

## Stomatopod Crustacea of Christmas Island and the Cocos (Keeling) Islands

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**Abstract.** The stomatopod crustaceans of Christmas Island and the Cocos (Keeling) Islands are reported based on recent collections made by parties from the National University of Singapore, Australian Museum and Queensland Museum. A new species, *Pseudosquillisma tweediei*, is described from the Cocos (Keeling) Islands. Four species are reported for the first time from one or both of these localities, bringing the total known stomatopod fauna from these islands to 13 species in nine genera and five families. The discovery of *Parvisquilla multituberculata* at Christmas Island marks the first record of Squillidae from there. A lectotype is selected for *Raoulserenea ornata* (Miers, 1880).

**Key words.** Stomatopoda, mantis shrimp, Indian Ocean, *Pseudosquillisma*

### INTRODUCTION

The mantis shrimps (Stomatopoda) of the two Australian Indian Ocean territories, Christmas Island and the Cocos (Keeling) Islands have been treated by few studies (Gordon, 1935; Tweedie, 1950; Stephenson, 1962; Ah Yong, 2001, 2012b), together reporting a total of four species from Christmas Island and 11 species from the Cocos (Keeling) Islands, from the families Gonodactylidae Giesbrecht, 1910, Protosquillidae Manning, 1980 and Pseudosquillidae Manning, 1977.

Recent sampling from these islands by parties from the Australian Museum, Queensland Museum and the Lee Kong Chian Natural History Museum (formerly Raffles Museum of Biodiversity Research, National University of Singapore) resulted in small, but important collections of Stomatopoda, of which four species are first records for Christmas Island. A total of 13 species in nine genera and five families are now known from Christmas Island and the Cocos (Keeling) Islands (Table 1). All known records of Stomatopoda from Christmas Island and the Cocos (Keeling) Islands are reported below.

### MATERIAL AND METHODS

Descriptive terminology and size descriptors generally follow Ah Yong (2001, 2012a). Total length (TL) is measured from the tip of the rostrum to the apices of the submedian teeth of the telson. Carapace length (CL) is measured along the dorsal midline and excludes the rostrum. The corneal index

(CI) is given as 100 times CL divided by the corneal width. The abdominal-width carapace-length index (AWCLI) is given as 100 times the width at abdominal somite 5 divided by CL. The eye length-width index (ELWI) is given as 100 times the greatest eye length divided by greatest corneal width. The propodal index of the raptorial claw (PI) is given as 100 times CL divided by the propodus length. The propodus length-depth index (PLDI) of the raptorial claw is given as 100 times propodus length divided by maximum propodus depth. Specimens are deposited in the collections of the Australian Museum, Sydney (AM); the Florida Museum of Natural History (UF); the University Museum of Zoology, Cambridge, England (MZC); National Science Museum, Tokyo (NSMT); Lee Kong Chian Natural History Museum, National University of Singapore (ZRC); Nationaal Natuurhistorisch Museum (Naturalis), Leiden (RMNH); National Museum of Natural History, Smithsonian Institution, Washington D.C. (USNM); Natural History Museum, London (NHM); Swedish Museum of Natural History, Stockholm (SMNH). Synonymies are restricted to the original citation, primary synonyms, regional and major works.

### SYSTEMATICS

#### GONODACTYLIDAE Giesbrecht, 1910

##### *Gonodactylaceus ternatensis* (de Man, 1902)

- Gonodactylus glabrous* var. *ternatensis* de Man, 1902: 914 [part, type locality: Ternate, Indonesia, 0°48'N, 127°20'E]  
*Gonodactylus falcatus* — Tweedie, 1950: 140 [not *G. falcatus* (Forskål, 1775)]  
*Gonodactylus ternatensis* — Manning, 1978a: 10, figs. 7, 8, 13  
*Gonodactylaceus ternatensis* — Manning, 1995: 19, 42, 43, 51–55, pls. 1, 2, figs. 8a, b, 9f, 10d, 11e, 17–19 — Ah Yong, 2001: 42–43, fig. 20

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**Remarks.** *Gonodactylaceus ternatensis* was reported from the Cocos (Keeling) Islands by Tweedie (1950, as *Gonodactylus falcatus*) and Ah Yong (2001).

**Distribution.** Central Pacific to southern China, Indonesia, Vietnam, Thailand, the Andaman Sea, eastern Australia and the Cocos (Keeling) Islands (Ah Yong, 2001).

