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Southern High Latitude Squat Lobsters: Galatheoidea and Chirostyloidea from Macquarie Ridge with Description of a New Species of *Uroptychus*

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ABSTRACT. Macquarie Ridge is one of the southernmost seamount ridges, spanning 1600 kilometres from the southern tip of New Zealand to the Australia-Pacific-Antarctic triple junction halfway to Antarctica. Squat lobsters, superfamilies Chirostyloidea and Galatheoidea, are highly diverse at low and mid-latitudes, declining rapidly towards the poles; only 15 of the more than 1000 species have been recorded south of 50°S. Prior to the present study, one species of squat lobster (*Munidopsis pyrochela*, Munidopsidae) was known from the Macquarie Ridge, but recent research voyages in 2003 and 2008 collected a further five species from both superfamilies and three families. *Uroptychus tracey* (Chirostyloidea) is new to science. *Uroptychus insignis* (Henderson, 1885) is reported for the first time outside of the western Indian Ocean and re-described based on type material. Subtle differences between the western Indian Ocean and Macquarie Ridge specimens of *U. insignis* suggest that the latter specimens might represent a separate species. *Munida chathamensis* Baba, 1974 (Munididae) is re-described and reported for the first time outside of its Chatham Rise type locality. New morphological variation is reported for *Munida isos*. *Munidopsis tasmaniae* is reported not only for the first time from the Macquarie Ridge, but also for the first time from New Zealand waters.

KEYWORDS. Anomura, Galatheoidea, Chirostyloidea, New Zealand, Macquarie Ridge, Southern Ocean, seamount

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Introduction

Crustaceans commonly referred to as squat lobsters belong to two remotely related superfamilies in the infraorder Anomura, the Galatheoidea and the Chirostyloidea (Ahyong *et al.*, 2010; Schnabel & Ahyong, 2010; Macpherson & Baba, 2011). Their similar body plan, size and habitat along deep continental margins, slopes and seamounts, means they are often treated together (Poore *et al.*, 2011). Squat lobster diversity is highest at low latitudes with a centre around the Coral Triangle and the wider western Pacific (Schnabel *et al.*, 2011). Diversity quickly declines from temperate to polar latitudes with very few southern hemisphere records south of around 50°S. For instance, Fabricius (1793), Henderson (1885, 1888), Benedict (1902), Lagerberg (1905) and Arntz *et al.* (1999) report a total of 10 species from off southern Chile and Argentina (*Galacantha bellis* Henderson, 1885, *Gastroptychus milneedwardsi* (Henderson, 1885), *Munida curvipes* Benedict, 1902, *M. gregaria* (Fabricius, 1793), *M. spinosa* Henderson, 1885, *Munidopsis aspera* (Henderson, 1885), *Ms. opalescens* (Benedict, 1902), *Ms. subsquamosa* Henderson, 1885, *Ms. trifida* Henderson, 1885 and *Uroptychus parvulus* (Henderson, 1885). Henderson (1888) reports *Munidopsis antonii* (Filhol, 1884) from southwest of Australia at 50°S, and Schnabel (2009) reports *Gastroptychus novaezelandiae* Baba, 1974, from southern New Zealand at 53°S. Most recently, Ahyong (2014) reported *Munidopsis pyrochela* Ahyong, 2014 from the Macquarie Ridge (50°S) and Marsh *et al.* (2015) report an undescribed species of yeti crab (*Kiwa* sp.) from hydrothermal vent fields on the East Scotia Ridge (see also Roterman *et al.*, 2013; Ahyong & Roterman, 2014: fig. 4). The southernmost record for a squat lobster to date, *Munidopsis albatrossae* Pequegnat & Pequegnat, 1973, is from 70°14'37"S in the Bellingshausen Sea at 1920 m depth (García Raso *et al.*, 2008). To date, only 15 of the more than 1000 species of squat lobsters worldwide are known at these high southern latitudes.

The New Zealand squat lobster fauna is still in the discovery phase, with 56 species currently reported across both superfamilies (Ahyong, 2007, 2013, 2014; Baba, 2005; Chilton, 1911; Cubelio *et al.*, 2007; Henderson, 1885; Vereshchaka, 2005; Schnabel & Bruce, 2006; Schnabel, 2009). The most comprehensive reports to date are those of Ahyong (2007), reporting 27 species of galatheoids collected during the NORFANZ expedition to the Norfolk Ridge and Lord Howe Rise north of New Zealand, and Schnabel (2009), reporting 16 species of chirostyloids from New Zealand and the Kermadec Ridge to the north. A few records of *Gastroptychus novaezelandiae* are known south of New Zealand, including the Bounty Plateau, the Auckland Islands and the Campbell Plateau, the latter the southernmost record at just over 53°S. All of these records lie on the southern reaches of the New Zealand continental shelf. Prior to the present study, only one species of squat lobster, *Munidopsis pyrochela* Ahyong, 2014, was recorded from the Macquarie Ridge.

The Macquarie Ridge extends 1600 km southwest from New Zealand, and represents the oceanic portion of the Australia-Pacific plate boundary between the Alpine fault of New Zealand's South Island and the submarine Australia-Pacific-Antarctic triple junction (Lamarche *et al.*, 1997; Lebrun *et al.*, 2003). To date there has been little sampling of the Macquarie Ridge and its elevated features, with most sampling in the region concentrated around Macquarie Island (McKnight, 1984; Dawson, 1988; Butler *et al.*, 2000).

In 2008, the interdisciplinary New Zealand-Australian research voyage, "MacRidge 2" (TAN0803), conducted an extensive survey with the objectives to physically characterize selected seamounts associated with the Macquarie Ridge and to determine the macroinvertebrate assemblage composition of selected seamounts (Rowden, 2008). Ten seamounts were mapped and sampled along the ridge between 48° and 59°S with peaks at depths of approximately 90–1200 m. The bases of the seamounts ranged from approximately 750 to 2500 m water depth (elevations ranged from 450 to 1300 m). Deployments of a camera sled showed abundant sponge and coral (gorgonian and soft corals) cover on basaltic substrate. Benthic sampling was also undertaken in 2003 (TAN0306) on Christable Seamount, a crescent-shaped feature, situated between the Macquarie Ridge and the slope of the Campbell Plateau near the Auckland Islands with a summit depth of 910 m and a base depth of 3000 m (Clark *et al.*, 2003) (Fig. 9). We herein report on the squat lobsters collected by these surveys, supplemented by additional specimens from selected New Zealand and Indian Ocean localities.

Materials and methods

Morphological terminology follows Baba (2005) and Baba, Ahyong & Macpherson (2011). Measurements of specimens are given in millimetres (mm). Carapace length (cl) is measured along the dorsal midline and includes the rostrum. Postrostral carapace length (pcl) is measured from the base of the rostrum to the posterior margin of the carapace. Pereopods 1–4 are abbreviated P1–4, respectively. In the descriptions of *U. insignis*, *U. tracey* and *M. chathamensis*, ranges of morphometric variation are indicated with the measurement for the holotype in square brackets. Drawings were made using a WACOM Intuos3 Graphics Tablet and Adobe Illustrator CS6, or ink and drawing film. Specimens examined are deposited in the Invertebrate Collection of the National Institute of Water and Atmospheric Research, Wellington (NIWA), the Museum of New Zealand Te Papa Tongarewa (NMNZ), the Australian Museum, Sydney (AM), the Muséum national d'Histoire naturelle, Paris (MNHN), and the Kitakyushu Museum of Natural History, Kitakyushu, Japan (ZLKU). Localities lie within the New Zealand Exclusive Economic Zone (EEZ) unless otherwise stated.

Systematics

Superfamily Chirostyloidea Ortmann, 1892

Family Chirostylidae Ortmann, 1892

Genus *Uroptychus* Henderson, 1888

Uroptychus insignis (Henderson, 1885)

Figs 1–4, 5A

Diptychus insignis Henderson, 1885: 419 (type locality: off Marion Island, Prince Edward Islands, 46°41'S, 38°10'E, 567 m).

Uroptychus insignis.—Henderson, 1888: 175, pl. 21, figs 1, 1a, 1c [not 1b].—Baba, 2005: 227 (key, synonymies).—Baba *et al.*, 2008: 34 (synonymies).

Type material. BMNH 1902.10.2.9–14, ov. female lectotype (cl 17.1, pcl 10.6 mm), 6 male paralectotypes (cl 7.6, pcl 4.5 to cl 16.7, pcl 10.7 mm), 7 female paralectotypes (pcl 3.1–11.0 mm), off Marion Island, Prince Edward Islands, southern Indian Ocean, 46°41'S, 38°10'E, 567 m, “Challenger” Stn. 145A.

Other material examined. *Macquarie Ridge*: NIWA 40904, 1 ov. female (cl 15.9, pcl 10.5 mm), 1 female (cl 8.7, pcl 5.5 mm), 2 males (cl 12.0, pcl 7.4; cl 18.1, pcl 11.8 mm), Hjort Seamount, 56°14.78–14.49'S, 158°30.34–30.9'E, 676–750 m, 16 April 2008, TAN0803/98; NIWA 40664, 1 male (pcl 13.1 mm), 1 unknown (pcl 11.6 mm), Seamount 8 (Australian EEZ), 55°13.75–13.75'S 158°15.49–15.89'E, 501–775 m, 15 April 2008, TAN0803/88 (specimens lost at sea; studied from images).

Crozet Islands: MNHN IU-2010-5427, 1 male (cl 18.0, pcl 11.5 mm), 1 female (pcl 5.6 mm), 46°36.56'S, 49°39.28'E, 902–1217 m, on black coral, R/V “Croix du Sud” Palangre No. 36, 25 December 2002; MNHN IU-2010-5433, 1 male (pcl 9.3 mm), no specific locality, R/V “Anyo Maru 22”, coll. Jérôme Maison, January–April 1997; MNHN IU-2010-5431, 1 ov. female (cl 17.0, pcl 10.2 mm), 46°29.06'S, 50°0.15'E, 830–930 m, R/V “Anyo-Mar 22” Palangre 164, coll. Jérôme Maison, 15 March 1997; MNHN IU-2010-5434, 1 female (pcl 7.2 mm), 46°54.12'S, 51°09.12'E, 544 m, R/V “Anyo-Mar 22” Palangre 183, coll. Jérôme Maison, 30 March 1997; MNHN IU-2014-12002, 9 males (pcl 4.9–9.0 mm), 1 ov. female (pcl 10.9 mm), 7 females (pcl 6.0–10.0 mm), 46°21'S, 50°07'E, 490–495 m, MD30/BIOMASS, R/V “Marion Dufresne” stn. 25-CP59, 10 February 1982.

Kerguelen Islands: MNHN IU-2010-5429, 3 females (pcl 8.8–10.0 mm), 49°5 9.40'S, 67°5 0.70'E, 760 m, Kerguelen 472, R/V “Esperance-Anyo” Ligne 77, coll. David Beaufils, 11 May 2008; MNHN IU-2010-5432, 1 male (cl 4.8, pcl 2.9 mm), 1 female (cl 7.3 mm, pcl 4.4 mm), 49°31.69'S, 67°18.22'E, 980–1031 m, R/V “Albius” Palangre No. 111, 18 May 2002; AM P97998, 1 female (cl 14.3, pcl 9.0 mm), 50°06'S, 64°48'E, 489 m, Poker II st. 180, 22 September 2010; AM P97999, 1 male (cl 11.8, pcl 7.2 mm), 50°11'S, 64°55'E, 483 m, Poker II stn. 179, 22 September 2010; MNHN IU-2007-4986, 1 female (cl 9.2, pcl 5.7 mm), 50°11'S, 64°55'E, 483 m, Poker II stn. 179, 22 September 2010; MNHN IU-2007-4996, 1 female (cl 4.6, pcl 2.7 mm), 50°11'S, 64°55'E, 483 m, Poker II stn. 179, 22 September 2010; AM P98003, 1 male (cl 4.3, pcl 2.7 mm), 50°11'S, 64°55'E, 483 m, Poker II stn. 179, 22 September 2010.

Amsterdam Island: MNHN IU-2010-5428, 1 ov. female (pcl 4.5 mm), 1 female (pcl 4.6 mm), 37°47.20'S, 77°38.98'E, 940–1680 m, R/V “Marion-Dufresne”, CP7, 9 July 1986.

Prince Edward Islands: MNHN IU-2014-12003, 1 male (pcl 8.4 mm), 1 ov. female (pcl 10.8 mm), 1 female (pcl 6.0 mm), Marion Island, 46°41'S, 38°07'E, 315–570 m, MD08/BENTHOS, R/V “Marion Dufresne” stn. 36, CP173, 29 March 1976.

