chauliodoniscus* the front of the head closes on to the branchial chamber leaving the anal portion of the telson projecting.

Head

None of the known haploniscid species has eyes or any trace of ocular pigmentation. The head (cephalon) is typically semicircular in outline, smooth, and dorsally convex. Conspicuous tubercles are present in only two species, *Haploniscus tuberculatus* and *H. rugosus*. Some form of rostral process is evident in a little over half the species of the family. It may take the form of a small median tooth or knob (*Haploniscus antarcticus, H. bicuspis, H. bruuni, H. capensis, H. furcatus, H. intermedius, H. kermadecensis, H. laticephalus, H. miccus, H. oviformis, H. percavix, H. polaris, H. robinsoni, H. rugosus, H. saphos, H. silus, H. spinifer, H. tricornis, H. tridens, Abyssoniscus ovalis* and *Chauliodoniscus princeps*), a well-developed acute tooth (*Haploniscus acutirostris, H. belyaevi, H. gernekei, H. helgei, H. profundicola, H. rostratus, H. tricornoides, H. unicornis, Antennuloniscus armatus, A. dilatatus*, and *Aspidoniscus perplexus*), or a large blunt process (*Haploniscus charcoti, H. curvirostris, H. gibbernasutus, H. spatulifrons, H. tangaroae, Hydroniscus abyssi, H. lobocephalus, H. minutus, H. ornatus, H. quadrifrons*, and *H. vitjazi*). When devoid of a rostrum the anterior margin of the cephalon may be convex (*Haploniscus ingolfi, H. obtusifrons, H. spinifer, H. tuberculatus, Antennuloniscus ornatus, A. subellipticus, Mastigoniscus pistus, Chauliodoniscus parallelus*, and *C. reyssi*), concave (*Haploniscus excisus, H. foresti, H. hydroniscoides, H. inermis, H. minutus, H. similis, H. telus, H. tropicalis, H. ultraabyssalis, Mastigoniscus concavus, M. gratissimus, M. gratus, M. latus, Chauliodoniscus tasmanaeus*, and *C. trituberculatus*), or straight to weakly sinuous (*Haploniscus acutus, H. menziesi, H. monodi, H. myriamae, H. nondescriptus, Antennuloniscus dimeroceras, A. quadratus, Chauliodoniscus armadilloides, C. elevatus, C. ovalis, C. quadrifrons*, and *Mastigoniscus generalis*). The configuration of the rostrum, or anterior cephalic margin, is an easily observed character useful in identification keys. During conglobation in *Hydroniscus* the large rostral process fits neatly into the space between the pleotelsonic processes effecting intimate closure of the ball.

Pereon

The pereon comprises seven segments and is normally convex dorsally, but may be somewhat flattened by lateral splaying of the tergal plates (epimera), or subcylindrical by lateral compression. From one to three of the posterior pereonites are frequently fused or partly fused with the pleotelson. Coxal plates are absent. The fusion or otherwise of the posterior pereonites has at times been used as a taxonomic character but must be treated with caution since the presence or absence of a suture-line can be a very subjective matter, dependent, for example, on the type of microscope illumination used or the nature of the preparation. Often a suture-line is evident in a decalcified specimen that was not apparent before treatment.

Seven free pereonites have been figured for only 16 species (*Haploniscus acutirostris, H. antarcticus, H. curvirostris, H. excisus, H. furcatus, H. miccus, H. piestus, H. saphos, H. silus, H. tangaroae, Antennuloniscus armatus, A. dimeroceras, A. ornatus, A. subellipticus, Chauliodoniscus quadrifrons* and *C. tasmanaeus*) although the posterior two or three segmental junctions are weakly delineated compared with the more anterior ones. Most often pereonite 7 is shown medially fused with the pleotelson leaving only the lateral margins free. In others, pereonites 6 and 7 or 5–7 are similarly partially fused, this trend culminating in the total fusion of the pleotelson with pereonites 5–7 to form a single robust segment in species of *Hydroniscus*. Only *Haploniscus bruuni* has pereon segments 5 and 6 fused but freely separated from segment 7. Species of *Mastigoniscus* are characterised by having pereonite 7 conspicuously reduced in size and partly concealed by pereonite 6 (this refers to the adult condition and is not to be confused with the juvenile (manca) stage in which pereonite 7 is typically reduced and pereopod 7 is absent).

A wide gap in the sequence of pereon segments normally occurs between pereonites 4 and 5 marking the point of maximum body flexion. Some conglobating species have the anterior epimeral plates grooved or sculptured to facilitate overlapping or interlocking during enrollment. Adjacent margins of the pereonal segments are commonly microscopically crenulate and finely setulose, the setules presumably acting to exclude sediment particles that might impare freedom of movement from the limb bases and intertergal spaces.

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A number of species have sporadic short setae along all lateral margins, but none is densely setose. Well-developed surface tubercles are found in *Haploniscus rugosus* and *H. tuberculatus*.

Decalcification of the cuticle reveals some interesting additional features. The outer epimeral surfaces appear as translucent lamellar expansions within which run fine canals that extend from the fleshy part of the plate to the bases of the marginal and surficial setae. Similar laminar margins, normally reinforced by mineral deposits, occur on the first and second male pleopods. The exact nature of the mineralisation is not known but would reward further study in view of the great depths at which haploniscids are known to live, well below the calcium carbonate compensation depth. The heavily calcified exoskeleton must be maintained against the negative calcium carbonate equilibrium.

Ventrally the pereon is deeply concave to accommodate the limbs, the cuticle being transversely thickened and minutely sculptured. In cleared and decalcified preparations the ventral nerve chord, powerful longitudinal muscle blocks, gut, and gonads are readily observed. Female haploniscids possess cuticular organs (as described by Veuille 1978, Lincoln and Boxshall 1983a) opening dorsally on pereonite 5.

Pleotelson

The posterolateral angles are typically produced as small dentate processes that extend back to about the level of the pleotelsonic mid-margin. A few species have larger and more conspicuous processes as in *Haploniscus belyaevi, H. furcatus, H. inermis, H. ultraabyssalis, H. unicornis, Antennuloniscus dimeroceras, Mastigoniscus concavus, M. generalis, M. gratus* and *M. pistus*, and in *Mastigoniscus gratissimus* the pleotelsonic process are immensely elongate, approaching half the body length and dominating the overall appearance of the animal. Two species, *Mastigoniscus gratus* and *M. pistus*, have the ventral surface of the posterolateral processes distinctly grooved. The groove presumably serves to acommodate the very long whip-like copulatory stylet of the male second pleopod — if so it might be absent in females, but to date no females of these species have been collected. Occasionally, the pleotelsonic processes are located subterminally and are not immediately visible from dorsal inspection, as, for example, in *Haploniscus telus, Hydroniscus quadrifrons* and *H. abyssi*, whilst in the two monotypic genera *Abyssoniscus* and *Aspidoniscus* the processes are absent, the pleotelson tapering to a blunt point. On the ventral surface the pleotelson has a large, subcircular, deeply concave, branchial chamber housing the pleopods and closed to the outside by the calcified operculate first pleopod (♀) or first and second pleopods (♂). The subcircular anal opening with its pair of non-calcified anal valves is located close to the hind margin of the pleotelson and is separated from the branchial chamber by a stout cuticular pre-anal bar (pre-anal ridge of Wilson and Hessler 1980). As in several other deep-sea asellote families faecal products are discharged outside the branchial chamber, a condition not present in more primitive members of the Asellota.

Antenna 1

The first antenna (antennule) comprises a three-segmented peduncle and a small three- to five-segmented flagellum, and is usually about one-half to one-third the length of antenna 2. Only one species, *Hydroniscus vitjazi*, has a relatively long multi-articulate antennular flagellum (about 16-articulate). There has been confusion in some species' descriptions over the numbering of the flagellar articles — often the third peduncular article is small and has been counted as the first flagellar article. In all but a few haploniscids the first true flagellar article is very short, noticeably smaller than peduncle article 3 and also smaller than flagellum article 2. This reduced segment can be used as a marker for the base of the flagellum. One or more flagellar articles typically support elongate aesthetascs, numbering from about one to four per article. These have received little attention to date since they demand special preparations for precise observation, but the antennular aesthetasc formula is variable from species to species and may prove to be a valuable character for fine resolution taxonomy.

Antenna 2

The second antenna (antenna) usually extends to about one-third to one-half of the body length and has a stout six-segmented peduncle with a multi-articulate flagellum ranging from 6 to 37 articles. Commonly the flagellar articles are slender and bear a few short setules, but in *Haploniscus inermis, H. monodi, Chauliodoniscus elevatus, C. reyssi* and *Abyssoniscus ovalis* they are broad and robust, supporting a dense array of long setae. The four proximal peduncular articles are short and stout, the first article often being difficult to discern. Article 3 characteristically bears a large dorsally directed tooth. This tooth may be a homologue of the antennal scale found in primitive asellotes. A few *Haploniscus* species (*foresti, helgei, inermis*) have the antennal tooth reduced, and in *Hydroniscus* and *Abyssoniscus* it is absent altogether. Rarely, the tooth is apically serrate or cleft (*Haploniscus ultraabyssalis, Mastigoniscus generalis, M. gratissimus* and *M. latus*). Peduncle articles 5 and 6 are elongate and simple, prolonged apically on article 5 only in *Haploniscus belyaevi* and on article 6 in *Haploniscus ingolfi. H. pygmaeus* and *H. spinifer.*

Antennuloniscus species possess an uniquely diagnostic antenna 2. The peduncle is especially large and robust, articles 1 and 2 short, article 3 elongate with a small tooth, article 4 short, and articles 5 and 6 fused into a single elongate element. The spine-like apex of the fused article extends beyond the point of attach-

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ment of a small whip-like flagellum that comprises relatively few small articles (about 6–9). Peduncle article 3 has a more or less conspicuous longitudinal groove into which articles 4–6 can be reflexed.

Mouthparts

Prior to this work few details of the mouthpart structure are available. Many descriptions omit these appendages, and in others the figures are so generalised or so small as to be of little value. Using interference contrast microscopy and unstained preparations the fine structure can be readily observed.

Labrum

The upper lip has a simple rounded anterior profile and is fringed with many short marginal and surficial setules. Occasionally the lip is weakly bilobed.

Mandible

The haploniscid mandible is remarkable for its basic and extremely conservative design. It shows none of the structural innovations characteristic of some of the other asellote families. The body of the mandible is usually rather elongate, slender distally, with a very prominent truncated molar, a well-developed incisor, lacinia (left mandible only), spine row, and an elongate three-segmented palp. The incisor has a heavily chitinised margin and carries four or five rounded teeth. Left and right mandibles differ in the lacinia mobilis and spine row — only the left mandible possesses a true lacinia whilst the right mandible has an extra distal spine in the spine row. This asymmetry in mandible morphology supports the view that the lacinia mobilis is derived by modification of the distal-most spine in the spine row. Like the incisor, the lacinia is also robustly dentate and seems to have the same complement of teeth as the accompanying incisor. The distal spines of the spine row are coarsely toothed, the proximal ones simple or sparsely setose. The number of spines in the row ranges through the family from about three to seven.

The haploniscid molar is elongate, cylindrical, and apically truncated. The distal surface is concave between two raised chitinous margins, one of which is relatively smooth and straight with a large tooth at each end, the other irregularly dentate across the entire margin. Extending beyond the apex of the molar along the dentate margin are a number of slender setae. From a functional standpoint the haploniscid molar seems to be designed to crush or scrape sediment particles, suggesting that they are primarily deposit feeders.

In those species examined during the present study the molar exhibited very little structural variety. The palp on the other hand is of more taxonomic value: it is three-segmented with the second segment typically much the longest, and the apical segment suboval and reflexed at an angle to the long axis. Article 1 is normally naked but may occasionally have one or more fine distal setae, article 2 bears a group of two or three distal spines, and article 3 has a row of plumose or serrate marginal spines (from 2–7) and 2–4 long distal spines. The surface of palp articles 2 and 3 may be decorated with arrays of minute setules. From the arrangement of the spines and the reflexed posture of the terminal article it can be assumed that the mandibular palp is used to groom the antennae.

Labium

The lower lip is especially fragile and easily damaged. It is strongly bilobed, the divergent apices of the two lobes carrying numerous short setae, a few of which may be stout and rather spine-like.

Maxilla 1

The first maxilla (maxillule) is composed of two slender plates, the outer plate carrying about 11–13 robust curved apical spines (16 in *Hydroniscus vandeli* according to the figures of Chardy 1974) arranged in two rows and angled outwards from the midline. Some of the spines have dentate margins. The inner lobe is much smaller with one or two small apical spines and a few slender setae. The surfaces of both plates bear numerous fine straight setae.

Maxilla 2

The second maxilla (maxilla) comprises three slender plates and has a much more complex armature than maxilla 1. The middle and outer lobes are subequal in size, the inner usually a little shorter and broader. All three lobes are well provided with long setae on the inner, outer, and distomedial surfaces. In all species examined the inner lobe carried a pair of ornate comb-like apical spines and one or two simple spines on the inner distal margin. The inner proximal margin usually has a few very long setae. Both the outer and middle lobes support three or four robust spines.

Maxilliped

By far the largest of the mouthparts, the maxilliped has frequently been figured in haploniscid descriptions but seems to have limited taxonomic utility although its micro-armature has yet to be fully explored. The main body (endite) is subrectangular, with the setose inner distal margin folded inwards at a right angle to the endite surface. The distal margin is often obscured by rows of short spinules, but usually has two to four small pectinate spines. The number of coupling hooks (receptaculi) usually ranges from one to three (except four figured by Kensley (1978) for *Haploniscus gerneker*). The large five-articulate palp is also a conservative structure, although the second article may be more or less elongate in relation to the others. Attached to the outer margin of the protopod is a large laminar subtriangular epipod. The epipod shows some interspecific variability, but should be treated with caution as the margin is very thin and is frequently broken or frayed, presumably as the result of mechanical damage during collection.

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Pereopods

All seven pairs of pereopods are ambulatory and have an essentially similar morphology. In contrast to many other deep-sea asellotes that have either broad setose natatory limbs and/or extremely long and slender walking limbs, the haploniscid pereopods are relatively short and have a sparse armature of short setae and spines. In the normal posture only the extremities of the limbs extend outside the body margin, and during conglobation they are fully retracted. The coxal segment is absent — coxal vestiges may occur in the sculptured region around the limb sockets but this has yet to be investigated. The haploniscid pereopod thus comprises an elongate basis that tapers proximally to a well-developed ball and socket joint, a stout and elongate ischium, a short cup-shaped merus, a slender rectangular carpus and propodus, and a slender dactylus carrying a large claw (unguis). The carpus is somewhat immersed in the broad meral article, indicative of a strongly mobile joint. Pereopod length tends to increase successively from front to back with all six pereopod articles contributing to this increase. Although the pereopods are superficially similar there are several subtle differences in chaetotaxy as well as a weak demarkation into two groups — pereopods 1–4 and pereopods 5–7. Pereopods 1–4 are relatively short with small dactyli and tend to be sparsely setose; pereopods-5–7 on the other hand are more elongate, spinose rather than setose, and have long slender dactyli. This demarkation also shows in the location of the limb sockets on the ventral pereon surface — pereopods 1–4 are arranged in an equidistant series whilst pereopods 5–7 (especially 6 and 7) are grouped closely together reflecting the partial fusion and compression of the posterior pereonites.

Little has been made of the structure and chaetotaxy of haploniscid pereopods, but for species' definitions they have considerable value. Unlike many other types of deep-sea asellotes that lose all or most of their fragile limbs during collection, the small semi-protected pereopods of haploniscids often survive more or less intact. Where possible all seven should be figured as a series. It was found, for example, that some species have a robust solitary subapical spine on the anterodistal margin of the carpus of pereopod 6 but not on the other legs. The inner and outer distal surfaces of the carpus normally carry a comb-like row of tiny spinules, and the posterior margin of the carpus and propodus typically forms a minutely serrate, scalloped, membrane. This membrane is best developed on the propodus of the anterior pereopods, becoming only weakly discernible or absent on pereopods 5–7. It may also occur as a small patch on the dactylus. The junction of the dactylus and its unguis is marked by a small accessory tooth that can be simple or apically bifid, very small and indistinct through to large and conspicuous.

Penes

The pair of male papillae are not visible externally but show clearly in decalcified slide preparations. Each papilla has a conical wrinkled base extending into a slender apical tube. They are located on the mid-ventral posterior margin of pereonite 7, closely applied to the base of pleopod 1, with their apical shafts inserted into the median duct formed by the longitudinal fusion of the sympods of the first pleopod pair. This median channel serves to convey seminal fluids to the apex of pleopod 1, where they pass to the styliform copulatory endopods of the second pleopods for transference to the female during mating. The structurally simplistic penes are of little taxonomic value except as a means of confirming sexual maturity.

Pleopods

The first and second male pleopods are highly transformed for sperm transfer and exhibit a wide range of species specific architecture and ornamentation. They are one of the primary taxonomic characters of asellotes.

Pleopod 1 (♂) is a single elongate triangular plate formed by the longitudinal fusion of the sympods of the pleopod pair. Distally the pleopod is usually spatulate with a setose margin — this apical section probably represents either the exopodal or endopodal ramus of an ancestral biramous appendage. The rami are fused to the sympod and are normally more or less contiguous along the midline. The median sperm duct opens on the inner (dorsal) distal margin of the sympod, at a point close to the base of the copulatory stylet of pleopod 2 when the pleopods are in the closed position. The outer (ventral) surface of pleopod 1 is flattened or weakly convex, whilst the inner surface is variously sculptured with lobes and grooves. This sculpturing further aids in the close fitting of pleopods 1 and 2, as together they form an effective operculum closing off the branchial chamber. Both pleopods 1 and 2 have a well mineralised sympodal cuticle. The musculature associated with pleopod 1 is extrinsic and acts simply to erect the appendage and open the branchial chamber.

Pleopod 2 (♂) has a stout fleshy subtriangular sympod that houses large intrinsic muscles as well as small extrinsic ones. The lateral and distal margins of the sympod bear several setae, which together with those on the apex of pleopod 1, are probably the functional analogues of the setae fringing the opercular pleopod 2 of the female and serve to exclude from the branchial chamber particulate matter carried in respiratory currents generated by pleopods 3–5. Although high transformed, pleopod 2 has both an exopod and endopod. The exopod is a small knob-like process on the distomedial margin of the sympod. It is often weakly curved but supports no armature or sculpturing. When figured, it has been shown as a single segment in all species except *Abyssoniscus ovalis*, in which it is clearly illustrated by Birstein as two-articulate.

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Internally, this rather unspectacular exopod is connected to a pair of very large intrinsic muscles by a tendon that inserts along the distal margin. These muscles occupy the greater part of the volume of the sympod. As yet their function is unclear. Contraction of these exopod retractors would presumably pull the exopod inwards and downwards, also perhaps distorting the sympod itself, but just what this achieves remains to be investigated. It may be important in sperm transfer or ejection, or may register a grip on some part of the female during copulation.

The endopod is the most conspicuous feature of the second male pleopod. It forms a two-segmented copulatory organ comprising a stout muscular basal article and an elongate styliform distal article. The distal shaft houses a fine longitudinal groove that extends from a small reniform opening on the ventral surface to the apex. The groove appears to have formed by the partial rolling-up of the ramus, and may become a fully enclosed duct towards the tip in those species having a long copulatory filament. Relatively small intrinsic antagonistic muscles in the sympod effect the erection and extension of the copulatory organ. On structural evidence alone the copulatory endopod appears to operate in the manner of a syringe, picking up seminal fluid from the opening of the sperm canal on pleopod 1 and ejecting or transferring it via the stylet-duct to the female during mating. The morphology of the endopod is a valuable taxonomic character showing subtle but probably highly conservative interspecific variety. The stylet may be short, not reaching the apex of the sympod as in *Haploniscus antarcticus, H. inermis, H. intermedius, H. monodi, H. miccus, H. obtusifrons, H. piestus, H. saphos, H. silus, H. tangaroae, H. tridens, H. ultraabyssalis, H. unicornis, Antennuloniscus armatus, A. dimeroceras, Chauliodoniscus reyssi*, and *C. tasmanaeus*, moderately elongate, surpassing the sympod as in *Haploniscus acutirostris, Abyssoniscus ovalis, Antennuloniscus ornatus, Hydroniscus lobocephalus, H. vandeli*, and *H. vitjazi*, or extremely long, forming a filiform thread as in *Haploniscus belyaevi, H. bicuspis, H. furcatus, H. profundicola, H. spinifer, Mastigoniscus concavus, M. generalis, M. gratissimus, M. gratus, M. latus*, and *M. pistus*. In several described species the form of the male pleopod 2 is not mentioned. Those forms with a very long copulatory filament tend to exhibit a corresponding enlargement of the proximal endopod article and associated musculature. It is difficult to imagine how species exhibiting the long coiled filaments (as in *Mastigoniscus* spp.) control the movement and position of such slender capillary tubes. Some rigidity is provided by a shallow membrane that extends from the base of the stylet to about its midpoint, and additional guidance may be given by the grooves in the apex of pleopod 1 and the ventral grooves in the pleotelsonic processes, when these are present.

In the female, pleopod 1 is absent and the second pair of pleopods are fused to form a single subcircular opercular plate fringed with setae. The cuticle is heavily mineralised. In one species, *Aspidoniscus perplexus*, the long marginal setae on the opercular pleopod are plumose. In all other haploniscids known these setae are simple.

Pleopods 3–5 are similar in the two sexes. All three pairs are laminar, non-mineralised, and serve a respiratory role. Pleopods 3 and 4 are biramous, pleopod 5 uniramous. Pleopod 3 has a subtriangular endopod carrying three large plumose setae, one located on the inner distal margin, the other two on the outer margin. The suboval exopod is much smaller than the endopod and has its outer margin fringed with a dense row of short fine setules interspersed with a few longer setae. The number of setae ranges from 1 (*Haploniscus miccus, H. myriamae*), through 2 (*Aspidoniscus perplexus, Mastigoniscus gratissimus, M. pistus*), 3 (*Haploniscus belyaevi, H. silus, Antennuloniscus subellipticus*), 4 (*Haploniscus gibbernasutus, Chauliodoniscus tasmanaeus*), 5 (*Haploniscus oviformis, H. profundicola, Mastigoniscus gratus, M. latus*), 6 (*Haploniscus saphos*), 7 (*Haploniscus charcoti, H. foresti, H. hydroniscoides, H. piestus, Antennuloniscus dimeroceras*), 8 (*Haploniscus tangaroae, Abyssoniscus ovalis*), 10 (*Haploniscus helgei, H. laticephalus*), 13 (*Haploniscus inermis*), 15 (*Haploniscus similis*), and 17 (*Hydroniscus lobocephalus*), to 30 (*Hydroniscus vitjazi*).

Pleopod 4 has a naked endopod similar in shape to that of pleopod 3. The exopod is elongate, tapering distally, carrying a solitary large plumose apical seta. The outer margin is fringed with simple setae. Pleopod 5 is subtriangular and devoid of armament. Useful taxonomic characters on pleopods 3 and 4 are limited to the shape and relative lengths of the exopods, and to the chaetotaxy of the exopod margin of pleopod 3. Unfortunately, only about one-quarter of the known species have had pleopods 3 and 4 figured. Pleopod 5 is taxonomically redundant.

Uropods

Haploniscid uropods are inconspicuous, simplistic, uniramous appendages inserted on the distoventral margin of the pleotelson. They are normally partially recessed into concave surfaces between the outer rim of the anal opening and the posterolateral pleotelsonic processes. One species, *Aspidoniscus perplexus*, has uniquely positioned uropods. They are apparently set close together, ventral to the anus, although their exact insertion on the pleotelson has not been described.

In all material examined during this study the uropod was two-segmented, comprising a short peduncle bearing one or two long apical setae, and an oblong ramus carrying a tuft of distal setae. Many published figures of uropods omit a peduncular article giving the impression of a one-segmented uropod. This is probably an oversight since the peduncle is recessed and

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may be difficult to observe without prior decalcification and preparation as a slide mount. Uropods scarcely if ever extend beyond the posterior extremity of the pleotelson or its lateral processes.

