



Deep-water brachyura from the surveys of the FORV Sagar Sampada off the Andaman and Nicobar archipelagos, India

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ARTICLE INFO

Article history:

Received 28 May 2019

Received in revised form 16 December 2019

Accepted 28 January 2020

Available online 3 February 2020

Keywords:

Brachyura

Deep-water

Taxonomy

Andaman sea

New records

ABSTRACT

The deep-water decapod crustacean fauna of the Andaman Sea is interesting in that it has zoogeographical affinities with those of the Indian and western Pacific fauna. The present study reports 17 brachyuran species from 11 families and 17 genera collected by the Indian Fishery Oceanography Research Vessel Sagar Sampada during five separate cruises from 2010–2017. Of these, *Homolochunia valdiviae* Doflein, 1904 (previously known from East Africa, Madagascar, Seychelles, Comoros and Moluccas) and *Dairoides seafdeci* Takeda & Ananongsuk, 1991 (previously only known from Thailand) are new records for the Indian EEZ. In addition, *Parilia pattersoni* Ng, Devi & Kumar, 2018, described from the western part of the Bay of Bengal, is recorded for the first time from the Andaman Sea as well as Arabian Sea. The taxonomy of *Dicranodromia baffini* (Alcock and Anderson, 1899), *Paromolopsis boasi* Wood-Mason in Wood-Mason and Alcock, 1891, *Arcania undecimspinosa* De Haan, 1841, *Platymaia alcocki* Rathbun, 1918 and *Carcinoplax indica* Doflein, 1904 is discussed in detail.

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1. Introduction

The deep waters off the Andaman and Nicobar archipelagos (> 200–1000 m) support a diverse brachyuran fauna (Alcock, 1899a, 1901), and while it has zoogeographical affinities to the rest of the Indian Ocean as well as western Pacific, there are also a number of endemic species (Castro, 2005, 2007; Doflein, 1904; Galil, 2003; Griffin and Tranter, 1986a; Guinot, 1995; Guinot and Richer de Forges, 1982, 1985, 1995; Kumar et al., 2013; Ng, 2000; Ng et al., 2017, 2018a, 2018b, 2019a, 2019b; Ng and Richer de Forges, 2015; Takeda and Ananongsuk, 1991; Trivedi et al., 2018).

For India, the published brachyuran literature for the deep-water fauna is largely restricted to the British era (Alcock, 1902). In general, the deep waters of the Indian Exclusive Economic Zone have not been well sampled in recent years (but see Mendoza and Suvarna Devi, 2017; Ng, 2019; Ng et al., 2017; 2018a; 2018b; 2019c; Ng and Kumar, 2015; Padate et al., 2019; Prema et al., 2018), in sharp contrast to the Western Indian and Western Pacific Ocean (see review in Richer de Forges et al., 2013). The

lack of data is of concern especially since there is an increase in anthropogenic activities in Indian waters, particularly from deep-sea fishing by commercial trawlers.

The present study deals mostly with 17 taxa of deep-water brachyuran fauna of the Andaman Sea based on the material collected during extensive surveys by India's only deep-water Fishery Oceanography Research Vessel (FORV) Sagar Sampada in the Indian Exclusive Economic Zone.

2. Materials and methods

The samples were collected during five cruises of FORV Sagar Sampada (cruise numbers 280, 292, 334, 349 and 367) over a period of seven years from 2010–2017 (Fig. 1). The specimens examined are deposited in the Referral Centre of the Centre for Marine Living Resources and Ecology (CMLRE), Ministry of Earth Sciences, Government of India, Kochi; Museum of Marine Biology, Cochin University of Science and Technology (CUSAT), Kochi, Kerala; and Department of Aquatic Biology and Fisheries, University of Kerala (DABFUK), Trivandrum. The abbreviations used in the section are as follows: CL — carapace length; G1 — male first gonopod; HOT — High Opening Trawl model net; HSOT (CV) — High Speed demersal Trawl (Crustacean Version); IO/SS/BRC — Indian Ocean/Sagar Sampada/Brachyura; P — pereopods; stn. — station.

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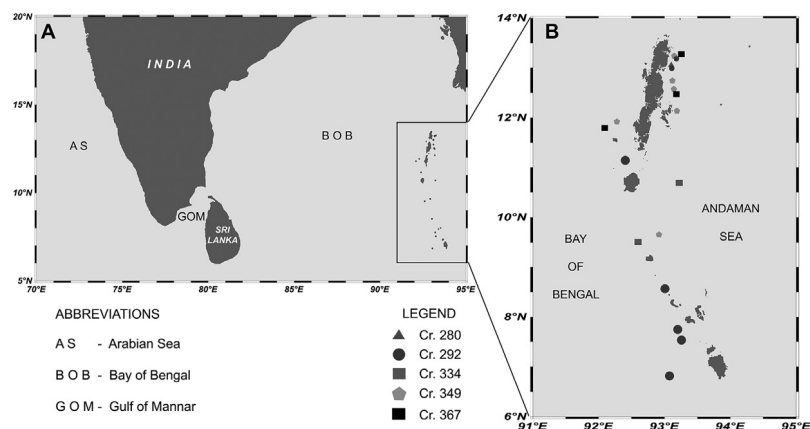


Fig. 1. (A) Map of India indicating the geographical location of the study area; (B) enlarged view of sampling locations during FORVSS cruise numbers 280, 292, 334, 349 and 367.

3. Results and discussion

3.1. *Dicranodromia baffini* (Alcock and Anderson, 1899)

Superfamily Homolodromioidea Alcock, 1899

Family Homolodromiidae Alcock, 1899

Genus *Dicranodromia* Milne-Edwards, 1880

Dicranodromia baffini (Alcock and Anderson, 1899)

(Fig. 2A–J)

3.1.1. Synonymy

Arachnodromia baffini Alcock and Anderson, 1899: 7 (type locality: Arabian Sea, off Travancore coast, RIMSS Investigator stn. 232, 7°17'30"N, 76°54'30"E, 430 fathoms (786 m) depth, grey mud); Alcock, 1899a: 19; Alcock, 1900: 132; Alcock, 1901: 33, pl. 1 figs. 1, 1a–c; Rathbun, 1937: 59; Venkataraman et al., 2004: 313 (table); Ng et al., 2008: 39.

Dicranodromia baffini (Alcock and Anderson, 1899): Chace, 1940: 8; Gordon, 1950: 204, text-fig. 1A, B; Martin, 1990: 708, 715; Guinot, 1995: 208, fig. 13; Dev Roy, 2008: 11; Ng et al., 2008: 39; Dev Roy and Nandi, 2012: table 1; Dev Roy, 2013: 150; Trivedi et al., 2018: 43.

Dicranodromia (= *Arachnodromia*) *Baffini*: Milne-Edwards and Bouvier, 1900: 16; Milne-Edwards and Bouvier, 1902: 15, 21; Bouvier, 1906: 481, 482.

Dicranodromia Baffini: Doflein, 1904: 5, 6; Ihle, 1913: 86, 89 (cit.); Balss, 1922: 104.

"*Arachnodromia*" *baffini*: Baez and Martin, 1989: 499.

3.1.2. Material examined

IO/SS/BRC/00076–00079, 2 males, 18.52–19.71 mm CL, 2 ovigerous females, 24.57–25.04 mm CL, Andaman Sea, FORVSS stn. 367II08, 13.27°N, 93.26°E, 635 m, HSDT (CV), 26.11.2017.

