

A review of the New Zealand Chirostylidae (Anomura: Galatheoidea) with description of six new species from the Kermadec Islands

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Prior to the present study, seven species of deep-sea Chirostylidae ('squat lobsters'), were known from New Zealand: *Gastroptychus novaezelandiae*, *Uroptychodes spinimarginatus*, *Uroptychus australis*, *Uroptychus maori*, *Uroptychus novaezelandiae*, *Uroptychus politus*, and *Uroptychus tomentosus*. All species are examined from type material and discussed, original illustrations supplemented, and new records provided where available. *Uroptychus maori* and *Uroptychus novaezelandiae* are re-described. The chirostylid fauna of the Kermadec Islands, a remote group of islands north-east of New Zealand, is studied. *Uroptychus alcocki* and *Uroptychus scambus* are reported for the first time from New Zealand, and six new species of the genus *Uroptychus* are described. Distributional patterns of New Zealand species are discussed and a key to New Zealand *Uroptychus* species is presented. © 2009 The Linnean Society of London, *Zoological Journal of the Linnean Society*, 2009, 155, 542–582.

ADDITIONAL KEYWORDS: *Gastroptychus* – south-western Pacific – *Uroptychodes* – *Uroptychus*.

INTRODUCTION

Chirostylidae, commonly referred to as deep-sea squat lobsters, inhabit the lower shelf and slopes of the continental margins and exhibit remarkable host and habitat associations (Baba & Haig, 1990; Rice & Miller, 1991; Baba & de Saint Laurent, 1992; Ah Yong & Poore, 2004). Worldwide, c. 180 chirostylid species are currently described, c. 160 of which are distributed in the Indo-Pacific (Baba, 2005). Recent work (Baba & de Saint Laurent, 1992; Ah Yong & Baba, 2004; Baba, 2000, 2004, 2005; Ah Yong & Poore, 2004) has greatly increased the number of known species in this region, particularly in the south-west Pacific, but records of New Zealand chirostylids remain extremely scarce. Including Henderson's (1885) first report on the collections of the HMS *Challenger* off New

Zealand, a total of only seven species has been described from this region.

This study provides the first review of New Zealand Chirostylidae including a re-examination of all species so far recorded: *Uroptychus maori* Borradaile, 1916 and *Uroptychus novaezelandiae* Borradaile, 1916 are re-described and new records are provided for *Uroptychus maori*; *Gastroptychus novaezelandiae* Baba, 1974, *Uroptychodes spinimarginatus* (Henderson, 1885), *Uroptychus politus* (Henderson, 1885), and *Uroptychus tomentosus* Baba, 1974 are revised and new records provided where available. The New Zealand paralectotypes of *Uroptychus australis* (Henderson, 1885) have been referred to a new species currently being described elsewhere (K. Baba, pers. comm.), and further records for this species are presented as well as new records of *U. australis* s.s. from locations around New Zealand.

The Kermadec Islands were first visited during the brief transit of the HMS *Challenger* through New Zealand waters in June and July 1874. They comprise a cluster of small islands at the approximate midway point between New Zealand and Tonga, they lie on a

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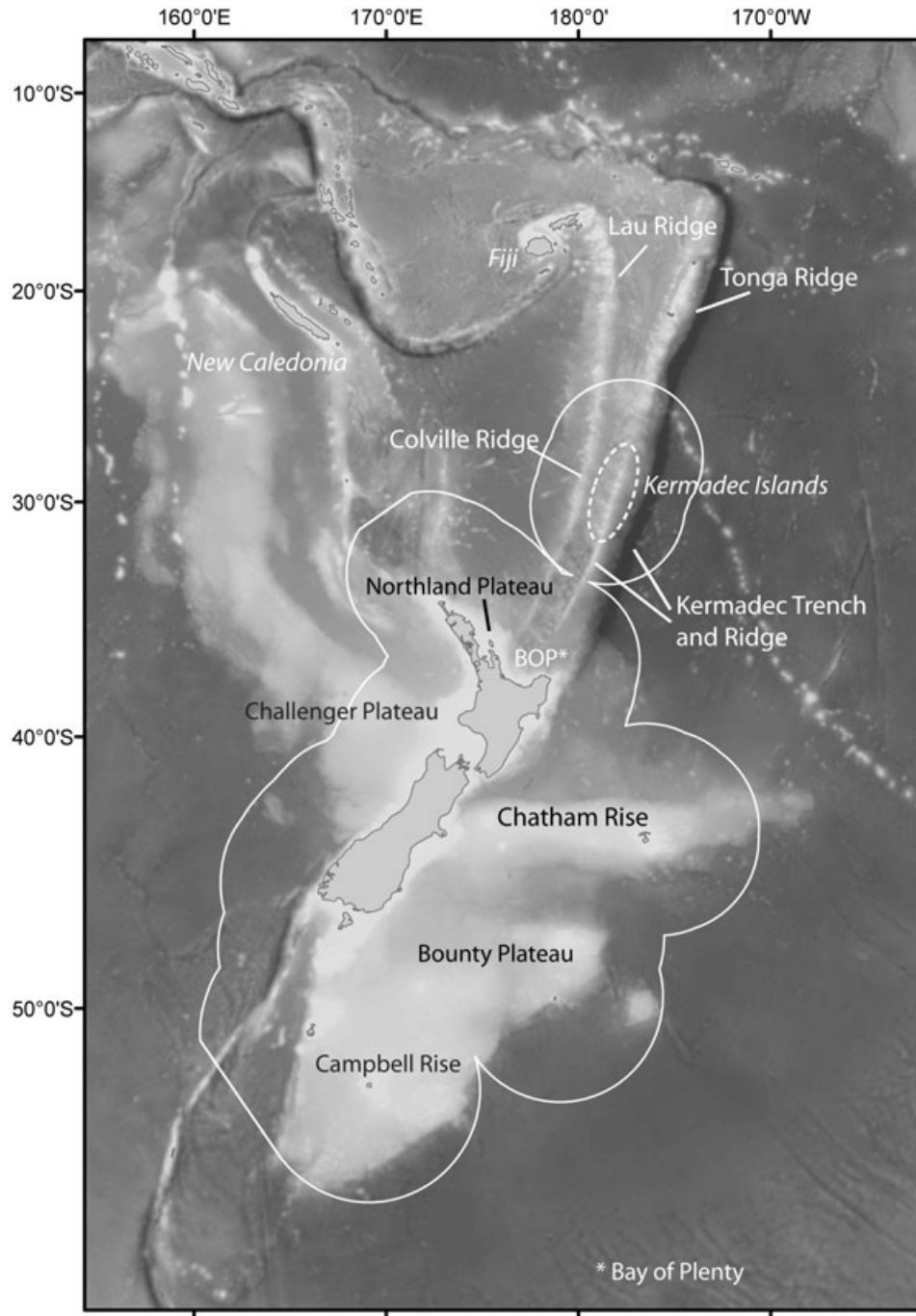


Figure 1. Sea floor topography of the south-west Pacific around New Zealand showing major islands (italic), underwater features, and the New Zealand Exclusive Economic Zone. Bathymetry based on Smith & Sandwell (1997).

ridge of hydrothermally active seamounts adjacent to the deep Kermadec Trench (e.g. Wright, Worthington & Gamble, 2006) and they provide an isolated and highly diverse range of marine habitats (Fig. 1). All records by Henderson (1885) were collected from two *Challenger* stations north of the islands and they remain the only records for Chirostylidae from the

Kermadec region. Material from the Kermadecs presented here include first New Zealand records for *Uroptychus alcocki* Ahyong & Poore, 2004, *Uroptychus scambus* Benedict, 1902, and six new species that are described: *Uroptychus paku*, *Uroptychus rutua*, *Uroptychus kaitara*, *Uroptychus toka*, *Uroptychus webberi*, and *Uroptychus yaldwyni*.

This is the first comprehensive account of New Zealand Chirostylidae and fills a conspicuous gap of knowledge in the south-west Pacific chirostylid fauna. Fifteen species of Chirostylidae in three genera are now known from New Zealand. A key to New Zealand *Uroptychus* species is provided and distributions discussed, including the southernmost records worldwide for this family and a potentially high proportion of endemism around the Kermadec islands, possibly a result of its isolation.

MATERIAL AND METHODS

New collections were made using trawls, sleds, and dredges, and date back to 1961 from a depth range of 69 to 1395 m.

A full description is provided for those species new to science or re-described (*Uroptychus maori* and *Uroptychus novaezelandiae*); for all other species a diagnosis is provided. A portion of the material for *Gastroptychus novaezelandiae* was used for complete meristic examination, all additional material presented has been identified as belonging to *G. novaezelandiae* but not fully measured. The terminology follows Baba (2005). Measurements of specimens are given in millimetres (mm) and indicate the carapace length including the rostrum unless otherwise indicated. All measurements provided are taken along the midline of the respective segment unless otherwise indicated (except the width of the carapace and the sternal plastron that was read at its widest, usually posterior, portion). The ambulatory legs or pereopods 2–4 are abbreviated P2–4. If more than three specimens were examined from one station the range of carapace lengths is provided in the material examined section. Specimens are deposited at NIWA and NMNZ. Descriptions were prepared using DELTA (Descriptive Language for Taxonomy: Dallwitz, Paine & Zurcher, 1997). Drawings were made using a WACOM Intuous3 Graphics Tablet and Adobe Illustrator CS2; distribution ranges were mapped using ESRI ArcMap version 9.1; and the satellite altimetry is after Smith & Sandwell (1997).

INSTITUTIONAL ABBREVIATIONS

BMNH, Natural History Museum, London; NIWA, National Institute of Water and Atmospheric Research, Wellington; NMNZ, National Museum of New Zealand Te Papa Tongarewa, Wellington; NZOI, New Zealand Oceanographic Institute (now NIWA), Wellington; PMBS, Portobello Marine Biological Station, New Zealand; VUW, Victoria University of Wellington; ZLKU, Kitakyushu Museum of Natural History, Kitakyushu, Japan; ZMUC, Zoologisk

Museum, Natural History Museum of Denmark, University of Copenhagen.

SYSTEMATIC ACCOUNT

Seven chirostylid species in three genera are currently known in New Zealand waters with the first species recorded from the *Challenger* voyage 1873–76 and presented by Henderson (1885), who described three species (*Uroptychus spinimarginatus* [now *Uroptychodes*], *Uroptychus australis*, and *Uroptychus politus*) from two stations off the Kermadec Islands. In the early 20th century, the *Terra Nova* Expedition, on the way to the Ross Sea, collected two new species (*Uroptychus maori* and *Uroptychus novaezelandiae*) off the northern tip of New Zealand that were subsequently described by Borradaile (1916). Most recently, Baba (1974) described two species (*Gastroptychus novaezelandiae* and *Uroptychus tomentosus*) collected by the Japanese Fisheries Research vessel *Kaiyo Maru* on the Chatham Rise east of the New Zealand South Island. Four of the seven species (*G. novaezelandiae*, *Uroptychus maori*, *Uroptychus novaezelandiae*, and *Uroptychus tomentosus*) have not been recorded outside of New Zealand waters and have not been illustrated beyond the initial description. The remaining chirostylid genera *Chirostylus* and *Eumunida* have so far not been reported from New Zealand.

FAMILY CHIROSTYLIDAE ORTMANN, 1892

GENUS *GASTROPTYCHUS* CAULLERY, 1896

Ptychogaster A. Milne Edwards, 1880: 63. – Henderson, 1888: 170.

Gastroptychus Caullery, 1896: 390 [replacement name for *Ptychogaster* A. Milne Edwards, 1880, junior homonym of *Ptychogaster* Pomel, 1847: fossil Reptilia Chelonia]. – Miyake & Baba, 1968: 379. – Baba, 2005: 19. – Poore, 2004: 220.

GASTROPTYCHUS NOVAEZELANDIAE BABA, 1974

(FIG. 2)

Gastroptychus novaezelandiae Baba, 1974: 381, figs 1 and 2. – Baba, 2005: 212 (key), 214 (list).

Type material: HOLOTYPE: ♂ (11.5 mm), Chatham Rise, 43° 14.5'S, 174° 43.0'E, 440 m, 13.vii.1968, FV *Kaiyo Maru* Stn 28, coll. K. Baba (ZLKU 15123).

Other material examined: Northland Plateau: 1 ♂ (6.8 mm), 35° 35.90'S, 175° 12.80'E, 308 m, 4.v.1975, stn I11 (NIWA 14565). 4 ♀ ovig. (10.8–15.3 mm), 1 ♀ (10.8 mm), 2 ♂ (10.7, 16.8 mm) from five stations.

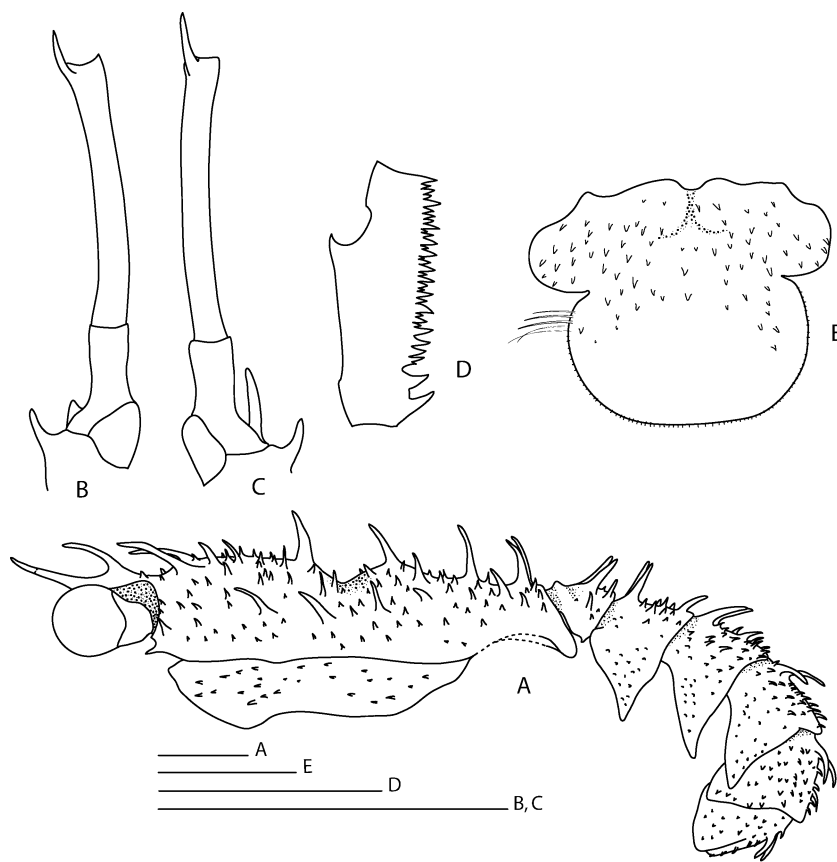


Figure 2. *Gastroptychus novaezelandiae* Baba, 1974, holotype, ♂, ZLKU 15123: A, carapace and abdomen, lateral; B, antenna, right, ventral; C, antenna, left, ventral; D, mesial ridge, left, dorsal; E, telson, most setae omitted; Scale bars = 2 mm.

1 ♀ (8.6 mm), 38° 40.00'S, 169° 25.99'E, 550 m, 16.iv.1970, NZOI stn J30 (NMNZ Cr.012072). 2 ♀ (10.0, 11.3 mm), 39° 33.90'S, 169° 14.70'E, 604 m, 18.x.1982, stn U227 (NIWA 14581) on Challenger Plateau. 1 ♀ ovig. (19.2 mm), 37° 20.19'S, 176° 22.40'E, 297 m, 19.i.1998, stn Z8994 (NIWA 14568). 1 ♀ (13.3 mm), 1 ♂ (13.0 mm), 37° 32.56'S, 177° 7.57'E, 339–360 m, 20.ii.2000, stn Z10021 (NIWA 14572) 2 ♀ ovig. (14.7, 15.7 mm), 5 ♀ (14.5–15.3 mm), 1 ♂ (14.4 mm) from six stations in the Bay of Plenty. 20 ♀ ovig. (9.2–15.0 mm), 16 ♀ (7.7–15.8 mm), 17 ♂ (6.6–17.5 mm) from 35 stations on the Chatham Rise. 8 ♀ ovig (10.0–13.0 mm) 6 ♀ (7.5–9.2 mm), 10 ♂ (8.4–13.1 mm), from three stations on the Otago shelf. 1 ♂ (11.7 mm), Puysegur Bank, 46° 20.29S, 166° 19.00E, 23.x.1967, 461–466 m, NZOI stn E818. 3 ♀ ovig. (12.3, 12.7, 13.7 mm), 4 ♀ (10.3–14.7 mm), 6 ♂ (11.2–15.8 mm) from four stations on the Bounty Plateau. Auckland Islands: 1 ♀ ovig. (12.3 mm), 50° 58.00'S, 165° 45.00'E, 549 m, 7.v.1963, stn D39 (NIWA 11620). 1 ♂ (8.1 mm), 50° 58.00S, 165° 45.00E, 7.v.1963, 549–465 m, NZOI stn D39 (NMNZ Cr.012073). 1 ♀

(11.7 mm), Campbell Plateau, 53° 15.90'S, 172° 46.10'E, 501 m, 22.ix.1978, stn S51 (NIWA 14580). 2 ♀ (17.5, 17.9 mm) from two stations with no location information.

Diagnosis: Carapace 1.7–1.8 times as long as wide (including rostrum), covered with spinules and spines (paired spines in epigastric region and just anterior of posterior margin, one median spine in metagastric, and two spines along midline of cardiac region and four or five strong spines along lateral branchial region, decreasing in size posteriorly). Rostrum with large, curved dorsal spine. Anterior margin of sternite 3 concave with row of six to eight spines. Sternite 4 with one pair of large lateral spines; surface with scattered small spines and granules only. Abdomen covered with spines; pair of large submedian spines on anterior portions of segments 1–6 each; telson anterior portion covered with denticles. Antennal scale small and triangular, barely reaching midpoint of penultimate article, rudimentary or absent; ultimate article with distal spine; penultimate article

unarmed. Maxillipeds 3 widely separated; propodus with two to five spines along extensor margin; ischium with 33 teeth on mesial ridge (including two to three strong teeth on basis). Pereopod 1 (cheliped) slender, palm 2.4–3.0 times as long as dactyli. Pereopods 2–4 carpi seven to eight times longer than propodi.

Variation: Baba (1974) gave only one measurement of the carapace length (11.5 mm). The material presented here includes a further 115 specimens with carapace lengths between 6.6 (NIWA 14565) and 19.2 mm (NIWA 14568). Within this size range, the morphometric proportions of the carapace, telson, sternum, and pereopods correspond well with that of the holotype examined. The only significant difference appears to be in the height–width ratio of the cheliped palm with the male holotype palm being nearly 12 times as high as wide. In both small males and females, the palm is more slender (15.5 and 16.3 times as high than wide, respectively).

Body sizes of males and females were not significantly different; ovigerous females were generally the largest specimens (range: 9.2–19.2, mean: 12.8, median: 12.8 mm, $N = 42$), followed by males (range: 6.6–17.5, mean: 12.0, median: 11.9 mm, $N = 40$). Non-ovigerous females were the smallest on average (range: 7.5–15.8, mean: 11.2, median 10.8 mm, $N = 34$).

The size of the ovum ranged from 1.6–2.2 mm in diameter.

The large series of specimens examined showed considerable variation in the presence, absence, and size of the antennal scale. Of 58 specimens examined for this character, only six (10%) bore a scale as shown in Baba (1974). Most specimens (70%) showed a rudimentary scale and in 20% of the specimens, the scale appeared to be absent. This character varied even from left to right on the same specimen (Fig. 2), from specimens collected from one station, and no sex or geographical correlation was obvious.

The basis of maxilliped 3 usually bears three strong spines (proximal smallest), the holotype lacks the smaller proximal spine.

Small differences are noted amongst major spines on the dorsal surfaces of the carapace and abdomen, usually with an additional spine to the characteristic spines noted by Baba (1974). The only exception are two specimens from the NMNZ collection that, unfortunately, lack location information; both females lack the dorsal spine on the carapace but otherwise match the diagnostic characters of *G. novaezelandiae*.

A curious deformation of the rostrum was noted on male NIWA 14572 that had a sagittal split along most of the length of the rostrum (appearing like two

parallel rostra and lacking a dorsal spine). Otherwise, the specimen matched the species description well.

Remarks: *Gastroptychus novaezelandiae* Baba, 1974 is a New Zealand endemic and the most common chirostylid in New Zealand waters. It belongs to the group with a concave anterior margin of sternite 3, maxillipeds 3 widely separated, and the P2–4 propodi very short (carpus more than seven times longer than propodus). It is most similar to *Gastroptychus brachyteres* Baba, 2005 (from the Kei Islands, Indonesia) and *Gastroptychus brevipropropus* Baba, 1991 (from around New Caledonia) but it can be readily distinguished from both these species by the dorsal spine on the rostrum, the pronounced paired submedian spines on the abdominal tergites 1–6, at least two spines on the extensor margin of the propodus of the third maxilliped, and the lack of prominent submedian spines on the sternal plastron (only scattered granules and very small spines along sternite 4).

Distribution: Margins of the New Zealand continental shelf at depths of 264–732 m and from about 34°S (north-east of the North Island) to 53°S (sub-Antarctic slope) (Fig. 3).

Ecological and biological remarks: Baba (1974) noted that the holotype of *G. novaezelandiae* was taken from a dorsal groove of the pennatulacean *Balticina willemoesii* (Kölliker). The NIWA station register provides notes for occasional collection of pennatulaceans and other cnidarians in the same haul containing *G. novaezelandiae* and recent benthic imagery taken on the Chatham Rise revealed this species perched on small hydrozoans and gorgonian corals as well as two occasions with specimens walking on the soft sediment (unpubl. data).

The female specimen NIWA 14574 carried a sacculinid rhizocephalan parasite under the abdomen. Additionally, some pereopods of the female NIWA 14580, the southernmost record, are thickly covered with solitary hydroids.

GENUS *UROPTYCHODES* BABA, 2004

Uroptychodes Baba, 2004: 98. – Baba, 2005: 26.

UROPTYCHODES SPINIMARGINATUS (HENDERSON, 1885) (FIG. 4)

Diptychus spinimarginatus Henderson, 1885: 419.

Uroptychus spinimarginatus. – Henderson, 1888: 176, pl. 21: fig. 2, 2a. – Thomson, 1899: 196 (list). – Baba, 1988: 46, figs 18, 19.

