

Review of the deep-water asellote genus *Notopais* Hodgson, 1910 (Crustacea: Isopoda: Munnopsididae) with description of three new species from the south-western Pacific

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Abstract

The munnopsidid genus *Notopais* Hodgson, 1910 is taken out of synonymy with *Echinozone* Sars, 1897. The type species *Notopais spicata* Hodgson, 1910 and *Notopais quadrispinosa* (Beddard, 1886) are redescribed and three new species described: *Notopais beddardi* n. sp. collected from Antarctica at a depth of less than 37 metres; *Notopais minya* n. sp. collected from the south-eastern Australian continental slope between the depths of 429–466 metres; and *Notopais zealandica* n. sp. collected from the Chatham Rise between the depths of 1386–1640 metres, off the south-eastern New Zealand coast. *Notopais* is distinguished from *Echinozone* by three defining characters: the flattened appearance of the ventral side of the cephalon, the presence of pedestal setae on the pereonites and antenna 2 article 1 with produced distolateral angle with prominent spine and distal robust seta. This genus is exclusively found in the Southern Hemisphere and is known from Antarctica and the south-western Pacific.

Key words: Isopoda, Munnopsididae, *Notopais*, Antarctica, Pacific, deep-sea, taxonomy, New Zealand, Australia

Introduction

Notopais Hodgson, 1910 was erected to include the single female specimen of *Notopais spicatus* Hodgson, 1910 which, due to its lack of natatory pereopods was unable to be placed in any existing genus. *Notopais* was placed in the family Munnopsididae Lilljeborg, 1864, which also contained the similar genera *Pseudarachna* Sars, 1897, *Aspidarachna* Sars, 1897, *Echinozone* Sars, 1897 and *Ilyarachna* Sars, 1897. Vanhöffen (1914) later synonymised the monotypic *Notopais* with *Pseudarachna* based on the broadened state of pereopods 5 and 6.

These four genera were later removed to the then newly created family Ilyarachnidae Hansen, 1916. Wilson (1989) revised the Ilyarachnidae and the closely related families of Munnopsididae and Eurycopidae Hansen, 1916, changing the classification of the Ilyarachnidae and Eurycopidae to subfamilies within the family Munnopsididae.

Hult (1937) synonymised the genera *Echinozone* and *Aspidarachna* with *Ilyarachna*. *Pseudarachna spicata* was referred to as *Ilyarachna spicata* by Wolff (1962) in a key to the *Ilyarachna* species. Hessler & Thistle (1975) reassessed the then known genera of the Ilyarachnidae, reinstating the original four genera of Sars and creating *Bathybadistes* Hessler & Thistle, 1975. Hessler & Thistle (1975) reallocated several species (most of which stand today), and placed *N. spicatus* into synonymy with *Echinozone quadrispinosa* (Beddard, 1886), although no evidence was provided to support their decision. Schultz (1976) also recognised Sars' four genera and, like Brandt (1990), did not acknowledge the paper by Hessler & Thistle (1975) and their synonymy of *N. spicata* with *N. quadrispinosa*. Schultz (1976) transferred *Pseudarachna spicata* to *Echinozone* and described new material collected from Anvers Island. More recently, Brandt (1990) also synonymised *E. spicata* with *E. quadrispinosa*, but provided only limited support for her decision. Neither author referred to the type material of *Notopais spicata* with only Brandt referring to the type material of *E. quadrispinosa*.

In this contribution, *E. spicata* is brought out of synonymy and redescribed from the type material. *E. quadrispinosa* is also redescribed from type material, and a lectotype and paralectotype are designated as the syntypes contained two species. Three new species from Antarctica, Australia and New Zealand are described.

Methods and abbreviations

Illustrations were made using a Nikon Labophot-2 and a Zeiss Stemi SV 11 dissecting microscope, both fitted with a camera lucida. Borrowed type material was redescribed without dissection (conditions of loan) and all appendages were drawn *in situ*. For this reason, setation illustrated on these appendages are approximate. *Notopais beddardi* n. sp. was also described without dissection in order to conserve the only individual of this new species. In order to preserve the holotypes of the other two new species, a paratype was dissected where appendages were present, otherwise limbs were dissected from either an additional paratype or the holotype. Descriptions that were prepared from more than one individual are identified in the figure captions.

Descriptions were prepared using the computer program DELTA (Dallwitz *et al.* 2000). All ratios were calculated using the maximum lengths and widths of segments unless stated otherwise in the text.

Abbreviations used in text are as follows: BS – broom setae; PLS – plumose setae; RFS – robust flagellate setae; RS – robust setae; SS – simple setae; NSW – New South Wales; Tas – Tasmania; Vic – Victoria; BMNH – Natural History Museum, London;

Taxonomy

MUNNOPSISIDIDAE Lilljeborg, 1864 Subfamily Ilyarachninae Hansen, 1916

Notopais Hodgson, 1910

Notopais Hodgson, 1910: 69.

Type species *Notopais spicatus* Hodgson, 1910, by monotypy.

Diagnosis: Cephalon frons narrow, allowing for almost horizontal position of maxillipeds *in situ* in lateral view. Pereonites 1–4 anterior margins usually with spines, if not, margins with robust setae; all spines tipped with robust (pedestal) setae, making spines look more pronounced. Antenna 2 article 1 distolateral angle with horn-like prominent spine and terminal robust seta. Mandible palp absent; incisor process large, rounded, without defined cusps; lacinia mobilis reduced or absent. Pereopods 5 and 6 carpus and propodus flat, expanded, margins with plumose setae. Pereopods 7 ambulatory, robust, retains plumose setae similar to pereopods 5 and 6. Uropods biramous.

Description: Body compact, cuticle brittle; cephalon trapezoid, broad, wider posteriorly, dorsal face domed, ventrally, cephalon flattened, frons narrow allowing maxillipeds to appear almost horizontal in lateral view. Pereonites 2–4 anterolateral margins usually with spines, anterior margins usually with spines, if not, margins with robust setae; all spines tipped with robust (pedestal) setae, making spines look more pronounced. Antenna 2 articles 1–4 short, combined length less than half of length of article 5; article 1 distolateral angle with prominent spine, horn-like, and terminal robust seta; article 6 more elongate than 5. Mandible massive, calcareous; palp absent; incisor process large, rounded, without defined cusps; lacinia mobilis reduced or absent. Pereopods 5 and 6 carpus expanded, discoidal, flat; propodus flat, expanded; superior margin of ischium and both margins of carpus and propodus with row of evenly-spaced long plumose setae. Pereopod 7 ambulatory, but more robust and retaining long, plumose setae similar to that of pereopods 5 and 6. Pleon triangular in dorsal view, with domed medial keel. Operculum vaulted, with prominent medial keel. Uropods biramous, small, flat.

Remarks: *Notopais* can be distinguished by: the flattened appearance of its mouthparts *in situ*, pereonites 1–4 anterior margins most commonly with spines or otherwise with robust setae; all spines tipped with robust (pedestal) setae; antenna 2 article 1 with produced anterolateral angle with a distal robust seta; pereopods 5, 6 and 7 with superior mar-

gin of ischium and both margins of the carpus and propodus with row of evenly spaced long, plumose setae; and uropods biramous, small and flat.

On studying Sars' material of *Echinozone coronata* (Sars, 1870) the type species for *Echinozone* genus, it can be found that *Notopais* differs from this genus in cephalon and body shape, the presence of pedestal setae and with the distinct shape of antenna 2 article 1. In *Notopais* the frons is narrower compared with *Echinozone*, allowing the frontal arch to meet up with the maxillipeds at a wider angle, giving them a more horizontal appearance. The more acute angle between the frontal arch and maxillipeds seen in *Echinozone* gives it a much more triangular appearance, especially in lateral view. This structure adds more emphasis on the curvature of the animal and its body is more arched than in *Notopais*. *Notopais* has pedestal setae tipping all of its spines, similar to that found in *Bathybadistes* and these are not present in *Echinozone*. Although many Ilyarachninae (including *Echinozone*) have a robust seta and/or a spine on the anterolateral angle of antenna 2 article 1, the shape of this in *Notopais* is distinct and exclusive to this genus. Its shape is akin to a bull's horn and is always tipped with a robust seta making it more pronounced.

This genus now contains: *Notopais beddardi* n. sp., *N. zealandica* n. sp., *N. minya* n. sp., *N. magnifica* (Vanhöffen, 1914) **comb. nov.**, *N. quadrispinosa* (Beddard, 1886) **comb. nov.**, *N. spicata* Hodgson, 1910 (type species) and *N. spinosa* (Hodgson, 1902) **comb. nov.** The genus appears to be restricted to the Southern Hemisphere, from Antarctic waters to the south-east continental slope of Australia, at depths from 36 to 1640 metres.

Key to the species of *Notopais*

1. Anterior margin of pereonite 5 with large, distinct spines 2
 - Anterior margin of pereonite 5 either smooth, with robust setae or small spines only. 3
2. Cephalon with pair of short dorsal spines; pereonite 4 with anterior facing spines set back from anterior margin, most marginal spines on pereonites with body margins; anterolateral margins of pereonites 5 and 6 pointing towards cephalon
 -*N. quadrispinosa*
 - Cephalon with pair of large, distinct dorsal spines; pereonite 4 with anterior facing spines on anterior margin; all marginal spines on pereonites are well defined and acutely angled; anterolateral margins of pereonites 5 and 6 rounded.....*N. spicata*
3. Cephalon with dorsal spines; pereonites 1–4 with large spines; anterior margin of pereonite 5 normal, continuous, without overhang..... 4
 - Cephalon with no dorsal spines; pereonites 1–4 with robust setae only, large spines absent; pereonite 5 with anterior margin overhanging pereonite 4..*N. zealandica* n. sp.
4. Cephalon with 4 dorsal spines (not including, if present, any on anterolateral margins) 5
 - Cephalon with 2 dorsal spines only, no small spines on anterolateral margins; no sub-marginal lateral spines on pereonite 4; anterior margin of pereonite 5 with stiff robust

- setae; antenna 2, articles 1 and 2 distosuperior margin with row of 4 robust setae
 *N. beddardi* n. sp.
5. Pereonites 6–7 dorsal surface with no spines; cephalon with no spines on anterolateral margins 6
 — Pereonites 6–7 dorsal surface both with pair of small spines; cephalon anterolateral margins each with single small spine, another pair of spines are set well back from margin but are not on central dome; pereonite 5 anterior margin with 4 small spines ..
 *N. spinosa*
6. Cephalon with 4 spines, which are small enough to be regarded as tubercles; pereonites 2–3 anterior margin with 6 spines; pereonite 5 anterior margin smooth; antenna 2 article 1 only article with distolateral angle with defined spine and terminal robust seta
 *N. minya* n. sp.
- Cephalon with 4 large, distinct spines, the inner pair larger than outer pair; pereonites 1–4 anterior margins with continuous row of spines (when mature adult); pereonite 5 dorsal surface with pair of rounded domes, one each side of centre, anterior margin smooth
N. magnifica

***Notopais spicata* Hodgson, 1910 (Fig. 1)**

Notopais spicatus Hodgson, 1910: 70–71, pl. 8, fig. 1.

Pseudarachna spicata.— Vanhöffen, 1914: 593, fig. 126.— Hale, 1937: 43–45, figs 18–19.— Kusakin, 1967: 313–314, fig. 54.