Diagnosis. Carapace excluding rostrum wider than long; dorsum smooth, with transverse row of epigastric spines; lateral margins divergent, spinose; anterolateral spine overreaching outer orbital spine; anterior branchial spine separated from remaining branchial spines by wide unarmed

margin (occasionally with 1 or 2 small spines). Rostrum sharply triangular, margins unarmed or with few minute denticles. Sternite 3 anterior margin with deep, V-shaped median emargination. Basal antennal article with small outer spine; ultimate and penultimate articles each with distomesial spine. Antennal scale extending almost to apex of ultimate peduncle article. Crista dentata uniformly and minutely dentate. P2–4 similar; merus with small spines on extensor margin; propodus flexor margin broadened distally and lined with movable spines; dactylus flexor margin lined with strong, obliquely directed, corneous teeth.

Description of type material. *Carapace*: Wider than long (length 0.8–[0.9] × width); greatest width 1.7–[2.1] × distance between anterolateral spines. Dorsal surface moderately convex from anterior to posterior, large specimens with feeble depression between gastric and anterior branchial regions; with sparse short setae; bearing transverse field of 6–9[7] small spines in addition to few acute granules across epigastric region. Lateral margins broadly convex, divergent posteriorly, with row of distinct spines: first (anterolateral spine) well developed, directed straight forward, overreaching lateral orbital spine, followed by 2 (rarely 1) small spines on hepatic margin; fourth spine situated on anterior end of anterior branchial margin, smaller than anterolateral spine; fifth strong, distantly posterior to preceding spine, situated on anterior end of posterior branchial margin (rarely 1 or 2 extra small spines between fourth and fifth), followed by 3–6[4] posteriorly diminishing spines; last spine followed by low ridge along lateral margin. Rostrum elongate triangular, with interior angle of 22–27°[23°], horizontal and directed straight forward; dorsal surface flattish basally, becoming rounded in cross-section distally; lateral margin straight, with up to 3 minute spines distally; length 1.6–[2.0] × width, 0.6 (rarely 0.7) × pcl, width about half (small specimens) or less than half (large specimens) carapace width at posterior carapace margin. Outer orbital spine very small, moderately remote from and slightly anterior to base of anterolateral spine of carapace. Pterygostomial flap anteriorly angular, produced to small spine, surface somewhat granular or with several small spines on anterior portion.

Sternum: Sternites 1–3 with anterior margin convex between bases of maxilliped 1, surface without distinct ridge in midline. Sternal plastron length 0.7–0.8 × width, lateral extremities divergent posteriorly. Sternite 3 distinctly depressed, anterolateral angle blunt or rarely sharply produced; anterior margin with deep V-shaped median emargination, without median spines. Sternite 4 with bluntly or obsolescently denticulate anterolateral margin, anteriorly blunt angular or rounded, posterolateral margin 0.5–0.6 length of anterolateral margin. Sternite 5 slightly broader than sternite 4, anterolateral margins strongly convex anteriorly, 1.3–1.4 × length of posterolateral margin of sternite 4. Widest at sternite 7.

Abdomen: Tergite 1 gently convex from anterior to posterior. Tergite 2 2.7–[3.3] × wider than long; pleural lateral margins weakly concave and weakly divergent posteriorly, posterolaterally angular. Pleuron 3 with angular lateral margin. Telson about half as long as wide; posterior plate 1.1–1.5[1.4] × longer than anterior plate (longer in small specimens), posterior margin distinctly emarginate.

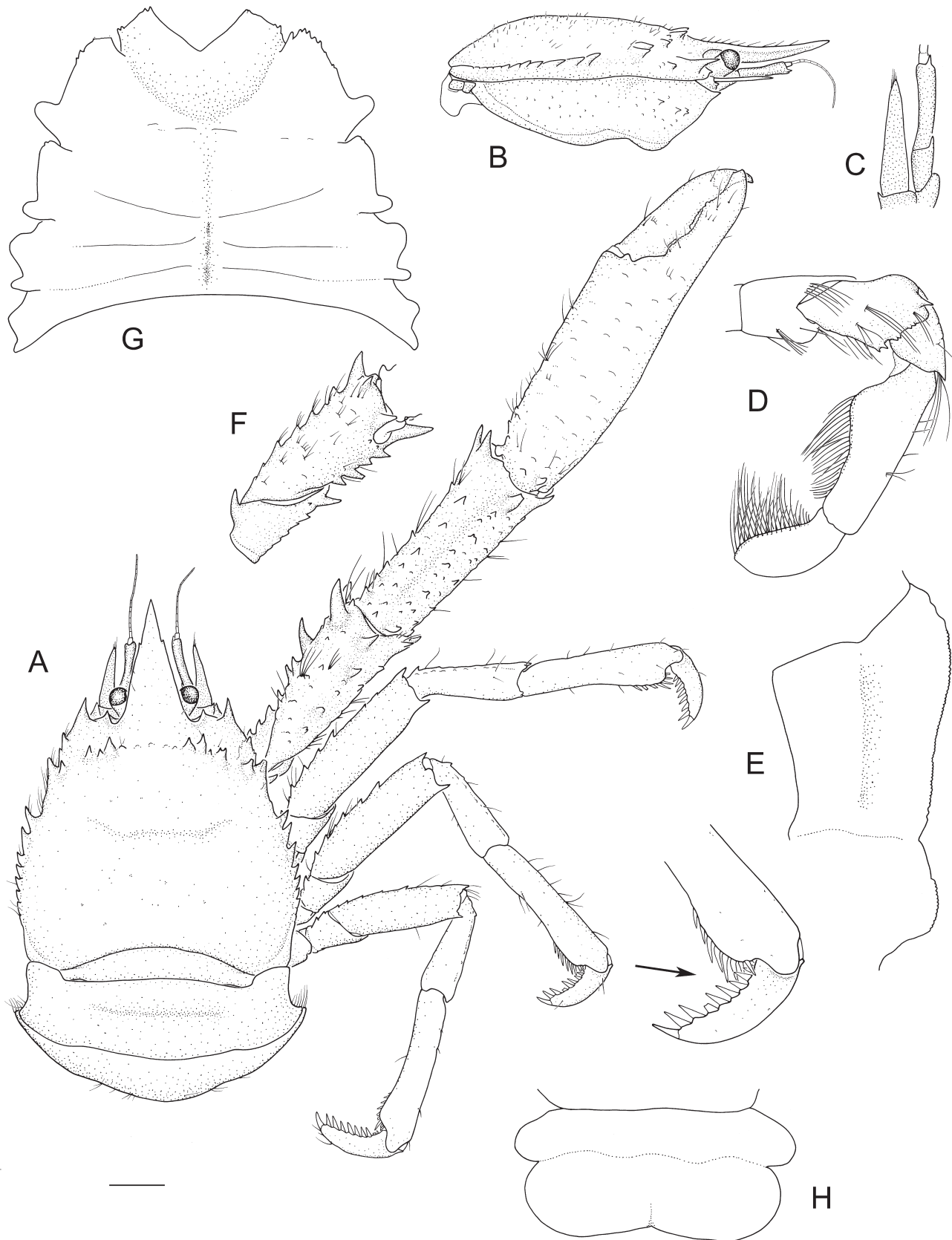


Figure 1. *Uroptychus insignis* (Henderson, 1885), ov. female pcl 10.5 mm, Hjort Seamount, Macquarie Ridge (NIWA 40904). (A) dorsal habitus. (B) carapace, right lateral. (C) right antenna, ventral view. (D) right maxilliped 3, lateral. (E) right crista dentata. F, right P1 ischium and merus, ventral. (G) sternal plastron. (H) telson. Scales: A, B, F = 2.5 mm; C, D, G, H = 1.25 mm; E = 0.5 mm.

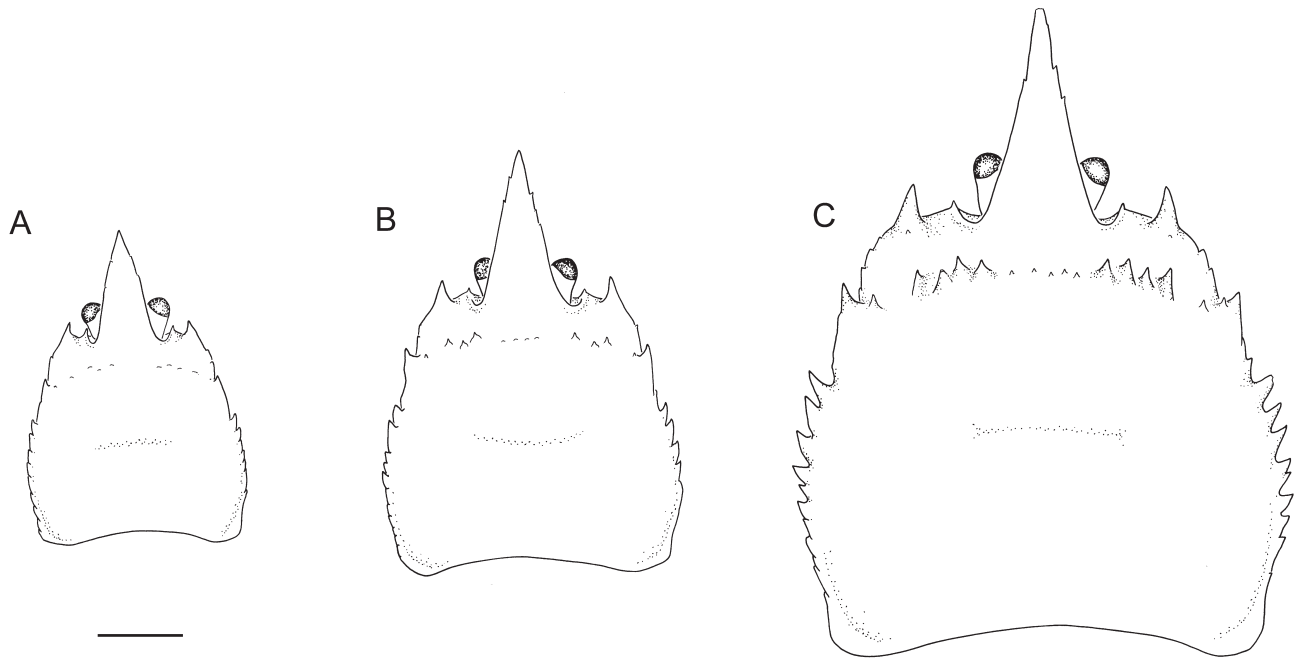


Figure 2. *Uroptychus insignis* (Henderson, 1885), carapace, Hjort Seamount, Macquarie Ridge (NIWA 40904). (A) female pcl 5.5 mm. (B) male pcl 7.4 mm. (C) male pcl 11.8 mm. Scale = 2.5 mm.

Eye: Relatively short (length 1.4–[1.5] × width), somewhat narrowed distally, reaching anteriorly at most to proximal one-third of rostrum. Cornea not dilated, more than half length of remaining eyestalk.

Antennule: Distal article of antennular peduncle relatively slender, 3.0–[4.0] × longer than high (proportionally longer in large specimens).

Antenna: Antennal peduncle extending far beyond cornea, overreaching midlength of rostrum. Article 2 with small distolateral spine. Antennal scale tapering, [1.8]–2.1 × wider than article 5, slightly falling short of, fully reaching or slightly overreaching tip of article 5. Articles 4 and 5 each with small distomesial spine. Article 5 about twice as long as article 4, width 0.6 × height of distal article of antennule. Flagellum of 9–17 segments, overreaching distal end of P1 merus.

Maxillipeds: Maxilliped 1 with bases broadly separated. Maxilliped 3 basis with mesial ridge proximally lobe-like, with a few obsolescent denticles; ischium distally not rounded on flexor margin, crista dentata with numerous tiny denticles; merus wide relative to length, about twice length of ischium, flattish on mesial face, distolateral spine distinct, flexor margin ridged along distal half, with 4–6 small spines distal to midlength; distolateral spine of carpus distinct.

Pereopod 1 (cheliped): Sparsely to moderately setose, length 3.0–4.1 pcl (males), 3.0–[3.8] pcl (females), (greater in larger specimens). Ischium with well-developed dorsal spine, ventromesial margin with strong subterminal spine proximally followed by small spines. Merus, carpus and palm with sparse denticles on dorsal surface (fewer on palm). Merus 0.6–[0.9] pcl (longer in large specimens), distally and mesially spinose, a few mesial spines strong, ventrally with small spines along mesial margin. Carpus [1.0]–1.1 × length of merus, distally spinose. Palm length 2.1–2.4 (males), 2.3–2.7[2.6] (females) × width, [1.2]–1.4 × carpus length. Fingers (dactylus and pollex) inclined somewhat

laterally in large specimens, straight in small specimens, not gaping, distally crossing. Dactylus length 0.6–[0.7] × palm length (shorter in large specimens), occlusal margin with low median process proximal to position of opposite eminence on pollex.