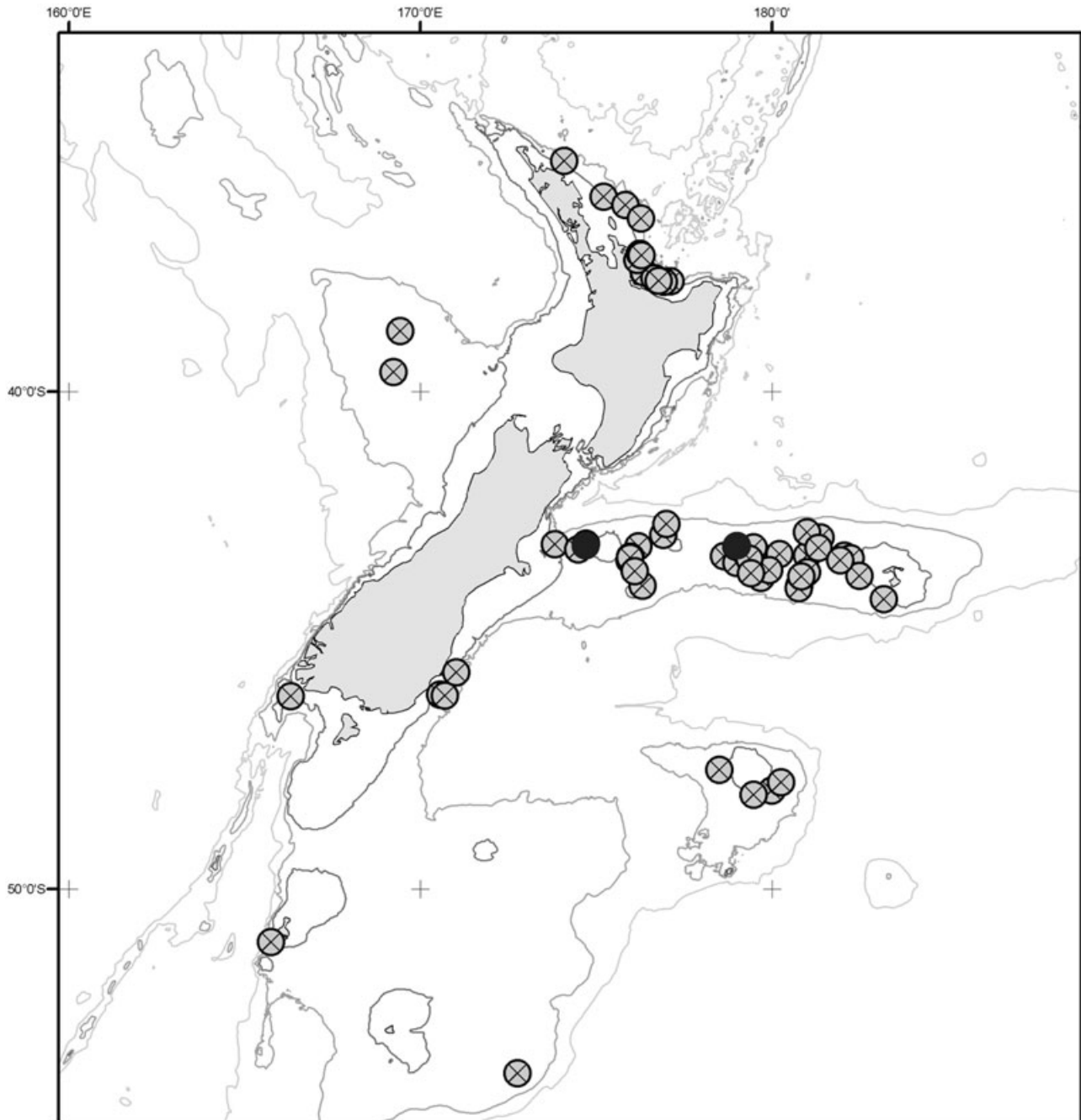


Figure 3. Records of *Gastroptychus novaeseelandiae* Baba, 1974 around New Zealand. Solid circles indicate the type records. 250, 1000, and 2500 m bathymetric contours are shown.

Uroptychodes spinimarginatus. – Baba, 2004: 112, fig. 9b, c. – Baba, 2005: 27, 216 (list).

Type material: 1 ♀ ovig. (10.3 mm), lectotype, 1 ♂ (9 mm), paralectotype, off Kermadec Islands, 29° 55' S, 178° 14' W, 952 m, 14.vii.1874, *Challenger* stn 170 (BMNH 1888: 33). 2 ♀ ovig. (6.7, 7.7 mm), paralectotypes, off Meangis Islands south of Philippines

[= Kepulauan Talaud S of Mindanao], 4° 33' N, 127° 6' E, 914 m, 10.ii.1875, *Challenger* stn 214 (BMNH 1888: 33).

Other material examined: 1 ♀ ovig. (11.7 mm), Manado Bight (Indonesia), 1° 31' N, 124° 47' E, 458 m, 12.iii.1914, Great Northern Telegraph Co., Capt.

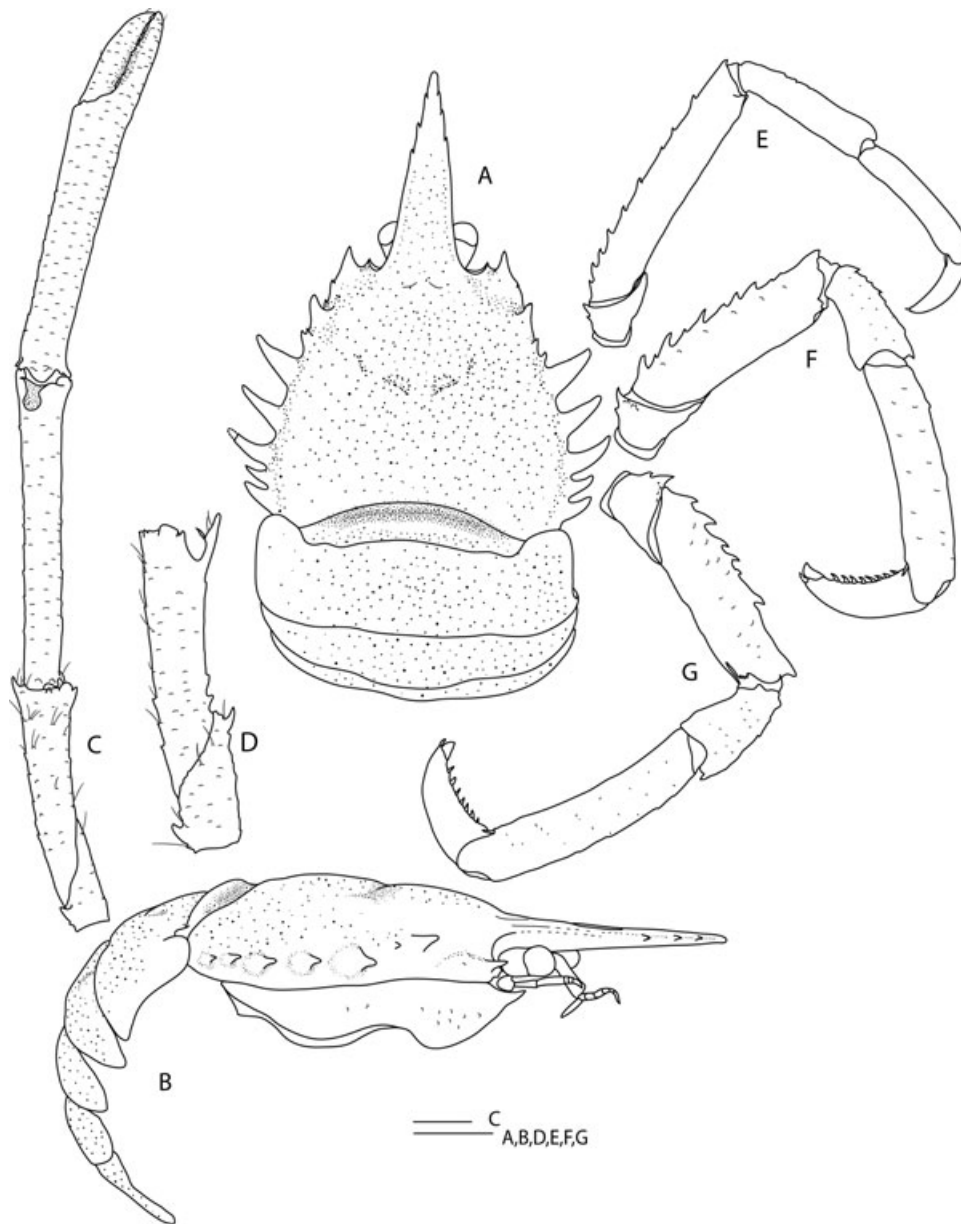


Figure 4. *Uroptychodes spinimarginatus* (Henderson, 1885), syntype, ♀ ovig., BMNH 1888: 33: A, carapace and abdomen, dorsal, setae omitted; B, carapace and abdomen, lateral, setae omitted; C, right cheliped, dorsal; D, right cheliped, ischium and merus, lateral; E–G, right pereopods 2–4. Scale bars = 2 mm.

Christiansen (ZMUC CRU–11191; examined by Baba, 2005).

Diagnosis: Carapace excluding rostrum slightly broader than long, dorsally unarmed, covered with fine setae; lateral margins with moderate anterolateral spine, two or three small hepatic spines, two or three spines in the anterior branchial region (the first largest) and five (rarely six) strong spines in the posterior branchial region. Rostrum with two to five small spines on distolateral margin. Antennal

peduncle with ultimate article 1.8 times longer than penultimate; penultimate article with small distomesial spine; ultimate unarmed; antennal scale reaching or slightly overreaching mid-length of adjacent ultimate article. Maxilliped 3 ischium with one to three small spines lateral to rounded flexor distal margin; mesial ridge with obsolescent denticles; distolateral spines on merus and carpus small or obsolescent; merus with three or four small spines on distal half of flexor margin. Pereopod 1 (cheliped) 2.4–2.8 times carapace length; with setiferous scale-like ridges;

ischium with ventral and distodorsal spines; merus with three distal spines (lateral strongest), carpus 0.8 times length of palm. Pereopods 2–4 meri with rows of spines along extensor margins; propodi unarmed except distal pair of spines on flexor margin.

Variation: A comparison of the lectotype with the other material shows some small variation: the cheliped is more slender in small females; height–width ratio of the propodal palm in the largest Philippine specimen is 7.6 compared to 5.0 and 4.9 for the lectotype female and ZMUC Manado Bight females, respectively. The single small male in this series has a slightly stouter propodal palm (3.9 times higher than wide). Overall, the spines and rugosities of the appendages, maxilliped, and pterygostomial flap are least pronounced in the female lectotype compared to the other specimens of the series, characters that appear to vary with size and sex among the material examined.

Remarks: *Uroptychus spinimarginatus* is clearly distinguishable from its congeners by the combination of an unarmed carapace dorsum, only the distal third of the lateral margin of rostrum with spines, ultimate antennal article nearly twice as long as penultimate article, and the lateral branchial margin with five or six large spines, diminishing in size posteriorly.

The syntypes of this species were collected by HMS *Challenger* from widely separated locations in the south-west (Kermadec Islands) and north Pacific (Philippines). The female from off the Kermadec Islands was designated as the lectotype (Baba, 1988).

Distribution: Western Pacific; the Kermadec Islands, south of Mindanao (Philippines) (Henderson, 1885, 1888), Hunter and Matthew Islands, New Caledonia and Kei Islands (Baba, 2004) and Manado Bight (Indonesia) (Baba, 2005), 458–952 m. In New Zealand, this species is so far only known from the type locality (Fig. 5).

GENUS *UROPTYCHUS* HENDERSON, 1888

Diptychus A. Milne Edwards, 1880: 63.

Uroptychus Henderson, 1888: 173 [replacement name for *Diptychus* A. Milne Edwards, 1880, junior homonym of *Diptychus* Steindachner, 1866, Pisces]. – Alcock, 1901: 281. – Baba, 1988: 17; 2005: 27. – Ah Yong & Poore, 2004: 12.

UROPTYCHUS ALCOCKI AHYONG & POORE, 2004

Uroptychus alcocki Ah Yong & Poore, 2004: 15, fig. 2 [type locality: south-east of Ballina, New South

Wales, Australia, 29° 02'S, 153° 48'E, 137 m; holotype, ♀, AM P31412]. – Baba, 2005: 28, fig. 6.

Material examined: Lord Howe Ridge: 1 ♀ ovig. (7.1 mm), 24° 52.90' S, 159° 37.30' E, 69 m, 3.vi.1978, stn Q71 (NIWA 23033). 6 ♀ ovig. (6.3–6.9 mm), 1 ♀ (6.1 mm), 5 ♂ (5.7–7.1 mm), 26° 59.70' S, 159° 18.90' E, 376–427 m, 2.vi.1978, stn Q70 (NIWA 23030). 5 ♀ ovig. (5.5–7.0 mm), 1 ♀ (5.6 mm), 3 ♂ (6.4–7.4 mm), 27° 00.00' S, 159° 18.29' E, 354–377 m, 2.vi.1978, stn Q69 (NIWA 23031). 7 ♀ ovig. (4.9–8.6 mm), 1 ♀ (6.4 mm) 9 ♂ (4.1–7.4 mm), 27° 00.00' S, 159° 18.29' E, 354–377 m, 2.vi.1978, stn Q69 (NIWA 23032). Guyot Seamount: 1 ♀ (4.9 mm), 1 ♂ (5.5 mm), 27° 59.59' S, 155° 37.50' E, 420 m, 11.xii.1979, stn P925 (NIWA 10893). West Norfolk Ridge: 1 ♂ (6.8 mm), 32° 10.80' S, 167° 21.19' E, 356 m, 25.vii.1975, stn I96 (NIWA 23034). Norfolk Ridge: 1 ♀ (5.0 mm), 28° 54.60' S, 167° 44.20' E, 390–402 m, 27.i.1977, stn P27 (NIWA 23036). 1 ♀ ovig. (8.5 mm), 29° 41.83' S, 168° 02.62' E, 337–322 m, 14.v.2003, RV *Tangaroa*, stn TAN0308/20 (NMNZ Cr.012074). 1 ♂ (5.9 mm), 32° 37.38' S, 167° 35.17' E, 126–121 m, 29.v.2003, RV *Tangaroa*, stn TAN0308/106 (NMNZ Cr. 012075). Kermadec Ridge: 1 ♂ (6.1 mm), 30° 31.60' S, 178° 34.39' W, 275 m, 27.iii.1982, stn T255 (NIWA 23035). 2 ♀ ovig. (8.6, 8.8 mm), 33° 02.59' S, 179° 34.60' W, 350–490 m, 18.vii.1974, NZOI stn K795 (NMNZ Cr. 012076). 1 ♀ ovig. (5.9 mm), no station information, stn B.S. 353 (NMNZ Cr. 012077).

Diagnosis: Carapace glabrous; longer than wide; lateral margins subparallel, with anterolateral spine, lateral spine at base of indistinct cervical groove and usually with small spine at anterior margin of branchial region; dorsum unarmed. Rostrum broad triangular, slightly broader than long, nearly horizontal. Sternal plastron about as wide as long along midline; sternite 3 strongly depressed, anterior margin distinctly concave with pair of median spines. Telson having posterior lobe relatively long and narrow, about 2.5 times that of anterior lobe. Eyes not extending beyond (but nearly reaching) tip of rostrum. Basal antennal article with small outer spine; ultimate article with distal spine. Antennal scale slightly extending beyond midlength to barely reaching end of ultimate article. Maxilliped 3 merus with small spine on distal portion of extensor margin; merus with small distolateral spine and small extensor marginal spine proximally. Pereopod 1 (cheliped) propodus palm entirely granular; carpus, merus, and ischium with distinctly granular ventral surface; ischium with short distolateral spine. Pereopods 2–4 carpi and meri unarmed along dorsal margin; propodi with row of 6–8 inclined spines, distalmost paired; dactyli with

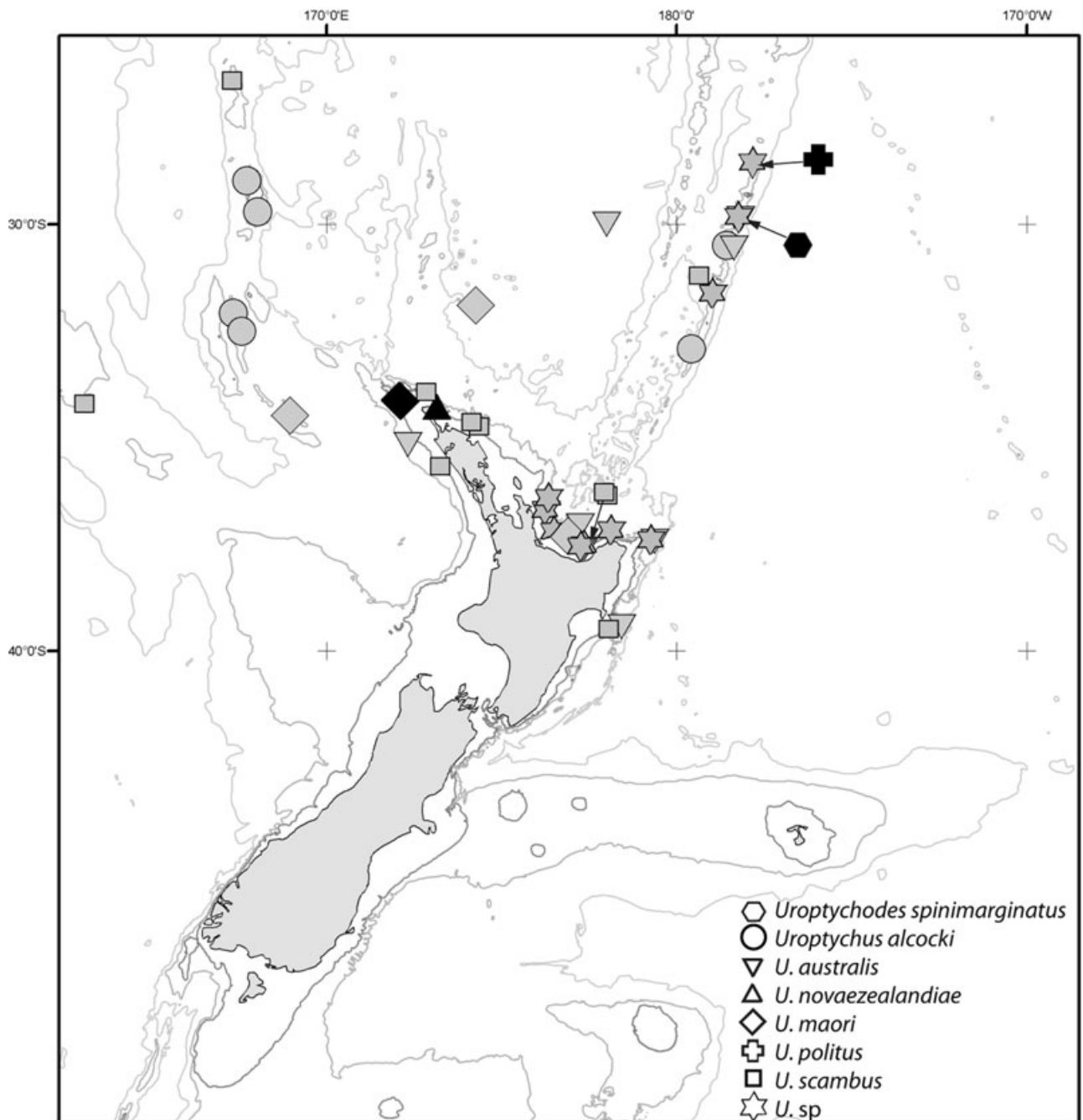


Figure 5. Records of *Urotychodes spinimarginatus* (Henderson, 1885), *Urotychus alcocki* Ahyong & Poore, 2004, *Urotychus australis* (Henderson, 1885), *Urotychus novaezealandiae* Borradaile, 1916, *Urotychus maori* Borradaile, 1916, *Urotychus politus* (Henderson, 1885), *Urotychus scambus* Benedict, 1902, and *Urotychus* sp. around New Zealand. Solid symbols indicate type records. 250, 1000, and 2500 m bathymetric contours are shown.

large, sharp triangular, slightly inclined and widely spaced spines along flexor margin.

Variation and remarks: New Zealand material corresponds well with the descriptions given by Ahyong & Poore (2004) and Baba (2005). Small variations were

noted as follows: the lateral carapace margin may have a bifurcate large spine behind the anterolateral spines (NIWA 23033), and a second spine behind the anterolateral spine is frequent but absent in about 10% of specimens; the lateral margin of the rostrum may be convex (more leaf-like) (NIWA 23033); the

KEY TO NEW ZEALAND SPECIES OF *UROPTYCHUS*

1. Dorsal surface and appendages covered with denticles or small spines.....*Uroptychus kaitara* sp. nov.
- Dorsal surface and appendages not covered with denticles or small spines.....2
2. Lateral margins of carapace with spines, other than anterolateral spine.....3
- Lateral margins of carapace without spines, other than anterolateral spine.....6
3. Single spine on carapace lateral margin only.....4
- Multiple spines on carapace lateral margin.....5
4. Rostrum wide, triangular (about as broad as long). Penultimate antennal articles unarmed.....
- Rostrum narrow, triangular (longer than broad). Penultimate antennal article with distal spine.....*Uroptychus alcocki* Ahyong & Poore, 2004
- Rostrum narrow, triangular (longer than broad). Penultimate antennal article with distal spine.....*Uroptychus novaezelandiae* Borradaile, 1916
5. Dorsal carapace surface with spines. P2–4 carpi and meri with dorsal spines.....*Uroptychus paku* sp. nov.
- Dorsal carapace surface unarmed. P2–4 carpi and meri of unarmed.....*Uroptychus yaldwyni* sp. nov.
6. Carapace wider than long (including rostrum). Sternum at least three times as wide as long along midline.....
- Carapace longer than wide (including rostrum). Sternum at most slightly wider than long.....7
7. P2–4 dactyli with flexor marginal spines (other than distal two) strongly inclined, nearly contiguous to flexor margin.....*Uroptychus australis* (Henderson, 1885)
- P2–4 dactylus with flexor marginal spines not contiguous to flexor margin.....8
8. P2–4 propodi with row of spines along flexor margin.....9
- P2–4 propodi with distal spines only.....12
9. Lateral carapace margins parallel. Rostrum strongly deflected ventrally.....*Uroptychus webberi* sp. nov.
- Lateral margin convex. Rostrum horizontal or slightly deflected ventrally.....10
10. P2–4 propodi flexor margin with single distal spine only.....*Uroptychus* sp.
- P2–4 propodi flexor margin with pair of distal spines.....11
11. Cheliped with large curved spine on ischium. Fringe of plumose setae along extensor margin of P2–4 dactyli.....*Uroptychus maori* Baba, 1974
- Cheliped with small dorsal spine on ischium. P2–4 dactyli without plumose setae.....
- Cheliped with small dorsal spine on ischium. P2–4 dactyli without plumose setae.....*Uroptychus politus* (Henderson, 1885)
12. P2–4 dactyli shorter than half length of propodus, with three to six spines along flexor margin.....
- P2–4 dactyli longer than half length of propodus, with seven spines along flexor margin.....13
13. Carapace with distinct inflation in epigastric region; carapace without process on anterior portion of branchial lateral region.....*Uroptychus rutua* sp. nov.
- Epigastric carapace region not inflated; distinct process on anterior portion of branchial lateral region.....
- Epigastric carapace region not inflated; distinct process on anterior portion of branchial lateral region.....*Uroptychus toka* sp. nov.

ocular peduncle is generally wider than previously illustrated, with the peduncle width being 0.23–0.28 the distance between anterolateral spines compared to 0.18 (Ahyong & Poore 2004) and 0.2 (Baba, 2005); the anterior margin of sternite 4 is acute in five specimens (e.g. NIWA 23035 and NMNZ Cr. 012077); The cheliped is more massive in large males (males from NIWA 23031 had a ratio of the palm length–width of 2.7–2.9 whereas the females had ratios between 3.6 and 4.5); the fingers of the cheliped are widely gaping in large male specimens and one specimen (NIWA 23031) had a second distodorsal spine on the merus in addition to the distodorsal spine on the carpus.