3.1.3. Remarks

Dicranodromia baffini was described by Alcock and Anderson (1899) from the southeastern Arabian Sea off Kerala coast based on two males and one female. Subsequently, Alcock (1899b) reported another male from the Bay of Bengal off the west coast of the Andamans at depths of 436–531 m. The only other report of this species is by Gordon (1950), who examined a female specimen from the Maldives (494 m). She provided detailed illustrations of the sternal suture 7/8 and described the anterior end as "somewhat sinuous groove ending in a tiny opening 'o' situated a little behind the tubercle 't' and opposite the anterior rim of the genital pore. The tubercle is near the junction of sternites 6 and 7, and may be formed partly by both or may

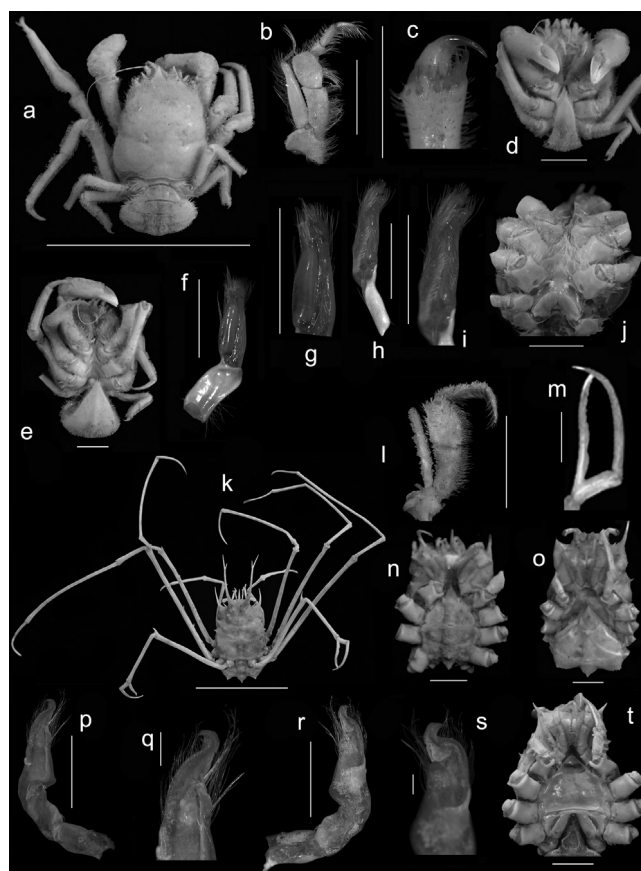


Fig. 2. *Dicranodromia baffini* (Alcock and Anderson, 1899): (A) dorsal view of habitus; (B) right maxilliped 3; (C) pereopod 5 subchela; (D) ventral view of habitus (male pleon); (E) ventral view of habitus (female pleon); (F) G1 (pleonal view); (G) G1 distal portion (pleonal view); (H) G1 (sternal view); (I) G1 distal portion (sternal view); (J) ventral view of female indicating position of vulvae. *Homolochunia valdiviae* Doflein, 1904: (K) dorsal view of habitus; (L) right maxilliped 3; (M) pereopod 5 subchela; (N) ventral view of habitus (male pleon); (O) ventral view of habitus (female pleon); (P) G1 (pleonal view); (Q) G1 distal portion (pleonal view); (R) G1 (sternal view); (S) G1 distal portion (sternal view); (T) ventral view of female indicating position of vulvae. Scale: A, K, 50 mm; B, D, E, J, L–O, T, 10 mm; C, F–I, P, R, 5 mm; Q, S, 1 mm.

belong to sternite 7". (Gordon, 1950: 204). This contrasts with Alcock and Anderson's (1899: 8) report that the "sternal grooves of the female end, without tubercles, at the level of the openings of the oviducts". The structure of the sternal suture 7/8 and

the presence of tubercles at the level of the gonopores in the present female specimen agrees with [Gordon's \(1950: text figs. 1A, B\) figures](#). The condition observed in [Alcock and Anderson's \(1899\) specimen](#) may be because it is a juvenile. This species otherwise closely resembles *D. doederleini* [Ortmann, 1892](#), from which it differs in having distinct granulation on the palm of the cheliped, the presence of an elongated, spinose anteroexternal tooth of the antennal basal article, and a relatively shorter P5 merus which does not reach the branchio-cardiac groove of the carapace ([Guinot, 1995](#)). The records of "*Dicranodromia buffini*" (sic) by [Sakai \(1976\)](#) from Japan and "*Dicranodromia baffini*" by [Davie and Short \(1989\)](#) from Australia have been referred to *D. doederleini* [Ortmann, 1892](#), and *D. aff. foersteri* [Guinot, 1993](#), respectively ([Guinot, 1995](#)).

3.1.4. Geographical and bathymetric distribution

Arabian Sea off Kerala, Bay of Bengal west off the Andamans, Maldives ([Guinot, 1995](#)). Depth range: 435–833 m ([Guinot, 1995](#)).

3.2. *Homolochunia valdiviae* [Doflein, 1904](#)

Superfamily Homoloidea De Haan, 1839

Family Homolidae De Haan, 1839

Genus *Homolochunia* [Doflein, 1904](#)

Homolochunia valdiviae [Doflein, 1904](#)

(Fig. 2K–T)

3.2.1. Synonymy

Homolochunia Valdiviae [Doflein, 1904](#): 22, 147, 183, 189, pl. 1 figs. 1, 2, pl. 9 figs. 1–8, pl. 10 figs. 1, 2, pl. 43 fig. 1, pl. 49 fig. 3, pl. 51 fig. 2 (type locality: off Eastern coast of Africa, Valdivia stn. 251, 1°40.6'S, 41°47.1'E, 693 m depth; Valdivia stn. 254, 0°29.3'S, 42°47.6'E, 977 m depth).

Homolochunia valdiviae: [Ihle, 1913](#): 65, 93, fig. 33; [Gordon, 1950](#): 224, 239, fig. 18A–C; [Griffin and Brown, 1976](#): 250 (remarks); [Kensley, 1981a](#): 60; [Kensley, 1981b](#): 37; [Guinot and Richer de Forges, 1981a](#): 549, figs. 4K, 6AL, A2, pl. 5 fig. 1, 1a–d; [Guinot and Richer de Forges, 1995](#): 430, figs. 50c–d, 51a–c; [Ng et al., 2008](#): 40.

3.2.2. Material examined

IO/SS/BRC/00080–00081, 1 male, 27.10 mm CL, 1 female, 29.70 mm CL, Andaman Sea, FORVSS stn. 367II08, 13.27°N, 93.26°E, 635 m, HSDT (CV), 26.11.2017.

3.2.3. Remarks

Homolochunia valdiviae was described by [Doflein \(1904\)](#) from one adult male, one juvenile male and two ovigerous females off the east coast of Africa at depths of 693 and 977 m. Subsequently, [Ihle \(1913\)](#) figured the P5 subchela from [Doflein's \(1904\)](#) specimen and [Gordon \(1950\)](#) reported *H. valdiviae* from off Zanzibar (781–640 m) with comments on the general morphology, and provided detailed illustrations of the female thoracic sternites 7 and 8. [Guinot and Richer de Forges \(1981a\)](#) reported this species off Madagascar. [Guinot and Richer de Forges \(1995\)](#), in their revision of the Homolidae, emphasized that the "sugar-tong" P5 subchela is the diagnostic character for this species. The old records of this species from the western Pacific by [Sakai \(1955, 1976\)](#), [Miyake \(1983\)](#) and [Nagai \(1994\)](#) have been referred to *Homolochunia gadaletae* [Guinot and Richer de Forges \(1995\)](#) (see also [Richer de Forges and Ng, 2008](#)).

3.2.4. Geographical and bathymetric distribution

Indian Ocean: East coast of Africa, Madagascar, Comoros, Seychelles, Indonesia ([Guinot and Richer de Forges, 1995](#)). Depth range: 395–1000 m ([Guinot and Richer de Forges, 1995](#)). This is the first record for Indian waters.

