

Squat lobsters (Crustacea: Decapoda: Anomura: Galatheidae) from Singapore, with description of a new species of the genus *Galathea* Fabricius, 1793

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Abstract. Five species of squat lobsters of Galatheidae are reported on the basis of material mainly collected during the Comprehensive Marine Biodiversity Survey of Singapore in 2013. *Allogalathea longimana* Cabezas, Macpherson & Machordom, 2011 is reported for the first time from Singapore. *Galathea johnsoni*, n. sp., is distinguished from its closest congeners, *G. aculeata* Haswell, 1882 and *G. peitho* Macpherson & Robainas-Barcia, 2015, by the shape of the carapace and the lengths of the distomesial spine on the first antennal article and meri of the ambulatory legs.

Key words. Crustacea, Galatheidae, *Allogalathea*, *Galathea*, new species, Singapore

INTRODUCTION

The family Galatheidae is one of the most diverse groups of decapod crustaceans (Macpherson & Baba, 2011; Macpherson & Robainas-Barcia, 2015). During the last decade, the group has been studied in various areas of the Pacific and Indian Oceans (e.g., Macpherson & Cleva, 2010; Cabezas et al., 2011; Macpherson & Robainas-Barcia, 2013, 2015), but the fauna of Singapore is still poorly known. Johnson (1970) recorded four species including a new species from Singapore: *Galathea aculeata* Haswell, 1882, *G. elegans* Adams & White 1848, *Galathea longimanooides* Johnson, 1970, and *G. spinosorostris* Dana, 1852. Among them, *G. elegans* was later transferred to the genus *Allogalathea* Baba, 1969, and the specimens of *G. spinosorostris* reported by Johnson (1970) were referred to *G. coralliophilus* Baba & Oh, 1990 (cf. Baba et al., 2008; Macpherson & Robainas-Barcia, 2015). Therefore, there are only two studies on galatheids from Singapore (Johnson, 1970; Baba & Oh, 1990). The Comprehensive Marine Biodiversity Survey of Singapore, organised by the National University of Singapore and National Parks Board of Singapore, collected many shallow-water crustaceans, including galatheids. Examination of the specimens has shown that they include five species in two genera. The present paper reports these species, with a description of a new species of the genus *Galathea* Fabricius, 1793.

MATERIAL AND METHODS

Postorbital carapace length (pcl), the indication of specimen size, is measured in the dorsal midline from the posterior margin of the orbit to the posterior margin of the carapace, and the breadth is between the largest lateral points, excluding spines. The length of the rostrum is measured from the tip to between the basal lateral incisions, and the breadth is between left and right lateral basal incisions. Total lengths of the pereopods are measured from the proximal margin of the merus to the tip of the dactylus. Article lengths of the chelipeds and ambulatory legs are measured along the dorsomesial and extensor margins, excluding spines but including rounded distal projections if present, respectively. The general terminology employed largely follows Baba et al. (2009, 2011) and Macpherson & Robainas-Barcia (2015). Abbreviations used in the text include: Mxp3 (third maxilliped), P1 (first pereopod, cheliped), and P2–4 (second to fourth pereopods, first to third ambulatory legs). The specimens examined are deposited in the Lee Kong Chian Natural History Museum, National University of Singapore (formerly the Raffles Museum of Biodiversity Research, Zoological Reference Collection; ZRC).

SYSTEMATICS

GALATHEIDAE Samouelle, 1819

Allogalathea Baba, 1969

Remarks. This genus was established by Baba (1969) for *Galathea elegans* and is characterised by the rostrum being extremely elongate, ventrally carinate, with five to nine small lateral teeth. The excavated orbit, and the endopod of uropod, are about as broad as long (cf. Macpherson & Baba, 2011). Recently, Cabezas et al. (2011) examined numerous specimens from various localities in the Indo-West Pacific

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and described three new species based on the molecular evidence and subtle morphological characters. The present material includes two species, of which *A. longimana* Cabezas, Macpherson & Machordom, 2011, is recorded for the first time from Singapore.

***Allogalatea elegans* (Adams & White, 1848)**

(Fig. 1A)

Restricted synonymy.

Galathea elegans Adams & White, 1848: pl. 12, fig. 7 (type locality: Corregidor Island, Philippines). — Johnson, 1970: 3.

Allogalatea elegans — Baba, 1969: 6, fig. 1. — Baba et al., 2008: 53 (compilation). — Cabezas et al., 2011: 256, figs. 2, 3, 6B (revision of the genus, selection of lectotype).

Material examined. Stn SD25, 01°21.48' N, 103°84.7' E, St. John's Island, 7.6 m, scuba diving, 22 May 2013, 1 ovigerous female (pcl 6.3 mm) [ZRC 2015.0084]; Stn SD68, 01°13.8' N, 103°50.25' E, Tekukor, 10 m, scuba diving, 25 May 2013, 1 male (pcl 5.3 mm) [ZRC 2015.0085]; Stn SD133, 01°13.318' N, 103°51.617' E, Kusu Island, 11 m, scuba diving, 31 May 2013, 1 male (pcl 4.7 mm) [ZRC 2015.0086]; Stn SD 167, 01°12.55' N, 103°47. 2' E, Pulau Jong, 15.4 m, scuba diving, 4 June 2013, 2 males (pcl 4.1, 4.4 mm), 1 ovigerous female (pcl 5.4 mm) [ZRC 2015.0087].

Coloration. In the material examined, there are different colour patterns on the carapace and abdomen. The general pattern is uniformly dark brown, with either one or two pair of narrow white stripes.

Distribution. Widely distributed in the Indo-West Pacific region, including Mozambique, Madagascar, Red Sea, Indonesia (Banda and Celebes Seas), Philippines, Taiwan, New Caledonia, Chesterfield islands, and Vanuatu; subtidal to depth of 120 m (Cabezas et al., 2011). The present material confirms the occurrence of *A. elegans* in Singapore, although Johnson (1970) previously reported this species.

Remarks. The present specimens agree well with the re-description of *A. elegans* by Cabezas et al. (2011).