SYSTEMATICS

Order ISOPODA
Suborder ASELLOTA
Superfamily JANIROIDEA

DIAGNOSIS: Female pleopod 1 absent; second pair of pleopods fused medially to form a single opercular plate closing the branchial chamber. Male with first pair of pleopods fused along midline; second pleopod sympod robust, exopod small, endopod well-developed, two-segmented, forming copulatory organ. Sympods of male pleopods 1 and 2 together forming effective operculum.

COMPOSITION: The Janiroidea contains about 24 families although the status of some of these groups remains controversial. Those currently recognised are: Abyssianiridae, Acanthaspidiidae, Dendrotionidae, Desmosomatidae, Echinothambematidae, Eurycopidae, Haplomunnidae, Haploniscidae, Ilyarachnidae, Ischnomesidae, Joeropsididae, Janirellidae, Janiridae, Macrostylidae, Mesosignidae, Microparasellidae, Mictosomatidae, Munnidae, Munnopsidae, Nannoniscidae, Paramunnidae, Pleurocopidae, Pseudomesidae, and Thambematidae. A useful key to janiroidean families is given by Wolff (1962: 31).

Family HAPLONISCIDAE Hansen, 1916

Haploniscini Hansen, 1916: 28.
Haploniscidae: Gurjanova 1933: 402; Menzies 1956: 6; 1962: 94; Wolff 1962: 49; Menzies & George 1972: 107.

DIAGNOSIS: Janiroidea with cephalon free; eyes absent; body compact, oval, dorsoventrally flattened. Pereonites 1–7 subequal in width (pereonite 7 rarely reduced), all wider than long. Pleotelson comprising a single somite, but may exhibit more or less fusion dorsally with up to three posterior pereon somites. Anus outside branchial chamber, separated by continuous robust cuticular bar. Antennae shorter than body; antenna 1 shorter than antenna 2. Mandible with well-developed incisor, lacinia, spine row, and slender truncated molar; palp elongate, three-segmented with article 3 reflexed. Maxilliped palp articles slender, less than half width of endite. Pereopods 1–7 ambulatory, simple, subsimilar; dactylus with single major claw and diminutive accessory tooth. Uropods uniramous, ventro-subterminal.

COMPOSITION: Including the new taxa described herein the family comprises a total of 82 species allocated to seven genera: *Abyssoniscus* Birstein, 1971; *Aspidoniscus* Menzies & Schultz, 1968; *Antennuloniscus* Menzies, 1962; *Chauliodoniscus* gen. nov.; *Haploniscus* Richardson, 1908; *Hydroniscus* Hansen, 1916; and *Mastigoniscus* gen. nov. A list of all known species together with relevant geographical and depth distribution data is given later (*see* pp. 50–53).

Key to the genera of the Haploniscidae

1. Pleotelson tapering to an obtuse point 2
— Pleotelson truncated or broadly rounded posteriorly 3
2. Uropods not concealed, set close together, ventral to the anal valves; female opercular pleopod fringed with long plumose distomarginal setae ..... *Aspidoniscus*
— Uropods concealed; female opercular pleopod fringed with short simple marginal setae ..... *Abyssoniscus*
3. Antenna 2 characteristically modified; peduncle article 3 elongate and grooved, article 4 short, articles 5 and 6 fused and apically prolonged, flagellum small and slender, subterminal ..... *Antennuloniscus*
— Antenna 2 unmodified 4
4. Pereonites 5–7 fused with pleotelson into immobile segment; antenna 2 peduncle article 3 without spine ..... *Hydroniscus*
— Pereonites 5–7 free or only medially fused with pleotelson; antenna 2 peduncle article 3 with dorsal spinous process 5
5. Pereonite 7 much reduced in adult, conspicuously shorter and narrower than pereonite 6 ..... *Mastigoniscus*
— Pereonite 7 subequal with pereonite 6 in adult 6
6. Pereonites 2–4 in male with anterolateral processes; body subcylindrical; conglobating habit ..... *Chauliodoniscus*
— Pereonites 2–4 in male without anterolateral processes; body dorsoventrally flattened; rarely conglobating fully ..... *Haploniscus*

Haploniscus Richardson, 1908

Haploniscus Richardson, 1908: 75; Vanhöffen 1914: 557; Hansen 1916: 28; Menzies 1956: 8; 1962: 94; Wolff 1962: 50; Birstein 1963a: 41; 1963b: 817; 1971: 180; Menzies & George 1972: 107; Chardy 1974: 1137.

TYPE-SPECIES: *Nannoniscus bicuspis* Sars, 1877.

DIAGNOSIS: Haploniscidae with pereonites 5–7 free, of subequal width, and without anteriorly directed lateral angles (pleotelson may exhibit fusion mid-dor-

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sally with one or more posterior pereonites but lateral margins remain separated). Antenna 2 peduncle article 3 stout, about as long as wide, and with spinous dorsal process (only rarely reduced or absent). Pleotelson truncated posteriorly, posterolateral angles produced. Uropods two-segmented, inserted into concavity between anal rim and pleotelsonic processes.

COMPOSITION: With 52 recognised species this is by far the largest genus in the family. The lack of any single conspicuous diagnostic character, as for example in the modified antenna 2 of *Antennuloniscus*, or the robust pleotelson of *Hydroniscus*, makes a simple and unambiguous definition of the genus impossible. It has thus become a depository for all forms lacking a distinctive morphology. Further work will undoubtedly reveal the heterogeneity of the genus, but the dearth of adequate descriptions and figures for many of the taxa makes any such analysis inconclusive at this stage.

Haploniscus tangaroae sp. nov. (Figs 1–3)

MATERIAL EXAMINED: NZOI Stns E416, 6♂♂, 11♀♀; E709, 1♀; F744, 37♂♂, 70♀♀; F879, 1♂; F910, 5♂♂, 9♀♀; P971, 4♂♂, 3♀♀; P937, 2♂♂, 1♀; P969, 1♂, 1♀; S151, 4♂♂; S153, 99♂♂, 75♀♀; S154, 52♂♂, 31♀♀.

HOLOTYPE: Adult male (in alcohol) from NZOI Stn S153, off east coast of South Island, New Zealand, 27 October 1979, 45°21.1′S, 173°35.8′E, 1386 m, deposited in the collections of the New Zealand Oceanographic Institute, Wellington, New Zealand, type no. H-426.

PARATYPES: In alcohol and as microscope slide mounts, deposited in the collections of the New Zealand Oceanographic Institute, type nos P-602, P-603, P-604, P-605, P-606, P-607, P-608, P-609, P-610, P-611, P-612, and the British Museum (Natural History), reg. no. 1983:460.

ETYMOLOGY: The species is named after the New Zealand Oceanographic Institute research vessel "Tangaroa" employed for both deep-sea cruises covered by this report.

DESCRIPTION: Male:

Body Length 3.2 mm, maximum width 1.6 mm, smooth, white; pleotelson abruptly narrower than pereon.

Cephalon Broader than long, lateral margins rounded, dorsally strongly convex. Rostral process raised, subrectangular, weakly concave medially with elevated margins that project over and round the anterior margin of the head, appearing sinuous in lateral aspect. Front of rostrum may appear convex or concave depending upon the angle of view.

Pereon Oval in outline, strongly convex dorsally with epimera weakly splayed. Pereonites of about equal width, 6 and 7 much shorter than rest; pereonite 7 fused mid-dorsally with pleotelson; posterior sutures of pereonites 5 and 6 also indistinct. Adjacent lateral margins of pereonites 4 and 5 minutely crenulate and setulose; setules also present on posterolateral margin of pereonite 1 and anterior and posterior margins of pereonites 2–4.

Pleotelson Tapering posteriorly and broadly truncated; posterolateral processes small, scarcely projecting beyond posterior mid-margin. Dorsal surface convex between conspicuous longitudinal ridges; lateral surfaces near vertical and flattened or weakly concave. Branchial and anal openings subcircular.

Antennae Antenna 1 reaching to end of peduncle of antenna 2; peduncle articles 1 and 2 subequal in length, article 1 stout, article 2 slender, article 3 about two-thirds length of article 2; flagellum four-articulate with article 1 half length of article 2; aesthetasc formula 0:1:2:3. Antenna 2 peduncle article 3 with prominent dorsal tooth, articles 5 and 6 subequal in length, flagellum 12-articulate.

Mouthparts Labrum and labium unmodified. Mandibular incisors and lacinia (left) five-dentate; left spine row comprising six spines, right row seven spines; the four proximal spines on each side simple, the distal two or three (right) spines irregularly dentate. Mandibular palp article 1 short; article 2 three times length of article 1; article 3 oval, reflexed. Article 1 naked, outer margin of article 2 bearing three long spinules, article 3 with two short serrate marginal spines and four long simple apical spines. Maxilla 1 outer lobe robust, with 12 stout spines of which about four have dentate margins; inner lobe slender, bearing single short apical spine and small group of setae. Maxilla 2 inner lobe with pair of ornate comb-like apical spines; middle and outer lobes each with four apical spines; all three lobes bearing many marginal and surficial setae. Maxilliped with distal margin of endite carrying three small ornate spines; margin and surface minutely setulose; three coupling hooks present; palp article 2 slightly less than twice length of article 3.

Pereopods Pereopods increasing in length from 1–7; basis with two or three posteromarginal setae; ischium of pereopod 1 naked, of pereopods 2–4 with single posteromarginal seta, of pereopods 5–7 with one or two antero- and posteromarginal setae; merus short, distally expanded; carpus rectangular, posterior margin of pereopods 1–4 setose, of pereopods 5–7 weakly spinose, posterodistal angle of pereopods 2–7 with slender spine; carpus of pereopod 6 only bearing large subterminal spine on anterior margin; propodus little shorter than carpus, posterior margin of pereopods 1–4 setose, of pereopods 5–7 spinose; dactylus short, beoming longer and more slender from pereopod 1 to pereopod 7; unguis half length of dactylus, accessory tooth simple.

Pleopods Pleopod 1 sympod triangular, margin with one or two small setae; rami contiguous, distal margins broadly rounded, each lobe bearing about 11 setae; shallow oblique groove present on dorsal surface at junction of sympod and ramus, the groove carrying two setae; in decalcified preparations sympod and rami with membranous margins and long setal canals. Pleopod 2 sympod tapering distally, outer margin

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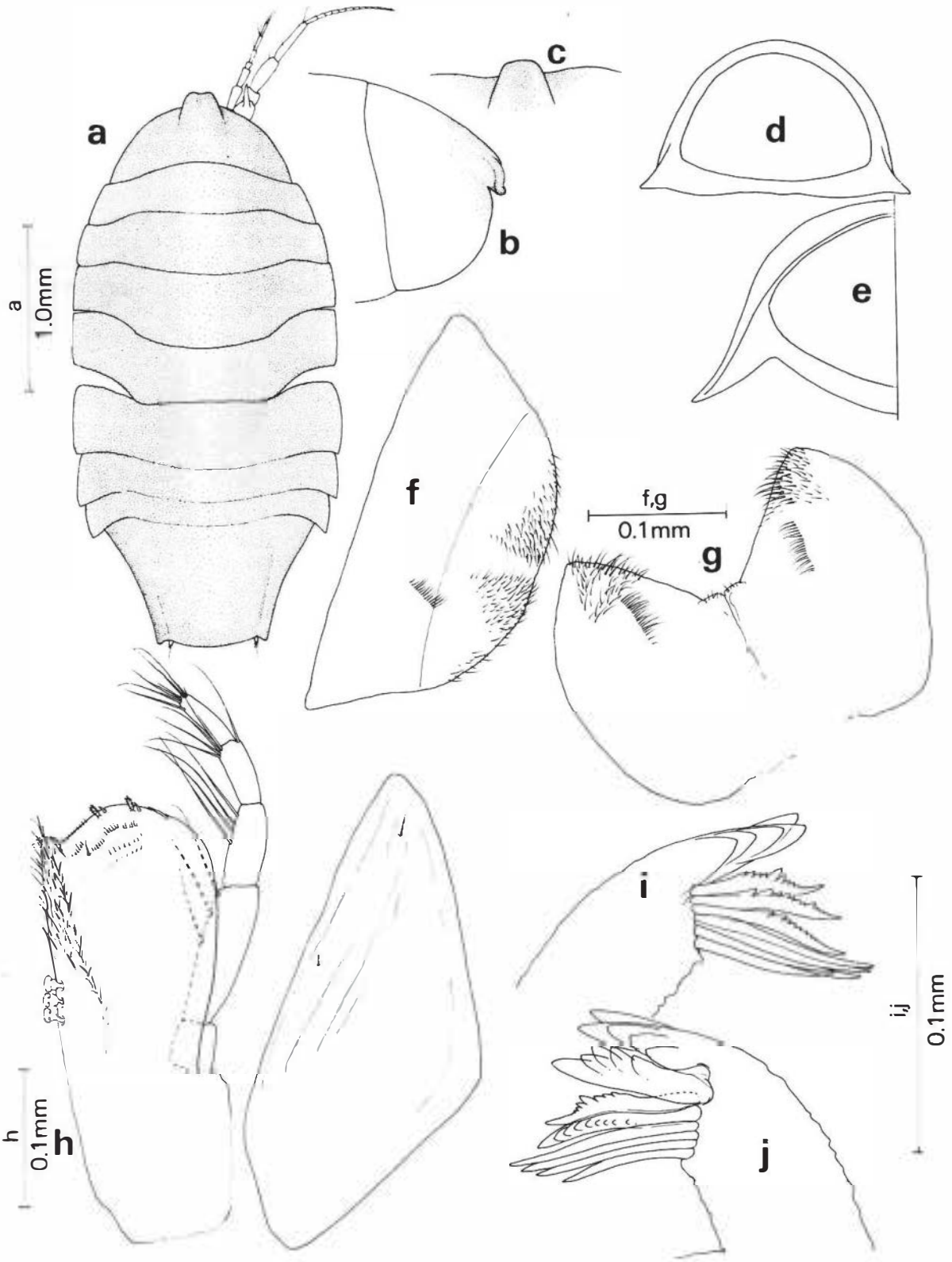

FIG. 1. *Haploniscus tangaroae* sp. nov. Paratype male, NZOI Stn S153: a, entire, dorsal view; b, cephalon, lateral view; c, rostrum, anterodorsal aspect; d, transverse section, posterior cephalon; e, transverse section, posterior pereonite 2; f, labrum; g, labium; h, maxilliped; i, right mandible; j, left mandible.

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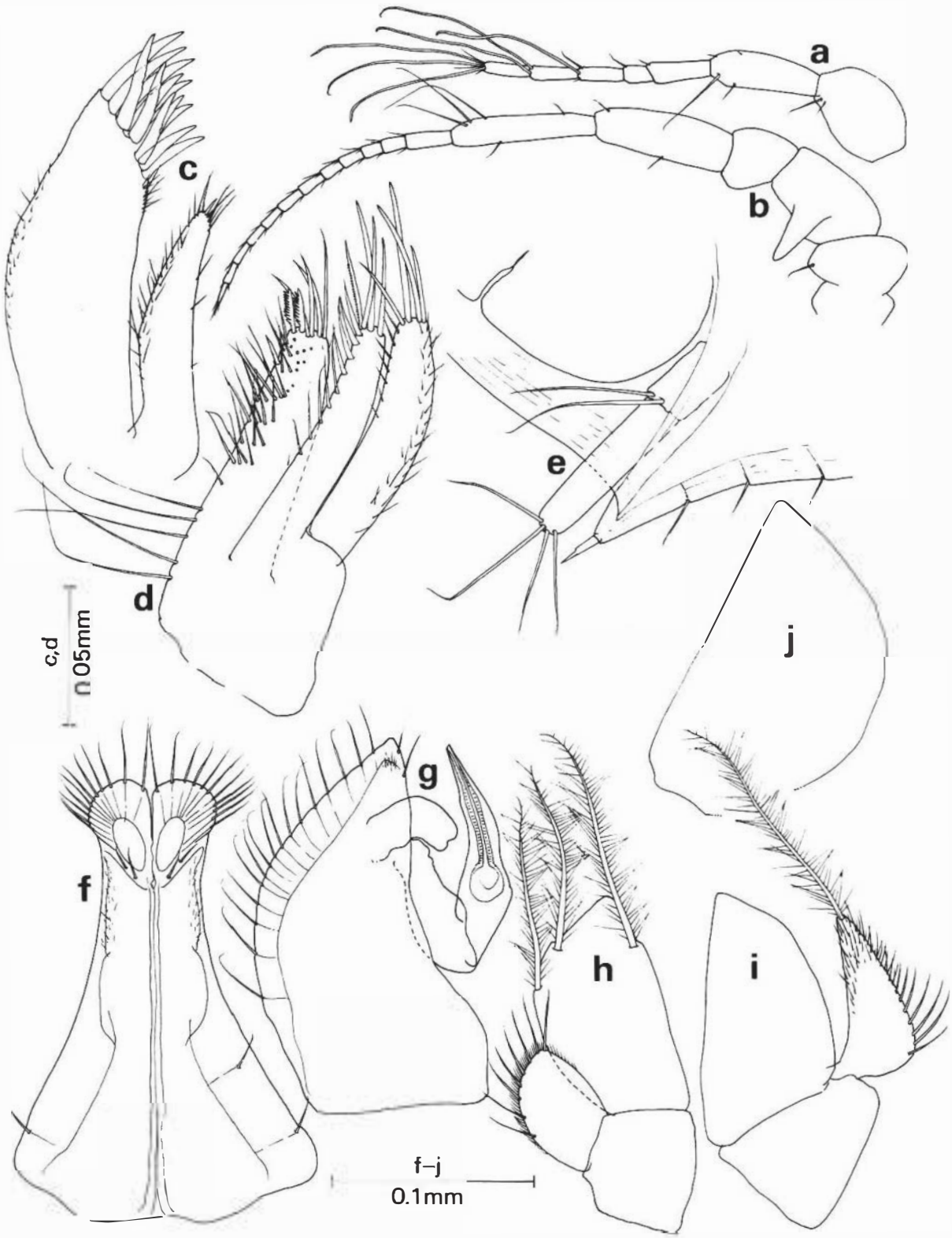

FIG. 2. *Haploniscus tangaroae* sp. nov. Paratype male, NZOI Stn S153: a, antenna 1; b, antenna 2; c, maxilla 1; d, maxilla 2; e, uropod; f, pleopod 1; g, pleopod 2; h, pleopod 3; i, pleopod 4; j, pleopod 5.

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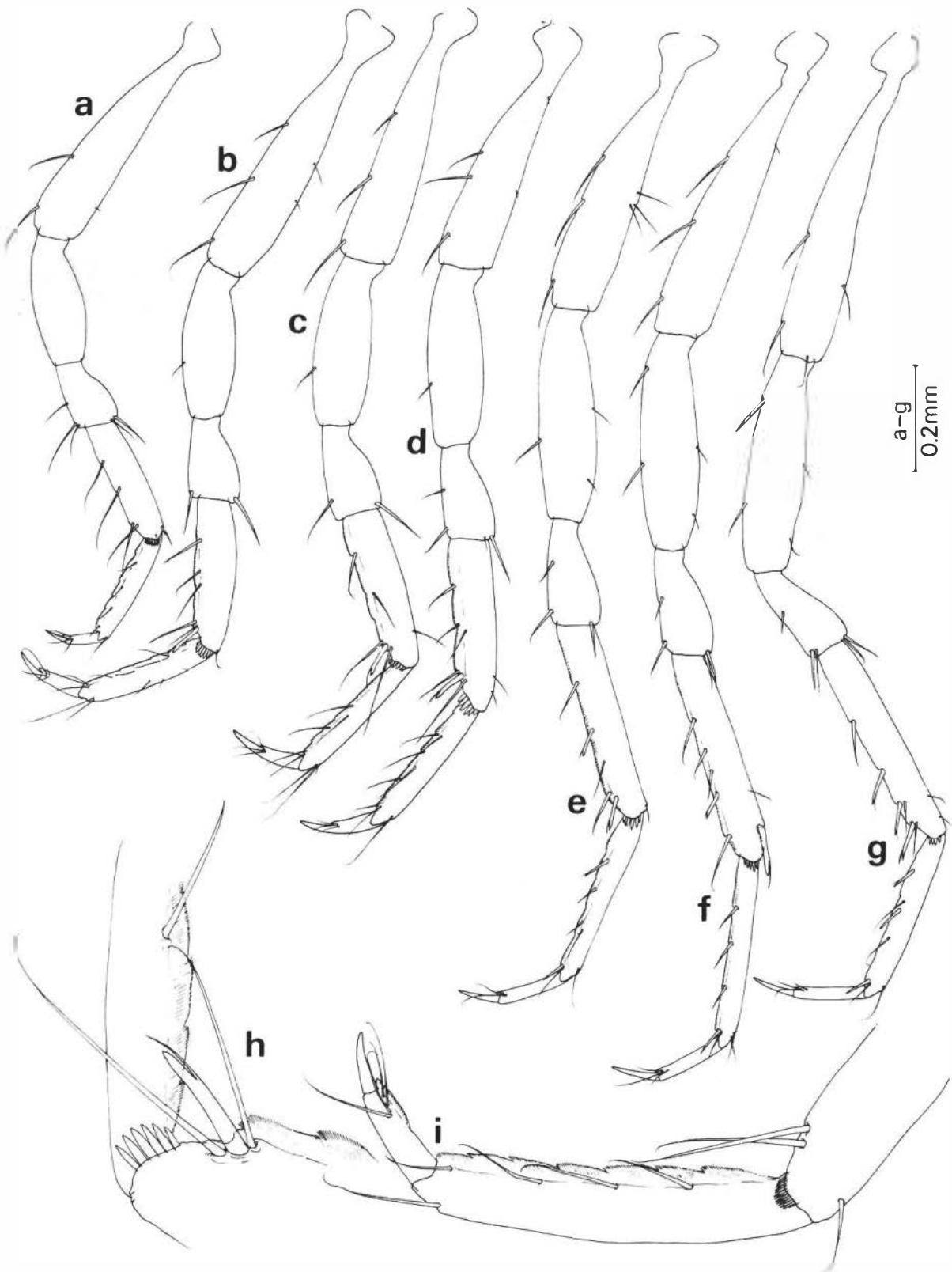

FIG. 3. *Haploniscus tangaroae* sp. nov. Paratype male. NZOI Stn S153: a, pereopod 1; b, pereopod 2; c, pereopod 3; d, pereopod 4; e, pereopod 5; f, pereopod 6; g, pereopod 7; h, pereopod 3, apex of carpus; i, pereopod 1, distal articles.

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broadly convex with about 18 well-spaced setae, subapical surface bearing small group of fine setules; exopod prominent, curved; copulatory endopod article 1 stout, article 2 robust but not reaching beyond end of sympod. Pleopod 3 exopod half length of endopod, margin fringed with fine short setules and eight long setae. Pleopod 4 exopod triangular, outer proximal margin bearing seven long setae, distal surfaces finely setulose.

Uropods Uropod just reaching to apex of pleotelsonic process; ramus twice length of peduncle; peduncle with two apical setae, ramus with about four distal setae.

Female: Except for dimorphic pleopods 1 and 2, female morphology essentially similar to male. Pleopod 2 subcircular, posterior margin fringed with simple setae, ventral surface bearing two rows of five minute setules.

REMARKS: *Haploniscus tangaroae* can be distinguished from all known species of *Haploniscus* by the configuration of the rostrum. Also easily observed and useful in combination with the novel rostral process, but not itself uniquely diagnostic, is the pair of longitudinal ridges on the dorsal pleotelson. Several individuals were infested with sessile protozoans, attached mostly to the ventral pereon and the dorsal and lateral surfaces of the pleotelson, and characterised by their tubular annulated sheaths. Also ectoparasitic on *H. tangaroae* was a new nicothoid copepod described as *Sphaeronella bradfordae* by Boxshall and Lincoln (1983), and a new species of tantulocaridan, *Deoterthron megacephala*, described by the same workers (Lincoln and Boxshall 1983b).