Pereopods 2–4 (walking legs): Sparsely setose. Meri successively shorter posteriorly (P3 merus 0.9 × length of P2 merus, P4 merus 0.8 × length of P3 merus), P2–3 meri subequally broad, P4 merus slightly narrower than P3 merus; length-breadth ratio, 3.1–[4.2] on P2, 3.0–[3.8] on P3, 2.5–[3.3] on P4 (relatively narrow in large specimens); dorsal margin with several small spines including terminal spine, ventrolateral margin with terminal spine only. P2 merus length 0.7–[0.9] × pcl, subequally long as (in large specimens) or slightly shorter than (in small specimens) P2 propodus; P3 merus length 0.8–[1.0] × length of P3 propodus; P4 merus length 0.7–[0.8] × length of P4 propodus. Carpi successively slightly shorter posteriorly; carpus-propodus length ratio, 0.5–[0.6] on P2–3, 0.4–[0.6] on P4; extensor margin with small proximal spine. Propodi subequal on P2–4 or shorter on P2 than on P3–4; flexor margin distally convex strongly in large specimens, feebly so in small specimens, ending in pair of spines preceded by 5–8, 4–7, 3–7 spines (fewer in small specimens) on P2, 3 and 4 respectively. Dactyli 0.3–[0.4] × as long as propodi on P2, 0.4 on P3, 0.4–[0.5] on P4; dactylus-carpus length ratio, 0.5–0.9[0.6] on P2, 0.6–0.9[0.8] on P3, 0.8–1.1[0.9] on P4 (smaller in large specimens); flexor margin slightly curving, with 6–10 [9 or 10] acute, proximally diminishing, somewhat inclined spines (fewer in small specimens).

Eggs: Number of eggs carried, about 50; size, 1.3 × 1.2 mm to 1.3 × 1.3 mm.

Colour in life (Fig. 5A). Bright red.

Remarks. *Uroptychus insignis* (Henderson, 1885), originally described from the south-west Indian Ocean

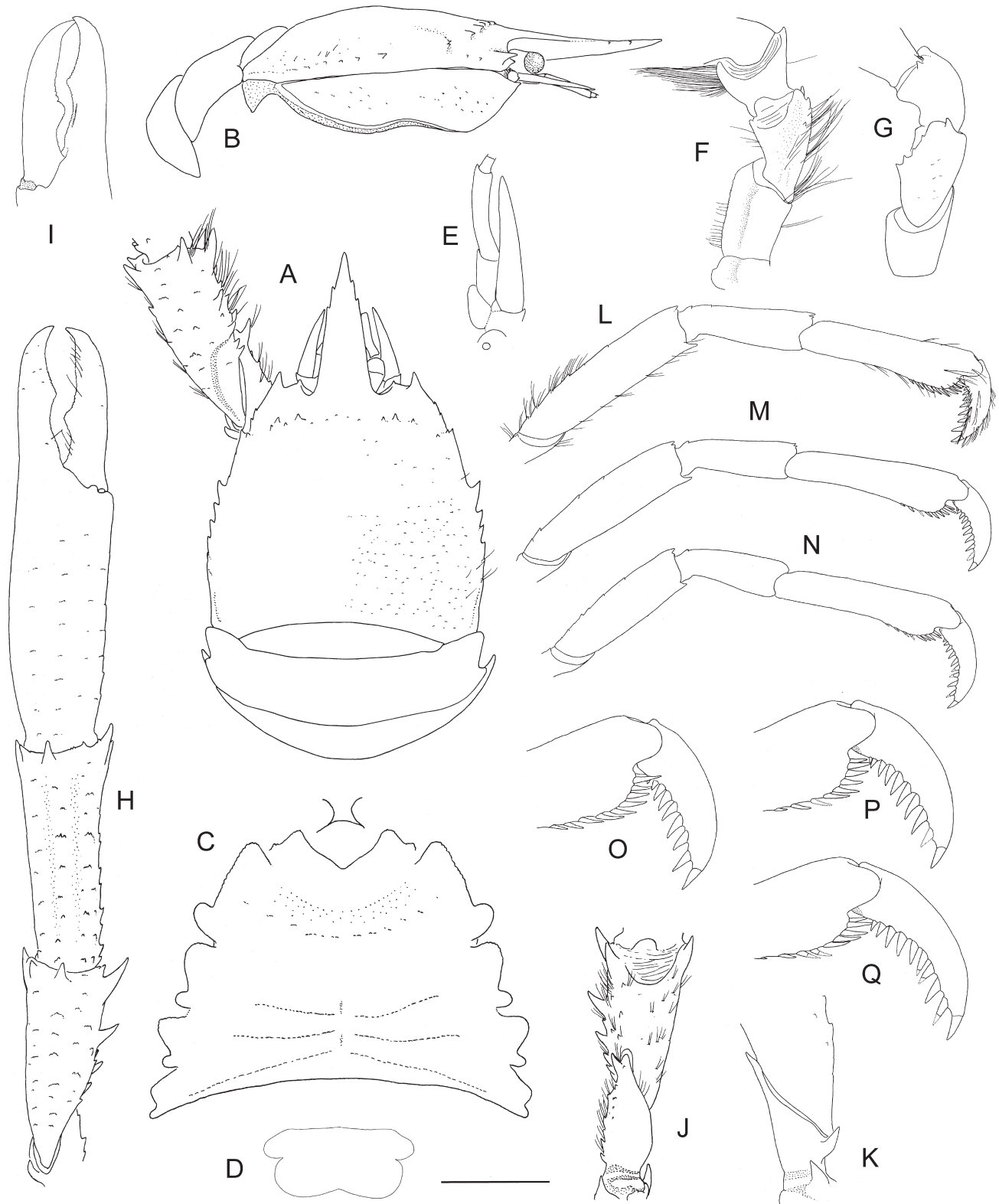


Figure 3. *Uroptychus insignis* (Henderson, 1885), lectotype, ov. female, pcl 10.6 mm, (BMNH 1902.10.2.9–14). (A) carapace and anterior part of abdomen, proximal part of left cheliped, dorsal. (B) carapace and abdomen, right lateral. (C) sternal plastron. (D) telson. (E) left antenna, ventral. (F) left maxilliped 3, ventral. (G) same, setae omitted, lateral. (H) left P1, setae omitted. (I) left P1 fingers, ventral view. (J) left P1 ischium and merus, ventral. (K) same, proximal part, lateral. (L–N) right P2–4. (O–Q) same, distal articles. Scales: A, B, H–N = 5 mm; C = 2.0 mm; D–G, O–Q = 2.5 mm.

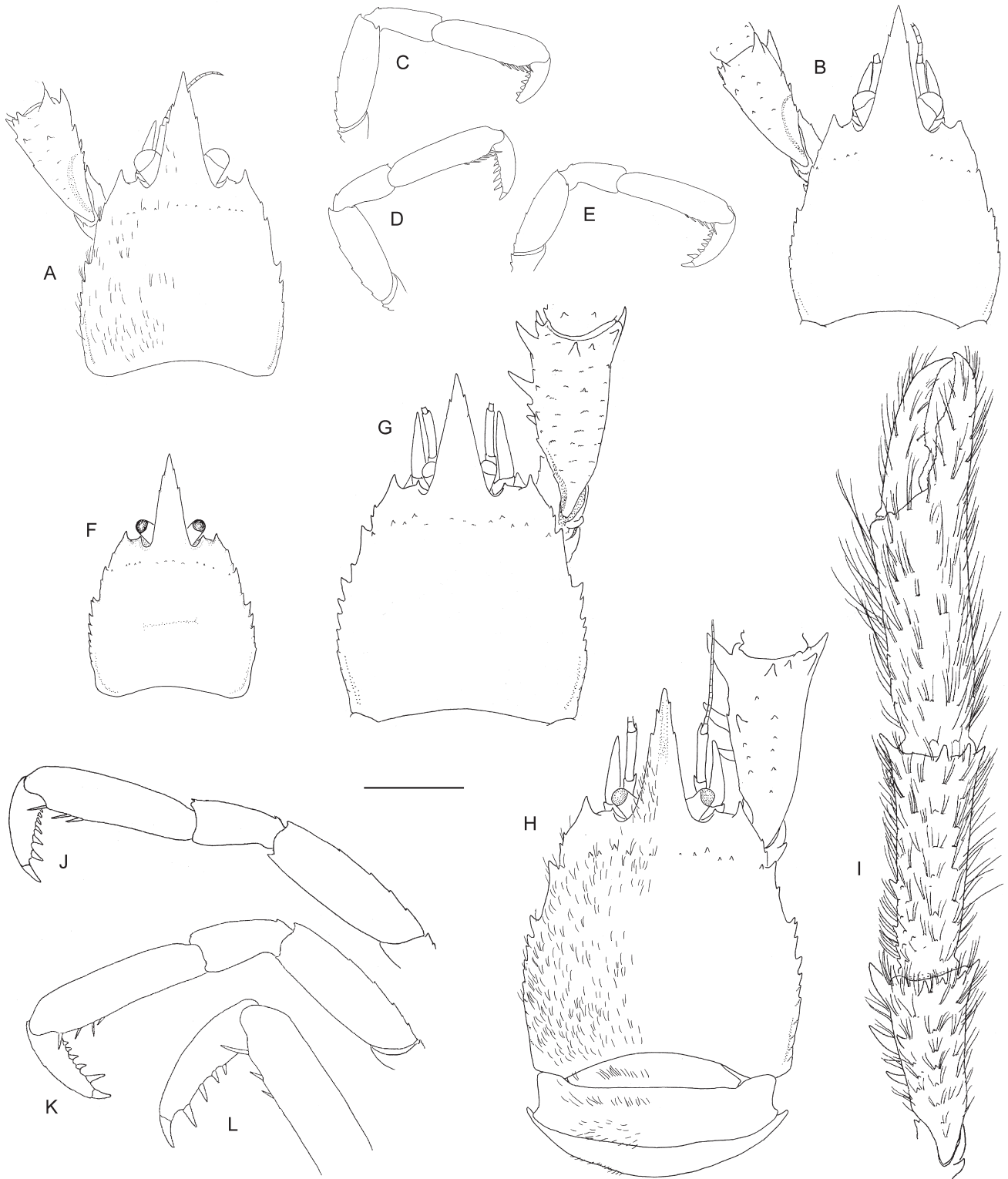


Figure 4. *Uroptychus insignis* (Henderson, 1885). (A) female pcl 4.4 mm, Kerguelen Islands (MNHN IU-2010-5432). (B–E) paralectotype, male pcl 4.5 mm (BMNH 1902.10.2.9–14). (F) female pcl 7.2 mm, Kerguelen Islands (AM P97999). (G) paralectotype, male pcl 10.7 mm, (BMNH 1902.10.2.9–14). (H–I) male pcl 11.5 mm, Crozet Islands (MNHN IU-2010-5427). (J–L) female pcl 2.9 mm, Kerguelen Islands (MNHN IU-2010-5432). (A, B, G, H) carapace and proximal articles of P1; (C–E) right P2–4; (F) carapace; (I) right P1; (J–L) left pereopods 2–4; Scale: A–E = 2.5 mm; F–I = 5.0 mm; J–L = 1.0 mm.

off Marion Island, Prince Edward Islands, has not been recorded elsewhere until now. The Macquarie Ridge specimens (Figs 1, 2) are tentatively assigned to *U. insignis* based on their strong similarity to the type material and other specimens from the south-west Indian Ocean (Amsterdam Island, Kerguelen Islands, Crozet Islands) reported here (Figs. 3, 4). The type material is re-described and figured herein along with comparative material from the Crozet and Kerguelen islands for comparison with the Macquarie Ridge specimens. Among the Indian Ocean specimens, no morphological differences worthy of note were observed. Size related variation is evident, however. In the smallest specimen from the Kerguelen Islands (pcl 2.9 mm, male, MNHN IU-2010-5432), P1 is much shorter ($2.3 \times$ pcl) and the P2–4 propodi have fewer spines on the flexor margin and are not distally inflated as in large specimens (Fig. 4J–L). The branchial and epigastric spines are more pronounced in the largest specimens. The ovigerous female (pcl 10.2 mm, MNHN IU-2010-5431) has the rostrum somewhat curving dorsally. Number of eggs carried and size for three specimens: 6, 1.4×1.7 to 1.6×1.6 mm (pcl 4.5 mm, MNHN IU-2010-5428); 30, 1.6×1.7 to 1.7×1.9 mm (pcl 10.2 mm, MNHN IU-2010-5431); ca 50, 1.3×1.3 mm to 1.2×1.4 mm (pcl 10.9 mm, MNHN IU-2014-12002).

The Macquarie Ridge specimens agree closely with the Indian Ocean material in almost all respects, but differ subtly in being less setose, especially on the chelipeds and carapace, and, more significantly, in having more pronounced epigastric spines on the carapace. The development of the epigastric spines varies allometrically in both Macquarie Ridge and Indian Ocean material but in size-matched specimens, the spines of the Macquarie Ridge specimens are comparatively larger, except in the smallest specimens in which the epigastric armature is yet to appear. The difference in epigastric armature is most noticeable in the largest specimens in which the largest epigastric spines in Macquarie Ridge specimens are as large as, instead of smaller than, the adjacent branchial marginal spines. The Macquarie Ridge specimens might prove to be specifically distinct from the Indian Ocean populations, but are here regarded as *U. insignis* pending further studies currently underway.