Distribution and ecological remarks: *Uroptychus alcocki* is so far known from eastern Australia, Tasman Sea, northern New Zealand, Kermadec

Islands, Taiwan, and Japan; it appears to be widespread in the western Pacific (K. Baba, pers. comm.). This species is not known south of 33°S across the Tasman Sea and is not known north of 32°N indicating that it prefers tropical to subtropical latitudes (Fig. 5). This species is now known from a depth range of 69 to 600 m.

Some specimens were preserved clinging to small pieces of gorgonian coral (NIWA 10893, 23031, and 23032) indicating a possible association.

UROPTYCHUS AUSTRALIS (HENDERSON, 1885)

Diptychus australis Henderson, 1885: 420 [part, specimens from *Challenger* stn 164 and male from *Challenger* stn 194A] [type locality: off Port Jackson, New South Wales, Australia, 34° 8'S, 152° 0'E, 950 m, 12.vi.1874, *Challenger* stn 164, lectotype designated by Baba (2005)].

Uroptychus australis. – Henderson, 1888: 179, pl. 21: fig 4a–c. – Thomson, 1899: 197 (list). – Ah Yong & Poore, 2004: 18, fig. 3. – Poore, 2004: 224, fig. 60. – Baba, 2005: 224 (list).

Not *Uroptychus australis* Henderson, 1885 [paralectotypes from *Challenger* stns 170 & 171 and female from *Challenger* stn 194A]. (= *Uroptychus* spp.).

Type material: 1 ♂ (6.2 mm), lectotype, off Port Jackson, 34° 8'S, 152° 0'E, 950 m, 12.vi.1874, *Challenger* stn 164 (BMNH 1888: 33). 1 ♀ ovig (10.0 mm), 1 ♀ (10 mm), paralectotypes, type locality (BMNH 1888: 33). 1 ♂ (6.9 mm), paralectotype, off Banda, 4° 31.0'S, 129° 57.2'E, 958 m, 29.ix.1874, *Challenger* stn 194A (1/2) (BMNH 1888: 33).

Other material examined: Reinga Basin: 1 ♂ (8.0 mm), 2 ♀ (7.2, 8.8 mm), 35° 19.99'S, 172° 19.99'E, 1029–1074 m, 22.iii.1968, NZOI stn E880 (NMNZ Cr. 012078). Kermadec volcanic arc: 1 ♀ (10.0 mm), 1 ♀ ovig. (8.38 mm), 29° 51.70'S, 178° 10.90'W, 965–1008 m, 27.vii.1974, NZOI stn K831 (NMNZ Cr. 012079). 2 ♀ (4.1, 4.3 mm), 30° 36.49'S, 178° 22.50'W, 1030 m, 30.vii.1974, stn K861 (NIWA 23053). 1 ♂ (7.4 mm), 30° 01.89'S, 178° 48.06'W, 872–1086 m, 23.iv.2002, RV *Tangaroa*, stn TAN0205/73 (NIWA 18585). 1 ♂ (10.0 mm), 33° 10.24'S, 179° 58.20'W, 999–643 m, 16.iv.2002, RV *Tangaroa*, stn TAN0205/32 (NIWA 18592). Hikurangi Plateau: 2 ♀ (10.0, 11.1 mm), 37° 34.00'S, 179° 22.00'E, 1395 m, 6.iii.1969, stn D836 (NIWA 23052). Hikurangi Trough: 1 ♀ (10.0 mm), 39° 28.56'S, 178° 25.29'E, 874 m, 3.vi.1999, RV *Kaharoa*, stn KAH9907/38 (NIWA 18582). Chatham Rise: 4 ♂ (10.3–11.7 mm), 4 ♀ (7.1–10.5 mm), 3 ♀ ovig. (8.8, 10.0, 10.8 mm), 37° 34.00'S, 179° 22.00'E, 1395 m, 6.iii.1969, NZOI stn D836 (NMNZ Cr. 012080).

Diagnosis: Carapace excluding rostrum distinctly longer than broad; lateral margins unarmed, subparallel, posterior quarter with low ridge; dorsum unarmed or with pair of small epigastric tubercles. Rostrum sharply triangular. Sternal plastron wider than long along midlength; sternite 3 strongly depressed, anterior margin narrow; deeply emarginated, with pair of median spines. Antennal basal article with distinct outer spine; ultimate and penultimate articles unarmed; antennal scale slightly shorter to slightly longer than peduncle. Pereopod 1 (cheliped) merus with at least one row of large tubercles on inner proximal margin; ischium with stout triangular distodorsal spine. Pereopods 2–4 with proximal portion of the merus dorsal ridge with irregular margin; carpi smooth along dorsal margin; pereopods flexor margin with terminal spines paired, closely followed by penultimate spine and close to

juncture with dactylus; dactyli with spines on flexor margin orientated parallel to dactylar margin; length of P4 merus about half that of P3.

Variation: The new records agree with the illustrations by Ah Yong & Poore (2004) with only minor variations: most specimens bear a pair of epigastric tubercles but in about 10% of the specimens, these are absent (one specimen from NZOI station D836 NMNZ Cr. 012080 bears an additional minute tubercle).

The antennal scale is more commonly just short of the antennal peduncle but about 25% of the specimens bear an antennal scale slightly overreaching the antennal peduncle. Large tubercles on the inner margin of the merus are mostly arranged in two short longitudinal rows but may only comprise very few tubercles in small specimens although large males show this character most clearly.

Remarks: *Uroptychus australis* closely resembles *Uroptychus empheres* Ah Yong & Poore, 2004, *Uroptychus gracilimanus* (Henderson, 1885), *Uroptychus vandamae* Baba, 1988, and *Uroptychus remotispinatus* Baba & Tirmizi, 1979 but is distinct from these in the combination of having the antennal scale longer or slightly shorter instead of distinctly shorter than the antennal peduncle, sternite 4 lacking a field of granules and the anterolateral spine falling short of the anterior margin of sternite 3, large tubercles on the proximal flexor margin of the cheliped merus, in having the P4 merus about half instead of two-thirds as long as that of P3, the spines on the flexor margin of the P2–4 orientated parallel to, instead of oblique to the dactylar margin.

Henderson's (1885) type material, from four *Challenger* stations amongst Indonesia (male and female), Port Jackson (male and two females), and the Kermadec Islands (two females), include three species of which Baba (2005) designated the male from *Challenger* stn 164 (Port Jackson) as lectotype. The female from *Challenger* stn 194 (off Banda, Indonesia) and the specimens from *Challenger* stns 170 and 171 (Kermadec Islands) belong to a different and undescribed species *Uroptychus* sp. (see below). *Uroptychus australis* differs from this species in e.g. lacking distinct epigastric spines, the antennal scale nearly reaching or overreaching the antennal peduncle and having inclined spines along the dactylar flexor margin of the walking legs nearly contiguous with the margin.

Distribution: This is a widespread south-west Pacific species, currently known from eastern Australia, New Zealand, and Indonesia, at depths of 458–1395 m (Fig. 5).

Specimens from NZOI station D836 (NMNZ Cr. 012080) were preserved with pieces of gorgonian coral indicating a possible association of this species with coral.

UROPTYCHUS KAITARA SP. NOV. (FIG. 6)

Type material: HOLOTYPE: ♀ ovig. (3.5 mm), Macaulay Island, Kermadec Ridge, 30° 17.59'S, 178° 25.30'W, 398–412 m, 28.vii.1974, stn NZOI K840 (NMNZ Cr. 012081).

Diagnosis: Carapace longer than broad, entirely covered with small spines on dorsal and lateral surfaces; dorsal surface sculptured with epigastric and cardiac regions inflated; lateral margins subparallel. Anterior margin of abdominal tergite 2 with scattered small spines. Sternal plastron approximately as long as wide along midlength. Antennal peduncle articles subequal in length, penultimate article with long distal spine (rounded, lobe-like); antennal scale reaching midlength of ultimate peduncle article. Maxilliped 3 carpus with three spines along extensor margin. Pereopod 1 (cheliped) slender and unarmed except for small distodorsal spine on ischium. Pereopods 2–4 merus with five to seven spines on dorsal crest; carpus unarmed; propodus with distal pair of spines only, without marked projection; dactylus not truncate distally, with five or six acute triangular spines along flexor margin, loosely arranged, perpendicular to flexor margin, and very small (approximately quarter width of penultimate) ultimate spine, penultimate largest.

Description of holotype: Carapace: 1.2 times as long as broad (0.8 without rostrum), moderately convex from side to side. Dorsal surface covered with small spines; lateral epigastric area and cardiac region broadly inflated; cervical groove deep and distinct. Frontal margin deeply excavate; outer orbital angle produced to a sharp tooth. Anterolateral margin with small spine, slightly posterior to orbital spine; lateral margin subparallel, slightly wider posteriorly; with 21 or 22 small spines excluding anterolateral spine, hepatic region with five or six lateral spines, six spines in anterior branchial region, ten spines in posterior branchial region. Posterior margin with transverse row of small spines. Rostrum triangular, slightly deflected ventrally, length 0.4 times that of remaining carapace; dorsal surface excavate and with small spines on posterior two-thirds; lateral margins smooth. Pterygostomial flap lateral surface covered with small spines, anterior margin produced into a spine.

Sternum: sternal plastron 1.1 times as wide as long, lateral extremities subparallel between sternites 5–7

(sternite 4 widest), surface smooth and unarmed. Anterior margin with median notch flanked by pair of incurved submedian spines and produced medially; lateral margins rounded. Sternite 4 two times as wide as sternite 3, anteriorly deeply concave but shallow; anterolateral margin rounded with blunt round terminus.

Abdomen: tergites smooth and unarmed except for scattered small spines in anterior and lateral portions of tergite 2. First abdominal tergite with ridge at posterior margin; tergites 2–4 without transverse ridges or grooves. Pleural margins of segments 2 to 4 rounded, tergite 2 wide, slightly concave. Telson 1.7 times as broad as long; posterior portions equal length of anterior portion.

Eyes: smooth. Cornea subglobular, 0.5 times length of ocular peduncle, reaching distal quarter of rostrum.

Antennal peduncle: Article 2 with distinct outer spine, reaching nearly to midlength of penultimate article of peduncle. Penultimate article with very blunt and lobe-like distal spine (left peduncle with additional, ventral spine). Ultimate article unarmed, 1.1 times as long as penultimate. Antennal scale reaching to midlength of ultimate article; 3.7–4.0 times as long as wide.

Maxilliped 3: surface smooth. Ischium without distal spines, two teeth on basis of mesial ridge, otherwise obsolescent teeth. Merus extensor margin with distal spine, very blunt, lobe-like; flexor margin with one large median spine. Carpus extensor margin with two or three blunt spines, distal spine absent; propodus and dactylus unarmed.

Pereopod 1: slender, 3.9 times as long as carapace, surface scattered with long setae. Ischium with dorsal distal spine only. Merus and carpus unarmed; carpal length 0.9–1.0 times as long as palm. Propodus with palm 4.8–5.4 times as long as high, unarmed. Length of dactylus 2.5–2.9 times as long as propodus, occlusal margins slightly gaping on right, with median process, not gaping on left cheliped.

Pereopods 2–4: similar. Merus 0.8–1.0 times as long as propodus; dorsal margin with four to seven spines on dorsal crest (including distal spine); ventral margin without spines. Carpus unarmed. Propodus 1.7–2.0 times as long as dactylus; extensor margin smooth; flexor margin with only distal pair of spines. Dactylus straight; flexor margin with spines along distal two-thirds; with five or six spines along flexor margin (excluding distal spine), stout triangular, perpendicular to margin; penultimate spine largest; distal spine very small.

Variation and remarks: *Uroptychus kaitara* sp. nov. belongs in a group of species with an unarmed dorsal carapace, carapace lateral margin with more than three spines, P2–4 propodi without marked distal

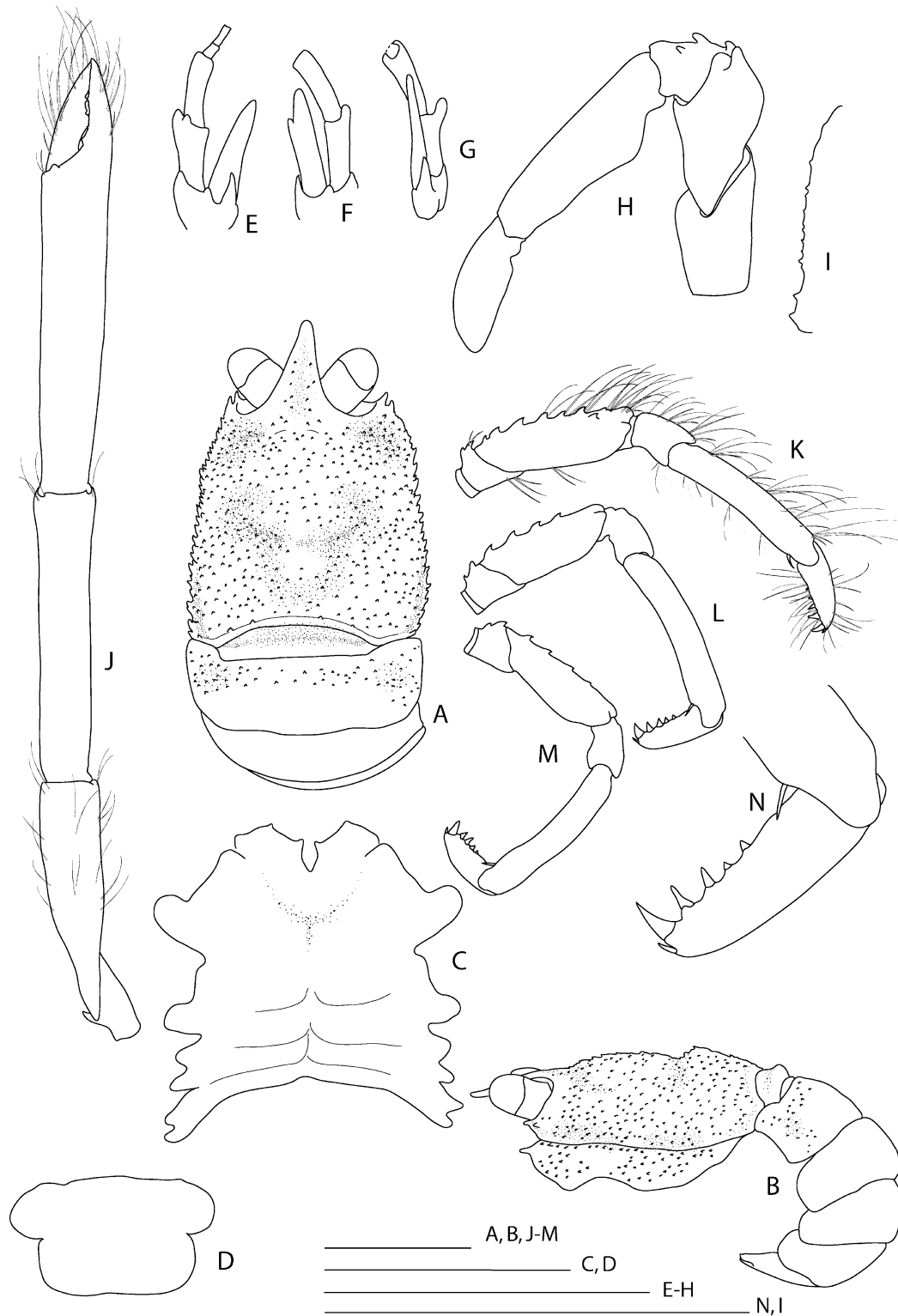


Figure 6. *Uroptychus kaitara* sp. nov. holotype, ♀ ovig., NMNZ Cr. 012081: A, carapace and abdomen dorsal, setae omitted; B, carapace and abdomen, lateral, setae omitted; C, sternal plastron; D, telson, setae omitted; E, antenna, left, ventral; F, antenna, right, ventral; G, antenna, right, lateral; H, endopod of third maxilliped, right, lateral, setae omitted; I, mesial ridge, right; J, right cheliped, dorsal; K–M, right pereopods 2–4; N, dactylus and distal portion of propodus of right pereopod 2, lateral. Scale bars = 2 mm.

projection, dactyli penultimate spine extremely broader than ultimate, penultimate not much larger than antepenultimate, remaining spines loosely arranged; a group of species that comprises *Uroptychus inclinis* Baba, 2005, *Uroptychus tridentatus* (Henderson, 1885), and *Uroptychus zezuensis* Kim, 1972. It differs, however, from all these species in having the entire dorsal surface and entire lateral margin of the carapace and anterior margin of tergite 2 covered with small spines (*Uroptychus inclinis* and *Uroptychus tridentatus* have seven and *Uroptychus zezuensis* bears five distinct spines along the anterior lateral margin, the posterior third and posterior carapace margin are unarmed). The dorsal surface is also more sculptured in *Uroptychus kaitara* with the epigastric and branchial region broadly inflated and separated by a deep and distinct cervical groove (*Uroptychus inclinis*, *Uroptychus tridentatus*, and *Uroptychus zezuensis* are evenly convex with an indistinct cervical groove). Of the closely allied species, only *Uroptychus tridentatus* with its wide western Pacific distribution shares the distribution range of *Uroptychus kaitara*; *Uroptychus inclinis* is only known from the Kei Islands, Indonesia and *Uroptychus zezuensis* has only been recorded from the north-western Pacific.

Uroptychus kaitara sp. nov. can also be allied to species that have spines along the carapace lateral margin, spines across the entire dorsal carapace surface, and a smooth cheliped palm, such as *Uroptychus paku* sp. nov., *Uroptychus fusimanus* Alcock & Anderson, 1899, and *Uroptychus sexspinosus* Balss, 1913. All of these species, however, have scattered large spines on an otherwise smooth carapace and abdomen, whereas *Uroptychus kaitara* is densely covered with small spines including the second tergite of the abdomen. *Uroptychus kaitara* further differs from these three species in having spines along the dorsal margin of P2–4 meri only, whereas *Uroptychus paku* and *Uroptychus sexspinosus* have spines along the merus and carpus and *Uroptychus fusimanus* has unarmed ambulatory legs.

The left palm of the cheliped of the holotype is considerably larger than the right. All legs of the holotype are detached.

Distribution: Off Macauley Island, Kermadec Islands; 398–412 m (Fig. 7).

Etymology: Kaitara is the Māori word for coarse, with reference to the tuberculate dorsal surface.

UROPTYCHUS MAORI BORRADAILE, 1916 (FIGS 8, 9)

Uroptychus maori Borradaile, 1916: 92, fig. 6 [type locality: off Three Kings Islands, New Zealand, 34° 15.60'S, 174° 6.00'E, 183 m, 25.vii.1911, *Terra Nova* stn 90].

Type material: HOLOTYPE: ♂ (12.9 mm), off Three Kings Islands, New Zealand, 34° 15.60'S, 174° 6.00'E, 183 m, 25.vii.1911, *Terra Nova* stn 90 (BMNH 1917.1.29.116).

Other material examined: 2 ♂ (12.0 mm, carapace of second specimen mostly missing), West Norfolk Ridge, 34° 37.20'–37.68'S, 168° 57.03'–58.09'E, 521–539, 3.vi.2003, RV *Tangaroa*, stn TAN0308/154 (NMNZ Cr. 012082). 1 ♀ ovig. (20.5 mm), 1 ♂ (15.3 mm), Three Kings Ridge, 31° 58.82'S, 174° 15.87'E, 700 m (NIWA 23133). 1 ♀ ovig. (17.5 mm), 1 ♂ (13.3 mm), Bay of Plenty, 37° 25.39'–25.99'S, 176° 52.99'–54.10'E, 464–631 m, 6.viii.1997 (NIWA 23134).

Diagnosis: Carapace longer than wide, finely granulated on dorsal surface, unarmed, cervical groove distinct; lateral margin convexly divergent, without spines but finely serrate, distal portion with ridge. Rostrum narrow, triangular, 0.4 times remainder of carapace length. Pterygostomian flap with distinct spine on anterior margin; granulate on surface. Sternal plastron wider than long along midlength, sternum 3 deeply excavate, anteriorly produced to blunt angular point. Abdomen unarmed. Corneal breadth more than half length of ocular peduncle. Antennal peduncle unarmed; article 2 with small distolateral spine; antennal scale reaching midlength or nearly reaching end of ultimate article, width more than 1.5 times that of peduncle. Pereopod 1 (cheliped) with very large curved spine on ventral margin of ischium; merus with row of spines and eminences along ventral margin, covered with small ridges along dorsal surface. Pereopods 2–4 meri and carpi smooth along dorsal margins; propodi without convex flexor margin; with row of spines along less than distal three-quarters, distally paired; dactyli with 11–12 stout triangular spines along entire length; almost perpendicular to flexor margin, slightly decreasing in size proximally, with fringe of plumose setae on extensor margin.

