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Results of the Comprehensive Marine Biodiversity Survey International Workshops 2012 and 2013: Stomatopod Crustacea

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Abstract. Stomatopod Crustacea collected by the 2012 and 2013 marine biodiversity workshop surveys around Singapore are reported. Seventeen species in 12 genera and three families are reported, of which one species, *Gonodactylellus sentosa*, is new to science and eight are reported for the first time from Singapore (*Gonodactylellus viridis*, *Acanthosquilla derijardi*, *Alachosquilla vicina*, *Clorida decorata*, *Cloridina ichneumon*, *Dictyosquilla foveolata*, *Levisquilla jurichi* and *Quollastria subtilis*).

INTRODUCTION

The stomatopod crustaceans, commonly known as mantis shrimps, are a group of almost 500 extant species of marine predators arrayed in seven superfamilies and 20 families (Ahyong & Harling, 2000; Ahyong, 2001; Schram, 2010). In 2012 and 2013, scientific expeditions were conducted to characterise marine biodiversity around Singapore (see Tan et al., 2012 and this volume). The "northern expedition" focused on the Johor Straits in the vicinity of Pulau Ubin (October–November 2012) and the "southern expedition" targeted the Singapore Strait in the vicinity of St John's Island (May–June 2013). Sampling was conducted from the shore by hand, on scuba, and by dredge and trawl to a depth of 150 m. Small but significant collections of stomatopod crustaceans were made during these expeditions, including a species new to science and eight species reported here for the first time from Singapore waters.

MATERIAL AND METHODS

Morphological terminology and size descriptors follow Ahyong (2001, 2012). Total length (TL) is measured along the dorsal midline from the tip of the rostral plate to the apices of the submedian teeth of the telson. Carapace length (CL) is measured along the dorsal midline and excludes the rostral plate. Abdominal-width carapace-length index (AWCLI) is given as 100CL/width of abdominal somite 5. Synonymies are generally restricted to primary synonyms and regional works. Although specimens collected by the 2011 and 2013 expeditions form the basis of the study, additional specimens collected by other local surveys or from other localities are sometimes included to document new records. Material examined from Singapore is listed by locality in an approximately clockwise order starting with the northernmost localities. Specimens are deposited in the Lee Kong Chian Natural History Museum (ex Raffles Museum of Biodiversity Research), National University of Singapore (ZRC); the Australian Museum, Sydney (AM); Muséum national d'Histoire naturelle, Paris (MNHN), National Natuurhistorisch Museum, Leiden (RMNH); and the National Museum of Natural History, Smithsonian Institution, Washington D.C. (USNM).

SYSTEMATICS

Gonodactylidae Giesbrecht, 1910

Gonodactylellus Manning, 1995

Gonodactylellus sentosa sp. nov.

(Figs. 1, 3A)

Type material. Holotype: ZRC 2003.0684, female (TL 23 mm), Sentosa Reef, Singapore, in rock, coll. PKL Ng, December 1985.

Paratypes: ZRC 2015.0031, 1 male (TL 18 mm), western side, Pulau Semakau, 01°12.389'N, 103°45.24'E, 7.5 m, from encrusted coralline rock, SB41, SS-0376, coll. HH Tan et al., 23 May 2013; ZRC 1970.10.27.6, 1 female (TL 20 mm), Labuan, northern Borneo, coll. Singapore Museum staff, 1938.

Diagnosis. Mandibular palp 2-segmented. Telson with spiniform submedian denticles; lateral teeth indicated by distinct, triangular notch, apex acute, projecting well off margin of telson. Telson mid-dorsal carinae posteriorly armed, otherwise smooth; mid-dorsal carinae armed posteriorly; submedian tooth with 1 dorsal spine; intermediate tooth with 1 or 2 dorsal spines. Telson submedian and intermediate teeth with distinct ventral carina. Uropodal exopod proximal segment inner margin smooth, non-setose, with distal ventral spine; exopod distal segment inner margin

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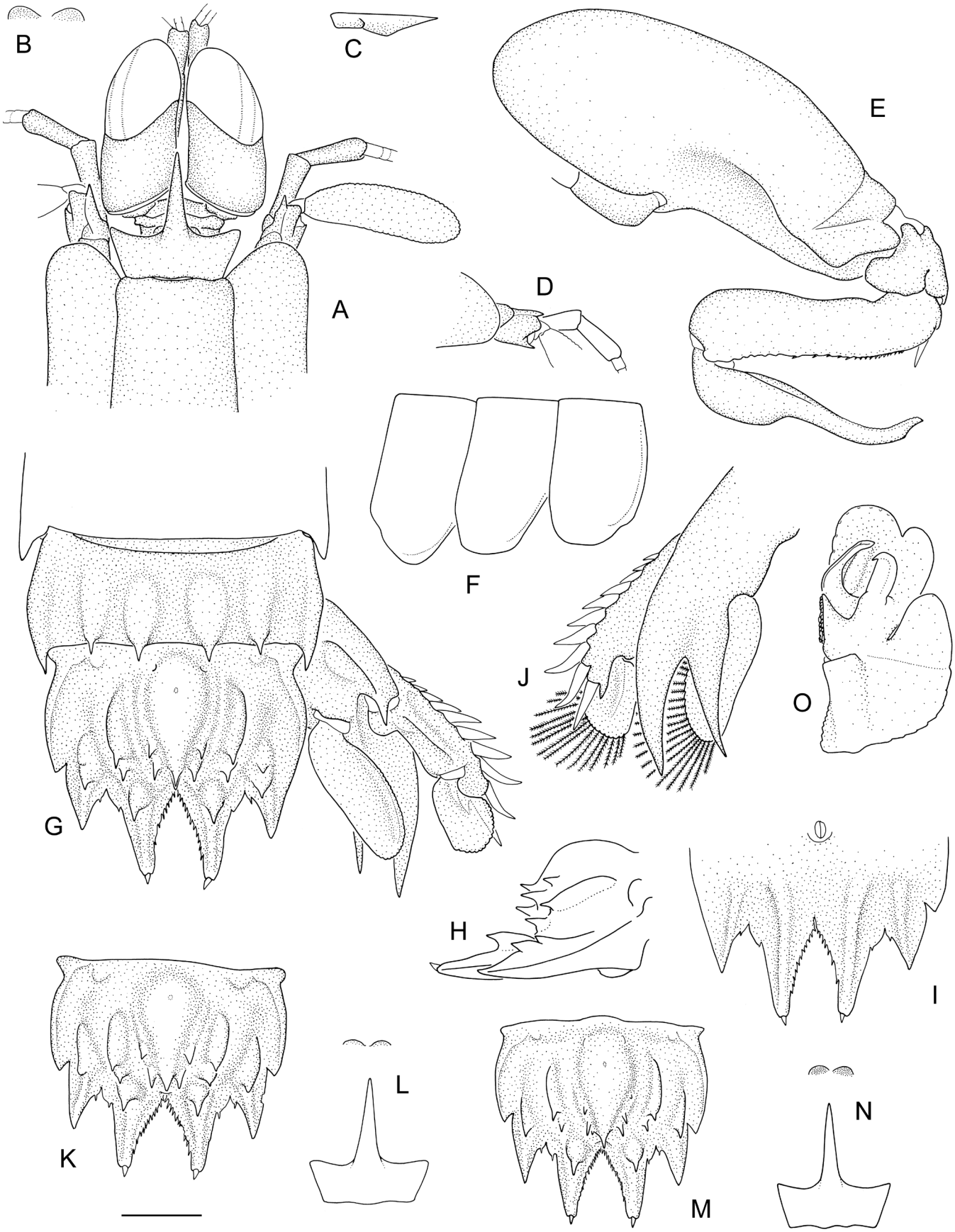

Fig. 1. *Gonodactylellus sentosa* sp. nov. A–J: female holotype, TL 23 mm, Sentosa Reef, Singapore (ZRC 2003.0684). K–L: female paratype, TL 20 mm, Labuan (ZRC 1970.10.27.6). M–O: male paratype, TL 18 mm, Pulau Semakau, Singapore, SB41 (ZRC 2015.0031). A, anterior cephalothorax; B, ocular scales; C, rostral plate, right lateral view; D, right antenna, lateral view; E, right raptorial claw; F, thoracic somites 6–8, lateral view; G, abdominal somites 5–6, telson and right uropod; H, telson, right lateral view; I, telson, ventral view; J, right uropod, ventral view; K, M, telson, dorsal view; L, N, ocular scales and rostral plate; O, right pleopod 1 endopod, anterior view. Scale bar = 1.0 mm (A, C–N); 0.5 mm (B, O).

smooth, non-setose. Uropodal endopod narrow, length less than 3 times width; inner margin smooth, non-setose.

Description. Eyes elongate; cornea subconical. Ocular scales low, rounded, separate. Antennular peduncle length 0.62–0.64CL. Antennal scale length 0.39–0.42CL.

Rostral plate slightly longer than wide; basal portion with slightly concave anterior margins; anterolateral margins angular; lateral margins divergent anteriorly; median spine about twice length of basal portion, laterally compressed, with obtusely angular ventral keel.

Raptorial claw dactylus without proximal notch on outer margin; propodus with proximal movable spine, opposable margin sparsely pectinate proximally.

Mandibular palp 2-segmented. Maxillipeds 1–5 each with epipod.

Thoracic somites 6 and 7 lateral processes subequal to or slightly broader than that of thoracic somite 6; lower margins subtruncate. Thoracic somite 8 anterolateral margin rounded; sternal keel obsolete.