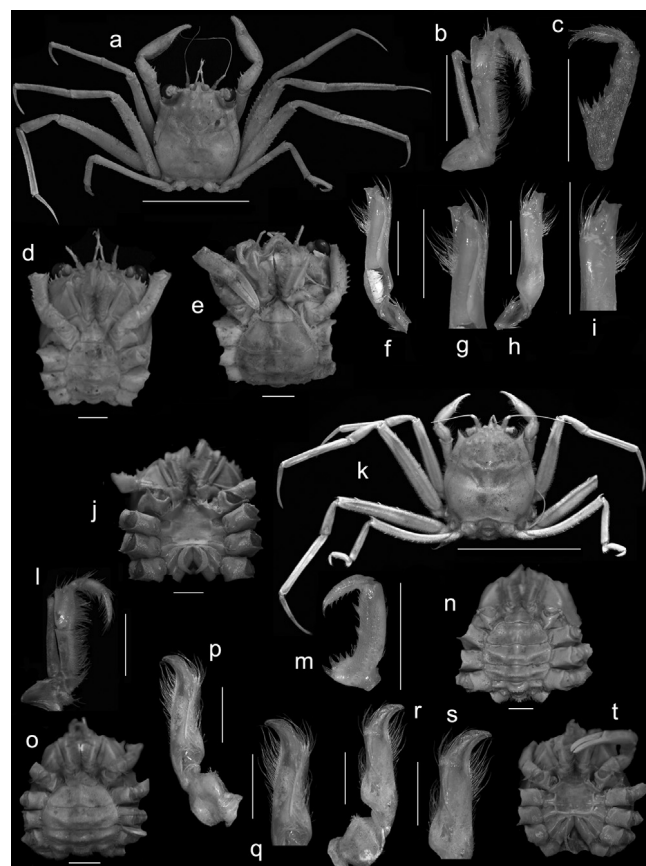


Fig. 3. *Homolax megalops* ([Alcock, 1894](#)): (A) dorsal view of habitus; (B) right maxilliped 3; (C) pereiopod 5 subchela; (D) ventral view of habitus (male pleon); (E) ventral view of habitus (female pleon); (F) G1 (pleonal view); (G) G1 distal portion (pleonal view); (H) G1 (sternal view); (I) G1 distal portion (sternal view); (J) ventral view of female indicating position of vulvae. *Paromolopsis boasi* Wood-Mason in [Wood-Mason and Alcock, 1891](#): (K) dorsal view of habitus, (L) right maxilliped 3; (M) pereiopod 5 subchela; (N) ventral view of habitus (male pleon), (O) ventral view of habitus (female pleon); (P) G1 (pleonal view); (Q) G1 distal portion (pleonal view); (R) G1 (sternal view); (S) G1 distal portion (sternal view); (T) ventral view of female indicating position of vulvae. Scale: A, K, 50 mm; B–E, J, L–O, T, 10 mm; F–I, P–S, 5 mm.

3.3. *Homolax megalops* ([Alcock, 1894](#))

Genus *Homolax* [Alcock, 1899](#)

Homolax megalops ([Alcock, 1894](#))

(Fig. 3A–J)

3.3.1. Synonymy

Homola megalops [Alcock, 1894](#): 408 (type locality: Andaman Sea, RIMSS Investigator, stn. 115, 11°31'40"N, 92°46'40"E, 188–220 fathoms (344–402 m) depth, green mud); [Alcock and Anderson, 1894](#): 176; [Alcock and Anderson, 1895](#), pl. 14 fig. 1, la; [Alcock and Anderson, 1899](#): 5 (list); [Lloyd, 1907](#): 6, 7; [Kemp and Sewell, 1912](#): 27; [Ihle, 1913](#): 88 (list); [Serène and Lohavanijaya, 1973](#): 24 (key); [Sakai, 1976](#): 39; [Sakai, 1979](#): 2, 3 (key), 4; [Yaldwyn and Dawson, 1976](#): 94 (key); [Eldredge, 1980](#): 277 (remarks); [Kazmi, 1988](#): 126, table 2; [Tirmizi and Kazmi, 1991](#): 34, figs. 10, 11; [Zarenkov, 1994](#): 97, fig. 1A(l–3); [Venkataraman et al., 2004](#): 313 (table).

Homola (*Homolax*) *megalops*: [Alcock, 1899a](#): 9; [Alcock, 1900](#): 158; [Alcock, 1901](#): 62, pl. 4 fig. 21; [Ihle, 1913](#): 92 (list).

Homolax megalops ([Alcock, 1894](#)): [Guinot and Richer de Forges, 1995](#): 351, figs. 17A, B, 18a–d; [Dev Roy, 2008](#): 11; [Ng et al., 2008](#): 40; [Dev Roy and Nandi, 2012](#): table 1; [Trivedi et al., 2018](#): 43.

Thelxiope megalops: [Gordon, 1950](#): 222, 223, 241, fig. 20A; [George and Rao, 1967](#): 334.

3.3.2. Material examined

IO/SS/BRC/00107–00108, 2 females, 28.29–44.35 mm CL, Andaman Sea, FORVSS stn. 28011, 13.03°N, 93.10°E, 278 m, HSDT (CV), 16.09.2010. IO/SS/BRC/00109–00114, 4 males, 42.92–51.55 mm CL, 2 berried females, 36.32–40.56 mm CL, Andaman Sea, FORVSS stn. 29234, 13.22°N, 93.18°E, 299 m, HSDT (CV), 27.11.2011. IO/SS/BRC/00084–00086, 2 males, 36.34–43.35 mm CL, 1 female, 34.96 mm CL, Andaman Sea, FORVSS stn. 29238, 13.00°N, 93.11°E, 308 m, HSDT (CV), 28.11.2011. IO/SS/BRC/00101–00103, 3 berried females, 46.97–53.76 mm CL, Bay of Bengal, FORVSS stn. 29283, 6.84°N, 93.05°E, 337 m, HSDT (CV), 10.12.2011. IO/SS/BRC/00090–00092, 1 male, 43.34 mm CL, 1 female, 26.34 mm CL, 1 berried female, 36.90 mm CL, Andaman Sea, FORVSS stn. 349II05, 12.54°N, 93.15°E, 300 m, HSDT (CV), 10.04.2016. IO/SS/BRC/00093–00094, 1 male, 57.33 mm CL, 1 female, 35.57 mm CL, Andaman Sea, FORVSS stn. 349II06, 12.74°N, 93.11°E, 332 m, HSDT (CV), 10.04.2016. IO/SS/BRC/00099–00100, 1 male, 29.12 mm CL, 1 female, 39.70 mm CL, Andaman Sea, FORVSS stn. 349II07, 13.24°N, 93.17°E, 332 m, HSDT (CV), 10.04.2016. IO/SS/BRC/00098, 1 female, 29.82 mm CL, Andaman Sea, FORVSS stn. 349II08, 12.14°N, 93.19°E, 411 m, HSDT (CV), 11.04.2016. IO/SS/BRC/00095–00097, 1 male, 30.24 mm CL, 2 berried females, 38.50–46.19 mm CL, Bay of Bengal, FORVSS stn. 349II09, 11.93°N, 92.28°E, 290 m, HSDT (CV), 12.04.2016. IO/SS/BRC/00088, 1 male, 38.05 mm CL, Andaman Sea, FORVSS stn. 367II05, 12.49°N, 93.18°E, 314 m, HSDT (CV), 25.11.2017. IO/SS/BRC/00089, 1 berried female, 40.38 mm CL, Andaman Sea, FORVSS stn. 367II15, 11.80°N, 92.09°E, 646 m, HSDT (CV), 28.11.2017. DABFUK, 5 males, 2 females, fishing port, Tuticorin, Tamil Nadu, Southeast India, coll. Kumar et al. March 2017. DABFUK, 2 females, Bay of Bengal, coll. V. Kakati, 2010. DABFUK, 2 males, 5 females, fishing port, Kollam, Kerala, India, coll. 20 May 2017

3.3.3. Remarks

Homolax megalops [Alcock, 1894](#), is the most common deep-water homolid in Indian waters and was first described from one male and one female from the Andaman Sea (344–402 m) (see also [Alcock and Anderson, 1895](#)). [Alcock \(1899a, 1900, 1901\)](#) added records from the southwestern part of the Bay of Bengal and southeastern Arabian Sea off Sri Lanka, with [Gordon \(1950\)](#) listing it from the Gulf of Aden, and [Tirmizi and Kazmi \(1991\)](#) from Pakistan. [Kemp and Sewell \(1912\)](#) discussed the sexual dimorphism in the species, particularly with regards to cheliped proportions. [Guinot and Richer de Forges \(1995\)](#) reviewed the taxonomy of the species. The good series of specimens from various parts of Indian seas indicate that the characters of the rostrum (whether it is sharp or terminally bifid), P5 merus (whether it is a gently curved or almost straight), podophthalmite (degree of inflation) and shape of the orbit are quite variable; are neither useful species characters nor size-dependent. Males with a CL 30–40 mm are already mature as evident in their fully developed G1 structures but they still have relatively slender chelae which are covered only with scattered setae overall. Only large males (40 mm CL and above) possess swollen chelae which have the inner surfaces densely tomentose.