Description of holotype: Carapace: 1.4 times as long as broad (as long as broad excluding rostrum), moderately convex from side to side. Dorsal surface unarmed, finely granulated. Frontal margin deeply excavate, relatively straight; outer orbital angle produced into small spine. Anterolateral margin with well-developed spine, lateral margin convexly divergent posteriorly, unarmed but irregular, with pair of granules on anterior border of branchial lateral margin, posterior margin unarmed. Rostrum narrow, triangular, slightly deflected ventrally, 0.4 times length of remaining carapace; dorsal surface smooth, glabrous, slightly excavate dorsally; lateral margins

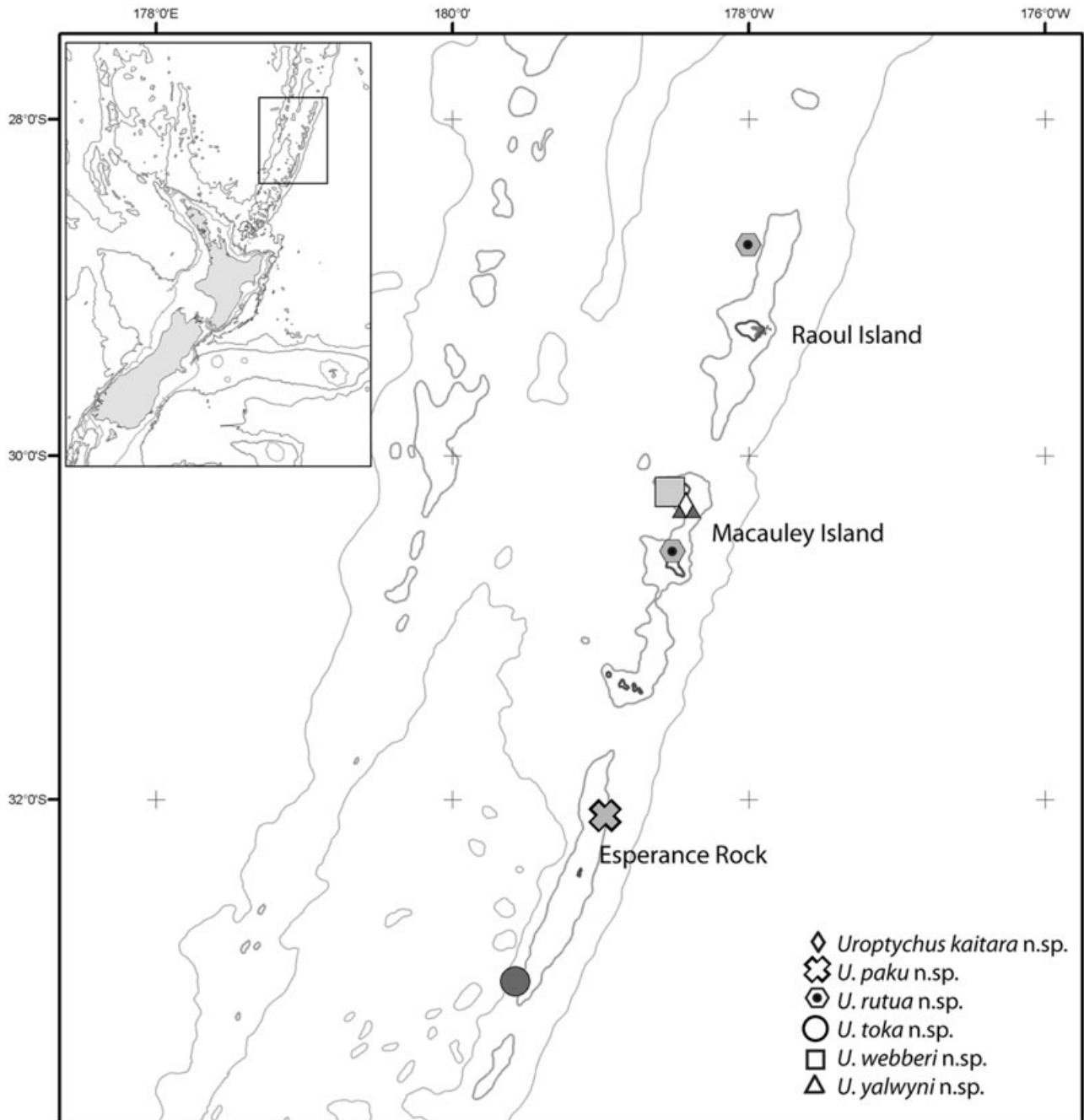


Figure 7. Records of *Uroptychus kaitara* sp. nov., *Uroptychus paku* sp. nov., *Uroptychus rutua* sp. nov., *Uroptychus toka* sp. nov., *Uroptychus webberi* sp. nov., and *Uroptychus yaldwyni* sp. nov. around the Kermadec Islands, New Zealand. 250, 1000, and 2500 m bathymetric contours are shown.

with fine lateral serration along posterior two-thirds, unarmed. Pterygostomian flap lateral surface slightly granulate, anterior margin produced into a small spine.

Sternum: Sternal plastron 1.2 times as wide as long, lateral extremities subparallel between sternites 5–7. Anterior margin with median notch flanked

by pair of submedian spines and deeply excavated, produced anteriorly to blunt, angular point; lateral margins square; surface smooth. Sternite 4 2.5 times as wide as sternite 3, anteriorly deeply V-shaped, anterior midline grooved. Anterolateral margin produced to blunt tooth (not overreaching sternite 3); surface smooth, unarmed.

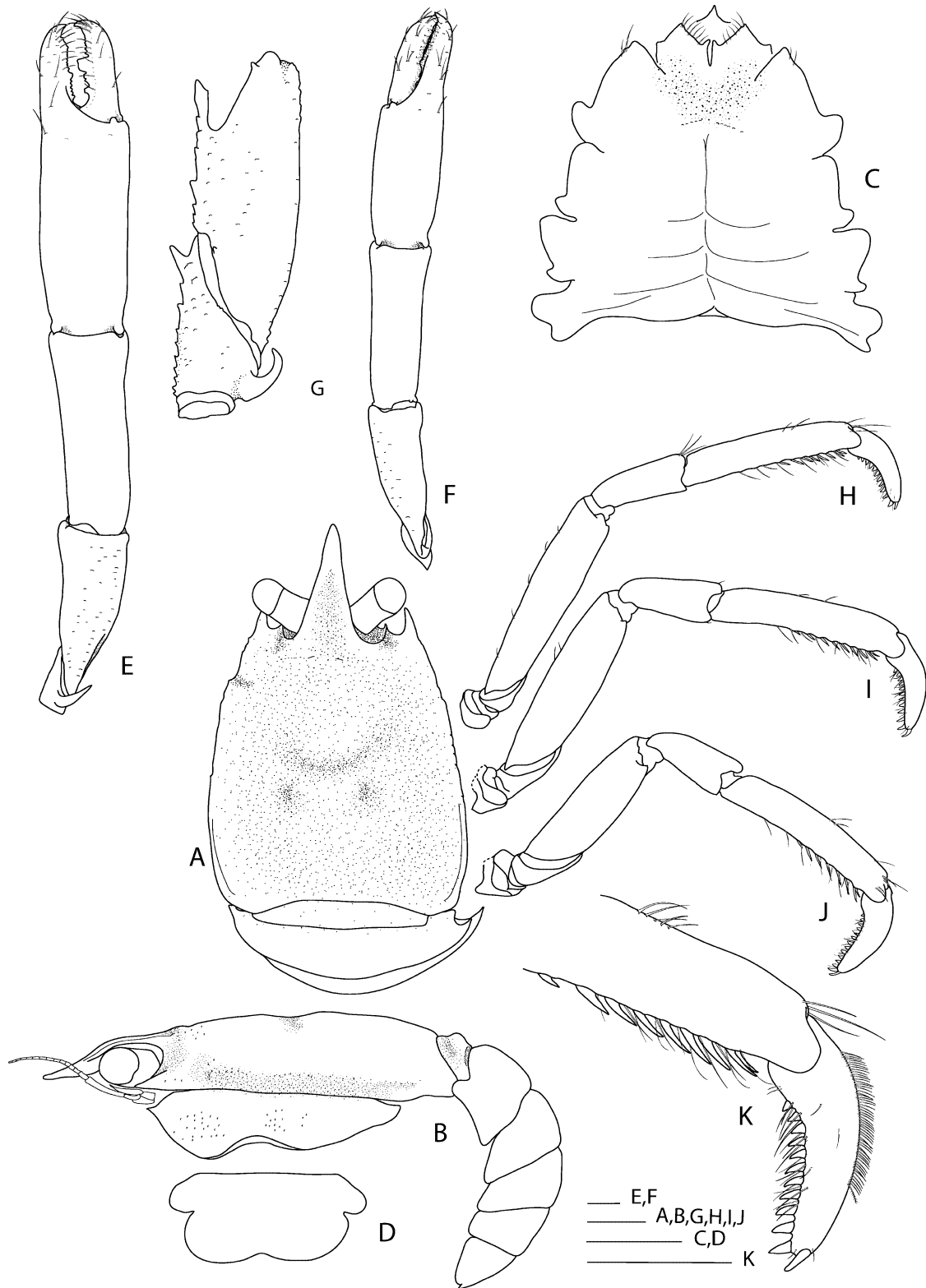


Figure 8. *Uroptychus maori* Borradaile, 1916, holotype, ♂, BMNH 1917.1.29.116: A, carapace and abdomen, dorsal, setae omitted; B, carapace and abdomen, lateral, setae omitted; C, sternal plastron; D, telson, setae omitted; E, left cheliped, dorsal; F, right cheliped, dorsal; G, left cheliped, ischium and merus, lateral; H–J, right pereopods 2–4; K, dactylus and distal portion of propodus of right pereopod 3, lateral. Scale bars = 2 mm.

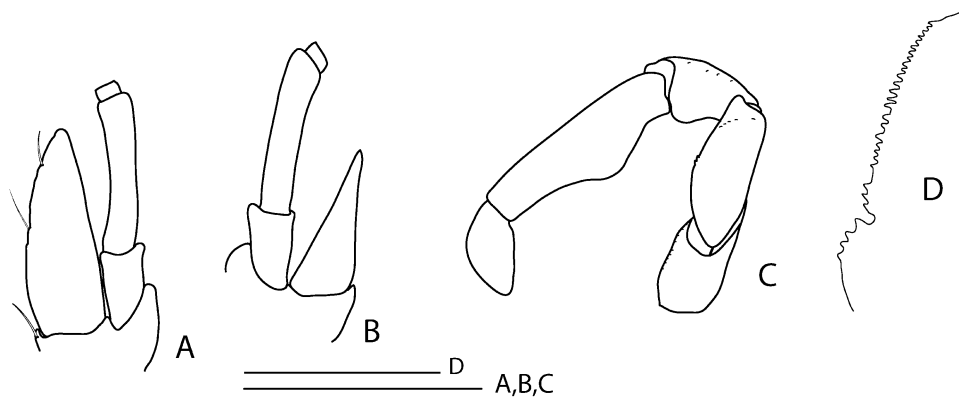


Figure 9. *Uroptychus maori* Borradaile, 1916, holotype, ♂, BMNH 1917.1.29.116. A, antenna, right, ventral; B, antenna, left, ventral; C, endopod of third maxilliped, right, lateral, setae omitted; D, mesial ridge, right. Scale bars = 2 mm.

Abdomen: Tergites smooth and unarmed. Abdominal tergite 1 with ridge at posterior margin. Pleural margins of segments 2–4 distally narrowing to broad triangular point. Telson and tergite 6 1.2 times as broad as long, posterior margin emarginate; two times length of proximal portion.

Eyes: Smooth. Cornea subcylindrical, 0.4 times length of ocular peduncle, reaching distal third of rostrum.

Antennal peduncle: Article 2 with small distolateral spine. Penultimate article unarmed distally. Ultimate article unarmed, 2.3 times as long as penultimate. Antennal scale nearly reaching end of ultimate article; 2.2–2.6 times as long as wide, more than 1.5 times as wide as the peduncle.

Maxilliped 3: surface smooth, unarmed except for two small granules on median portion of merus flexor margin; ischium with 27–30 small denticles; basis with row of larger spines than on ischium.

Pereopod 1: relatively stout, 2.3 (right) and 3.1 (left) times as long as carapace (including rostrum), surface glabrous on carpus and propodus. Ischium with disto-dorsal and disto-ventral spines (dorsal spine very large and curved). Merus surface with rows of granules, ventral row of eminences and round spines, with two small ventral spines distally. Carpus surface smooth, with two ventral spines distally (small and blunt), carpus 0.6–0.7 times as long as palm. Propodus with palm 2.1–2.2 times as long as high, unarmed. Dactylus 0.3–0.4 times as long as propodus, occlusal margins slightly or not gaping, denticulate.

Pereopods 2–4: decreasing in length posteriorly, surface slightly setose and unarmed. Merus dorsal margin unarmed; 1.2–0.9 times as long as propodus (merus shortening from P2 to P4). Carpus, dorsal margin unarmed, 0.6 (P2) to 0.5 (P4) times propodal length. Propodus 2.2 times as long as dactylus, extensor margin smooth; flexor margin with spines along

0.7–0.4 length of margin (from P2 to P4); with 7 to 10 spines. Dactylus gently curved; flexor margin with 11–12 spines along entire length; stout triangular, subequal, slightly decreasing in size proximally; fringe of plumose setae along the extensor margin.

Ovum: 1.4–2.7 mm.

Variation: The additional material examined can unequivocally be identified as *Uroptychus maori*. Examination of many specimens reveals that the bilateral asymmetry of the chelipeds and the antennal scale as illustrated by Borradaile (1916) is unusual. The left cheliped is considerably larger than the right in the male holotype but subequal in all other specimens except for the male from NIWA 23134 where the left cheliped is smaller than the right. The left antennal scale is shorter and narrow triangular in the holotype but examination of the material shows that the more common form is the larger scale of the right scale of the holotype: nearly reaching the end of the peduncle, rounded and at least 1.5 times as wide as the peduncle. The asymmetries can probably be attributed to regrowth of a lost appendage.

Notes on variation from the holotype are as follows: the granulation and spination of the ischium and merus of the cheliped are more pronounced in large specimens with two large spines along the ventral margin of the merus. The rostrum of the male from NIWA 23134 is stunted, shorter than the ocular peduncle. Females appear larger than males (females' carapace length range: 17.5–20.5 mm, mean: 19.0 mm; males from 12.0–15.3 mm, mean: 13.4). The propodal palm is more massive in females with a height–width ratio of 2.2–2.6 for males and 3.3–3.5 for females (holotype male is 2.1–2.2). Large specimens have up to 14 inclined spines along the flexor margin of the propodus of the walking legs.

Remarks: *Uroptychus maori* Borradaile, 1916 most closely resembles the species with denticulate lateral carapace margins and massive chelipeds: *Uroptychus brucei* Baba, 1986, *Uroptychus litosus* Ah Yong & Poore, 2004, and *Uroptychus nitidus occidentalis* Faxon, 1893. *Uroptychus maori* differs from *Uroptychus brucei* in having the rostrum not deeply excavate, the absence of spines on antennal article 4 where *Uroptychus brucei* bears a distal spine, *Uroptychus maori* has spines on P2 propodus along less than three-quarters of length of flexor margin, *Uroptychus brucei* has spines along the entire flexor margin of the propodus, the anterior margin of sternite 3 is angular in *Uroptychus maori* whereas produced to spines in *Uroptychus brucei*. *Uroptychus maori* differs from *Uroptychus litosus* in the shape of the carapace, with *Uroptychus litosus* lateral margins distinctly convex posteriorly whereas *Uroptychus maori* has more subparallel lateral margins; *Uroptychus maori* has a finely granulated dorsal carapace surface where the carapace is smooth in *Uroptychus litosus*; very strong anterolateral spines, distinctly overreaching the outer orbital spine (the anterolateral spine only slightly overreaches the outer orbital spine in *Uroptychus litosus*); the anterior margin of sternite 4 is rounded and entire (laterally serrated and with strong anterior spine in *Uroptychus litosus*) and *Uroptychus maori* has a more elongate cheliped (ratio of cheliped length to carapace length for *Uroptychus maori* 2.8–3.5 for the longer cheliped and *Uroptychus litosus* approximately 2). *Uroptychus maori* differs from *Uroptychus nitidus occidentalis* in the fine granulation of the carapace surface (the latter having a smooth surface), in the shape of anterior margin of sternite 3 (medially produced angular margin and overreaching lateral angle in *Uroptychus maori* and laterally produced to spine, overreaching medial angle in *Uroptychus nitidus occidentalis*); in the relative length of the articles of the antennal peduncle (in *Uroptychus maori*, the ultimate article is 2.3 times as long as the penultimate, whereas in *Uroptychus nitidus occidentalis*, the two are subequal).

Uroptychus maori also differs from all the above species by the extremely large and curved spine on the distodorsal margin of the ischium of the cheliped and the presence of plumose setae on the extensor margin of the dactyli of the walking legs.

Of all closely allied species, the distribution range of *Uroptychus maori* is most proximate to *Uroptychus litosus* (known from Tasmania). *Uroptychus brucei* has only been recorded from north-western Australia and *Uroptychus nitidus* has a known Atlantic and north-western Pacific distribution range.

Distribution: Three Kings Islands north of the North Island of New Zealand from a depth of 183 m (type locality) and now from the West Norfolk Ridge, the Three Kings Ridge, and the Bay of Plenty (Fig. 5); 183–700 m.

UROPTYCHUS NOVAEZELANDIAE BORRADAILE,
1916 (FIGS 10, 11)

Uroptychus novae-zealandiae Borradaile, 1916: 93, fig. 94 [type locality: off North Cape, New Zealand, 34° 25'S, 173° 10'E, 128 m, 3.viii.1911, *Terra Nova*, stn 96].

Type material: HOLOTYPE: ♀ (4.1 mm), off North Cape, New Zealand, 34° 25'S, 173° 10'E, 128 m, 3.viii.1911, *Terra Nova*, stn 96 (BMNH 1917.1.29.117).

Diagnosis: Carapace smooth and unarmed on dorsal surface, widening posteriorly, with acute anterolateral spine and one large lateral spine on anterior part of branchial region. Rostrum narrow triangular, slightly longer than one-third of remaining carapace. Abdomen smooth and unarmed. Anterior margin of sternite 3 shallowly concave with V-shaped median notch, no submedian spines. Cornea approximately one-fifth length of remaining stalk, nearly reaching end of rostrum. Sternal plastron slightly wider than long. Antenna stout, article 4 with strong distal spine, article 5 unarmed; antennal scale falling short of ultimate article. Maxilliped 3 merus and carpus with small distal spine on extensor margin. Pereopod 1 (cheliped) stout, smooth; carpus approximately length of carapace without rostrum, two distodorsal spines on merus and carpus. Pereopods 2–4 propodi with row of spines on ventral margin, without concave flexor margin.

Description of holotype: *Carapace:* 1.3 times as long as broad (including rostrum), shallowly convex from side to side. Dorsal surface smooth and unarmed; cervical groove indistinct. Frontal margin excavate, relatively straight; outer orbital angle produced into small spine. Anterolateral margin with well-developed spine, lateral margin slightly divergent posteriorly (widest at distal quarter), hepatic region with one very small lateral spine (preceding anterolateral spine on right, only very small granule on left), one lateral spine in anterior branchial region (at anterior margin of anterior branchial region). Posterior margin unarmed. Rostrum narrow triangular, slightly deflected ventrally, length 0.4 times that of remaining carapace; surface dorsally excavate; lateral margins smooth. Pterygostomian flap lateral surface smooth, anterior margin produced into a small spine.

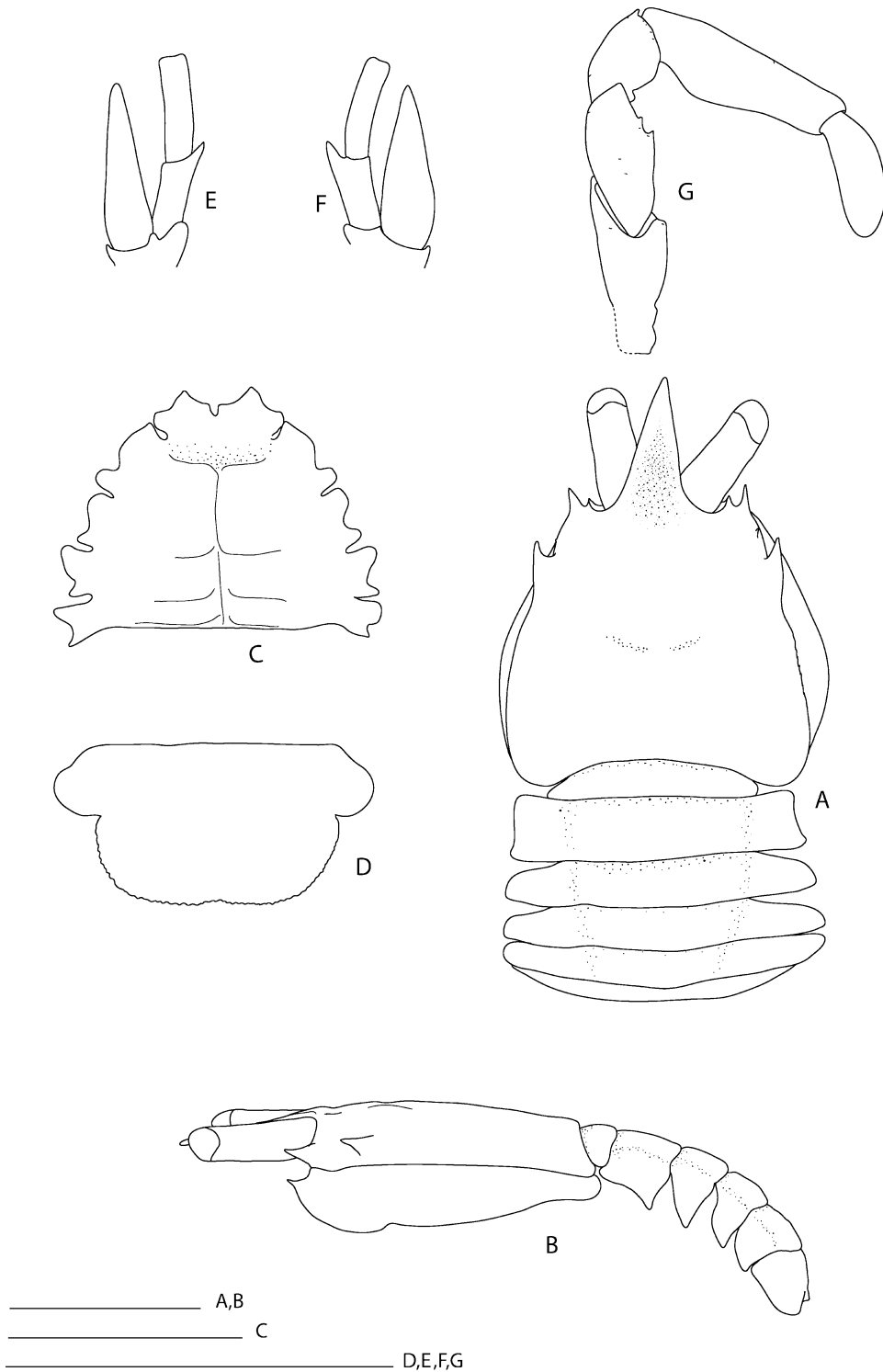


Figure 10. *Uroptychus novaezelandiae* Borradaile, 1916, holotype, ♀, BMNH 1917.1.29.117: A, carapace and abdomen, dorsal; B, carapace and abdomen, lateral; C, sternal plastron; D, telson, setae omitted; E, antenna, right, ventral; F, antenna, left, ventral; G, endopod of third maxilliped, left, lateral, setae omitted. Scale bars = 2 mm.