Pleopod 1 endopod with lateral lobe on posterior 'endite'.

Abdominal somites 1–5 posterolateral angles unarmed. AWCLI 800–820. Abdominal somite 6 with submedian, intermediate and lateral bosses armed in all specimens.

Telson slightly wider than long; with 7–12 spiniform submedian denticles; intermediate teeth distinct, triangular, apices extending posteriorly to about midlength of submedian teeth; lateral teeth indicated by short, triangular notch, apex acute, projecting off margin of telson. Telson median carina not markedly inflated, similar in males and females, not obscuring accessory median carinae, with a group of up to 5 or 6 posterior spines (1 or 2 spines on median, 2 spines on each accessory median); anterior submedian carina with 2 spines in longitudinal row; submedian tooth armed dorsally with 1 spine; intermediate tooth with 1 or 2 dorsal spines; knob absent; submedian and intermediate teeth with distinct ventral carina.

Uropodal protopod terminal spines with length subequal; upper proximal surface with obtuse swelling behind dorsal carina. Uropodal exopod proximal segment outer margin with 10 movable spines, distalmost reaching or slightly exceeding apex of distal segment; inner margin smooth, non-setose; distal margin with ventral spine; exopod distal segment with outer margin setose, inner margin smooth, non-setose; ventral surface with slightly arcuate longitudinal carina. Uropodal endopod length 2.44–2.79 breadth, dorsally with low lateral carina; distal half of outer margin setose, remainder smooth, non-setose.

Colour in life (based on holotype). Overall light green with pale mottling or speckling on lateral surfaces of body; with 2 narrow, irregular, off-white transverse bands, one across carapace at position of cervical groove, and a second across posterior quarter of abdominal somite 6, continuing onto uropodal protopod. With 5 minute iridescent blue spots in uneven row across carapace behind white transverse band, submedian pair of spots with black outline, larger than others. Minute iridescent blue spot medially on thoracic somites 6 and 7 and abdominal somite 1, with pair smaller blue iridescent spots in transverse row on abdominal somite 3, and row of 3 spots across abdominal somites 4 and 5. Row of 4 iridescent blue spots across anterior margin of telson. Eyes green with irregular white mottling are 2 lines laterally. Antennae and antennules clear with few scattered white spots. Raptorial claw dactylus white, propodus translucent with pale reddish margins; carpus and merus green with white speckling or mottling. Meral spot white/colourless. Uropodal endopod pale with white mottling, marginal setae pink-red.

Measurements. Male (n = 1) TL 18 mm, female (n = 2) TL 20–23 mm. Other measurements of holotype: CL 4.7 mm, antennular peduncle length 2.9 mm, antennal scale length 1.9 mm, abdominal somite 5 width 3.7 mm.

Etymology. Named after the type locality, Sentosa Reef, Singapore; used as a noun in apposition.

Remarks. *Gonodactylellus sentosa* sp. nov. belongs to the group of species in the genus sharing upright dorsal spines on the telson surface (notably, with at least one conical spine or tubercle at the base of the submedian teeth of the telson), low ocular scales, and, in most species, smooth, non-setose inner margins of the uropodal exopod and endopod – the *G. molyneux* group (Ahyong & Erdmann, 2007). Of the *molyneux* group species, the new species resembles *G. barberi* Ahyong & Erdmann, 2007, and *G. snidvongsi* (Naiyanetr, 1987), sharing similar telson morphology and setation of the uropodal exopod and endopod. Of these, *Gonodactylellus sentosa* most closely resembles *G. barberi*, differing subtly but consistently in having a 2- instead of 3-segmented mandibular palp, rounded instead of anteriorly truncate ocular scales and more prominent lateral teeth on the telson. *Gonodactylellus sentosa* and *G. snidvongsi* share a 2-segmented mandibular palp, but the new species differs in having fewer dorsal telson spines (notably, only a single dorsal spine at the base of the submedian telson teeth versus a cluster of two, usually three or more spines), less prominent lateral teeth of the telson, and apparently maturing at a larger size. In *G. snidvongsi*, the numerous dorsal telson spines, including the cluster at the base of the submedian teeth are developed even in specimens as small as TL 13–14 mm, the lateral marginal teeth stand out markedly from the margin of the telson, and marked male dimorphism in the strongly inflated median carina of the telson is already evident by TL 14 mm. *Gonodactylellus sentosa* may also differ from *G. snidvongsi* and *G. barberi* in colour pattern by having only few, minute, iridescent blue spots on the dorsal surface of the body. In *G. barberi* and *G. snidsvongi*, the dorsal blue spots are more numerous and considerably larger (compare Fig. 3A with Manning, 1995: pl. 3, for *G. snidvongsi*, captioned as *G. hendersoni*; see also Ahyong & Erdmann, 2007).

The known distributions of *G. sentosa*, *G. snidvongsi* and *G. barberi* are discrete. *Gonodactylellus snidvongsi* appears to have a northern distribution, from the Gulf of Thailand and Vietnam. *Gonodactylellus sentosa* is presently known only between Singapore and northern Borneo, and *G. barberi* ranges from Sulawesi (Indonesia) to the southern Philippines. Thus, *G. snidvongsi* and *G. sentosa* occur on the Sunda Shelf, whereas the distribution of *G. barberi* is essentially Wallacean. Records from eastern Indonesia as *G. demani* (Henderson, 1893) (Holthuis, 1941) and from Bali as *G. snidvongsi* or *G. hendersoni* (Manning, 1967b) (Barber & Erdmann, 2000; Ahyong & Erdmann, 2007) represent an undescribed species presently under study.

The type specimens of *G. sentosa* agree closely, with the chief point of difference being the undeveloped right lateral tooth on the telson of the holotype, probably the result of moult irregularities. The holotype also has two spines on the intermediate carinae of the telson instead of one as in the paratypes, reflecting its larger body size. Marked sexual dimorphism in telson carinal inflation is not evident in the type series, being similar in the male (TL 18 mm) and females (TL 20–23 mm); whether such dimorphism in male *G. sentosa* is weakly expressed, or whether it develops in males above TL 18 mm remains to be determined.

Distribution. Singapore to Labuan, Borneo; shore to 7.5 m amongst encrusted coralline rock and boulders.

Gonodactylellus viridis (Serène, 1954)
(Fig. 3B)

Gonodactylus chiragra var. *viridis* Serène, 1954: 6, 7, 10, 74, 75, 76, 87, fig. 13-3 [type locality: Cauda Bay, Vietnam].
Gonodactylus viridis. — Manning, 1978a: 4, fig. 2a–c.
Gonodactylinus viridis. — Manning, 1995: 66–68, figs. 8c, d, 9c, 10e, 11c, 25a. — Moosa, 2000: 407, 419.
Gonodactylellus viridis. — Ahyong, 2001: 63–64, fig. 31.

Material examined. SINGAPORE: ZRC 1989.2874, 1 female (TL 26 mm), Labrador Beach, Singapore, amongst *Caulerpa*, coll. PKL Ng, October 1989; ZRC 1999.2121, 1 female (TL 50 mm), Sentosa Reef, Singapore, coll. PKL Ng, 1986; USNM 221928, 1 male (TL 55 mm), Singapore, coll. T Cronin, 1988; USNM 221926, 3 males (TL 42–48 mm), Singapore, coll. T Cronin, 1988; ZRC 2003.0309, 1 male (TL 41 mm), Lower Beach, Tanjong Gul, December 1951; ZRC, 1 female (TL 56 mm), Terumba Raya, intertidal reef, IT122, SS-3994, coll. CGS Tan et al., 30 May 2013. MALAYSIA: ZRC ex1970.10.14.1–20, 2 females (TL 27–32 mm), Pulau Aor, South China Sea, coll. MWF Tweedie, June 1938; AM P49688, 2 females (TL 16–24 mm), Paya Beach, Pulau Tioman, South China Sea, 02°46'N, 104°10'E, 2 m, *Padina* covered coral rubble, coll. J Lowry, 19 May 1997; ZRC 1970.10.14.21–28, 4 males (TL 29–47 mm), 4 females (TL 34–44 mm), Labuan, Borneo, coll. MWF Tweedie, August 1938.

Remarks. Although *Gonodactylellus viridis*, as presently understood, is a species complex (Ahyong et al., 2008; Ahyong, 2012), the present specimens represent *G. viridis* sensu stricto, representing the first formal records for Singapore and Malaysia. Specimens reported from Singapore as "*G. chiragra*" (e.g., Tan & Ng, 1988: 111) are clearly this species.

Distribution. Reported from Japan to Vietnam, the Philippines and New Caledonia, Australia, to Phuket, Andaman Sea; for the first time from Singapore and Malaysia; intertidal to shallow subtidal.

NANNOSQUILLIDAE Manning, 1980a

Acanthosquilla Manning, 1963

Acanthosquilla derijardi Manning, 1970
(Fig. 3C)

Acanthosquilla derijardi Manning, 1970: 1434–1438, fig. 2 [type locality: Grand Recif, Tuléar, Madagascar]. — Moosa, 1975: 8. — Moosa, 1991: 183. — Manning, 1995: 141, 143. — Moosa, 2000: 430, 431. — Ahyong, 2001: 144: fig. 70 [part, not Shelburne Bay specimens]; 2008: 50. — Ahyong et al., 2008: 44.
Acanthosquilla sirindhorn Naiyanetr, 1995: 409–417, pl. 1, figs. 1, 2 [type locality: Pattani, Gulf of Thailand].