***Allogalatea longimana* Cabezas, Macpherson & Machordom, 2011**

(Fig. 1B)

Galathea elegans — Haswell, 1882: 163. (not *Galathea elegans* Adams & White, 1848).

Allogalatea elegans — Miyake, 1982: 149, pl. 50, fig. 5.

Allogalatea longimana Cabezas, Macpherson & Machordom, 2011: 261, figs. 5, 6D (type locality: Musorstom 3, stn CP107, Philippines, 111–115 m).

Material examined. Stn SD45, 01°13.477' N, 103°51.361' E, Lazarus Island, 16.2 m, scuba diving, 23 May 2013, 1 ovigerous female (pcl 5.6 mm) [ZRC 2015.0088]; Stn SD145, 01°13.6' N, 103°44.8' E, Pulau Hantu, 11.7 m, scuba diving, 1 June 2013, 2 males (pcl 5.6–6.9 mm) [ZRC 2015.0089]; Stn SD167, 01°12.55' N, 103°47. 2' E, Pulau

Jong, 15.4 m, scuba diving, 4 June 2013, 1 male (pcl 5.4 mm) [ZRC 2015.0090].

Coloration. Body generally white, with three longitudinal dark brown stripes, extending on to abdomen (stripes each with narrow median, white line). P1 also white, lateral margin of merus brown. P2–4 entirely white.

Distribution. Japan, Philippines, and Australia; depths of 36–194 m (Cabezas et al., 2011). Now also from Singapore, 11.7–16.2 m depth.

Remarks. The specimens examined agree well with the original description of *A. longimana* provided by Cabezas et al. (2011). The species can be immediately distinguished from its other congeners by the long P1, being more than three times the length of the carapace and its palm about twice the finger length.

Galathea Fabricius, 1793

Remarks. The genus *Galathea* is most species-rich in the family Galatheididae and includes 144 species occurring in the Indian and Pacific oceans (Macpherson & Robainas-Barcia, 2015). As mentioned previously, Johnson (1970) recorded three species from Singapore (*G. aculeata*, *G. longimanoides*, and *G. spinosorostris*). Later, Baba & Oh (1990) described *G. coralliophilus* for the specimens which had been referred to *G. spinosorostris* by Johnson (1970). The present material includes three species. Johnson's (1970) specimen reported as *G. aculeata* probably belongs to a new species described below.

***Galathea coralliophilus* Baba & Oh, 1990**

(Fig. 1C)

Restricted synonymy.

Galathea coralliophilus Baba & Oh, 1990: 358, fig. 1 (type locality: Raffles Lighthouse, Singapore, tidal). — Baba et al., 2008: 68 (compilation). — Dong & Li, 2010: 9, fig. 5. — Macpherson & Robainas-Barcia, 2015: 91.

Material examined. Stn MF61 (61044 to 61045), 01°10.999' N, 103°43.480' E, Pulau Pawai, southern mangrove, mudflat, 0.4–0.8 m, 10 June 2012, 2 males (pcl 2.2, 3.9 mm) [ZRC 2015.0091]; Stn SW10, 01°12.928' N, 103°51.099' E, St John's Island, DRTech, 0.2–0.8 m, 21 May 2013, 1 female (pcl 3.7 mm) [ZRC 2015.0092]; Stn SD40, 01°12.389' N, 103°45.24' E, Pulau Semakau, 7.5 m, scuba diving, 23 May 2013, 1 ovigerous female (pcl 2.9 mm) [ZRC 2015.0093]; Stn SB41, 01°12.389' N, 103°45.24' E, Pulau Semakau, 5 m, scuba diving, 23 May 2013, 1 male (pcl 3.3 mm), 1 ovigerous female (pcl 3.0 mm) [ZRC 2015.0094]; Stn SD45, 01°13.477' N, 103°51.361' E, Lazarus Island, 16.2 m, scuba diving, 23 May 2013, 3 females (pcl 2.4–4.0 mm), 2 ovigerous female (pcl 3.1, 4.9 mm) [ZRC 2015.0095]; Stn SD54, 01°13.9' N, 103°52.00' E, Kusu Island, 7.8 m, scuba diving, 24 May 2013, 1 male (pcl 2.3 mm), 2 females (pcl 2.5, 2.7 mm), 3 ovigerous females (pcl 3.4–3.6 mm) [ZRC 2015.0096]; Stn SB55, 01°13.9' N, 103°52.00' E, Kusu Island, 4 m,