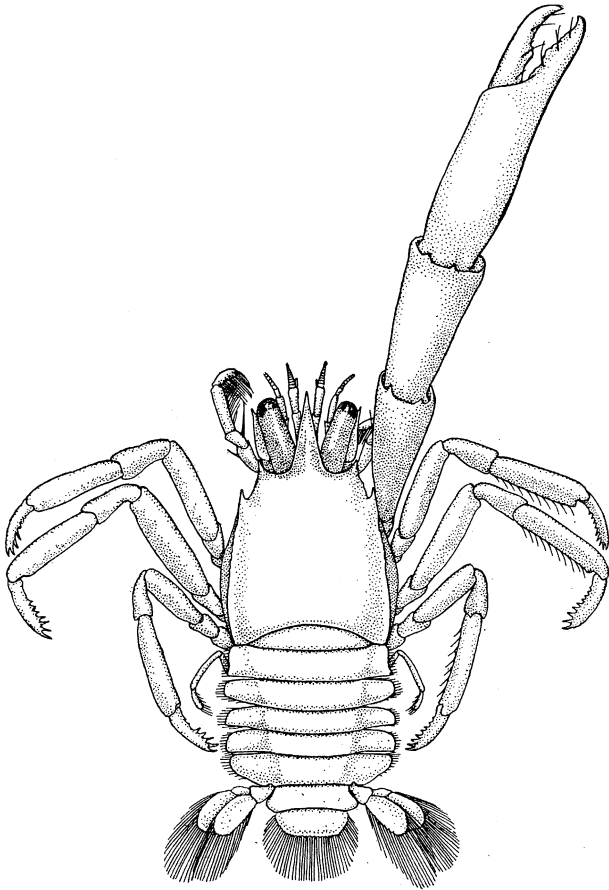


Figure 11. *Uroptychus novaezelandiae* Borradaile, 1916, holotype, ♀, BMNH 1917.1.29.117: dorsal view of specimen with appendages attached, carapace length 11.5 mm. After Borradaile (1916).

Sternum: sternal plastron 1.3 times as wide as long, widening posteriorly. Anterior margin produced laterally with median triangular notch; lateral margins rounded; surface smooth. Sternite 4 1.9 times as wide as sternite 3, anteriorly shallowly concave, anterior midline grooved. Anterolateral margin rounded with blunt terminus (not reaching midpoint of sternite 3); surface smooth, unarmed.

Abdomen: tergites smooth and unarmed. Pleural margins of segments 2 to 4 distally narrowing to triangular point. Telson and tergite 6 2.0 times as broad as long, posterior margin of telson slightly emarginate; 1.4 times length of proximal portion.

Eyes: smooth. Cornea subcylindrical, elongate and slender, 0.2 times length of ocular peduncle, nearly reaching end of rostrum.

Antennal peduncle: article 2 with small distolateral spine. Penultimate article with strong distal spine. Ultimate article unarmed, 1.3 times as long as penultimate. Antennal scale nearly reaching end of ultimate article; 3.6 times as long as wide.

Maxilliped 3: surface smooth, ischium without distal spines. Merus extensor margin without spine; flexor margin with two median spines. Carpus with small distal spine on extensor margin; propodus and dactylus unarmed.

Supplementary description (from Borradaile, 1916: fig. 11): All appendages of the holotype are missing. From the original illustration of the dorsum by Borradaile (1916) (with walking legs and right cheliped illustrated), it appears that the cheliped is relatively short and stout (approximately 2.5 times carapace length), with a smooth surface (setae have only been illustrated around the occlusal margin of the fingers). The carpus is approximately the same length as the carapace without rostrum and three-quarters of length of the propodal palm. Length of the fingers a little more than half length of the propodal palm; two distodorsal spines on each of the merus and carpus and a text reference is made to distoventral spines on the merus. Pereopods 2–4 are similar, smooth except for row of spines along the entire flexor margin of the propodi. Length of merus and propodus subequal (P3 merus is illustrated longest on both sides, P2 is 0.9 times as long and P4 0.7 times as long). Carpi approximately 0.5 times length of propodi. Dactyli with sharp triangular spines loosely arranged along the flexor margin, decreasing in size posteriorly.

Remarks: *Uroptychus novaezelandiae* belongs to a group of small-bodied species that have a smooth carapace with a single strong lateral spine on the anterior carapace lateral margin and elongate ocular peduncle. This group comprises *Uroptychus alcocki* Ahyong & Poore, 2004, *Uroptychus yokoyai* Ahyong & Poore, 2004, *Uroptychus latirostris* Yokoya, 1933, *Uroptychus cavirostris* Alcock & Anderson, 1899, *Uroptychus sibogae* Van Dam, 1933, and *Uroptychus mauritius* Baba, 2005. *Uroptychus novaezelandiae* can be easily distinguished from all other species in having a very small cornea (one-fifth of length of remaining eye stalk) that is not dilated. Additionally, *Uroptychus novaezelandiae* has an acute frontal margin of sternite 3 with a median notch (all other species have a round, strongly convex frontal margin and *Uroptychus yokoyai*, additionally, does not have a median notch). *Uroptychus novaezelandiae* is the only species in this group with a terminal spine on the penultimate article of the antennal peduncle in addition to an unarmed ultimate article. Further, *Uroptychus novaezelandiae* differs from the first four species in having a narrowly triangular rostrum, width at the base approximately one-quarter carapace width, whereas *Uroptychus alcocki*, *Uroptychus yokoyai*, *Uroptychus latirostris*, and *Uroptychus cavirostris* have a widely triangular rostrum where the

width is at least one-third (*Uroptychus cavirostris*) to half (*Uroptychus alcocki*, *Uroptychus yokoyai*, *Uroptychus latirostris*) of the carapace width. It also differs from *Uroptychus alcocki*, *Uroptychus yokoyai*, *Uroptychus latirostris*, and *Uroptychus mauritius* in having an emarginated telson in adults (all three species have a semicircular to elongate trianguloid telson without emargination).

The record of *Uroptychus novaezelandiae* only directly falls into the distribution range of *Uroptychus alcocki*, which is a widespread western Pacific species. *Uroptychus yokoyai* is known from the nearby Tasmanian seamount, *Uroptychus latirostris* is known from Japan, *Uroptychus sibogae* has a north-western Pacific distribution, *Uroptychus cavirostris* is an Indian Ocean species, and *Uroptychus mauritius* is only known from Mauritius.

Distribution: Known only from the type locality, off North Cape, New Zealand, from a depth of 128 m (Fig. 5).

UROPTYCHUS PAKU SP. NOV. (FIG. 12)

Type material: HOLOTYPE: ♀ (3.1 mm), Esperance Rock, Kermadec Ridge, 32° 11.10'S, 179° 05.20'W, 122–307 m, 6.iv.1998 (NIWA 9805).

Diagnosis: Carapace more than 1.5 times longer than broad; lateral carapace margins subparallel, with five spines (excluding anterolateral spine); dorsal surface with three small epigastric spines, two submedian spines on anterior cardiac margin, and one pair of posterior branchial spines. Sternal plastron slightly longer than broad. Antennal peduncle with distal spines on ultimate and penultimate articles; antennal scale reaching end of peduncle. Sternite 3 with median notch flanked by submedian spines; sternite 4 produced to spines on anterolateral corner. Pereopod 1 (cheliped) with one small distodorsal and ventral spine; rows of spines on merus and carpus, palm smooth. Pereopods 2–4 with spines on dorsal crest of merus and carpus; propodus with terminal pair of spines only; dactyli slender and elongate, with rows of slender inclined spines, loosely arranged, penultimate spine more than twice as broad as antepenultimate spine.

Description of holotype: Carapace: 1.7 times as long as broad (0.9 excluding rostrum) shallowly convex from side to side. Dorsal surface smooth; cervical groove indistinct (faintly indicated); gastric region with three small spines; cardiac region with pair of small spines on anterior margin; posterior branchial region with pair of large spines (right spine with additional small lateral spine). Frontal margin deeply excavate. Outer

orbital angle produced into small spine. Anterolateral margin with well-developed spine; lateral margins subparallel, with five spines excluding anterolateral spine: one hepatic, one anterior branchial region, three posterior branchial spines on lateral margin, posterior-most spine largest (excluding anterolateral spine). Posterior margin unarmed. Rostrum narrow triangular, slightly deflected ventrally, 0.9 times length of remaining carapace; dorsal surface slightly excavate; lateral margins with two or three spines and with fine lateral serration along posterior portion. Pterygostomian flap lateral surface smooth, anterior margin narrow triangular and produced to spine.

Sternum: sternal plastron 0.9 times as wide as long, lateral extremities subparallel between sternites 5–7; surface smooth, unarmed. Anterior margin of sternite 3 acutely produced anteriorly, with median notch flanked by pair of submedian spines; lateral margin produced to acute tooth. Sternite 4 2.2 times as wide as sternite 3, anterior margin shallowly concave, anterior midline grooved; anterolateral margin produced to tooth (not overreaching sternite 3).

Abdomen: tergites smooth and unarmed. First abdominal tergite with transverse ridge; tergite 2 with anterior ridge. Second pleural margin anteriorly produced to narrow angle. Telson and tergite 6 two times as broad as long; posterior portion 1.3 times length of anterior portion.

Eyes: cornea subglobular, 0.2 times length of ocular peduncle, nearly reaching distal quarter of rostrum.

Antennal peduncle: article 2 with acute outer spine. Penultimate and ultimate article with distal spine. Ultimate article 2.5–2.6 times as long as penultimate. Antennal scale slightly overreaching peduncle; 4.7–5.0 times as long as wide.

Maxilliped 3: surface smooth, ischium unarmed. Merus extensor margin with well-developed distal spine with accompanying small spine proximal to it; flexor margin with one median spine and with distal spine. Carpus with proximal spine on extensor margin and long distal spine.

Pereopod 1: slender, 2.8 times as long as carapace, surface with scattered long setae. Ischium with dorsal and ventral spines distally. Merus surface with three rows of spines, with five or six distal spines. Carpus with three rows of spines and with three distal spines, length 1.3–1.4 times that of palm. Propodus with palm 3.3–3.7 times as long as high, unarmed. Dactylus 0.6 times as long as propodus; occlusal margins not gaping, denticulate.

Pereopods 2–4: similar (meri slightly shortening and reduction in spination from P2–4). Merus dorsal margin with five to seven spines on dorsal crest (including one to two distal spines); ventral margin with distal spine only; length 0.7–0.9 times that of propodus. Carpus, dorsal margin with three to five

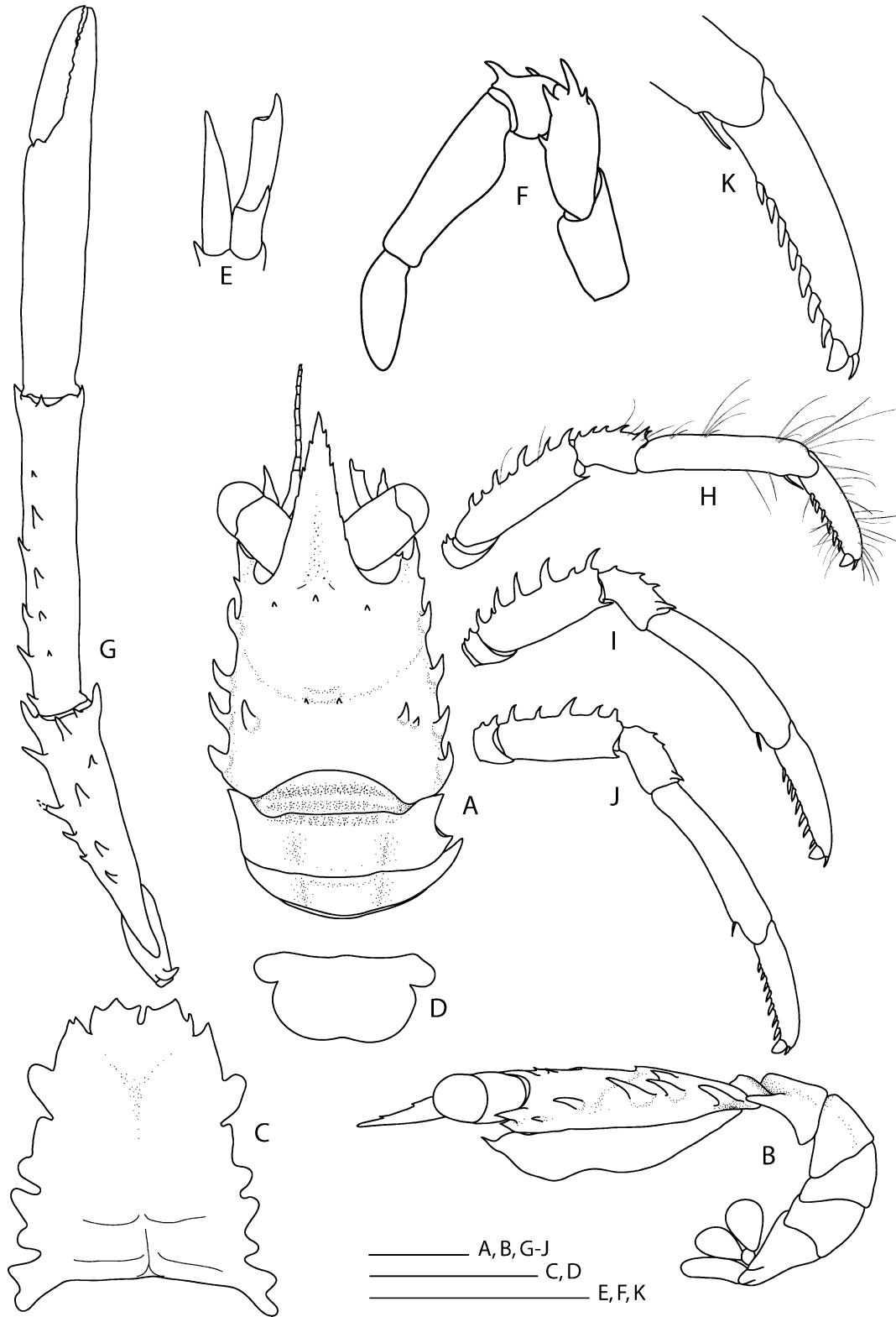


Figure 12. *Uroptychus paku* sp. nov., holotype, ♀, NIWA 9805: A, carapace and abdomen, dorsal, setae omitted; B, carapace and abdomen, lateral, setae omitted; C, sternal plastron; D, telson, setae omitted; E, antenna, right, ventral; F, endopod of third maxilliped, left, lateral, setae omitted; G, right cheliped, dorsal, setae omitted; H–J, right pereopods 2–4; K, dactylus and distal portion of propodus of right pereopod 3, lateral. Scale bars = 1 mm.

spines (including distal spine); ventral margin without spines. Propodus 1.3–1.4 times as long as dactylus, extensor margin smooth; flexor margin with only distal pair of spines. Dactylus straight and slender; flexor margin with ultimate spine slender, penultimate spine broad triangular and prominent, preceded by six to seven slender inclined spines along entire length.

Variation and remarks: *Uroptychus paku* sp. nov. belongs to the group of species in the genus with spines along the lateral carapace margin and on the dorsal surface (not restricted to the epigastric region) and P2–4 dactyli with pronouncedly broad penultimate spine preceded by slender inclined spines on the flexor margin. *Uroptychus paku* is closely allied to *Uroptychus sexspinosus* Balss, 1913 and *Uroptychus fusimanus* Alcock & Anderson, 1899 but differs from both in dorsal carapace ornamentation and rostrum. *Uroptychus sexspinosus* has six lateral carapace spines and a number of equally sized spines on the epigastric, hepatic, cardiac, and branchial regions. In contrast, *Uroptychus paku* has five spines on the lateral carapace margin and only eight dorsal spines (the paired branchial spines being much larger than the remaining spines). Furthermore, the rostrum in *Uroptychus sexspinosus* is half the length of the remaining carapace, whereas the rostrum of *Uroptychus paku* is nearly as long as the remaining carapace. *Uroptychus fusimanus* differs from *Uroptychus paku* in having the dorsal carapace surface with many spines in more or less distinct rows, seven spines along the convex lateral carapace margin (see above for *Uroptychus paku*), rostrum simple (distally serrated in *Uroptychus paku*) and shorter than half length of remaining carapace (nearly as long as carapace in *Uroptychus paku*), P2–4 meri and carpi unarmed (dorsally furnished with strong spines in *Uroptychus paku*).

Neither of these species have a distribution that is close to *Uroptychus paku*; *Uroptychus sexspinosus* is known from Japan and *Uroptychus fusimanus* is known from India.

Distribution: North of L'Esperance Island, Kermadec Islands, 122–307 m (Fig. 7).

Etymology: Paku is the Māori word for small or tiny, a reference to the small size of the specimen.

UROPTYCHUS POLITUS (HENDERSON, 1885)

Diptychus politus Henderson, 1885: 420 [type locality: Kermadec Islands, 28° 33.00'S, 177° 50.00'W, 1098 m, 15.vii.1874, *Challenger* stn 171].

Uroptychus politus. – Henderson, 1888: 178, pl. 6: fig 2 a, b. – Thomson, 1899: 196 (list). – Baba, 1974: 387, fig. 5. – Baba, 2005: 219 (key), 230 (list).

Type material: 1 ovig. ♀, syntype, (7.2 mm), Kermadec Islands, 28° 33.00'S, 177° 50.00'W, 1098 m, 15.vii.1874, *Challenger* stn 171 (BMNH 1888: 33).

Diagnosis: Carapace distinctly longer than broad, smooth and unarmed on dorsal surface; lateral margin unarmed, convexly divergent posteriorly; anterolateral spine relatively small, distinctly posterior to lateral orbital spine. Rostrum narrow triangular. Corneal width distinctly more than half length of ocular peduncle. Sternal plastron approximately as long as broad; sternite 3 posteriorly delimited by weakly convex depression, anterior margin moderately concave with small median notch flanked by submedian spines; sternite 4 smooth on ventral surface, anteriorly ending in tooth, not reaching anterior end of sternite 3. Abdomen smooth and unarmed. Antenna slender, articles 4 and 5 unarmed; antennal scale not reaching beyond midlength of article 5. Ischium of maxilliped 3 mesial ridge with mostly obsolescent spines; other segments unarmed. Pereopod 1 (cheliped) three times as long as carapace; merus and carpus with pair of stout ventrodorsal spines, ischium with small distodorsal spine. Pereopods 2–4 meri and carpi smooth dorsally; propodi with pair of terminal spines preceded by row of five to seven spines along distal half to two-thirds, flexor margin without convex distal margin; dactyli without fringe of plumose setae, with sharp triangular spines on flexor margin, distal two slightly separated from third.

Remarks: Two specimens (a male and a female) of *Uroptychus politus* were recorded by Henderson (1885) but only the female and a single left cheliped remain of the type series.

Distribution: Presently known only from west of the Kermadec Islands at 1098 m (Fig. 5).

UROPTYCHUS RUTUA SP. NOV. (FIG. 13)

Type material: HOLOTYPE: ♀ (4.5 mm), Raoul Island, Kermadec Ridge, 30° 33.79'S, 178° 30.59'W, 30.vii.1974, 165–180 m, stn NZOI K857 (NMNZ Cr. 012083). 1 ♂ (3.9 mm), paratypes, same locality as holotype (NIWA 43869). 1 ♀ ovig. (3.6 mm), Raoul Island, Kermadec Ridge, 28° 45.0'S, 178° 00.0'W, 179 m, 24.viii.1972, stn B.S. 297 (NMNZ Cr. 012084).

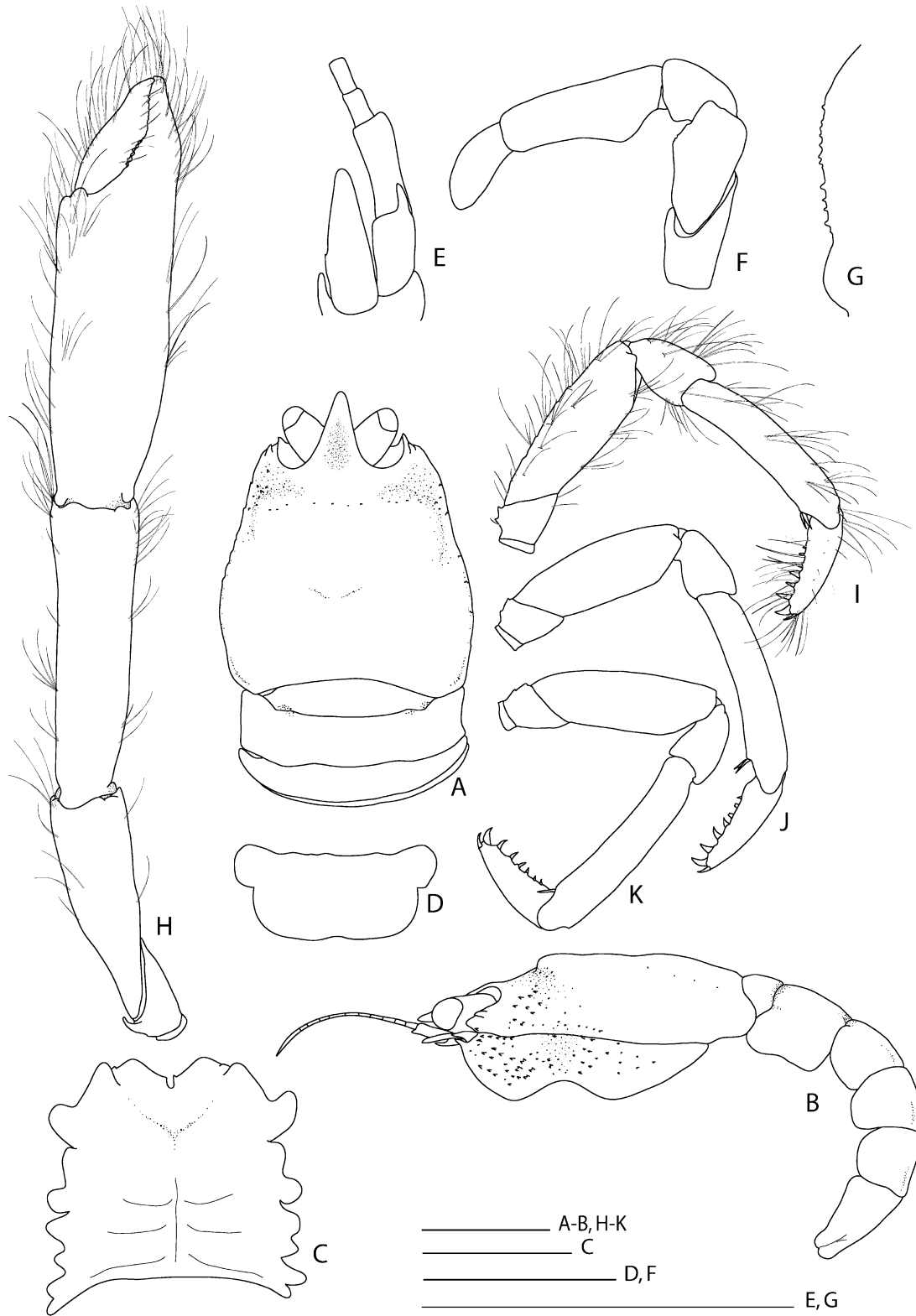


Figure 13. *Uroptychus rutua* sp. nov., holotype, ♀, NMNZ Cr. 012083: A, carapace and abdomen, dorsal, setae omitted; B, carapace and abdomen, lateral, setae omitted; C, sternal plastron; D, telson, setae omitted; E, antenna, left, ventral; F, endopod of third maxilliped, left, lateral, setae omitted; G, mesial ridge, left; H, right cheliped, dorsal; I–K, right pereopods 2–4. Scale bars = 2 mm.