Ilyarachna spicata.— Wolff, 1962: 95.— Amar & Roman, 1974: 579–580, fig. 11.

Echinozone spicata.— Schultz, 1976: 8–10, figs 3–4.

Pseudarachna vanhoeffeni.— Schultz, 1976: 13.

Echinozone quadrispinosa.— Brandt, 1990: 216, fig. 1 (part).

Material Examined.— Holotype. Female (3.0 mm), Winter Quarters, McMurdo Sound, Ross Sea, Antarctica, 77°49'0"S 167°7'4"E, 28 February 1902, inside 20-fathom line (36.6 metres), S.S. *Discovery* (BMNH 1910.3.18.150).

Additional material.— Male (3.0 mm), Gauss Station, Davis Sea, Antarctica, 66°2'S 89°38'E, 12 August 1902 or 19 December 1902, 385 m, *Gauss* (ZMHB 17739).

Description: Holotype. Body 2.3 times as long as greatest width (from spine to spine) of pereonite 2; widest at pereonite 2; cuticle not highly calcified, lightly setose. Cephalon smooth, with 2 dorsal spines; posterolateral margins rounded; ridge encompassing antennae with no extension. Pereonites 1–5 anterior margins each with 4 well-developed spines; anterolateral margins of pereonites 1–4 with spines, 5–7 rounded and smooth; pereonites 1–4 with pair of lateral, sub-marginal spines and each with pair of widely spaced, small, dorsal sub-lateral spines.

Antenna 1 broken; article 1 2.1 times as long as wide, dorsal surface concave, with 1 sub-marginal robust flagellate seta, distal margin with 1 flagellate robust and 1 broom seta,

superior margin with 1 simple and 1 broom seta; article 2 0.4 times as long as article 1, 2.0 times as long as wide, distal margin with 1 robust flagellate seta; remaining articles all rectangular, length varying; article 3 with 2 simple setae; article 4 with 1 simple seta; article 6 with 1 distal aesthetasc. Antenna 2 broken, articles 1–2 squat, both wider than long; article 1 superior margin with 2 simple setae; article 2 1.2 times as long as article 1, distolateral angle with spine, terminal robust seta and inferior margin with 1 simple seta; article 3 1.0 times as long as article 1, distolateral angle with spine terminated with robust seta, inferior margin with 2 simple setae and distoinferior margin with 1 short robust seta, 2 flagellate robust setae (long) and 1 simple seta; article 4 small, 0.8 times as long as article 1, not ornamented.

Pereopod 1 basis 7.2 times as long as wide, inferior margin with 4 setae (2 SS, 1 distal RFS, 1 distal RS), lateral face with 3 setae (all SS); ischium 3.8 times as long as wide, inferior margin with 3 setae (all SS), lateral face with 2 setae (both SS); merus 1.3 times as long as wide, inferior margin with 4 setae (all SS), distosuperior margin with 1 seta (SS); carpus 3.8 times as long as wide, inferior margin with 2 setae (both long SS, in proximal half), superior margin with 3 setae (all SS, 1 distal); propodus 4.0 times as long as wide, inferior margin with 8 setae (all SS, on distal half), superior margin with 2 setae (both SS, distal); dactylus 3.3 times as long as proximal width, superior margin with 5 setae (all SS, distal).

Pereopod 7 basis 3.3 times as long as wide, inferior margin with 4 setae (3 SS, 1 RFS), lateral face with 1 seta (SS), superior margin with 3 setae (all SS); ischium 3.5 times as long as wide, inferior margin with 3 setae (all SS, 2 distal), lateral face with 1 seta (SS, distal), superior margin with 3 setae (2 SS, 1 PLS); merus 1.7 times as long as wide, inferior margin with 4 setae (all SS, distal), distosuperior margin with 2 setae (both SS); carpus 3.4 times as long as wide, inferior margin with 8 setae (3 PLS, 3 SS, 2 sub-marginal SS), superior margin with 5 setae (2 SS, 2 sub-marginal SS, 1 distal RFS); propodus 8.3 times as long as wide, inferior margin with 3 setae (all SS), lateral face with 1 seta (SS, proximal), superior margin with 4 setae (all distal, 3 SS, 1 PLS); dactylus 6.0 times as long as proximal width, superior margin with 5 setae (all SS), inferior margin with 1 seta (SS).

Pleon lateral sides indent and posterior end coming to a rounded point, with scattered simple setae. Operculum 2.7 times as long as proximal width, medial keel with robust setae and lateral and distal margin with numerous long setae (unable to identify actual type of setae).

Male: Similar to female in setation and spines although spines are more pronounced. Larger than female. Cephalon posterolateral margin squarer than in female, reaching beyond anterolateral margin of pereonite 1. Ventrally, frons not as narrow as in female (female not illustrated in lateral view), mouthparts not complete, so unable to comment on their position. Pereonite 4 anterolateral margin and pereonite 5 posterolateral margin with pair of robust setae; pereonites 1–5 anterior margins higher than in female; pereonites 5–7 not as rounded as in female. Pleon 1.1 times as long as proximal width.

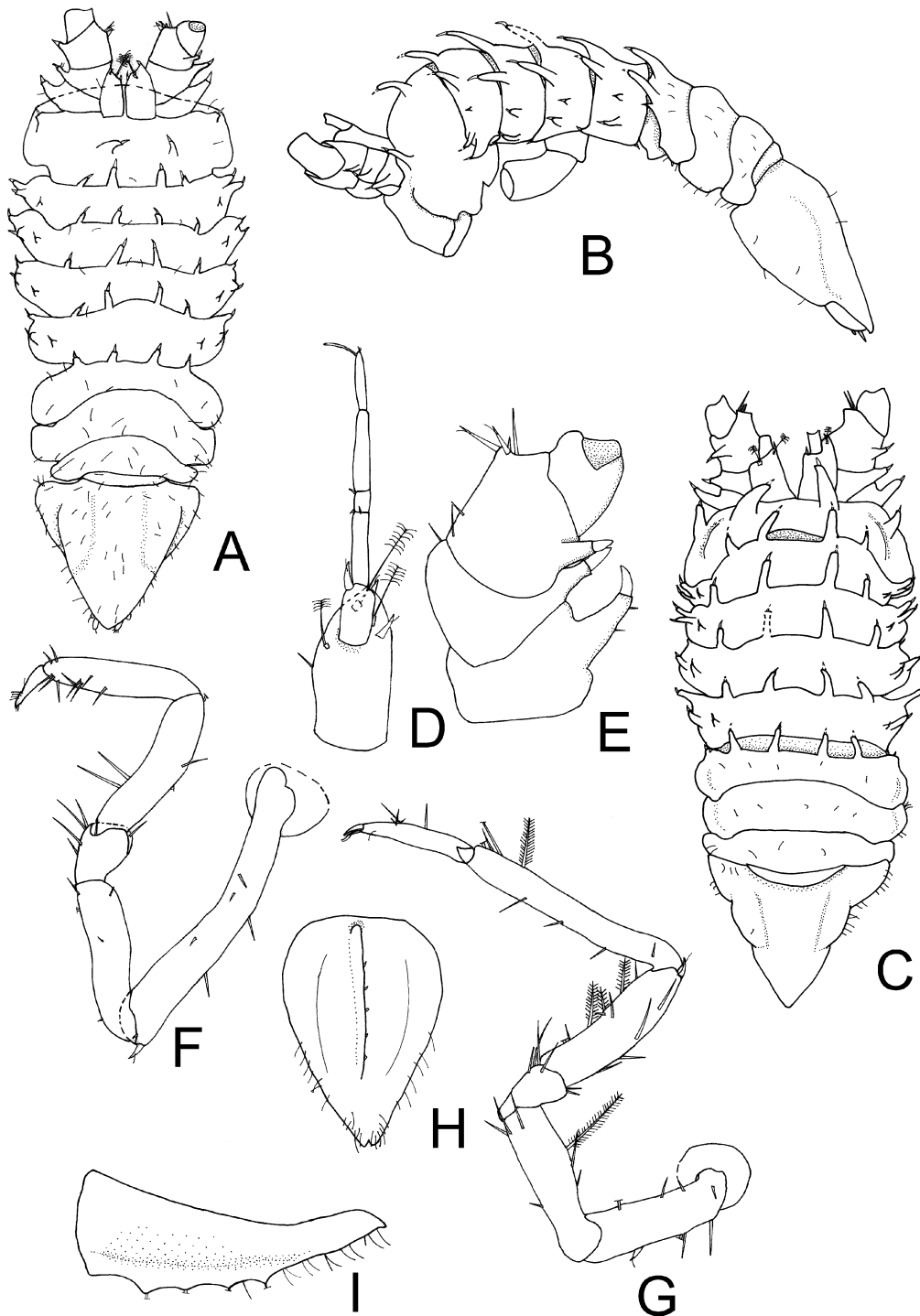


FIGURE 1. *Notopais spicata* Hodgson, 1910. A, D–I, female holotype, 3.0 mm; B, C, Vanhöffen's specimen, male, 3 mm. A, dorsal view; B, lateral view; C, dorsal view; D, left antenna 1; E, right antenna 2; F, right pereopod 1; G, left pereopod 7; H, operculum; I, operculum, lateral view.

Remarks: *Notopais spicata* is distinguished by the prominent spines on the anterior margins of the first 5 pereonites and the single spine on each of the first three articles of antenna 2. This species was previously considered to be a junior synonym of *N. quadrispinosa* by Hessler & Thistle (1975) and Brandt (1990). After redescribing the type material for both species, it is clear that they are distinct. The spines on the cephalon and anterior margins of the first five pereonites of *N. spicata* are more strongly produced and more acute than those of *N. quadrispinosa*; the anterior spines on the fourth pereonite are set back from the anterior margin of *N. quadrispinosa* while in *N. spicata* these spines are on the absolute anterior margin; and the shape of pereonites 5–7 differs markedly between the two species, in *N. spicata* the lateral margins are rounded and in *N. quadrispinosa*, the anterolateral margins are pointed towards the cephalon. The arrangement of spines and robust setae on both antennae is another character that one can use to distinguish the two species. Robust setae feature much more prevalently on the antennal article margins of *N. quadrispinosa*.

Schultz (1976) redescribed *N. spicata* from material collected from Antarctica. Schultz also assessed the illustration and description by Vanhöffen (1914) and created a new species *Pseudarachna vanhoeffeni* (incorrectly labelled new combination). This species was based on Vanhöffen's description, which stated that it only has one uropodal ramus. Examination of Vanhöffen's specimen revealed that the uropod is biramous, the exopod is minute, and may quite easily be overlooked. The name is considered to be a junior synonym of *N. spicata*.

Distribution: Antarctica, eastwards from the Prince Olav coast to the Anvers Islands, including the areas of the Davis and Ross Seas, from 36.6–560 metres.

***Notopais quadrispinosa* (Beddard, 1886), comb. nov. (Fig. 2)**

Ilyarachna quadrispinosa Beddard, 1886: 76–78, pl. 12, figs 2–6.— Nordenstam, 1933: 266–273, fig. 77.— Stephensen 1947: 8.— Wolff, 1962: 95.— Amar & Roman, 1974: 579.