***Gonodactylellus espinosus* (Borradaile, 1898)**

(Fig. 1A)

*Gonodactylus espinosus* Borradaile, 1898: 35, fig. 5a, b, pl. 5 [type locality: Rotuma, Fiji Islands] — Manning, 1967b: 21–23, fig. 8  
*Gonodactylus chiragra* — Tweedie, 1950: 139–140 [not *Gonodactylus chiragra* (Fabricius, 1781)]

*Gonodactylellus espinosus* — Manning, 1995: 19, 56–57 — Ah Yong, 2001: 53, fig. 25; 2002: 350–352, fig. 2

**Material examined.** CHRISTMAS ISLAND: ZRC 2013.0529, 1 damaged male (TL 30 mm), Flying Fish Cove, 10°25.79'S, 105°40.03'E, intertidal, stn. CI3-15, 10 February 2012; AM P90249, 1 female (TL 30 mm), Flying Fish Cove, 10°25.79'S, 105°40.03'E, in coral rocks and rubble, stn. CI3-17, 11 February 2012.

**Remarks.** The present specimens of *G. espinosus* are the first records from Christmas Island. Ah Yong (2001) first recorded the species from the Cocos (Keeling) Islands.

**Distribution.** Central Pacific from Rotuma, Fiji, the Line Islands, French Polynesia, the Cocos (Keeling) Islands from the shore to at least 5 m (Ah Yong, 2002); now from Christmas Island.

***Gonodactylellus kume* Ah Yong, 2012**

*Gonodactylus incipiens* — Moosa, 1991: 158 [part, not *G. incipiens* (Lanchester, 1903)]

*Gonodactylellus micronesicus* — Ah Yong, 2001: 57, fig. 27A–I [part, Indian Ocean and Lizard Island specimens, not *G. micronesicus* (Manning, 1971)]

*Gonodactylellus kume* Ah Yong, 2012b: 235–238, figs. 2B–F, 3 [type locality: Kume Island, Ryukyus, Japan]

**Material examined.** CHRISTMAS ISLAND: AM P91058, 1 male (TL 12 mm), Merrial Beach, 10°28'26"S, 105°33'29"E, 13 m, rubble, stn. WA903, MV *Fastwater*; coll. L. Hughes, 21 October 2008.

**Remarks.** The specimen of *G. kume* agrees well with the type description (Ah Yong, 2012b) and is the first recorded from Christmas Island. The single specimen is mature, with a well-developed pleopod 1 endopod and penes. Ah Yong (2001) reported *G. kume* from the Cocos (Keeling) Islands under the name *Gonodactylellus micronesicus* (Manning, 1971).

**Distribution.** Western Pacific to eastern Indian Ocean, from southern Japan to Papua New Guinea, the Solomon Islands, New Caledonia and northern Australia (Ah Yong, 2012b).

***Gonodactylus childi* Manning, 1971**

(Fig. 1B)

*Gonodactylus childi* Manning, 1971: 75–77 [type locality: Runit (Yvonne) Island, Eniwetak Atoll, 11°32'47"S, 162°21'56"E] — Ah Yong, 2001: 67, fig. 33

Not *Gonodactylus childi* Manning, 1971: fig. 1 [paratypes = *Gonodactylellus incipiens* (Lanchester, 1903)]

**Material examined.** CHRISTMAS ISLAND: ZRC 2013.0532, 1 female (TL 21 mm), Flying Fish Cove, 10°25.79'S, 105°40.03'E, intertidal, stn. CI3-25, 14 February 2012; ZRC 2013.0530, 1 male (TL 15 mm), 1 juvenile female (TL 9 mm), Flying Fish Cove, 10°25.79'S, 105°40.03'E, intertidal, stn. CI3-15, 10 February 2012; AM P90250, 1 male (TL 20 mm), Flying Fish Cove, 10°25.79'S, 105°40.03'E, in coral rocks and rubble, stn. CI3-17, 10 February 2012; ZRC 2013.0531, 1 juvenile male (TL 8 mm), 1 juvenile female (TL 8 mm), Flying Fish Cove, 10°25.79'S, 105°40.03'E, in coral rocks and rubble, stn. CI3-17, 10 February 2012.

**Remarks.** The present specimens of *G. childi* are the first records of the species from Christmas Island. The anterior margins of the rostral plate slope posteriorly in specimens up TL 15 mm, and are transverse above this size. Similarly, males TL 15 mm and above have a well-developed pleopod 1 endopod.

**Distribution.** French Polynesia to Eniwetak Atoll, Japan, Indonesia, northern Australia (Ah Yong, 2012b), and now from Christmas Island.