Haploniscus silus sp. nov. (Figs 4–6)

MATERIAL EXAMINED: NZOI Stns P933, 1♀; P934, 1♀, 2 juv.; P935, 2♀♀; P937, 1♂, 1♀; P940, 1♂; P941, 3♂♂, 7♀♀.

HOLOTYPE: Adult male (dissected) from NZOI Stn P941, 23 April 1980, 41°15.2′S, 167°07.2′E, Tasman Sea, 1457–1463 m, deposited in the collections of the New Zealand Oceanographic Institute, Wellington, New Zealand, type no. H-427.

PARATYPES: In alcohol and as microscope slide preparations, deposited in the collections of the New Zealand Oceanographic Institute, type nos P-613, P-614, P-615, P-616, P-617, P-618, and the British Museum (Natural History), reg. no. 1983:461.

ETYMOLOGY: The epithet is from the Greek word *silos* meaning snub-nosed.

DESCRIPTION: Male:

Body Length 2.6 mm, maximum width 1.25 mm, smooth, white; body oval, pereon continuous with pleotelson.

Cephalon Broader than long, lateral margins rounded, dorsally convex. Rostrum weakly produced as a flat rectangular ridge having a slight median depression.

Pereon Oval in outline, moderately convex dorsally, lateral margins not splayed; pereon outline smooth, pereonites 6 and 7 shorter than rest; pereonite 7 fused mid-dorsally with pleotelson. Adjacent lateral margins of pereonites 1–6 crenulate and minutely setulose.

Pleotelson Tapering posteriorly, broadly truncated, posterolateral angles small, scarcely projecting beyond the posterior mid-margin. Dorsal surface convex between conspicuous longitudinal ridges; lateral surfaces flattened or weakly concave. Branchial chamber and anal opening subcircular.

Antennae Antenna 1 reaching to end of peduncle of antenna 2, peduncle articles 1 and 2 subequal in length, article 1 stout, article 2 slender, both somewhat inflated distally, article 3 about two-thirds length of article 2; flagellum four-articulate with article 1 half length of article 2; aesthetasc formula 0:1:2:3. Antenna 2 peduncle article 3 with prominent dorsal spinous process; articles 5 and 6 subequal in length; flagellum 11-articulate.

Mouthparts Labrum and labium unmodified. Mandibular incisor and lacinia (left) five-dentate; left spine row consisting of six spines, right spine row of seven spines, four proximal spines on each side simple, distal two or three (right) spines dentate. Mandible palp article 1 little less than half length of article 2, article 3 oval, reflexed; article 1 naked, article 2 with three distal spines, article 3 with three serrate marginal spines and three long simple distal spines. Maxilla 1 outer lobe bearing 13 stout apical spines, four of these with dentate margins; inner lobe slender with small apical spine and small group of setae. Maxilla 2 inner lobe with pair of ornate comb-like apical spines and single simple subapical marginal spine, inner proximal margin bearing four very long setae; middle and outer lobes each carrying four apical spines; all three lobes with many marginal and surficial setae. Maxilliped with distal margin of endite bearing four small ornate spines; margin and surface minutely setulose; three coupling spines present; palp article 3 about two-thirds length of article 2.

Pereopods Pereopods increasing in length from 1 to 7; basis with two or three posteromarginal setae and 0–5 anteromarginal setae; ischium elongate-oval with 0–2 small antero- and posteromarginal setae; merus short, expanded distally, posterodistal angle of pereopods 1–4 with seta, of pereopods 5–7 with spine; carpus rectangular, posterior margin with four or five setae, posterodistal angle of pereopods 2–4 with stout spine absent from 1 and 5–7, pereopod 6 only having large subterminal spine on anterior margin; propodus little shorter than carpus, posterior margin with about 4–6 setae; dactylus of pereopods 1–4 about 65 percent of propodus length, of pereopods 5–7 about 85 percent; unguis half length of datcylus, accessory tooth weakly bifid.

Pleopods Pleopod 1 sympod triangular, margin bearing two small setae; rami contiguous, distal margins broadly rounded, each ramus having six long setae;

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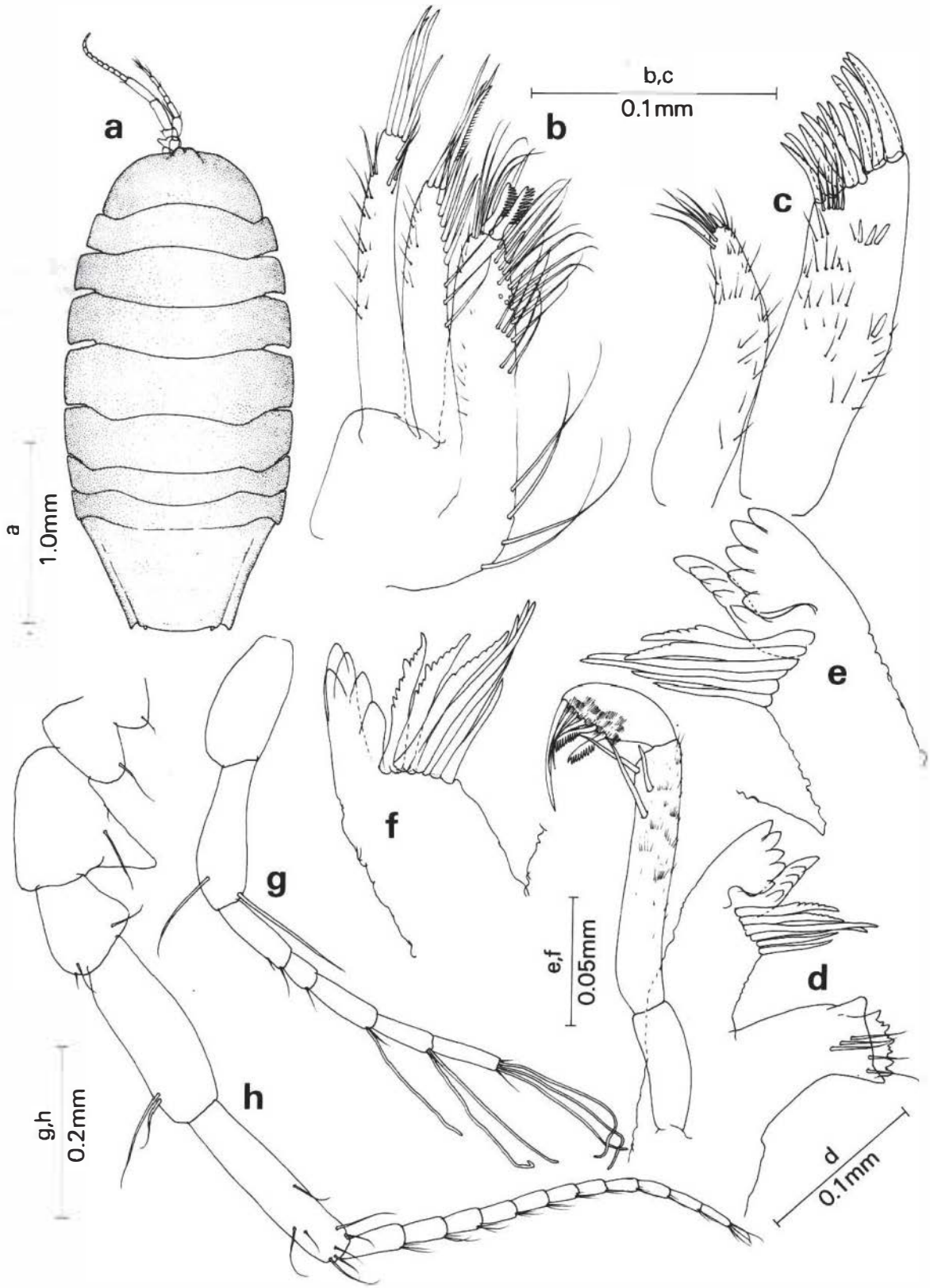

FIG. 4. *Haploniscus silus* sp. nov. Holotype male: a, entire, dorsal view; b, maxilla 2; c, maxilla 1; d, left mandible; e, left mandible; f, right mandible; g, antenna 1; h, antenna 2.

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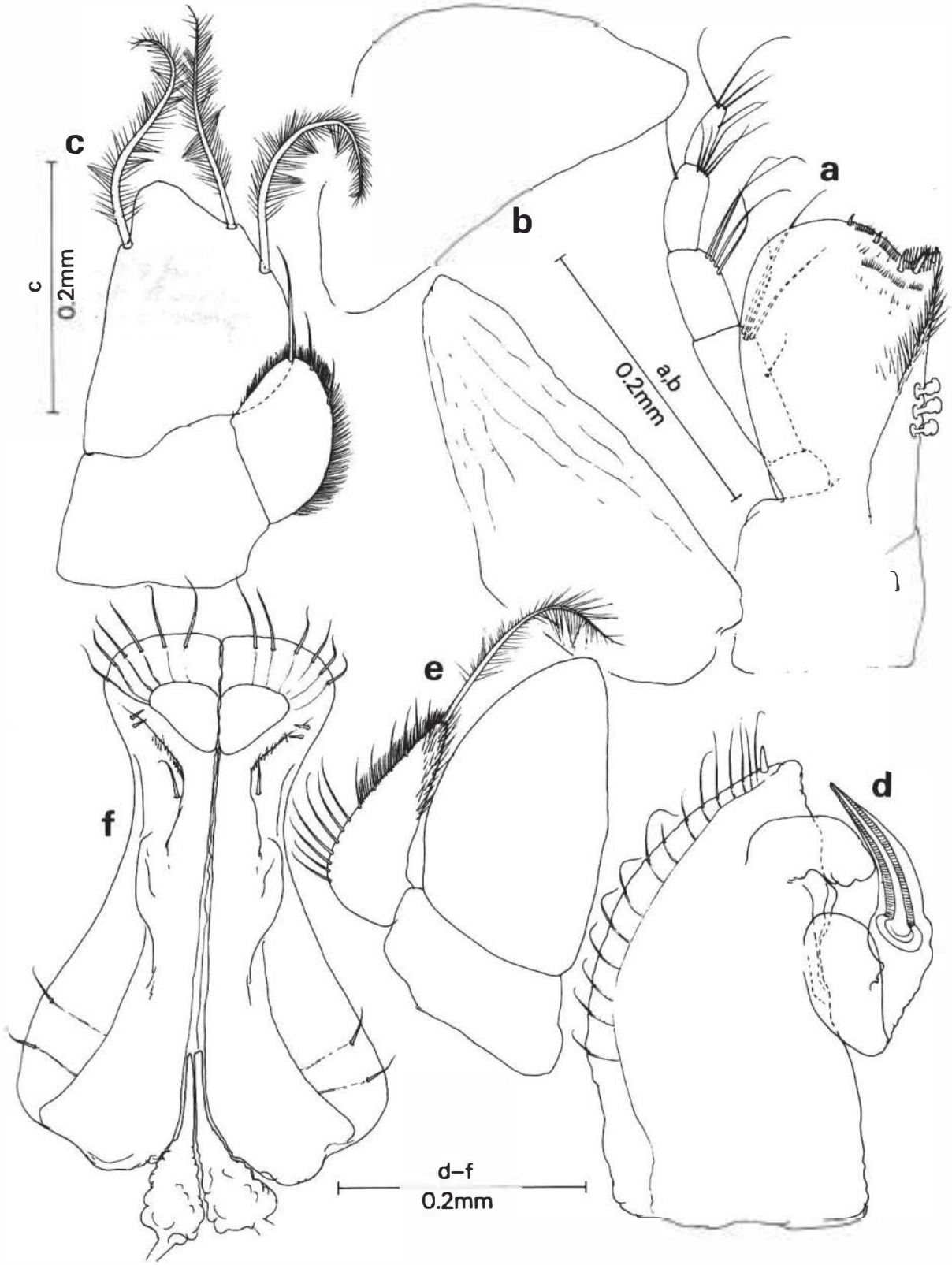

FIG. 5. *Haploniscus silus* sp. nov. Holotype male: a, maxilliped; b, pleopod 5; c, pleopod 3; d, pleopod 2; e, pleopod 4; f, pleopod 1.

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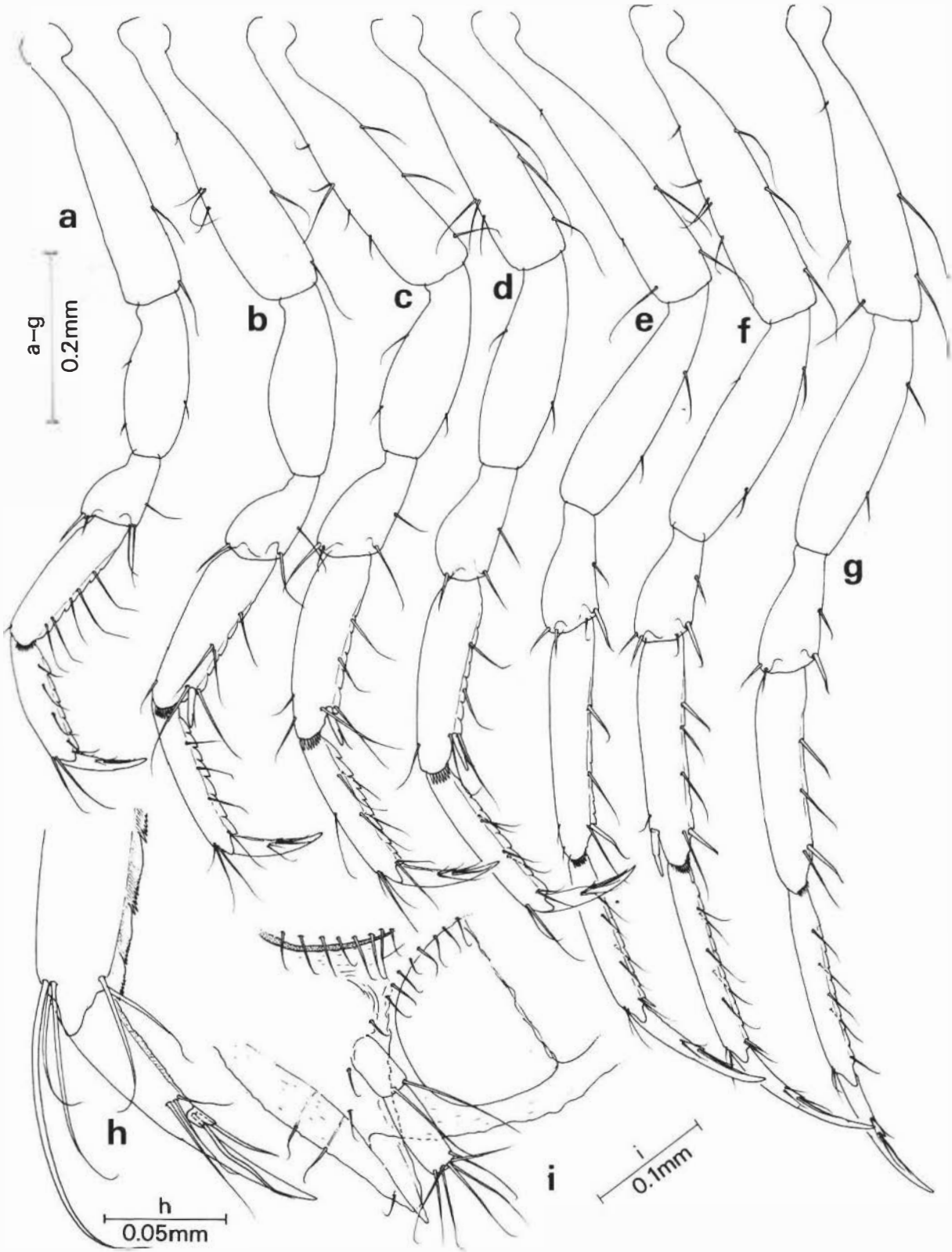

FIG. 6. *Haploniscus silus* sp. nov. Holotype male: a, pereopod 1; b, pereopod 2; c, pereopod 3; d, pereopod 4; e, pereopod 5; f, pereopod 6; g, pereopod 7; h, pereopod 3, distal articles; i, uropod, ventral pleotelson.

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shallow oblique groove present on dorsal surface at junction of sympod and ramus, lateral margin of groove finely setulose with two distal and one proximal setae; in decalcified preparations sympod and rami with broad membranous margins and long setal canals. Pleopod 2 sympod tapering distally, outer margin convex, carrying about 15 well-spaced setae and a solitary apical spine; exopod prominent, curved; copulatory endopod article 1 stout, article 2 robust but not reaching beyond apex of sympod. Pleopod 3 exopod fringed with fine short setules and three long setae. Pleopod 4 exopod slender, triangular, three-quarters length of endopod, outer proximal margin with seven setae, distal margin fringed with short setules and about six longer setae, distal surface finely setulose.

Uropods Uropod not quite reaching to end of pleotelsonic process; ramus twice length of peduncle; peduncle with two long apical setae, ramus with about eight apical setae.

Female: Generally similar to male except for dimorphic pleopods. Pleopod 2 subcircular, fringed with simple setae; posterior margin of pre-anal bar similarly setose.

REMARKS: *Haploniscus silus* is most closely allied to the previous species, *H. tangaroae*. It shares the same basic body form, longitudinal ridges on the pleotelson and small posterolateral processes. The mouthparts and pereopods are also quite similar, and the pleopods exhibit a strong resemblance in overall shape although the setation is different. Both have the distinctive subapical spine on the anterior margin of the carpus of pereopod 6. The two species can be distinguished on the shape of the rostrum, pleopod chaetotaxy, and body outline. *Haploniscus silus* has the pleotelsonic and pereonal margins continuous without lateral splaying of the epimera whilst *H. tangaroae* exhibits a discontinuous pereon/pleotelson outline and has distinctly splayed epimera.

Haploniscus miccus sp. nov. (Figs 7–9)

MATERIAL EXAMINED: NZOI Stns S147, 1♀; S153, 3♂♂, 4♀♀.

HOLOTYPE: Adult male (in alcohol) from NZOI Stn S153, 27 October 1979, 45°21.1′S, 173°35.8′E, off New Zealand east coast, 1386 m, deposited in the collections of the New Zealand Oceanographic Institute, Wellington, New Zealand, type no. H-430.

PARATYPES: In alcohol and as microscope slide preparations deposited in the collections of the New Zealand Oceanographic Institute, type nos P-623, P-624, and the British Museum (Natural History), reg. no. 1983:462.

ETYMOLOGY: The epithet is from the Greek word *mikkos* meaning little.

DESCRIPTION: Male:

Body Length 2.6 mm, maximum width 1.3 mm, smooth, white; body oval, pleotelson narrower than pereon.

Cephalon Broader than long, lateral margins rounded, dorsal surface convex. Rostrum inconspicuous, as a very small median bump on the anterior margin.

Pereon Oval in outline, moderately convex dorsally, epimeral margins splayed; pereon outline smooth, all seven pereonites subequal in length, pereonite 7 not fused with pleotelson. Adjacent lateral margins of pereonites 1–6 minutely crenulate and setulose.

Pleotelson Tapering posteriorly and broadly truncated, posterolateral angles small, projecting little beyond posterior mid-margin. Dorsal surface smooth, convex. Branchial chamber and anal opening subcircular.

Antennae Antenna 1 not reaching end of peduncle of antenna 2; peduncle article 1 little shorter than article 2, swollen, article 3 only about one-third length of article 2; flagellum four-articulate with article 1 half length of article 2; aesthetasc formula 0:1:2:2+2. Antenna 2 peduncle article 3 with large dorsal tooth, articles 5 and 6 subequal in length, article 5 much stouter than article 6, flagellum 13-articulate.

Mouthparts Labium and labrum unmodified. Mandibular incisor and lacinia (left) five-dentate; left spine row consisting of six spines, right row of seven, the four proximal spines on each side simple, distal two or three (right) spines dentate. Mandibular palp article 1 one-third length of article 2, article 3 oval, reflexed; article 1 naked, outer margin of article 2 with three distal spines, article 3 with three serrate marginal spines and three long simple apical spines. Maxilla 1 outer lobe bearing 11 stout apical spines of which five appear dentate; inner lobe with small apical spine and group of stout setae. Maxilla 2 inner lobe bearing pair of ornate comb-like apical spines, middle and outer lobes each with four apical spines. Maxilliped with distal margin of endite bearing three small ornate spines, margin and surface minutely setulose; three coupling spines present; palp article 3 half length of article 2.

Pereopods Pereopods increasing in length from 1 to 7; basis very narrow proximally with two or three posteromarginal and 0–3 anteromarginal setae; ischium elongate-oval on pereopods 1–4, becoming rectangular on pereopods 5–7, with 0–2 antero- and posteromarginal setae; merus short, distally expanded on pereopods 1–4, less so on pereopods 5–7; carpus rectangular, posterior margin with three setae and small distal spine, pereopod 6 only having large subterminal spine on anterior margin; propodus subequal in length with carpus, posterior margin bearing three or four setae, also with distal spinule on pereopods 5–7; dactylus little over half length of propodus; unguis two-thirds dactyl length, accessory tooth weakly bifid.

Pleopods Pleopod 1 sympod triangular, rami contiguous, distal margin of each ramus with seven or eight short setae. Pleopod 2 sympod subtriangular, outer

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Inset 4*

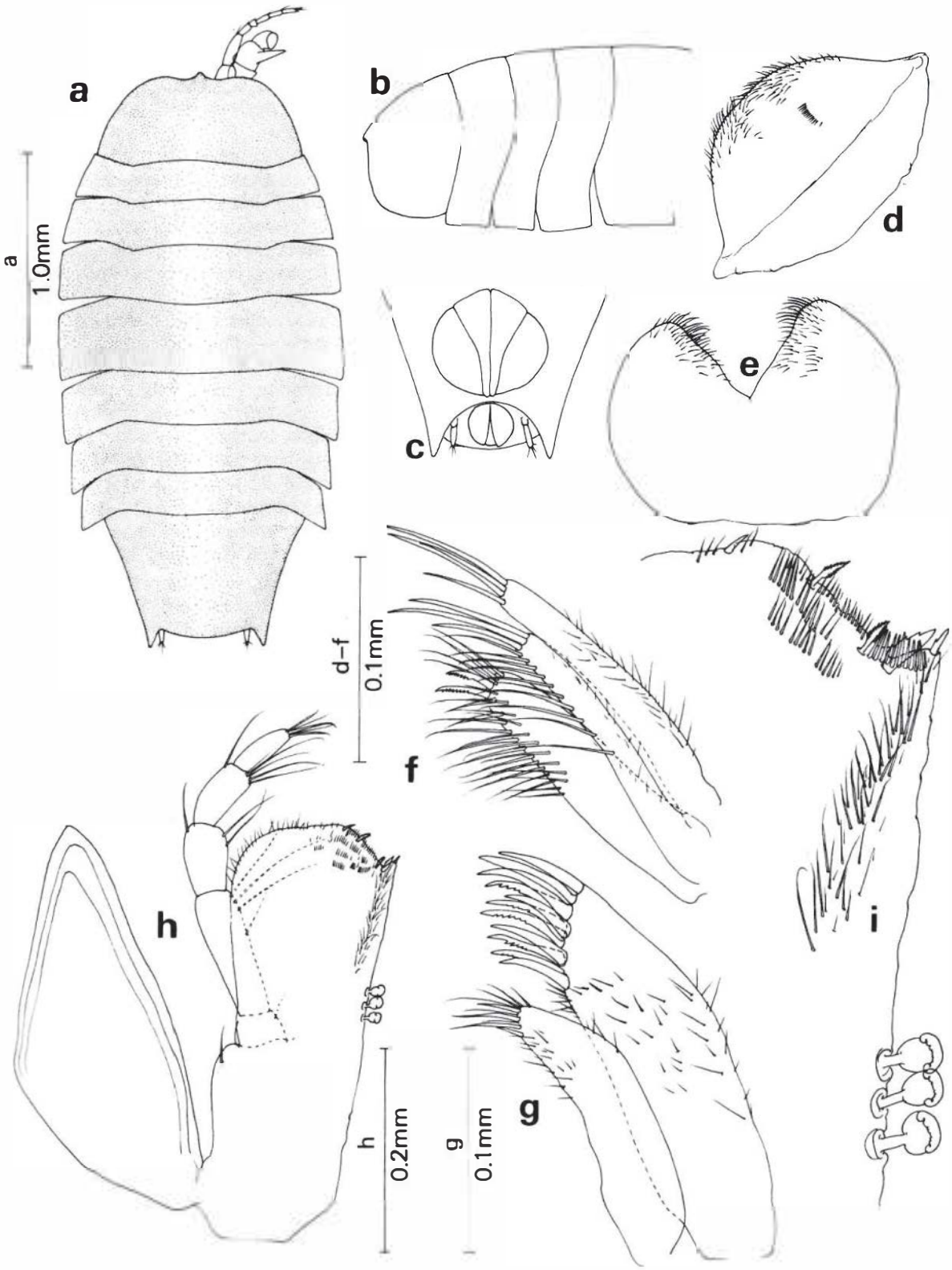

FIG. 7. *Haploniscus miccus* sp. nov. Paratype male, NZOI Stn S153: a, entire, dorsal view; b, anterior pereon and cephalon, lateral view; c, pleotelson, ventral view; d, labrum; e, labium; f, maxilla 2; g, maxilla 1; h, maxilliped; i, maxilliped endite, inner distal margin.