Echinozone quadrispinosa.— Kussakin, 1967: 312.— Schultz, 1976: 4–5.— Kussakin & Vasina, 1982: 326, fig. 29.— Brandt, 1990: 216–218, fig. 1 (part).

Material examined.— Lectotype (here designated). Ovigerous female (6.0 mm), Station 149H, off Cumberland Bay, Kerguelen Island, southern Indian Ocean, 48°45'S 69°14'E, 29 January 1874, 127 fathoms (232 m), volcanic mud, HMS *Challenger* (BMNH 1889.4.27.73).

Additional material.— Paralectotype (here designated). Female (pereonites 5–7 and pleon only, 2.0 mm) Station 149H, off Cumberland Bay, Kerguelen Island, southern Indian Ocean, 48°45'S 69°14'E, 29 January 1874, 127 fathoms (232 m), volcanic mud, HMS *Challenger* (BHMN 2004.676).

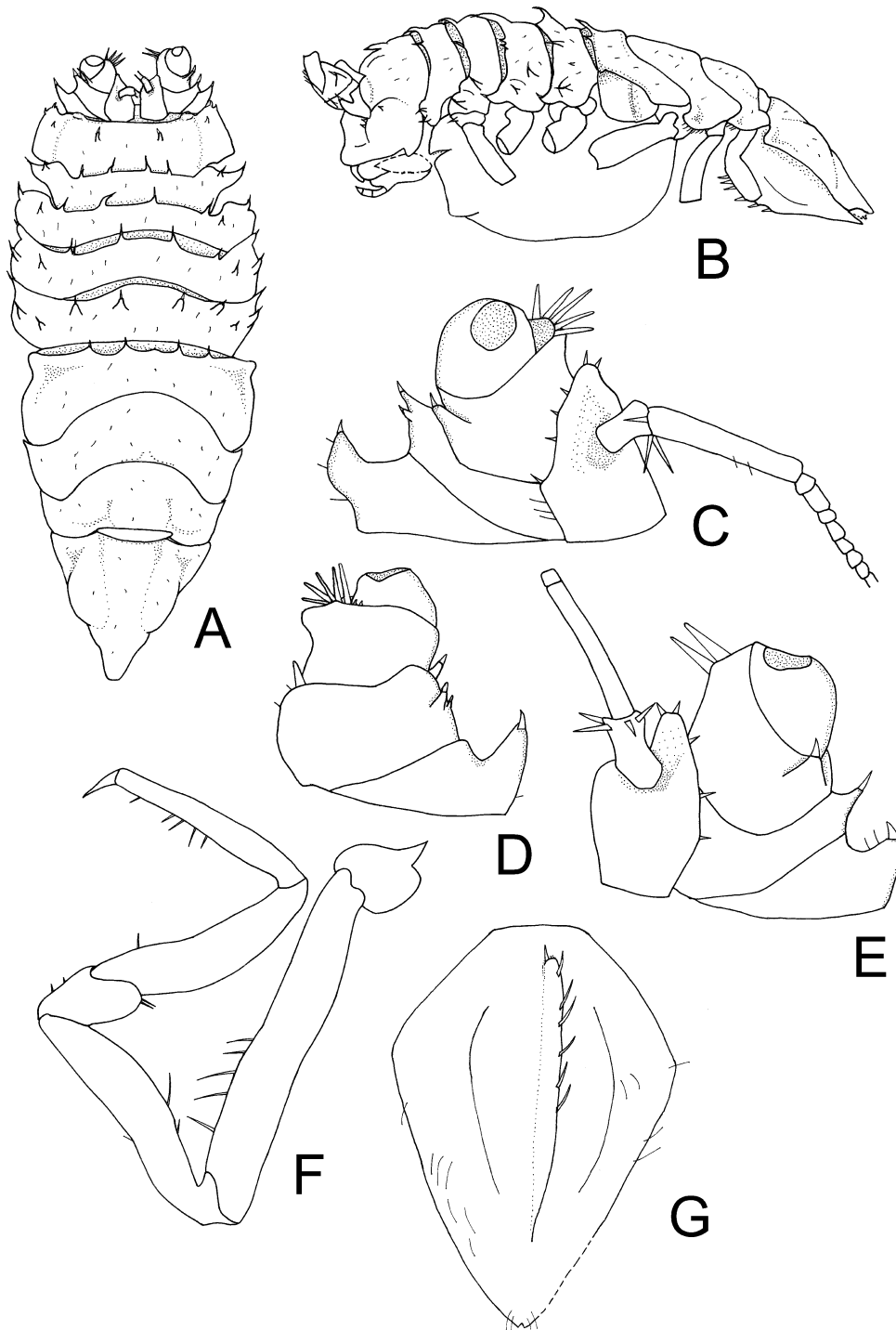


FIGURE 2. *Notopais quadrispinosa* (Beddard, 1886). Female lectotype, 6.0 mm. A, dorsal view; B, lateral view; C, left antenna 1 and 2, dorsal view; D, left antenna 2, ventral view; E, right antenna 1 and 2; F, left pereopod 1; G, operculum.

Description: Lectotype. Body 2.4 times as long as greatest width (from spine to spine) of pereonite 2; widest at pereonite 3; cuticle not highly calcified, lightly setose. Cephalon smooth, with 2 dorsal spines; anterolateral margins each with 2 small spines and 1 small sub-marginal spine; posterolateral margins rounded; ridge encompassing antennae, with poorly developed extensions near first articles of antennae. Pereonites 1–3 and 5 anterior margins each with 4 well developed spines; pereonite 4 still with 4 well developed spines, but set back from anterior margin; pereonites 5–7 anterolateral margins pointing towards cephalon; pereonites 3 and 4 only with pair of lateral, sub-marginal spines; pereonites 1–4 each with pair of widely spaced, small, dorsal spines near lateral margins.

Antenna 1 of 11 articles (at least, number refers to what could actually be seen); article 1 distal end triangular, 1.5 times as long as wide, dorsal surface forms shallow depression, distal margin has 2 robust setae, superior margin with 3 simple setae (in proximal half) and 4 robust setae (evenly spaced); article 2 0.3 times as long as article 1, 2.0 times as long as wide with 4 robust setae (at least, all evenly spaced around distal margin); remaining articles all rectangular, length varying; article 3 with 2 simple setae (at least). Antenna 2 article 1 with 3 simple setae; article 2 1.1 times as long article 1, distolateral angle with 2 spines, one smaller than other, both with terminal robust seta, distoinferior margin with 1 robust and 2 simple setae; article 3 0.9 times as long as article 1, distolateral angle with spine terminated with 1 robust seta, distoinferior margin with 5 long robust and 2 short robust setae in a clump; article 4 small, 0.3 times as long article 1, with no ornamentation.

Pereopod 1 basis 6.3 times as long as wide, inferior margin with 5 setae (all SS); ischium length 4.7 times as long as wide, inferior margin with 1 seta (SS), superior margin with 2 setae (both SS); merus 1.2 times as long as wide, inferior margin with 2 setae (both SS), distosuperior margin with 2 setae (both SS); carpus 4.1 times as long as wide, inferior margin with 1 seta (SS proximal); propodus 7.5 times as long as wide, inferior margin with 5 setae (all SS); dactylus 2.3 times as long as proximal width.

Pleon 0.9 times as long as proximal width, lateral sides rounded and posterior end coming to a rounded point, with scattered simple setae. Operculum 4.0 times as long as proximal width, medial keel with proximal facing robust setae and surface, and lateral and distal margins with few scattered long setae (unable to determine actual type).

Remarks: *N. quadrispinosa* can be distinguished by the distinctive setation on the antennae, four spines on the anterior margin of pereonites 1–3 and 5 in conjunction with pereonite 4 where the spines are set back from the absolute margin. For further morphological discussion please read the previous remarks section for *N. spicata*.

Distribution: Antarctica, reliably known from the Crozet Islands to the Leopold and Astrid Coast, from 168–245 metres.

Notopais beddardi n. sp. (Fig. 3)

Material examined.— Holotype. Female (4.0 mm), Station 149H, off Cumberland Bay,

Kerguelen Island, southern Indian Ocean, 48°45'S 69°14'E, 29 January 1874, 127 fathoms (232 m), volcanic mud, HMS *Challenger* (BMNH 2004.677).

Description: Holotype. Body 2.4 times as long as greatest width (from spine to spine) of pereonite 2; widest at pereonite 4; cuticle not highly calcified, lightly setose. Cephalon lightly setose with 2 dorsal spines; posterior margins rounded, but almost square; ridge encompassing antennae with no extension. Pereonites 1–4 anterior margins each with 4 well developed spines; pereonite 5 anterior margin with evenly spaced stiff simple setae; pereonite 5 with anterolateral margin rounded; pereonites 1–4 anterolateral margins with spines, 5–7 rounded and smooth; pereonites 1–4 each with pair of lateral, sub-marginal spines.

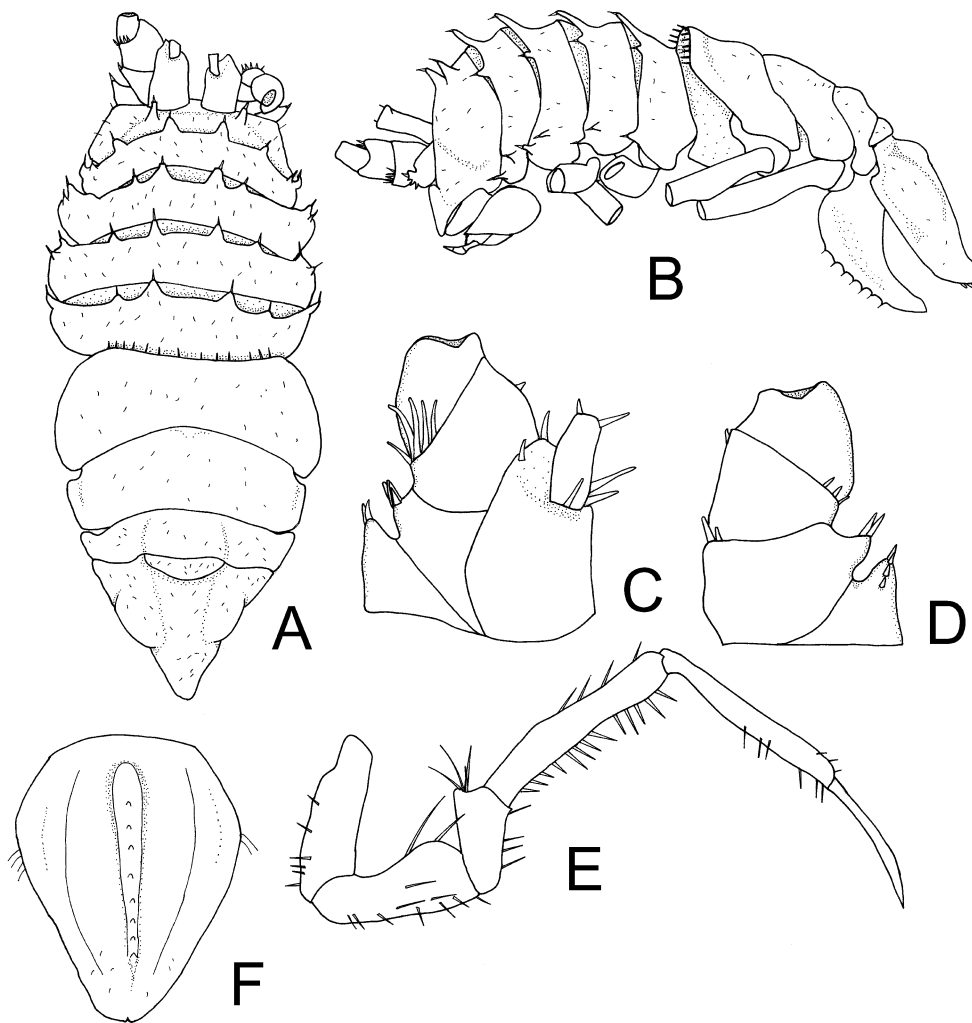


FIGURE 3. *Notopais beddardi* n. sp. Female holotype, 4.0 mm. A, dorsal view; B, lateral view; C, left antenna 1 and 2, dorsal view; D, left antenna 2, ventral view; E, right pereopod 2; F, operculum.