Uroptychus insignis most closely resembles *U. zeidleri* Ah Yong & Poore, 2004a, from Tasmania. The two species are readily separated by the branchial marginal carapace spination (arranged in a single, even, unbroken row in *U. zeidleri*; anterior branchial spine separated from the remainder by an unarmed interval, or at most with 1 or 2 small, well-spaced spines in *U. insignis*) and dentition of the crista dentata (teeth evenly decreasing in size distally in *U. zeidleri*; teeth uniformly minute in *U. insignis*).

Six specimens of *U. insignis* were collected from Macquarie Ridge during TAN0803, but the two specimens from stn. 88 were unfortunately lost at sea under adverse weather conditions.

Distribution. Southern Indian Ocean off Prince Edward Island, Amsterdam Island, the Crozet and Kerguelen Islands, and now from the southwestern Pacific from seamounts on the Macquarie Ridge; 315–1680 m (501–775 m on the Macquarie Ridge).

Uroptychus tracey n. sp.

Figs 5B, 6

Type material. NIWA 54266, male holotype (pcl 11.3, pcl 7.2 mm), Iceberg seamount, Andes seamount complex, Chatham Rise, $44^{\circ}09.49$ – 09.69 'S, $174^{\circ}33.30$ – 33.14 'W, 487–616 m, 28 June 2009, TAN0905/119. Paratypes (all Chatham Rise): NMNZ CR.023843, 6 males (pcl 2.4, 2.7, 3.4, 3.8, 4.8, 5.2, 5.2 mm), 2 ov. females (pcl 3.4, 5.5 mm), $43^{\circ}04.00$ 'S, $178^{\circ}39.00$ 'W, 549 m, 13 September 1963, NZOI stn. A910; NIWA 26452, 1 ov. female (pcl 4.5 mm), Main Knoll, $43^{\circ}31.84$ – 31.67 'S, $179^{\circ}37.75$ – 37.98 'E, 378–390 m, 07 June 2006, TAN0604/110; NIWA 60524, 2 ov. females (pcl 3.8, 5.3 mm), Diamond Head seamount, Andes seamount complex, $44^{\circ}08.38$ – 08.54 'S, $174^{\circ}43.18$ – 43.56 'W, 641–758 m, 26 June 2009, TAN0905/99; NIWA 60527, 2 males (pcl 5.5, 6.7 mm), Diamond Head Peak C, Andes seamount complex, $44^{\circ}08.85$ – 09.00 'S, $174^{\circ}41.45$ – 41.65 'W, 458–648 m, 27 June 2009, TAN0905/111; AM P97840, 2 males (pcl 6.2, 6.9 mm), 1 ov. female (pcl 4.8 mm), 1 female (damaged), Diamond Head seamount, Andes seamount complex, $44^{\circ}08.97$ – 09.02 'S, $174^{\circ}45.41$ – 45.63 'W, 519–609 m, 27 June 2009, TAN0905/113.

Other material examined. *Chatham Rise*: NIWA 33673, 1 male (pcl 5.3 mm), 1 female (pcl 6.0 mm), $43^{\circ}47.31$ – 47.74 'S, $175^{\circ}15.13$ – 14.77 'W, 520–532 m, 12 April 2007, TAN0705/118; NMNZ CR.023844, 1 male (pcl 4.3 mm), 1 ov. female (pcl 5.9 mm), $43^{\circ}51.00$ 'S, $179^{\circ}25.00$ 'E, 309 m, 20 May 1970, NZOI stn. J59; NMNZ CR.023845, 1 male (pcl 6.2 mm), $44^{\circ}05.50$ 'S, $176^{\circ}12.00$ 'E, 198 m, 17 May 1970, stn. J55; NIWA 14575, 1 female (pcl 3.4 mm), $44^{\circ}07.00$ 'S, $179^{\circ}13.00$ 'W, 402 m, 26 January 1968, stn. G307A; NIWA 60525, 1 ov. female (pcl 6.7 mm), Diamond Head seamount, Andes seamount complex, $44^{\circ}08.84$ – 08.87 'S, $174^{\circ}41.40$ – 41.68 'W, 440–600 m, 26 June 2009, TAN0905/97; NIWA 60520, 4 males (pcl 5.2, 5.7, 6.0, 6.5 mm), 1 ov. female (6.0 mm), Diamond Head seamount, Andes seamount complex, $44^{\circ}08.84$ – 08.87 'S, $174^{\circ}41.4$ – 41.68 'W, 440–600 m, 26 June 2009, TAN0905/97; NIWA 53847, 1 ov. female (pcl 6.7 mm), Iceberg seamount, Andes seamount complex, $44^{\circ}09.44$ – 09.55 'S, $174^{\circ}33.25$ – 33.41 'W, 485–533 m, 26 June 2009, TAN0905/105; NIWA 60521, 1 ov. female (pcl 5.7 mm), Iceberg seamount, Andes seamount complex, $44^{\circ}09.44$ – 09.55 'S, $174^{\circ}33.25$ – 33.41 'W, 485–533 m, 26 June 2009, TAN0905/105; NIWA 60522, 1 male (pcl 5.9 mm), 2 ov. female (pcl 4.1, 5.2 mm), Iceberg seamount, Andes seamount complex, $44^{\circ}09.49$ – 09.69 'S, $174^{\circ}33.30$ – 33.14 'W, 487–616 m, 28 June 2009, TAN0905/119; NIWA 60519, 1 male (pcl 4.3 mm), Ritchie Hill Summit, Andes seamount complex, $44^{\circ}10.50$ – 10.39 'S, $174^{\circ}33.13$ – 33.36 'W, 716–745 m, 27 June 2009, TAN0905/116.

SW New Zealand: NMNZ CR.023846, 1 male (pcl 6.0 mm), 1 ov. female (pcl 3.8 mm), Caswell High, off Fiordland, $45^{\circ}57.00$ 'S, $166^{\circ}9.00$ 'E, 514–534 m, 21 October 1967, stn. E803.

Macquarie Ridge: AM P97841, 1 male (pcl 5.2 mm), Seamount 6 (Australian EEZ), $52^{\circ}29.24$ – 29.03 'S, $160^{\circ}24.90$ – 24.55 'E, 350–560 m, 09 April 2008, TAN0803/63; AM P97842, 1 male (pcl 5.7 mm), Seamount 6 (Australian EEZ), $52^{\circ}23.85$ – 23.91 'S, $160^{\circ}39.40$ – 40.13 'E, 451–438 m, 09 April 2008, TAN0803/69.



Figure 5. Colour in life. (A) *Uroptychus insignis* (Henderson, 1885), male pcl 13.1 mm, Hjort Seamount, Macquarie Ridge, TAN0803/98 (NIWA 40664). (B) *Uroptychus tracey* n. sp., holotype, male pcl 7.2 mm, Iceberg Seamount, Andes seamount complex, TAN0905/119 (NIWA 54266). (C) *Munidopsis pyrochela* Ahyong, 2014, male pcl 13.6 mm, Clementsville Seamount, Macquarie Ridge, station TAN0803/33 (NIWA 39722). Scale = 10 mm.

Campbell Plateau: NMNZ CR.023847, 1 ov. female (pcl 6.0 mm), ESE of Campbell Island, 53°00.00'S, 172°45.00'E, 435 m, 01 February 1965, stn. F146.

Diagnosis. Carapace lateral margin lined with distinct spines behind anterolateral spine; spines and short serrated ridges across entire dorsal surface. Antennal scale distinctly overreaching peduncle, slender (length about $5 \times$ width). P1 palm with median pair of small spines close to proximal margin only, otherwise unarmed. P2–4 meri and carpi with spinose extensor margins; propodi each with row of movable spines along flexor margin. P2–4 dactyli tapering distally, more than half as long as propodi; entire flexor margin lined with spines, contiguous, prominent penultimate spine.

Description. *Carapace*: length [1.5]–1.8 \times width (including rostrum) (0.8–[1.0] excluding rostrum); greatest width at midlength of branchial region. Dorsal surface slightly convex from anterior to posterior; cervical groove not deep but distinct. Entire dorsal surface covered with spines, short spinules and setose ridges; distinct row of epigastric spines, usually with large median spine. Orbit rounded; small outer orbital spine; frontal margin between outer orbital spine and anterolateral spine oblique, relatively straight; Anterolateral spine prominent. Lateral margin convex, divergent posteriorly, with 6 or 7 spines excluding anterolateral spine (1 or 2 small spines on hepatic margin, 1 prominent spine on anterior branchial margin, 4 (rarely 5) prominent spines on posterior branchial). Rostrum triangular, horizontal, [0.6]–0.8 \times pcl; dorsal surface excavate, covered with small granules; lateral margins finely serrated posteriorly (nearly spinose sub-apically). Pterygostomian flap surface covered with small spines and granules, anterior margin narrowly triangular but not produced to spine.

Sternum: Sternites 1–3 with anterior margin strongly sinusoid between bases of maxilliped 1, not acute, surface with distinct ridge in midline. Sternal plastron width 1.1 \times length, lateral extremities subparallel between sternites 5–7.

Sternite 3 anterior margin deeply excavated with U-shaped median notch, produced anteriorly, lateral margins produced to tooth. Sternite 4 width 2.2 \times sternite 3 width, anterior margin steeply convex, anterior midline grooved, anterolateral margin produced to tooth (not overreaching sternite 3), lateral midlength unarmed. Lines demarcating fifth to seventh sternites smooth, surfaces smooth. Widest at sternite 7.

Abdomen: Tergites smooth and unarmed; tergite 1 with transverse dorsal ridge; tergites 2–4 without transverse ridges or grooves. Pleural margins of somites 2–4 distally narrowing to triangular point. Telson length [0.4]–0.5 \times width; posterior plate [1.3]–1.4 \times longer than anterior plate, posterior margin emarginate.

Eyes: movable, sparsely setose. Cornea subglobular, 0.3 \times length of remaining eyestalk.

Antennule: Distal article of antennular peduncle relatively slender, length 3.8–[5.6] \times width (most slender in largest specimen, holotype).

Antenna: Antennal peduncle overreaching cornea (cornea slightly overreaching midlength of antennal article 5). Article 2 with distinct outer spine. Antennal scale [1.5]–1.7 \times wider than article 5, length 4.2–[5.6] \times width, overreaching tip of article 5. Article 4 with distal spine. Article 5 length [2.0]–2.5 \times article 4 length, armed with distomedian spine (small to large spine). Flagellum of 12–18 segments, not reaching end of P1 merus.

Maxillipeds: Maxilliped 1 with bases broadly separated. Maxilliped 3 surfaces smooth; ischium with small spine lateral to rounded distal end of flexor margin, crista dentata with obsolescent or very small denticles; merus longer than wide, extensor margin with curved distal spine, flexor margin with 2 median spines; carpus with distal extensor spine.