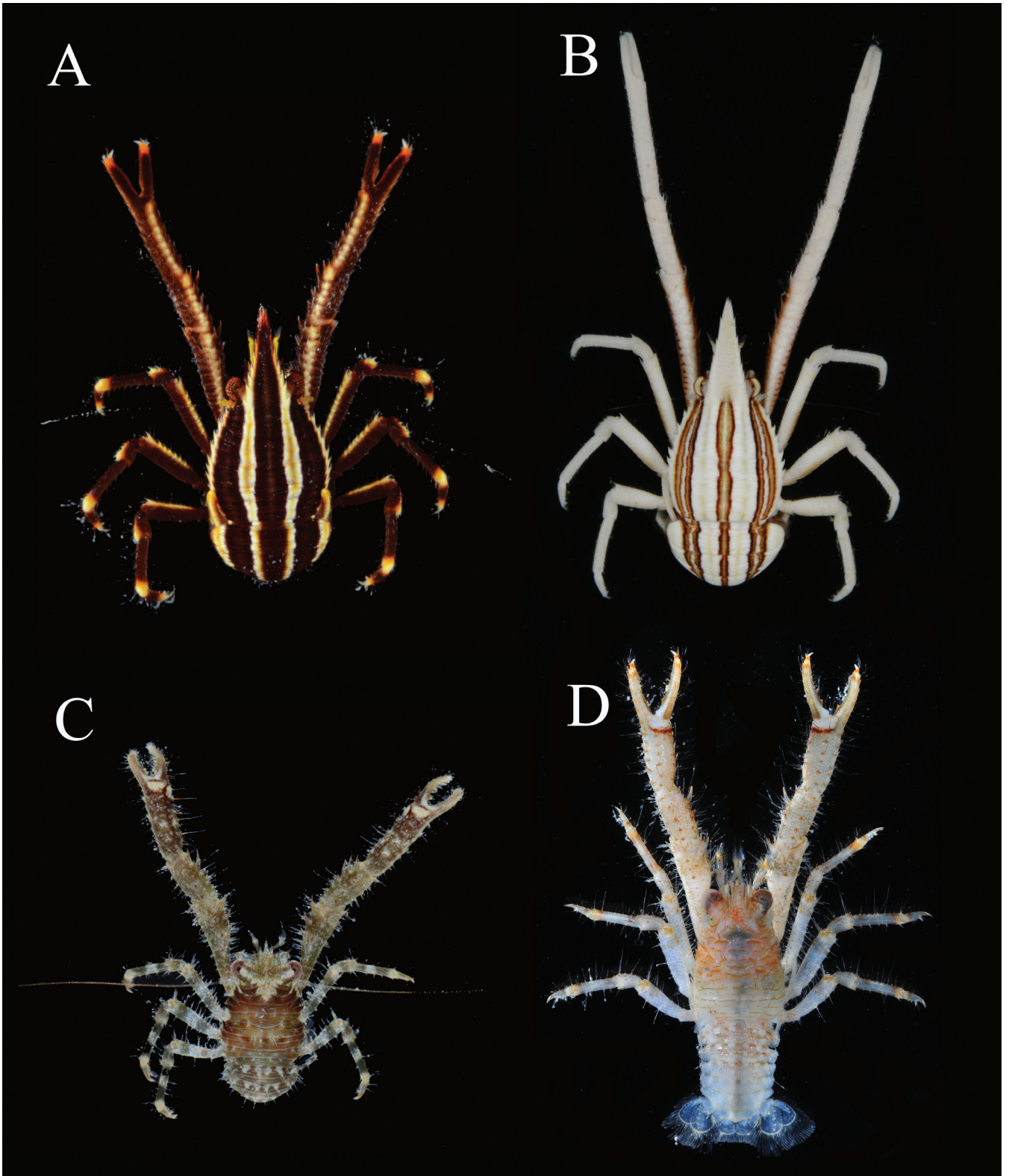


Fig. 1. Colour of living animals, dorsal view. A, *Allogalatea elegans*, ovigerous female (pcl 5.4 mm, ZRC 2015.0087); B, *Allogalatea longimana*, ovigerous female (pcl 5.6 mm, ZRC 2015.0090); C, *Galathea coralliophilus*, male, (pcl 3.6 mm, ZRC 2015.0106); D, *Galathea johnsoni*, new species, paratype, male (pcl 3.2 mm, ZRC 2015.0111).

24 May 2013, scuba diving, 3 males (pcl 2.7–3.2 mm), 1 female (pcl 1.3 mm), 4 ovigerous females (pcl 2.9–3.5 mm) [ZRC 2015.0097]; Stn IT82, 01°12.789' N, 103°50.187' E, Big Sister's Island, 0.5 m, 26 May 2013, 1 male (pcl 4.1 mm), 1 ovigerous female (pcl 3.7 mm) [ZRC 2015.0098]; Stn SW117, 01°13.116' N, 103°51.079' E, St John's Island, DRTech, 0.4 m, 30 May 2013, 1 female (pcl 3.6 mm) [ZRC 2015.0099]; Stn IT122, 01°12.757' N, 103°45.227' E, Terumbu Raya, 0.5 m, 30 May 2013, 1 ovigerous female (pcl 3.5 mm) [ZRC 2015.0100]; Stn SB132, 01°13.9' N, 103°52.00' E, Kusu Island, 8 m, scuba diving, 31 May 2013, 2 males (pcl 2.3, 2.8 mm), 1 ovigerous female (pcl 2.8 mm) [ZRC 2015.0101]; Stn TB142, 01°17.838' N, 104°04.157' E, East Johor Strait, 28.7–28.8 m, beam trawl, 31 May 2013, 1 ovigerous female (pcl 2.4 mm) [ZRC 2015.0102]; Stn SB146, 01°13.6' N, 103°44.8' E, Pulau Hantu, 5–7 m, scuba diving, 1 June 2013, 1 ovigerous female (pcl 3.0 mm) [ZRC 2015.0103]; Stn SD150, 01°13.318' N, 103°51.617' E, Kusu Island, 10.7 m, scuba diving, 1 June 2013, 1 male (pcl 3.5 mm) [ZRC 2015.0104]; Stn SB152, 01°13.318' N, 103°51.617' E, Kusu Island, 11 m, scuba diving, 3 June 2013, 1 male (pcl 3.4 mm) [ZRC 2015.0105]; Stn SD177, 01°13.318' N, 103°51.617' E, Kusu Island, 16.3 m, scuba diving, 4 June 2013, 1 male (pcl 3.6 mm) [ZRC 2015.0106]; Stn DR198 (SEA-0019), 01°10.778' N, 103°47.443' E, south of Sebarok Island, 29.7 m, dredge, 3 September 2013, 1 male (pcl 2.8 mm) [ZRC 2015.0107]; Stn DR256 (SEA-2791), 01°14.421' N, 103°43.831' E, between Bukom Island and Terumbu Pempang Laut, 17.2–18.4 m, 18 December 2013, 1 male (pcl 3.1 mm) [ZRC 2015.0108]; Stn SB315 (SUB-0323), 01°09.613' N, 103°44.483' E, Raffles Lighthouse, 6–9 m, scuba diving, 8 March 2014, 1 male (pcl 2.7 mm) [ZRC 2015.0109].

Coloration. Body and P1–4 generally brown. Carapace with dark brown spots posteriorly; rostrum whitish. P1 with large spot of bluish white on distal part of palm.