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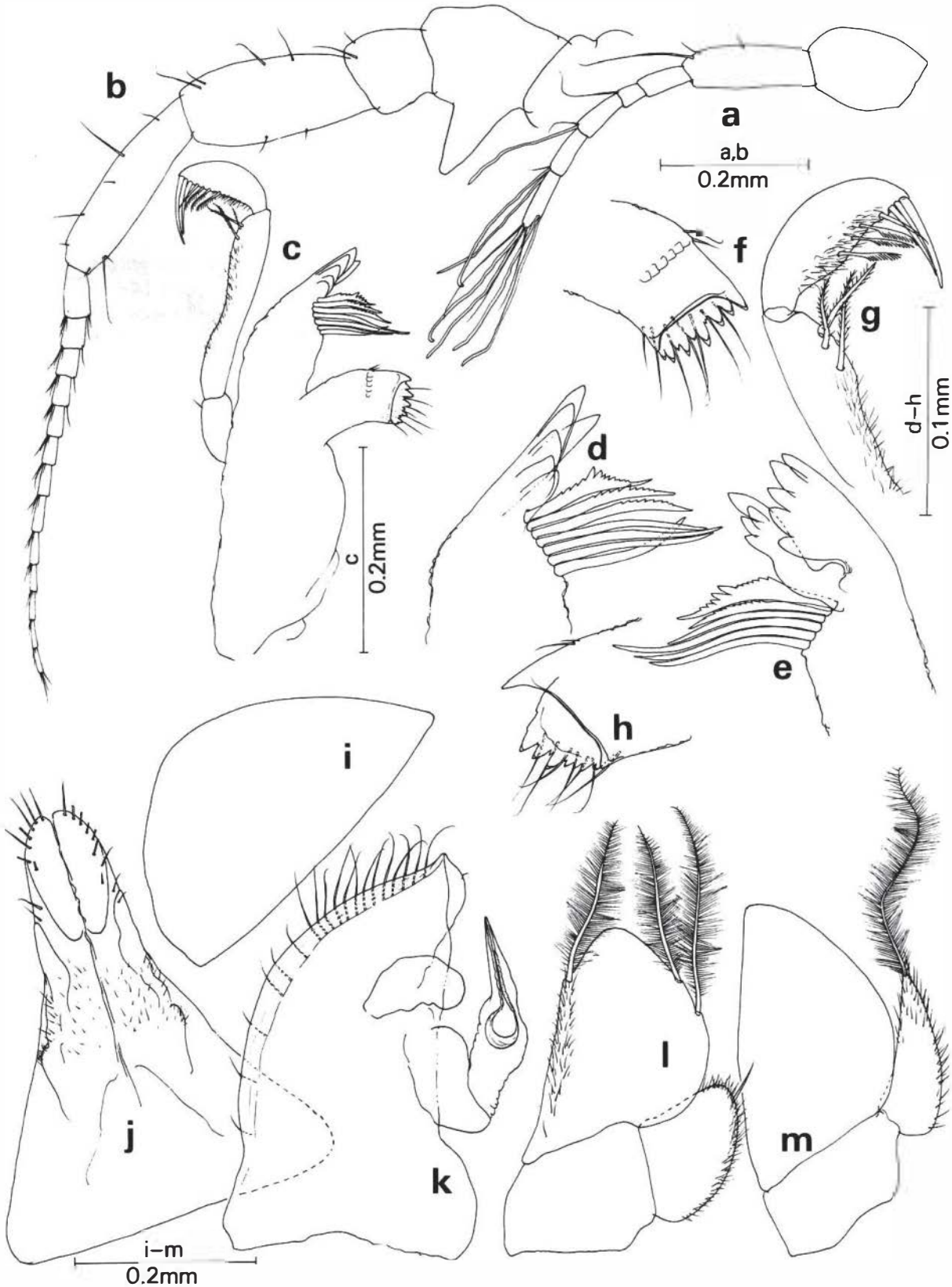

FIG. 8. *Haploniscus miccus* sp. nov. Paratype male, NZOI Stn S153: a, antenna 1; b, antenna 2; c, right mandible; d, right mandible; e, left mandible; f, right molar; g, right mandibular palp; h, left molar; i, pleopod 5; j, pleopod 1; k, pleopod 2; l, pleopod 3; m, pleopod 4.

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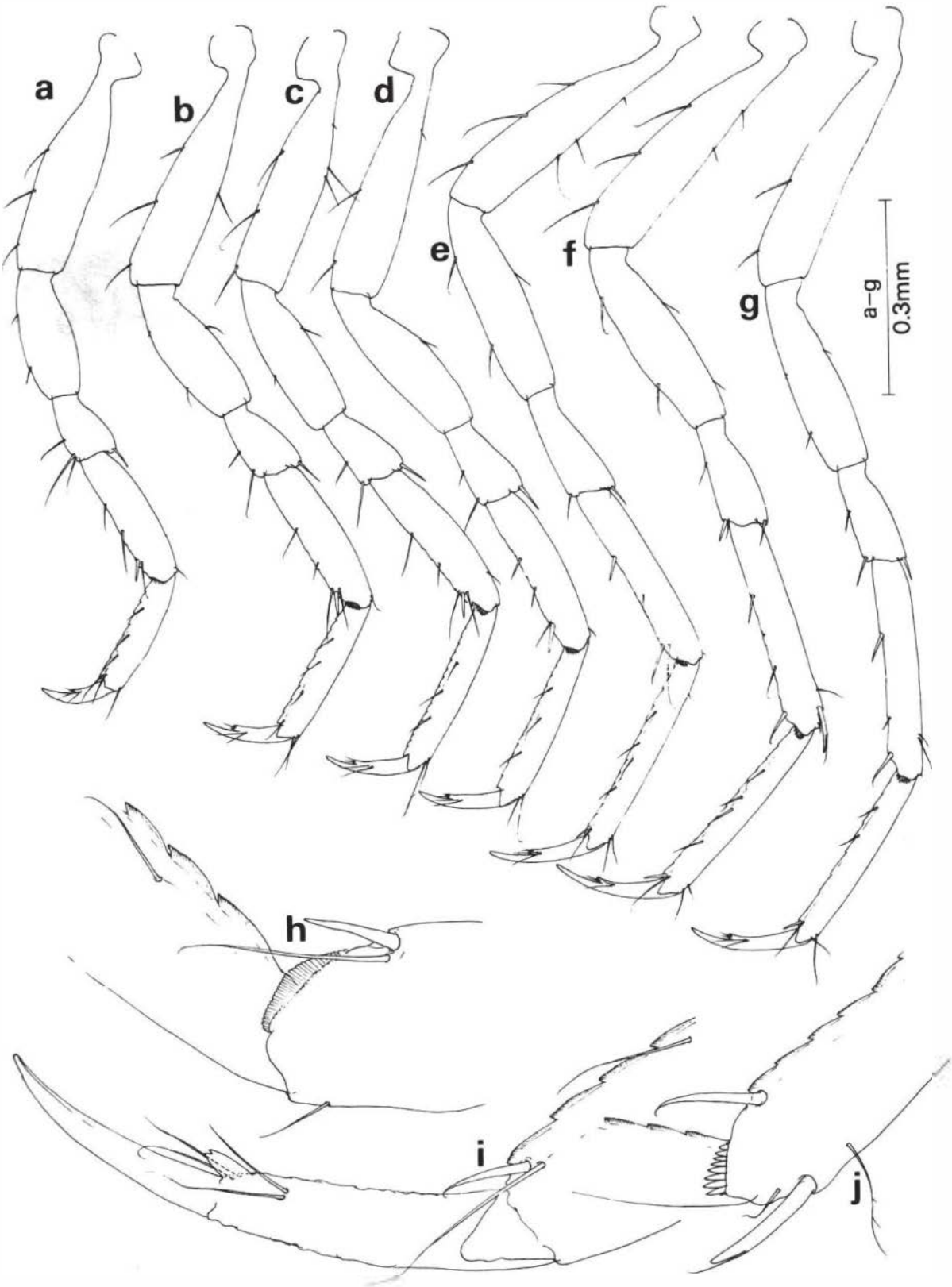

FIG. 9. *Haploniscus miccus* sp. nov. Paratype male, NZOI Stn S153: a, pereopod 1; b, pereopod 2; c, pereopod 3; d, pereopod 4; e, pereopod 5; f, pereopod 6; g, pereopod 7; h, pereopod 1, distal carpus; i, pereopod 6, distal articles; j, pereopod 6, distal carpus.

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margin convex and fringed with about 19 well-spaced setae; in decalcified preparations outer margin showing narrow membranous margin and short setal canals; exopod short and rounded; copulatory endopod article 1 stout, article 2 short and not reaching apex of sympod. Pleopod 3 exopod outer margin finely setulose with single large seta. Pleopod 4 exopod narrowly triangular, reaching to about mid-length of endopod, outer margin setulose.

Uropods Uropod not quite reaching to end of pleotelsonic process; ramus about twice length of peduncle; peduncle bearing one or two long apical setae, ramus with 4–6 distal setae.

Female: Similar to male except for sexually dimorphic pleopods 1 and 2. Pleopod 2 subcircular, margin setose, setae simple.

REMARKS: In relative proportions of body and general configuration *Haploniscus miccus* seems to be closest to *H. silus* and *H. tangaroae*. It also shares with these species the large subapical spine on the anterior margin of the carpus of pereopod 6. Distinguishing features include the precise form of the male first pleopod and the diminutive rostrum. A tiny rounded rostrum linked with a broadly truncated pleotelson having small lateral processes is present in only two other haploniscids, *H. antarcticus* Vanhöffen and *H. percavix* Menzies. Menzies (1962) provided only a scant description of *H. percavix* without details of any appendages, although it is clear from the figure that it has a more elongate pleotelson than *H. miccus* and has the pereon/pleotelson outline continuous. Similarly, Vanhöffen (1914) gives a rather superficial account of *H. antarcticus*, but includes a sketchy figure of the male pleopod 1 sufficient to set it apart from *H. miccus*.

Haploniscus piestus sp. nov. (Figs 10–12)

MATERIAL EXAMINED: NZOI Stns F869, 1♀; F892, 1♀; P933, 1♂: P939, 1♀; P941, 1♂, 5♀♀.

HOLOTYPE: Adult male (as microscope slide mounts), from NZOI Stn P933, 20 April 1980, 41°39.7′S, 165°13.1′E, Tasman Sea, 4419–4421 m, deposited in the collections of the New Zealand Oceanographic Institute, Wellington, New Zealand, type no. H-429.

PARATYPES: In alcohol and as microscope slide preparations, deposited in the collections of the New Zealand Oceanographic Institute, type nos P-620, P-621, P-622, and the British Museum (Natural History), reg. no. 1983:463.

ETYMOLOGY: The epithet is from the Greek word *piestos* meaning depressed, and alludes to the flattened body form of this species.

DESCRIPTION: Male:

Body Length 3.45 mm, maximum width 1.75 mm, smooth, white; body broadly oval and strongly dorsoventrally flattened; lateral margins of pereon and pleotelson only weakly discontinuous.

Cephalon Much broader than long, dorsally convex with outer surfaces splayed, anterolateral angles rounded, anterior margin deeply concave. Rostrum raised, arising behind front margin of head, apex surmounted by obtuse tooth so that it may appear tridentate from some viewing angles.

Pereon Broad, oval, strongly depressed, convex medially with lateral epimera splayed almost to horizontal; pereon outline smooth; pereonites 6 and 7 shorter than rest; pereonite 7 not fused with pleotelson although suture line less pronounced than on more anterior pereonites. Adjacent lateral margins of pereonites 1–5 minutely crenulate and setulose.

Pleotelson Short, tapering, broadly truncated, posterolateral processes small; dorsal surface smooth, depressed as for pereon. Branchial chamber and anal opening subcircular.

Antennae Antenna 1 reaching only to mid-point of peduncle article 5 of antenna 2; peduncle article 1 robust, little shorter than the more slender article 2, article 3 just over half length of article 2; flagellum four-articulate with article 1 half length of article 2; aesthetasc formula 0:0:1:2. Antenna 2 relatively long and robust, extending back to the posterior margin of pereonite 4; peduncle article 3 bearing only small blunt dorsal tooth, articles 5 and 6 subequal in length, flagellum 14-articulate.

Mouthparts Labrum and labium unmodified. Mandibular incisor and lacinia (left) five-dentate, left spine row consisting of five spines, right row of six, the proximal three spines on each side weakly setose, the distal two or three (right) spines coarsely dentate. Mandible palp article 1 little over half length of article 2, article 3 small, reflexed; outer margin of article 1 with single spine, of article 2 with two apical spines, of article 3 with eight short marginal spines and two long apical spines. Maxilla 1 outer lobe carrying 13 stout spines of which five appear dentate; inner lobe apically setose with one short and one long spine, inner margin bearing single small spine. Maxilla 2 inner lobe with pair of ornate comb-like apical spines and single subapical marginal spine, inner proximal margin bearing four very long setae; middle lobe with two apical spines; outer lobe with four apical spines. Maxilliped with distal margin of endite bearing two small spines, inner distal angle with one large and one small spine, distal surface minutely setulose; three coupling spines present; palp article 3 little less than half length of article 2.

Pereopods Pereopods increasing markedly in length from 1 to 6, 7 slightly shorter than 6; basis narrow proximally, anterior margin of pereopods 2–7 with three or four setae, posterior margin with 2–4; ischium showing big increase in length from pereopod 1 to 7, ischium of pereopod 6 almost twice length of that of pereopod 1; merus short, expanded distally, anterodistal angle of pereopods 1–5 with single spine, of 6 and 7 with pair of slender spinules, posterodistal angle of pereopods 1–4 with pair of setae, of 5–7 with single

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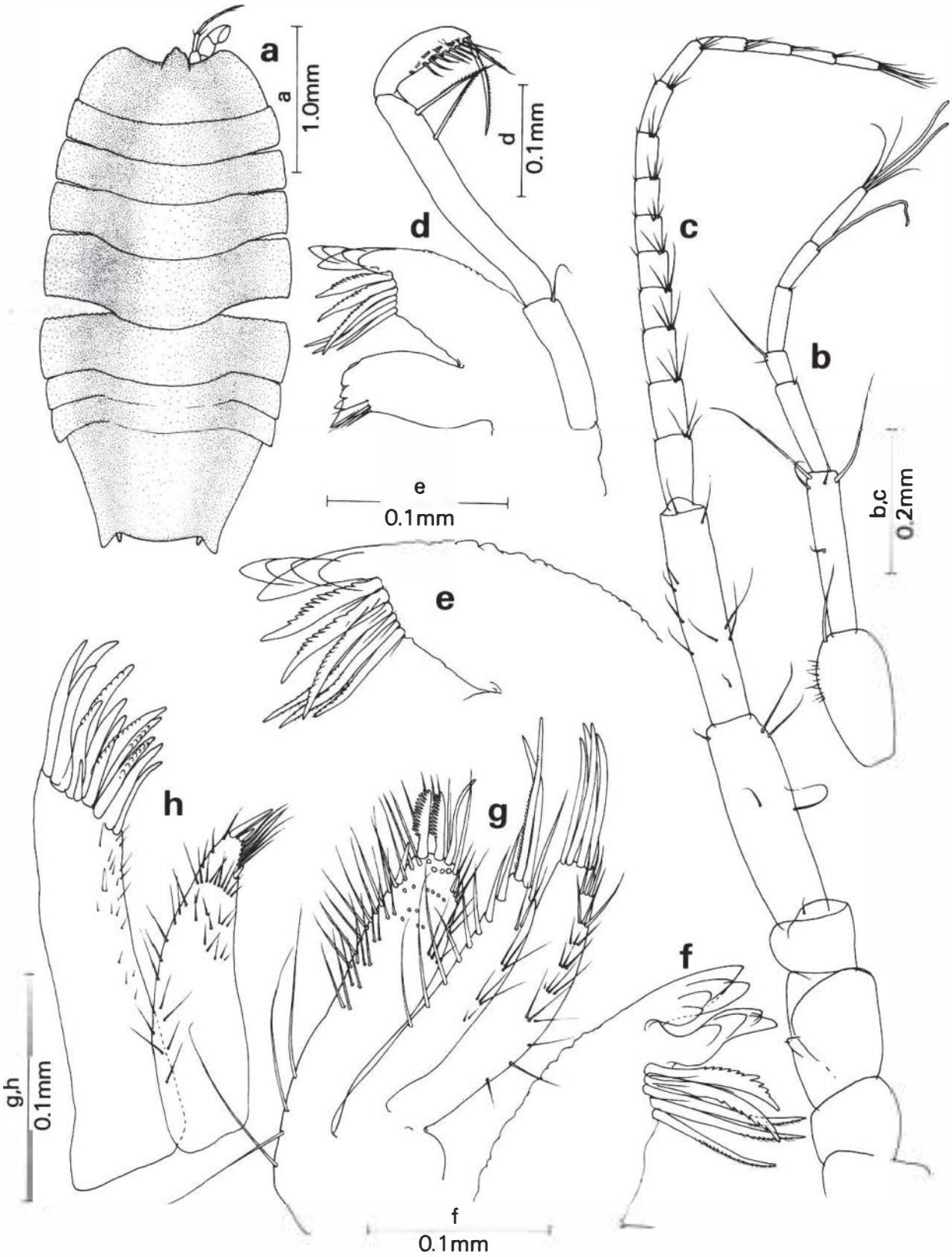

FIG. 10. *Haploniscus piestus* sp. nov. Paratype female, NZOI Stn F869: a, entire, dorsal view. Holotype male: b, antenna 1; c, antenna 2; d, right mandible; e, right mandible; f, left mandible; g, maxilla 2: h, maxilla 1.

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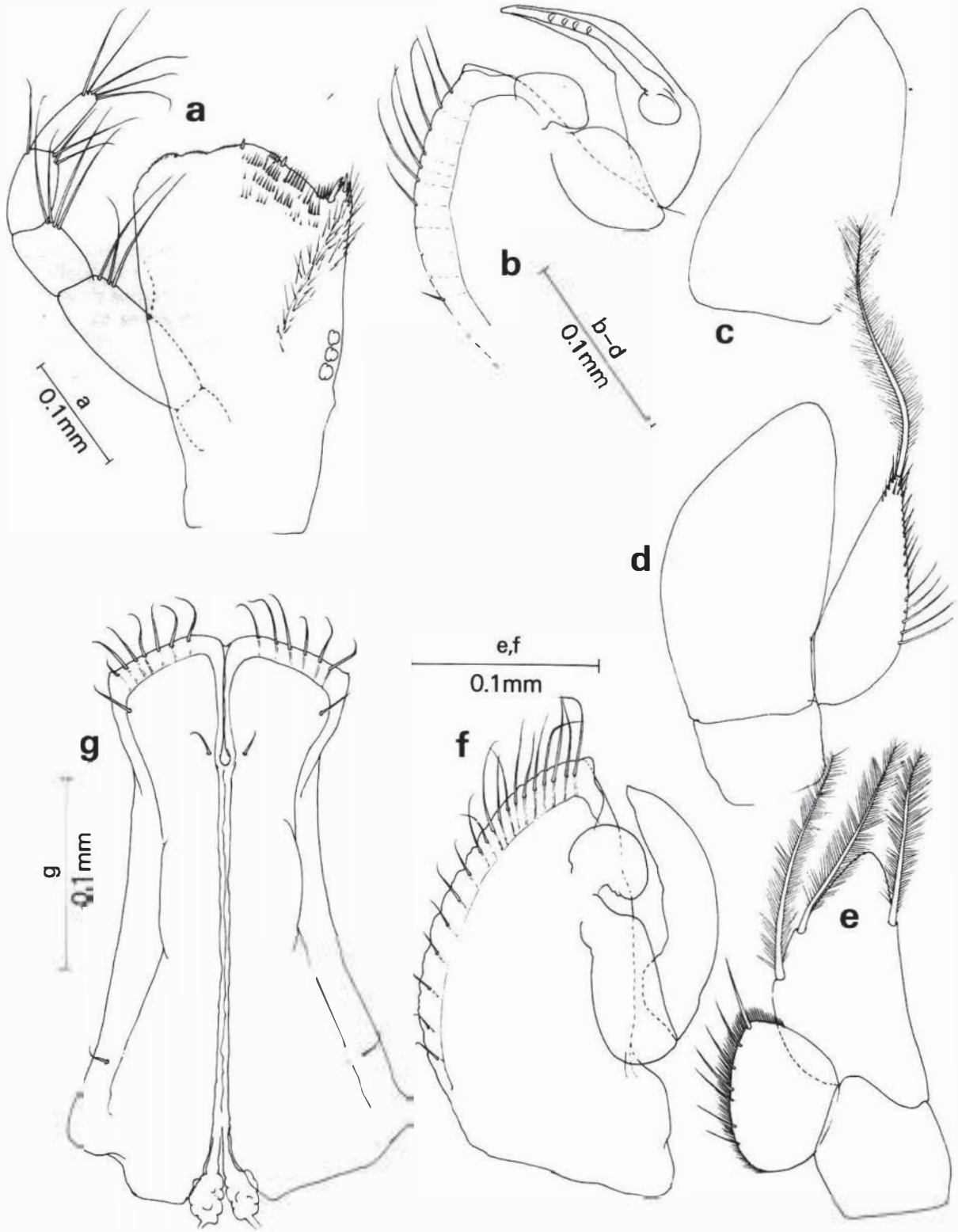

FIG. 11. *Haploniscus piestus* sp. nov. Holotype male: a, maxilliped; b, pleopod 2, paratype male, NZOI Stn P941; c, pleopod 5; d, pleopod 4; e, pleopod 3; f, pleopod 2; g, pleopod 1.