Pereopod 1 (cheliped): Moderately setose. Elongate, length [2.5]–2.9 \times cl (in both sexes) ([4.0]–4.9 \times pcl, longest in large male holotype). Ischium with dorsal and ventral spines distally. Merus and carpus surface with longitudinal rows of spines; 6 distal spines. Merus [1.0]–1.4 \times pcl. Carpus

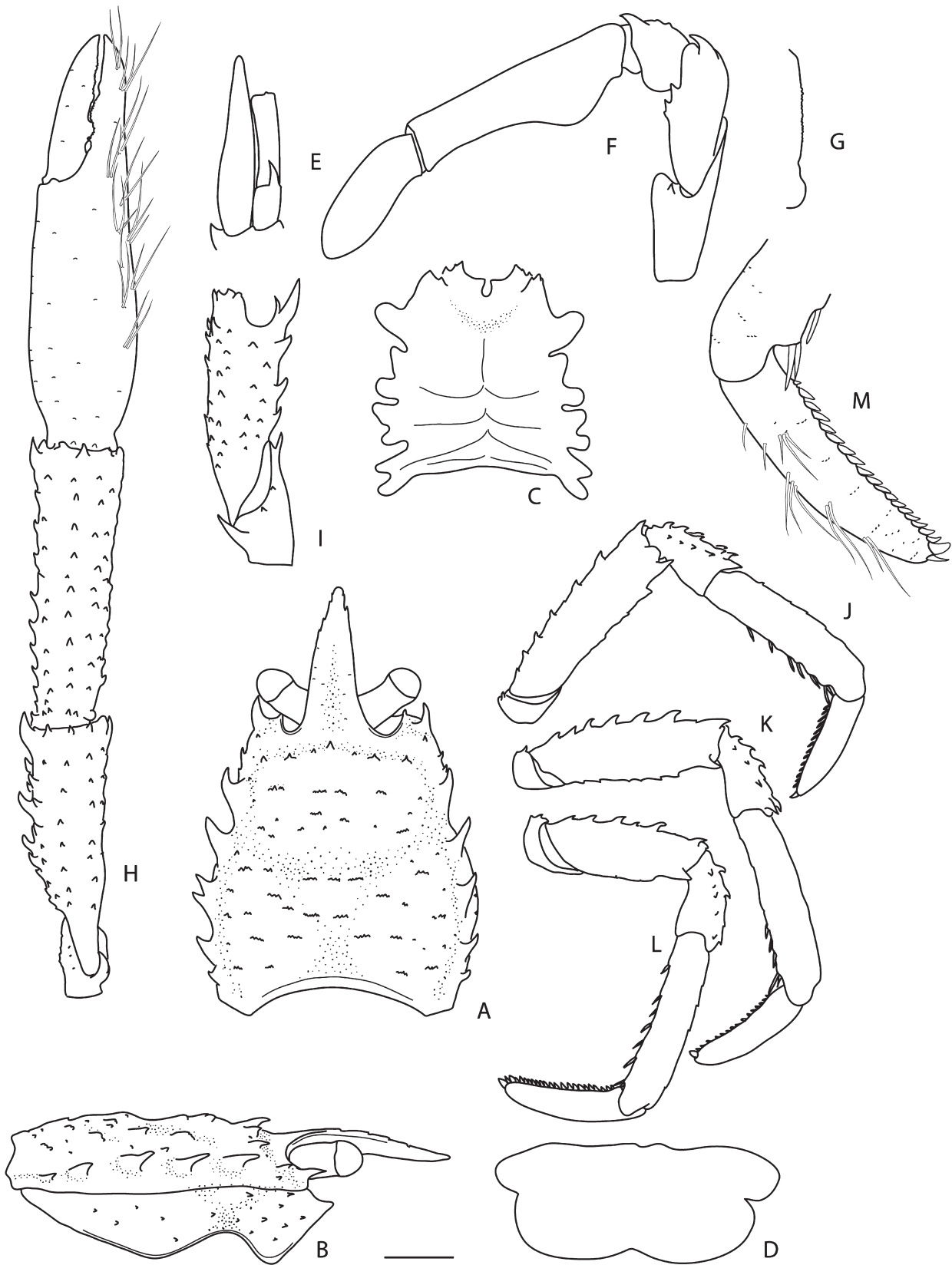


Figure 6. *Uroptychus tracey* n. sp., holotype, male pcl 7.2 mm, NIWA 54266: (A) carapace, dorsal; (B) carapace, lateral; (C) sternal plastron; (D) telson; (E) left antenna, ventral; (F) endopod of left maxilliped 3, lateral; (G) right crista dentata; (H) right P1, dorsal; (I) right P1 ischium and merus, ventral; (J-L) right P2-4, lateral, setae omitted; (M) left P4 dactylus and propodus, lateral. Scale: A-C, H-J = 2 mm; D-G, M = 1 mm.

subequal in length to both merus and palm. Propodus with palm 2.1–2.7[2.5] (males), 2.3–3.4 (females) \times as long as high (subequal right and left); surface covered with small granules and setal pits; two small spines proximally adjacent to carpal articulation. Dactylus length about 0.5 \times palm length; occlusal margin finely denticulate.

Pereopods 2–4 (walking legs): Similar, surfaces spinose. Meri successively shorter posteriorly (P3 merus length 0.8–[0.9] \times P2 merus length, P4 merus length [0.8]–0.9 \times P3 merus length); extensor margin with row of 5 or 6 spines (excluding distal spine); flexor margin irregular or with small spines or serrations; length-breadth ratio 3.0–3.5. Carpi equal in length from P2–4, 0.4 \times length of propodi; extensor margin with row of 2–4 spines (excluding 2 distal spines) paralleling row of smaller spines on lateral surface; flexor margin smooth. Propodi subequal in length; length-width ratio ranging from 4.4 (P2) to 5.3 (P4); extensor margin smooth (slightly irregular in proximal portion of P2 and P4); flexor margin straight (not inflated), with pair of terminal spines preceded by 3–6 spines along, on P4 distributed along entire length; distal pair of flexor spines not remote from penultimate spine. Dactyli length 0.6–0.7 \times propodi length; flexor margin straight, with 20 obliquely directed, contiguous spines along entire length (excluding distal spine); distal spine slender, penultimate spines prominent, more than twice width of ultimate and antepenultimate; remaining spines gradually more slender and elongate towards proximal end.

Eggs: 1.0–1.7 mm in diameter.

Colour in life (Fig. 5B). Carapace, cheliped and legs base colour pale orange, abdomen clear. Dark orange on tips of spines, cheliped fingers and in central patches of abdominal tergites 1–3.

Remarks. The specimens of *U. tracey* n. sp. agree well in proportions and spination in most parts. Some variability is present in the size of the distal spine on the ultimate antennal article, ranging from a minute granule to a small spine in most specimens, to distinct and large in two specimens (male, NIWA 40304; ovigerous female, NMNZ CR.023847). The posterior branchial margin of the carapace bears four prominent spines, or rarely five through bifurcation of one of the spines, as in the holotype (Fig. 6A). The expression of the dorsal carapace ornamentation also varies slightly, with the holotype having mostly finely serrated ridges (other than the distinct spines in the epigastric region). In some specimens, however, the median portion may be produced to a spine in some areas and in the most spinose specimen (ovigerous female, NZOI stn. F146, NMNZ CR.023847), all of these ridges are produced into spines. Slight differences were also

observed in two females (NIWA 60520 and 26452), which lacked the median epigastric spine that is present in all other specimens. One parasitized female (NIWA 33673) has the externa of a sacculinid rhizocephalan under its abdomen.

This species belongs to the group of spiny species having distinct spines along the lateral carapace margin, across the entire dorsal carapace surface and on P1–4. The unarmed abdomen and cheliped palm align this new species with *Uroptychus sexspinosus* Balss, 1913 (Japan, 500 m) and *U. fusimanus* Alcock & Anderson, 1899a (Travancore coast, southern India, 787 m). Balss (1913: fig. 21) illustrates *U. sexspinosus* with only scattered small spines on the dorsal carapace surface, although the description records the carapace dorsum as unarmed. It differs from *U. tracey* n. sp. in having P2–4 much more slender, with smooth instead of spinose flexor margins of the propodi. *Uroptychus fusimanus* differs from *U. tracey* n. sp. in having the antennal scale not over-reaching the peduncle (distinctly over-reaching in the new species), the length of the P2–4 dactyli being less than one-third propodi length instead of more than half that of the propodi in the new species. In addition, the penultimate spine of the P2–4 dactyli is most prominent in *U. tracey*; in *U. fusimanus*, however, the ultimate spine appears to be larger than the remaining spines (see Alcock & Anderson, 1899b: pl. 44, fig. 4). This could prove to be a distinctive difference between the two species given that Alcock & McArdle (1902: pl. 57, figs. 1, 1a) clearly depicted this pronounced spine for *U. nanophyes*. Both *U. sexspinosus* and *U. fusimanus*, known only from their respective type material, require detailed redescription.

Among southwestern Pacific species, *U. tracey* n. sp. most closely resembles *U. cardus* Ahyong & Poore, 2004, but the dorsal carapace spination of *U. cardus* is restricted to the epigastric region (compared to the entire dorsal surface in the new species), the extensor margins of the P2–4 meri and carpi are unarmed (with a row of spines in the new species) and the antennal scale is broader in *U. cardus* than in *U. tracey* n. sp. (about 3 times longer than wide versus about 5 times longer than wide).

Etymology. Named in honour of our colleague Di Tracey for her contributions to New Zealand deepwater marine science and her instrumental role in collecting the Macquarie Ridge specimens; used as a noun in apposition.

Distribution. This is a cold temperate species, endemic to New Zealand continental shelf and seamount localities south of the subtropical convergence. Currently known from the Chatham Rise, off Fiordland, Macquarie Ridge, Campbell Rise; 198–758 m (Fig. 9).

Superfamily Galatheoidea Samouelle, 1819

Family Munididae Ah Yong, Baba, Macpherson and Poore, 2010

Genus *Munida* Leach, 1820

Munida chathamensis Baba, 1974

Fig. 7

Munida chathamensis Baba, 1974: 388–390, figs 6, 7 (type locality: Chatham Rise, New Zealand, 44°44.0'S, 175°42.0'W, 995–1110 m).—Baba, 2005: 260 (key, synonymies).—Baba *et al.*, 2008: 90 (synonymies).

Type material. ZLKU-15553, female holotype (cl 11.5 mm, pcl 7.4 mm), Chatham Rise, 44°44.0'S, 175°42.0'E, 995–1110 m, mud, 16 July 1968, RV “Kaiyo Maru” sta. 36.

Other material examined. *Macquarie Ridge*: NIWA 11027, 1 male (cl 13.4, pcl 9.5 mm), Spastic Spider seamount, 48°33.03'S, 164°57.07'E, 1067 m, 13 December 1998, stn. Z9586; NIWA 39630, 2 males (cl 9.3, pcl 6.1; cl 10.8, pcl 7.1 mm), 1 ov. female (pcl 12.4 mm), Spastic Spider seamount, 48°31.57'S, 164°56.44'E, 1364–1096 m, 30 March 2008, TAN0803/21; NIWA 39702, 1 male (cl 20.9, pcl 14.3 mm), 1 female (cl 14.4, pcl 10.2 mm), Clementsville seamount, 50°05.710'S, 163°27.66'E, 1697–1091 m, 1 April 2008, TAN0803/32.

Christable Seamount: NIWA 46526, 5 males (pcl 8.4–25.1 mm), 5 ov. females (pcl 13.0–16.9 mm), 50°56.56'S, 164°36.55'E, 1140–1105 m, TAN0306/6, 14 April 2003; NIWA 46527, 2 males (pcl 14.1 mm; 1 damaged), 6 females (cl 20.2, pcl 12.9; cl 21.2, pcl 14.2 mm; others damaged), 50°56.56'S, 164°36.55'E, 1140–1105 m, TAN0306/6, 14 April 2003; NIWA 46528, 2 males (cl 20.3, pcl 13.5; cl 24.4, pcl 16.5 mm), 2 ov. females (cl 24.2, pcl 16.6; cl 24.9, pcl 16.7 mm), 50°56.30'S, 164°33.16'E, 1053–998 m, 14 April 2003, TAN0306/4; NIWA 76183, 1 male (cl 30.5, pcl 20.6 mm), 50°56.30'S, 164°33.16'E, 1053–998 m, 14 April 2003, TAN0306/4.

Campbell Plateau: NIWA 11612, 1 female (cl 13.5 mm, pcl 9.0 mm), SE of Campbell Island, 53°59.80'S, 171°13.20'E, 1075 m, 21 September 1978, stn. S46.

Diagnosis. Carapace with long, scattered setae; transverse striae widely spaced, often intervened by short striae or scales; with transverse row of 6–8 epigastric spines; with granules and scattered spinules on anterolateral region; with or without postcervical spine. Rostrum spiniform. Supraocular spines divergent. Margins of carapace with 5 spines posterior to cervical groove. Thoracic sternite 4 at most with few short striae; sternites 5–7 smooth. Abdominal tergite 2 with row of 6–9 (usually 6) spines on anterior border; remaining tergites unarmed. Eye with cornea dilated, maximum diameter about one-third distance between anterolateral spines. Basal antennular article overreaching cornea; with 2 terminal spines, mesial shorter; ventral surface with spine near midlength. Basal antennal article with strong mesial spine; article 2 with mesial and lateral terminal spines, neither overreaching article 3; article 3 with lateral spine. Maxilliped 3 ischium with distal flexor spine; merus flexor margin with subequal distal and proximal spine, or distal spine slightly smaller. P1 slender, 2–3 × cl; palm upper and inner margin spinose, spines extending onto pollex including row of spines originating close to lateral margin with apices often overhanging lateral margins, especially in small specimens. P2–3 meri with spinose extensor and flexor margins. P4 extensor and flexor margins with distal spine. P2–4 dactyli with movable spines distributed along entire flexor margin and slender corneous seta at base of unguis.

Description. *Carapace*: Dorsum with long, scattered setae and short fine setae on striae. Transverse striae widely spaced, often intervened by short striae or scales; cervical groove distinct; with transverse row of 6–8 (usually 6) epigastric spines, of which pair behind supraocular spines largest; parahepatic region with granules and 1–4 (usually 2 or 3) spinules; anterior branchial region with short rugae and 1 or 2 spines; rarely with postcervical spine. Frontal margins slightly oblique; rostrum spiniform, faintly upcurved, length 0.4–[0.6] pcl. Supraocular spines slightly divergent, deflected dorsally, length 0.4–[0.5] rostral length. Anterolateral spine well developed, situated at anterolateral angle, extending almost to sinus between rostrum and supraocular spine. Hepatic margin anterior to cervical groove with short spine behind anterolateral spine. Branchial margin with 5 slender, curved spines posterior to cervical groove.