Distribution. Indonesia (West Irian), Gulf of Thailand, Singapore, South China Sea, and Taiwan; intertidal to depths of 17 m (Baba & Oh, 1990; Dong & Li, 2010; Macpherson & Robainas-Barcia, 2015). The present specimens were obtained from rocky or sandy substratum at depths of 0.2–29.7 m.

Remarks. The specimens examined agree well with the original description of *G. coralliophilus* and its diagnostic key characters provided by Macpherson & Robainas-Barcia (2015). *Galathea coralliophilus* is the most common species of squat lobster in Singapore.

Galathea johnsoni, new species

(Figs. 1D, 2, 3)

Galathea aculeata — Johnson, 1970: 4, fig. 1a. (not *Galathea aculeata* Haswell, 1882).

Material examined. Stn 4713DR3, 1°13.099' N, 103°47.194' E, beside Pulau Jong, 43.3–74.6 m, dredge, 15 May 2013, holotype, male (pcl 4.6 mm) [ZRC 2015.0110]; Stn 4815DR1, 1°15.182' N, 103°48.482' E, west of Sentosa, 21 m, dredge,

11 January 2013, paratype, 1 male (pcl 3.2 mm) [ZRC 2015.0111]; Stn 4713DR1, 1°13.166' N, 103°47.141' E, next to Pulau Jong, near Semakau, 40.8 m, dredge, 15 May 2013, paratype, 1 ovigerous female (pcl 4.2 mm) [ZRC 2015.0112]; Stn TB186, 1°09.318' N, 103°44.200' E, Near Raffles Lighthouse, 35–37.9 m, beam trawl, 5 June 2013, paratype, 1 male (pcl 4.1 mm) [ZRC 2015.0113].

Description. Carapace (Fig. 2A, B) with ridges bearing row of short setae and some moderately long setae, postorbital carapace as long as broad or slightly broader than long. Cervical groove distinct, laterally bifurcated. Gastric region with ridges scale-like or in concentric arcs; epigastric region with two submedian spines; median protogastric region unarmed (paratypes) or with two small spines (holotype). One hepatic spine and one parahepatic spine, and one anterior branchial spine on each side. Anterior branchial region with short or small, occasionally scale-like, ridges. Mid-transverse ridge laterally interrupted, preceded by shallow cervical groove, followed by 5 (paratypes) or 6 (holotype) main ridges including posterior submarginal ridge, with two transverse ridges running across cardiac region and laterally interrupted; much shorter ridges between main ridges. Lateral margins gently divergent toward base of posteriormost spine, with eight spines (two in front of and six behind anterior cervical groove); first spine anterolateral, second spine small, additional strong spine ventral to between first and anterior branch of cervical groove; three spines on anterior branchial margin and three spines on posterior branchial margin, last spine usually smaller than others. External orbital limit ending in small spine, infraorbital margin with three small spines (Fig. 2C, G). Rostrum (Fig. 2A, B) moderately elongate, triangular, 1.4–1.8 times as long as broad, 0.3 entire carapace length and breadth 0.4 that of carapace, nearly horizontal in lateral view; distance between distal-most lateral incisions 0.2–0.3 distance between proximal-most lateral incisions; dorsal surface with small setiferous ridges; lateral margin with 4 deeply incised sharp teeth.

Pterygostomian flap with long, longitudinal ridges, anterior margin terminating in small spine (Fig. 2G).

Thoracic sternum as long as broad, lateral extremities gently divergent posteriorly. Sternite 3 (Fig. 2D) oblong in general outline, slightly narrower than anterior margin of sternite 4; anterior margin with median V-shaped cleft; surface with short ridges. Sternite 4 (Fig. 2D) with anterior margin concave; surface with 3 granular, transverse ridges, anterior 2 ridges widely interrupted medially. Sternites 5–7 nearly smooth on surface.

Abdomen (Fig. 2E, F) with row of short setae and some moderately long setae on each transverse ridge. Somite 1 with blunt transverse ridge anteriorly; short, slightly elevated ridge on each posterolateral side. Somite 2 and 3 each with 2 transverse ridges on tergite, anterior ridge more distinctly elevated than posterior ridge. Somites 4 with anterior ridge only. Somites 5 and 6 each with a pair of obsolete ridges anterolaterally. Somite 6 with posteromedian margin straight. Telson (Fig. 2F) incompletely subdivided into 7 platelets by