***Gonodactylus platysoma* Wood-Mason, 1895**

*Gonodactylus platysoma* Wood-Mason, 1895: 11, pl. 3, figs. 3–9 [type locality: restricted to Society Islands, French Polynesia, 17°00'S, 150°00'W, by lectotype selection (Ghosh & Manning, 1988: 654)] — Manning, 1995: 75–76, pls. 9, 10, figs. 9d, 10b, 11b, 27b, 31 — Ah Yong, 2001: 71–72, fig. 35

*Gonodactylus chiragra* var. *tumidus* Lanchester, 1903: 447, 456, pl. 23: fig. 1 [type locality: Minikoi, Laccadive Islands (= Lakshadweep), 8°17'S, 73°02'E]

*Gonodactylus chiragra* var. *acutus* Lanchester, 1903: 447, 456, pl. 23: fig. 3 [type locality: Minikoi, Laccadive Islands (= Lakshadweep), 8°17'S, 73°02'E]

**Remarks.** Ah Yong (2001) first recorded *Gonodactylus platysoma* from Christmas Island and the Cocos (Keeling) Islands.

**Distribution.** French Polynesia to Okinawa, Australia, Indo-Malayan region to the western Indian Ocean (Ah Yong, 2001).

**ODONTODACTYLIDAE Manning, 1980**

***Odontodactylus scyllarus* (Linnaeus, 1758)**

*Cancer scyllarus* Linnaeus, 1758: 633 [type locality: Rinca, Greater Sunda Island, Indonesia, by neotype selection (Ah Yong, 2001)]  
*Gonodactylus bleekeri* A. Milne-Edwards, 1868: 65, footnote [type locality: Batavia, Indonesia (= Jakarta, 6°10'S, 106°48'E)]



Fig. 1. A, *Gonodactylellus espinosus* (Borradaile, 1898), male, TL 30 mm, Flying Fish Cove, Christmas Island, CI3-15 (ZRC 2013.0529). B, *Gonodactylus childi* Manning, 1971, 1 female TL 21 mm, Flying Fish Cove, Christmas Island, CI3-25 (ZRC 2013.0532). C, *Pseudosquilla ciliata* (Fabricius, 1787), male TL 51 mm, West Island, Cocos (Keeling) Islands, CK-16 (ZRC 2012.0674). D, *Pseudosquillisma tweediei* sp. nov., male paratype, TL 48 mm, Bali (AM P91065). E, *Pseudosquillisma oculata* (Brullé), West Africa, specimen not seen. F–G, *Raoulserenea ornata* (Miers, 1880), female paralectotype, TL 50 mm, Philippines (NHM 156e). H–I, *Raoulserenea ornata* (Miers, 1880), male lectotype, TL 22 mm, locality unknown, probably southwestern Pacific Ocean (NHM 62 35). Photos: J.C. Mendoza (A, B); P. Ng (C); H.H. Tan (D); A. Anker (E); H. Taylor (F).



*Pseudosquillisma tweediei*, new species

(Fig. 1D, 2)

*Pseudosquilla oculata* — de Man, 1891: 59–60 — Borradaile, 1907: 214 — Kemp, 1913: 102–103 — Odhner, 1923: 6 — Tweedie, 1950: 141 [part] — Holthuis, 1941: 267 — Manning, 1970: 1431, 1439–1440 — Liu, 1975: 186, fig. 1.1–1.4 — Moosa, 1984: 39 [Not *P. oculata* (Brullé, 1837)]

*Pseudosquillisma oculata* — Cappola & Manning, 1995: 285–286 (not fig. 6) — Moosa, 2000: 427 — Ahyong, 2001: 117, fig. 57 [Not *P. oculata* (Brullé, 1837)]

**Type material.** Holotype: ZRC.1970.10.22.14, female (TL 48 mm), Cocos (Keeling) Islands, coll. C. Gibson-Hill, 1941. Paratypes: AM P91065, 1 male (TL 48 mm), Bali, Indonesia, purchased, aquarium trade collector, December 2011; UF22508, 1 male (TL 26 mm), Northern Channel, outside of reef, Ningaloo Reef, Western Australia, Australia, 22°35.634'S, 113°37.908'E, 20 m, NIN09-St-80, coll. F. Michonneau, May 2009.