Sternum: Sternite 3 transverse, medially emarginate, laterally rounded to subtruncate. Sternite 4 triangular, wider than long, margins straight to faintly convex, anterior apex rounded, narrower than sternite 3; sternites 5–7 smooth; ridges demarcating fourth to seventh sternites feebly granular.

Abdomen: Tergites with scattered setae. Tergite 2 with row of 6–8 (usually 6) spines on anterior border and uninterrupted transverse stria; remaining tergites unarmed. Tergite 3 with 1 uninterrupted transverse stria. Tergite 4 with 2 uninterrupted transverse striae. Telson length 0.8–[0.9] × width; lateral margins lined with coarse golden setae, few fine setae in females.

Eye: Cornea dilated, with maximum corneal diameter almost one-third distance between anterolateral spines; few, widely spaced eyelashes.

Antennule: Basal article overreaching cornea; with 2 terminal spines, mesial shorter; with two lateral spines, distal markedly longer than proximal; midventral surface with prominent spine.

Antenna: Basal article of peduncle with strong mesial spine. Article 2 with distomesial and distolateral spines, neither overreaching article 3. Article 3 with distolateral spine; unarmed distomesially.

Maxilliped 3: Ischium with distal flexor spine. Merus flexor margin with prominent proximal and distal spine, lengths subequal or distal slightly shorter, intervening margin unarmed or with 1 spine or 1 or 2 tubercles; extensor margin unarmed.

Pereopod 1 (cheliped): Slender, adult length 2.9–3.9 pcl (males), [1.8]–3.2 pcl (females); sparsely setose; strongly spinose, with longitudinal rows of spines. Dorsal margin of dactylus with proximal spine and row of small spines along proximal three-fourths of length; occlusal margin denticulate. Propodus palm upper and inner margin spinose, spines extending onto pollex including row of spines originating close to lateral margin with apices often overhanging lateral margins, especially in small specimens; palm length about 3 × height, dorsal margin slightly longer than dactylus; pollex with 1 or 2 small subterminal spines, occlusal margin denticulate, outer margin unarmed. Carpus length about 2.5 × height, multispinose. Merus with numerous irregularly distributed spines on lateral, dorsal and mesial surfaces.

Pereopods 2–4 (walking legs): Similar, length decreasing posteriorly. P2–3 merus extensor margin with 9–16 [13–14] and 9–15 [9–10] spines, respectively; flexor margin with 5–9 [7] and 4–9 [5–6] spines, respectively. P4 merus

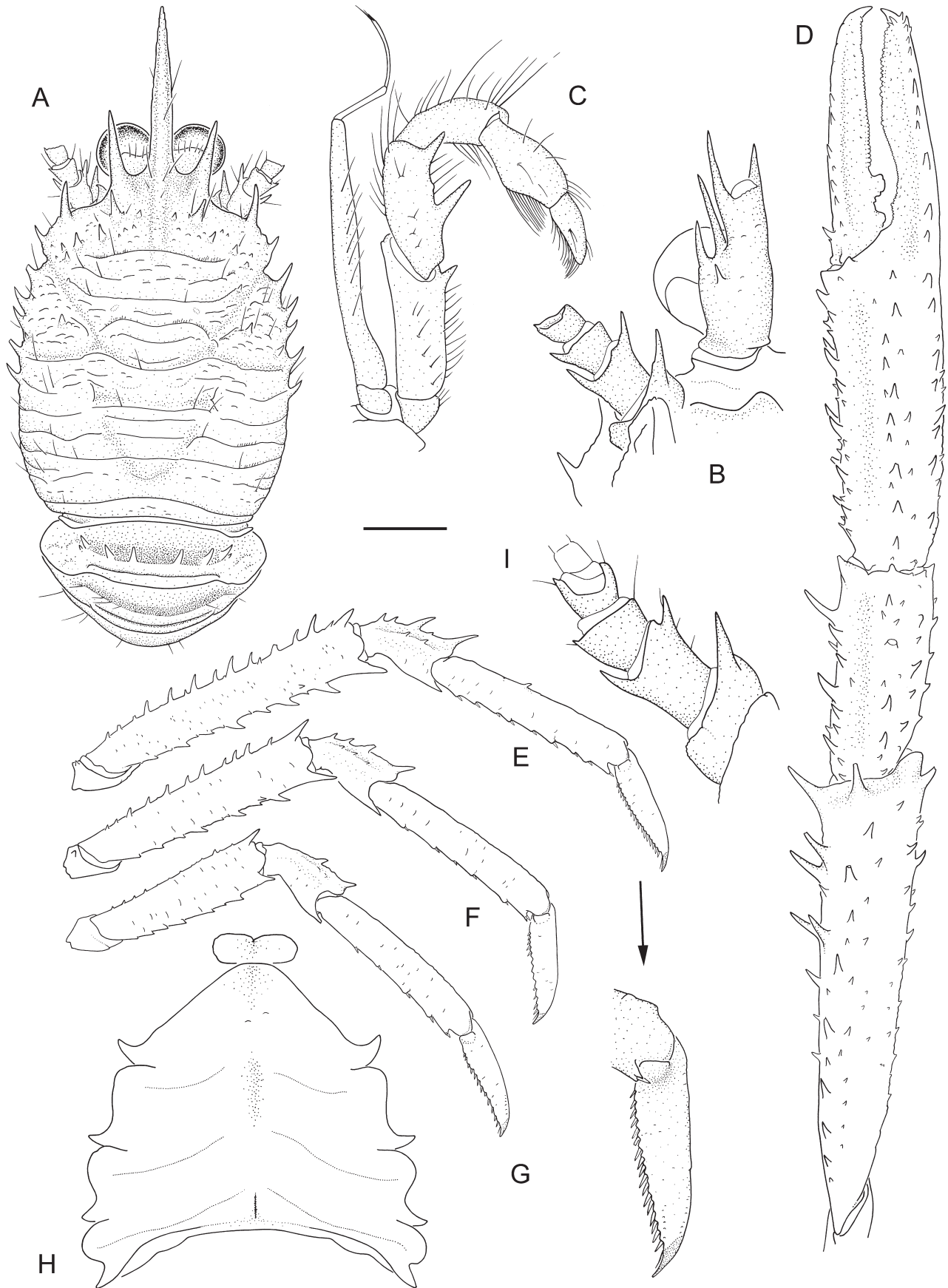


Figure 7. *Munida chathamensis* Baba, 1974. (A–H) male pcl 20.6 mm, Christable Seamount (NIWA 76183). (I) male pcl 6.1 mm, Spastic Spider Seamount (NIWA 39630). (A) carapace and abdomen. (B) right antenna and antennule, ventral. (C) right maxilliped 3. (D) right P1 (setae omitted). (E–G) right P2–4 (setae omitted). (H) sternal plastron. (I) right antenna, ventral. Scale: A, D–G = 5.0 mm; B, C, H = 2.5 mm; I = 0.5 mm.

extensor margin with 2–7[6] spinules along proximal half and distal one-third with 1–3 spinules in addition to distal spine; flexor margin with 1–6[3] spines. Carpus of P2, 3 and 4 with 3–7[4], 3–4[3] and 1–2[1] extensor spines, respectively (distal and antepenultimate longest); 1 flexor spine. Propodus extensor margin with 1 or 2 small spines (P2) or unarmed (P3–4); flexor margin of P2, 3 and 4 with 6–10[8–9], 5–8[5–6], 4–7[5] movable spines, respectively. Dactylus of P2, 3 and 4 with [11]–17, [11]–15, 10–15[12–13] movable spines, respectively, distributed along entire flexor margin; with slender corneous seta at base of unguis.

Remarks. Prior to the present study, *Munida chathamensis*, was known only from the holotype from the Chatham Rise. The new records of *M. chathamensis* from the Campbell Rise and Macquarie Ridge, however, extend its distribution southwards into Subantarctic waters. Moreover, the species is re-figured and re-described based on the holotype and large series examined herein. *Munida chathamensis* very closely resembles two other Subantarctic species, *M. spinosa* Henderson, 1885 [south Atlantic Ocean: Rio de la Plata] and *M. spicae* Macpherson & de Saint Laurent, 2002 [south Indian Ocean: Prince Edward, Crozet, Saint Paul and New Amsterdam islands]. The three species uniquely share a ventral spine near the midlength of the basal antennular segment. The distinctions between the three species are subtle, with *M. chathamensis* differing from *M. spicae* and *M. spinosa* in having straight instead of slightly convex margins of the fourth thoracic sternite and less oblique frontal margins of the carapace. *Munida chathamensis* might also mature at a larger size than *M. spicae*; the smallest reported ovigerous female of *M. spicae* (pcl 6.2 mm, Macpherson & de Saint Laurent, 2002) is half the size of the smallest ovigerous *M. chathamensis* reported here (pcl 12.4 mm, NIWA 39630). The distinctions between *M. spicae* and *M. spinosa*, however, are presently ambiguous and require further study. *Munida chathamensis*, *M. spicae* and *M. spinosa* form a discrete group within the genus and together have an essentially circumpolar distribution suggesting this group evolved in the Southern Ocean, perhaps under the influence of the West Wind Drift.

Morphological variation is evident in typical cheliped sexual dimorphism (proportionally longer and stouter in adult males), in the length of the cheliped spines (proportionally longer in smaller specimens) and in the prominent development of the distolateral spine on antennal peduncle article 3, except in the smallest specimens in which the spines are minute (males, pcl 6.1–7.1 mm, NIWA 39630; Fig. 7 I). Of these, the 6.1 mm male (NIWA 39630) has a rhizocephalan externa under the abdomen.

Of the regional species, *M. chathamensis* most closely resembles *M. isos*, with which it is sometimes sympatric; the two species are readily separated by the presence in *M. chathamensis* of the ventral spine on the basal antennular article, the size of the distal flexor spine on the maxilliped 3 carpus (subequal to or slightly shorter than the proximal spine in *M. chathamensis*; markedly smaller in *M. isos*), a generally more slender antennular peduncle article 2 in *M. isos*, and the consistent presence of a distolateral spine on antennular peduncle article 3 (usually absent in *M. isos*).

Distribution. New Zealand, from the Chatham Rise south to the Campbell Plateau and seamounts on Macquarie Ridge; 995–1697 m.

Munida isos Ah Yong & Poore, 2004

Fig. 8

- Munida isos* Ah Yong & Poore, 2004b: 34, fig. 6 (type locality: off St. Patricks Head, Tasmania, 41°35'S, 148°14'E, 1100 m). —Poore, 2004: 234, fig. 64d (compilation). —Baba, 2005: 265 (key, synonymies). —Ah Yong, 2007: 31. —Baba *et al.*, 2008: 102 (synonymies).
Munida microps. —Haig, 1973: 273 (part, smaller specimen only). —Davie, 2002: 65 (in part, no record).
Munida gordonii Vereshchaka, 2005: 139, fig. 2 (type locality: New Zealand, 41°35.45'S, 175°46.39'E, 1000–1400 m).

Material examined. *Macquarie Ridge*: NIWA 39597, 2 females (pcl 7.2, 11.1 mm), 2 males (pcl 7.0, 7.3 mm), Spastic Spider Seamount, 48°31.90'S, 164°56.84'E, 1060–1112 m, 30 March 2008, TAN0803/19; NIWA 99730, 1 ov. female (cl 13.3, pcl 9.0 mm), Seamount 1, Spastic Spider, 48°33.03'S, 164°57.07'E, 1067 m, Z9586, 13 December 1998; NIWA 39574, 1 ov. female (pcl 6.1 mm), 1 female (pcl 7.1 mm), 2 males (pcl 5.5, 7.3 mm) Spastic Spider Seamount, 48°32.92'S, 164°57.75'E, 1318–1327 m, 30 March 2008, TAN0803/17; NIWA 39762, 10 males (cl 7.6, pcl 4.8 to cl 18.4, pcl 12.3 mm), 6 ov. females (cl 12.3, pcl 8.2 to cl 14.4, pcl 10.2 mm), 10 females (cl 9.2, pcl 6.4 to cl 13.5, pcl 9.1 mm, largest with epicaridean), Clementsville Seamount, 50°05.429–05.320'S, 163°28.930–28.330'E, 1077–1408 m, 01 April 2008, TAN0803/33; NIWA 39791, 1 ov. females (pcl 9.3 mm), 1 female (pcl 8.4 mm), 2 males (pcl 5.2 mm, one damaged), Clementsville Seamount, 50°05.920'S, 163°29.10'E, 1144.0–1365 m, 01 April 2008, TAN0803/36; NIWA 39983, 3 ov. females (pcl 10.1–12.1 mm), 2 males (pcl 7.5 mm, one damaged), Eltanin Seamount, 51°02.590'S, 161°58.85'E, 560–506 m, 04 April 2008, TAN0803/52; NIWA 39916, 1 female (pcl 9.0 mm), Eltanin Seamount, 51°05.73'S, 161°58.58'E, 462–524 m, 04 April 2008, TAN0803/48; AM P97852, 3 ov. females (pcl 10.5–12.1 mm), 4 females (pcl 8.2–12.5 mm), 4 males (pcl 7.0–11.6 mm), Seamount 7 (Australian EEZ), 53°42.91'S, 159°07.830'E, 770–810 m, 12 April 2008, TAN0803/79; AM P97854, 3 ov. females (pcl 12.1, 15.1 mm, one damaged), 2 males (pcl 10.1, 10.5 mm), Seamount 8, Macquarie Ridge (Australian EEZ), 55°21.19'S, 158°26.20'E, 605–709 m, 15 April 2008, TAN0803/93; AM P97853, 1 ov. female (damaged, pcl ~14.5 mm), Seamount 8 (Australian EEZ), 55°22.87'S, 158°25.59'E, 504–637 m, 15 April 2008, TAN0803/89.