3.3.4. Geographical and bathymetric distribution

Indian Ocean, Gulf of Aden to the Andaman Sea ([Guinot and Richer de Forges, 1995](#)). Depth range: 250–1068 m ([Guinot and Richer de Forges, 1995](#)).

Paromolopsis boasi Wood-Mason in [Wood-Mason and Alcock, 1891](#)

Genus *Paromolopsis* Wood-Mason in [Wood-Mason and Alcock, 1891](#)

Paromolopsis boasi Wood-Mason in [Wood-Mason and Alcock, 1891](#) (Fig. 3K–T)

3.4.1. Synonymy

Paromolopsis boasi Wood-Mason in [Wood-Mason and Alcock \(1891\)](#): 268, fig. 5. (type locality: Bay of Bengal, off North Sentinel Island, Andamans, 480 fathoms (878 m) depth); [Anderson, 1896](#): 102; [Bouvier, 1896](#): 29 (footnote), 43; [Alcock, 1901](#): 65, pl. 5 fig. 23.

Paromolopsis boasi: [Alcock, 1899a](#): 11; [Alcock, 1900](#): 160; [Ihle, 1913](#): 54, 60, 73, figs. 23B, 32; [Gordon, 1950](#): 244, fig. 16C; [Serène and Lohavanijaya, 1973](#): 29, figs. 39–42, pl. 3D; [Sakai, 1976](#): 43, pl. 15 fig. 2; [Serène and Vadon, 1981](#): 121; [Guinot and Richer de Forges, 1981a](#): 540, figs. 3B, 4L, pl. 6 fig. 3, 3a; [Miyake, 1983](#): 14, 197, pl. 5 fig. 5; [Guinot, 1984](#): 8 (list), pl. 3, fig. A; [Davie and Short, 1989](#): 165, fig. 1C; [Jamieson et al., 1993](#): 323, fig. 5, table 1; [Zarenkov, 1994](#): 99; [Guinot and Richer de Forges, 1995](#): 355, figs. 18f–h, 19A, B; [Dev Roy, 2008](#): 12; [Dev Roy and Nandi, 2012](#): table 1; [Dev Roy, 2013](#): 150; [Ng et al., 2008](#): 41; [Richer de Forges and Ng, 2008](#): 42 (discussion); [Ahyong et al., 2009](#): 115, fig. 82, 83a, b; [Trivedi et al., 2018](#): 43.

Paramolopsis boasi (sic): [Venkataraman et al., 2004](#): 313 (table).

3.4.2. Material examined

IO/SS/BRC/00130–00131, 1 male, 52.60 mm CL, 1 female, 31.98 mm CL, Andaman Sea, FORVSS stn. 367II08, 13.27°N, 93.26°E, 635 m, HSDT (CV), 26.11.2017. IO/SS/BRC/00132–00133, 2 males, 46.88–52.12 mm CL, Andaman Sea, FORVSS stn. 367II15, 11.80°N, 92.09°E, 646 m, HSDT (CV), 28.11.2017.

3.4.3. Remarks

Paromolopsis boasi is a widely distributed Indo-Western Pacific species that was described from only one specimen (sex not specified but appears to be a male) collected from west of the Andamans in the Bay of Bengal (Wood-Mason in [Wood-Mason and Alcock, 1891](#)). The species has since been reported off western Sri Lanka, Arabian Sea, off the eastern and western coasts of the Andamans, Réunion and Madagascar ([Alcock, 1899a, 1900, 1901](#); [Anderson, 1896](#); [Guinot and Richer de Forges, 1981a, 1995](#)). It has also been reported from many parts of the western Pacific (see [Davie and Short, 1989](#); [Richer de Forges and Ng, 2008](#); [Ng and Richer de Forges, 2017](#)). [Guinot and Richer de Forges \(1995\)](#) discussed the variation in this species with regard to carapace granulation, form of the anterolateral spine, spinulation on the P2–P4 merus as well as the relative length of the P5 merus. [Ahyong et al. \(2009\)](#) indicated this is a species complex. [Serène and Lohavanijaya \(1973\)](#) reported this species from the South China Sea with figures of the maxilliped 3, male pleon and gonopods. Comparing the present material with those from the South China Sea by [Serène and Lohavanijaya \(1973\)](#), the Indian specimens differ in having a spinose distolateral angle of the maxilliped 3 ischium (vs. truncated angle in the South China Sea material—[Serène and Lohavanijaya, 1973](#): fig. 39), the lateral margins of the male telson converge proximally (vs. margins subparallel in the South China Sea material—[Serène and Lohavanijaya, 1973](#): fig. 42), and the distal portion of the G1 is more curved (vs. less so in the South China Sea material—[Serène and Lohavanijaya, 1973](#): fig. 40). Compared to the material from Madagascar by [Guinot and Richer de Forges \(1981a\)](#), the Indian material appears to have relatively less inflated branchial regions, a more distinctly curved

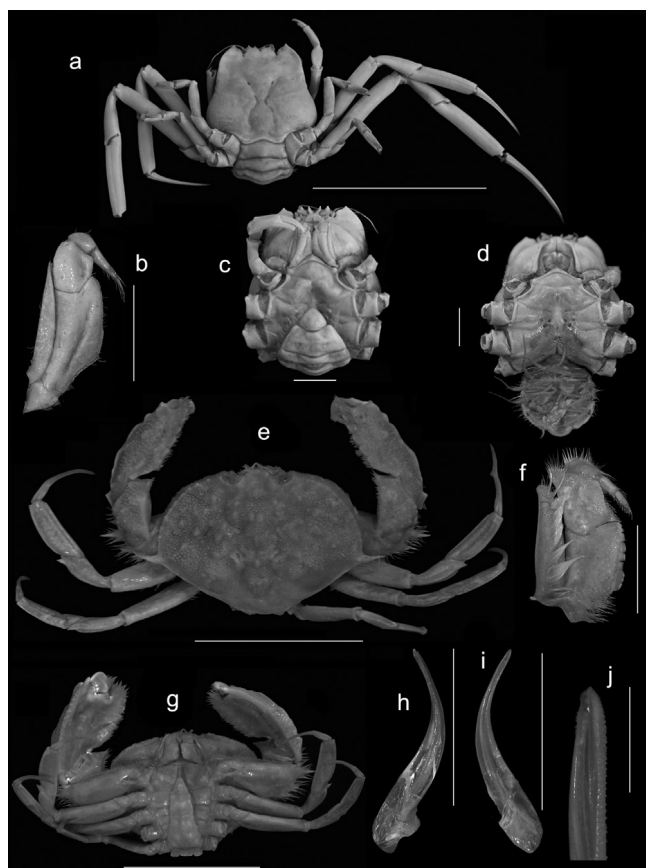


Fig. 4. *Ethusa andamanica* (Alcock, 1894): (A) dorsal view of habitus, (B) right maxilliped 3; (C) ventral view of habitus (female pleon); (D) ventral view of female indicating position of vulvae. *Mursia bicristimana* Alcock and Anderson, 1894: (E) dorsal view of habitus, (F) right maxilliped 3; (G) ventral view of habitus (male pleon); (H) G1 pleonal view; (I) G1 (sternal view); (J) G1 distal portion (sternal view). Scale: A, C, E, G, 50 mm; D, H–I, 10 mm; B, F, 5 mm; J, 1 mm.

distal spine on the anterior margin of the P5 merus with the posterior margin possessing 16 spines (vs. the anterior margin with only a granulose patch with posterior margin spines apparently fewer and less curved in the Madagascar specimens), the presence of two large corneous teeth on the non-dilated portion of the P5 propodus (vs. with 4 small teeth in the Madagascar specimens), and the P5 dactylus being relatively wider proximally (see Guinot and Richer de Forges, 1995: fig. 18f, h). These observations support the idea that there are probably more species, but this can only be resolved in a complete revision of the genus examining material from throughout its range.