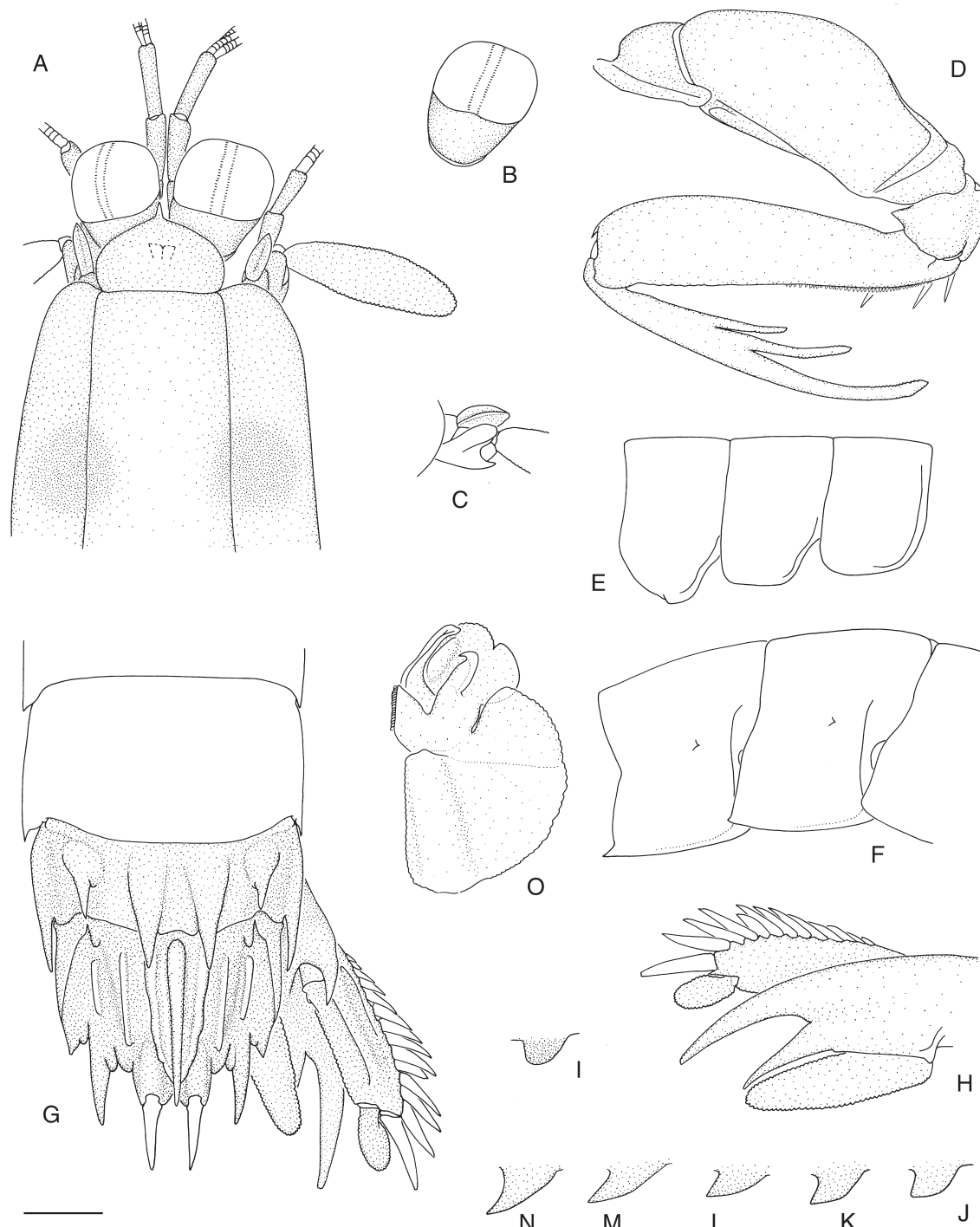


Fig. 2. *Pseudosquillisma tweediei* sp. nov.: A–N, female holotype, TL 48 mm, Cocos (Keeling) Islands (ZRC.1970.10.22.14); O, male paratype, TL 48 mm, Bali (AM P91065). A, anterior cephalothorax; B, right eye; C, right antennal protopod; D, right raptorial claw; E, thoracic somites 6–8, right lateral view; F, abdominal somites 4 and 5, right lateral view; G, abdominal somites 5–6, telson and right uropod; H, right uropod, ventral view; I, thoracic somite 8 sternal keel, right lateral view; J–N, abdominal somites 1–5 sternal keel, right lateral view; O, male right pleopod 1 endopod, anterior view. Scale bars = 2.0 mm (A–N); 1.0 mm (O).

**Other material examined.** SEYCHELLES: MZC, 1 male (TL 27 mm), 3 females (TL 40–49 mm), Coetivy, coll. J.S. Gardiner & M. Caius. JAPAN: SMNH 42398, 1 male (TL 43 mm), Port Lloyd, Ogasawara Islands, coll. S. Bock, 1914; NSMT Cr9331, 1 male (TL 37 mm), Miyano-Oshima, Chichi-jima, Ogasawara Islands, reef, coll. K. Yanagawa, 1 July 1976. SAMOA: RMNH S.48, 1 male (TL 53 mm), 1 female (TL 40 mm), Samoa, 1887, Mus. Godeffroy. TONGA: USNM 281530, 1 female (TL 42 mm), E shore Hungu Island, Vava'u Group, 18°40'55"S, 174°06'05"W, 0–5.1 m, small undercut cave in shore along shallow surge channel, stn. JTW 93-95, coll. J. Williams et al., November 1993; USNM 307133, 1 female (TL 36 mm), Port Refuge, W shore Vava'u Island, Vava'u Group, 18°38'23"S, 174°04'01"W, reef top with spur & grooves at shore, stn. JTW 93-44, coll. J. Williams. FRENCH POLYNESIA: SMNH 42397, 1 male (TL 32 mm), Moorea, Tahiti, Society Islands, coll. Eugenie Expedition; USNM 307175, 1 female (TL 27 mm), Society Islands, 17°28'38"S, 149°45'E, 9.1–13.7 m, stn. RW 89-28, coll. R. Winterbottom, 12 December 1989; USNM 307180, 1 female (TL 34 mm), Society Islands, 17°29'13"S, 149°45'49"E, 18.3–24.4 m, stn. RW 89-41, coll. R. Winterbottom, 17 December 1989; UF18552, 1 male (TL 30 mm), Mekemo, Tuamotu Islands, reef flat, coll. P. Bacchet & J. Letourneaux, April 2009.