Christable Seamount: NIWA 46521, 17 females (pcl 7.6–15.1 mm), 2 females (pcl 10.8, 9.3 mm), 8 males (pcl 10.0–11.9 mm), 51°03.20'S, 164°36.43'E, 990–973 m, 14 April 2003, TAN0306/5; NIWA 76192, 1 male (cl 21.1, pcl 14.6 mm), 51°03.20'S, 164°36.43'E, 990–973 m, 14 April 2003, TAN0306/5; NIWA 46519, 1 male (pcl 10.8 mm), 51°03.88'S, 164°35.27'E, 968–973 m, 14 April 2003, TAN0306/8; NIWA 10934, 10 ov. females (pcl 7.5–12.4 mm), 7 females (pcl 5.6–9.3 mm), 13 males (6.2–12.2 mm), 51°04.32'S, 164°36.36'E, 1065–1030 m, 14 April 2003, TAN0306/7; NIWA 46522, 8 ov. females (pcl 8.4–12.1 mm), 4 females (pcl 6.2–8.6 mm), 9 males (pcl 9.6–12.9 mm, one damaged), 50°56.30'S, 164°33.16'E, 1053–998 m, 14 April 2003, TAN0306/4; NIWA 46520, 14 ov. females (pcl 8.3–13.5 mm), 5 females (pcl 6.6–10.5 mm), 11 males (pcl 5.8–12.9 mm), 50°56.56'S, 164°36.55'E, 1140–1105 m, 14 April 2003, TAN0306/6; NIWA 46523, 1 ov. female (pcl 10.0 mm), 2 females (pcl 9.7, 11.0 mm), 4 males (pcl

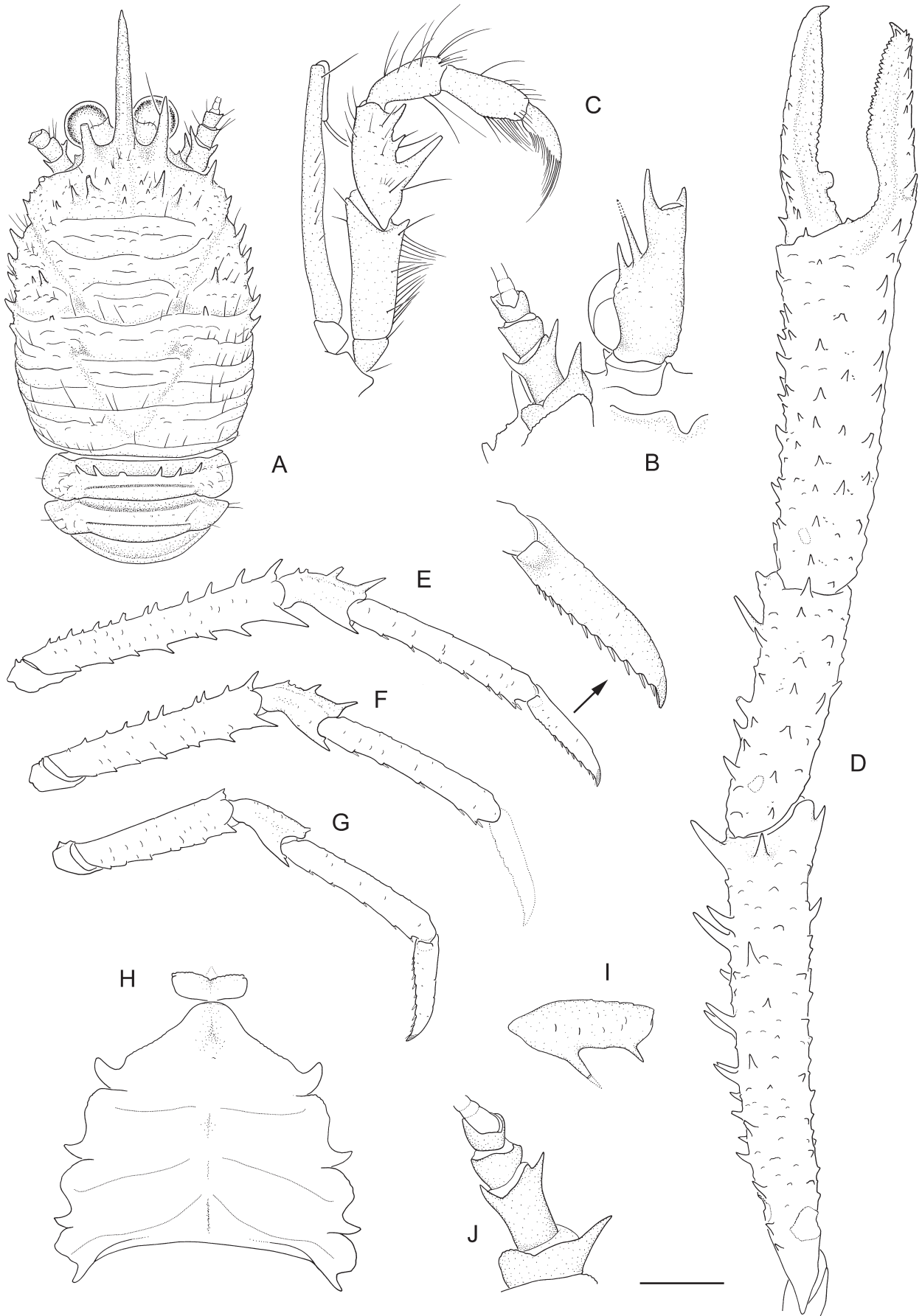


Figure 8. *Munida isos* Ahyong & Poore, 2004. (A–H) male pcl 14.6 mm, Christable Seamount (NIWA 76192). (I–J) ov. female pcl 8.3 mm, Clementsville Seamount (NIWA 39762). (A) carapace and abdomen. (B) right antenna and antennule, ventral. (C) right maxilliped 3. (D) right P1 (setae omitted). (E–G) right P2–4 (setae omitted). (H) sternal plastron. (I) right maxilliped 3 merus. (J) right antenna, ventral. Scale: A, D–G = 4.0 mm; B, C, H = 2.0 mm; I–J = 1.0 mm.

6.9–11.3 mm), 50°56.56'S, 164°36.55'E, 1140–1105 m, 14 April 2003, TAN0306/6.

Diagnosis. Carapace with long, scattered setae; transverse striae widely spaced, often intervened by short striae or scales; with transverse row of 6 or 7 epigastric spines; with numerous granules on anterolateral region; with or without postcervical spine. Rostrum spiniform. Supraocular spines divergent. Margins of carapace with 5 spines posterior to cervical groove. Thoracic sternite 4 at most with few short striae; sternites 5–7 smooth. Abdominal tergite 2 with row of 6–9 (usually 6) spines on anterior border; remaining tergites unarmed. Eye with cornea dilated, maximum diameter about one-quarter distance between anterolateral spines. Basal antennular article overreaching cornea; with 2 terminal spines, mesial shorter; ventral surface unarmed. Basal antennal article with strong mesial spine; article 2 with short mesial and lateral terminal spines, neither overreaching article 3; article 3 with or without small lateral spine. Maxilliped 3 ischium with distal flexor spine; merus flexor distal spine about half length of proximal spine, occasionally with small spine on margin between distal and proximal spines. P1 slender, length 2–3 × cl (about 3–4 × pcl); pollex without spines on outer margin. P2–3 meri with spinose extensor and flexor margins. P4 extensor and flexor margins with distal spine. P2–4 dactyli with movable spines distributed along entire flexor margin and slender corneous seta at base of unguis. (Modified after Ah Yong & Poore, 2004b).

Remarks. *Munida isos* is the most abundant seamount squat lobster around New Zealand (Rowden *et al.*, 2010). Material examined from Macquarie Ridge and Christable seamounts accords well with material described by Ah Yong & Poore (2004b) from southeastern Australia. Size and number of epigastric and hepatic carapace spines and tubercles varies with body size, with large specimens having the most pronounced ornamentation. The outer margin of antennal article 3 (described as unarmed by Ah Yong & Poore, 2004b) is usually unarmed (Fig. 9J) in the present series but may have a small spine in larger specimens (Fig. 9B). Postcervical spines are generally absent in *M. isos*, noted present in nine specimens (female, pcl 6.2 mm, NIWA 46522; male, pcl 11.1 mm, NIWA 10934; 6 females pcl 6.5–8.3 mm, NIWA 39762; male pcl 14.6 mm, NIWA 76192, Fig. 9A). Of the specimens from NIWA 76192 with postcervical spines, the spine is present on the left side only in the 6.5 mm female, and as a double spine on the right side of the 6.8 mm female.

Rhizocephalan externae are present under the abdomen of specimens from five lots (NIWA 10934, 39597, 46520, 46521, 45523) and epicaridean parasites are present in specimens from six lots (NIWA 10934, 39597, 39762, 46522, 46523).

Distribution. Known from eastern Australia (from east of Broken Bay, New South Wales, south to Tasmania) and widespread around New Zealand (from the Kermadec Ridge, Bay of Plenty, East Cape Ridge, Hikurangi Margin, Chatham Rise, off Fiordland), Solander Trough, and Macquarie Ridge; typical seamount species, 462–2756 m.

Family Munidopsidae Ortmann, 1898

Genus *Munidopsis* Whiteaves, 1874

Munidopsis pyrochela Ah Yong, 2014

Fig. 5C

Munidopsis sp. —O'Shea *et al.*, 1999: 51, fig. 27. —Poore *et al.*, 2011, pl. 23F.

Munidopsis serricornis. —Baba & Poore, 2002: 241–244, figs. 6 A, B, 7A, 8A, 9A, B [part]. —Ah Yong & Poore, 2004b: 46, 57. —Poore, 2004: 235, 237, fig. 65g. —Yaldwyn & Webber, 2011: 214.

Munidopsis cf. *serricornis*. —Webber *et al.*, 2010: 226. —Taylor *et al.*, 2010: 15. —Rowden *et al.*, 2011: 73.

Munidopsis pyrochela Ah Yong, 2014: 207, figs. 6, 9 (type locality: Ritchie Seamount, E Chatham Rise, 44°10.0–10.1'S, 174°34.4–35.7'W, 836–1100 m).

Material examined. *Macquarie Ridge*: NIWA 39722, 1 male (pcl 13.6 mm), Clementsville seamount, 50°05.43–05.31'S, 163°28.92–28.32'E, 1077–1408 m, 01 April 2008, TAN0803/33.

Diagnosis. Rostrum broad, flat, medially carinate, trifid distally. Carapace with pair of epigastric spines, otherwise unarmed dorsally; surface of dorsal half with faint short striae; lateral margins with 4 spines (1 anterolateral, 3 branchial); posterior orbital margin transverse; outer orbital spine distinct. Abdominal tergites unarmed. Telson with 8 plates. Maxilliped 3 merus flexor margin with 2 or 3 spines. P1 carpus length less than twice width, dorsal surface unarmed; merus with 3 longitudinal rows of prominent spines (dorsal, mesial, ventromesial). P2–4 meri distinctly spinose along extensor margin; dactyli flexor margin with movable spines, and more slender movable spine at base of corneous unguis. Pereopods without epipods. (After Ah Yong, 2014).

Colour in life (Fig. 5C). Carapace and abdomen off-white; lateral margins and ridges with pale orange-brown marks. Chelipeds deep orange-red. Walking legs off-white. Cornea pale pink.

Remarks. The present specimen of *Munidopsis pyrochela* is the southernmost documented representative of the *Munidopsis serricornis* group. It is a common seamount species occurring in New Zealand, southeastern Australia, and the southwest Indian Ocean (Ah Yong, 2014).