3.4.4. Geographical and bathymetric distribution

Western Indian Ocean to the Andaman Sea, Australia, Indonesia, Malaysia, South China Sea, Japan and New Caledonia (Ahyong et al., 2009). Depth range: 284–1097 m (Guinot and Richer de Forges, 1995).

3.5. *Ethusa andamanica* Alcock, 1894

Superfamily Dorippoidea MacLeay, 1838

Family Ethusidae Guinot, 1977

Genus *Ethusa* Roux, 1830

Ethusa andamanica Alcock, 1894

(Fig. 4A–D)

3.5.1. Synonymy

Ethusa andamanica Alcock, 1894: 405 (type locality: Andaman Sea, RIMSS Investigator, stn. 115, 11°31'40"N, 92°46'40"E, 188–220 fathoms (344–402 m) depth, green mud); Alcock, 1896: 284; Alcock, 1899a: 33; Kemp and Sewell, 1912: 27; Ihle, 1916: 153 (list), 155 (list); Castro, 2005: 513, fig. 4; Ng et al., 2008: 60; Dev Roy and Nandi, 2012: table 1; Trivedi et al., 2018: 39.

Aethusa andamanica: Alcock and Anderson, 1895: pl. 14 fig. 8.

?*Ethusa andamanica*: Doflein, 1904: 27, pl. 13 figs. 7, 8, 64; Parisi, 1914: 302, figs. 3, 4.

3.5.2. Material examined

IO/SS/BRC/00134, 1 female, 30.61 mm CL, Andaman Sea, FORVSS stn. 29238, 13.00°N, 93.11°E, 308 m, HSDT (CV), 28.11.2011.

3.5.3. Remarks

Ethusa andamanica was described from the Andaman Sea (344–402 m) by Alcock (1894) and is distinguished from its closest congener *E. orientalis* Miers, 1886, in having the anterior extension of the endostome overreaching the antennular fossae, as compared to shorter endostome reaching the basal antennular article in the latter (see Alcock and Anderson, 1895; Castro, 2005).

3.5.4. Geographical and bathymetric distribution

Off southwestern India, Andaman Sea and Nicobar Islands (Castro, 2005). Depth range: 110–439 m (Castro, 2005).

3.6. *Mursia bicristimana* Alcock and Anderson, 1894

Family Calappidae De Haan, 1833

Genus *Mursia* Desmarest, 1823

Mursia bicristimana Alcock and Anderson, 1894

(Fig. 4E–J)

3.6.1. Synonymy

Mursia bicristimana Alcock and Anderson, 1894: 179 (type locality: Gulf of Mannar, RIMSS Investigator Stn. 151, 13.5 miles north, 64°W of Colombo, 142–400 fathoms (260–732 m) depth, brown mud); Alcock and Anderson, 1896: pl. 24 fig. 5; Anderson, 1896: 103; Alcock, 1896: 150; Alcock, 1899a: 5 (list), 23, pl. 3 figs. 3, 3a–b.; Lloyd, 1907: 6; Kemp and Sewell, 1912: 29; Spiridonov and Apel, 2007: 2859, 2884 (key), figs. 2D, E, 3C, D, 4A, B, 5A, B, 6A, B, 7A, B, 8A, 9A; Ng et al., 2008: 48; Dev Roy and Nandi, 2012: table 1; Kumar et al., 2013: 534, figs 4a–c, 5, 6a–d, 7a, b; Trivedi et al., 2018: 32.

Mursia africana: Ng et al., 2002: 356, (not *Mursia africana* Galil, 1993).

Mursia xienchengi Lai and Galil, 2006: 58, figs. 1a–c, 2a, b.

Mursia armata bicristimana: Doflein, 1904: 41, pl. 17 fig. 3, pl. 18 fig. 4.

?*Mursia bicristimana*: Galil, 1993: 356, figs. 1 f, 3 j, k, 5c–d.

Mursia armata: Zarenkov, 1994: 100 (not *Mursia armata* De Haan, 1837).

3.6.2. Material examined

IO/SS/BRC/00135, 1 male, 42.21 mm CL, Andaman Sea, FORVSS stn. 349II05, 12.54°N, 93.15°E, 300 m, HSDT (CV), 10.04.2016.

3.6.3. Remarks

The taxonomy of *Mursia bicristimana*, described from the Gulf of Mannar (260–732 m) by [Alcock and Anderson \(1894\)](#) was revised by [Galil \(1993\)](#) but has changed substantially in recent years due to additional material becoming available (see [Spiridonov and Apel, 2007](#); [Kumar et al., 2013](#)). The present material from the Andamans conforms to the strict diagnosis for the species by [Kumar et al. \(2013\)](#). The Arabian Sea material referred to “*Mursia bicristimana*” by [Spiridonov and Apel \(2007\)](#) was referred to a new species, *M. arabica*, by [Kumar et al. \(2013\)](#). [Laurie's \(1906\)](#) specimens of “*Mursia bicristimana*” (and some reported by [Galil, 1993](#)) were referred to a new species, *Mursia minuta*, by [Spiridonov and Apel \(2007\)](#) but this name had to be replaced by *Mursia spiridinovi* [Karasawa, 2018](#), as it was preoccupied ([Karasawa, 2018](#)).

3.6.4. Geographical and bathymetric distribution

Gulf of Mannar, Sri Lanka, Andaman Sea, Kerala ([Kumar et al., 2013](#)). Depth range: 260–732 m ([Alcock and Anderson, 1894](#)), 70–100 m ([Kumar et al., 2013](#)).

3.7. *Arcania undecimspinosa* De Haan, 1841

Superfamily Leucosioidea [Samouelle, 1819](#)

Family Leucosiidae [Samouelle, 1819](#)

Subfamily Eballiinae [Stimpson, 1871](#)

Genus *Arcania* [Leach, 1817](#)

Arcania undecimspinosa De Haan, 1841

([Fig. 5A–G](#))

3.7.1. Synonymy

Arcania undecimspinosa: [Alcock, 1896](#): 266; [Ihle, 1918](#): 313 (list); [Sankarankutty, 1962](#): 155; [Serène and Vadon, 1981](#): 124; [Pal and Khora, 1999](#): 8 (list), 13; [Galil, 2001](#): 197, figs. 3D, 7D; [Krishnamoorthy, 2007](#): 85; [Dev Roy, 2008](#): 31; [Dev Roy and Nandi, 2012](#): table 1; [Trivedi et al., 2018](#): 46.

3.7.2. Material examined

IO/SS/BRC/00136, 1 male, 17.68 mm CL, Andaman Sea, FORVSS stn. 334II02B, 10.71°N, 93.22°E, 124 m, Naturalist's dredge, 25.01.2015.