Diagnosis: Carapace approximately as wide as long; lateral margin without distinct spines or processes; dorsal surface unarmed except for small spines and granules in hepatic region, epigastric region distinctly inflated. Sternal plastron slightly wider than long along midlength. Penultimate antennal article with well-developed distal spine, ultimate unarmed. Maxilliped 3 unarmed. Pterygostomial flap surface with spines (anterior spines bifurcated). Pereopod 1 (cheliped) with small distodorsal spine. Pereopods 2–4 dorsal margin of P2 merus irregular, otherwise smooth; carpi smooth on dorsal margin; propodi with pair of distal spines on flexor margin only; dactyli straight, longer than half length of propodi, with seven or eight sharp triangular spines, slender distal spine, loosely arranged and perpendicular to flexor margin, penultimate prominent.

Description of holotype: Carapace: 1.1 times as long as broad (0.8 without rostrum), strongly convex from side to side. Dorsal surface sparsely setose; cervical groove indistinct (faintly indicated), gastric region with two broad prominences and transverse row of small denticles; hepatic region with scattered small spines and granules; dorsum otherwise unarmed. Frontal margin deeply excavate. Outer orbital angle produced into small spine. Anterolateral margin rounded, with small spine dorsomesial of margin. Lateral margin slightly divergent posteriorly, irregular but unarmed. Posterior margin unarmed. Rostrum triangular, slightly deflected ventrally; 0.4 times length of remaining carapace; dorsal surface excavate; lateral margins smooth; unarmed. Pterygostomial flap lateral surface covered with small spines (bifurcate spines in anterior half), anterior margin produced into a spine (directed dorsally).

Sternum: sternal plastron 1.2 times as wide as long, lateral extremities subparallel between sternites 5–7, surface smooth. Anterior margin rounded, with median u-shaped notch with one small submedian spine (no spine on right). Lateral margins slightly produced. Sternite 4 two times as wide as sternite 3, anteriorly shallowly concave, anterior midline grooved, anterolateral margin rounded with blunt terminus (nearly reaching terminus of sternite 3).

Abdomen: tergites smooth and unarmed. Pleural margins of segments 2 to 4 rounded (tergite 2 wide, nearly square). Telson and tergite 6 2.7 times as broad as long, telson posterior portion emarginate; posterior portions two times length of anterior portion.

Eyes: nearly reaching end of rostrum. Cornea globular (distally narrowing), 0.3 times length of ocular peduncle, nearly reaching end of rostrum.

Antennal peduncle: Article 2 with strong and slender outer spine. Penultimate article with distal spine. Ultimate article unarmed, 1.2 times as long as penultimate. Antennal scale reaching to midlength of ultimate article; 2.8–3.0 times as long as wide.

Maxilliped 3: surface smooth, ischium without distal spines, three or four teeth on mesial ridge among otherwise obsolescent spines, basis smooth. Merus, carpus, propodus, and dactylus unarmed.

Pereopod 1: slender, 3.1–3.7 times as long as carapace (4.3–5.0 without rostrum), surface moderately setose (particularly distally). Ischium with dorsal distal spine. Merus and carpus unarmed, carpus 1.0–1.2 times as long as palm. Propodus with palm 2.5–3.7 times as long as high. Dactylus 0.5 times as long as propodus; occlusal margins not gaping, denticulate.

Pereopods 2–4: similar (meri slightly shortening from P2–4), surfaces setose, unarmed. Merus dorsal margin unarmed (P2 slightly irregular margin where setae attach, smooth on P3–4); 1.1–0.8 times as long as propodus (P2 merus longest, P3–4 meri subequal, propodi increasing in length). Propodus 1.6–1.9 times as long as dactylus (propodi slightly lengthening from P2–4), extensor margin smooth. Flexor margin with only distal pair of spines. Dactylus straight; flexor margin with eight loosely arranged spines, ultimate small, penultimate larger, subequal to antepenultimate, antepenultimate and remaining proximal spines subperpendicular to margin.

Ovum: 0.6 mm (female paratype with two large eggs under abdomen).

Variation: All legs are detached from the specimens of *Uroptychus rutua*. The two paratypes agree well with the holotype female in proportions and spination. The frontal margin of the sternal plastron bears small submedian spines in both paratype specimens (a spine is only visible on one side of the holotype) indicating that submedian spines adjacent to the median notch is the more common condition. The cervical groove is more distinct in the male paratype and the left antennal scale falls short of the midlength of the ultimate antennal article (the right scale is normal). The female paratype has only been preserved with a single walking leg, the dactylus bears six spines in addition to the ultimate spine (instead of seven for holotype and male paratype). The palm of the cheliped of the small female paratype is more slender but comparable to the left cheliped of the female holotype (4.4 and 4.0 for paratype, 3.74 and 2.52 for holotype). The male paratype is missing its chelipeds; however, the particularly robust right cheliped accompanying the holotype probably belongs to the male paratype (the suture lines appear to match).

Remarks: *Uroptychus rutua* sp. nov. is most closely related to *Uroptychus toka* sp. nov. with respect to carapace shape and size and armature of the abdomen, maxilliped 3, pereopods, and sternal plastron. Their relationships are discussed under that species (see below).

Uroptychus rutua is closely allied to species with unarmed dorsal and lateral carapace surfaces, maxilliped 3 unarmed, with distal pair of spines on P2–4 propodi, dactyli with six or seven spines along the flexor margin. This includes *Uroptychus paenultimus* Baba, 2005, *Uroptychus glaber* Baba, 1981, and *Uroptychus tomentosus* Baba, 1974. *Uroptychus rutua* is readily distinguished from these by the strongly convex carapace with distinctly elevated epigastric inflations and a field of spinules on the hepatic carapace region (all three species have very shallowly convex and smooth carapace curvature without spines on the dorsal surface). *Uroptychus paenultimus* further differs from *Uroptychus rutua* in having an acute frontal margin of the sternal plastron (rounded in *Uroptychus rutua*), maxilliped 3 merus with spines (unarmed in *Uroptychus rutua*) and eight or nine slender and inclined spines on the P2–4 dactyli (seven sharp triangular spines arranged perpendicular to margin in *Uroptychus rutua*). *Uroptychus tomentosus* can further be distinguished from *Uroptychus rutua* by carapace size (6.4–17.7 mm for *Uroptychus tomentosus* and 3.6–3.9 mm for *Uroptychus rutua*) and length of P2–4 dactylus (less than half length of propodus for *Uroptychus tomentosus* and more than half length for *Uroptychus rutua*). Finally, *Uroptychus glaber* additionally differs from *Uroptychus rutua* in having an unarmed antennal peduncle.

The record for *Uroptychus rutua* overlaps with the distribution range for *Uroptychus tomentosus* whereas *Uroptychus paenultimus* and *Uroptychus glaber* are known from Indonesia and Japan, respectively.

Distribution: Raoul Island, Kermadec Islands, 165–180 m (Fig. 7).

Etymology: Rutua is the plural Māori word for bump or bulge with reference to the paired inflations on the anterior portion of the dorsal carapace.

UROPTYCHUS SCAMBUS BENEDICT, 1902

Uroptychus scambus Benedict, 1902: 297, fig. 41 [type locality: off Honshu, Japan, 337 fms (617 m); holotype, ♀ ovig., USNM 26165]. – Doflein & Balss, 1913: 134. – Van Dam, 1937: 100, fig. 1. – Baba, 1981: 120; 1988: 43; – Baba, 2005: 58, 217, 230 (list).

Uroptychus glyphodactylus MacGilchrist, 1905: 249 [type locality: east of the Andamans, 'Investigator' St. 331, 569 fm (1041 m); two syntypes, Zoological Survey

of India, Calcutta]. – Alcock & MacGilchrist, 1905: pl. 70, fig. 4; pl. 71: fig. 1, 1a, 1b, 1c, 1d (no record).

Uroptychus edwardi Kensley, 1981: 69, figs 6, 7 [type locality: between Durban and East London, South Africa; 900 m; holotype, ♀ ovig., South African Museum A16033].

Material examined: 2 ♂ (4.5, 7.3 mm), Makassar Strait, Indonesia, 03°56'S, 118°26'E, 2084 m, 24.viii.1951, *Galathea* stn 453 (ZMUC CRU-11506). 2 ♂ (5.4, 4.9 mm), 1 ♀ ovig. (5.0 mm), Norfolk Ridge, 26° 25.93–25.99'S, 167° 10.87–09.64'E, 750–774 m, 18.v.2003, TAN0308/43 (NMNZ Cr. 012088). 1 ♂ (5.4 mm), Kermadec Ridge, 31° 05.25–05.41'S, 179° 05.40–04.78'W, 1129–944 m, 19.iv.2002, RV *Tangaroa*, stn TAN0205/48 (NIWA 18590). 1 ♀ (3.5 mm), Lord Howe Rise, 34° 12.43'S, 162° 39.49'E 760–758 m, 26.v.2003, TAN0308/82 (NMNZ Cr. 012089). 1 ♀ (4.0 mm), Northland Plateau, 34° 12.79'S, 173° 01.30'E, 452–460 m, 23.xi.1977, stn I368 (NIWA 10145). 1 ♂ (4.9 mm), 1 ♀ ovig. (5.0 mm), Northland Plateau, 34° 42.30'S, 174° 17.59'E, 705–684 m, 20.xi.1977, stn I366 (NIWA 10136). 1 ♀ ovig. (5.2 mm), Northland Plateau, 34° 43.49'S, 174° 31.49'E, 743 m, 11.x.1968, NZOI stn F913 (NMNZ Cr. 012085). 1 ♂ (4.1 mm), Northland Plateau, 35° 58.99'S, 173° 10.00'E, 701–689 m, 23.iii.1968, NZOI stn E884 (NMNZ Cr. 012086). 1 ♀ ovig. (4.9 mm), Bay of Plenty, 37° 12.54–12.96'S, 177° 14.25–14.20'E, 910–701 m, 11.xi.2004, RV *Tangaroa*, stn TAN0413/59 (NIWA 10198). 1 ♂ (5.4 mm), 1 ♀ ovig. (5.0 mm), 1 ♀ (5.5 mm), Bay of Plenty, 37° 32'S, 177° 20'E, 732 m, 30.ix.1962, VUW Haul 13 (NMNZ Cr. 012087). 1 ♂ (5.8 mm), Hikurangi Trough, 39° 26.80–27.40'S, 178° 19.99–18.40'E, 1000–800 m, 16.vi.1990, stn R439 (NIWA 16707).

Diagnosis: Carapace broader than long, dorsal surface smooth; lateral margin strongly convex posteriorly, anterolateral spine well-developed, directed straight forward or slightly curved mesially. Sternal plastron at least three times wider than long; sternite 3 anterior margin widely and shallowly excavated, with small median notch. Rostrum short, barely reaching or slightly overreaching ocular peduncle. Antennal peduncle unarmed, ultimate and penultimate articles subequal length; antennal scale barely reaching end of antennal article 4. Maxilliped 3 unarmed; ischium with obsolete denticles on mesial ridge. Pereopod 1 (cheliped) slender, 4.8–5.7 times as long as carapace; ischium with stout distodorsal spine; merus and carpus with at least one terminal dorsal spine. Pereopods 2–4 slender; meri and carpi smooth along dorsal margins; carpi long, slightly shorter than propodi on P2–3, much shorter on P4; propodi unarmed; P4 propodus 0.4 times length of P2 propodus; propodus and

dactylus subprehensile and subequal in length, gaping when folded, margins bearing plumose setae; flexor margin of dactylus with 9–16 spines nearly perpendicular to margin, all spines obscured by dense setae.

Variation and remarks: *Uroptychus scambus* Benedict, 1902 is a widespread Indo-West Pacific species and very distinct with its very wide carapace and sternum (wider than high for both characters), short rostrum (at most slightly overreaching the ocular peduncles) and subprehensile and setose propodus and dactylus of the walking legs. The New Zealand *Uroptychus scambus* closely agree with the description by Kensley (1981) for South African material.

Sexual dimorphism is not only significant with respect to the size of the cheliped palm but also in the height–width ratio of the sternal plastron. Male specimens have a more massive cheliped propodal palm than females (height–width ratio for males: 3.0–3.6; females: 3.7–4.0) and females have a significantly wider sternal plastron than males (height–width ratio for males: 3.2–3.8; females: 6.1–7.5) with the highest height–width ratio in ovigerous females where the sternum is both increased in width and simultaneously reduced in height in large females. This probably enlarges the cavity under the abdomen and may allow the females to support more eggs (female NIWA 10136 carried 14 eggs, each a diameter between 1.22 and 1.59 mm).

The cheliped spination increases with body size, with the cheliped carpus in the largest male (ZMUC CRU–11506) bearing ten strong spines along its mesial margin. None of the New Zealand specimens had spines along the mesial margin but the largest specimens had a row of up to nine strong granules, progressively diminishing in number and size in smaller specimens. Additionally, large specimens also have two or three terminal spines on the carpus and merus in addition to the strong distodorsal spine.

The small female (NMNZ Cr 012089) had a small kentrogonid rhizocephalan under its abdomen.

Distribution: East coast of South Africa, Andaman Sea, Nicobar Islands, Indonesia, Japan, New Zealand, and Tasman Sea, 296–2084 m. In New Zealand, *U. scambus* has been found between 452 and 1129 m (Fig. 5).

UROPTYCHUS TOKA SP. NOV. (FIG. 14)

Type material: HOLOTYPE: ♀ ovig. (5.3 mm), L'Esperance Rock, Kermadec Ridge, 33° 02.59'S, 179° 34.60'W, 350–490 m, 18.vii.1974, stn NZOI K795 (NMNZ Cr. 012090).

Diagnosis: Carapace approximately as wide as long; lateral margin without distinct spine but irregular, with large serrated process on anterior branchial region. Dorsal surface of carapace with cluster of small spines and granules on lateral hepatic and epigastric region, otherwise smooth. Lateral carapace margins convexly divergent posteriorly. Sternal plastron slightly wider than long along midlength. Basal antennal article with blunt triangular distolateral spine; penultimate antennal article with stout distal spine, ultimate unarmed; scale stout and rounded, not reaching midlength of ultimate article. Maxilliped 3 spineless. Pterygostomian flap surface covered with spines (anterior spines bifurcated). Sternal plastron anterior margin rounded with shallow concavity bearing U-shaped notch flanked by minute pair of submedian spines. Pereopod 1 (cheliped) with small distodorsal spine on ischium only. Pereopods 2–4 dorsal margin of meri and carpi smooth; propodi with pair of distal spines on flexor margin only; dactyli straight, longer than half length of propodi, with seven sharp triangular spines (excluding distal spine), loosely arranged and perpendicular to flexor margin, penultimate larger than antepenultimate.

Description of holotype: Carapace: 1.1 times as long as broad (0.8 without rostrum), moderately convex from side to side. Dorsal surface sparsely setose (transverse row of small spines in epigastric and hepatic region); cervical groove not deep but distinct, epigastric and hepatic region covered with small spines, hepatic region with a small spine posterior to anterolateral spine and covered with small spines (in posterior portion), carapace otherwise unarmed. Frontal margin deeply excavate; outer orbital angle produced into small spine, anterior to anterolateral spine. Anterolateral margin rounded, with small spine dorsomesial to margin, lateral margin convexly divergent posteriorly, with seven to nine small irregular spines posterior to anterolateral spine, distinct serrated process at anterior branchial margin. Posterior margin unarmed. Rostrum triangular, slightly deflected ventrally, 0.2 times length of remaining carapace; dorsal surface strongly excavate; lateral margins smooth. Pterygostomian flap lateral surface covered with small spines, anterior margin produced into a spine.

Sternum: sternal plastron 1.3 times as wide as long, lateral extremities subparallel between sternites 5–7. Sternite 3 anterior margin rounded, with median notch flanked by small submedian spines, lateral margins rounded. Surface smooth. Sternite 4 0.5 times as wide as sternite 3, anterior midline grooved; anterolateral margin rounded with blunt terminus.

Abdomen: tergites smooth and unarmed, without transverse ridges or grooves. Pleural margins of

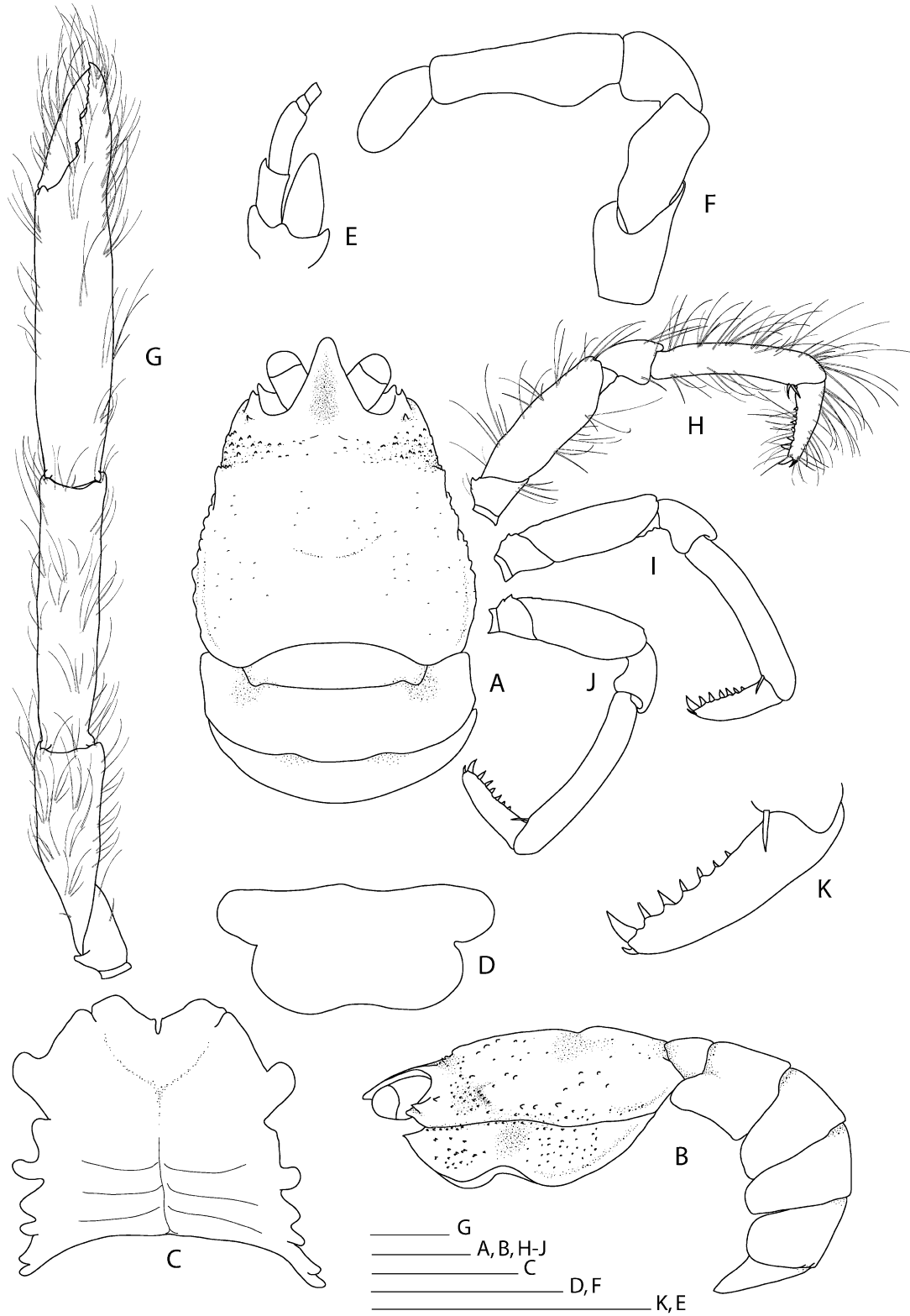


Figure 14. *Uroptychus toka* sp. nov., holotype, ♀ ovig., NMNZ Cr. 012090: A, carapace and abdomen, dorsal, setae omitted; B, carapace and abdomen, lateral, setae omitted; C, sternal plastron; D, telson, setae omitted; E, antenna, left, ventral; F, endopod of third maxilliped, left, lateral, setae omitted; G, right cheliped, dorsal; H–J, right pereopods 2–4; K, dactylus and distal portion of propodus of right pereopod 2, lateral. Scale bars = 2 mm.

segments 2 to 4 rounded (tergite 2 slightly concave). Telson and tergite 6 two times as broad as long; posterior portions 0.8 times length of anterior portion.

Eyes: cornea subglobular, 0.4 times length of ocular peduncle, nearly reaching end of rostrum.

Antennal peduncle: article 2 with blunt and triangular outer spine. Penultimate article with stout distal spine. Ultimate article unarmed, 1.1–1.2 times as long as penultimate. Antennal scale not reaching midlength of ultimate article; two times as long as wide.

Maxilliped 3: surface smooth, ischium without distal spines, a few scattered small spines, basis smooth. Merus extensor margin without spine; flexor margin without spine. Carpus, propodus, and dactylus unarmed.

Pereopod 1: slender, 3.9–4.0 times as long as carapace, surface moderately setose. Ischium with distodorsal spine. Merus and carpus, surface unarmed; carpus as long as palm. Propodus with palm 3.5–3.6 times as long as high, unarmed. Length of dactylus 0.4 times as long as propodus, occlusal margins not gaping, denticulate.

Pereopods 2–4: similar; surfaces setose and unarmed. Merus 1.0–0.7 times as long as propodus (P2 merus slightly longer, P3–4 meri subequal). Propodus 1.7–2.0 times as long as dactylus (propodus increasing in length from P2–4), extensor margin smooth. Flexor margin with only distal pair of spines. Dactylus straight; flexor margin with eight spines, ultimate slender, penultimate prominent, other spines sharp triangular, loosely arranged and perpendicular to margin, diminishing proximally.