**Diagnosis.** Carapace with pair of dark circular “eye-spots”, margins diffuse, without pale outline. Body and raptorial claws uniformly coloured, without white spots. Eyes dorsoventrally flattened; about 1.3 times longer than wide. Raptorial claw propodus, when folded, not usually extending posteriorly beyond ischium, propodus as long as or shorter than CL at or above CL ~8 mm and TL ~40 mm. Uropodal protopod with distinct step on inner proximal margin.

**Description.** Eye dorsoventrally flattened; cornea broader than stalk, subtrapezoidal in dorsal view, not extending beyond antennular peduncle segment 2; CI 306–439; ELWI 126–133. Ocular scales narrow, separate, truncate.

Antennal peduncle 0.53–0.70CL; protopod inner margin with articulated plate, trefoil in cross-section; antennal scale with entire margin setose, 0.45–0.52CL.

Rostral plate wider than long; anterior margin rounded, slender median spinule.

Raptorial claw dactylus with 3 slender teeth; propodus with 3 movable spines proximally, with small distal tooth; propodus usually extending posteriorly slightly beyond ischium when folded, slightly longer than to shorter than CL (PI 89–109), but shorter than CL at or above CL ~8 mm and TL ~40 mm; PLDI 375–438.

Thoracic somites 6 and 7 with truncate lateral margins, that of thoracic somite 6 slightly wider than that of thoracic somite 7. Thoracic somite 8 lateral margins irregularly rounded; sternal keel rounded.

Abdomen subcylindrical; AWCLI 655–745. Somites 1–3 posterolaterally rounded. Somite 4 with or without small posterolateral spine. Somite 5 with distinct posterolateral spine. Sternal keel posteriorly angular on somites 1 and 2, becoming sharper, spiniform on somites 3–5. Abdominal somite 6 with paired submedian, intermediate and lateral spines.

Pleopod 1 endopod of male with lateral lobe on posterior ‘endite’; hook process shorter than tube process.

Telson subtriangular, submedian teeth movable; accessory median carina irregular; anterior submedian carina straight; anterior intermediate carina straight, shorter than anterior submedian carina; marginal carina distinct, smooth.

Uropodal protopod with inner margin broadly concave, with distinct angular step near midlength of inner margin; outer spine longer than inner spine. Uropodal exopod proximal segment with small fixed distal spine and 10–13 (usually 11 or 12) graded, movable spines on outer margin, distalmost spine exceeding exopod distal article; distal article ovate, shorter than half-length of proximal segment. Uropodal endopod elongate, inner and outer margins broadly convex.

**Colour in life.** Overall pale, drab grey-green, generally uniform, with slight appearance of diffuse banding on abdomen; posterior margins of thoracic and abdominal somites pink-red. Carapace with pair of dark circular eye-spots, margins diffuse, without pale outline. Thoracic sternites 6–8 each with pair of black patches. Abdominal somite 6, telson and uropod with blue-green spines; telson accessory median and anterior submedian carinae pinkish. Uropodal protopod with blackish patch on proximal ventral surface; exopods and endopod with clear pink-red marginal setae. Antennule and antennal scale translucent. Raptorial claw merus drab grey-brown, without spots; propodus and dactylus uniformly translucent, with slight pinkish tinge, pale orange at dactyl-propodus articulation. Pereopods 1–3 translucent pale-bluish.

The holotype is faded to grey-brown except for the dark, circular, carapace “eye-spots”. Colour notes taken by the collector: “Fairly uniform light grey, slightly pink at the joints and on the carapace, the spines of the telson bluish green or green”.

**Etymology.** Named after the late Michael Tweedie, who was the first to report stomatopods from the Cocos (Keeling) Islands.