3.7.3. Remarks

[Naruse \(2014\)](#) revised the taxonomy of *Arcania undecimspinosa* (De Haan, 1841) and described two new allied species from the western Pacific. [Alcock \(1896\)](#) reported *A. undecimspinosa* from the Andamans and the Palk Strait off Tamil Nadu but their material must be reappraised as there appears to be at least two forms in the Indian Ocean (T. Naruse, pers. comm.). The present specimen from the Andamans differs from *A. undecimspinosa* s. str. in having the lateral pair of posterior teeth on the carapace cylindrical (vs. with lobe-like teeth in *A. undecimspinosa* s. str.), the frontal teeth are truncate (vs. with triangular teeth in *A. undecimspinosa* s. str.), the fused pleonal somites 3–5 are relatively wider with a distinct constriction at the junction of somites 4 and 5 (vs. less constricted in *A. undecimspinosa* s. str.), the prominently convex distal margin of somite 5 and lateral margins of somite 6 (vs. less convex in *A. undecimspinosa* s. str.), proportionately wider telson tapering distally (vs. more narrow telson with rounded distal margin in *A. undecimspinosa* s. str.) and a G1 with the distal portion straight ([Fig. 5D–G](#)) (vs. dorsal curved in mesial view in *A. undecimspinosa* s. str.) (cf. [Naruse, 2014](#): figs. 4a–c, 5a–c). More specimens, however, will need to be obtained to ascertain the validity of the various differences observed above. For the moment, it is identified with *A. undecimspinosa*.

3.7.4. Geographical and bathymetric distribution

South Africa to India, Andamans and Western Pacific regions ([Galil, 2001](#)). Depth range: 14–420 m ([Galil, 2001](#)).

3.8. *Parilia pattersoni* Ng et al., 2018

Genus *Parilia* Wood-Mason in [Wood-Mason and Alcock, 1891](#)

Parilia pattersoni Ng et al., 2018

([Fig. 5H–N](#))

3.8.1. Synonymy

Parilia pattersoni Ng et al., 2018: 305, 310 (key), figs. 1D, 2C, 3D, 4G, H, 5G–I, 6D, 7G, H, 8N–S, 9E, F (type locality: Tuticorin fishing port, Tamil Nadu, southeastern India); [Trivedi et al., 2018](#): 48. *Parilia alcocki* (not *Parilia alcocki* Wood-Mason, in [Wood-Mason and Alcock, 1891](#)): [Doflein, 1904](#): 44, pl. 14 figs. 8, 9. *Parilia major*: [Vidhya et al., 2017](#): 2334 (not *Parilia major* [Sakai, 1961](#)).

3.8.2. Material examined

IO/SS/BRC/00137, 1 male, 50.04 mm CL, Andaman Sea, FORVSS stn. 29238, 13.00°N, 93.11°E, 308 m, HSDT (CV), 28.11.2011; CUSAT, 1 male, 68.0 mm CL, station C1 200–210 E, Ponnani, Malappuram district, northern Kerala, beam trawl, 1960s.

3.8.3. Remarks

Parilia pattersoni is the largest leucosiids known, and was first described on specimens collected by fishermen from Tuticorin fishing port, southeastern India ([Ng et al., 2018a, 2018b](#)). [Ng et al. \(2018a, 2018b\)](#) referred [Doflein's \(1904\)](#) record of “*Parilia alcocki*” from Western Sumatra to *P. pattersoni*. The present record of this species from the Andaman Sea and off the Kerala coast in the Arabian Sea extends its zoogeographical range.

3.8.4. Geographical and bathymetric distribution

Eastern India, off Western Sumatra ([Ng et al., 2018a, 2018b](#)). Depth range: 100–300 m ([Ng et al., 2018a, 2018b](#)). This is the first record from the western Indian Ocean and the Andaman Sea.

3.9. *Tanaoa pustulosus* (Wood-Mason in [Wood-Mason and Alcock, 1891](#))

Genus *Tanaoa* [Galil, 2003](#)

Tanaoa pustulosus (Wood-Mason in [Wood-Mason and Alcock, 1891](#))

([Fig. 6A–G](#))

3.9.1. Synonymy

Randallia pustulosa Wood-Mason in [Wood-Mason and Alcock, 1891](#): 266 (type locality: Bay of Bengal between N. and S. Sentinel Islands, RIMSS Investigator stn. 56, 240–220 fathoms (439–403 m) depth, globigerina and coral sand); [Wood-Mason, 1892](#): pl. 5 fig. 4; [Anderson, 1896](#): 103; [Alcock, 1896](#): 196; [Alcock, 1899a](#): 27; [Doflein, 1904](#): 42, pl. 14 figs. 1–6; [Ihle, 1918](#): 312 (list); [Serène, 1954](#): 491; [Sakai, 1976](#): 99, pl. 30 fig. 2; [Yaldwyn and Dawson, 1976](#): 95, figs. 2–5; [Serène and Vadon, 1981](#): 119, 124; [Richer de Forges, 1983](#): 634 (table); [McLay, 1988](#): 100, fig. 20; [Chen, 1989](#): 217, fig. 15, pl. 4 fig. 1; [Tan, 1996](#): 1054; [Ikeda, 1998](#): 82, pl. 19 fig. 1a–d; [Ng et al., 2001](#): 10; [Chen and Sun, 2002](#): 342, fig. 151, pl. 3.1; [Galil, 2003](#): 404 (synonymy), Table 1. *Randallia vitjazi* [Zarenkov, 1994](#): 104, pl. 5 8B; [Galil, 2003](#): 405 (synonymy), Table 1; [Ng et al., 2008](#): 94. *Tanaoa pustulosus* (Wood-Mason in [Wood-Mason and Alcock, 1891](#)): [Galil, 2003](#): 404, figs. 1D, 3G, H; [Ng et al., 2008](#): 94; [Dev Roy, 2013](#): 151; [Trivedi et al., 2018](#): 50. *Tanaoa pustulosa*: [Dev Roy and Nandi, 2012](#): table 1.

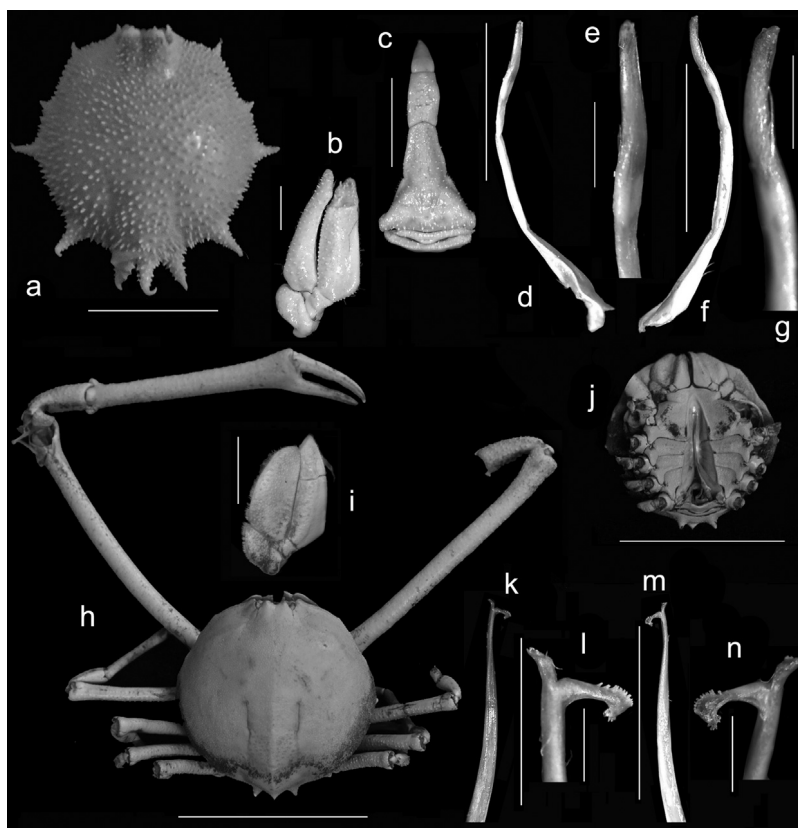


Fig. 5. *Arcania undecimspinosa* De Haan, 1841: (A) dorsal view of habitus; (B) right maxilliped 3; (C) ventral view of male pleon; (D) G1 (pleonal view); (E) G1 distal portion (pleonal view); (F) G1 (sternal view); (G) G1 distal portion (sternal view). *Parilia pattersoni* Ng et al., 2018: (H) dorsal view of habitus; (I) right maxilliped 3; (J) ventral view of habitus; (K) G1 (pleonal view); (L) G1 distal portion (pleonal view); (M) G1 (sternal view); (N) G1 distal portion (sternal view). Scale: H, J, 50 mm; A, I, K, M, 10 mm; C, D, F, 5 mm; B, E, G, L, N, 1 mm.