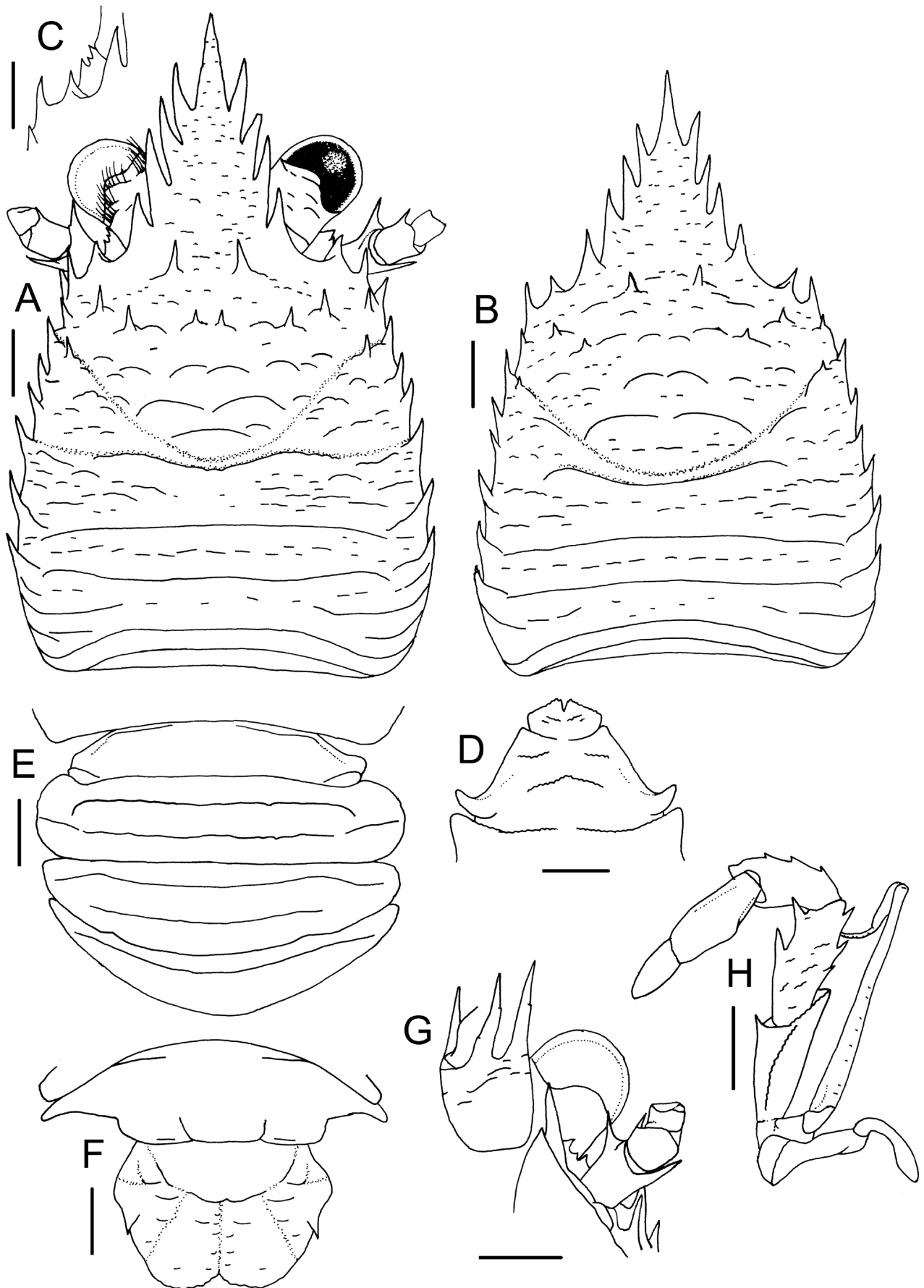


Fig. 2. *Galathea johnsoni*, new species, holotype, male (pcl 4.6 mm, ZRC 2015.0110) (A, C–H); paratype, ovigerous female (pcl 4.2 mm, ZRC 2015.0112) (B). A, carapace, eyes, and antennal peduncles, dorsal view; B, carapace, dorsal view; C, left anterolateral part of carapace, showing orbit, dorsal view; D, thoracic sternites 3 and 4, ventral view; E, abdominal somites 1–4, dorsal view; F, abdominal somite 6 and telson, extensor view; G, left part of cephalothorax, showing antennular and antennal peduncles, and anterior part of pterygostomial flap, ventral view; H, left Mxp3, lateral view. Setae omitted except on dorsal surface of left ocular peduncle. Scale bars = 1.0 mm.

shallow sutures, weakly calcified posteriorly; surface with short and moderately long ridges on anterior half; lateral margins convex proximally, each with small median spine or obtuse angle (males) or unarmed (female); posterior margin with distinct median notch. Males with two pairs of gonopods on somites 1 and 2.

Ocular peduncles (Fig. 2A) 1.4 times longer than broad in dorsal view; corneas not dilated, maximum diameter 0.7 rostrum width; eyelashes composed of sparse, short setae.

Antennular peduncle with article 1 (Fig. 2G) armed with three well-developed spines, distodorsal spine largest; distomesial spine somewhat smaller and more slender than distolateral spine. Ultimate article with tuft of short setae on dorsodistal margin.

Antennal peduncle (Fig. 2G) moderately short. Article 1 armed with distomesial spine nearly reaching distal margin of article 4. Article 2 with two well-developed distal spines, distolateral spine slightly longer than distomesial spine and exceeding midlength of article 3. Article 3 with small distomesial spine dorsally. Article 4 unarmed.

Mxp3 (Fig. 2H) relatively slender. Ischium with small distoflexor spine; crista dentata with 23–25 denticles. Merus slender, as long as ischium in maximum length; flexor margin with two strong spines of subequal size, proximal spine located at mid-length, distal spine at terminal end; extensor margin with three spines, proximal spine smallest. Carpus with three minute spines or small protuberances on extensor margin. Propodus convex on medioflexor margin. Dactylus moderately elongate. Exopod overreaching distal margin of carpus.

P1 (Fig. 3A–C) 1.8 (paratype female) – 2.1 (holotype male) times entire carapace length, with short to moderately long, simple and plumose setae arising from numerous ridges and bases of spines; setae non-iridescent. Merus 0.6 carapace length, 1.5 (holotype male) – 1.7 (paratype female) times as long as carpus, with spines arranged roughly in longitudinal rows, mesial and distal spines prominent. Carpus 0.8 (holotype male) – 1.0 (paratype female) length of palm, 1.8 (holotype male) – 2.7 (paratype female) times as long as broad; dorsal surface with two longitudinal rows of irregularly-arranged, small spines; mesial and lateral surfaces each with median row of three or four spines, distomesial spine prominent; ventromesial margin with row of four small spines. Palm 1.8 (holotype male) – 2.7 (paratype female) times longer than broad, with lateral and mesial margins subparallel; dorsal surface with two rows of small spines along mesial margin and laterally to midline; dorsolateral row of spines continued on to whole lateral margin of fixed finger; ventrolateral and ventromesial margins each with row of irregularly arranged spines; ventral surface with 2 small spines on distal third. Fingers distally crossing when closed, two terminal teeth of fixed finger accommodating opposing distal spine of movable finger between, each finger distally spooned and with small blunt tooth ventrally (Fig. 3D); opposable margins concave medially (males) or straight (female), with row of small, blunt

or subacute teeth (in males, fixed finger and dactylus with 1 and 2 prominent proximal teeth, respectively). Dactylus 0.8 (holotype male) – 1.3 (paratype female) length of palm, with row of small spines on dorsomesial margin; ventromesial margin with two small spines proximally.