Material examined. SINGAPORE: ZRC 2015.0032, 1 male (TL 55 mm), Big Sister's Island, intertidal sand burrow near rocky reef, yabby pump, IT81, coll. YL Lee et al., 26 May 2013.

Remarks. *Acanthosquilla derijardi* has a somewhat complicated history of synonymy, discussed in detail by Ahyong (2008) and Ahyong et al. (2008). Although Manning (1995), followed by Ahyong (2001), treated *Acanthosquilla manningi* Makarov, 1978, and *A. multispinosa* Blumstein, 1974, as junior synonyms of *A. derijardi*, subsequent studies showed them to be separate species (Ďuriš, 2007; Ahyong, 2008; Ahyong et al., 2008). The present specimen, representing *A. derijardi* sensu stricto, constitutes the first record of the species from Singapore. The dorsal row of telson spines consists of a median spine, three submedian spines and a lateral group of six spines.

Distribution. Widely distributed in the Indo-West Pacific from Madagascar and the Red Sea to Australia, New Caledonia and Taiwan; intertidal to 35 m (Moosa, 1975; this study).

Alachosquilla Schotte & Manning, 1993

Alachosquilla vicina (Nobili, 1904)
(Fig. 3D)

Lysiosquilla vicina Nobili, 1904: 229 [type locality: Obock, Red Sea].— Kemp, 1915: 176–179, pl. 1: figs. 4–8.
Alachosquilla vicina. — Schotte & Manning, 1993: 572. — Moosa, 2000: 432. — Ahyong, 2001: 147, fig. 72.

Material examined. SINGAPORE: ZRC 2015.0033, female (TL 44 mm), St John's Island, north lagoon, 01°13.116'N,

103°51.079'E, 0.0–0.5 m, yabby pump, burrow in muddy-sand, YB74, SS-1641, coll. A Anker et al., 25 May 2013.

Remarks. The present specimen is the largest known of the species and agrees well in all respects with published accounts (Kemp, 1915; Ahyong, 2001); both raptorial claws have 10 dactylar teeth. The orange ovaries are visible through the cuticle along length of thorax and abdomen.

Distribution. Red Sea and the Gulf of Aden to Australia, the Philippines and now from Singapore; intertidal to shallow subtidal depths.

Squillidae Latreille, 1802

Carinosquilla Manning, 1968

Carinosquilla lirata (Kemp & Chopra, 1921)
(Fig. 3E)

Squilla lirata Kemp & Chopra, 1921: 303–306, figs. 3–4 [type locality: Singapore]. — Chopra, 1934: 38–39. — Tweedie, 1934: 39. — Serène, 1954: 6, 8. — Ghosh & Manning, 1988: 658.
Carinosquilla lirata. — Moosa, 1975: 10. — Ahyong, 2001: 207; 2006: 312, fig. 2.
Keijia lirata. — Manning, 1995: 205–207, figs. 105c, 106c, 107c, 108c, 127, 128. — Moosa, 2000: 443.

Material examined. SINGAPORE: ZRC, 1 female (TL 60 mm), Terumbu Memban, intertidal rocky reef and sand, IT80, SS-2706, coll. CS Tan et al., 26 May 2013.

Remarks. The specimen agrees well with published accounts (Kemp & Chopra, 1921; Manning, 1995). Kemp & Chopra (1921), Chopra (1934) and Tweedie (1934) reported *Carinosquilla lirata* from Singapore.

Distribution. Vietnam, Thailand, Indonesia and Singapore to Madras, India; intertidal to 25 m (Serène, 1954; this study).

Carinosquilla multicarinata (White, 1848)
(Fig. 3F)

Squilla multicarinata White, 1848: 144, pl. 6, fig. 1 [type locality: the Philippines, by lectotype designation (Ahyong & Moosa, 2004)]. — Nobili, 1903: 38. — Kemp, 1913: 86–88, 196, pl. 6 figs 73–76. — Kemp & Chopra, 1921: 307. — Parisi, 1922: 102–103. — Tweedie, 1934: 39. — Serène, 1939: 344, 349.
Carinosquilla multicarinata. — Manning, 1991: 8–9; 1995: 175–178, pl. 31, figs. 105a, 106a, 107a, 108a, 109–111. — Moosa, 2000: 443. — Ahyong & Moosa, 2004: 63, fig. 1. — Ahyong, 2005: 206.

Material examined. SINGAPORE: ZRC, 1 male (TL 58 mm), East Johor Strait, 01°17.838'N, 104°04.157'E, 28.8–28.7 m, muddy gravel, dead shells, beam trawl, TB142, SS-2936, SC Lim et al., 31 May 2013; ZRC, 1 female (TL 58 mm), Singapore port limit, near eastern boarding ground A, 01°13.036'N, 103°52.820'E, 103–98 m, rocky gravel, beam trawl, TB29, SS-0350, SC Lim et al., 22 May 2013; ZRC, 1 female (TL 16 mm), off Kusu Island, Singapore port limit, near southern fairway, 01°12.273'N, 103°52.148'E, 142–79.3 m, rocky & white marine clay, beam trawl, TB159, 5213TB3-122, SS-0374, coll. SC Lim et al., 3 June 2013.

Remarks. The two larger specimens agree well with published accounts of adult *C. multicarinata* (see Kemp, 1913; Manning, 1995; Ahyong & Moosa, 2004). Dorsal carination in the 16 mm juvenile is rudimentary: most of the supplementary carinae are yet to develop and only the median, submedian, intermediate and lateral carinae terminate in spines. Nevertheless, the chief diagnostic characters of the species are recognisable: the transverse carinae on thoracic somite 5 are well developed; the apex of the prelateral lobe, whilst not yet a spine, is a small point; and the mandibular palp is present, although as yet only represented by a tiny bud. *Carinosquilla multicarinata* was previously reported from Singapore by Kemp & Chopra (1921) and Manning (1991).

Distribution. Japan to Vietnam, the Philippines, Thailand, Malaysia, Singapore and the north-eastern Indian Ocean; 8 m to at least 79 m (Serène, 1939; present study).

Clorida Eydoux & Souleyet, 1842

Clorida decorata (Wood-Mason, 1895)
(Fig. 4A, B)

Clorida decorata Wood-Mason, 1895: 231 [type locality: Port Blair, Andaman Islands]. — Blumstein, 1974: 115. — Makarov, 1979: 48–50, fig. 3. — Manning, 1995: 186, figs. 116, 117, 118c–d. — Ahyong et al., 1999: 42, fig. 3. — Moosa, 2000: 437–438.
Squilla decorata. — Kemp, 1913: 3, 10, 20, 27, pl. 1: figs. 13–16. — Tweedie, 1934: 34–35.

Material examined. SINGAPORE: ZRC, 1 male (TL 46 mm), 2 females (TL 45–55 mm), Bedok, Singapore, coll. RL Chermin, 2 January 1957; ZRC 1999.2322, 1 male (TL 37 mm), Singapore area, SFRS; ZRC 2013.0664, 1 female (TL 46 mm), off Tanjung Rhu, 0116.712–16.594'N, 103°54.392–53.868'E, 22.7–23.7 m, beam trawl, 5416TB1-002, 14 January 2013; ZRC, 1 male (TL 45 mm), Marina East, 01°17.029'N, 103°53.018'E, dredge; ZRC, 1 female (TL 17 mm), marina barrage outside Marina Bay, 01°16.415'N, 103°52.838'E, 19.6–19.4 m, rectangular dredge, coll SC Lim, 22 May 2013; ZRC, 1 female (TL 30 mm), near Sentosa, beside Rasa Sentosa, 01°15.182–15.020'N, 103°48.482–48.739'E, 21 m, sandy, rectangular dredge, CMBS 4815DR1-010, 11 January 2013; ZRC, 1 male (TL 73 mm), near Sentosa, beside Rasa Sentosa, 01°15.232–14.910'N, 103°48.475–48.825'E, 20.1–17.7 m, beam trawl, CMBS 4815TB1-021, 11 January 2013.

Remarks. The present series agrees well with published accounts (Wood-Mason, 1895; Kemp, 1913; Manning, 1995; Ahyong et al., 1999). As reported by Ahyong et al. (1999) for material from Macau, the angular anterolateral margin of the lateral process of thoracic somite 7 varies from obtuse to acute. The abdominal submedian carinae are developed in all specimens and the petasma is well developed in all males. The ventral carinae on the telson are well developed in all specimens examined except the juvenile female (TL 17 mm). Tweedie (1934) reported *C. decorata* from Penang, Malaysia.

Sexual dimorphism is evident in the inflated telson carinae and tubercles of large males compared to the proportionally uninflated ornamentaion in females (Fig. 4A, B).

Distribution. Andaman Islands, the Gulf of Thailand, Vietnam, Macau and Penang, Malaysia; a new record for Singapore; 7–62 m (Blumstein, 1974; Kemp, 1913).

Cloridina Manning, 1995

Cloridina ichneumon (Fabricius, 1798)
(Fig. 2, 4C)

Squilla ichneumon Fabricius, 1798: 416 [type locality: Bombay, India, by neotype selection (Holthuis, 2000)]. — Kemp, 1913: 205. — Holthuis, 2000: 16.
Squilla microphthalma H. Milne Edwards, 1837: 523 [type locality: Bombay, India, by lectotype designation (Ahyong, 2001)]. — Kemp, 1913: 31–33, pl. 1 figs 17–20. — Holthuis, 1941: 242.
Chloridella microphthalma. — Wood-Mason, 1895: 8–9, pl. 4: figs 1–5.
Clorida microphthalma. — Tirmizi & Manning, 1968: 29–31, fig. 11. — Moosa, 1991: 203–204.
Cloridina microphthalma. — Manning, 1995: 191. — Moosa, 2000: 439–440.
Cloridina ichneumon. — Holthuis, 2000: fig. 3. — Ahyong, 2001: 230, 231; 2005: 206.