3.9.2. Material examined

IO/SS/BRC/00138, 1 male, 30.42 mm CL, Bay of Bengal, FORVSS stn. 29289, 7.53°N, 93.25°E, 580 m, HSDT (CV), 11.12.2011. IO/SS/BRC/00139, 1 male, 30.11 mm CL, Andaman Sea, FORVSS stn. 349II08, 12.14°N, 93.19°E, 411 m, HSDT (CV), 11.04.2016. IO/SS/BRC/00140, 1 male, 31.32 mm CL, Andaman Sea, FORVSS stn. 367II08, 13.27°N, 93.26°E, 635 m, HSDT (CV), 26.11.2017.

3.9.3. Remarks

Tanaoa pustulosus was originally described as a *Randallia* from off the Andamans in the Bay of Bengal (439–403 m) (Wood-Mason and Alcock, 1891) (see also Wood-Mason, 1892). The species has been widely reported across the Indo-West Pacific (Galil, 2003). Galil (2003) erected a new genus *Tanaoa* with *R. pustulosa* as the type species, on the basis of its characteristic antennular fossa, efferent branchial channels, maxilliped 3, male pleon and G1. Nine species are now recognized in the genus (see Ng and Richer de Forges, 2007; Galil and Ng, 2015).

3.9.4. Geographical and bathymetric distribution

Off Eastern Africa and Madagascar to Andaman Sea and Western Pacific regions (Galil, 2003). Depth range: 85–977 m (Galil, 2003).

3.10. *Urashima lamellidentatus* (Wood-Mason, 1892)

Genus *Urashima* Galil, 2003

Urashima lamellidentatus (Wood-Mason, 1892)
(Fig. 6H–N)

3.10.1. Synonymy

Randallia lamellidentata Wood-Mason, 1892: pl. 5, figs. 5, 5a, 5b; Alcock, 1894: 404 (type locality: Andaman Sea, RIMSS Investigator, st. 115, 11°31'40"N, 92°46'40"E, 188–220 fathoms (344–402 m) depth, green mud); Alcock, 1896: 195; Alcock, 1899a: 26; Kemp and Sewell, 1912: 29; Ihle, 1918: 312 (list); Serène, 1954: 491; Serène, 1968: 45; Yaldwyn and Dawson, 1976: 96; Richer de Forges, 1983: 634.

Urashima lamellidentata: Galil, 2003: Table 1; Dev Roy and Nandi, 2012: table 1; Kumar et al., 2013: 548, figs. 7e, 12a, b, 13a–d.

Urashima lamellidentatus: Galil, 2003: 417, fig. 2E; Ng et al., 2008: 94; Trivedi et al., 2018: 50.

3.10.2. Material examined

IO/SS/BRC/00141, 1 male, 35.92 mm CL, Andaman Sea, FORVSS stn. 29238, 13.00°N, 93.11°E, 308 m, HSDT (CV), 28.11.2011.

3.10.3. Remarks

Urashima lamellidentatus (Wood-Mason, 1892) was described as a *Randallia* on the basis of material from the Andaman Sea (344–402 m) and is geographically restricted to the Indian waters and the Maldives. Galil (2003) established a new genus *Urashima* with *Randallia pustuloides* Sakai, 1961 as the type species due to its characteristic laterally compressed cheliped fingers, pereopods with granulate carpus and propodus, as well as the oar-shaped G1. *Urashima lamellidentatus* differs from its only congener *U. pustuloides* in having lamellate crests on the anterolateral carapace margins (absent in the latter species), lamellate denticles on the posterior carapace margin (triangular denticles in the latter), and crested dorsal margin of cheliped palm (subcylindrical palm in the latter) (Galil, 2003).

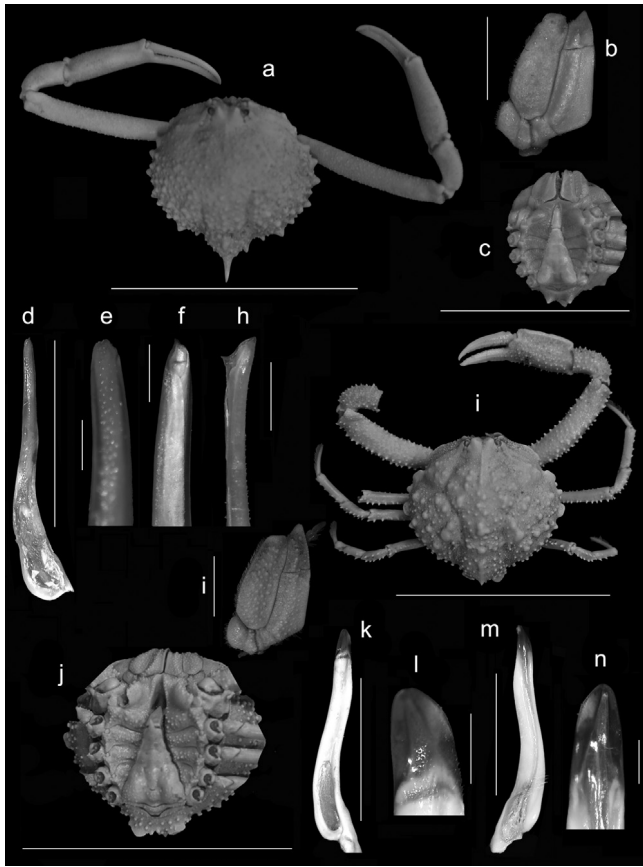


Fig. 6. *Tanaoa pustulosus* (Wood-Mason in Wood-Mason and Alcock, 1891): (A) dorsal view of habitus; (B) right maxilliped 3; (C) ventral view of habitus (male pleon); (D) G1 (lateral view); (E) G1 distal portion (lateral view); (F) G1 distal portion (mesial view); (G) G1 distal portion (pleonal view). *Urashima lamellidentatus* Wood-Mason, 1892: (H) dorsal view of habitus; (I) right maxilliped 3; (J) ventral view of habitus (male pleon); (K) G1 (lateral view); (L) G1 distal portion (lateral view); (M) G1 (mesial view); (N) distal portion (mesial view). Scale: A, C, H, J, 50 mm; D, K, M, 10 mm; B, I, 5 mm; E–G, L, N, 1 mm.