Antenna 1 article 1 rectangular and elongate, 1.7 times as long as wide, dorsal surface concave and forms shallow depression, distal margin with 5 robust setae; article 2 elongate, 0.4 times as long as article 1, 2.4 times as long as wide, with 2 robust setae (distal). Antenna 2 articles 1–3 more or less triangular; article 1 spine on distolateral angle with 3 additional robust setae on ventral side; article 2 inferior margin 1.2 times as long as article 1, distolateral angle with spine and 4 terminal robust setae, distoinferior margin with 2 robust setae; article 3 inferior margin 1.3 times as long as article 1, with 5 long robust and 3 short robust setae on distosuperior rim of article, distoinferior margin with 1 robust seta; article 4 small, 0.6 times as long as article 1, with no ornamentation.

Pereopod 2 basis 2.7 times as long as wide, inferior margin with 6 setae (all SS); ischium 2.1 times as long as wide, inferior margin with 7 setae (1 SS, 6 sub-marginal SS), lateral face with 3 setae (all SS), superior margin with 2 setae (both SS, in distal half); merus 1.7 times as long as wide, inferior margin with 4 setae (all SS), distosuperior margin with 4 setae (all SS); carpus 6.0 times as long as wide, inferior margin with 13 setae (all RS, evenly spaced), superior margin with 4 setae (all SS, in distal half); propodus 8.2 times as long as wide, inferior margin with 6 setae (all SS), superior margin with 3 setae (all SS, distal half); dactylus 9.7 times as long as proximal width.

Pleon 0.6 times as long as proximal width, lateral sides rounded and posterior end coming to a rounded point, with scattered simple setae. Operculum 1.9 times as long as proximal width, medial keel with evenly spaced downward facing robust setae, lateral margins and distal surface with few setae (unable to determine actual types).

Remarks: *Notopais beddardi* n. sp. can be identified by the combination of having only two dorsal spines on the cephalon; anterior facing marginal spines on only the first four pereonites, with robust setae on the corresponding margin of the fifth; the unique setal combinations of the first two articles in antenna 1 and the first three articles in antenna 2; the rounded anterior margin of pereonite 5; and the anterolateral margins of pereonites 5 and 6 rounded and smooth, and not coming to a point. The spines on the anterior margin of article 4 on *N. beddardi* are set on the absolute anterior margin, similar to that seen in *N. spicata* (although they are not as pronounced or as acutely angled) instead of almost being dorsal as is in *N. quadrispinosa*. *N. beddardi* does not have anterior spines on the fifth pereonite as in *N. quadrispinosa*, instead it has a row of short stout setae. The shape of pereonites 5–7 also differs between the two species. In *N. beddardi* these pereonites are broader than those in *N. quadrispinosa*. Pereonite 5 in *N. beddardi* has a rounded anterolateral margin, and the corresponding margins of pereonites 6 and 7 are not as acute as those in *N. quadrispinosa*. The spination of both antennae are also different between the two species. The first article of antenna 1 in *N. beddardi* has long robust setae around the distal margin, while *N. quadrispinosa* has robust setae along the superior margin. The number of robust setae on the spines of the first two antennal articles of antenna 2 also differ, with *N. beddardi* having many more robust setae on the distosuperior margins than in *N. quadrispinosa* which has a single robust seta terminating each spine. The position of

robust setae on the distal margin of the article 3 of antenna 2 also differs between the two species, with those of *N. beddardi* being on the superior margin, while on *N. quadrispinosa* they are on the inferior margin.

Distribution: Known only from type locality, off Kerguelen Island, southern Indian Ocean.

Etymology: For Frank E. Beddard, the distinguished biologist, who described the many isopods which were collected during the *Challenger* expedition of 1873–1876.

***Notopais minya* n. sp. (Figs 4–7)**

Material examined.— All material from eastern Australia. Holotype. Ovigerous female (5.0 mm), Stn SLOPE 56, 44 km E of Nowra, NSW, from 34°55.79'S 151°08.06'E to 34°56.06'S 151°07.86'E, 22 October 1988, WHOI epibenthic sled, muddy coarse shell, 429–466 m, G.C.B. Poore et al., R.V. *Franklin* (NMV J52877). Paratypes. 69 males, 91 females, 9 fragments (between 2.0–5.5 mm; 1 male, 3 mm and 2 females, 4.0 mm and 4.5 mm, dissected), type locality (NMV J52876).

Additional material.— 2 males, 2 females, 2 fragments, 79-K-1 Stn 32, shelf, eastern Bass Strait, 39°41.7'S 148°39.5'E, 27 March 1979, dredge, muddy sand, 115 m, G.C.B. Poore, HMAS *Kimbla* (NMV J18851). 4 males, 5 females, 1 fragment, Stn SLOPE 2, off Nowra, NSW, 34°57.9'S 151°8.0'E, 14 July 1986, WHOI epibenthic sled, in bryozoa and shell, 503 m (bottom), G.C.B. Poore et al., R.V. *Franklin* (NMV J18847). 2 females, Stn SLOPE 19, off Eden, NSW, 37°07.3'S 150°20.2'E, 20 July 1986, WHOI epibenthic sled, grey coarse shell, 520 m (bottom), G.C.B. Poore et al., R.V. *Franklin* (NMV J18848). 1 female, Stn S05/84/64, 15 km E of Cape Connella, Tas, 43°24.6'S 147°32.5'E, 22 October 1984, WHOI epibenthic sled, 82 m, R. Wilson, R.V. *Soela* (NMV J18874). 1 female, 79-K-1 Stn 33, Flinders Canyon, eastern Bass Strait, 39°40.3'S 148°46.5'E, 27 March 1979, dredge, coarse shell, 293–329 m, G.C.B. Poore, HMAS *Kimbla* (NMV J18852). 2 males, 4 females, 3 fragments, Stn SLOPE 1, off Nowra, NSW, 34°59.52'S 151°5.94'E, 14 July 1986, WHOI epibenthic sled, coarse shell, 204 m (bottom), G.C.B. Poore et al., R.V. *Franklin* (NMV J18846). 1 female, Stn S05/84/29, Tasman Sea, eastern slope, 70 km S of Gabo Island, Vic, 38°10.3'S 149°57.2'E, 14 October 1984, WHOI epibenthic sled, 592 m, R. Wilson, R.V. *Soela* (NMV J18854). 1 female, Stn S05/84/30, Tasman Sea, eastern slope, 50 km S of Mallacoota, Vic, 38°06.2'S 149°45.5'E, 14 October, 1984, WHOI epibenthic sled, 188 m, R. Wilson, R.V. *Soela* (NMV J18855). 2 males, 7 females, 6 fragments, Stn SLOPE 40, south of Point Hicks, Vic, 38°17.7'S 149°11.3'E, 24 July 1986, WHOI epibenthic sled, coarse sand, gravel and mud, 400 m (bottom), M.F. Gomon et al., R.V. *Franklin* (NMV J18849). 3 males, 4 females, 79-K-1 Stn 35, shelf, eastern Bass Strait, 39°28.4'S 148°41.8'E, 28 March, 1979, dredge, shell and sand, 110 m, G.C.B. Poore, HMAS *Kimbla* (NMV J18853).

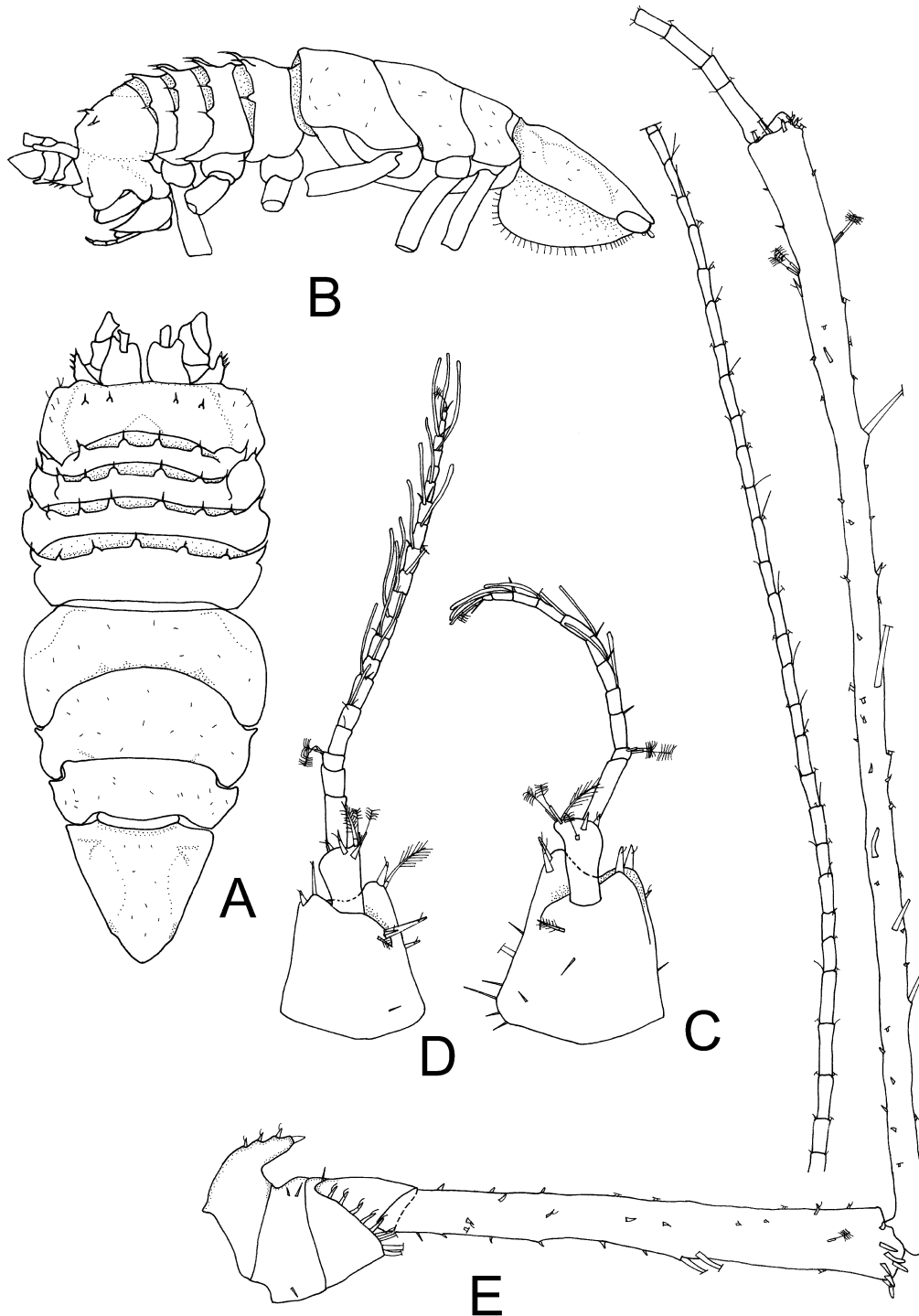


FIGURE 4. *Notopais minya* n. sp. A, B, female holotype, 5.0 mm; C and E, female paratype, 4.0 mm; D, male paratype, 4 mm. A, dorsal view; B, lateral view; C, left antenna 1; D, right antenna 1; E, right antenna 2.