Material examined. SINGAPORE: ZRC 1994.3570–3572, 3 females (TL 15–32 mm), Sungei Ponggol, Singapore, stn 3, dredge 5, 1 June 1994; ZRC 1996.682, 1 female (TL 14 mm), Sungei Ponggol, Singapore, stn 4, dredge 1, Reef Ecology Study Team, 27 June 1995; ZRC 1996.699, 2 females (TL 13–14 mm), Sungei Ponggol, stn 4 dredge 2, REST, 27 June 1995; ZRC 2013.0673, 1 male (TL 69 mm), Pulau Ubin, between OBS Camp 1 and Camp 2, 01°24.983'N, 103°56.021'E, intertidal, yabby pump, JS1454, SW48, coll. A Anker et al., 20 October 2012; ZRC 1990.4328, 1 female (TL 27 mm), Pulau Tekong, Singapore, dredge stn 6, 27 March 1987; ZRC 1994.449, 1 female (TL 43 mm), Gul Basin, Singapore, stn E, grab 3, coll. Reef Ecology Study Team, 5 November 1993; ZRC 1990.8402, 1 male (TL 28 mm), Kallang Basin, Singapore, dredge, stn 5, coll. Reef Ecology Study Team, 22 February 1989; ZRC 1993.5343, 1 male (TL 26 mm), Kallang Basin, Singapore, dredge 2, stn 6, coll. Reef Ecology Study Team, 4 June 1993; ZRC 1992.9079, 1 male (TL 57 mm), Singapore River, stn 1, dredge 1, 5 November 1992; ZRC, 1992.9098, 1 female (TL 38 mm), Singapore River, station 7, dredge 1, 5 November 1992; ZRC, 1 female (TL 17 mm), between Pulau Semakau & Pulau Bakom, 01°12.391–12.831'N, 103°46.326–46.432'E, 9.9–14 m, rectangular dredge, CMBS DR4612A-009, coll. HH Tan et al., 17 August 2012. INDIA: RMNH S1164, male (TL 44 mm), Bombay (neotype of *Squilla ichneumon* Fabricius, 1798); MNHN St. 481, female (broken, CL 11.3 mm), Bombay, coll. Roux (lectotype of *Squilla microphthalma* H. Milne Edwards, 1837).

Remarks. The identity of *Squilla ichneumon* Fabricius, 1798, long considered a species inquirendum, was fixed by neotype selection (Holthuis, 2000) and determined as a senior subjective synonym of *Cloridina microphthalma* (H. Milne Edwards, 1837). Holthuis (1941) listed *C. ichneumon* (as *C. microphthalma*) from Singapore; that record, however, was based on Miers' (1880) misinterpretation of Eydoux & Souleyet's (1842) remarks comparing their newly described *C. latreillei* from Singapore, with *C. microphthalma*. The present records are therefore the first of the species from Singapore, agreeing well with the neotype of *C. ichneumon* and published accounts (as *C. microphthalma*) (Wood-Mason, 1895; Kemp, 1913; Tirmizi & Manning, 1968). The anterolateral spines of the carapace are well developed in all specimens including the TL 14 mm female. The mandibular palp is present as a tiny bud in the 17 mm juvenile female, but is well-developed in larger specimens. The petasma is developed in males TL 28 mm or larger. The post-anal carina is either absent or faintly indicated and the raptorial claw has 4 or 5 dactylar teeth, usually 5. When 5 dactylar teeth are present, the proximal-most tooth is considerably smaller than the adjacent tooth (Fig. 2D). *Cloridina ichneumon* (primarily under the name *C. microphthalma*) has been frequently reported but seldom illustrated, so the TL 57 mm and TL 69 mm males are figured here (Fig. 2, 4C). Sexual dimorphism in the form of inflated telson carinae is evident in adult males, being most pronounced in the TL 69 mm specimen.

Distribution. East Africa to India, the Andaman Sea, Gulf of Thailand, the South China Sea and New Caledonia; a new record for Singapore; intertidal to 64 m (Blumstein, 1974; Manning, 1990).

Cloridopsis Manning, 1968

Cloridopsis scorpio (Latreille in Latreille, Le Peletier, Serville & Guérin, 1828)
(Fig. 4D)

Squilla scorpio Latreille in Latreille, Le Peletier, Serville & Guérin, 1828: 472 [type locality: Pondicherry, India]. — Lanchester, 1900: 264; 1901: 554. — Balss, 1910: 8. — Kemp, 1913: 3, 10, 21, 42–44, pl. 2: fig. 30. — Kemp & Chopra, 1921: 300. — Tweedie, 1934: 36–37. — Chuang, 1961: 180, pl. 82.
Cloridopsis aquilonaris Manning, 1978a: 28–30, fig. 14 [type locality: Japan].
Cloridopsis scorpio. — Blumstein, 1974: 118. — Moosa, 1975: 11. — Manning, 1995: 196. — Ahyong et al., 1999: 42–46, fig. 4a–k. — Moosa, 2000: 441. — Ahyong, 2005: 206. — Ahyong et al., 2008: 91–94, fig. 70.
Oratosquilla sp. — Tan & Yeo, 2003: 141–142.

Material. SINGAPORE: ZRC 2013.0667, 1 female (TL 71 mm), Pulau Ubin, 01°24.495'N, 103°57.130'E, CMBS-trap, (Photo-055), RMBR internal barcode ID107559, 7 March 2012; ZRC 2013.0669, 1 female (TL 57 mm), Chek Jawa, 01°24.4275'N, 103°59.5642'E, mudflat bear boardwalk, JS-0734, SW13, 16 October 2012; ZRC 2013.0668, 1 female (TL 47 mm), Chek Jawa, mudflat near boardwalk, 01°24.4275N, 103°59.5642E, JS-0674 PT, 16 October 2012; ZRC 2013.0672, 1 female (TL 61 mm), Sungei Puaka, shrimp trap left overnight, CMBS-N19, 8 March 2012; ZRC 2013.0670, 1 female (TL 106 mm), Sekudu, Pulau Ubin,

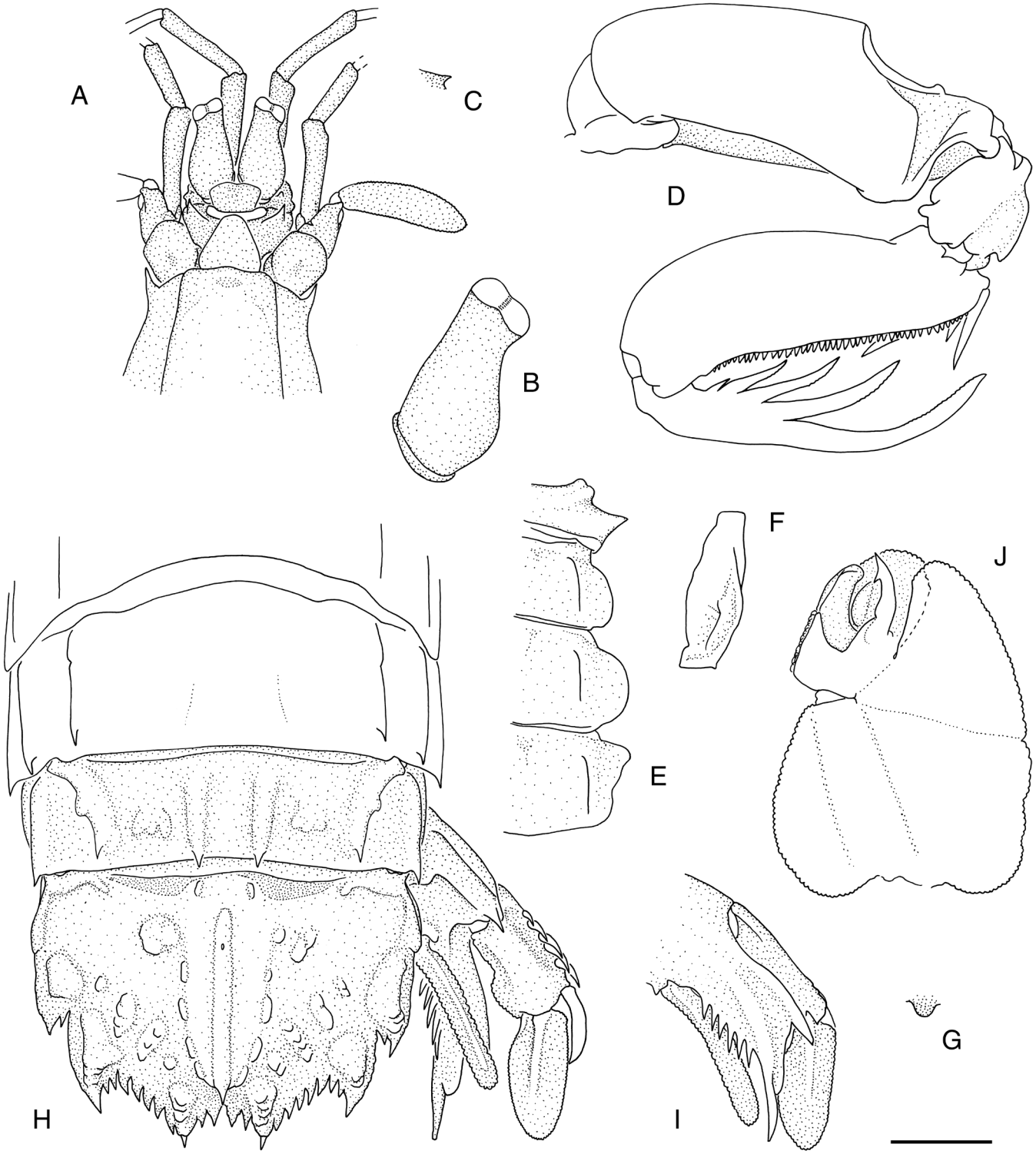

Fig. 2. *Cloridina ichneumon* (Fabricius, 1798), male, TL 57 mm, Singapore River (ZRC 1992.9079). A, anterior cephalothorax; B, right eye; C, right antennular somite dorsal process; D, right raptorial claw; E, thoracic somites 5–8, right dorsal view; F, thoracic somite 5, right lateral view; G, thoracic somite 8 sternal keel, right lateral view; H, abdominal somites 5–6, telson and right uropod, dorsal view; I, left uropod, ventral view; J, right pleopod 1 endopod, anterior view. Scale bar = 2.5 mm (A, C–I); 1.3 mm (B, J).