**Remarks.** *Pseudosquilla oculata* (Brullé, 1837) (type locality: Canary Islands) has long been attributed an almost cosmopolitan distribution throughout the tropical Pacific, Indian and Atlantic oceans, although regional differences have been recognised (Schmitt, 1940; Manning, 1969; Ahyong, 2001). Manning (1964) showed that eastern Pacific records of *P. oculata* (see Schmitt, 1940) were referable to a different species, *P. adialta* (Manning, 1964). Manning (1969) and Ahyong (2001) recognised subtle morphological

heterogeneity among Indo-West Pacific, eastern and western Atlantic populations. Comparison of *P. oculata* from across its putative range shows that *P. oculata* sensu stricto is restricted to the Atlantic Ocean and that the Indo-West Pacific form is referable to a separate species, herein named *Pseudosquillisma tweediei*. The most striking differences between *P. tweediei* and *P. oculata* are colour-in-life (Fig. 1D, E). Both have a pair of dark eyespots on the carapace, but those of *P. oculata* are darker, almost black, well-defined and always surrounded by a well-defined whitish ring. In contrast, the carapace eye-spots in *P. tweediei* are diffuse, dark green-grey and without the well-defined outline of *P. oculata*. Body colouration also differs. In *P. tweediei*, the body and raptorial claws are uniformly coloured, without white spotting. In *P. oculata*, the body and raptorial claw has white spots, numerous in the Western Atlantic, and very few or none on the body in the eastern Atlantic, although the raptorial claws remain spotted (Manning, 1969, 1977). The eastern and western Atlantic forms of *P. oculata* may themselves represent separate species, but are treated here as conspecific pending further study.

*Pseudosquillisma tweediei* and *P. oculata* are very similar morphologically, having subtle morphometric differences. In specimens of *P. tweediei* larger than about CL 8 mm and TL 40 mm, the eye is proportionally more elongate as indicated by the ELWI (123–130) and the propodus length of the raptorial claw is equal to or shorter than the carapace length. In *P. oculata* from both sides of the Atlantic, the propodus of the raptorial claw is longer than (or rarely as long as) the carapace length. In western Atlantic *P. oculata*, the eye in specimens above CL ~8 mm and TL ~40 mm is about as wide as long (ELWI 94–111; Manning, 1969). In eastern Atlantic *P. oculata*, the ocular proportions (ELWI 114–130; Manning, 1969) overlap those of *P. tweediei*. Based on similarities in colour pattern and eye proportions, *P. tweediei* may be more closely related to eastern Atlantic than western Atlantic populations of *P. oculata*. The distinctions among species of *Pseudosquillisma*, with subtle morphological but obvious colour pattern differences, parallel those within the pseudosquillid genus *Raoulserenea*, where colour pattern, especially that of the carapace eye-spots is the most obvious distinguishing feature (Ahyong, 2001).

Four species of *Pseudosquillisma* are now known from the Indo-Pacific: *P. adialta* (Manning, 1964) (type locality: Clipperton Island, eastern Pacific), *P. guttata* (Manning, 1972) (type locality: Midway Island, Pacific Ocean), *P. kensleyi* Ahyong, 2005 (type locality: Sodwana Bay, South Africa) and *P. tweediei*. *Pseudosquillisma tweediei* differs from *P. adialta* and *P. guttata* in colour pattern, the latter two having pale mottling and spots over the body, partially obscuring the carapace eye-spots, instead of a uniform pattern with eye-spots unobscured. *Pseudosquillisma tweediei* differs from *P. kensleyi* in having a dorsoventrally flattened rather than subglobular eye. Ongoing studies suggest that additional undescribed species of *Pseudosquillisma* occur in the central Pacific (Ahyong, unpubl.).

The holotype of *P. tweediei* was reported from the Cocos (Keeling) Islands by Tweedie (1950) as one of two specimens of identified as *P. oculata*. Tweedie's (1950) second specimen reported as *P. oculata* is referable to *Raoulserenea oxyrhyncha* (see Ahyong, 2001). The synonymies included above for previous records of *P. oculata* from the Indo-West Pacific are restricted to those considered reliably identifiable with *P. tweediei*; other records require verification against other similar species, especially *P. guttata*, *Raoulserenea komaii* (Moosa, 1991) and *R. oxyrhyncha* (Borradaile, 1898), all of which are morphologically very similar.

**Distribution.** Widely distributed in the Indo-West Pacific from the western Indian Ocean to the Cocos (Keeling) Islands, Western Australia, Indonesia, the South China Sea, Japan, Samoa, Tonga and French Polynesia; shallow subtidal to at least 24 m.

#### *Raoulserenea komaii* (Moosa, 1991)

*Pseudosquilla komaii* Moosa, 1991: 171–173, fig. 4 [type locality: Chesterfield Islands, New Caledonia, 19°03.00'S, 158°53.93'E]  
*Raoulserenea komaii* — Manning, 1995: 116 — Ahyong, 2001: 121–122, fig. 59; 2005: 162

**Remarks.** Ahyong (2001) first recorded *Raoulserenea komaii* from the Cocos (Keeling) Islands.

**Distribution.** South Africa to French Polynesia including New Caledonia, Japan and the Cocos (Keeling) Islands; shore to at least 8 m (Ahyong, 2005).