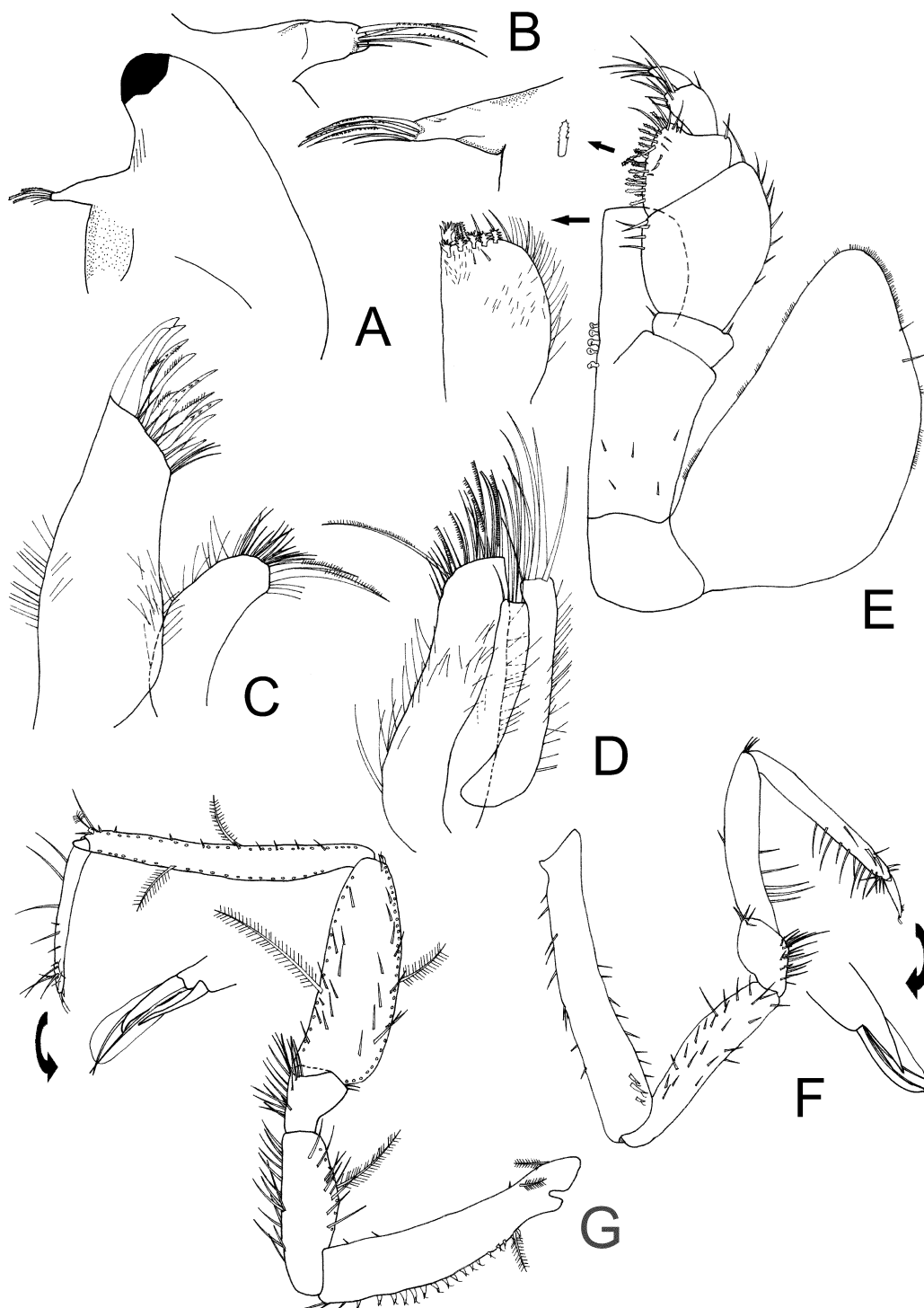


FIGURE 5. *Notopais minya* n. sp. All figures from female paratype. A, left mandible; B, left mandibular molar (top) and right mandibular molar (bottom); C, right maxilla 1; D, left maxilla 2; E, left maxilliped; F, left pereopod 1; G, right pereopod 7.

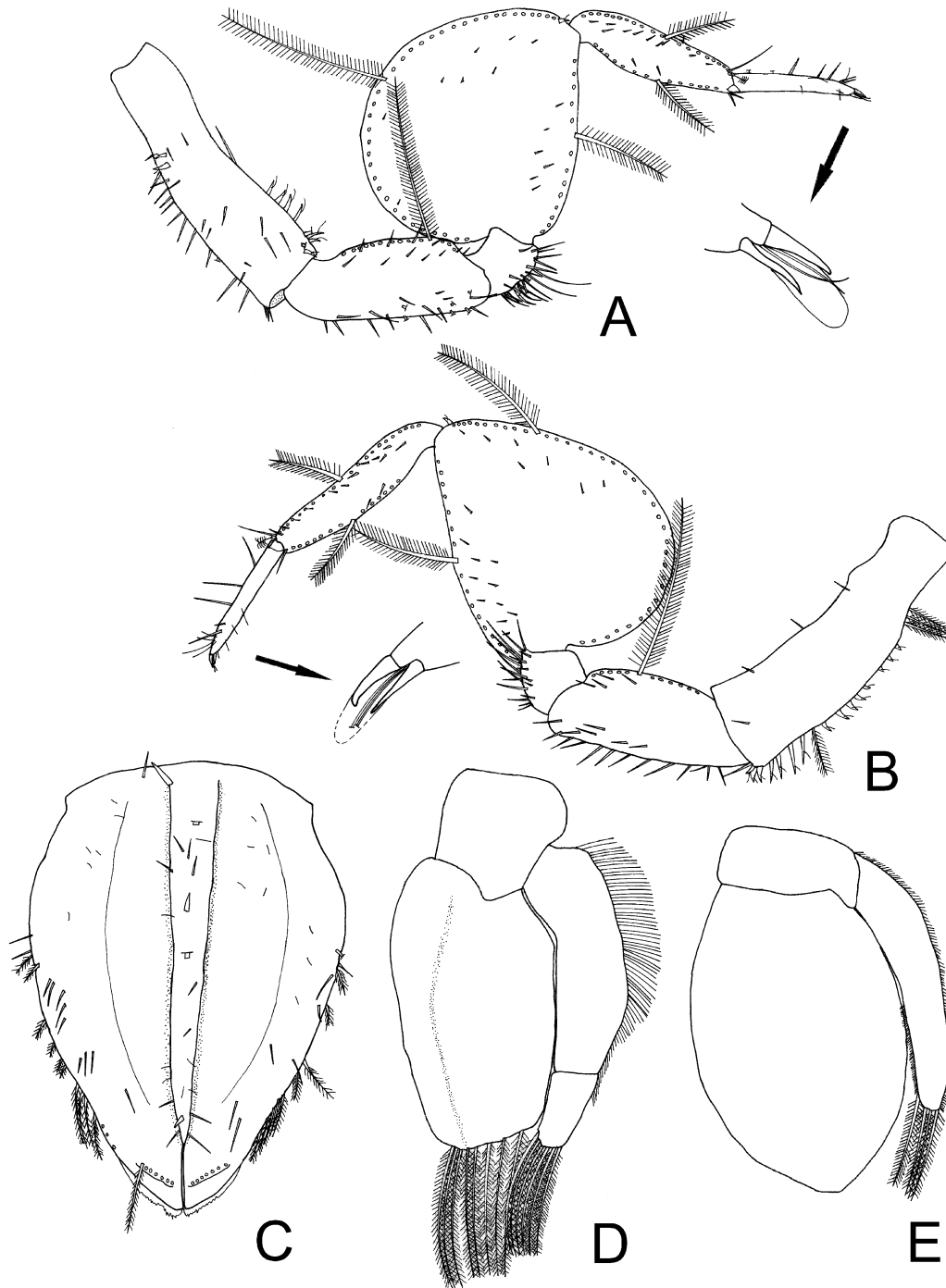


FIGURE 6. *Notopais minya* n. sp. All figures from female paratypes, operculum only from female paratype 4.5 mm. A, left pereopod 5; B, right pereopod 6; C, operculum; D, left pleopod 3; E, left pleopod 4.

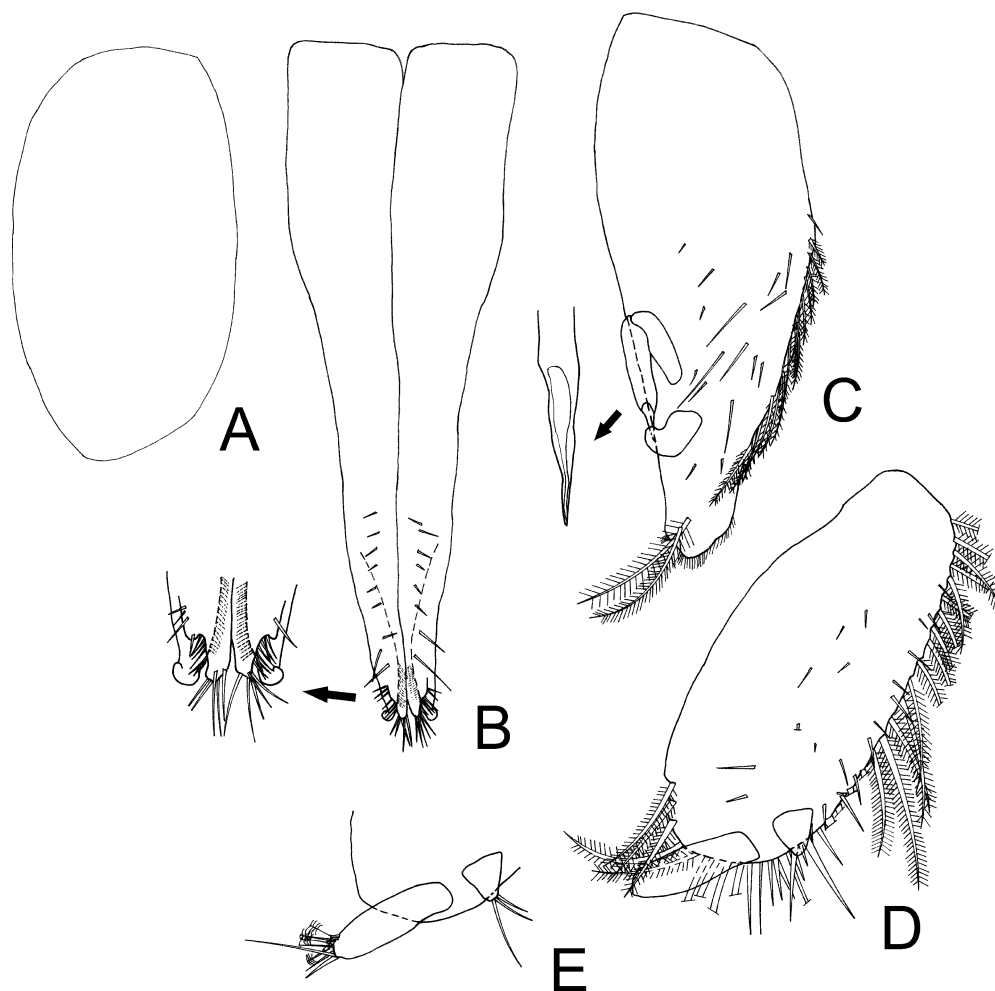


FIGURE 7. *Notopais minya* n. sp. A, D and E, female paratype; B, C, male paratype. A, left pleopod 5; B, pleopod 1; C, left pleopod 2; D, left uropod; E, enlargement of distal part of left uropod.