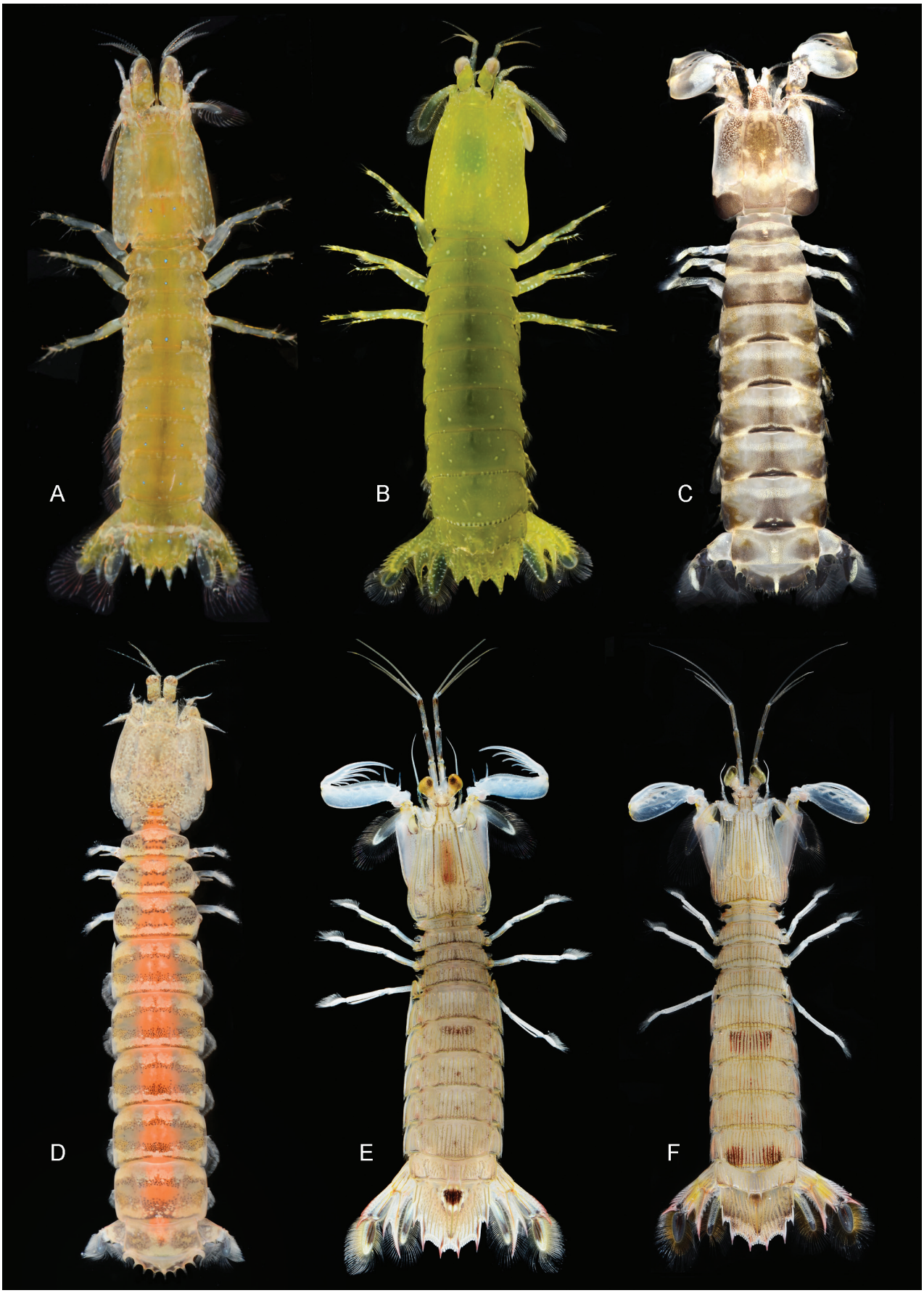

Fig. 3. A, *Gonodactylellus sentosa* sp. nov., male paratype, TL 18 mm, Pulau Semakau, SB41 (ZRC 2015.0031); B, *Gonodactyllelus viridis* (Serène, 1954), female, TL 56 mm, Terumba Raya, IT122, SS-3994 (ZRC); C, *Acanthosquilla derijardi* Manning, 1970, male, TL 55 mm, Big Sister's Island, IT81 (ZRC 2015.0032); D, *Alachosquilla vicina* (Nobili, 1903), female (TL 44 mm), St John's Island, north lagoon, YB74, SS-1641 (ZRC 2015.0033); E, *Carinosquilla lirata* (Kemp & Chopra, 1921), female, TL 60 mm, Terumbu Memban, IT80, SS-2706 (ZRC); F, *Carinosquilla multicarinata* (White, 1848), male, TL 58 mm, East Johor Strait, TB142, SS-2936 (ZRC).

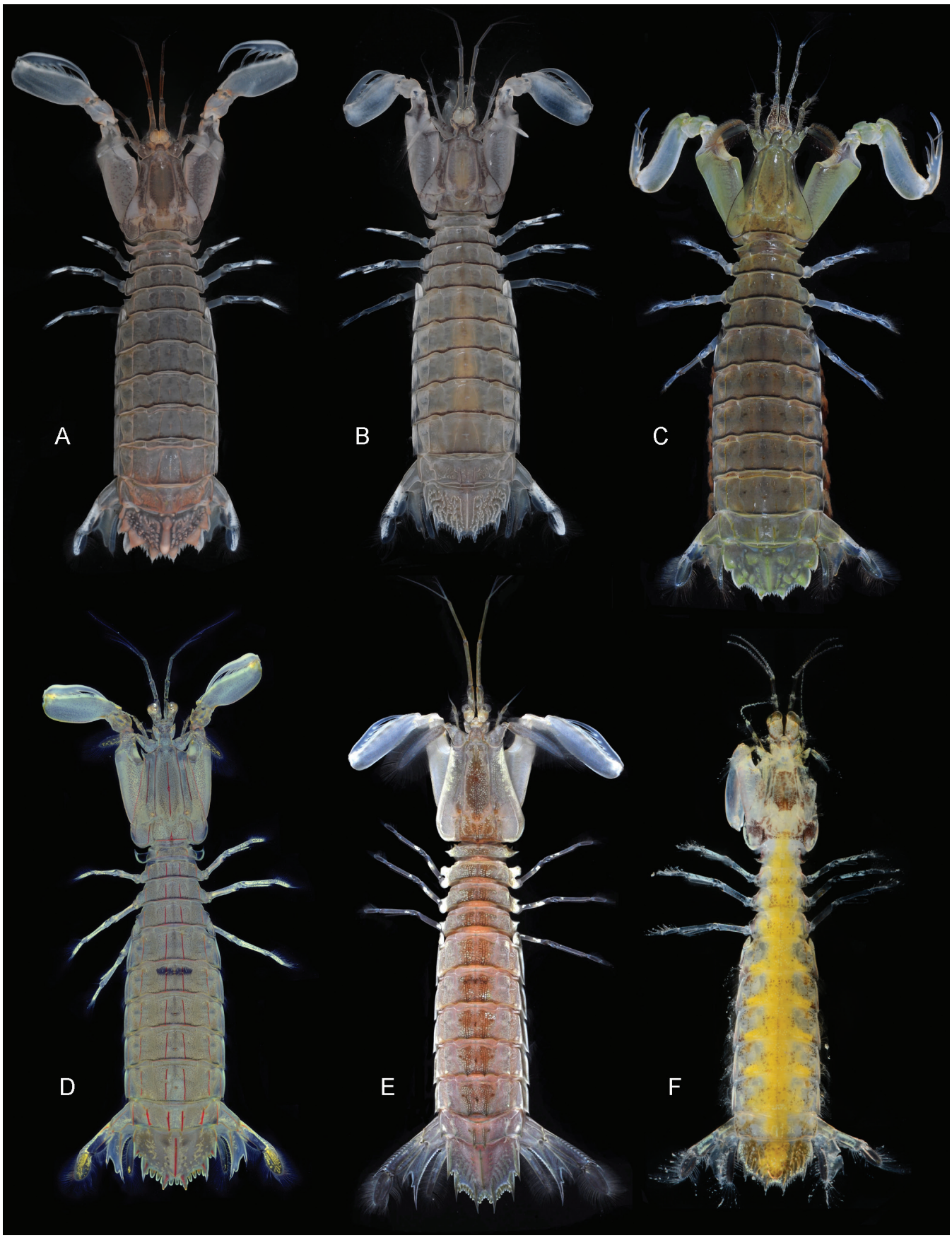

Fig. 4. A, *Clorida decorata* (Wood-Mason, 1895), male, TL 73 mm, beside Rasa Sentosa, CMBS 4815TB1-021 (ZRC); B, *Clorida decorata* (Wood-Mason, 1895), female, TL 46 mm, off Tanjung Rhu, 5416TB1-002 (ZRC 2013.0664); C, *Cloridina ichneumon* (Fabricius, 1798), male, TL 69 mm, Pulau Ubin, between OBS Camp 1 and Camp 2 (ZRC 2013.0673); D. *Cloridopsis scorpio* (Latreille in Latreille, Le Peletier, Serville & Guérin, 1828), female, TL 71 mm, Pulau Ubin (ZRC 2013.0667); E, *Dictyosquilla foveolata* (Wood-Mason, 1895), female, TL 91 mm, outside Tanjong Rhu, 5316DR2-004 (ZRC); F, *Levisquilla jurichi* (Makarov, 1979), female, TL 20 mm, Raffles reserve, near Raffles Lighthouse, DR2, SS-0309 (ZRC).