Ovum: 1.0–1.1 mm.

Remarks: *Uroptychus toka* sp. nov. is most similar to *Uroptychus rutua* sp. nov. but differs with respect to dorsal carapace armature; specifically, the presence of a spine behind the anterolateral spine and a distinct process on the anterior margin of the branchial lateral region (both absent in *Uroptychus rutua*) and the absence of broad paired inflations in the epigastric region.

See similarities to other congeners under *Uroptychus rutua*.

Distribution: L'Esperance Rock, Kermadec Ridge, 350–490 m (Fig. 7).

Etymology: Toka is the Māori word for rock, with reference to the type locality (L'Esperance Rock).

UROPTYCHUS TOMENTOSUS BABA, 1974 (FIG. 15)

Uroptychus tomentosus Baba, 1974: 384, figs 3, 4 [type locality: holotype, ♂, 45°14.3'S, 171°29.2'E, 116 m, ZLKU 15125].

Type material: 1 ♀ (11.3 mm), paratype, south Chatham Rise, 44° 50.3'S, 171° 51.8'E, 118–120 m, 19.vi.1968, FV *Kaiyo Maru* stn 4, coll. K. Baba (ZLKU 15126).

Other material examined: Northland Plateau: 1 ♀ (15.0 mm), north of New Zealand, 34° 7.50'S, 172° 47.00'E, 315 m, 13.x.1968, stn F924 (NIWA 23158). 1 ♀ (7.6 mm), 35° 49.00'S, 174° 30.00'E, 80 m (NIWA 9800). Bay of Plenty: 1 ♀ ovig. (8.3 mm), 2 ♀ (6.4, 8.1 mm), 1 ♂ (7.8 mm), from four stations. Chatham Rise: 2 ♂ (13.7, 14.3 mm), 43° 53.40'S, 173° 54.20'E, 400 m, 30.x.1979, stn S177 (NIWA 23143). 1 ♀ (4.3 mm), 44° 0.00'S, 172° 58.20'E, 81–79 m, 6.x.1962, stn B554 (NIWA 10093). 2 ♀ (12.3, 16.8 mm), 44° 10.20'S, 176° 59.20'W, 278 m, 23.iii.1978, stn Q34 (NIWA 23149). 2 ♂ (9.0, 10.7 mm), 44° 12.30'S, 173° 29.90'E, 327 m, 28.x.1979, stn S156 (NIWA 23148). 1 ♂ (11.7 mm), 44° 57.00'S, 171° 46.00'E, 123 m, 19.i.1970, stn G668 (NIWA 10674). 1 ♀ ovig. (16 mm), 44° 9.00'S, 176° 6.50'E, 126 m, 23.x.1979, stn S134 (NIWA 10099). South-east New Zealand: 3 ♀ ovig. (10.4, 13.0, 16.8 mm), 5 ♀ (8.7–14.8 mm), 6 ♂ (6.7–15.7 mm), from eight stations. Bounty Islands: 1 ♀ ovig. (14.3 mm), 48° 10.10'S, 179° 30.00'E, 228 m, 20.iii.1979, stn I700 (NIWA 23138). 1 ♂ (12.7 mm), 1 ♀ ovig. (14.3 mm), 1 ♀ (12.7 mm), 48° 12.60'S, 179° 29.10'E, 260 m, 25.ix.1978, stn S62 (NIWA 23144). 3 ♂ (8.5, 9.5, 17.7 mm), 4 ♀ ovig. (13.2–17.3 mm), 48° 9.50'S, 179° 47.00'E, 220 m, 15.iii.1979, stn I680 (NIWA 10900). 1 ♂ (6.4 mm), 48° 9.60'S, 179° 15.90'E, 250 m, 20.iii.1979, stn I701 (NIWA 23055).

Diagnosis: Carapace longer than wide, dorsal surface unarmed, covered with fine setae; lateral margins irregular but without spines, concavely divergent, distal portion with ridge. Rostrum 0.4 times as long as remainder of carapace, anteriorly rounded. Pterygostomian flap granulate, anterior portion covered with serrate ridges, with sharp anterior spine. Sternal plastron wider than long along midlength, sternite 3 with round anterior margin and semicircular median notch; sternite 4 entire. Abdomen unarmed, setose. Cornea small. Antenna stout; penultimate article with small distal spine; ultimate article unarmed; scale barely overreaching penultimate article to barely reaching midlength of ultimate article. Maxilliped 3 unarmed. Pereopod 1 (cheliped) slender, three times as long as carapace, setose and unarmed except small distodorsal spine on ischium. Pereopods 2–4 sparsely to strongly setose; meri smooth to irregular on proximal portion of dorsal crest, unarmed; carpi smooth along dorsal margin; propodi with pair of distal movable spines only; dactyli broad relative to length, less than half length of propodus, with three to six spines, loosely

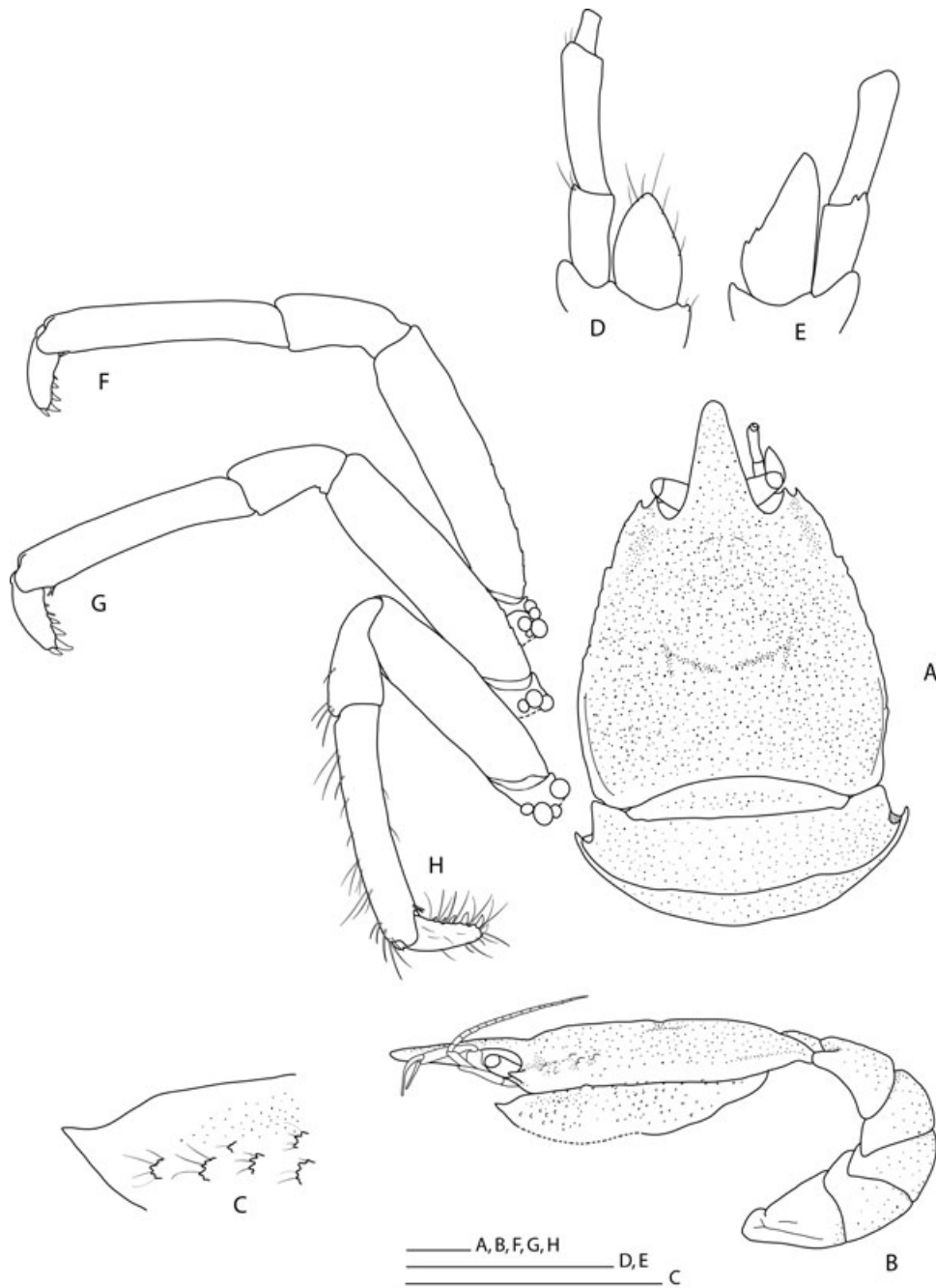


Figure 15. *Uroptychus tomentosus* Baba, 1974, paratype. A–C, ♀, ZLKU 15126; D, ♀ ovig., NIWA 10900; E, ♀ ovig., NMNZ Cr. 012092; F–H, ♀ ovig., NMNZ Cr. 012096. A, carapace and abdomen, dorsal, setae omitted; B, carapace and abdomen, lateral, setae omitted; C, anterior portion of pterygostomial flap showing serrate ridges; D, antenna, left, ventral; E, antenna, right, ventral; F–H, right pereopods 2–4, lateral showing akentrogonid rhizocephala infestation. Scale bars = 2 mm.

arranged, flexor margin with ultimate spine smaller than penultimate, subequal to antepenultimate.

Variation: Variations from the original account by Baba (1974) include the length and shape of the antennal scale. The length of the scale ranges from

barely overreaching the penultimate to reaching to the middle of the ultimate article of the antennal peduncle, whereas the width of the scale remains 1.6–1.7 times that of the antennal peduncle (1.6 in the paratype) (Fig. 15 shows short scale of ovigerous female of NIWA 10900). More commonly, the scale

terminates in a more round tip than illustrated in the holotype. One female (Mu 68–81, NMNZ Cr. 012092, south-east New Zealand) bears two small distal spines on the penultimate article.

The new records support Baba's (1974) remarks on variation regarding the degree of setation of the body and appendages varying from densely setose to moderately setose with no clear pattern related to sex or size. With regards to the spination of the dactyli of the ambulatory legs, specimens most commonly (60%) bear five spines, larger specimens more often bear six spines, and smaller specimens bear three to four spines.

Further variation is exhibited in the length–width ratio of the carapace, 1.2 in paratype female, slightly more in smaller specimens (1.3 in 8.5 mm male, NIWA 10900) and slightly less in large specimens (1.1 in 14.3 mm female, NIWA 23138).

Females are generally larger than males (range of carapace length for ovigerous females: 10.4 to 17.3 mm, mean 14.6 mm, median 14.3 mm; females: 4.3 to 16.8 mm, mean 11.0 mm, median 11.8 mm; males: 6.4 to 17.7 mm, mean 10.6 mm, median 9.5 mm).

Large males show slightly gaping fingers of the cheliped.

The female paratype and the large female of the (NMNZ Cr. 012096, south-east New Zealand) are infected with akentrogonid rhizocephalans on the ambulatory legs, the antennae, and the third maxilliped. Additionally, two specimens are infected by kentrogonids beneath the abdomen (two kentrogonids on NIWA 23158; one large sacculinid rhizocephalan on NIWA 23160).

Remarks: *Uroptychus tomentosus* is recognizable by its setaceous body and appendages, round rostrum, small ocular peduncle, rounded frontal margin of the sternal plastron with a U-shaped median notch, short, rounded antennal scale, and the short dactyli of the ambulatory legs with three to six widely spaced spines.

The female paratype matches the description of the holotype. It represents the only female of the type series of seven specimens and was collected from close to the type locality and at a similar depth.

Uroptychus tomentosus is most similar to *Uroptychus pilosus* Baba, 1981, which shares the short antennal scale and short P2–4 dactyli. *Uroptychus tomentosus* differs from *Uroptychus pilosus* by having a distinct anterolateral and postorbital spine (vs. rounded), a small (sometimes minute) distal spine on the penultimate antennal article (vs. unarmed), and by having three to six spines on the dactyli of the walking legs (vs. only two terminal spines).

Distribution: Chatham Rise, east of New Zealand's South Island (between 43° 09'S and 44° 50'S), at depths of 116–382 m. This species is one of the more common New Zealand chirostyliids and appears to be endemic to the continental shelf of the eastern coast of New Zealand (Fig. 16). Its range is extended to the northern tip of New Zealand (34°08'S) and to the Bounty Islands to the south (48°13'S) from a depth range of 64–540 m.

UROPTYCHUS WEBBERI SP. NOV. (FIG. 17)

Type material: HOLOTYPE: ♀ ovig. (10.7 mm), Macauley Island, Kermadec Ridge, 30° 13.09'S, 178° 31.99'W, 610–640 m, 29.vii.1974, stn NZOI K846 (NMNZ Cr. 012097).

Diagnosis: Carapace longer than broad; lateral margins parallel behind hepatic region, distal third with wide and distinct ridge, stout anterolateral spine; dorsal surface smooth, unarmed. Rostrum short, 0.2 times remaining carapace length, apex rounded, falling short of ocular peduncles. Sternal plastron as broad as long along midlength; sternite 3 with pair of submedian spines, strong anterolateral spines. Sternite 4 not reaching anterior end of sternite 3, smooth except for tuberculate transverse ridge. Antennal articles 4–5 unarmed; scale nearly twice as wide as article 4, reaching midlength of article 5, rounded. Pereopod 1 (cheliped) ischium with one stout distodorsal and one distoventral spine followed by row of granules. Pereopods 2–4 meri and carpi smooth along dorsal margins; propodi with six to ten spines along distal 0.5–0.6 of flexor margin, distal paired, margins not convex; dactyli strongly curved, without plumose setae, with loosely arranged spines, ultimate slender, longer than remaining spines, subequal width to remaining spines on flexor margin.

Description of holotype: Carapace: 1.2 times as long as broad (1.0 without rostrum), moderately convex from side to side. Dorsal surface smooth; cervical groove indistinct (faintly indicated), gastric region unarmed, only with very small granules in epigastric region. Frontal margin slightly excavate, relatively straight, relatively straight; outer orbital angle produced into small spine. Anterolateral margin with well-developed spine; lateral margin subparallel from posterior to hepatic region, widest at posterior three-quarters, with distinct ridge in posterior third, unarmed but irregular. Posterior margin unarmed. Rostrum short, deflected ventrally, 0.2 times the length of remaining carapace, round apex; dorsal surface smooth, sparsely setose, and shallowly

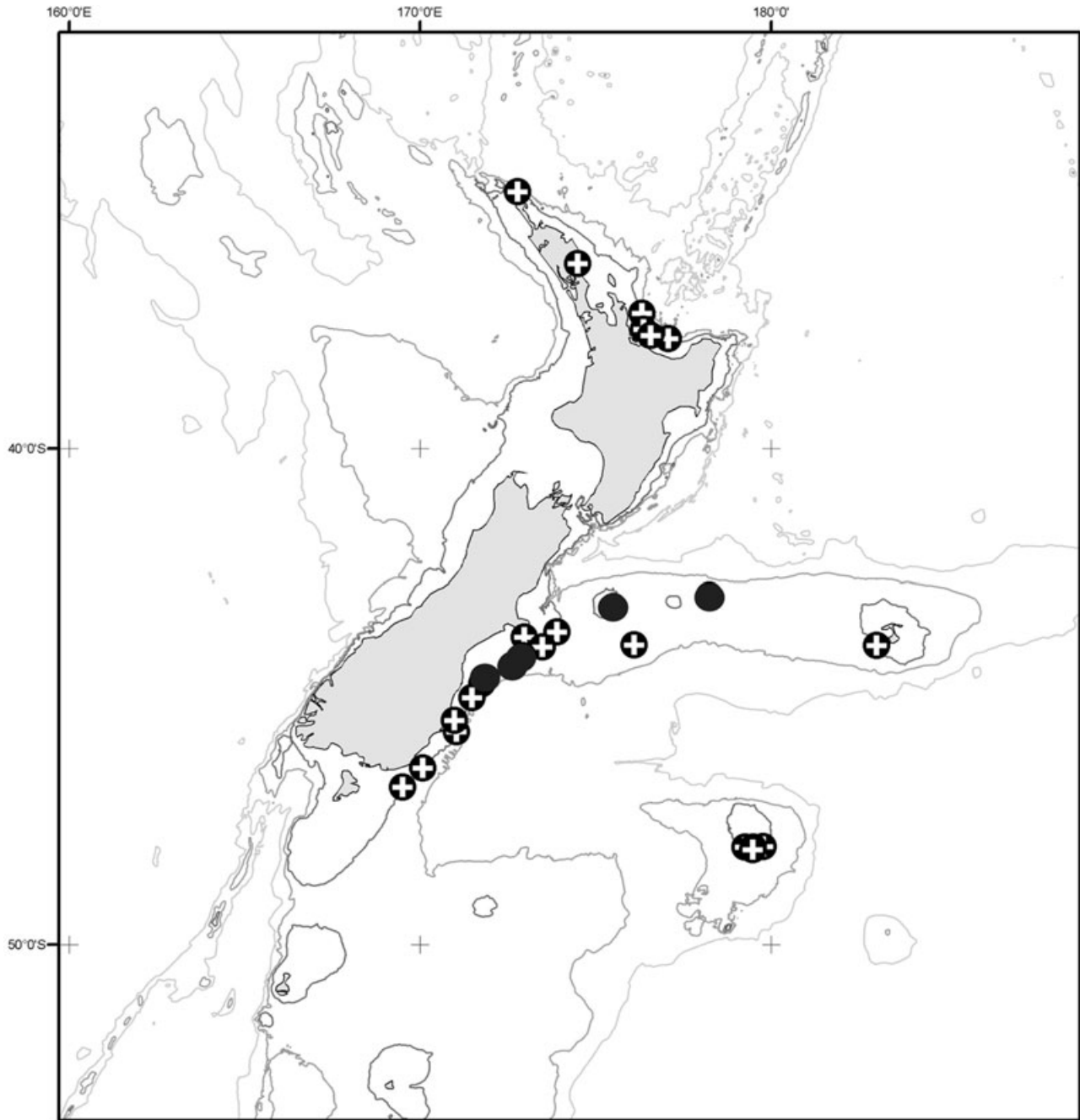


Figure 16. Records of *Uroptychus tomentosus* Baba, 1974 around New Zealand. Solid circles indicate the type records. 250, 1000, and 2500 m bathymetric contours are shown.

convex; lateral margins smooth. Pterygostomian flap lateral surface with few granules, anterior margin produced into a small spine.

Sternum: sternal plastron as wide as long, lateral extremities slightly divergent between sternites 5–7, serrated along lateral margins, surface smooth except for transverse row of granules on sternite 4. Anterior margin of sternite 3 with median notch flanked by

pair of submedian spines; lateral margins produced to strong tooth. Sternite 4 two times as wide as sternite 3, anteriorly shallowly concave; anterolateral margin produced to tooth (not overreaching sternite 3 but reaching base of anterolateral tooth).

Abdomen: tergites smooth and unarmed, with very few setae. First abdominal tergite with shallow ridge at anterior margin. Pleural margins of segments 2–4



Figure 17. *Uroptychus webberi* sp. nov., holotype, ♀ ovig., NMNZ Cr. 012097: A, carapace and abdomen dorsal, setae omitted; B, carapace and abdomen, lateral, setae omitted; C, sternal plastron; D, telson, setae omitted; E, antenna, right, ventral; F, endopod of third maxilliped, left, lateral, setae omitted. G, mesial ridge, left; H, right cheliped, dorsal; I, right cheliped, ischium and merus, lateral; J–L, right pereopods 2–4; M, dactylus and distal portion of propodus of right pereopod 3, lateral. Scale bars = 2 mm.

rounded; tergite 2 wide, slightly concave. Telson and tergite 6 two times as broad as long, distal portion emarginate, length 1.4 times that of proximal portion.

Eyes: cornea subglobular, 0.4 times length of ocular peduncle, overreaching rostrum.

Antennal peduncle: article 2 with blunt distolateral spine. Penultimate and ultimate articles unarmed distally. Ultimate article two times as long as penultimate. Antennal scale reaching to midlength of ultimate article; 2.1–2.2 times as long as wide.

Maxilliped 3: surface smooth, ischium without distal spines, 12 teeth on mesial ridge (four or five strong spines on basis). Merus, carpus, propodus, and dactylus unarmed.

Pereopod 1: stout, 2.7 times as long as carapace (3.3 excluding rostrum), surface smooth, fingers furnished with long setae. Ischium with dorsal and ventral spines distally and with row of spinules on ventral margin. Merus with rows of granules, ventral row of spines, with two ventral spines distally. Carpus sparsely tuberculate on ventral surface, with two small, round ventral spines distally, carpus 1.1–1.2 times as long as palm. Propodus with palm 2.4–2.5 times as long as high, unarmed. Dactylus 0.3 times as long as propodus, occlusal margins slightly gaping, denticulate, with distinct distal process.

Pereopods 2–4: decreasing in length and spination posteriorly (merus of P4 0.7 times merus of P2), surface slightly setose (distally furnished with long setae). Merus unarmed, 1.3–1.0 times as long as propodus (P2 longest). Carpus unarmed. Propodus 2.0–2.2 times as long as dactylus, extensor margin smooth. Flexor margin with 6–10 spines along distal half portion, distal paired. Dactylus curved; with 9–12 spines along entire length of flexor margin, ultimate slender and longest, preceded by subequal stout and rounded spines.

Ovum: 1.4–1.6 mm.

Remarks: *Uroptychus webberi* sp. nov. is most closely allied to those species with a smooth lateral carapace margin and smooth dorsum, narrow rostrum, anterior margin of sternum with submedian spines, smooth sternite 4 with anterolateral angle not reaching anterior margin of sternite 3, P2–4 propodi with a row of spines along the distal portion of the flexor margin (with distally paired spines), without convex margin, dactyli with regularly arranged blunt, triangular spines, and lacking plumose setae. This group of species includes *Uroptychus litosus* Ahyong & Poore, 2004, *Uroptychus nitidus* (Milne Edwards, 1880), *Uroptychus similis* Baba, 1977, and *Uroptychus indicus* Alcock, 1901. *Uroptychus webberi* can be readily distinguished from these species by the parallel carapace margin with distinct and wide ridge

along posterior third, round rostrum overreached by ocular peduncle and broader antennal scale (approximately half as wide as long).

The truncation of the rostrum could also be a result of damage and confirmation of this condition is pending collection of further specimens. Only the third pereopods remain attached to the body and the left second pereopod is missing in the holotype.

The record for *Uroptychus webberi* is closest to the known distribution of *Uroptychus litosus*, known from Tasmania. *Uroptychus nitidus* has a known Atlantic and north-western Pacific distribution range, *Uroptychus similis* has been recorded from Midway Island, Hawaii, and *Uroptychus indicus* is widespread in the Indian Ocean.

Distribution: Off Macaulay Island, Kermadec Islands, 610–640 m (Fig. 7).