Description: Holotype. Body 2.5 times as long as greatest width (from spine to spine) of pereonite 2; widest at pereonite 3; cuticle not highly calcified, lightly setose. Cephalon lightly setose with 4 spines; anterior margins with few small, simple setae; posterolateral margins broadly rounded; ridge encompassing antennae, with no extension. Pereonite 1 anterior margin with 4 well developed spines, pereonites 2 and 3 with 6 and pereonite 4 with 5; pereonite 5 anterior margin rounded; anterolateral margins of pereonites 6 and 7 with small lobes, facing anteriorly.

Paratypes. Antenna 1 of 13 articles; article 1 distal end rounded, concave in centre, 1.1 times as long as wide, inferior margin with 1 simple and 1 flagellate robust seta, medial

surface with 2 simple setae, 1 broom seta and 4 flagellate robust setae, superior margin with 5 simple seta and 1 robust seta (broken); article 2 elongate, 0.5 times as long as article 1, 1.9 times as long as wide, with 2 robust flagellate setae and 4 broom setae; remaining articles all rectangular; article 4 with 2 broom setae; article 5 with 1 simple seta; from article 6 onwards, each article has 1 aesthetasc, many articles having additional simple setae; terminal article with 1 small simple seta and 1 broom seta. Male antenna 1 similar, of 22 articles; article 1 and 2 ratios similar to female, article 1 superior margin with 3 robust flagellate setae (1 long, 2 short) and 1 broom seta (in clump with robust flagellate setae), distal margin with 3 robust flagellate setae and 1 broom seta; article 2 1.6 times as long as wide, distal margin with 3 robust flagellate setae and 3 broom setae; article 5 with 2 broom setae; from article 8 onwards each article has 1 aesthetasc and many having additional simple setae. Antenna 2 articles 1–3 more or less triangular; article 1 superior margin with 3 additional robust flagellate setae; article 2 0.6 times as long as article 1, with 3 simple seta; article 3 0.6 times as long as article 1, with 1 simple seta and 9 flagellate robust setae (3 broken), all around lateral angled rim of article; article 4 small, 0.8 times as long as article 1, with no ornamentation; article 5 4.6 times as long as article 1, inferior margin with 1 simple seta (proximal end), 6 robust setae (evenly spaced), 2 long robust setae (at midpoint) and mesial face with 4 robust setae, 3 robust flagellate setae and 1 broom seta (at distal end), superior margin with 7 robust setae and 2 flagellate robust setae, distal margin with 8 blunt robust setae; article 6 10.3 times as long as article 1, inferior margin with 14 robust setae, 2 robust flagellate setae, 2 broom setae (distal) and 4 long robust setae, mesial face with 9 robust setae, 2 robust flagellate setae and 2 long robust setae, superior margin with 9 robust setae, 2 robust flagellate setae, 2 broom setae (distal), distal margin with 4 robust flagellate setae and 3 robust setae; flagellum of 33 articles (present, flagellum not complete), each setose.

Left and right mandible identical; mandible without microtrichs; spine row absent; molar small, terminated with 3 uni-serrate setae and 2 simple setae. Maxilla 1 lateral lobe 1.9 times as wide as mesial lobe, lateral and mesial margins with fine simple setae, distal margin with numerous simple setae, 5 robust setae, 3 robust dentate setae and 4 robust semi-plumose setae; mesial lobe with fine simple setae on margins, terminated with 15 simple setae and 2 long pectinate setae. Maxilla 2 lateral lobe with scattered fine simple setae, distally with 1 smaller and 4 long simple setae; middle lobe 1.1 times as wide as lateral lobe, distally with 4 long simple setae and 1 smaller simple seta; mesial lobe 3.4 times as wide as lateral lobe, margins with fine simple setae, terminated with 14 simple setae, 5 toothed setae and 1 long pectinate seta. Maxilliped coxa rectangular, small, 0.9 times as long as wide, 0.3 times as long as basis (including endite); basis elongate, length including endite 2.6 times as wide, with 5 simple setae (proximal); endite with 5 coupling hooks, and distally with 3 simple setae, 3 toothed setae, 6 fan setae (5 small, 1 large), and many fine simple setae; palp wider proximally, tapers distally, article 1 wide, rectangular, shortest, 0.1 times as long as basal endite, anterolateral margin with 1 simple seta, anteromesial

margin with 1 simple seta; article 2 5.1 times as long as, and 1.6 times as wide as article 1, and 1.6 times as wide as basal endite, superior margin with 9 simple setae (evenly spaced), and inferior margin with 4 simple setae (distal end); article 3 2.7 times as long as, and 0.9 times as wide as article 1, with 1 simple seta on superior margin (distal), inferior margin with 12 simple setae, and 17 semi-fan setae; article 4 almost rectangular, 1.6 times as long as, and 0.5 times as wide as article 1, superior margin with 1 simple seta (distal), and distal margin with 7 simple setae (inferior side); article 5 rectangular, small, narrowest of all articles, 1.3 times as long as, and 0.2 times as wide as article 1, with 6 terminal simple setae; epipod elongate, 1.8 times as long as wide, and 1.1 times as long as basis length, with many microtrichs on margin.

Pereopod 1 basis 6.5 times as long as wide, inferior margin with 9 setae (all SS), lateral face with 3 setae (all distal RFS), superior margin with 8 setae (all SS); ischium 4.3 times as long as wide, inferior margin with 2 setae (both SS), lateral face with 22 setae (all SS, scattered); merus 0.8 times as long as wide, inferior margin with 19 setae (all SS, of varying lengths, scattered), distosuperior margin with 5 setae (all SS); carpus 5.0 times as long as wide, inferior margin with 5 setae (long SS, proximal half), superior margin with 4 setae (all SS, 1 at midpoint, 3 at most distal corner); propodus 9.8 times as long as wide, inferior margin with 14 setae (all SS, in distal half), lateral face with 3 setae (all SS, in distal half), superior margin with 3 setae (all SS, in distal corner); dactylus 4.5 times as long as proximal width, superior margin with 4 setae (all SS, on distosuperior margin).

Pereopod 5 basis 3.4 times as long as wide, inferior margin with 18 setae (16 SS, 3 on distal corner, 2 proximal, sub-marginal RFS), lateral face with 13 setae (12 scattered SS, 1 RFS at distal end), superior margin with 8 setae (2 SS and 6 RFS, all in distal half); ischium 2.4 times as long as wide, inferior margin with 13 setae (all SS, 6 marginal, 7 sub-marginal), lateral face with 12 setae (all SS), superior margin convex, with 6 setae (5 sub-marginal SS, 1 distal SS); merus 0.9 times as long as wide, inferior margin with 22 setae (all SS, of varying lengths); carpus 3.6 times as long as wide, lateral face with 14 setae (all SS, scattered), superior margin with 1 seta (RFS, distal corner); propodus slightly expanded, 3.6 times as long as wide, inferior margin with 4 setae (all SS, 2 on distal margin, 2 sub-marginal), superior margin with 12 setae (10 sub-marginal SS, 1 long SS and 1 BS on distal corner); dactylus 6.3 times as long as proximal width, with 12 setae (all SS, all but 3 on superior margin).

Pereopod 6 basis thicker compared with basis in pereopod 5, 3.4 times as long as wide, inferior margin with 30 setae (25 RFS, 4 PLS, 1 distal SS), lateral face with 1 seta (distal SS), superior margin with 3 setae (all SS); ischium similar to that of pereopod 5, although 2.2 times as long as wide, inferior margin with 17 setae (all SS, 11 marginal, 6 sub-marginal), superior margin with 4 setae (all SS, sub-marginal in distal half); merus distosuperior margin cup-shaped, with carpus inserted into it, length 0.8 times as long as wide, inferior margin with 19 setae (all SS, of varying lengths); carpus similar to that of pereopod 5, 1.2 times as long as wide, lateral face with 18 setae (all SS, scattered); propodus

similar although more elongate than in pereopod 5, 4.4 times as long as wide, also inferior margin with 3 setae (all SS), superior margin with 12 setae (all SS); dactylus similar to that in pereopod 5, although 9.3 times as long as proximal width, with 13 setae (all SS, all but 3 on superior margin).

Pereopod 7 basis 4.6 times as long as wide, inferior margin with 21 setae (17 RFS, 1 proximal PLS, 3 distal SS), superior margin with 5 setae (3 short SS, 2 PLS at proximal end); ischium 2.5 times as long as wide, inferior margin with 14 setae (all SS), superior margin with 9 setae (all sub-marginal SS); merus 1.1 times as long as wide, inferior margin with 18 setae (all SS, of varying lengths), distosuperior margin with 2 setae (both SS); carpus 2.8 times as long as wide, inferior margin with 11 setae (all sub-marginal SS), superior margin with 13 setae (12 sub-marginal SS, 1 RFS at distal corner); propodus 8.6 times as long as wide, superior margin with 13 setae (11 sub-marginal, evenly spaced SS, distal corner with 1 long SS and 1 BS); dactylus 8.5 times as long as proximal width, with 14 setae (all SS, scattered along superior margin).

Pleon 0.9 times as long as proximal width, posterior tip rounded, with scattered simple setae. Male pleopod 1 2.9 times as long as proximal width, lateral margins indent 0.3 from proximal end, either side of centre margin with 17 simple setae (9+8), distally with pair of lobes which go over distolateral horns, with 29 simple setae (14+15). Male pleopod 2 sympod 2.5 times as long as wide, superior margin with 1 simple seta and 15 plumose setae, lateral surface with 16 simple setae (scattered), distal margin with 2 plumose setae and fringe of fine setae; exopod elongate and oval, length 0.1 times as long as sympod; stylet 0.3 times as long as sympod, terminating to a point, sperm duct 0.2 times as long as stylet. Operculum large, 1.8 times as long as proximal width, distally with medial slit and veined lamellar extension, median keel provided with a row robust and simple setae, distal surface with 14 plumose setae (7+7) and entire face with scattered simple setae of varying lengths, lateral margins with numerous plumose setae. Pleopod 3 exopod narrowing, 1.0 times as long as endopod, with row of fine simple setae and distally with 6 long plumose setae; endopod 1.7 times as long as wide, endopod with 8 long plumose setae. Pleopod 4 exopod slender, shorter than endopod, with its distal point at 0.7 times length of endopod, superior and inferior margin (part) with fringe of fine simple setae, with 4 terminal long plumose setae; endopod oval, 1.4 times as long as wide. Pleopod 5 1.8 times as long as wide.