01°24'17.00"N 103°59'18.14"E, SW31, 18 October 2012; ZRC 2013.0665, 1 female (broken, CL 3.9 mm), Ketam Deep, Celestial Resort jetty, dredge, CMBS-D10, 7 March 2012; ZRC 2013.0663, 1 male (TL 47 mm), Pasir Ris, eastern shore between Sungei Api-api and Sungei Tampines, MF58031-032, 11 May 2012; ZRC, 1 male (TL 51 mm), Changi, JS-2389, SW109, 28 October 2012; ZRC, 1 male (TL 59 mm), St John's Island, north lagoon, 01°13.116'N, 103°51.079'E, yabby pump, SW117, SS-3270, coll. PKL Ng et al., 30 May 2013; ZRC, 1 female (TL 43 mm), Semakau landfill (southern replanted mangrove), 01°12.106–12.100'N, 103°45.725–45.698'E, 1.0–1.1 m, MF39, coll. YL Lee et al., 9 October 2011.

Remarks. *Cloridopsis scorpio* was reported from Singapore, Peninsular Malaysia and Borneo by Lanchester (1900, 1901), Balss (1910), Kemp (1913), Kemp & Chopra (1921) and Tweedie (1934). It is common around Singapore, especially in estuarine habitats.

Distribution. Western Indian Ocean to Indonesia, Malaysia, China, Taiwan and Japan; intertidal to 20 m (Blumstein, 1974; Ahyong et al., 2008).

Dictyosquilla Manning, 1968

Dictyosquilla foveolata (Wood-Mason, 1895)
(Fig. 4E)

Squilla foveolata Wood-Mason, 1895: 2, pl. 2: fig. 1 [type locality: Hong Kong]. — Kemp, 1913: 3, 10, 22, 58, pl. 4: fig. 48.
Dictyosquilla foveolata. — Blumstein, 1974: 118. — Manning, 1995: 197. — Ahyong et al., 1999: 46–47, fig. 5. — Moosa, 2000: 441. — Ahyong, 2001: 244, fig. 120L–N; 2005: 206.

Material examined. SINGAPORE: ZRC 1970.10.23.13–15, 2 males (TL 77–85 mm), 1 female (TL 66 mm), Bedok, Singapore, coll. RL Chermin, 2 January 1957; ZRC 1999.2177, 3 males (TL 46–66 mm), 3 females (TL 64–85 mm), Bedok, 17 fm [31.1.m], 22 November 1956; ZRC 1999.2169, 2 females (TL 49–61 mm), Bedok, SFRS, 7 November 1956; ZRC 1999.2307, 1 male (TL 42 mm), Bedok, SFRS, 20 December 1956; ZRC, 1 female (TL 91 mm), outside Tanjong Rhu, 01°16.899–16.897'N, 103°53.825–54.034'E, 19.5–20.7 m, sandy, muddy, rectangular dredge, 5316DR2-004, 14 January 2013; ZRC 1999.2129, 1 male (TL 74 mm), Angler Buoy, Singapore, 9.2 m, 28 December 1956; ZRC 1999.2334, 1 male (TL 83 mm), 4 females (TL 80–87 mm), Singapore area. MALAYSIA: ZRC 1999.2136, 2 females (TL 87–95 mm), Pontian, Malacca Straits, SL Yang, 28 March 1982; AM P13517, 1 male (TL 60 mm), off Point Dondoeng, Malaysia, netted, flood tide in strait, coll. DG Stead; AM P14921, 1 male (TL 74 mm), 1 female (TL 94 mm), Sandakan, North Borneo, fishmarket, coll. CP Kong, 5 November 1956; ZRC, 1 male (TL 89 mm), 1 female (TL 109 mm), Pontian, Johor, Malacca Straits, coll. PKL Ng, February 1993.

Remarks. In addition to the specimen of *D. foveolata* collected during recent surveys, specimens from Malaysia and other Singaporean localities are included to document their presence there. The specimens agree well with published accounts (Wood-Mason, 1895; Kemp, 1913; Ahyong et al., 1999). The telson carinae of the smallest specimens (< ~ TL 60 mm), however, yet to reach full development, are more slender and less distinct than in adults, approaching the condition present in adults of *D. tuberculata* Ahyong, 2001, from Australia.

Distribution. China, Vietnam, Burma, and for the first time from Singapore and Malaysia; shallow subtidal to 47 m (Blumstein, 1974).

Harpiosquilla Holthuis, 1964

Harpiosquilla harpax (de Haan, 1844)

Squilla harpax de Haan, 1844 (atlas): pl. 51, fig. 1 [type locality: Japan]; 1849: 222 (text). — Tiwari & Biswas, 1952: 358, figs. 3b, d, f.
Squilla raphidea. — Chuang, 1961: 181, pls. 81, 82 [not *S. raphidea* Fabricius, 1798].
Harpiosquilla harpax. — Manning, 1967a: 103; 1969: 25–33, figs. 28–38. — Moosa, 1975: 11. — Moosa, 1986: 390. — Ahyong et al., 1999: 38, 41, fig. 2a–d. — Moosa, 2000: 432–433. — Ahyong, 2001: 257–261, fig. 126; 2005: 206. — Ahyong et al., 2008: 108–110, fig. 82–83.

Material examined. SINGAPORE: ZRC, 1 female (TL 43 mm), outside Tanjong Rhu, 01°16.712–16.594'N, 103°54.392–53.868'E, 22.7–23.7 m, sandy, muddy, beam trawl, 5416TB2-029, 14 January 2013; ZRC, 1 male (TL 141 mm), off Kusu Island, Singapore port limit, near southern fairway, 01°12.273'N, 103°52.148'E, 142–79.3 m, rocky & white marine clay, beam trawl, TB159, 5213TB3-008, coll. SC Lim et al., 3 June 2013.

Remarks. The specimens correspond to the current concept of *H. harpax*; the margins of the rostral plate are sinuous, tapering to a narrow apex and the anterodistal half of the margin of the antennal scale is black (Manning, 1969; Ahyong, 2001). The TL 43 mm female is a juvenile, having movable rather than fixed apices on the submedian teeth of the telson. Movable apices of the submedian teeth of the telson is a plesiomorphic feature in stomatopods, with fixed apices the derived condition (Ahyong, 2005), as expressed in adult *Harpiosquilla*. Tiwari & Biswas (1952) reported *H. harpax* from Singapore, and Manning (1969) recorded the species from Sandakan, North Borneo.

Distribution. Widely distributed in the Indo-West Pacific, from the western Indian Ocean to Japan and Australia. Intertidal to 187 m (Moosa, 1986).

Levisquilla Manning, 1977

Levisquilla jurichi (Makarov, 1979)
(Fig. 4F)

Clorida jurichi Makarov, 1979: 40, fig. 1. [type locality: Tonkin Bay, Vietnam, 21°13.5'N, 109°45.8'E]. — Moosa, 1991: 202.
Levisquilla jurichi. — Manning, 1995: 210. — Moosa, 2000: 445. — Ahyong, 2001: 271–274, fig. 133; 2008: 53. — Ahyong & Naiyanetr, 2002: 299.

Material examined. SINGAPORE: ZRC 1999.2081, 1 male (TL 29 mm), Johore Shoal, 01°19'11.4"N, 104°03'46.9"E, 34 m, coll. LW Low et al., 29 August 1997; ZRC 1992.5781, 1 female (TL 22 mm), Pulau Semakau, Singapore, Smith-McIntyre grab, stn 2, coll. Reef Ecology Study Team, 20 April 1992; ZRC, 1 female (TL 20 mm), Raffles reserve, near Raffles Lighthouse, 01°10.273'N, 103°45.613'E, 34.2–34.3 m, silt, gravel, dead shells, rectangular dredge, DR2, SS-0309, coll. SC Lim et al., 20 May 2013; ZRC, 1 male (broken, CL 3.7 mm), Raffles Reserve, near Raffles Lighthouse, 01°10.273'N, 103°45.613'E, 34.2–34.3 m, silt, gravel, dead shells, rectangular dredge, DR2, coll. SC Lim et al., 20 May 2013.