#### *Raoulserenea ornata* (Miers, 1880)

(Fig. 1F–I)

*Pseudosquilla ornata* Miers, 1880: 4, 111, pl. 3: figs. 5, 6 [type locality: unknown, probably southwestern Pacific Ocean, by present lectotype designation] — Tweedie, 1950: 141 — Stephenson, 1962: 34  
*Raoulserenea ornata* — Manning, 1995: 21, 116, 118, pl. 22, figs. 59b, 60c, d, f, 64 — Ahyong, 2001: 122, fig. 60; 2005: 163

**Remarks.** Miers (1880) described *R. ornata* (as *Pseudosquilla ornata*) based on two dry syntypes, a female from the Philippines (TL 50 mm, NHM 156e; Fig. 1F, G) and a male collected by the HMS Herald Expedition from an unspecified locality (TL 22 mm, NHM 62 35; Fig. 1H, I). Although, not specified, the collecting locality of the male syntype is almost certainly from the southwestern Pacific Ocean between northern Australia, New Caledonia and Fiji, where the HMS Herald sampled between 1853 and 1861 (David, 1995). Both syntypes have the distinctive pair of dark carapace “eye-spots” surrounded by a pale ring. The colouration of the male syntype corresponds precisely to the current concept of *R. ornata*: the body is uniformly dark and the raptorial claw has a pale yellow propodus and pink dactylus (see Manning, 1995; Ahyong, 2001). Unlike the male, the female syntype has distinct dark spots on the anterolateral surfaces of the carapace approaching the colour pattern of *R. hieroglyphica* (Manning, 1972), the significance of which requires further study. It is unfortunate that the

Table 1. Distribution of stomatopod species at Christmas Island and the Cocos (Keeling) Islands. Presence (+). First records (++).

	Christmas Island	Cocos (Keeling) Islands
<b>GONODACTYLIDAE</b>		
<i>Gonodactylaceus ternatensis</i> (de Man, 1902)		+
<i>Gonodactylellus espinosus</i> (Borradaile, 1898)	++	+
<i>Gonodactylellus kume</i> Ahyong, 2012	++	+
<i>Gonodactylus childi</i> Manning, 1971	++	
<i>Gonodactylus platysoma</i> Wood-Mason, 1895	+	+
<b>ODONTODACTYLIDAE</b>		
<i>Odontodactylus scyllarus</i> (Linnaeus, 1758)	+	
<b>PROTOSQUILLIDAE</b>		
<i>Chorisquilla quinquelobata</i> (Gordon, 1935)	+	
<b>PSEUDOSQUILLIDAE</b>		
<i>Pseudosquilla ciliata</i> (Fabricius, 1787)		+
<i>Pseudosquillisma tweediei</i> , new species		+
<i>Raoulserenea komaii</i> (Moosa, 1991)		+
<i>Raoulserenea ornata</i> (Miers, 1880)	+	+
<i>Raoulserenea oxyrhyncha</i> (Borradaile, 1898)		+
<b>SQUILLIDAE</b>		
<i>Parvisquilla multituberculata</i> (Borradaile, 1898)	++	

*Gonodactylus elegans* Miers, 1884: 566, 575, pl. 52: fig. b [type localities: Providence Island (9°14'S, 51°02'E) and Providence Reef (9°23'S, 51°03'E), Seychelles]  
*Odontodactylus scyllarus* — Stephenson, 1962: 35 — Manning, 1967a: 10–15, fig. 3; 1995: 82–85, pl. 13, figs. 35, 37, 38a, b — Ahyong, 2001: 85, fig. 41

**Remarks.** Stephenson (1962) first recorded *Odontodactylus scyllarus* from Christmas Island.

**Distribution.** Japan and Fiji to northern Australia, Indonesia and the South China Sea to East Africa (Ahyong, 2001).

#### PROTOSQUILLIDAE Manning, 1980

##### *Chorisquilla quinquelobata* (Gordon, 1935)

*Gonodactylus quinquelobatus* Gordon, 1935: 635–637, fig. 3 [type locality: Flying Fish Cove, Christmas Island, Indian Ocean]  
*Chorisquilla quinquelobata* — Manning, 1969: 159; 1995: 20, 94 — Ahyong, 2001: 94–95, fig. 45

**Material examined.** CHRISTMAS ISLAND: AM P91059, 1 female (TL 16 mm), Thundercliff Cave, 10°27'58"S, 105°36'24"E, 12.9 m, rubble, Stn WA884, MV Fastwater, coll. L. Hughes, 19 October 2008.