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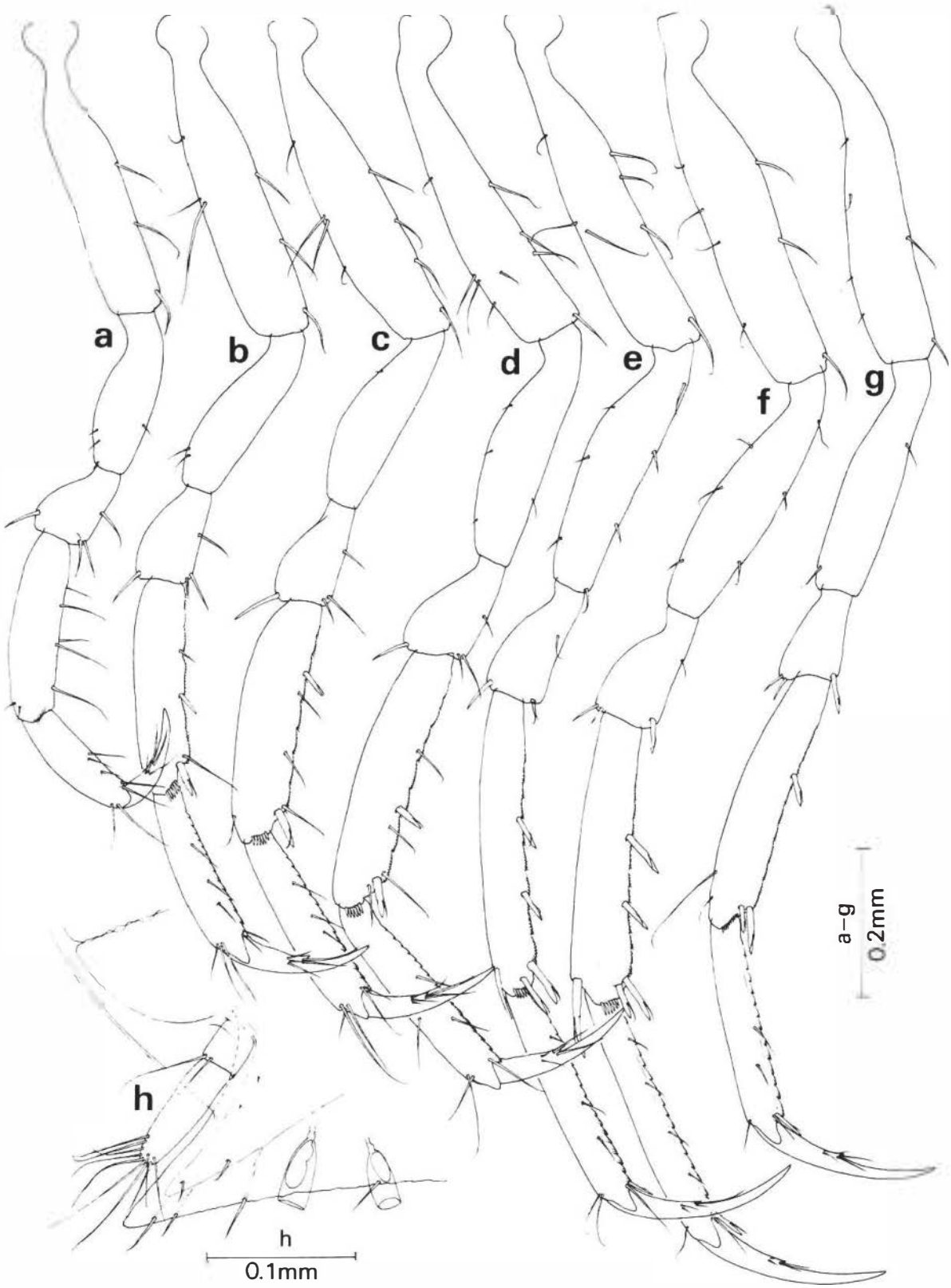

FIG. 12. *Haploniscus piestus* sp. nov. Holotype male: a, pereopod 1; b, pereopod 2; c, pereopod 3; d, pereopod 4; e, pereopod 5; f, pereopod 6; g, pereopod 7; h, uropod.

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spine; carpus rectangular, posterior margin of pereopod 1 setose, of 2–4 with setae and spines, of 5–7 with stout spines only, posterodistal angle of pereopod 1 naked, of 2–4 with solitary stout spine, of 5–7 with pair of stout spines; anterior margin of carpus of pereopods 5 and 6 with single large subapical spine; propodus much shorter than carpus on pereopod 1, only slightly shorter on pereopods 2–7, posterior margin sparsely setose, posterodistal angle on pereopods 5–7 with single slender spine; dactylus elongate; unguis half length of dactylus, accessory tooth simple.

Pleopods Pleopod 1 almost rectangular, lateral sympod margin with solitary seta; rami contiguous; each ramus with six or seven distomarginal setae and two surficial setae. Pleopod 2 sympod subtriangular, outer margin rounded, fringed with about 19 setae; exopod small and rounded; copulatory endopod article 1 robust, article 2 short and stout, not reaching beyond apex of sympod. Pleopod 3 exopod rounded, outer margin setulose and with seven setae. Pleopod 4 exopod elongate, outer proximal margin bearing five setae, outer distal margin fringed with short setae.

Uropods Peduncle one-third length of ramus; apex of peduncle with two setae, apex of ramus with about 10 setae.

Female: Similar to male except for sexually dimorphic pleopods. Pleopod 2 subcircular, fringed with simple setae.

REMARKS: It is difficult to assess critically the relationships of *Haploniscus piestus* because so many earlier species are inadequately described and any comparison has to be limited to superficial characters only. Five species seem to be close to *H. piestus*, having a similar body form, rostral configuration, and simple spatulate male pleopod 1. These are *Haploniscus tridens* Menzies, *H. tricornis* Menzies, *H. tricornoides* Menzies, and *H. capensis* Menzies from the South Atlantic, and *H. gernekei* Kensley from South Africa. *Haploniscus tricornis, H. tricornoides* and *H. capensis* differ from *H. piestus* in having longitudinal pleotelsonic ridges, and *H. gernekei* has distinctive divergent distal angles on the first male pleopod. The remaining species, *H. tridens*, is the most closely allied to *H. piestus*, agreeing quite well on most of the characters described and figured by Menzies, which for this species includes the mandible and a small part of pereopods 2 and 6. Despite these conformities they are clearly not conspecific, *H. piestus* having a much more depressed pereon and a more prominent rostral process.

Haploniscus saphos sp. nov. (Figs 13–15)

MATERIAL EXAMINED: NZOI Stn P939, 4♂♂, 2♀♀.

HOLOTYPE: Adult male (in alcohol) from NZOI Stn P939, 22 April 1980, 41°20.4′S, 166°54.8′E, Tasman Sea, 1760–1799 m, deposited in the collections of the New Zealand Oceanographic Institute, Wellington, New Zealand, type no. H-428.

PARATYPES: In alcohol and as microscope slide mounts, deposited in the collections of the New Zealand Oceanographic Institute, type no. P-619, and the British Museum (Natural History), reg. no. 1983:464.

ETYMOLOGY: The epithet is the Greek word meaning distinct.

DESCRIPTION: Male:

Body Length 3.02 mm, maximum width 1.70 mm, smooth, white; margins of pereon and pleotelson continuous.

Cephalon Deeply convex, anteriorly truncated, lateral margins weakly concave, anterior margin straight with small triangular rostral process.

Pereon Oval in outline, broadly convex mid-dorsally with epimeral surfaces moderately splayed; lateral margins of pereonites continuous, anterior and posterior angles quadrate; pereonites 5–7 partially fused with pleotelson, suture lines distinct laterally but very faint medially. Adjacent lateral margins of pereonites 1–4 fringed with short fine setules.

Pleotelson Very much shorter than maximum width, broadly truncated posteriorly with small posterolateral processes; lateral margins straight or weakly sinuous; dorsal surface convex with pair of shallow ridges parallel to lateral margin and extending from inner angle of posterolateral process to about half pleotelson length.

Antennae Antenna 1 peduncle article 2 longer and more slender than article 1, article 3 only one-third length of article 2; flagellum four-articulate with article 1 less than half length of article 2; aesthetasc formula 0:0:2:2+2. Antenna 2 peduncle article 3 with large triangular tooth (distal segments and flagellum missing).

Mouthparts Labrum and labium unmodified. Mandibular incisors and left lacinia five-dentate; left spine row comprising six spines, right row seven spines; four proximal spines on each side simple, distal two or three (right) spines irregularly dentate. Mandibular palp article 1 almost half length of elongate article 2, article 3 shorter than 1 and reflexed; article 1 naked, outer distal angle of article 2 with three long spinules, article 3 with three marginal spines and three long apical spines. Maxilla 1 outer lobe bearing 13 robust spines, inner lobe rather angular with single short apical spine and few fine setae. Maxilla 2 inner lobe with pair of ornate comb-like apical spines and three elongate simple spines, inner distal margin with single spine; outer and middle lobes each bearing four long apical spines, the innermost spine on the middle lobe having finely dentate margin; inner margin of middle lobe setose with five or six flattened blade-like setae. Maxilliped with distal margin of endite carrying three small ornate spines, distal surface with numerous setae and rows of short spinules; three coupling spines present; palp article 3 half length of article 2.

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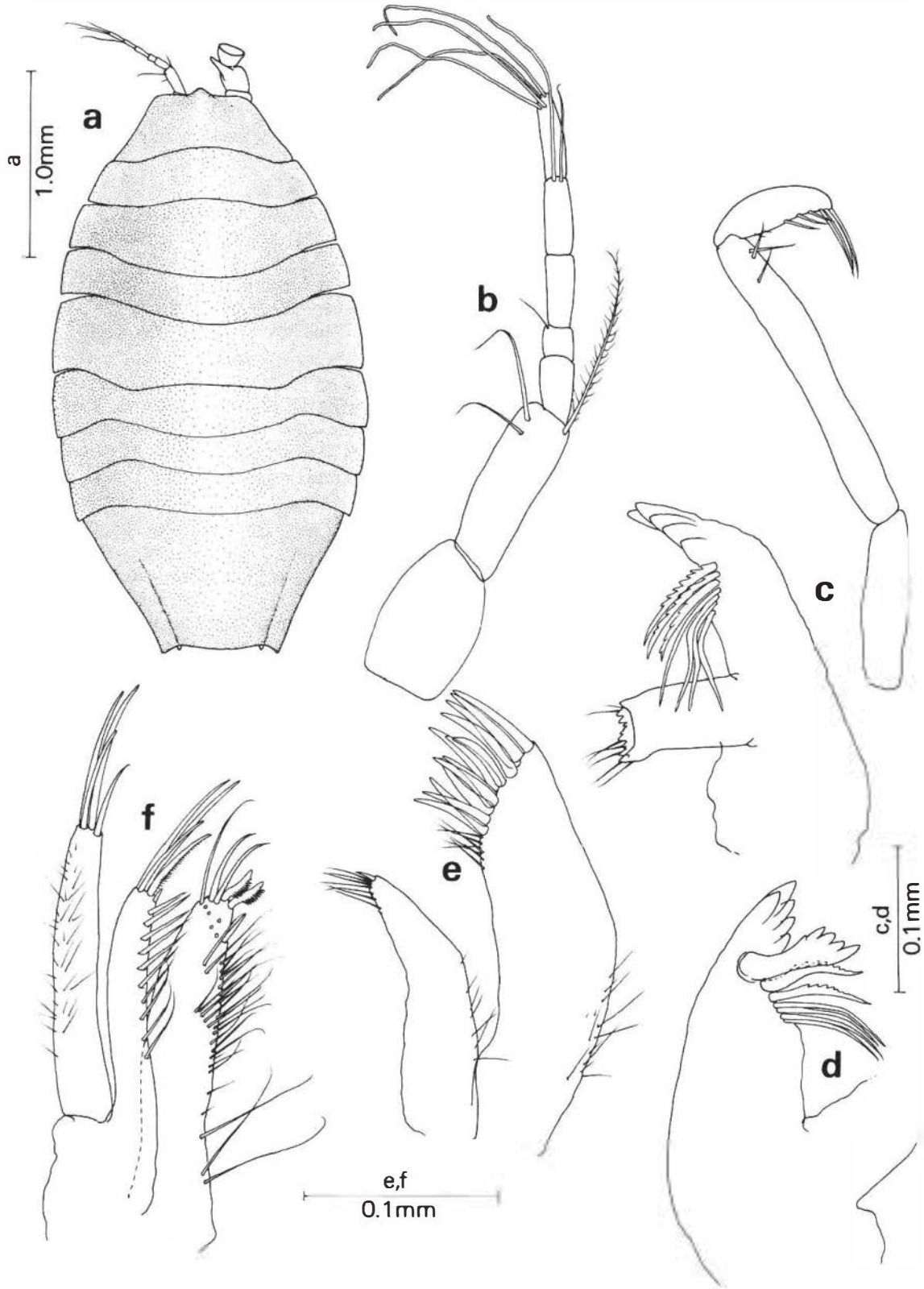

FIG. 13. *Haploniscus saphos* sp. nov. Holotype male: a, entire, dorsal view. Paratype male, NZOI Stn P939: b, antenna 1; c, right mandible; d, left mandible; e, maxilla 1; f, maxilla 2.

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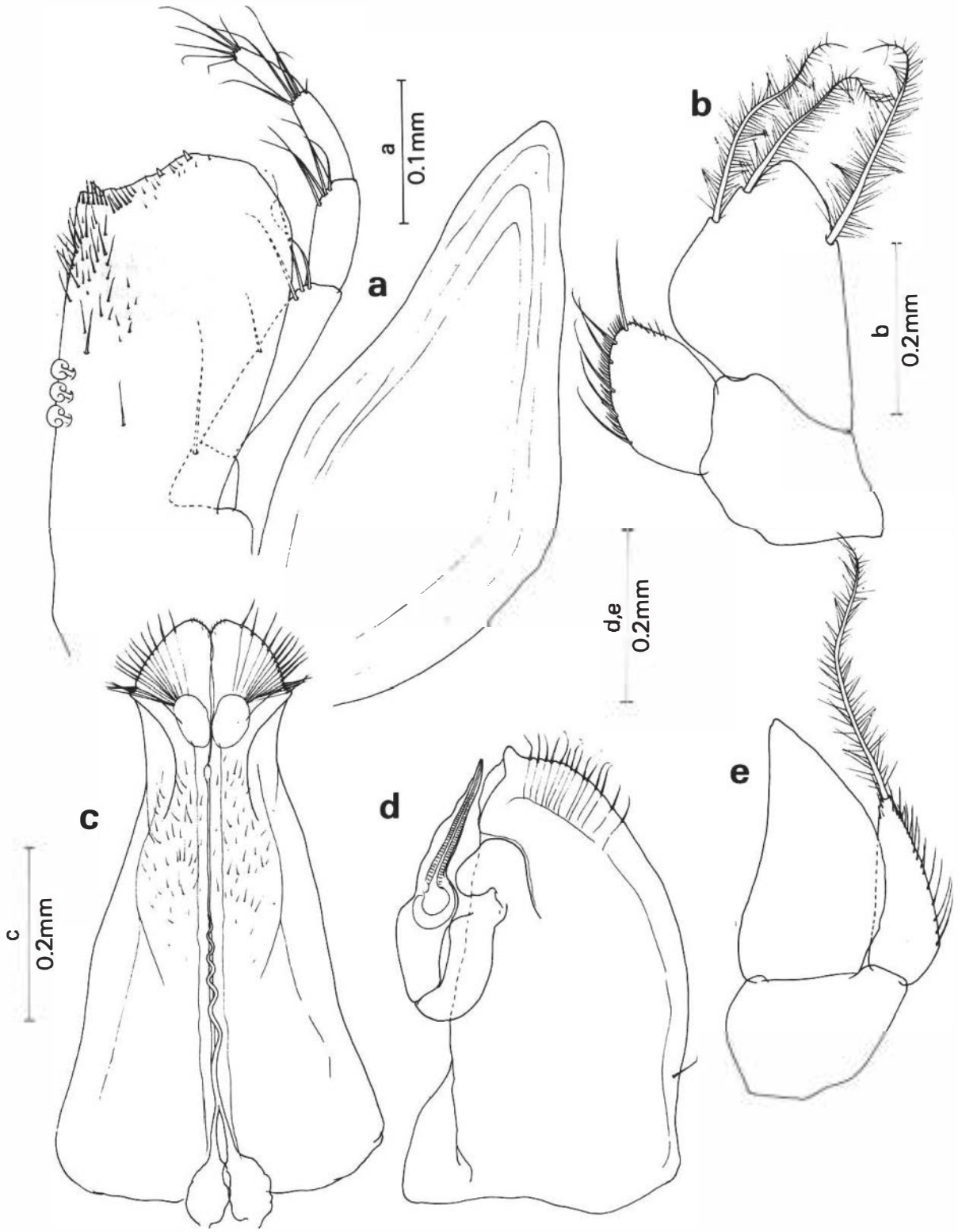

FIG. 14. *Haploniscus saphos* sp. nov. Paratype male, NZOI Stn P939: a, maxilliped; b, pleopod 3; c, pleopod 1; d, pleopod 2; e, pleopod 4.

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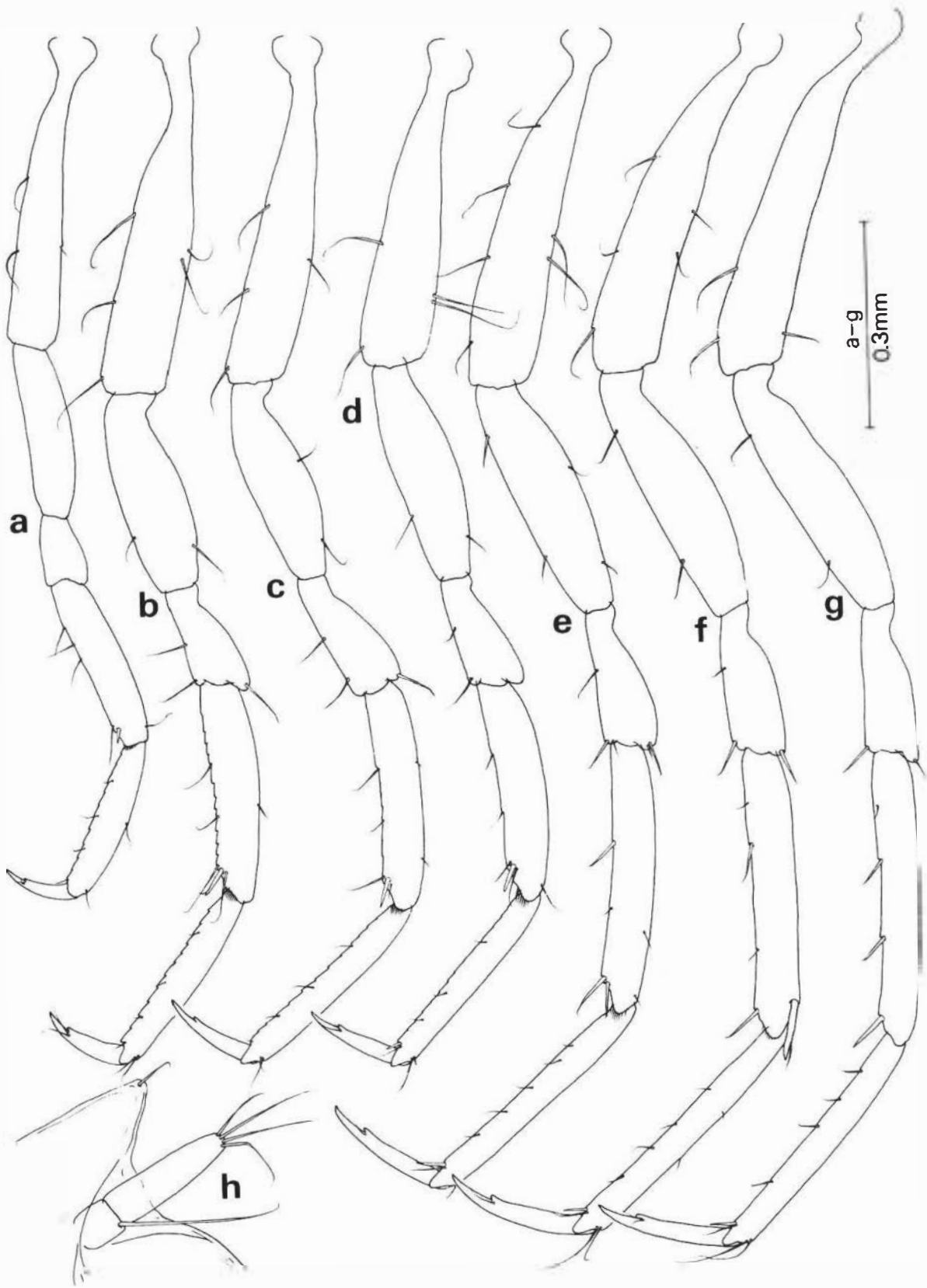

FIG. 15. *Haploniscus saphos* sp. nov. Paratype male, NZOI Stn P939: a, pereopod 1; b, pereopod 2; c, pereopod 3; d, pereopod 4; e, pereopod 5; f, pereopod 6; g, pereopod 7; h, uropod.

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Pereopods Pereopod 1 much shorter than pereopod 2, pereopods 2–4 subequal in length, shorter than pereopods 5–7, which are also subequal; all pereopods sparsely setose and spinose; basis with 1–3 antero- and posteromarginal setae; ischium elongate-oval with 0–2 marginal setae; merus expanded distally, posterior margin with two setae, anterodistal angle bearing single seta or spinule; carpus rectangular, posterior margin with three or four setae on pereopods 1–4 tending to spines on pereopods 5–7 and with single spine at distal angle, anterodistal margin of pereopod 6 bearing solitary large subapical spine; propodus more slender and little shorter than carpus, posterior margin with 4–6 short setules; dactylus weakly curved only; unguis almost one-third dactyl length, accessory tooth simple.
Pleopods Pleopod 1 triangular, spatulate, lateral margins of sympod membranous but devoid of setae; rami membranous, rounded, contiguous, each with 14 fine setae and long setal canals; small notches at outer proximal margin of rami mark line of shallow oblique grooves on dorsal surface that converge to midline. In the dissected paratype a long sinuous filament extends from the tip (or very close to the tip) of the penes along the sperm canal for about half its length. Pleopod 2 sympod outer margin rounded, membranous, bearing one proximal and 14 distal setae, the latter with long setal canals; exopod simple, inconspicuous; copulatory endopod with stylet not reaching beyond apex of sympod. Pleopod 3 exopod bearing six long marginal setae and fringe of short setules. Pleopod 4 exopod extending about two-thirds length of endopod, outer margin with five well-spaced proximal setae, becoming more densely setulose distally.
Uropods Only just projecting beyond posterior margin of pleotelson and thus scarcely visible from dorsal aspect; peduncle one-quarter length of ramus with single long apical seta.

Female: Except for sexually dimorphic pleopods 1 and 2, similar to male.

REMARKS: *Haploniscus saphos* is readily distinguished from other known species of the genus by its broadly oval body shape in combination with a diminutive obtuse rostral process and a very short broad pleotelson. Three Southern Ocean species, *Haploniscus antarcticus*, *H. laticephalus* and *H. oviformis* possess a small triangular rostrum and approach *H. saphos* in general body form, but are easily separated on a number of features of detail. Of these, only *H. antarcticus* has had the male described for direct comparison with *H. saphos*.

Chauliodoniscus gen. nov.

TYPE-SPECIES: *Chauliodoniscus tasmanaeus* sp. nov.

DIAGNOSIS: Haploniscidae with pereonites 5–7 free (pleotelson may be fused mid-dorsally with one or two pereon somites but lateral margins separated); one or more of pereonites 2–4 with prolonged anterolateral angles; pereonite 5 freely articulating with pereonite 6. Head without rostrum; body only weakly depressed dorsoventrally, subcylindrical in transverse section; fully conglobating. Antenna 2 peduncle article 3 stout, about as long as wide and with long spinous process. Pleotelson truncated posteriorly, posterolateral angles weakly produced. Uropods two-segmented, inserted in concavities between anal rim and pleotelsonic processes.

ETYMOLOGY: The generic name is formed by combining the Greek words *chauliodon* meaning with projecting teeth and *oniskos* meaning an insect. Gender masculine.

COMPOSITION: In addition to the type-species described below, eight other species are allocated to the new genus from their previous designation in *Haploniscus*: *armadilloides* Hansen, 1916; *elevatus* Menzies, 1962; *ovalis* Menzies, 1962; *parallelus* Menzies, 1962; *princeps* Menzies, 1962; *quadrifrons* Menzies, 1962; *reyssi* Chardy, 1974, and *trituberculatus* Menzies, 1962.

REMARKS: The novel morphology of *Chauliodoniscus tasmanaeus* gen. et sp. nov. amongst the other haploniscids in the New Zealand fauna was immediately obvious. The body is subcylindrical rather than depressed, has no hint of a rostrum, and is fully conglobating with the front of the head closing against the ventral surface of the pleotelson. The head does not seal tightly with the pleotelson however, the concave cephalic margin leaving a space through which the antennae project. Another feature of interest is the precise mode of conglobation, not previously noted for haploniscids — the head closes on to the branchial chamber leaving the anus outside the rolled-up body. This may enable the isopod to void faeces whilst fully enrolled without contaminating the enclosed appendages or respiratory surfaces.