Remarks. The present specimens of *L. jurichi* agree well with published accounts (Makarov, 1979; Moosa, 1991; Ahyong, 2001) and constitute the first records of the genus and species from Singapore. The figured specimen is a mature female, with the ripe yellow ovaries visible through the cuticle along length of thorax and abdomen (Fig. 4E).

Distribution. Andaman Sea, Vietnam, New Caledonia, Australia, and for the first time from Singapore. 9–43 m (Ahyong, 2001).

Oratosquillina Manning, 1995

Oratosquillina anomala (Tweedie, 1935)
(Fig. 5A)

Squilla affinis var *intermedia* Nobili, 1903: 38–39 [part; preoccupied by *Squilla intermedia* Bigelow, 1893] [type locality: Singapore, fixed by present lectotype designation]. — Kemp, 1913: 58.
Squilla oratoria var. *perpensa*. — Parisi, 1922: 98 [part, Singapore specimen; not *Squilla oratoria* var. *perpensa* Kemp, 1911].
Squilla anomala Tweedie, 1935: 45 [type locality: Siglap, Singapore]. — Moosa, 1973: 147.
Oratosquilla anomala. — Manning, 1978b: 7–10, figs. 1–3.
Oratosquillina anomala. — Manning, 1995: 225, 227. — Moosa, 2000: 447. — Ahyong, 2001: 285, 286.

Material examined. SINGAPORE: ZRC 2013.0674, 1 male (TL 84 mm), off Coney Island, otter trawl along entire length of island, 10–15 m, photo 16-3, CMBS T21, 8 March 2012; ZRC, 1 male (TL 55 mm), NE Chek Jawa, KL Yeo, 17 June 2003; ZRC, 2 males (TL 75–77 mm), Beting Bronok, Pulau Ubin, 01°26.348–26.482'N, 104°02.934–02.591'E, CMBS DW56, 22 October 2012; ZRC 2013.0676, 1 male (TL 39 mm), mouth of Pasir River, Pulau Ubin, 01°25.003–25.097'N, 104°05.049–04.997'E, 11.6–13.0 m, DW55 JS1660 P T, rectangular dredge, laterite gravels, dead shells, coll. B Richer de Forges et al., 22 October 2012; ZRC, 2 females (TL 28–44 mm), near Eastern Bunkering A, 01°18.140'N, 104°04.221'E, 25.1–22.4 m, clay, beam trawl, TB96, coll. SC Lim, 28 May 2013; ZRC, 1 female (TL 91 mm), near Eastern Bunkering A, 01°18.140'N, 104°04.221'E, 25.1–22.4 m, clay, beam trawl, TB96, coll. SC Lim, 28 May 2013; ZRC, 1 female (TL 39 mm), eastern Johor Strait, 01°17.838'N, 104°04.157'E, 28.8–28.7 m, muddy gravel, dead shells, beam trawl, TB142, SS-2935, coll. SC Lim et al., 31 May 2013; ZRC, 1 male (TL 77 mm), eastern Johor Strait, 01°17.838'N, 104°04.157'E, 28.8–28.7 m, muddy gravel, dead shells, beam trawl, TB142, SS-2937, coll. SC Lim et al., 31 May 2013; ZRC, 1 postlarva (TL 25 mm), Eastern Fairway, 01°16.835'N, 103°55.284'E, 18.0–15.8 m, silty gravel, rectangular dredge, DR14, 5316DR1-006, coll. SC Lim, 21 May 2013; ZRC, 1 female (TL 44 mm), off Tanjung Rhu, 01°16.712–16.594'N, 103°54.392–53.868'E, 22.7–23.7 m, beam trawl, 5416TB1-085, 14 January 2013; ZRC, 1 female (TL 35 mm), off Kusu Island, Singapore port limit, near southern fairway, 01°12.273'N, 103°52.148'E, 142–79.3 m, rocky & white marine clay, beam trawl, TB159, 5213TB3-121, SS-0373, coll. SC Lim et al., 3 June 2013.

Remarks. *Oratosquillina anomala* has been reported from Singapore and peninsular Malaysia by Nobili (1903) (as *Squilla affinis* var. *intermedia*; preoccupied by *Squilla intermedia* Bigelow, 1893), Tweedie (1935) and Manning (1978b). The overall dorsal colouration of *O. anomala* ranges from light gray to light brown; it is figured here in colour for the first time (Fig. 5A, B), Abdominal spination is as previously reported for *O. anomala* from Singapore (submedian 5–6, intermediate 4–6, lateral 3–6, marginal 1–5) (Manning, 1978b). The 39 mm male is a juvenile; the penes and petasma are not fully developed.

Nobili's (1903) type series of *Squilla affinis* var. *intermedia* included specimens from Singapore and Nias, Indonesia, comprising at least four species (Manning, 1978b). The Indonesian syntypes are referrable to *Oratosquillina pentadactyla* (Manning, 1978b) and the Singaporean syntypes include *Oratosquillina anomala*, *O. interrupta* and *Erugosquilla woodmasoni* (Kemp, 1911). In order to fix the identity and type locality of *Squilla affinis* var. *intermedia* in line with current usage, the TL 66 mm male syntype figured by Manning (1978b: fig. 3) is designated as the lectotype.

Distribution. Singapore and peninsular Malaysia to China; shallow subtidal to at least 79 m depth (this study).

Oratosquillina inornata (Tate, 1883)

Squilla inornata Tate, 1883: 51, pl. 2 [type locality: Gulf St Vincent, South Australia, Australia].
Squilla oratoria var. *inornata*. — Tweedie, 1934: 37–38. — Chuang, 1961: 180, pl. 82.
Oratosquilla inornata. — Manning, 1971: 8; 1978b: 17–19, fig. 8 [part].
Oratosquilla hindustanica Manning, 1978b: 15–17, figs. 7, 15 [type locality: Tuticorin, Madras, Gulf of Manaar, India, 8°47'N, 78°08'E].
Oratosquilla solicitans Manning, 1978b: 25–28, figs. 13, 14, 15 [type locality: Sandakan, Sabah, Malaysia, 5°50'N, 118°07'E].
Oratosquilla megalops Manning, 1980b: 523–524, fig. 1 [type locality: Anping, southern Taiwan].
Oratosquillina hindustanica. — Manning, 1995: 225, 220.
Oratosquillina inornata. — Manning, 1995: 225, 220. — Ahyong, 2001: 291–293, fig. 141. — Ahyong & Naiyanetr, 2002: 300. — Ahyong, 2004: 19. — Ahyong et al., 2008: 154–156, fig. 122–123.
Oratosquillina megalops. — Manning, 1995: 225, 220.
Oratosquillina solicitans. — Manning, 1995: 225, 220. — Moosa,

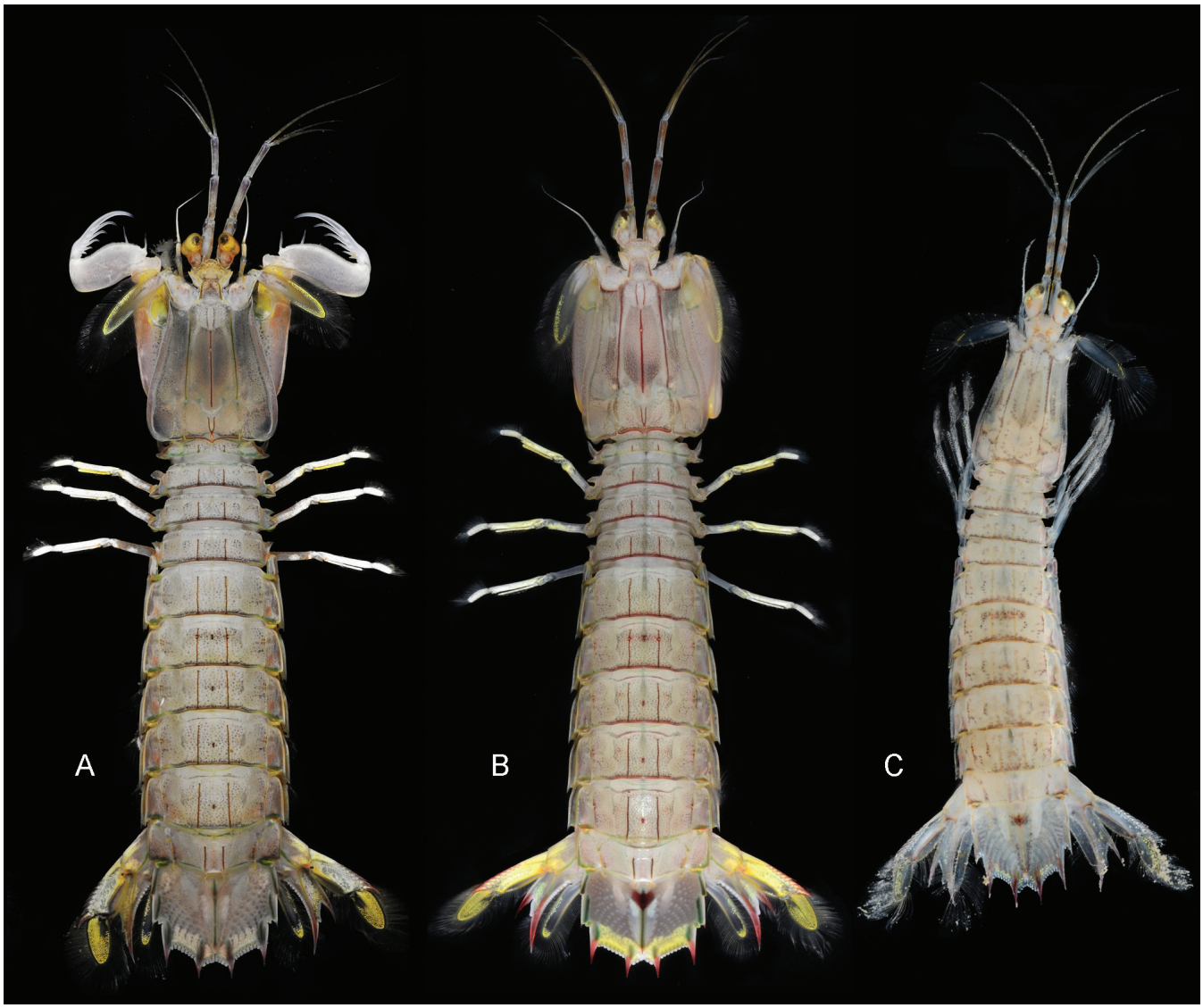

Fig. 5. A, *Oratosquillina anomala* (Tweedie, 1935), male, TL 84 mm, off Coney Island, CMBS T21 (ZRC 2013.0674); B, *Oratosquillina interrupta* (Kemp, 1911), female, TL 93 mm, near Eastern Bunkering A, TB97, SS3218 (ZRC); C, *Oratosquillina perpensa* (Kemp, 1911), female, TL 35 mm, Eastern Fairway, DR14, SS-0375 (ZRC).