P2–4 (Fig. 3E, F, H) moderately slender, with sparse, short to moderately long, simple and plumose setae. P2 1.0–1.2 times entire carapace length, subequal in length to P3. Meri successively shorter posteriorly (P3 merus 0.9 length of P2 merus, P4 merus 0.8 length of P3 merus); P2 merus 0.5 carapace length, 4.9–5.3 times as long as broad, 1.3–1.4 times longer than P2 propodus; P3 merus 4.3–4.4 times longer than broad, 1.1–1.2 times longer than P3 propodus; P4 merus 3.5–3.7 times as long as broad, 0.9–1.0 length of P4 propodus; extensor margins each with row of 9–11 (P2 and P3) and 5 or 6 (P4) proximally diminishing spines (spines on P4 arranged in lateral surface side except for distalmost spine); lateral surfaces with short to long, granular, transverse ridges, distoflexor margins each terminating in spine (strongest on P2), followed proximally by 1–3 spines and several elevated ridges. Carpi each with three or four (P2 and P3) spines and one distal (P4) spine on extensor margin; lateral surfaces each with two or three small spines sub-parallel to extensor margin; flexor distal margins each with a small spine. Propodi 5.4–6.1 times as long as broad; lateral surfaces with sparse, short ridges, and with one or two proximal small spines on only P2; extensor margins slightly crenulated, each with between two to four small spines on proximal half; flexor margins each with three to six (usually five) slender corneous spines; flexor distal margins each with another smaller spine on mesial side. Dactyli 0.4–0.5 length of propodi, each terminating in strong claw; flexor margins each with four or five proximally diminishing teeth, each tooth bearing slender corneous spine (Fig. 3G).

Epipods present on P1–3.

Coloration. (Fig. 1D). Body and P1–4 generally translucent white or pale red, ridges and spines on carapace and ambulatory legs reddish brown, scattered spots on rostrum and pereopods dark brown. Abdomen with row of white and reddish brown marks on each transverse ridge. P1 with dark red line on palm near base of dactylus, fingers light white along dorsal margins of cutting edges, with orange spot near base of each claw. P2–4 with pale light brown band on distal margin of each merus, carpi and propodi also each with pale light brown band distally, propodi each with pale reddish brown line on lateral midline.

Variation. As described above, the median protogastric region of the carapace has two small spines in the holotype and one male paratype (pcl 4.1 mm, ZRC 2015.0113), but such spines are absent in two other paratypes. P1 is longer and stouter in the three males examined than in the single female, and the opposable margins of the fingers are concave and armed with prominent proximal teeth in the males, unlike straight and with no large teeth in the female. The telson has a lateral spine or obtuse angle on each side in males, but the spine is absent in the female.