Conglobation imposes special mechanical and hence morphological demands on the body, manifest in *Chauliodoniscus tasmanaeus* in the loose articulation of the four anterior pereonites and the broad articulating membranes. Pereonite 4 has the normal open articulation with pereonite 5, which is itself mobile and structurally distinct from pereonites 6 and 7. Pereonites 6 and 7 exhibit partial fusion with the pleotelson and concommitant inflexibility, although weak dorsal sutures are still just visible. Pereonite 1 is unmodified. In the male only, pereonites 2–4 (especially 3 and 4) have well-developed anterolateral extensions that slide over one another during enrollment. These processes are splayed slightly and in an enrolled individual project outwards to form a spiky ball. The marked sexual dimorphism displayed by *Chauliodoniscus* has not previously been reported in haploniscids — the female is fully conglobating but lacks the striking anteriorly directed pereonal processes. Pleopod features that might eventually contribute to the generic diagnosis include the narrow and

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apically simplistic pleopod 1 of the male, and the very short stout copulatory endopod of pleopod 2 arising from a sparsely setose and heavily muscularised sympod.

Positive assignment of other species to *Chauliodoniscus* is made difficult by inadequate descriptions of most of the potential candidates. From Menzies' Atlantic species, *elevatus*, *princeps* and *quadrifrons* clearly belong to the new genus, possessing conspicuous pereonal processes and an arostrate cephalon. Three other species, *ovalis*, *parallelus* and *trituberculatus*, are included on the evidence of habitus figures that indicate a similar body form although the pereonal processes are less pronounced. Menzies makes no mention of any abililty these forms might have towards conglobation but it can reasonably be deduced from the arrangement and architecture of the pereon tergites that they do enroll. Also referred to the new genus is *reyssi* of Chardy (1974), which in addition to body shape agrees well with *C. tasmanaeus* in mouthpart and pleopod structure. Finally, *armadilloides* from an Ingolf station south of Iceland (Hansen 1916) completes the genus as presently conceived. Hansen notes the near cylindrical body shape, absence of rostrum, and a conglobating habit. His only adult specimen, a female, lacks pereonal processes, but in this respect resembles the female of the type-species. Future work may show that *armadilloides*, like *C. tasmanaeus*, exhibits sexual dimorphism. The new genus corresponds to Group A in Chardy's mathematical analysis of the Haploniscidae (Chardy 1977).

DISTRIBUTION: North and South Atlantic Ocean; Tasman Sea. Depth range 1301–5024 m.

Chauliodoniscus tasmanaeus sp. nov. (Figs 16–18)

MATERIAL EXAMINED: NZOI Stns P935, 1♂; P937, 4♂♂, 19♀♀.

HOLOTYPE: Adult male (in alcohol) from NZOI Stn P937, 21 April 1980, 41°19.2′S, 166°27.9′E, Tasman Sea, 3253–3347 m, deposited in the collections of the New Zealand Oceanographic Institute, Wellington, New Zealand, type no. H-432.

PARATYPES: In alcohol and as microscope slide preparations, deposited in the collections of the New Zealand Oceanographic Institute, type nos P-626, P-627, and the British Museum (Natural History), reg. no. 1983:465.

ETYMOLOGY: The epithet refers to the type-locality with the Greek suffix *-aeus* meaning belonging to.

DESCRIPTION: Male:

Body Length 2.25 mm, maximum width 0.85 mm, smooth, white, very heavily calcified; body elongate, rectangular, pleotelson slightly narrower than pereon; fully conglobating; dorsolateral margins and surfaces of body with numerous small setae.

Cephalon Broader than long, lateral margins rounded, dorsal surface deeply convex. Rostral process absent, anterior margin of head forming broad arch with weakly upturned and thickened rim. Front of head concave viewed dorsally, but may appear sinuous or even convex from a more posterodorsal aspect.

Pereon Strongly convex dorsally, almost parallel-sided, subcylindrical in transverse section, lateral surfaces about vertical. Pereonite 1 unmodified; pereonites 2, 3, and 4 with successively longer anterolateral processes each overlapping the one in front; these processes bevelled to allow freedom of movement during enrollment; apex of processes on pereonites 2–4 curved away from body. Pereonite 5 robust, widely spaced from pereonite 4, and freely articulating with pereonite 6, the lateral surface overlapping pereonite 5 during conglobation. Pereonites 1–5 with very broad articulating membranes. Pereonites 6 and 7 unmodified, partially fused and immobile, weak suture lines visible. Ventral surface of pereon extremely deeply concave.

Pleotelson Convex, tapering, very broadly truncated, with small posterolateral processes; posterior margin of pleotelson strongly convex (not clear from habitus drawing because of near vertical body margins). Branchial chamber and anal opening subcircular.

Antennae Antenna 1 peduncle articles 1 and 2 subequal in length, article 1 rounded, article 2 robust, article 3 one-third length of article 2; flagellum four-articulate with article 1 shorter than article 2; aesthetasc formula 0:1:2:1+2. Antenna 2 short, reaching only to the hind margin of the head; peduncle article 3 bearing long triangular dorsal tooth, article 5 greatly enlarged, rounded, about equal in length to article 6, which is stout but less inflated; flagellum nine-articulate with proximal articles broad; distal angle of peduncle article 6 and flagellar articles with rows of dense fine setae.

Mouthparts Labrum and labium unmodified. Mandibular incisor and lacinia (left) five-dentate; left spine row consisting of four spines, right row of five spines; two proximal spines on each side simple, distal two or three (right) spines dentate. Mandible palp article 1 elongate, little over half length of article 2, article 3 narrowly oval, reflexed; margin of article 1 with single seta, of article 2 with three distal spines, of article 3 with five graduated simple or finely setose spines. Maxilla 1 outer lobe bearing 13 robust spines about half of which have dentate margins; inner lobe slender, apex with two spines and group of four setae. Maxilla 2 inner lobe apex bearing pair of ornate comb-like spines and two simple spines, inner distal margin with single spine, inner proximal margin carrying three very long setae; middle lobe with three apical spines; outer lobe with four apical spines. Maxilliped endite having four small distomarginal spines and row of strong spinules at inner distal angle; two coupling spines present; palp article 3 slightly over half length of article 2.

Pereopods Increasing in length from 1 to 7 and with sparse armature of setae; spines absent; basis with 1–

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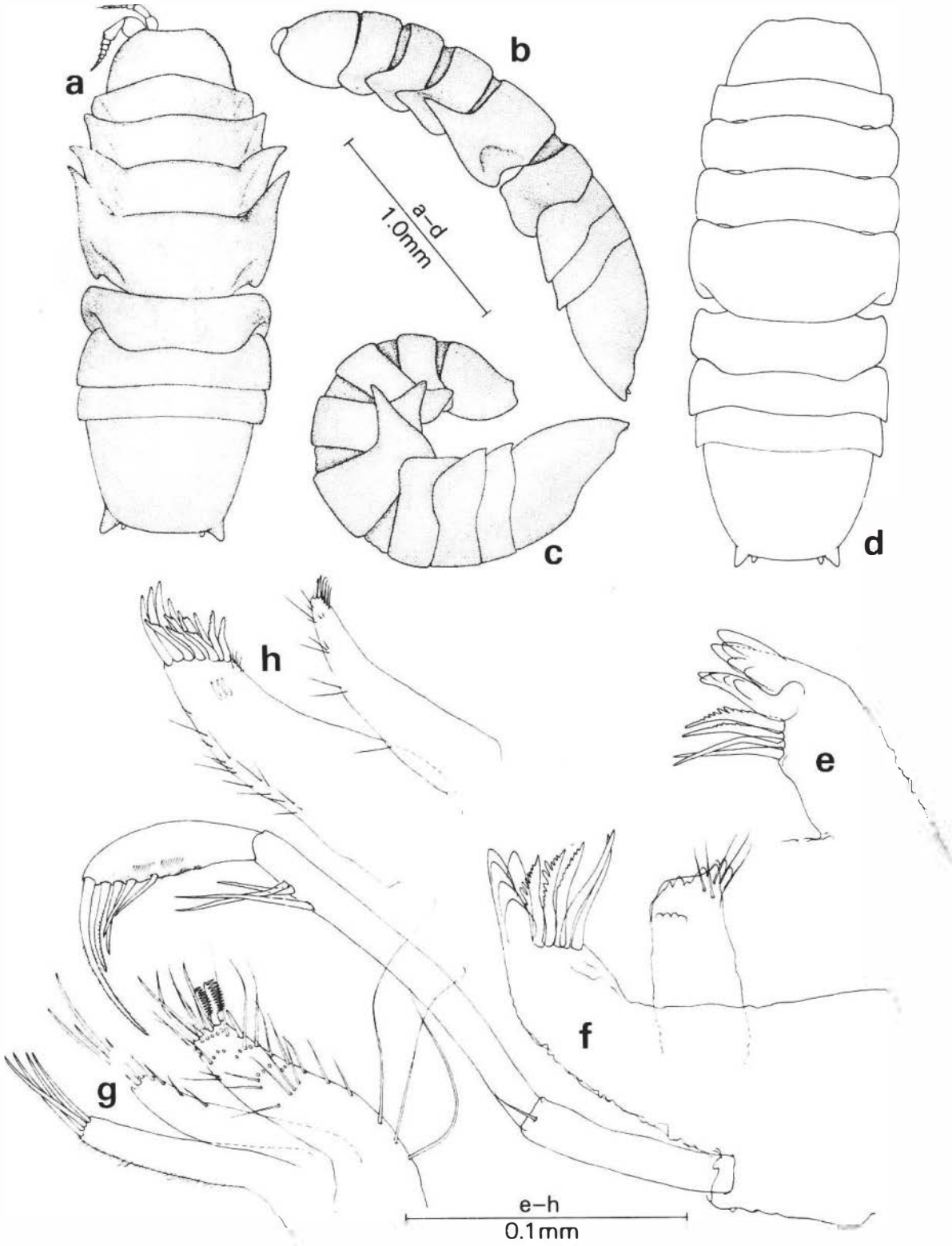

FIG. 16. *Chauliodoniscus tasmanaeus* gen. et sp. nov. Paratypes, NZOI Stn P937: a, entire male, dorsal view; b, entire male, lateral view; c, entire male, partially enrolled; d, entire female, dorsal view; e, left mandible; f, right mandible; g, maxilla 2; h, maxilla 1.

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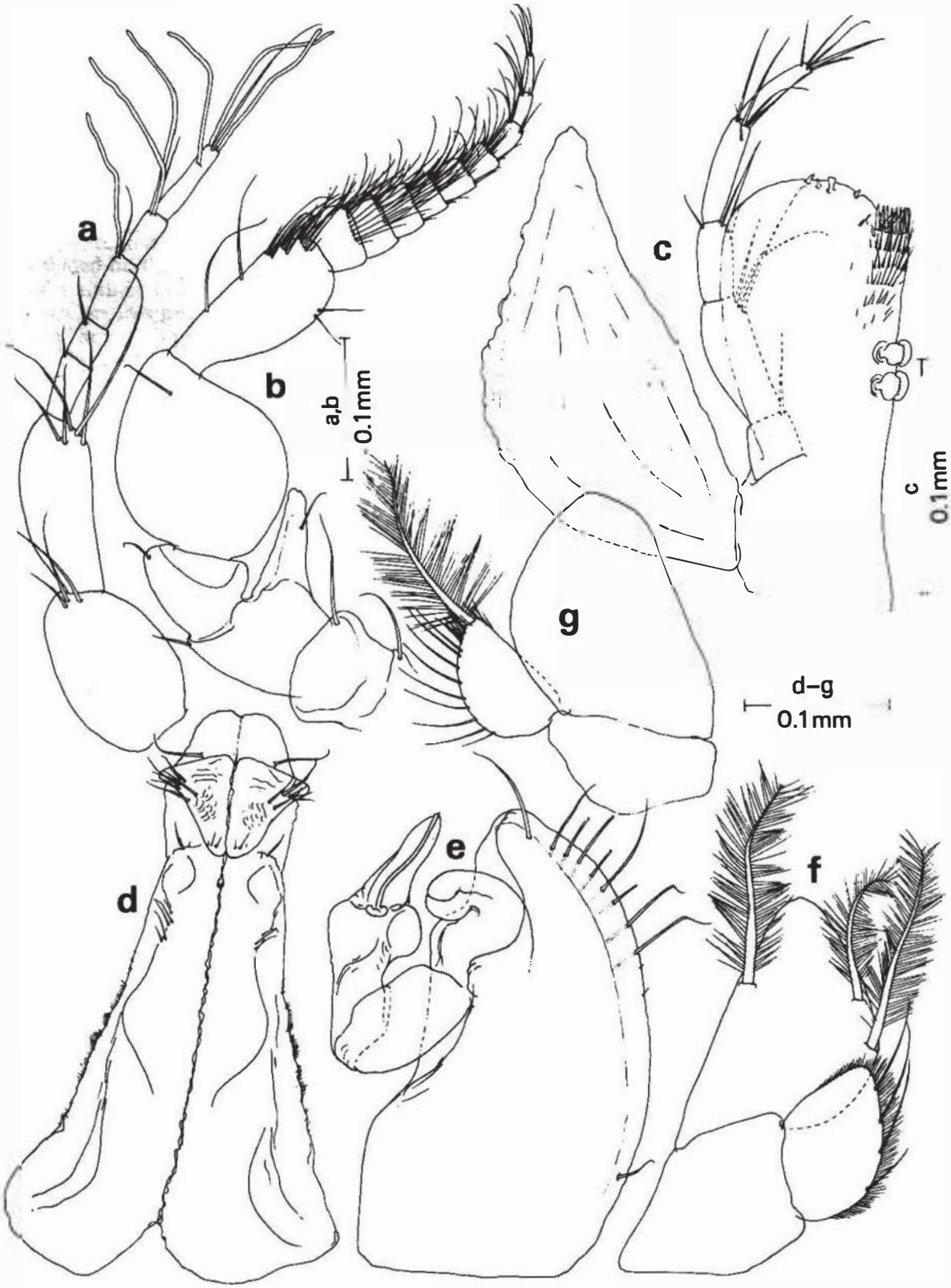

FIG. 17. *Chauliodoniscus tasmanaeus* gen. et sp. nov. Paratype male, NZOI Stn P937: a, antenna 1; b, antenna 2; c, maxilliped; d, pleopod 1; e, pleopod 2; f, pleopod 3; g, pleopod 4.

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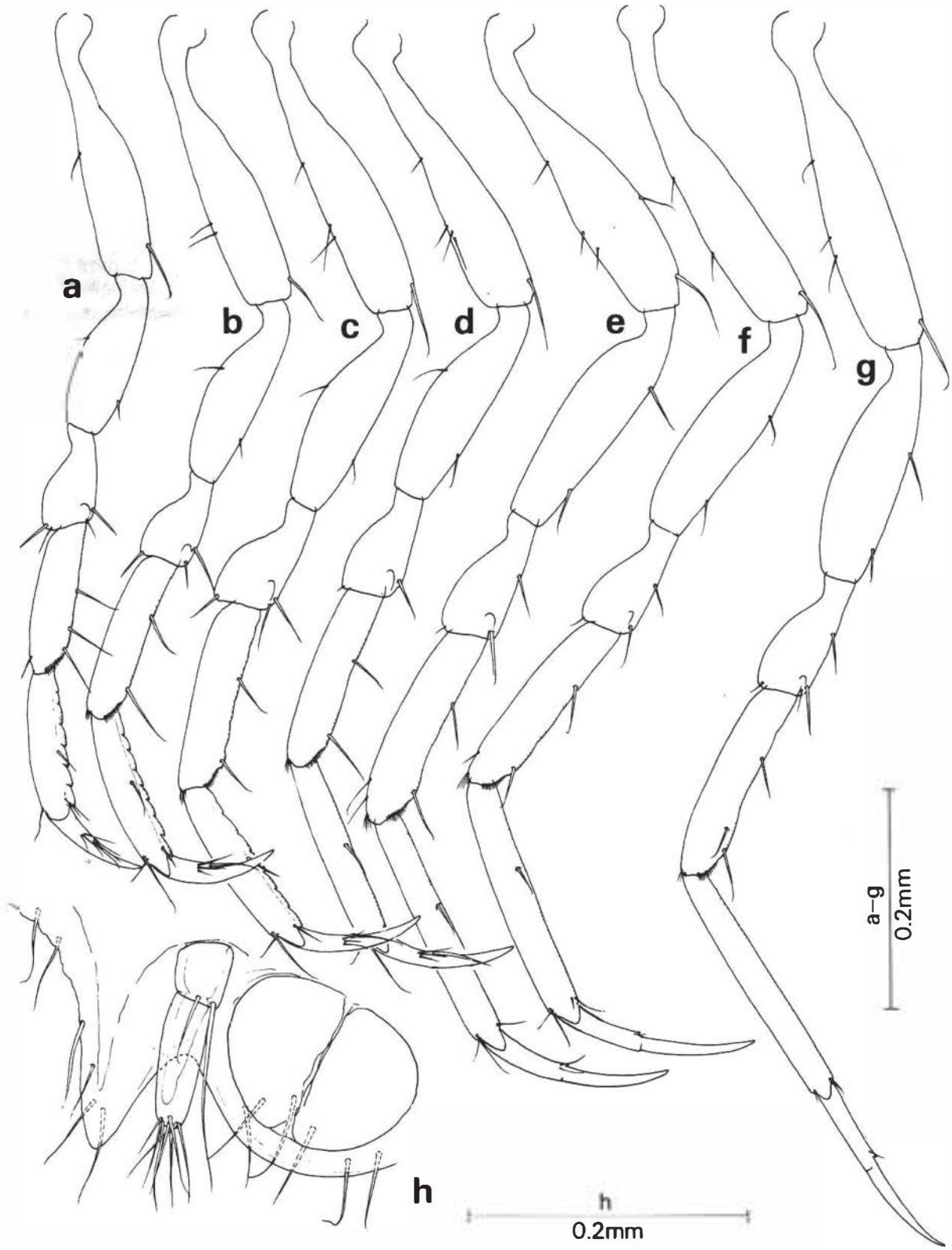

FIG. 18. *Chauliodoniscus tasmanaeus* gen. et sp. nov. Paratype male, NZOI Stn P937: a, pereopod 1; b, pereopod 2; c, pereopod 3; d, pereopod 4; e, pereopod 5; f, pereopod 6; g, pereopod 7; h, uropod, ventral pleotelson.

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4 small anteromarginal setae and one longer posterodistal seta; ischium elongate, anterior margin with single seta on pereopods 1–4, naked on 5–7, posterior margin with single seta on pereopods 1–4, two setae on pereopods 5–7; merus short, expanded distally, single long anterodistal seta on pereopods 1–3, much smaller seta on pereopods 4–7; pereopods 5–7 also with single mid-posteromarginal seta on merus; carpus rectangular, bearing three posteromarginal setae on pereopod 1, two setae on pereopods 2–7; propodus equal to carpal length on pereopod 1, becoming successively more elongate from pereopod 2 to pereopod 7, posterior mid-margin of pereopods 1–6 with single seta, of pereopod 7 naked; dactylus long, slender on posterior pereopods; unguis more than half length of dactylus, accessory tooth small and simple.

Pleopods Pleopod 1 sympod narrowly triangular, lateral margins with only narrow comb-like membrane, proximal setae absent, distal opening of sperm canal distinct; rami contiguous and devoid of apicomarginal setae, the dorsal surface forming a grooved knob-like triangular lobe with setose lateral horns. Pleopod 2 very robust, sympod fleshy, accommodating very large exopod retractors inserting on long medial tendon; outer margin of sympod bearing about nine distomarginal setae and one proximal seta; in decalcified preparations margin membranous with distinct setal canals; exopod small, hook-like, emerging between upper and lower margins of the flattened inner surface; copulatory endopod short, not reaching beyond end of sympod, article 1 stout, article 2 strongly sculptured, with blade-like distal part and well-defined sperm groove. Pleopod 3 exopod outer margin fringed with fine setules interspersed with four long setae. Pleopod 4 exopod short and broad, outer margin bearing about nine long setae, but without fringe of fine setules.

Uropods Uropod not reaching end of pleotelsonic process; peduncle almost half length of ramus with two apical setae; ramus with tuft of about eight apical setae.

Female: The pereonites of *Chauliodoniscus tasmanaeus* exhibit marked sexual dimorphism — in the female all the lateral angles are simple and rounded. These apart, the female has the same slender subcylindrical body shape as the male and conglobates fully to form the characteristic eccentric "ball". Pleopod 2 is subcircular, margin fringed with simple setae.

REMARKS: The distinctive features of *Chauliodoniscus tasmanaeus* were discussed earlier in the context of the generic diagnosis. The following key separates the nine species currently allocated to the genus, but because of inadequate data on most of these the key characters have had to be limited to aspects of body shape. The key is for males only — sexual dimorphism is pronounced in the type-species and may also occur in other members of the group to a greater or lesser extent, although it was not reported by Menzies for the four species of which he had both males and females (*ovalis, parallelus, princeps*, and *trituberculatus*). Females of *elevatus, quadrifrons* and *reyssi* are not known. The remaining species, *armadilloides*, is known only from a single adult female and has had to be included in the key as such.

Key to the species of *Chauliodoniscus* (males)

1. Pereonites 2–4♂ with strong anteriorly directed processes...2
— Pereonites 2–4♂ with at best small obtuse processes, or pereonite 4 alone produced...5
2. Antenna 2 peduncle article 5 greatly inflated...3
— Antenna 2 peduncle article 5 not inflated...4
3. Antenna 2 not reaching posterior margin of cephalon; pereonite 7 posterolateral angle obtuse...*tasmanaeus* sp. nov.
— Antenna 2 reaching to posterior margin of pereonite 1; pereonite 7 posterolateral angle acute...*elevatus*
4. Anterolateral process of pereonite 2♂ reaching well beyond posterior margin of cephalon...*princeps*
— Anterolateral process of pereonite 2♂ not or scarcely reaching posterior margin of cephalon...*quadrifrons*
5. Margins of pleotelson and pereon contiguous...*reyssi*
— Pleotelson narrower than pereon...6
6. Pleotelson with large dorsally indented swelling medially near posterior margin...*trituberculatus*
— Pleotelson convex dorsally...7
7. Front margin of cephalon broadly rounded, convex...*parallelus*
— Front margin of cephalon concave or sinuous...8
8. Front margin of cephalon concave; pereonite 2 lateral margin anteriorly produced...*ovalis*
— Front margin of cephalon sinuous; pereonite 2 lateral margin not produced...*armadilloides*(♀ only known)

Mastigoniscus gen. nov.

TYPE-SPECIES: *Mastigoniscus pistus* sp. nov.

DIAGNOSIS: Haploniscidae with pereonites 5–7 free (pleotelson may be fused mid-dorsally with one or more posterior pereon somites but lateral margins separated); pereonite 7 greatly reduced, narrower and very much shorter than pereonite 6, partially obscured dorsally by pereonite 6. Head without rostrum; body strongly dorsoventrally depressed. Antenna 2 peduncle article 3 stout, about as long as wide and with strong spinous process. Pleotelson expansive, posterolateral angles well developed. Male pleopod 2 endopod bearing exceptionally elongate thread-like copulatory stylet that loops around from the base; article 1 of the endopod is reversed from normal posture. Pleopod 4 exopod reaching beyond apex of endopod. Uropods two-segmented, inserted in concavities between anal rim and posterolateral pleotelsonic processes.

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ETYMOLOGY: The generic name is formed by combining the Greek words *mastigos* meaning a whip and *oniskos* meaning an insect, and alludes to the immensely long copulatory stylet. Gender masculine.

COMPOSITION: In addition to the type-species described below, four species previously placed in *Haploniscus* are transferred to *Mastigoniscus*: these are *concavus, gratus, gratissimus* and *generalis*, all described by Menzies and George (1972) from the region of the Peru-Chile Trench. A fifth, *H. latus* of Birstein (1971) from the N.W. Pacific, is also included, but does not fit comfortably within the present generic concept and may eventually find its proper designation elsewhere.