Uropod protopod elongate, 2.3 times as long as wide, margins subparallel, distal end rounded, smooth, lateral margin with 19 plumose setae (4 broken) and 20 simple setae, mesial margin with 5 plumose setae, surface with 17 scattered simple setae; exopod small, 0.1 times as long as protopod and 0.4 times as long as endopod, with 3 simple setae; endopod 0.3 times as long as protopod, with 4 simple and 4 broom setae.

Remarks: *Notopais minya* n. sp. shows some resemblance to *N. magnifica* although it does not have as many spines on its first four pereonites as has *N. magnifica*. *N. minya* also has only 4 small spines on its cephalon instead of the 2 large dorsal and 2 smaller ones

seen on the anterolateral angles of *N. magnifica*. *N. minya* also has a unique setation pattern on the first four articles of antenna 2. Unlike all other *Notopais* described in this paper, article 2 has no distolateral spine. Pereonites 5–7 are similar to that of *N. beddardi*, except the anterolateral margins on pereonite 6 are more acute.

Distribution: South-eastern Australia, from Nowra, New South Wales to Eastern Bass Strait, depths from 110–592 metres.

Etymology: Minya is an Aboriginal word meaning small.

Notopais zealandica n. sp. (Figs 8–10)

Material examined.— Holotype. Female (4.5 mm), Stn S150, Chatham Rise, New Zealand, 45°46.0'S 174°24.5'E, 26 October 1979, epibenthic sled, 1640 m, R.V. *Tangaroa* (NIWA 3303). Paratypes. 1 male (3.0 mm, part remaining only, pleon missing), 5 females (3.5 [dissected], 3.5, 4.0, 4.5 [dissected], 4.8 mm), Stn S153, Chatham Rise, New Zealand, 45°21.1'S 173°35.8'E, 27 October 1979, epibenthic sled, 1386 m, R.V. *Tangaroa* (NIWA 3304).

Additional material.— 2 fragments, Stn S153, Chatham Rise, New Zealand, 45°21.1'S 173°35.8'E, 27 October 1979, epibenthic sled, 1386 m, R.V. *Tangaroa* (NIWA 3331).

Description: *Holotype*. Body 2.1 times as long as width of pereonite 2 (from spine to spine), widest at pereonite 5; cuticle not highly calcified, smooth. Cephalon smooth; anterior margins with few small, simple setae; posterolateral margins broadly rounded; antennal ridge with poorly developed extensions near antennal bases. Pereonites 1–5 anterior margins with stiff simple setae; pereonite 5 with anterolateral margins rounded and blade-like overhang raised above pereonites anterior margin; anterolateral margins of pereonites 6 and 7 with small anteriorly facing lobes.

Paratypes. Antenna 1 of 9 articles; article 1 rectangular, 1.6 times as long as wide, dorsal surface concave, inferior margin with 5 simple setae, mesial surface with 1 broom seta, distal margin with 5 robust setae, 2 flagellate robust setae and 1 broom seta; article 2 0.3 times as long as article 1, 1.8 times as long as wide (not including distal projection) with 2 robust setae, one on distal projection; remaining articles all rectangular; article 4 with 3 simple setae; article 6 with 1 distal aesthetasc; terminal article with 3 small simple setae. Antenna 2 articles 1–3 more or less triangular; article 2 1.1 times as long as article 1, with 1 robust flagellate seta on distosuperior margin and 1 simple seta; article 3 1.4 times as long as article 1, distal margin with 5 peripheral long robust and 1 flagellate robust seta; article 4 small, about half the size of article 3, 1.1 times as long as article 1, not ornamented.

Left and right mandible identical in structure; mandible spine row absent; molar small, terminated by 2 uni-serrate and 3 simple setae (left molar terminated with 4 uni-serrate setae). Maxilla 1 lateral lobe 2.1 times as wide as mesial lobe, lateral and mesial margins with fine simple setae, distal margin with 6 robust, 3 robust dentate and 3 robust semi-plu-

mose setae; mesial lobe with fine simple setae on margins, terminated with 6 simple and 2 long pectinate setae. Maxilla 2 lateral lobe with scattered fine simple setae, distally with 4 long simple setae; middle lobe 1.2 times as wide as lateral lobe, distally with 3 long simple setae; mesial lobe 2.0 times as wide as lateral lobe, margins with fine simple setae, terminated with 7 simple setae, 4 toothed setae and 1 long pectinate seta. Maxilliped coxa rectangular, small, 0.8 times as long as wide, 0.2 times as long as basis (including endite); basis elongate 2.9 times as long as wide (including endite), with 2 simple setae, distal superior margin with 1 simple seta; endite with 4 coupling hooks, distally with 4 simple setae, 3 fan setae and many fine, simple setae; palp wide proximally distally narrow, article 1 wide, shortest, 2.0 times as long as basal endite, trapezoid, with 2 simple setae on anterolateral margin, anteromesial margin with 1 simple seta; article 2 3.1 times as long as and 1.4 times as wide as article 1, 2.0 times as wide as basal endite, with microtrichs on lateral margin, superior margin with 3 simple setae, lateral face with 1 simple seta, and inferior margin with 3 semi-fan setae and 1 simple seta; article 3 1.7 times as long as wide, and 0.9 times as wide as article 1, superior margin with 2 simple setae, inferior margin with 4 simple setae and 15 semi-fan setae; article 4 rectangular, 0.4 times as long as article 1, superior margin with 1 simple seta, distal margin with 1 simple seta and 3 semi-fan setae; article 5 rectangular, small, narrowest article, 0.8 times as long as, and 0.1 times as wide as article 1, with 5 terminal simple setae; epipod semi-oval, 2.1 times as long as wide, 1.2 times as long as basis, with numerous marginal microtrichs.

Pereopod 1 basis 6.3 times as long as wide, inferior margin with microtrichs and 6 setae (5 SS, 1 distal RFS), lateral face with 2 setae (both SS, distal), superior margin with 3 setae (all SS); ischium 3.5 times as long as wide, inferior margin with 4 setae (all SS), lateral face with 3 setae (2 RFS, 1 SS), superior margin with 5 setae (2 distal SS, 2 short RS, 1 long RS at midpoint); merus 1.2 times as long as wide, inferior margin with 5 setae (all SS), distosuperior margin with 3 setae (all SS); carpus 4.6 times as long as wide, inferior margin with 4 setae (all long SS, 2+2 on proximal half), superior margin with 5 setae (all SS, 2 in distal corner); propodus length 5.3 times as long as wide, inferior margin with 6 setae (all SS), lateral face with 8 setae (all SS, scattered), superior margin with 2 setae (both SS, in proximal half); dactylus 2.3 times as long as proximal width, superior margin with 4 setae (all SS).

Pereopod 5 basis 3.5 times as long as wide, inferior margin with 9 setae (3 RFS & 4 SS all in loose cluster, distal corner with 1 RFS and 1 SS); ischium 2.2 times as long as wide, inferior margin with 10 setae (9 SS, 1 sub-marginal SS); merus 1.2 times as long as wide, inferior margin with 7 setae (all SS); carpus 0.9 times as long as wide, lateral face with 2 setae (both SS), superior margin with 1 seta (RFS, distal corner); propodus slightly expanded, 2.6 times as long as wide, superior margin with 8 setae (7 sub-marginal SS, 1 BS on distal corner); dactylus 5.7 times as long as proximal width, with 4 setae (all SS, on distosuperior margin).

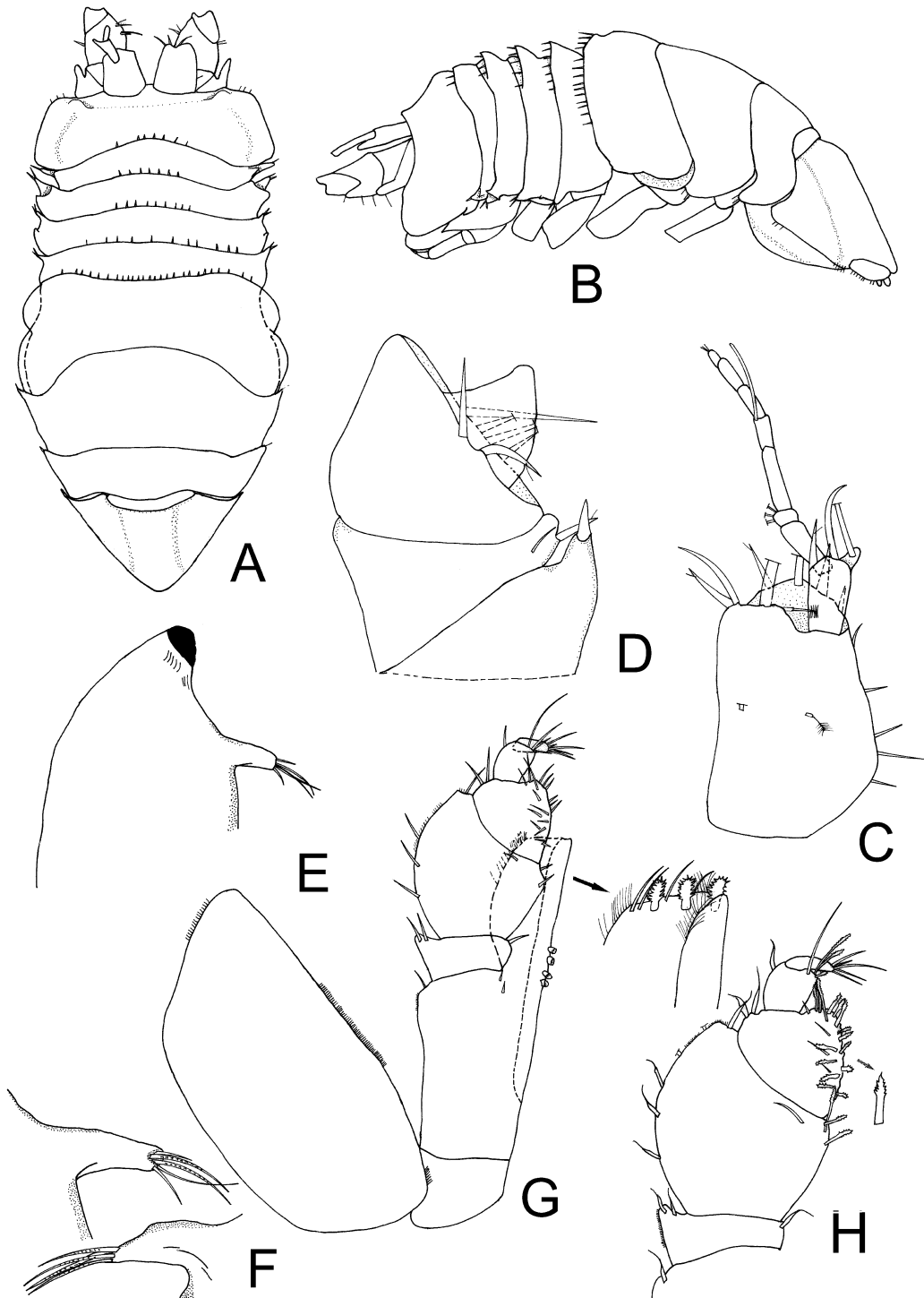


FIGURE 8. *Notopais zealandica* n. sp. A, B, female holotype, 4.5 mm; C–H, female paratype, 4.5 mm. A, dorsal view; B, lateral view; C, left antenna 1; D, right antenna 2; E, right mandible; F, right mandibular molar (top) and left mandibular molar (bottom); G, right maxilliped; H, right maxilliped palp.