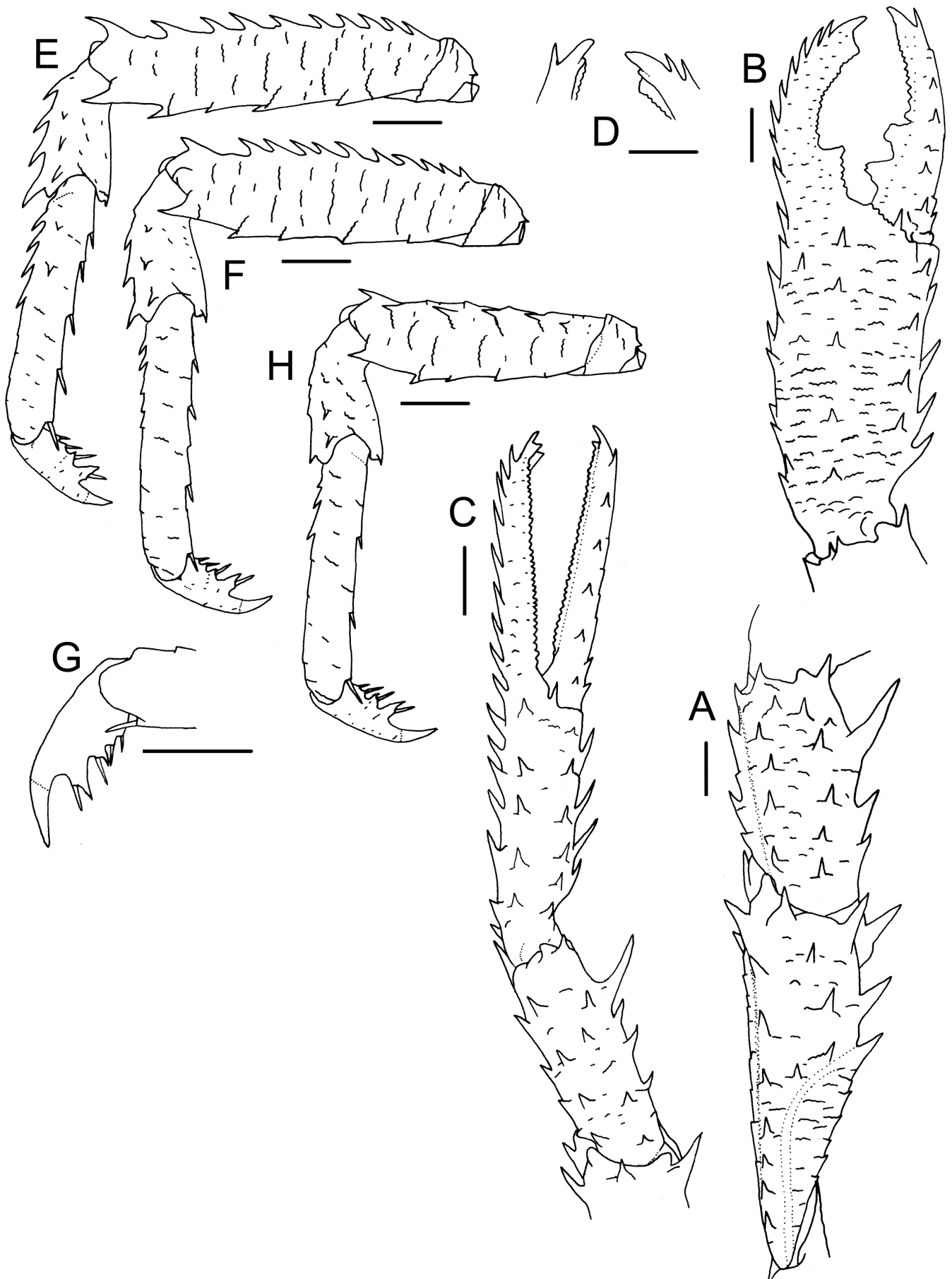


Fig. 3. *Galathea johnsoni*, new species, holotype, male (pcl 4.6 mm, ZRC 2015.0110) (A, B, D–H); paratype, ovigerous female (pcl 4.2 mm, ZRC 2015.0112) (C). A, left P1, merus and carpus, dorsal view; B, same, chela, dorsal view; C, same, carpus and chela, dorsal view; D, same, distal part of fingers, ventral view; E, left P2, lateral view; F, left P3, lateral view; G, same, dactylus, lateral view; H, left P4, lateral view. All setae omitted. Scale bars = 1.0 mm.

Distribution. At the present, known only from Singapore. The specimens examined were collected from rocky substrata at depths of 21–74.6 m.

Etymology. The present new species is named after Dr. Desmond S. Johnson for his contribution to the knowledge of Galatheidae as well as other decapod crustaceans in Singapore.

Remarks. *Galathea johnsoni*, new species, belongs to an informal group of the genus characterised by the carapace gastric region with scale-like ridges and epigastric spines, the anterior branchial region of the carapace with at least one spine on each side, and the epipod present on P1–3. The group includes six species in addition to the new species: *G. aculeata* Haswell, 1882, *G. johnsoni*, *G. lepidota* Macpherson & Robainas-Barcia, 2015, *G. peitho* Macpherson & Robainas-Barcia, 2015, *G. polydora* Macpherson & Robainas-Barcia, 2015, and *G. subsquamata* Stimpson, 1858. Among these species, *G. johnsoni* appears closest to *G. aculeata* and *G. peitho*. *Galathea aculeata* is reliably known only by the syntypes from Holborn Island and Port Molle in Queensland, Australia, and *G. peitho* are recorded from Australia, Papua New Guinea, Mariana Islands, and Japan (Macpherson & Robainas-Barcia, 2015). The three species have the carapace lacking a postcervical spine but with a spine between the anterolateral spine and anteriormost spine of the branchial margin and the P2–4 meri each armed with only one spine on the flexor side of the laterodistal margin. However, *G. johnsoni* is distinguished from the two described species by the following characters: 1) the carapace is broadest between the bases of the last lateral marginal spines, rather than the posterior second spines in *G. aculeata* and *G. peitho*; 2) the first article of the antennal peduncle has the distomesial spine nearly reaching the distal margin of the fourth article, instead of only exceeding the distal margin of the second article in the other two species; and 3) the meri of the ambulatory legs are more slender than those of *G. aculeata* and *G. peitho*; for example, the P2 merus is 4.9–5.3 times as long as broad in *G. johnsoni*, whereas it is noted only 2.9–3.2 [at most 3.2–3.4, judging from the figures for the article given by Macpherson & Robainas-Barcia (2015, figs. 4F, 81G)] times longer in the other two species.

Galathea johnsoni is further distinguished from *G. aculeata* by that the carapace excluding the rostrum is broader than or as broad as long, instead of longer in the latter species. The two transverse ridges running across the cardiac region of the carapace are interrupted laterally in *G. johnsoni*, unlike uninterrupted in *G. aculeata*. Johnson (1970) reported a specimen of *G. aculeata* from Singapore. Although his specimen is not available for study, it high probably belongs to the present new species based on the configuration of the carapace judging from his illustration (fig. 1a).

Galathea peitho differs from *G. johnsoni* in the Mxp3 merus being shorter than the ischium in the maximum length and unarmed on the extensor margin except for the distal spine. In *G. johnsoni*, the article is more slender and as long as the ischium and has three spines on the extensor margin.

Additionally, colouration in life is very different between the two species. The body and P1–4 are translucent brownish or greenish in *G. peitho*, whereas those are white or pale red in *G. johnsoni*. The bands on the P2–4 are reddish in *G. peitho*, instead of pale light brown in *G. johnsoni*.

Galathea longimanoides Johnson, 1970

(Fig. 4)

Galathea longimanoides Johnson, 1970: 6, figs. 1c–h (type locality: Johore Shoals, Singapore, 18.3 m). — Komai, 2000: 353 (list). — Baba et al., 2008: 72 (compilation). — Macpherson & Robainas-Barcia, 2015: 172, fig. 61.

Material examined. “*Galathea* nov. sp. cf. *longimana*”, no other data on label, 1 male (pcl 2.6 mm), 1 ovigerous female (pcl 3.1 mm) [ZRC 2015.0114]. Stn DR258 (SEA-3138), 103°40.135' N, 01°13.286' E, west of Jurong Island, 23.1–24.4 m, dredge, 19 December 2013, 1 male (pcl 2.3 mm) [ZRC 2015.0115].

Coloration. Johnson (1970) noted that “The ground colour is deep red or purple red. There is a conspicuous median, pale stripe, and there may be narrower lateral, longitudinal stripes”. A recently collected specimen (ZRC 2015.0115) unfortunately has no information on the fresh coloration.

Distribution. Known from Thailand, Singapore, and Vietnam; depths of 12–28 m (Macpherson & Robainas-Barcia, 2015). Johnson (1970) regarded *G. longimanoides* as a probable crinoid commensal based on the capture and coloration data. A specimen recently collected from Singapore was obtained by a dredge from rocky to muddy substratum at the depth of 23.1–24.4 m, together with asteroids and holothuroids but no crinoids.