REMARKS: The most striking feature of *Mastigoniscus* is the exceptionally long copulatory filament that extends far beyond the posterior extremity of the pleotelson. Also, the basal article of this endopod is directed posteriorly and away from the midline of the body instead of anteriorly and towards it as is normally the case, so that the filament performs a complete loop around the branchial chamber before projecting posteriorly. A conspicuous feature of the ventral pleotelson of the type-species is the narrow longitudinal groove along the posterolateral process — a groove that presumably accommodates the copulatory filament at some stage. If so, the groove may be absent in the female, but to date only the male is known. A similar pleotelsonic groove exists in *gratus* but is not mentioned for the other species of the genus and must be assumed to be absent although the figures are far from clear on this point. The copulatory filament may also receive mechanical support in *pistus* from the pair of grooved lateral processes on the apex of pleopod 1. Similar but less well-defined grooves occur in *generalis* and *latus*, but are absent in *gratus* and *concavus* which have instead a pair of stout spines on the distolateral apex of pleopod 1 against which the filament probably rests. By contrast, the first male pleopod of *gratissimus* is simple, devoid of any lateral processes, although it could be significant that this species has by far the longest of all known pleotelsonic processes.

Few figures of pleopods 3–5 appear in haploniscid literature, but from what is available it appears that pleopod 4 of *Mastigoniscus* (figured for *gratus, gratissimus* and *pistus*) is unique in having an exopod that is as long as, or longer than, the endopod. In all other haploniscids in which it is known the exopod is only about one-half to two-thirds the length of the endopod.

Other features of the new genus include a large pleotelson with prominent posterolateral processes (except *latus*), an arostrate cephalon, and a much reduced seventh pereon segment. As a proportion of body size the pleotelson of *pistus* is the most expansive known — a trend observed to a lesser extent in other members of the genus with the exception of *concavus* that has a stout but not enlarged pleotelson. The pleotelsonic processes reach their greatest development in *gratissimus* where they extend to about half the body length. Compression of pereonite 7 is strongest in *pistus* to the extent that it is scarcely visible from the dorsal aspect. This segment is also much narrower than the preceding one in *pistus*, but is subequal in width or only slightly narrower in the other members of the genus.

DISTRIBUTION: North (*latus* only) and South Pacific Ocean. Depth range 2476–6281 m.

Mastigoniscus pistus sp. nov. (Figs 19–21)

HOLOTYPE: Holotype male (as microscope slide mounts), from NZOI Stn S202, 2 November 1979, 42°14.7′S, 175°08.6′E, off New Zealand east coast, 2476–2542 m, deposited in the collections of the New Zealand Oceanographic Institute, Wellington, New Zealand, type no. H-433.

ETYMOLOGY: The epithet is taken from the Greek word *pistos* meaning authentic.

DESCRIPTION: Male:

Body Length 3.1 mm, maximum width 1.74 mm on pereonite 6; smooth, white, heavily calcified; body very broad, oval, pleotelson contiguous with pereon; nonconglobating.

Cephalon Much broader than long, margin evenly rounded, without rostral process.

Pereon Broad, compact, strongly dorsoventrally flattened, epimeral surfaces expansive and only weakly deflexed. Pereonites increasing in length from 1 to 5; lateral angles subquadrate without anteriorly or posteriorly directed processes; pereonite 6 shorter than pereonite 5 and more rounded anterolaterally; pereonite 7 extremely short and much narrower than pereonite 6, partially concealed by preceding segment.

Pleotelson Massive, almost circular, equal in length to entire pereon and bearing stout straight posterolateral processes; dorsal surface convex, weakly trilobed posteriorly; posterior margin weakly convex. The swollen and heavily calcified first and second pleopods contribute to the massive development of the pleotelson as a whole. Branchial opening massive, subcircular; anal opening small. Ventral surface of pleotelsonic processes with deep longitudinal groove that extends from the tip of the process into the branchial chamber.

Antennae Antenna 1 peduncle article 2 longer than article 1, article 3 one-third length of article 2; flagellum four-articulate with article 1 less than half length of article 2; aesthetasc formula 0:1:2:3. Antenna 2 peduncle article 3 with simple triangular tooth, article 5 and flagellum missing.

Mouthparts Labrum and labium unmodified. Mandibular incisor and lacinia (left) five-dentate; left spine row consisting of four dentate and two simple spines. Mandibular palp slender, article 1 slightly less than half length of article 2, article 2 narrowly oval, reflexed;

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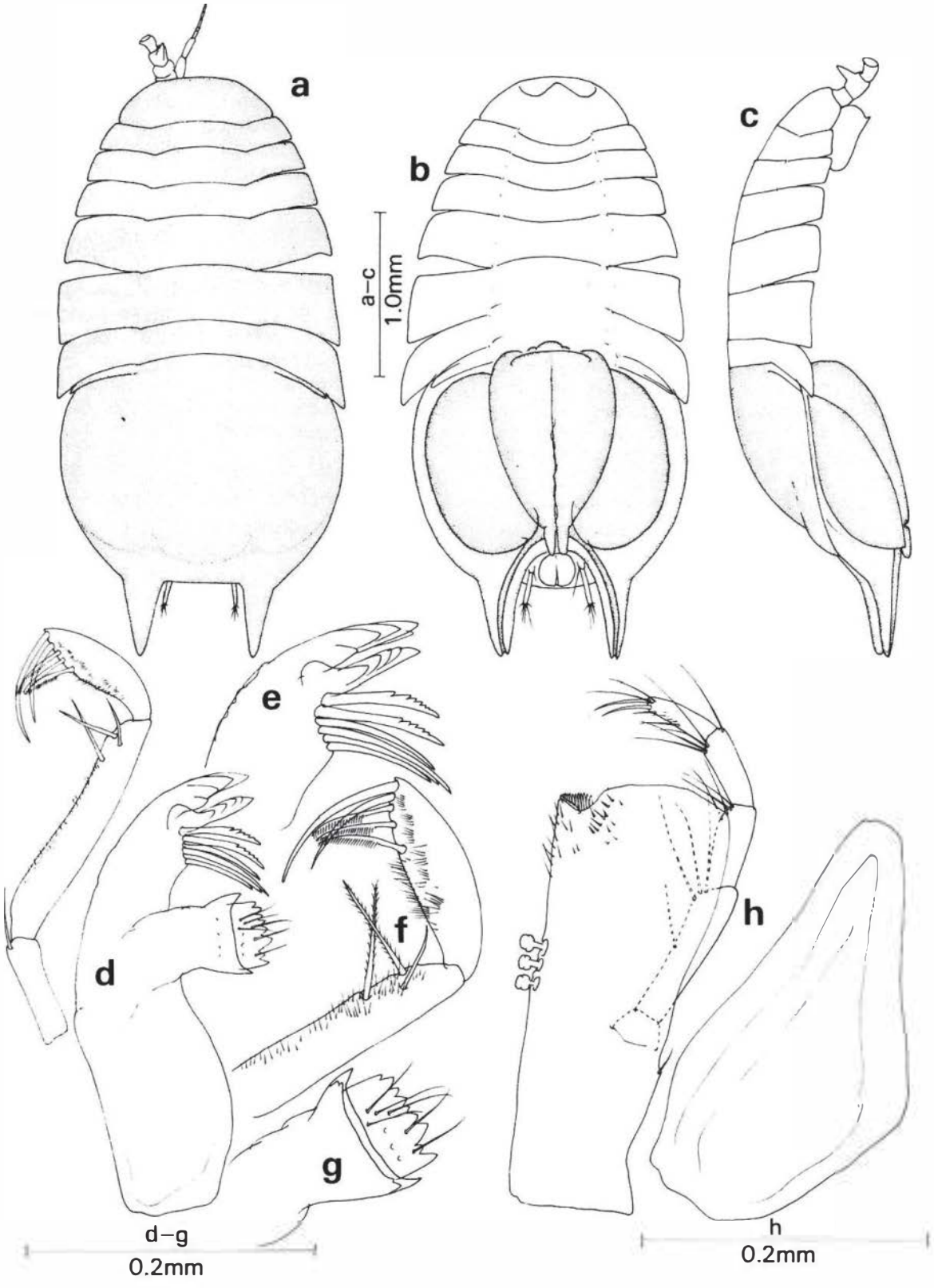

FIG. 19. *Mastigoniscus pistus* gen. et sp. nov. Holotype male: a, entire, dorsal view; b, entire, ventral view; c, entire, lateral view; d, left mandible; e, left incisor and spine row; f, left mandibular palp, distal articles; g, left molar; h, maxilliped.

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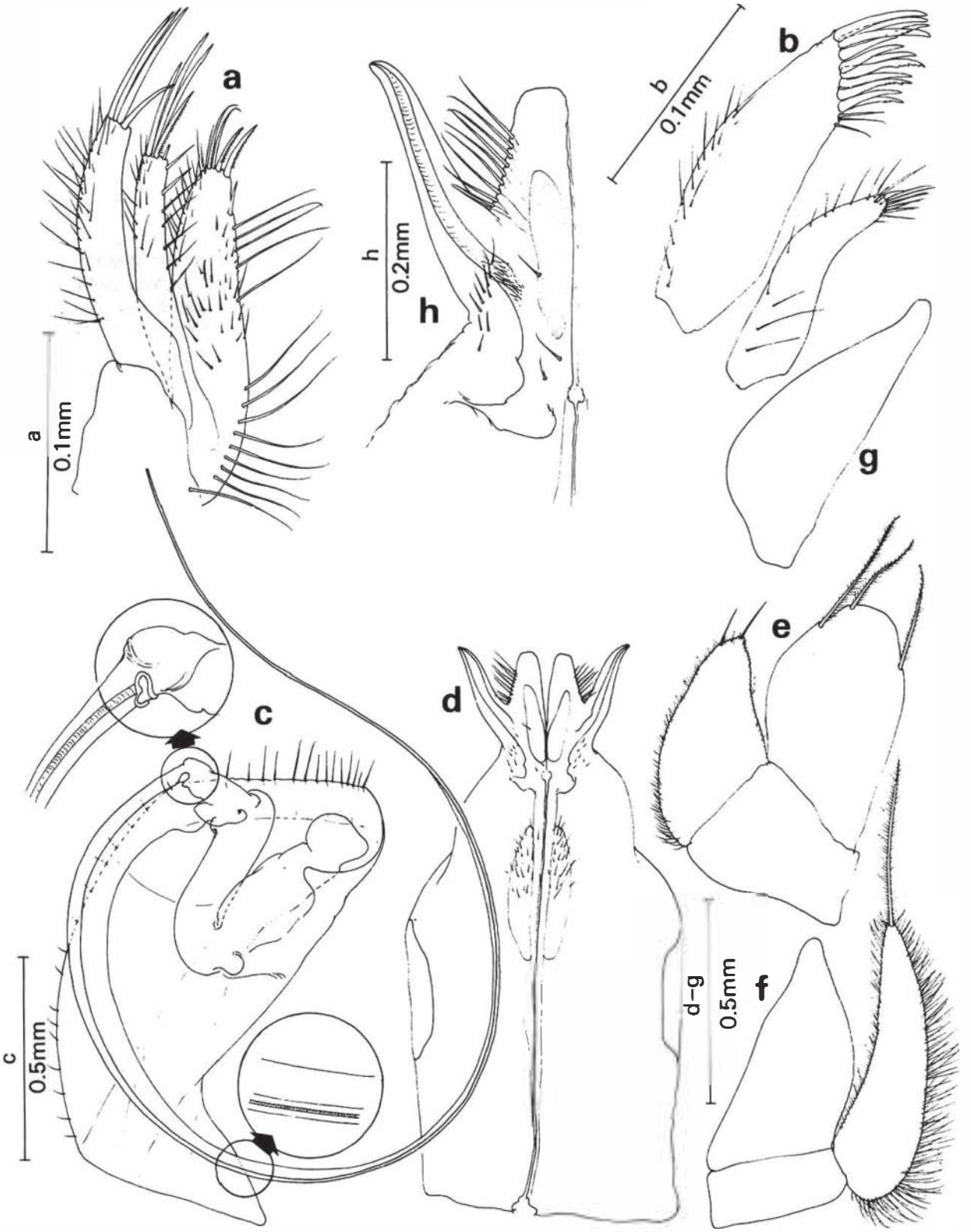

FIG. 20. *Mastigoniscus pistus* gen. et sp. nov. Holotype male: a, maxilla 2; b, maxilla 1; c, pleopod 2; d, pleopod 1; e, pleopod 3; f, pleopod 4; g, pleopod 5; h, pleopod 1, apex.

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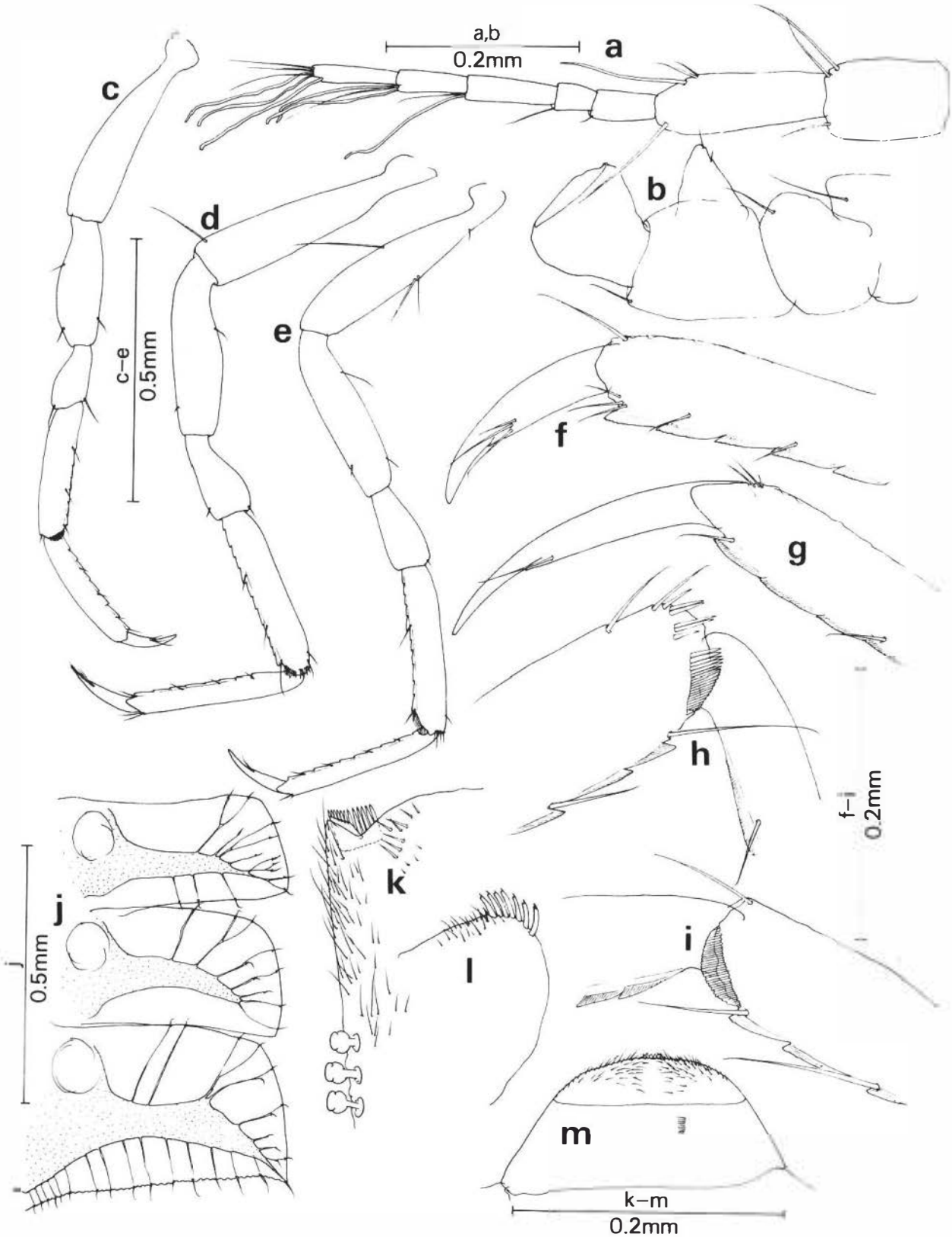

FIG. 21. *Mastigoniscus pistus* gen. et sp. nov. Holotype male: a, antenna 1; b, antenna 2, peduncle; c, pereopod 1; d, pereopod 2; e, pereopod 4; f, pereopod 1, distal articles; g, pereopod 4, distal articles; h, pereopod 2, apex of carpus; i, pereopod 1, apex of carpus; j, pereon epimera 2–4, decalcified; k, maxilliped endite; l, labrum; m, labium.

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article 1 bearing solitary distal seta, article 2 with two spines and one seta, article 3 having three comb-like spines and two long apical spines. Maxilla 1 outer lobe supporting 11 robust spines of which about four have dentate margins; inner lobe slender, apex with single spine and about eight setae. Maxilla 2 inner lobe bearing pair of comb-like apical spines and single simple distomarginal spine, inner margin fringed with about nine long setae; middle and outer lobes each with four long apical spines. Maxilliped endite with three coupling spines; palp article 3 half length of article 2.

Pereopods Only pereopods 1, 2, and 4 present on holotype. Basis slender, sparsely setose; ischium elongate, anterior and posterior margins with one or two small setules; merus short; carpus rectangular with two posteromarginal setae; propodus equal to length of carpus, posterior margin with four small setules.

Pleopods Pleopod 1 sympod very robust and heavily calcified, rectangular basally, tapering distally; rami structurally complex comprising rectangular median lobe and slender grooved laterally projecting horns; median lobes weakly divergent, devoid of apical setae but with row of about 10–11 lateral setae. Pleopod 2 sympod also extremely robust and calcified, accommodating large muscle pair inserting on exopod — the muscles have broad origins along the proximal and lateral margins of the sympod; distal margin of sympod bearing row of about 15 short setae; in decalcified preparations distal margin membranous with long setal canals; exopod small, knob-like, emerging close to inner distal angle of sympod; endopod very ornate and robust, article 1 elongate and reflexed away from midline of body (the reverse of the normal posture), article 2 immensely elongate performing complete loop within branchial chamber before emerging posteriorly; copulatory filament extending well beyond apex of pleotelsonic process (tip of filament broken off in holotype) and supported along three-quarters of its length by a wing-like membrane. Pleopod 3 exopod outer margin fringed with short setules and two long apical setae. Pleopod 4 exopod elongate, reaching to apex of endopod, outer margin densely fringed with long fine setules.

Uropods Very slender; peduncle one-quarter length of ramus with single apical seta; ramus bearing tuft of about seven setae.

Female: Unknown.

REMARKS: Important features of *Mastigoniscus pistus* were discussed earlier in the context of the generic diagnosis. This species has a somewhat unusual body shape for a haploniscid with its oval depressed pereon and massive bulbous pleotelson. Unlike other haploniscids studied so far, the first and second male pleopods do not form a relatively simple opercular valve over the branchial chamber, but are greatly enlarged, deeply convex ventrally and robustly calcified. The six species attributed to *Mastigoniscus* can be distinguished with the following key.

Key to the species of *Mastigoniscus* (males)

1. Posterolateral processes of pleotelson equal to length of pereon ..... *gratissimus*
— Posterolateral processes of pleotelson not more than half length of pereon 2
2. Lateral margins of pleotelson convexly rounded 3
— Lateral margins of pleotelson straight or weakly sinuous 5
3. Pleotelsonic processes very small, scarcely longer than uropods, acute ..... *latus*
— Pleotelsonic processes large, robust, apically blunt 4
4. Pleopod 1 apex with distolateral spines ..... *gratus*
— Pleopod 1 apex with stout distolateral grooved process ..... *pistus* sp. nov.
5. Pleopod 1 apex with stout distolateral spines; pleopod 2 sympod with about seven long distomarginal setae ..... *concavus*
— Pleopod 1 apex without distolateral spines; pleopod 2 sympod with only few short setae ..... *generalis*

Hydroniscus Hansen, 1916

Hydroniscus Hansen, 1916: 32; Menzies 1962: 109; Birstein 1963: 48; 1971: 192; Chardy 1974: 1160.

TYPE-SPECIES: *Hydroniscus abyssi* Hansen, 1916.

DIAGNOSIS: Haploniscidae with pereonites 5–7 fused with pleotelson to form a single robust segment (lateral sutures may be just visible but median surface of somites fully fused). Cephalon produced into large rostral lobe. Antenna 2 peduncle article 3 short, without spinous process. Uropods very small or absent. Fully conglobating. Pleotelson rounded or truncated posteriorly, posterolateral processes small, may be minute and inconspicuous from dorsal aspect.

COMPOSITION: Excluding the new species described below the genus comprises six species, four recorded from the Atlantic Ocean (*H. abyssi* Hansen, 1916; *H. quadrifrons* Menzies, 1962; *H. ornatus* Menzies, 1962; *H. vandeli* Chardy, 1974) and two from the Pacific Ocean (*H. minutus* Birstein, 1971; *H. vitjazi* Birstein, 1963).

REMARKS: Menzies (1962) gives a key to *Hydroniscus* in which he uses "uropoda absent" as a couplet separating *abyssi* and *quadrifrons* and yet goes on to describe and figure the uropods of *quadrifrons* in the subsequent text. Hansen (1916) specifically comments on the absence of uropods in the North Atlantic *abyssi*, a feature apparently shared only by *vitjazi* from the N.W. Pacific. Chardy (1977) noted that the six species could be divided into two groups on the shape of the posterolateral margin of pereonite 4. In the Pacific subgroup (*vitjazi, minutus*) the margin is backwardly produced, while in the Atlantic subgroup (*abyssi, quadrifrons, ornatus, vandeli*) there is no such process. The new species from New Zealand has the posterolateral angle of pereonite 4 produced, adding support to this geographical division.

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Hydroniscus lobocephalus sp. nov. (Figs 22–24)

MATERIAL EXAMINED: NZOI Stn P937, 9 specimens.

HOLOTYPE: Male (in alcohol) from NZOI Stn P937, 21 April 1980, 41°19.2′S, 166°27.9′E, Tasman Sea, 3253–3347 m, deposited in the collections of the New Zealand Oceanographic Institute, Wellington, New Zealand, type no. H-431.

PARATYPES: In alcohol and as slide preparations, in the collections of the New Zealand Oceaographic Institute, type no. P-625, and the British Museum (Natural History), reg. no. 1983:466.

ETYMOLOGY: The compound epithet is derived from the Greek words *lobos* meaning lobed, and *kephale* meaning head, and alludes to the massive rostrum of this species.

DESCRIPTION: Male:

Body Length 6.25 mm, maximum width 2.86 mm on pereonite 4; smooth, white, heavily calcified, fully conglobating.

Cephalon Head dominated by massive spatulate rostrum that fits neatly over anal opening and between the pleotelsonic processes during enrollment. Dorsal surface of rostrum almost flat, ventral surface swollen and deeply convex. Antennae located in deep cleft between rostrum and lateral margin of head.

Pereon Broad and strongly convex. Pereonites 1–4 free, posterolateral surfaces bevelled permitting smooth overlap of tergal margins during conglobation; posterolateral angle of pereonite 4 prolonged into backwardly directed tooth; adjacent margins of pereonites fringed with fine setules; very wide gap between pereonites 4 and 5 in extended individual, the point of articulation having a loose "ball and socket" arrangement on each side; pereonites 5–7 fused, without visible dorsal sutures and only weakly defined lateral sutures; anterolateral angle of pereonite 5 bearing small tooth that locates against the larger tooth on pereonite 4 during enrollment.

Pleotelson Convex, tapering posteriorly, with short stout conical posterolateral processes.

Antennae Antenna 1 peduncle article 2 little shorter and more slender than article 1, article 3 very small, about one-third length of article 2; flagellum nine-articulate with article 1 compressed and only half length of article 2; aesthetasc formula 1:2:2:2:2:4:4:4:4. Antenna 2 peduncle article 3 slightly longer than wide, without dentate dorsal process, article 5 shorter and stouter than article 6; flagellum 19-articulate, each article with three short fine setules.