Distribution. New Zealand and southeastern Australia, ranging in the east from the Chatham Rise and Snares Islands, south to the Macquarie Ridge and westwards to Tasmania including the South Tasman Rise and Cascade Plateau; also the Southwest Indian Ocean Ridge; 392–1414 m.

Munidopsis tasmaniae Ahyong & Poore, 2004

Munidopsis tasmaniae Ahyong & Poore, 2004b: 59, fig. 14 (type locality: off St. Patrick's Head, Tasmania, 41°35'S, 148°14'E, 1100 m). —Poore, 2004: 237, fig. 65i (compilation). —Baba, 2005: 297 (key, synonymies). —Baba *et al.*, 2008: 165 (synonymies). —Taylor *et al.*, 2010: 12, fig. 4, 16 (key).

Material examined. *Kermadec Ridge*: NIWA 85198, 1 female (cl 12.2, pcl 9.2 mm), Lillie seamount, Kermadec Ridge, 35°51.44–51.41'S, 178°26.87–26.55'E, 1237–1460 m, 19 March 2011, stn. TAN1104/124.

Louisville Ridge: NIWA 94435, 1 ov. female (cl 10.9, pcl 8.0 mm), 1 female (cl 9.5, pcl 6.8 mm), Ghost seamount, Louisville Ridge, 40°43.03–42.84'S, 165°20.56–20.73'W, 814–912 m, 23 February 2014, stn. TAN1402/111.

Chatham Rise: NIWA 53302, 2 ov. females (cl 14.9, pcl 11.4; cl 15.8, pcl 11.8 mm), Mummy Seamount, Graveyard seamount complex, 42°38.66–38.67'S, 179°52.88–53.05'W, 1052–1080 m, 18 June 2009, stn. TAN0905/48; NIWA 29555, 1 male (cl 12.9, pcl 9.4 mm), Diabolical Hill, Graveyard seamount complex, 42°47.48–47.33'S, 179°59.28–59.22'W, 882–1000 m, 04 June 2006, stn. TAN0604/97; NIWA 69817, 1 male (cl 14.5, pcl 11.5 mm), 1 female (cl 14.1, pcl 10.6 mm), RIP Seamount, Graveyard seamount complex, 42°46.72–46.93'S, 179°54.21–54.46'W, 917–1021 m, 17 June 2009, stn. TAN0905/39.

Macquarie Ridge: NIWA 21148, 1 female (pcl 8.0 mm), Clementsville seamount, 50°00.70'S, 163°41.20'E, 946–1060 m, 23 November 2001, stn. Z15059.

Diagnosis. Carapace covered with sparsely setose squamae and tubercles; cervical groove distinct; regions well defined; with pair of broad, blunt, flattened epigastric processes; frontal margin with large, blunt antennal process; lateral margins with 4 large, blunt anterolaterally directed teeth; posterior margin unarmed. Rostrum trianguloid, slightly shorter than to slightly longer than one-third pcl; broad basally, margins convex and serrate; apex blunt; dorsally carinate and sparsely tuberculate. Abdominal tergites unarmed; tergite 6 with posterior margin not strongly produced. Telson composed of 8 plates. Eyestalk movable, with short, papillate, tubercular process mediodorsally. P1–3 (cheliped and first two walking legs) with epipod. P1 elongate, twice carapace length; setose and rugose; palm length about twice width. P2–4 coarsely tuberculate; carpi extensor margin spinose; dactyli with 11–16 small movable spines on flexor margin. (Modified after Ahyong & Poore, 2004).

Remarks. The present specimens constitute the first record of the species from outside of Tasmanian waters and agree well with the type description (Ahyong & Poore, 2004). We include specimens of *M. tasmaniae* collected from seamounts on the southern Kermadec Ridge, the northern Chatham Rise and from the Louisville Ridge to document the occurrences at these localities. The known bathymetric range is extended to 119–1460 m although most specimens were collected from 700–1100 m.

Distribution. Australia (Tasmania) and now from New Zealand (southern Kermadec Ridge, northern Chatham Rise, Kaikoura Canyon, Macquarie Ridge), 119–1460 m.

Discussion

We present for the first time the squat lobster fauna of the Macquarie Ridge region, a seamount chain running south from the south westernmost tip of New Zealand towards Antarctica. Samples collected from seven features between 48°S and 56°S and Christable Seamount approximately 120 km to the east uncovered six species in three genera, one new to science. These represent a combination of New Zealand continental shelf and Indo-Pacific high latitude species. *Munida isos*, *Munidopsis tasmaniae* and *Ms. pyrochela* are the most widespread species, with close relatives elsewhere in the Indo-West Pacific. They are typically found on seamounts with distributions around the New Zealand continental shelf as far north as the Kermadec region and across the Tasman Sea to southeastern and southern Australia (*M. isos* and *M. tasmaniae*), and as far west as the Southwest Indian Ridge (*Ms. pyrochela*). *Uroptychus insignis* was originally known only from a number of isolated southern Indian Ocean islands, its distribution now extended eastwards by around 6500 km, but with all latitudinal records remaining at around 50°S. *Munida chathamensis* and *Uroptychus tracey* n. sp. are restricted to temperate and sub-Antarctic New Zealand from the Chatham Rise southwards, with the northernmost distribution approximating the position of the Subtropical Convergence at around 43°S (see review by Carter *et al.*, 2008).

Macquarie Ridge is one of few continuous features that interrupt the flow of the Antarctic Circumpolar Current (ACC or West Wind Drift Current), which circulates in a clockwise fashion around the Antarctic continent (Carter *et al.*, 2008). Macquarie Island is the only feature on the ridge that breaks the sea surface at approximately 55°S. The adjacent New Zealand subantarctic islands (Auckland Islands, Campbell, Antipodes and Bounty Islands) are not geologically associated with the Macquarie Ridge and instead lie on the Campbell Plateau, a large extension of the New Zealand continental shelf. All of these belong to Spalding's *et al.* (2007) wider Southern Ocean biogeographic realm, although Macquarie Island and the New Zealand subantarctic islands are placed in different ecoregions within this realm. Macquarie Island is associated with the southern Atlantic and Indian Ocean islands (e.g., Bouvet, Crozet and Kerguelen Islands), consistent with the distribution of *U. insignis* and perhaps *M. chathamensis* (with its near relatives *M. spica* and *M. spinosa* occurring off other Southern Ocean subantarctic islands), while the New Zealand subantarctic islands form a unique "Antipodean" province (see also Briggs, 1995). Biogeographic associations between the circumpolar subantarctic islands vary greatly between taxa. Griffiths *et al.* (2009) suggest connections between the New Zealand and Tasmanian fauna for cyclostome bryozoans, but for cheilostome bryozoans, pycnogonids and molluscs, the New Zealand region remained distinct from all others. Primo *et al.* (2008) found the ascidian fauna of the Antipodean province to be distinct from that of the remaining New Zealand region to the north and was comprised of broadly distributed Southern Hemisphere species whose distributions they linked to the West Wind Drift. Similar patterns of implied long-distance connectivity were also suggested for shallow-water asteroids between South Africa, the southern Indian Ocean and Australia (Waters & Roy, 2004). Forest & McLay (2001) combine the Macquarie Island and other antipodean islands into a single region based on the distribution of New Zealand hermit crabs, a model consistent with the ranges of most of the squat lobsters reported here.

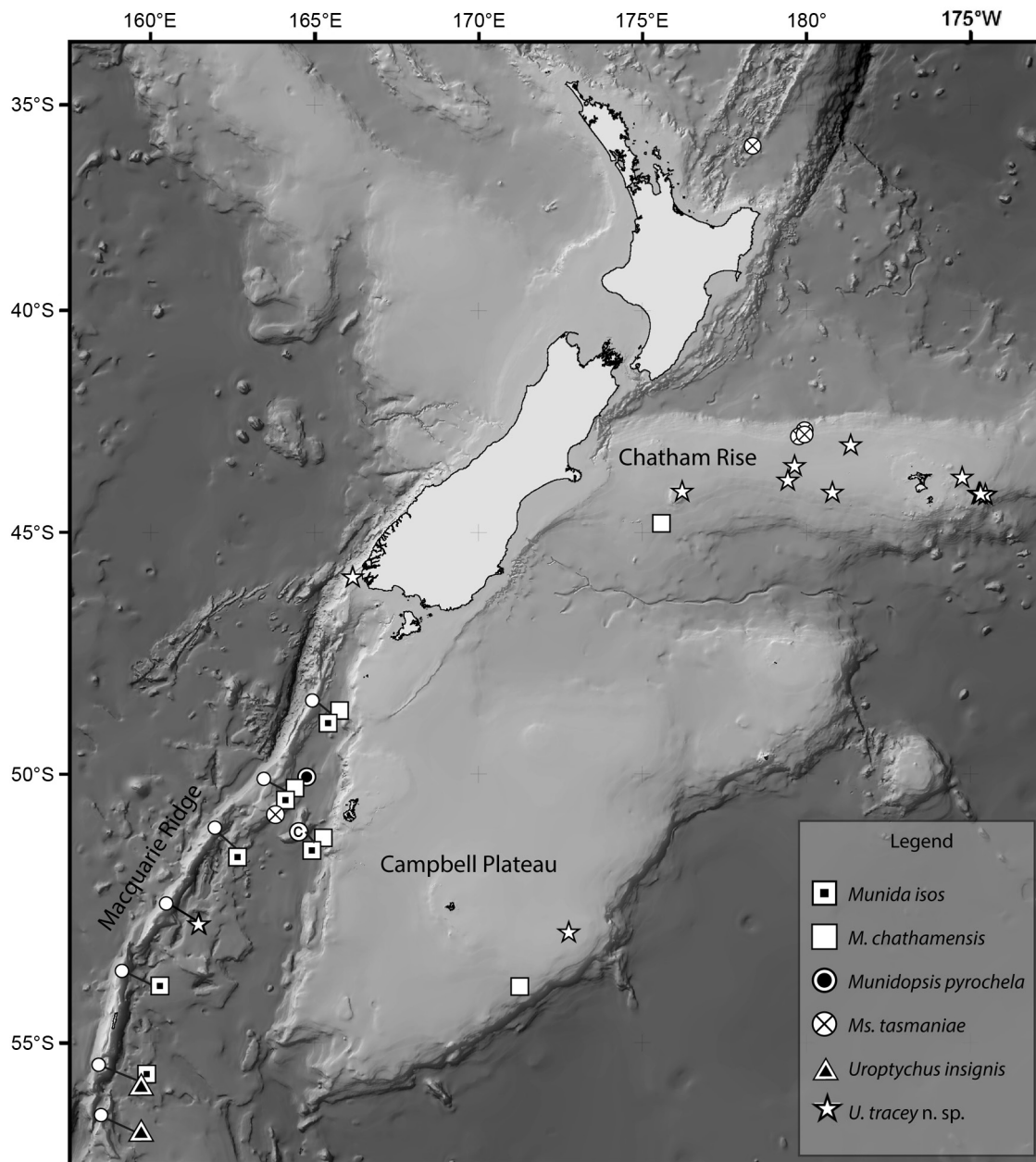


Figure 9. New Zealand region showing the Macquarie Ridge (○) and Christable (©) seamounts, and sampling sites of squat lobsters records reported herein.

While not highly diverse, the contemporary squat lobster fauna encountered on Macquarie Ridge appears to both reflect patterns of long-distance latitudinal connectivity via the West Wind Drift (*Uroptychus insignis* and *Munidopsis pyrochela*) and a trans-Tasman southern Australian-New Zealand connection (*Munida isos* and *Munidopsis tasmaniae*), and also possibly a southern New Zealand endemic element (*Uroptychus tracey* n. sp., *Munida chathamensis*). Interestingly, the species with the possibly widest distributions (*U. insignis*; *Ms. pyrochela*) belong to the two families (Chirostylidae and Munidopsidae) that typically feature abbreviated larval stages and, consequently, inferred limited dispersal capabilities (Baba, Fujita, Wehrmann & Scholtz, 2011; Rowden *et al.*, 2010). Additionally, considering the current bathymetric ranges of these species (~300–1600 m) and that they are currently associated with seamounts and continental margins, the

likely dispersal pathways across these distances around the Southern Ocean are unclear. There appear to be only limited underwater features that may serve as “stepping stones” for dispersal of larvae between the southern Indian Ocean islands and Macquarie Ridge, particularly if planktonic larval duration is expected to be limited, lending circumstantial weight to the possibility that the Macquarie Ridge *U. insignis* might represent an undescribed, albeit closely related species. Clearly, more questions remain. While limited in diversity, the distributions of the squat lobster fauna of Macquarie Ridge speak to wider questions around historical and recent dispersal routes for benthic macro-invertebrates to and from the New Zealand/southern Australia and sub-Antarctic/Antarctic regions (see summary in Dawson, 1988). Similarly, questions remain around the role of the West Wind Drift in presenting a possible physical barrier to the north-south dispersal for some taxa across the New Zealand region.

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