2000: 449.

Oratosquilla sp. — Ng et al., 2007: 103.

Harpiosquilla raphidea. — Ng et al., 2011: 66, fig. 6 [not *H. raphidea* (Fabricius, 1798)].

Harpiosquilla sp. — Ng et al., 2011: 471, unnumbered fig.

Material examined. SINGAPORE: ZRC 2013.0662, 1 female (TL 44 mm), Pulau Ubin, OBS camp, 01°25.120'N, 103°55.743'E, SW47, 20 October 2012; ZRC 2013.0658, 1 male (TL 62 mm), Kampong Melayu, Pulau Ubin, MF41, CMBS S/N 41071, coll. HH Ng et al., 11 November 2011; ZRC, 1 female (TL 31 mm), CMBS 38353, Kampong Melayu, Pulau Ubin, old site of mosque, MF38, 26 September 2011; ZRC 2013.0660, 1 female (TL 58 mm), intertidal area between OBS Camp 1 and Camp 2, 01°24.983'N, 103°56.021'E, 20 October 2012, SW48, JS-1653 P T; ZRC 2013.0656, 1 female (TL 94 mm), Pasir Ris, eastern shore between Sungei Api-api and Sungei Tampines, MF58031-032, coll. CMBS team, 11 May 2012; ZRC 2013.0659, 1 male (TL 52 mm), Chek Jawa, 01°24.748'N, 103°59.711'E, seine net over seagrass & algae, JS-1406, stn SW23, 17 October 2012; ZRC 2013.0661, 1 female (TL 83 mm), Changi, SW109, PHOTO, 28 October 2012; ZRC, 1 male (TL 91 mm), near East Coast Chalet, 01°17.641–17.582'N, 103°55.322–55.678'E, 10.2–11.7 m, beam trawl, muddy substrate, 5517TB1-005, 26 February 2013.

Remarks. *Oratosquillina inornata* is common in Singaporean waters where it burrows in muddy-sand.

Distribution. India to Australia, Indonesia, Singapore and the South China Sea to Taiwan and Japan; intertidal to 70 m (Ahyong & Naiyanetr, 2002).

***Oratosquillina interrupta* (Kemp, 1911)**
(Fig. 5B)

Squilla oratoria. — Dana, 1852: 621 [not *Squilla oratoria* de Haan, 1844].

Squilla affinis var. *intermedia* Nobili, 1903: 39 [part].
Squilla interrupta Kemp, 1911: 98 [type locality: Hong Kong, by lectotype selection (Ahyong, 2001)]. — Kemp, 1913: 72–74, pl. 5: figs. 60–62. — Tweedie, 1934: 38–39. — Ghosh & Manning, 1988: 657.
Oratosquilla interrupta. — Moosa, 1975: 13.
Oratosquillina interrupta. — Manning, 1995: 225, 227, 231–233, figs. 136e–g, 140, 141. — Moosa, 2000: 448. — Ahyong et al., 1999: 49–50, fig. 6j–m. — Ahyong, 2005: 206. — Ahyong et al., 2008: 157–158, figs. 124–125.

Material examined. SINGAPORE: ZRC 2013.0677, 1 male (TL 96 mm), 2 females (TL 109–114 mm), Pulau Ubin, 01°25.110'N, 103°55.722'E, CMBS DW17, 16 October 2012; ZRC, 1 female (TL 93 mm), near Eastern Bunkering A, 01°18.425'N, 104°04.607'E, 22.7–22.4 m, sticky clay, beam trawl, TB97, SS3218, coll. SC Lim et al., 28 May 2013.

Remarks. *Oratosquillina interrupta* was reported from Singapore, Peninsular Malaysia and Borneo by Kemp (1913) and Tweedie (1934). In the field, *O. interrupta* could be easily confused with *O. anomala* given the similar overall colouration, especially the yellow uropods (Fig. 5B). *Oratosquillina interrupta* can be distinguished, however, by the dark maroon proximal spot on the median carina of the telson (versus a diffuse brown patch in *O. anomala*), the inner proximal quarter of the uropodal exopod distal segment is black (compared to the inner proximal half in *O. anomala*), the divided dorsal ridge of the carpus of the raptorial claw (compared to undivided in *O. anomala*), the triangular versus subquadrate anterior lobe thoracic somite 6, and convex rather than concave margin of the lobe between the primary spines of the uropodal protopod.

Distribution. Australia to Hong Kong, Vietnam, Malaysia, Thailand to the western Indian Ocean; intertidal to about 46 m (Kemp, 1913).

Oratosquillina perpensa (Kemp, 1911)
(Fig. 5C)

Squilla perpensa Kemp, 1911: 98 [part][type locality: Hong Kong, by lectotype selection (Manning, 1978b)]. — Manning, 1967a: 105.
Oratosquilla perpensa. — Manning, 1978b: 21–23, fig. 11.
Oratosquillina perpensa. — Manning, 1995: 234. — Ahyong, 2001: 285, 286. — Ahyong et al., 2008: 164–165, figs 133–134.

Material examined. SINGAPORE: ZRC, 1 juvenile female (TL 35 mm), Eastern Fairway, 01°16.835'N, 103°55.284'E, 18.0–15.8 m, silty gravel, rectangular dredge, DR14, SS-0375, RMBR Cryo109768, coll. SC Lim, 21 May 2013.

Remarks. The single specimen of *O. perpensa* captured is a juvenile and lacks the raptorial claws. Manning (1967a) first recorded *O. perpensa* from Singapore.

Distribution. Eastern Indian Ocean eastward to Singapore, Indonesia, the Gulf of Thailand, Vietnam and Taiwan.

Quollastria Ahyong, 2001

Quollastria subtilis (Manning, 1978)

Oratosquilla subtilis Manning, 1978b: 33–34, fig. 19 [type locality: off Visakhapatnam coast, Madras, India].
Oratosquilla turbata Manning, 1978b: 35–36, fig. 20 [type locality: Banc de Pracel, W coast of Madagascar, 17°00'S, 43°30'E].
Oratosquillina subtilis. — Manning, 1995: 225, 226.
Oratosquillina turbata. — Manning, 1995: 225, 226.
Quollastria subtilis. — Ahyong, 2001: 308–310, fig. 149. — Ahyong & Moosa, 2004: 65. — Ahyong et al., 2008: 174–175, fig. 140. — Ahyong, 2013: 96.

Material examined. SINGAPORE: ZRC, 1 male (TL 33 mm), off Kusu Island, Singapore port limit, near southern fairway, 01°12.273'N, 103°52.148'E, 142–79.3 m, rocky & white marine clay, beam trawl, TB159, 5213TB3-120, SS-0372, coll. SC Lim et al., 3 June 2013.

Remarks. The single specimen constitutes the first record of the species from Singapore. The abdominal spination (submedian 5–6, intermediate 4–6, lateral 3–6, marginal 1–5) agrees well with published accounts (Manning, 1978b; Ahyong, 2001). The well-developed penes and fully modified pleopod 1 endopod suggest that the specimen is mature.

Distribution. Western Indian Ocean to Australia, Indonesia, Thailand, Vietnam the Philippines and Taiwan; a new record for Singapore; 31–111 m (Ahyong, 2001; Ahyong et al., 2008).

ACKNOWLEDGEMENTS

The Johor Straits marine biodiversity workshop on Pulau Ubin, Singapore was organised by the National Parks Board and National University of Singapore and held from 15 October to 2 November 2012 at Outward Bound School. The Singapore Strait marine biodiversity workshop was held on St. John's Island, Singapore from 20 May to 7 June 2013. The workshops, as part of the Comprehensive Marine Biodiversity Survey (CMBS), were organised by the National Parks Board and National University of Singapore with generous contributions from Asia Pacific Breweries Singapore, Care-for-Nature Trust Fund, Keppel Care Foundation, Shell Companies in Singapore and The Air Liquide Group. Thanks go to Dwi Listyo Rahayu and Joo Yong Ong for assistance with station data and Arthur Anker and Yen-Ling Lee for the colour photographs used in Figs. 3–5. Tin-Yam Chan, Mark Erdmann and Peter Ng are gratefully acknowledged for constructive reviews of the manuscript. This is a contribution from the Australian Museum Research Institute.

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