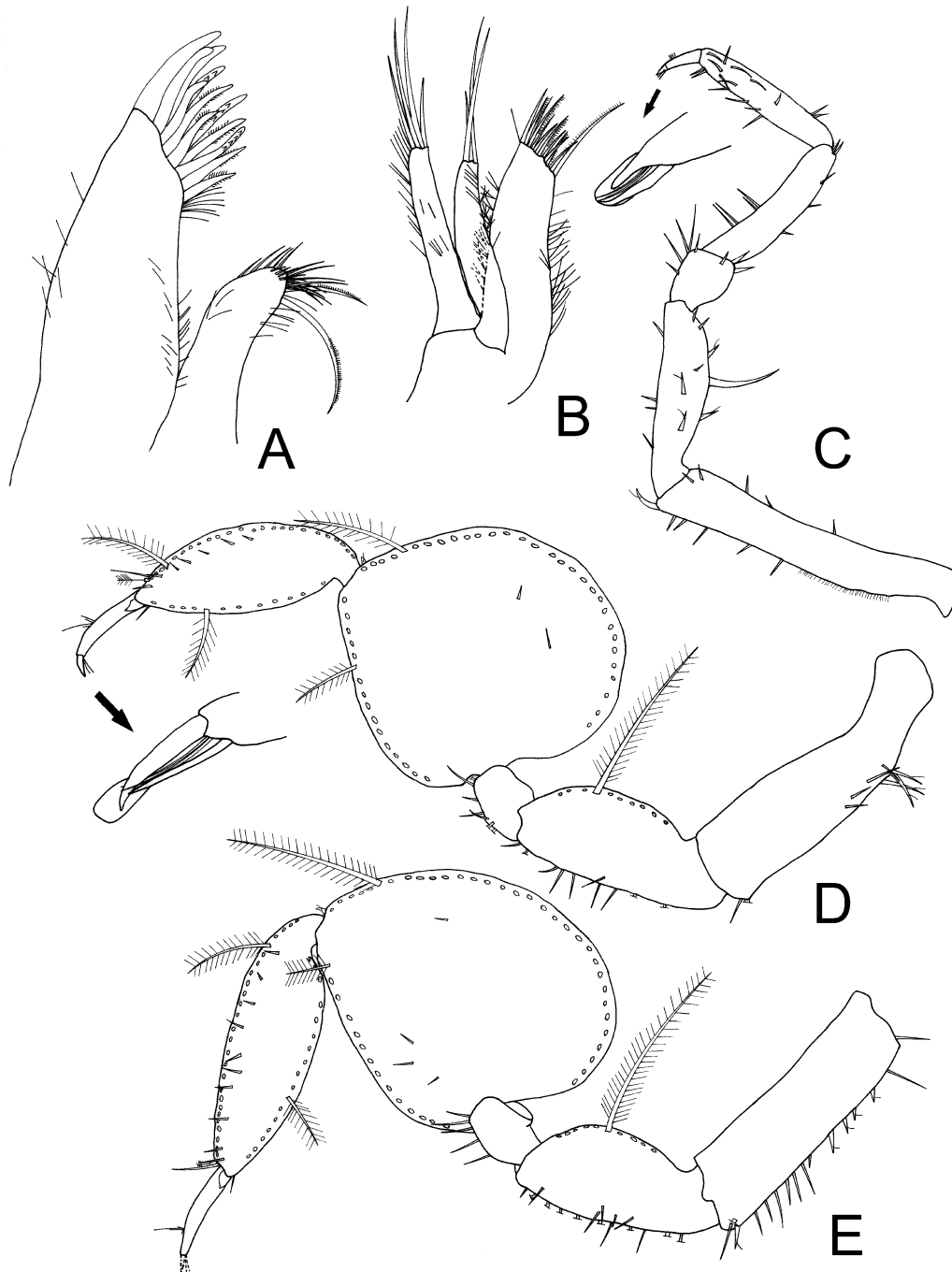


FIGURE 9. *Notopais zealandica* n. sp. A, B female paratype; C–E female holotype. A, right maxilla 1; B, right maxilla 2; C, right pereopod 1; D, left pereopod 5; E, left pereopod 6.

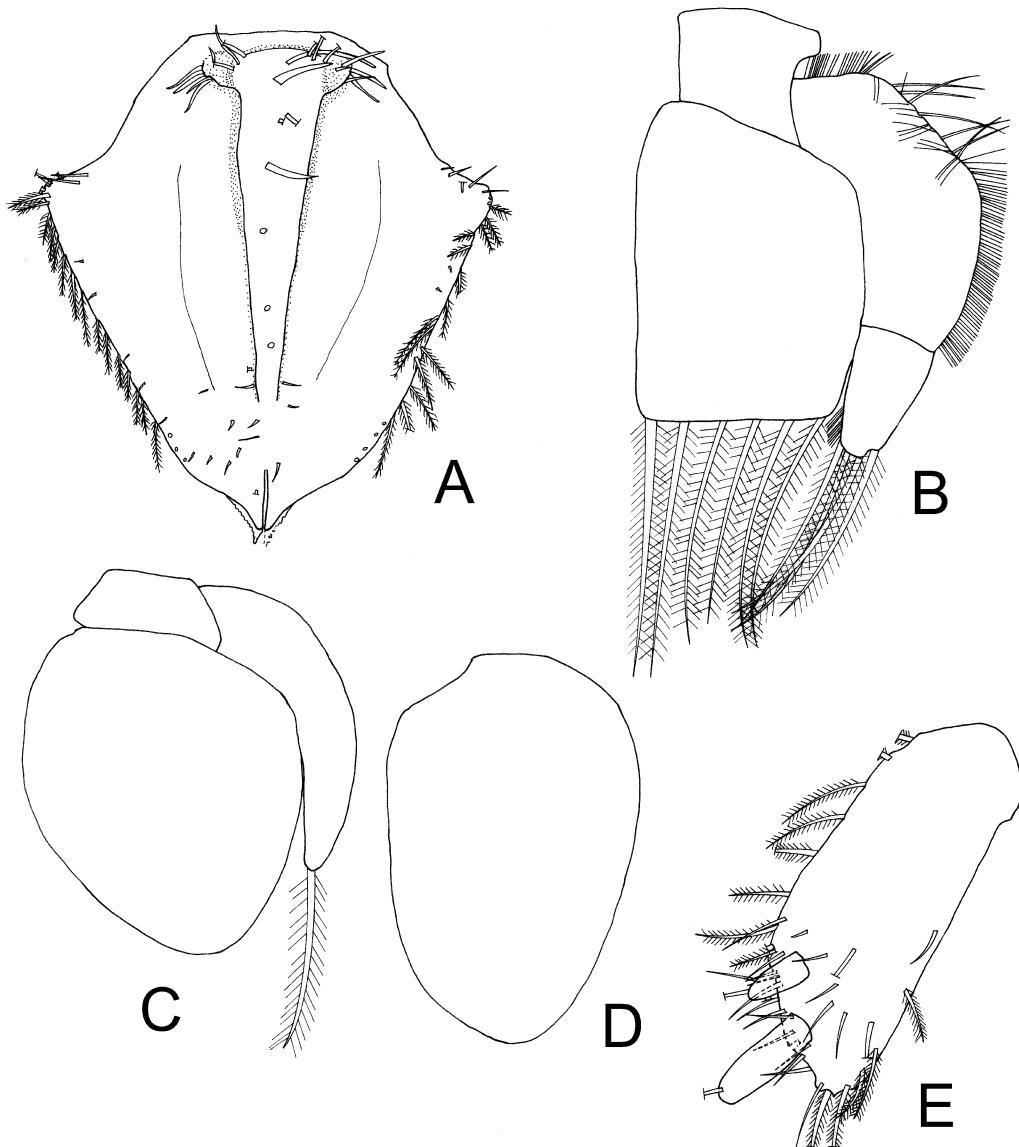


FIGURE 10. *Notopais zealandica* n. sp. All figures from female paratypes, operculum only from female paratype, 3.5 mm. A, operculum; B, left pleopod 3; C, left pleopod 4, D, left pleopod 5; E, left uropod.

Pereopod 6 basis thicker compared with basis in pereopod 5, 3.5 times as long as wide, inferior margin with 16 setae (10 SS, grouped in 2+7+1, 1 sub-marginal distal RS, 5 RFS, grouped in 4+1 on distal margin); ischium similar as in pereopod 5, although 2.1 times as long as wide, inferior margin with 16 setae (11 evenly spaced, marginal SS, 5 sub-marginal SS); merus distosuperior margin cup-shaped, with carpus inserted into it, 1.3 times as long as wide, inferior margin with 5 setae (all SS); carpus similar to carpus of pereopod 5,

except proximal end of superior margin is slightly more expanded, 0.9 times as long as wide, lateral face with 4 setae (all SS); propodus similar although more elongate than in pereopod 5, 2.8 times as long as wide, superior margin with 10 setae (all sub-marginal, evenly spaced SS); dactylus similar to that of pereopod 5, although 6.7 times as long as proximal width; unguis absent.

Pleon 0.5 times as long as proximal width and posterior tip rounded. Operculum large, 2.5 times as long as proximal width, distal end with medial slit and veined lamellar extension, proximal margin of median keel and keel itself provided with robust simple setae (proximal margin 7+8), distal surface with numerous scattered simple setae, anterior margins with 13 simple setae, 6 on right and 7 on left margin, lateral margins with numerous plumose setae. Pleopod 3 exopod distally narrow, 1.3 times as long as endopod, proximo-lateral margin with 6 simple setae set amongst continuous fine simple setae, distally with 4 long plumose setae; endopod 1.4 times as long as wide, with 6 long plumose setae. Pleopod 4 exopod slender, shorter than endopod, with its distal point at 0.7 times endopod length, superior margin smooth, with 1 apical long plumose seta; endopod sub-circular, 1.1 times as long as wide. Pleopod 5 1.5 times as long as wide.

Uropod protopod 2.6 times as long as wide, margins sub-parallel, distomesial angle produced, not extending past endopod, with 1 plumose and 1 simple seta, lateral margin with 8 plumose setae and 11 simple setae, mesial margin with 4 plumose setae, surface with 9 scattered simple setae; exopod small, 0.2 times as long as protopod and 0.6 times as long as endopod, with 3 simple setae; endopod 0.3 times as long as protopod with 1 simple seta.

Remarks: *Notopais zealandica* n. sp. is unique in that all pereonites lack anterior spines on their margins and instead are provided with stiff simple setae, similar to that seen on pereonite 5 of *N. beddardi*. *N. zealandica* is also the only species in this genus without spines on the cephalon, and it has a distinct blade-like extension raised above the anterior margin of pereonite 5.

Distribution: Chatham Rise, New Zealand.

Etymology: *N. zealandica* is named after New Zealand, as this species occurs within its waters.

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