Etymology: Named in honour of Richard Webber, Curator of Crustacea, National Museum of New Zealand Te Papa Tongarewa, Wellington for his contributions to New Zealand crustacean taxonomy, for providing material for this work, and his general support.

UROPTYCHUS YALDWYNI SP. NOV. (FIG. 18)

Type material: HOLOTYPE: ♀ ovig. (4.2 mm), Macaulay Island, Kermadec Ridge, 30° 17.59'S, 178° 25.30'W, 398–412 m, 28.vii.1974, stn NZOI K840 (NMNZ Cr. 012098).

Diagnosis: Carapace slightly longer than broad; strong anterolateral spine; lateral margin widening posteriorly, with seven or eight spines, one spine in branchial region, six or seven spines in posterior branchial region, unarmed in lateral hepatic region; dorsal surface unarmed, anterior cardiac region inflated, smooth. Sternal plastron slightly wider than long along midlength, sternite 3 medially produced to acute angular point at anterior margin, U-shaped median notch with pair of submedian spines. Maxilliped 3 unarmed. Pereopod 1 (cheliped) more than four times as long as carapace, ischium with distodorsal spine; with palm 4.5 times as long as broad. Pereopods 2–4 meri and carpi smooth along dorsal margin; propodi with pair of distal spines only; dactyli with six spines (excluding ultimate), perpendicular and loosely arranged along flexor margin, penultimate spine approximately twice as wide as ultimate, penultimate spine subequal to antepenultimate.

Description of holotype: Carapace: 1.2 times as long as broad (0.8 without rostrum), moderately convex from side to side. Dorsal surface sparsely setose and

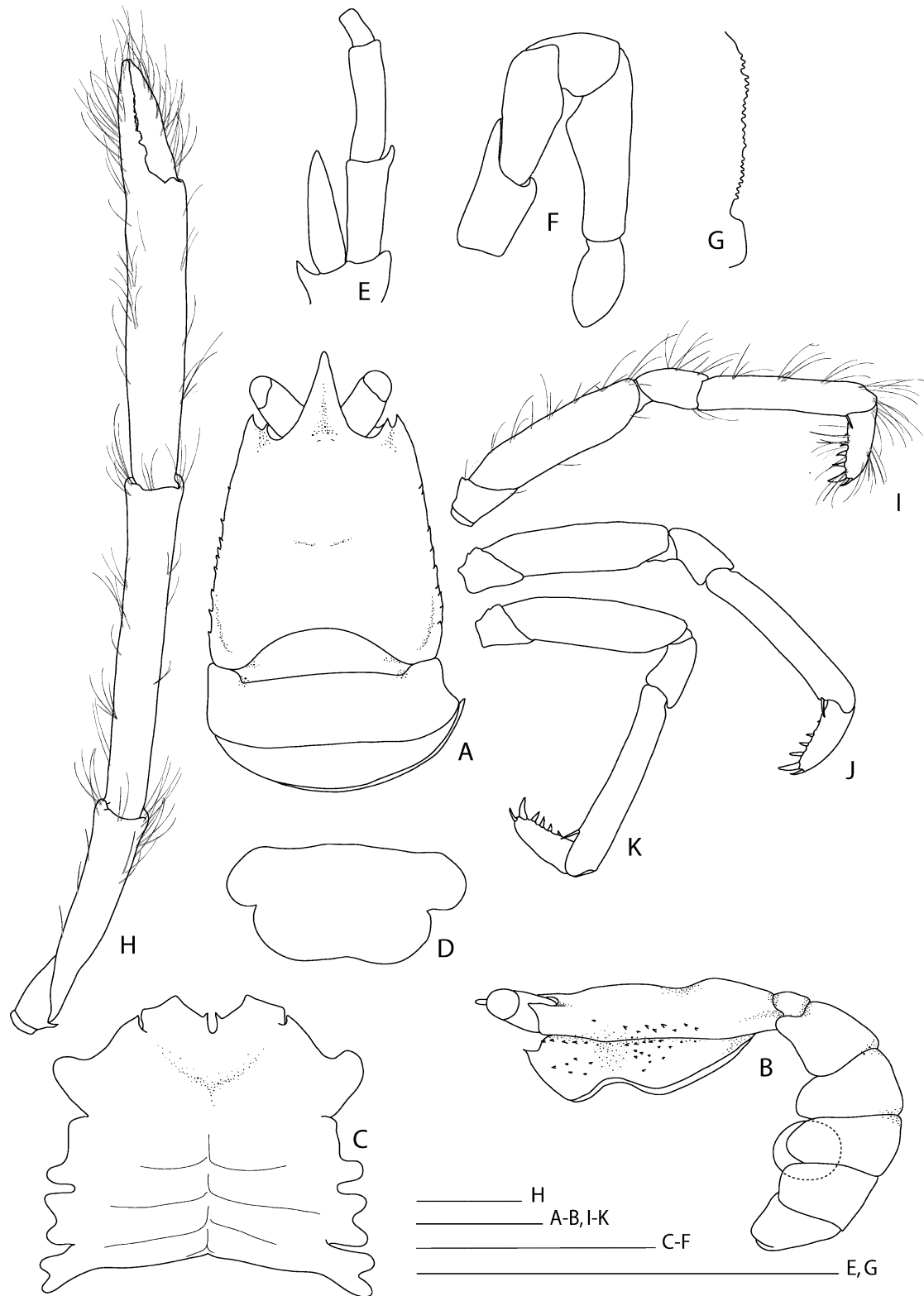


Figure 18. *Uroptychus yaldwyni* sp. nov., holotype, ♀ ovig., NMNZ Cr. 012098: A, carapace and abdomen dorsal, setae omitted; B, carapace and abdomen, lateral, setae omitted; C, sternal plastron; D, telson, setae omitted; E, antenna, left, ventral; F, endopod of third maxilliped, right, lateral, setae omitted. G, mesial ridge, right; H, right cheliped, dorsal; I–K, right pereopods 2–4. Scale bars = 2 mm.

unarmed; cervical groove medially deep and distinct; postcervical region slightly inflated towards the anterior portion. Frontal margin deeply excavate. Outer orbital angle produced to a sharp tooth, falling short of anterolateral spine. Anterolateral margin with well-developed spine, directed slightly dorsad; lateral margin subparallel, slightly wider posteriorly (widest in posterior three-quarters), with seven or eight small and inclined spines (excluding anterolateral spine). One spine in anterior branchial region, six or seven lateral spines in posterior branchial region. Posterior margin unarmed. Rostrum triangular, horizontal, 0.4 times length of remaining carapace; dorsal surface slightly excavate; lateral margins smooth. Pterygostomian flap lateral surface covered with small spines and with a row of spines along dorsal margin, anterior margin produced into a sharp spine, directed slightly dorsad.

Sternum: sternal plastron 1.3 times as wide as long, lateral extremities subparallel between sternites 5–7, surface smooth. Anterior margin of sternite 3 acutely produced medially, with median U-shaped notch flanked with pair of submedian spines. Lateral margins rounded. Sternite 4 2.1 times as wide as sternite 3, anteriorly shallowly concave; anterolateral margin narrow triangular, reaching midlength of sternite 3.

Abdomen: tergites covered with short, fine, scattered setae, tergites without transverse ridges or grooves. Pleural margins of segments 2–4 rounded (margin of segment 2 slightly concave). Telson and tergite 6 2.2 times as broad as long; posterior portions 1.3 times length of anterior portion, posterior margin moderately emarginate.

Eyes: cornea subglobular, slightly tapering distally; 0.3 times length of ocular peduncle, nearly reaching end of rostrum.

Antennal peduncle: article 2 with blunt but distinct outer spine. Penultimate article with distal spine. Ultimate article unarmed, 1.2 times as long as penultimate. Antennal scale slightly overreaching penultimate article, 3.5 times as long as wide.

Maxilliped 3: surface smooth, ischium without distal spines, very small teeth on mesial ridge, no teeth on basis. Maxilliped otherwise unarmed.

Pereopod 1: very slender, 4.2 times as long as carapace, surface moderately setose. Ischium with dorsal distal spine. Merus and carpus surfaces smooth and unarmed; carpus 1.1 times as long as palm. Propodus with palm 4.6–5.1 times as long as high, unarmed. Dactylus 0.4 times as long as palm, occlusal margins not gaping, denticulate.

Pereopods 2–4: similar (slightly decreasing in length posteriorly); surfaces setose. Merus unarmed, 1.1–0.9 times as long as propodus (meri subequal, propodi increasing in length posteriorly). Carpus

unarmed. Propodus about two times as long as dactylus, extensor margin smooth; flexor margin with only distal pair of spines. Dactylus straight; flexor margin with six spines along distal two-thirds of flexor margin; ultimate small, penultimate largest, preceded by successively diminishing, loosely arranged spines perpendicular to margin.

Ovum: 0.6–0.7 mm.

Remarks: *Uroptychus yaldwyni* sp. nov. belongs to the group of small-bodied species with spines or granules on lateral carapace margin, unarmed dorsal carapace surface, sternite 3 with median notch, P2–4 dactylar spines loosely arranged, and penultimate spine not extremely broad. *Uroptychus yaldwyni* is most closely related to *Uroptychus altus* Baba, 2005, *Uroptychus paenultimus* Baba, 2005, and *Uroptychus wolffi* Baba, 2005. It can be distinguished from these three species by the presence of six or seven small, slender spines on the lateral branchial margin of the carapace with an additional small spine on the anterior border of the anterior branchial region, a very strong anterolateral spine, nearly level with the dorsal margin of the ocular peduncle, a distinct cervical groove, distinct ridge along proximal third of lateral carapace margin, unarmed maxilliped 3, and dactylar spination of the walking legs: *Uroptychus yaldwyni* has four large triangular spines proximal to two distal spines, directed perpendicular to the flexor margin, whereas *U. altus*, *U. paenultimus*, and *U. wolffi* have three, eight to nine, and six slender and inclined spines proximal to two distal spines, respectively. Additionally, the cheliped is more slender and elongate in *Uroptychus yaldwyni* (4.2 times as long as carapace, palm greater than 4.5 times as long as broad; in *Uroptychus altus* the cheliped is 2.7 times as long as carapace, palm 1.9 times as long as broad; in *Uroptychus paenultimus*, the cheliped is three times as long as carapace, the palm is three times as broad as long; in *Uroptychus wolffi* the cheliped is 3.3 times as long as the carapace, the palm is three times as broad as long).

Uroptychus yaldwyni is also very similar to *Uroptychus amabilis* Baba, 1979 in carapace shape and size. *Uroptychus amabilis*, however, does not bear spines along the lateral carapace margin, has spines on the mesial ridge of the maxilliped 3, a distal spine on the distal antennal article, the antennal scale nearly reaching the end of the antennal peduncle, and the dactyli of the walking legs shorter than half length of the propodi.

All legs of the holotype are detached.

The record for *Uroptychus yaldwyni* is closest to the known distribution of *Uroptychus amabilis* from New Caledonia. All others, *Uroptychus altus*, *Uroptychus*

wolffi, and *Uroptychus paenultimus* have only been recorded from the Kei Islands, Indonesia.

Distribution: Macauley Island, Kermadec Islands, 398–412 m (Fig. 7).

Etymology: Named in honour of the late Dr John C. Yaldwyn (1929–2006), recognizing his contributions to the knowledge of New Zealand decapod crustacean research.

UROPTYCHUS SP.

Diptychus australis Henderson, 1885: 420 (part; specimens from stns 170, 171) (not *D. australis* Henderson, 1885).

Uroptychus australis. – Henderson, 1888: 180 (part; specimens from stn 170, 171) (not *Uroptychus australis* Henderson, 1885).

Material examined: Kermadec Islands: 8 ♀ ovig. (9.8–13.7 mm), 7 ♀ (4.2–12.8 mm), 9 ♂ (5.0–13.0 mm), 28° 25'S, 177° 50'E, 1225 m, 5.iv.1973, NMNZ stn BS312 (NMNZ Cr. 012099). 1 ♀ ovig. (9.5 mm), 28° 33.00'S, 177° 50.00'W, 1098 m, 15.vii.1874, *Challenger* stn 171 (BMNH 1888: 33) (paralectotype of *Uroptychus australis*). 1 ♀ ovig. (8.3 mm), 29° 55'S, 178° 14'W, 952 m, 14.vii.1874, *Challenger* stn 170 (BMNH 1888: 33) (paralectotype of *Uroptychus australis*). 1 ♂ (9.7 mm), 30° 05.89'–05.27'S, 178° 30.98'–30.88'W, 1201–1262 m, 16.v.2007, R.V. *Tangaroa*, stn TAN0706/32 (NIWA 29734). 1 ♀ (7.5 mm), 31° 05.25'S, 179° 05.40'W, 1129 m, 19.iv.2002, RV *Tangaroa*, TAN0205/48 (NIWA 18579). Bay of Plenty: 1 ♂ (7.0 mm), Bay of Plenty, 36° 40.49'S, 176° 23.99'E, 1306–1141 m, 6.x.1968, NZOI stn F897 (NMNZ Cr. 0120100). 1 ♀ ovig. (10.1 mm), Bay of Plenty, 37° 05.99'S, 177° 15.49'E, 843–938 m, 4.x.1968, NZOI stn F880 (NMNZ Cr. 0120101). 1 ♂ (7.0 mm), Bay of Plenty, 37° 25.49'S, 177° 30.00'E, 1267–1174 m, 4.x.1968, NZOI stn F879 (NMNZ Cr. 0120102). 1 ♂ (10.5 mm), 37° 19.50'S, 178° 10.99'E, 1050–1053 m, 3.x.1968, NZOI stn F873 (NIWA 23373). 1 ♂ (9.4 mm), Bay of Plenty, 37° 28.49'S, 177° 31.49'E, 997–942 m, 3.x.1968, NZOI stn F878 (NMNZ Cr. 0120103). 1 ♀ ovig. (12.7 mm), no station information, NMNZ BS 353 (NMNZ Cr. 0120105). 1 ♂ (7.9 mm), 1 ♀ ovig. (9.7 mm) East Cape Ridge, 37° 34.00S, 179° 22.00'E, 1395 m, 6.iii.1969, NZOI stn D836 (NMNZ Cr. 0120104).

Variation and remarks: Small variations were noted with respect to the size of the granule on the lateral carapace margin, from a very small granule (female 11 mm, NMNZ Cr. 012099) to a small spine (NIWA 18579) and position of spines on the P2–4 propodi; some specimens from one site (NMNZ Cr. 012099)

showed a single distal spine on the propodus close to the junction with the dactylus whereas the majority had the distal spine remote from the juncture. Sexual dimorphism was apparent in the size of the propodal palm of the cheliped with the palm in males between 2.7–3.2 times as high than broad and in females 3.5–4.3 times as high than broad.

The material examined matches the *Uroptychus australis* paralectotypes from *Challenger* stns 170 and 171 that belong to an undescribed species from a range of south-western Pacific locations under study by Keiji Baba (pers. comm.). It differs from *Uroptychus australis* in bearing a single distal spine on P2–4 propodi only and inclined sharp triangular spines along the flexor margin of the dactylus that are not contiguous with the margin.

Distribution: New Zealand; 421–1668 m (Fig. 5). Two specimens (NIWA 29734 and NMNZ Cr. 012099) were collected perched in a small piece of gorgonian coral indicating a possible host association.

DISCUSSION

Fifteen species of Chirostylidae in three genera are now known in New Zealand, more than doubling the number of species in the region.

Material presented here provides records for more than 20° latitude in the south-west Pacific, from just over 28°S on the Kermadec Ridge north-west of New Zealand, to 53° 16'S on the Campbell Rise, south of New Zealand, the latter extends the southernmost record for Chirostylidae worldwide; the previous highest latitudes in the southern hemisphere so far include Henderson's (1885) report of *Uroptychus parvulus* and *Gastroptychus milneedwardsi* from 51° 27' 30"S (*Challenger* station 310) in the Sarmiento Channel, Patagonia and recent records by Ah Yong & Poore (2004) from the Tasmanian seamounts from 44° 22'S for *Gastroptychus hendersoni* at approximately the same latitude as the Chatham Rise (Fig. 1). The records for *G. novaezelandiae* from 53° 16'S (NIWA 14580) extend the southern latitudinal range for Chirostylidae by approximately 2°.

New records of *Gastroptychus novaezelandiae* and *Uroptychus tomentosus* Baba, 1974 greatly expand known species ranges, indicating that they are abundant and widely distributed throughout (but not beyond) the New Zealand continental shelf (Figs 3 and 16 show locations of published and new records for each species). Further range extensions have been provided for *Uroptychus alcocki* Ah Yong & Poore, 2004 and *Uroptychus australis* (Henderson, 1885), species with wide south-west Pacific ranges. *Uroptychus maori* Borradaile, 1916, previously known only from the type locality (Three Kings Island, north of

New Zealand) is now also known from the northern Lord Howe Rise, the Three Kings Ridge, and south to the Bay of Plenty (Fig. 5). Conversely, no further specimens of *Uroptychodes spinimarginatus*, *Uroptychus novaezelandiae*, and *Uroptychus politus*, from New Zealand have been recorded.

It is noteworthy that all but the two common species are only known north of 40°S, possibly relating to the variable nutrient distribution of surface waters influenced by warm tropical currents. North of New Zealand, the warm-water Tasman Front moves eastward from northern Australia and the Coral Sea, circulating warm saline surface water (upper 500 m) and creating deep eddies and gyres as it is interrupted by the varied ocean topography of the New Zealand submarine platform (Bradford *et al.*, 1982; Heath, 1985; Tilburg *et al.*, 2001). These waters originating from the Tasman Front are retained north of approximately 42°S where the Chatham Rise provides a barrier between the warmer northern waters and colder waters influenced by the sub-Antarctic inflow. This subtropical convergence is recognized as a strong biogeographical barrier to pelagic and benthic organisms. Nodder *et al.* (2003) for example, found the greatest contrast between macrobenthic communities at the deep sites (2300 and 2600 m) north and south of the Chatham Rise that they attributed to differences in the flux of organic material to the sea-floor that resulted in organic-rich sediments north of the Chatham Rise and organic-poor sediments south of it. At a larger scale, these processes are likely to influence the distribution of widespread south-west Pacific species such as *Uroptychodes spinimarginatus*, *Uroptychus alcocki*, *Uroptychus australis*, and *Uroptychus scambus*.

CHIROSTYLIDAE FROM THE KERMADEC ISLANDS

The Kermadec Islands are an isolated group of geologically young islands and islets located nearly 800 km north-east of New Zealand between 29 and 31° S (Fig. 1). The islands are the emergent summits of a chain of active volcanic cones arising from the Kermadec suboceanic ridge created by westward collision and subduction of the Pacific Plate beneath the Australian Plate (e.g. Brook, 1998; Wright *et al.*, 2006). The ridge extends more or less continuously over a distance of 3000 km from the northern Tonga–Kermadec island arc to a continental margin system in New Zealand. It is flanked to the east by the 8000–10 000 m deep Kermadec Trench, and to the west by the 2500–3000 m deep Havre Trough, which separates the Kermadec Ridge from the parallel Colville Ridge, 175–200 km to the west.

The Kermadec Islands are of considerable biogeographical interest because they are equidistant

between temperate New Zealand and tropical Tonga. Benthic fish and invertebrate communities have mostly been characterized as a mix of tropical, subtropical and temperate (mostly widespread) species with a relatively low proportion of endemism in most taxa (Chilton, 1911; Schiel, Kingsford & Choat, 1986; Brook, 1998, 1999; Marshall, 2004; Gardner *et al.*, 2006; for shallow [< 50 m] and Blankenship *et al.*, 2006; Cleva & van Wormhoudt, 2006; McKnight, 2006; Takeda & Webber, 2006 for deep-water taxa). However, bryozoan (Gordon, 1984) and echinoderm (Clark & McKnight, 2001) communities are characterized by the relatively large proportion of perceived endemic species (32 and 38%, respectively) indicating the potential for in situ evolution along the deep ridge system. However, most previous ecological and biogeographical studies of the Kermadec Islands have focused on the shallow-water benthic communities and very little is known on taxa that inhabit depths beyond the shelf edge, such as chirostylids.

Three species of Chirostylidae were previously known from the Kermadecs [*Uroptychodes spinimarginatus*, *Uroptychus politus*, and *Uroptychus* sp. (paralectotypes of *Uroptychus australis*)]. Here, records of *Uroptychus australis* (Henderson, 1885) and *Uroptychus alcocki* (Ahyong & Poore, 2004), the six new species (from a depth range of 165 to 1225 m), and a further two new species (K. Baba, pers. comm.) bring the chirostylid fauna of the Kermadec Islands to 13 species.

All previously known species collected around the Kermadec Islands have a wide south-west Pacific distribution but none of the endemic main New Zealand continental shelf species (*Gastroptychus novaezelandiae*, *Uroptychus maori*, *Uroptychus novaezelandiae*, and *Uroptychus tomentosus*) have so far been found off the Kermadec Islands. This pattern corroborates earlier research on benthic invertebrate assemblages (including decapods) around the Kermadec Islands that found an overall depauperate fauna comprised of a mix of widespread tropical to temperate species, and that the most common New Zealand ‘continental’ species do not extend to the Kermadecs (Schiel *et al.*, 1986; Brook, 1999; Gardner *et al.*, 2006; Takeda & Webber, 2006). This was attributed to the biogeographical isolation, subtropical location, small range of habitats present, and the young geological history (Gardner *et al.*, 2006). The material examined here does not allow for estimates of abundances; they reflect 40 years of intermittent sampling effort and it appears that species densities are very low with most new species only recorded from a single site. However, six of the 11 now known chirostylids are endemic and/or rare, a proportion that exceeds endemism in echinoderms (38%, Clark & McKnight, 2001), bryozoans (32%, Gordon, 1984), and molluscs (19%, Brook,

1998) of the Kermadecs. It remains intriguing that neither of the genera *Eumunida* nor *Chirostylus*, apparent low-latitude genera, have been collected around the Kermadecs, a fact that may be attributed to the very low sampling intensity.

Chirostylidae are often found to be host-associated with other marine invertebrates such as pennatulaceans gorgonaceans, and antipatharians (Baba, 1974; Baba & Haig, 1990; Rice & Miller, 1991), which in turn are mostly limited to the steep rocky slopes of the seamounts, ridges, and continental margins. This may provide an additional limiting factor for wide distributions and high species densities across large distances, amplifying the isolated situation of islands such as the Kermadecs.

This is the first taxonomic research presenting New Zealand Chirostylidae since Baba's (1974) record. Approximately 30 undescribed species from the New Zealand region remain in New Zealand natural history collections and new records for more than 20 species remain to be documented in the future (K. E. Schnabel, unpubl. data). Clearly, the current diversity is greatly underestimated, reinforcing the unique position and marine diversity of New Zealand.

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