Mouthparts Labrum and labium unmodified. Mandibular incisor and lacinia (left) five-dentate; left spine row comprising six spines, right row seven spines, the four proximal spines in each row simple and setulose, distal two or three (right) spines coarsely dentate; palp of mandible relatively robust, article 1 about four-fifths length of article 2, article 3 oval and reflexed; article 1 bearing four fine setae, article 2 with three stout spines, article 3 with five small plumose marginal spines and three long apical spines. Maxilla 1 outer lobe with 13 robust apical spines of which four are setose; inner lobe angular, bearing one stout apical spine, one slender spine and about 11 setae. Maxilla 2 inner lobe apex with pair of ornate comb-like spines and four slender spines, inner margin bearing two simple spines; apex of middle and outer lobes each with four elongate spines; all three lobes with dense array of marginal and surficial setae. Maxilliped with inner distal angle of endite bearing short spine and row of strong spinules; three coupling spines present; palp article 3 slightly more than half length of article 2.

Pereopods All pereopods very sparsely setose and spinose. Pereopods 1–4 showing only small successive increase in length; pereopods 5–7 also about equal in length although much longer than anterior four pairs. Basis stout, elongate, that of pereopod 7 a little more slender than the rest; basis of pereopods 5–7 with four long posteromarginal setae; ischium elongate-oval on pereopods 1–4, subrectangular on pereopods 5–7; merus very short; carpus rectangular, posterodistal angle with single long bifid spine on pereopods 5–7; propodus slender; dactylus almost straight, on pereopods 1–4 less than half length of propodus, on pereopods 5–7 more than half propodus length.

Pleopods Pleopod 1 sympod narrowly triangular, prolonged distally into pair of oblique horn-like processes each bearing two small setules; distal opening of sperm canal distinct; dorsal surface of sympod densely setulose distomedially; rami contiguous, distal margins sinuous, each ramus with eight long setae; genital papillae conical with spine-like apex. Pleopod 2 sympod outer margin with short setae proximally and numerous (*ca.* 30) long setae distally; exopod small and simple; copulatory endopod extending only slightly beyond apex of sympod, article 1 short and stout, article 2 slender, angular, with straight distal shaft. Pleopod 3 exopod outer margin with dense fringe of short setae interspersed with 17 long setae. Pleopod 4 exopod slender, curved, outer margin with about 30 long setae.

Uropods Peduncle half length of ramus with two apical setae; ramus bearing tuft of about nine setae.

Female: Essentially similar to male except for sexually dimorphic pleopods 1 and 2.

REMARKS: *Hydroniscus lobocephalus* is immediately distinguished from other species of the genus by the stout conical pleotelsonic processes and the horn-like projections of male pleopod 1. It shares with *H. vitjazi* and *H. minutus* the backwardly directed lateral angle on pereonite 4, and with *H. vitjazi* a multi-articulate antenna 1 flagellum. Antenna 1 has a 16-articulate flagellum in *H. vitjazi*, and a nine-articulate flagellum in *H. lobocephalus* — in all other *Hydroniscus* species it is only three- or four-articulate. It is difficult to comment much on *H. minutus*, which in all respects

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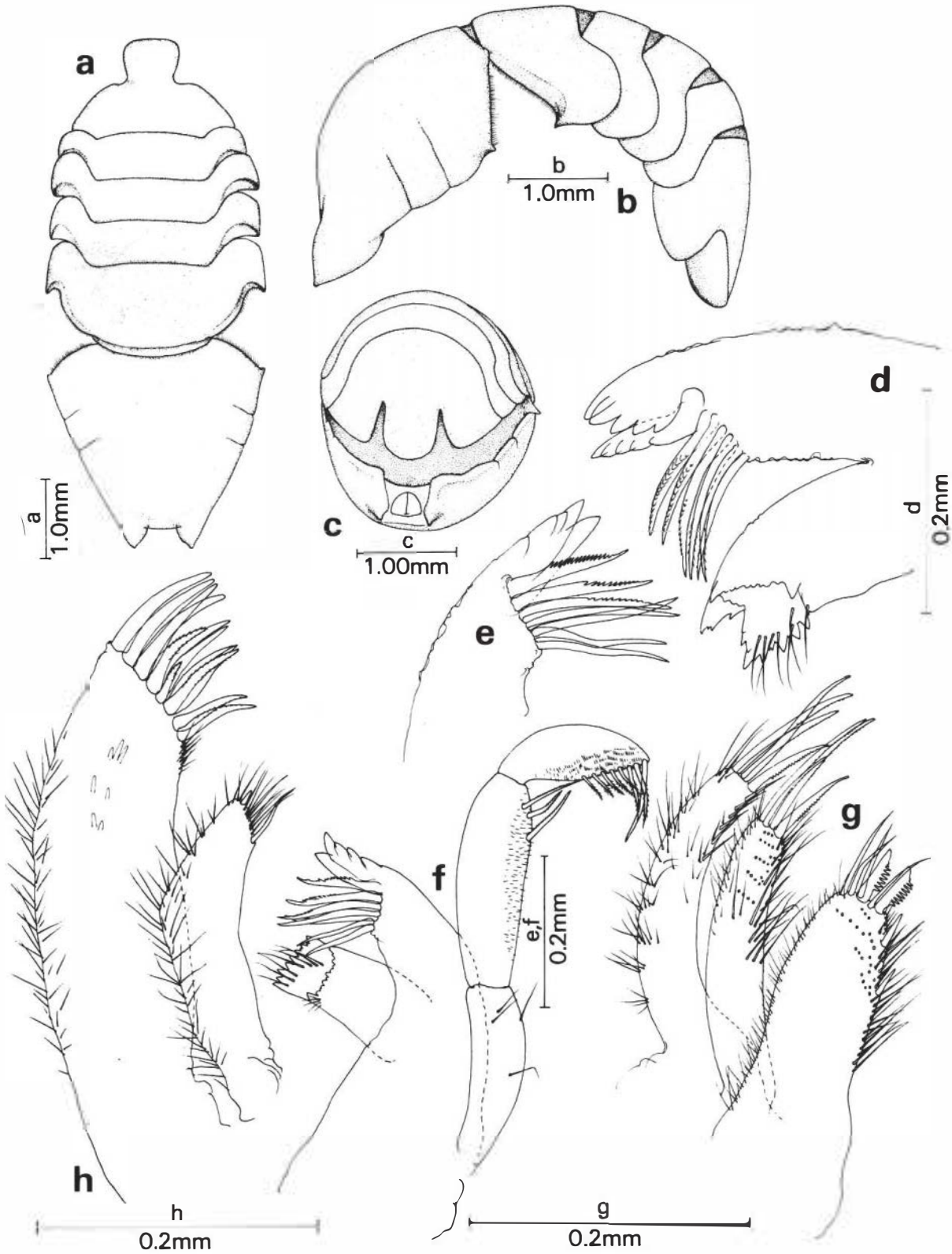

FIG. 22. *Hydroniscus lobocephalus* sp. nov. Paratype male, NZOI Stn P937: a, entire, dorsal view; b, entire, lateral view; c, entire holotype, enrolled; d, left mandible; e, right mandible; f, right mandible; g, maxilla 2; h, maxilla 1.

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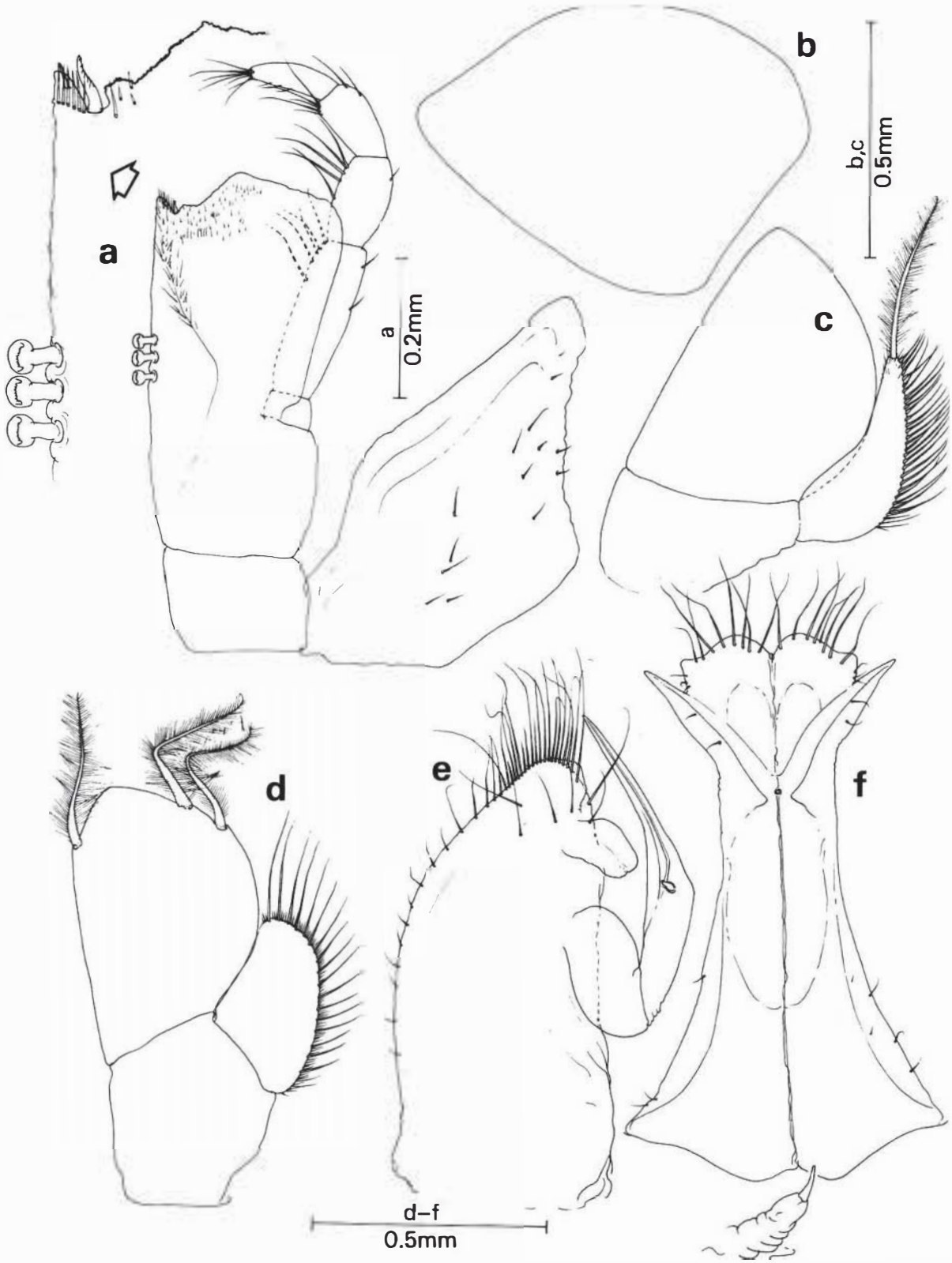

FIG. 23. *Hydroniscus lobocephalus* sp. nov. Paratype male, NZOI Stn P937: a, maxilliped; b, pleopod 5; c, pleopod 4; d, pleopod 3; e, pleopod 2; f, pleopod 1.

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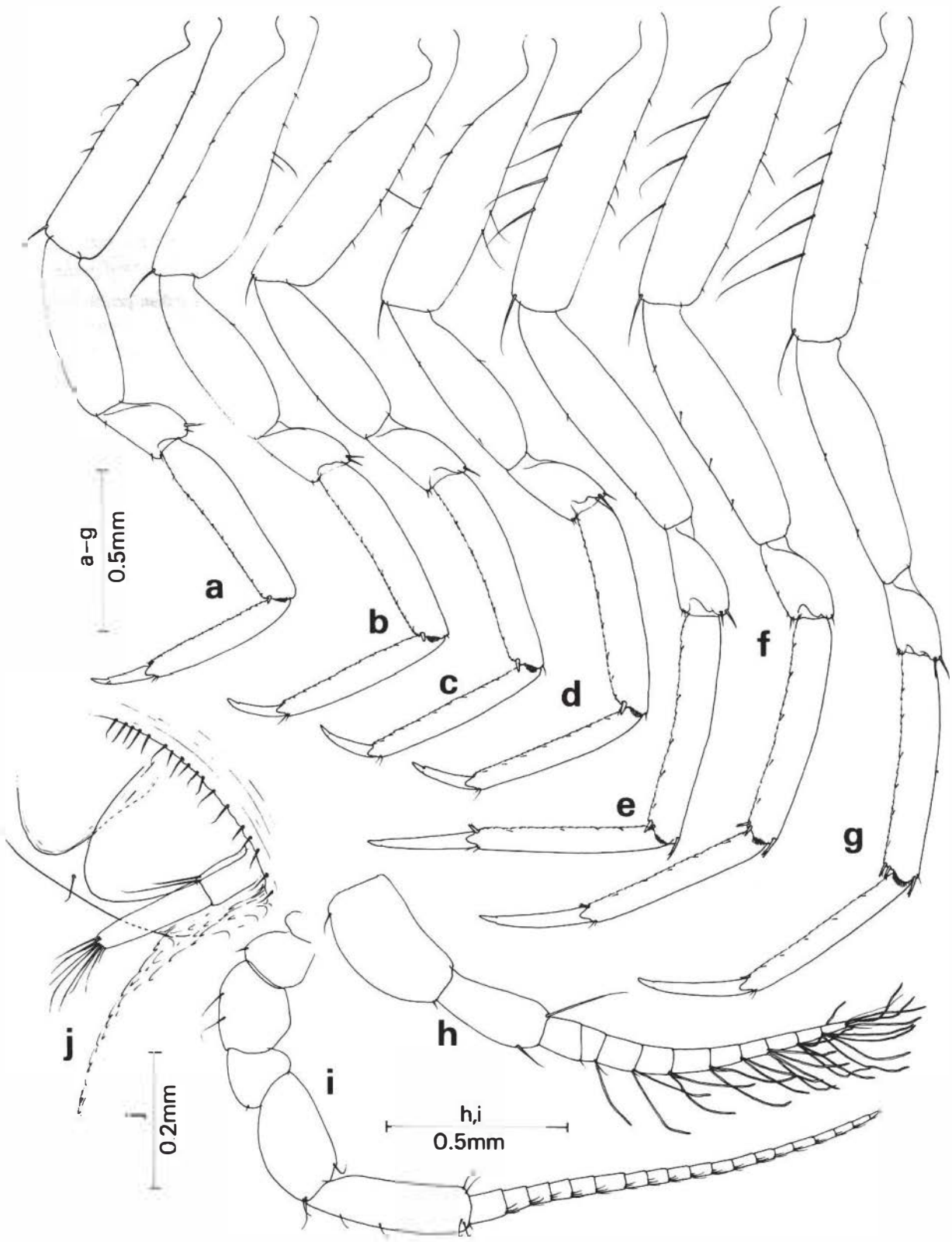

FIG. 24. *Hydroniscus lobocephalus* sp. nov. Paratype male, NZOI Stn P937: a, pereopod 1; b, pereopod 2; c, pereopod 3; d, pereopod 4; e, pereopod 5; f, pereopod 6; g, pereopod 7; h, antenna 1; i, antenna 2; j, uropod.

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appears to have been described from a solitary juvenile individual.

The paratype dissected as part of the preparatory work on *H. lobocephalus* was host to a new ectoparasite, *Deoterthron aselloticola* Boxshall & Lincoln, 1983, for which the authors erected a new Crustacean class, the Tantulocarida.

Key to the species of *Hydroniscus*

1. Posterolateral angle of pereonite 4 acutely produced and backwardly directed 2
— Posterolateral angle of pereonite 4 neither acute nor backwardly directed 4
2. Pleotelsonic processes moderately large, stout, conical ..... *lobocephalus* sp. nov.
— Pleotelsonic processes inconspicuous 3
3. Rostrum spatulate, expanded distally ..... *minutus*
— Rostrum tapering distally, truncated ..... *vitjazi*
4. Pleotelsonic processes projecting laterally ..... *ornatus*
— Pleotelsonic processes projecting posteriorly 5
5. Cephalon tuberose laterally ..... *quadrifrons*
— Cephalon smooth 6
6. Pereon segment 5 much wider than pereon segment 4 ..... *vandeli*
— Pereon segment 5 continuous with pereon segment 4 ... *abyssi*

WORLD LIST OF THE GENERA AND SPECIES OF HAPLONISCIDAE

Species	Distribution	Depth range (m)
Haploniscus Richardson, 1908		
acutirostris Menzies & George, 1972	South-East Pacific: Peru-Chile Trench off Peru	3909–3970
acutus Menzies, 1962	South Atlantic: off Namibia and Gabon	2514–4588
antarcticus Vanhöffen, 1914	Antarctic Indian Ocean, North Atlantic Ocean	385–3663
belyaevi Birstein, 1963	North-West Pacific	2415–6225
bicuspis bicuspis (Sars, 1877)	Arctic Atlantic, North-East Atlantic, South Atlantic	360–5024
bicuspis tepidus Wolff, 1962	North-East Atlantic: south-west of Iceland	1505
bruuni Menzies & George, 1972	South-East Pacific: Peru-Chile Trench off Peru	3909–6260
capensis Menzies, 1962	South Atlantic: off South Africa	706
charcoti Chardy, 1975	North Atlantic: north-east of Azores; Bay of Biscay	3360–4680
curvirostris Vanhöffen, 1914	Antarctic Indian Ocean. North-West Atlantic. South Atlantic: off Namibia	3423–3777
excisus Richardson, 1908	North-West Atlantic: off New England	3235
foresti Chardy, 1974	North-East Atlantic: Rockall Trough	2456
furcatus Chardy, 1974	Equatorial Atlantic: off Gabon; Gulf of Guinea	2273–3109
gernekei Kensley, 1978	Indian Ocean: off South Africa	680
gibbernasutus Birstein, 1971	North-West Pacific	5005–6710
helgei Wolff, 1962	Great Australian Bight	1360

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Species	Distribution	Depth range (m)
hydroniscoides Birstein, 1963	North-West Pacific	5005–8120
inermis Birstein, 1971	North-West Pacific	5005–8345
ingolfi Wolff, 1962	Arctic Ocean: south of Jan Mayen North-West Atlantic	2465–4100
intermedius Birstein, 1971	North-West Pacific	5005–6135
kermadecensis Wolff, 1962	South-West Pacific: Kermadec Trench	4540
laticephalus Birstein, 1968	South Pacific: east of New Zealand	1950
menziesi Birstein, 1963	North-West Pacific	5035–6135
miccus sp. nov.	South Pacific: east of New Zealand	710–1386
minutus Menzies, 1962	South Atlantic: off Argentina	5024
monodi Chardy, 1974	South Atlantic: off Angola and Gabon	1537–4223
myriamae Chardy, 1974	South Atlantic: off Angola and Namibia. Equatorial Atlantic: off Gabon	1537–4223
nondescriptus Menzies, 1962	South Atlantic: off South Africa	4885
obtusifrons Chardy, 1974	North Atlantic: south of Azores	3663
oviformis Birstein, 1968	Antarctic mid-Pacific	—
percavix Menzies, 1962	North Atlantic: off Azores South Atlantic: off South Africa and Namibia	2000–4885
piestus sp. nov.	South Pacific: west of New Zealand	1138–4421
polaris Menzies, 1962	South Atlantic: off South Africa and Gabon	2514–4960
profundicola Birstein, 1971	North-West Pacific	6090–7710
pygmaeus Birstein, 1969	Tropical Atlantic: Romanche Trench	7280
retrospinis Richardson, 1908	North-West Atlantic	713
robinsoni Menzies & Tinker, 1960	East Pacific: off Ecuador	2863–2864
rostratus (Menzies, 1962)	South Atlantic: off South Africa and Namibia	4829–4960
rugosus Menzies, 1962	South Atlantic: off South Africa, Namibia, and Angola	3049–4885
saphos sp. nov.	Tasman Sea	1760–1799
silus sp. nov.	Tasman Sea	1457–4421
similis Birstein, 1968	South Pacific: east of Auckland Islands	4810
spatulifrons Menzies, 1962	South Atlantic: off South Africa	4588
spinifer Hansen, 1916	North Atlantic: Davis Strait; south of Iceland South Atlantic	2514–4180
tangaroae sp. nov.	South Pacific: east and west of New Zealand	1174–3347
telus Menzies, 1962	South Atlantic: off South Africa	4960
tricornis Menzies, 1962	South Atlantic: off South Africa; South Georgia	3756–4588
tricornoides Menzies, 1962	South Atlantic: off South Africa	4960
tridens Menzies, 1962	South Atlantic: off Argentina	4843–5024
tropicalis Menzies, 1962	Caribbean South Atlantic: off Gabon; Gulf of Guinea	1261–3109
tuberculatus Menzies, 1962	South Atlantic: off South Africa and Namibia	4180–4588

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Species	Distribution	Depth range (m)
ultraabyssalis Birstein, 1963	Tropical West Pacific: Bougainville Trench	6920–9043
unicornis Menzies, 1956	North Atlantic: West Indies; south of Azores	3663–5122
Hydroniscus Hansen, 1916		
abyssi Hansen, 1916	North Atlantic: Davis Strait	3521–3610
lobocephalus sp. nov.	Tasman Sea	3253–3347
minutus Birstein, 1971	North-West Pacific	5005–5045
ornatus Menzies, 1962	South Atlantic: off Brazil; off South Africa	3954–4588
quadrifrons Menzies, 1962	North Atlantic: West Indies South Atlantic: off Argentina	5163–5684
vandeli Chardy, 1974	North Atlantic: south of Azores	3663
vitjazi Birstein, 1963	North-West Pacific	5461–7286
Antennuloniscus Menzies, 1962		
armatus Menzies, 1962	South Atlantic: off South Africa	4588–4960
dilatatus Chardy, 1974	North Atlantic: south of Azores	3663
dimeroceras (Barnard, 1920)	North and South Atlantic	1280–5843
ornatus Menzies, 1962	South Atlantic: off Cape Horn; South Georgia	3756–3839
quadratus Menzies & Schultz, 1968	Indian Ocean: south of Madagascar	2270
subellipticus Menzies & Schultz, 1968	South Atlantic: off Cape Horn	3733–3806
Aspidoniscus Menzies & Schultz, 1968		
perplexus Menzies & Schultz, 1968	Caribbean	3071
Abyssoniscus Birstein, 1971		
ovalis Birstein, 1971	North-West Pacific	5005–5045
Chauliodoniscus gen. nov.		
armadilloides (Hansen, 1916)	North Atlantic	1301–5240
elevatus (Menzies, 1962)	South Atlantic: off South Africa, Angola, and Gabon; Gulf of Guinea	1261–4960
ovalis (Menzies, 1962)	South Atlantic: off Argentina, off Congo River; Gulf of Guinea	2470–5024
parallelus (Menzies, 1962)	South Atlantic: off Argentina; off South Africa and Angola	3367–5024
princeps (Menzies, 1962)	South Atlantic: off South Africa and Namibia	3049–4885
quadrifrons (Menzies, 1962)	South Atlantic: off Gabon; off Congo River; Gulf of Guinea	1261–3921
reyssi (Chardy, 1974)	South Atlantic: off Angola	1537
tasmanaeus sp. nov.	Tasman Sea	3253–4441
tritubercularus (Menzies, 1962)	South Atlantic: off South Africa and Namibia	3049–4588
Mastigoniscus gen. nov.		
concavus (Menzies & George, 1972)	South-East Pacific: Peru-Chile Trench off Peru	4823–6281
generalis (Menzies & George, 1972)	Equatorial East Pacific: off Columbia	3254–3260

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Species	Distribution	Depth range (m)
gratissimus (Menzies & George, 1972)	Tropical East Pacific: off Costa Rica	3305–3325
gratus (Menzies & George, 1972)	South-East Pacific: Peru-Chile Trench off Peru	5825–5841
latus (Birstein, 1971)	North-West Pacific	5005–8345
pistus sp. nov.	South Pacific: east of New Zealand	2476–2502

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