Remarks. Johnson (1970) described *G. longimanoides* from Singapore based on the male holotype and an ovigerous female. Although Macpherson & Robainas-Barcia (2015) treated the specimens were lost; through a recent search of the ZRC collection, we found a lot containing one male and one ovigerous female labeled only “*Galathea* nov. sp. cf. *longimana*”. The male specimen agrees well with the original description and a recent account of *G. longimanoides* by Macpherson & Robainas-Barcia (2015) in the diagnostic aspect, and corresponds with the holotype of the species in the total carapace length including the rostrum (4.5 mm, pcl 2.6 mm). The carapace length of the female (5.0 mm, pcl 3.1 mm) is slightly larger than that given by Johnson (1970, 4.8 mm), but it can be treated as an acceptable error. Although the two specimens lack locality information on the label, the male is high probably considered the holotype of *G. longimanoides*. Selected morphological parts of the two specimens are herein illustrated for showing the specific status (Fig. 2). A topotypic male specimen of *G. longimanoides* was also obtained by the recent Comprehensive Marine Biodiversity Survey of Singapore.

The armature and ornament on the carapace vary in the four specimens examined (Fig. 4A, B). The epigastric spines are two in the two males, whereas they are five in the single

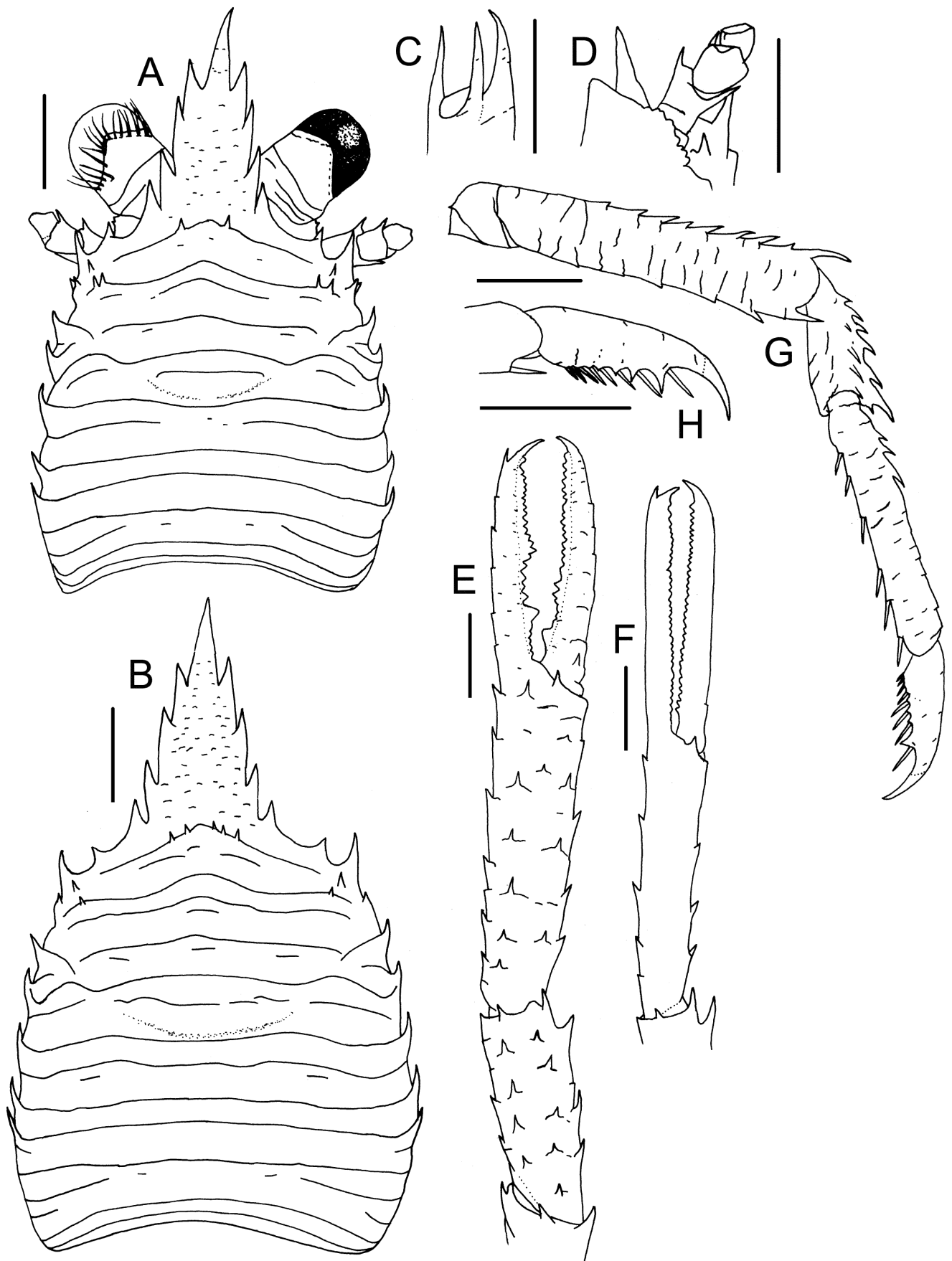


Fig. 4. *Galathea longimanoides* Johnson, 1970, male (pcl 2.6 mm, ZRC 2015.0114) (A, C–E, G, H); ovigerous female (pcl 3.1 mm, ZRC 2015.0114) (B, F). A, carapace, eyes, and antennal peduncles, dorsal view; B, carapace, dorsal view; C, left antennular peduncle, distal part of basal article, ventral view; D, left part of cephalothorax, showing antennal peduncle and anterior part of pterygostomian flap, ventral view; E, left P1, carpus and chela, dorsal view; F, same, chela, dorsal view (spines and ridges on surface omitted); G, detached ambulatory leg (probable P3), lateral view; H, same, dactylus, lateral view. Setae omitted except on dorsal surface of left ocular peduncle. Scale bars = 1.0 mm.

female. There are two parahepatic spines on each side in the larger male (probable holotype), but only one parahepatic spine is present in the smaller male and the female. The dorsal transverse ridges are stronger in the female than in the larger male. The chela is also somewhat stouter in the two males than in the female (Fig. 4E, F).

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