**Remarks.** The present specimen of *Chorisquilla quinquelobata* agrees well with the type series (Ahyong, 2001) and is the first to be collected since the original description. The outer margin of the proximal article of the uropodal exopod is armed with 9 or 10 movable spines.

**Distribution.** Presently known only from Christmas Island; shallow water to at least 12.9 m depth.

#### PSEUDOSQUILLIDAE Manning, 1977

##### *Pseudosquilla ciliata* (Fabricius, 1787) (Fig. 1C)

*Squilla ciliata* Fabricius, 1787: 333 [type locality: Exmouth Gulf, Western Australia, by neotype selection (Ahyong, 2001)]  
*Squilla stylifera* Lamarck, 1818: 189 [type locality: unknown]  
*Squilla quadrispinosa* Eydoux & Souleyet, 1842: 362, pl. 5, fig. 1 [type locality: Sandwich Islands (= Hawaiian Islands)]  
*Pseudosquilla ciliata* var. *occidentalis* Borradaile, 1900: 398, 402 [type locality: West Indies]  
*Pseudosquilla ciliata*. — Tweedie, 1950: 140 — Ahyong, 2001: 112–115, fig. 55; 2002: 355–356

**Material examined.** COCOS (KEELING) ISLANDS: ZRC 2012.0674, 1 male (TL 51 mm), West Island, lagoon side from airport near meteorological station, extensive seagrass bed, by hand and yabby pump, stn. CK16, coll. P. Ng et al., 22 March 2011; ZRC 2012.0676, 2 males (TL 55–63 mm), same.

**Remarks.** *Pseudosquilla ciliata* was first reported from Cocos (Keeling) Islands by Tweedie (1950). The present specimens, taken in seagrass beds, agree well with Ahyong (2001): the posterolateral margin of abdominal somite 4 is angular or with a small spine, and that of abdominal somite 5 has a distinct spine; the uropodal exopod is armed with 8–10 movable spines on the proximal article. Colouration in *P. ciliata* is highly variable; the present specimens were mottled in grey-green.

**Distribution.** Widely distributed throughout the tropical Indo-West Pacific, eastern and western Atlantic; shore to 86 m (Ahyong, 2001).



provenance of the male syntype is not known but given the importance of colour pattern in pseudosquillaid taxonomy, it is herein selected as the lectotype to fix the identity of *R. ornata* in accordance with prevailing usage.

*Raoulserenea ornata* was first recorded from Christmas Island by Stephenson (1962) and from Cocos (Keeling) by Tweedie (1950).

**Distribution.** South Africa to Australia, Vietnam, the Philippines and southern China to French Polynesia; coral reefs, from the shore to 18 m (Ahyong, 2005).

#### *Raoulserenea oxyrhyncha* (Borradaile, 1898)

*Pseudosquilla oxyrhyncha* Borradaile, 1898: 37, pl. 6: figs. 9–9d [type locality: Rotuma, Fiji] — Holthuis, 1941: 264–266, fig. 4  
*Pseudosquilla oculata* — Tweedie, 1950: 141 [part, not *P. oculata* (Brullé, 1837)]

*Raoulserenea oxyrhyncha* — Manning, 1995: 21, 116 — Ahyong, 2001: 123–125, fig. 61; 2005: 163

**Remarks.** Recorded from Cocos (Keeling) by Ahyong (2001).

**Distribution.** South Africa to the central Pacific including Indonesia, Papua New Guinea and the Cocos (Keeling) Islands; to at least 13.5 m (Ahyong, 2005).

### SQUILLIDAE Latreille, 1802

#### *Parvisquilla multituberculata* (Borradaile, 1898)

*Squilla multituberculata* Borradaile, 1898: 38, pl. 6, fig. 7, 7a–c [type locality: Sandal Bay, Lifou]

*Parvisquilla xishaensis* Liu, 1975: 183–184, 196, pl. 1, figs. 1–6 [type locality: Xisha Islands, South China Sea]

*Parvisquilla multituberculata* — Manning 1978b: 16–18, fig. 8 — Ahyong, 2012b: 245–246, fig. 5

**Material examined.** CHRISTMAS ISLAND: AM P91060, 1 damaged female (CL 1.5 mm), Thundercliff Cave, 10°27'58"S, 105°36'24"E, 12.9 m, rubble, Stn WA884, MV Fastwater, coll. L. Hughes, 19 October 2008.

**Remarks.** The present record of *Parvisquilla multituberculata* is the first for the species and family from Christmas Island.

**Distribution.** Widely distributed in the Indo-West Pacific, from the western Indian Ocean to French Polynesia, from the shore to 76 m (Ahyong, 2012b); a new record for Christmas Island.

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