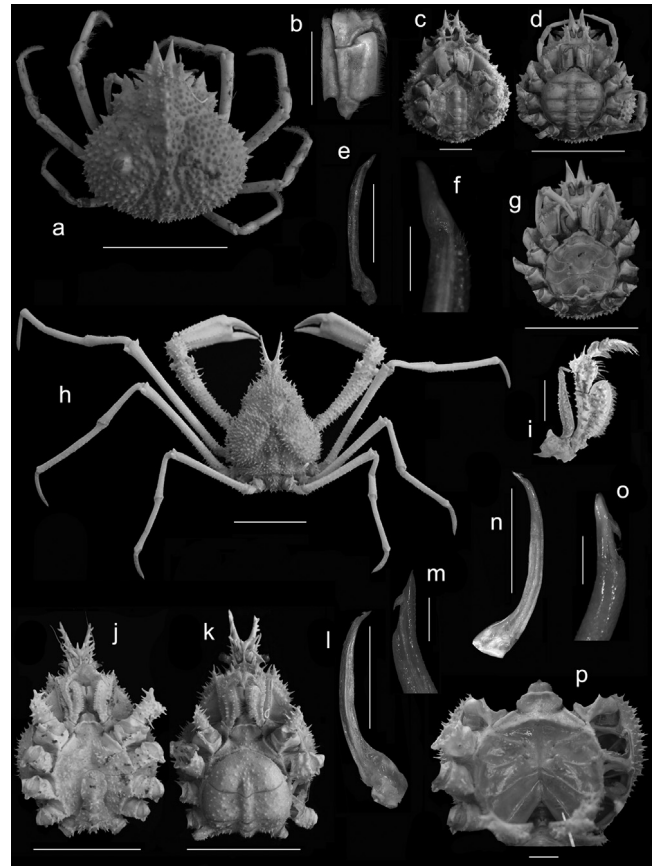


Fig. 7. *Paramaja gibba* (Alcock, 1895): (A) dorsal view of habitus; (B) right maxilliped 3; (C) ventral view of habitus (male pleon); (D) ventral view of habitus (female pleon); (E) G1 (pleonal view); (F) G1 distal portion (sternal view); (G) ventral view of female indicating position of vulvae. *Pleistacantha pungens* (Wood-Mason in (Wood-Mason and Alcock, 1891)): (H) dorsal view of habitus; (I) right maxilliped 3; (J) ventral view of habitus (male pleon); (K) ventral view of habitus (female pleon); (L) G1 (pleonal view); (M) G1 distal portion (pleonal view); (N) G1 (sternal view); (O) G1 distal portion (sternal view); (P) ventral view of female indicating position of vulvae. Scale: A, D, G, H, J, K, 50 mm; B, C, I, L, N, P, 10 mm; E, 5 mm; F, M, O, 1 mm.

3.10.4. Geographical and bathymetric distribution

Andamans, Maldives (Galil, 2003), off Kerala (Kumar et al., 2013). Depth range: 340–640 m (Galil, 2003), 30–70 m (Kumar et al., 2013).

3.11. *Paramaja gibba* (Alcock, 1895)

Superfamily Majoidea Samouelle, 1819

Family Majidae Samouelle, 1819

Subfamily ajinae Samouelle, 1819

Genus *Paramaja* Kubo, 1936

Paramaja gibba (Alcock, 1895)

(Fig. 7A–G)

3.11.1. Synonymy

Maja gibba Alcock, 1895: 239, pl. 4 fig. 5 (type locality: Andaman Sea, 250 fathoms (457 m) depth); Alcock, 1899a: 56; Alcock and Anderson, 1896: pl. 21 fig. 5, 5a; Kemp and Sewell, 1912: 31; Griffin and Tranter, 1986a: 211 (key), 216; Ng et al., 2008: 117; Dev Roy and Nandi, 2012: table 1.

Paramaja gibba: Ng and Richer de Forges, 2015: 133, figs. 10, 11, 13D, 14F, G, 15K–M, 36I, 39I, J, 41F, 43L, M, 48F, G, 52D, 53K, 55H, 68B, C; Trivedi et al., 2018: 52.

3.11.2. Material examined

IO/SS/BRC/00142, 1 male, 35.11 mm CL, Andaman Sea, FORVSS stn. 349II05, 12.54°N, 93.15°E, 300 m, HSDT (CV), 10.04.2016. IO/SS/BRC/00143, Andaman Sea, FORVSS stn. 367II05, 12.49°N, 93.18°E, 314 m, 1 female, 64.66 mm CL, HSDT (CV), 25.11.2017.

3.11.3. Remarks

Paramaja gibba was described from one small specimen collected at 457 m depth in the Andaman Sea (Alcock, 1895) but is now known to be widely distributed in the Indian Ocean region (Ng and Richer de Forges, 2015). Ng and Richer de Forges (2015) transferred this species to *Paramaja* Kubo, 1936, due to its short, stout pseudorostral spines, inflated branchial and cardiac regions of the carapace, variously sized granules on dorsal carapace, position of antennal flagellum inside the orbit, suborbital margin merging with postorbital denticular margin, unarmed dorsal margin of the ambulatory merus, and a relatively straight G1.

3.11.4. Geographical and bathymetric distribution

Madagascar, Saya de Malha, Socotra, Andaman Sea, Australia (Ng and Richer de Forges, 2015). Depth range: 230–580 m (Ng and Richer de Forges, 2015).

3.12. *Pleistacantha pungens* (Wood-Mason in Wood-Mason and Alcock, 1891)

Family Oregoniidae Garth, 1958

Subfamily Pleistacanthinae Štević, 2005

Genus *Pleistacantha* Miers, 1879

Pleistacantha pungens (Wood-Mason in Wood-Mason and Alcock, 1891)

(Fig. 7H–P)

3.12.1. Synonymy

Echinoplax pungens Wood-Mason in Wood-Mason and Alcock, 1891: 259 (type locality: Bay of Bengal, between N. and S. Sentinel Islands, RIMSS Investigator stn. 56, 240–220 fathoms (439–403 m) depth, globigerina and coral sand); Alcock and Anderson, 1896: pl. 17 fig. 1; Alcock, 1894: 400; Alcock, 1895: 179; Alcock, 1899a: 43; Alcock, 1899c: pl. 39; Sakai, 1976: 173, 174.

Pleistacantha pungens: Guinot and Richer de Forges, 1985: 131 (remarks); Ah Yong and Ng, 2007: fig. 6; Ng et al., 2008: 112; Dev Roy and Nandi, 2012: table 1; Ng et al., 2017: 129, fig. 3B, C, 4B, C, 5B, 6C, D, 7D–F, 8C, D, 9C, D, 10E–H, table 1; Trivedi et al., 2018: 45.

Pleistacantha moseleyi: Doflein, 1904: 76 (part); Griffin and Tranter, 1986b: 359, figs. 9a, 10b. (not *Pleistacantha moseleyi* Miers, 1886).

3.12.2. Material examined

IO/SS/BRC/00144-00146, 3 males, 74.55–93.27 mm CL, Bay of Bengal, FORVSS stn. 29206, 11.16°N, 92.39°E, 526 m, HSDT (CV), 22.11.2011. IO/SS/BRC/00148, 1 ovigerous female, 75.48 mm CL, Bay of Bengal, FORVSS stn. 29283, 6.84°N, 93.05°E, 337 m, HSDT (CV), 10.12.2011. IO/SS/BRC/00147, 1 male, 72.92 mm CL, Andaman Sea, FORVSS stn. 349104, 9.66°N, 92.92°E, 362 m, HSDT (CV), 6.04.2016. IO/SS/BRC/00149, 1 ovigerous female, 61.28 mm CL, Andaman Sea, FORVSS stn. 3671108, 13.27°N, 93.26°E, 635 m, HSDT (CV), 26.11.2017.

3.12.3. Remarks

Pleistacantha pungens was originally described from off the western coast of Andamans in the Bay of Bengal (439–403 m) (Wood-Mason and Alcock, 1891) (see also Alcock, 1895, 1899a, 1899b; Alcock and Anderson, 1896). The taxonomy of this species is a bit confused. Guinot and Richer de Forges (1981b) recognized *P. pungens* as a possibly distinct species, and Guinot and Richer de Forges (1985) commented on the presumed differences between *P. pungens* and *P. moseleyi* Miers, 1886. Griffin and Tranter (1986b) disagreed and synonymized it with *P. moseleyi*. Ah Yong and Ng (2007) decisively recognized the validity of *P. pungens* based on the examination of the Investigator material. With more material, Ng et al. (2017) compared *P. pungens*, *P. moseleyi*, *P. ori* Ah Yong and Ng, 2007 and *P. kannu* Ng et al., 2017; and distinguished *P. pungens* from *P. moseleyi* by the rostral spines being straight and directed obliquely laterally (Fig. 7H, J, K; see Ng et al., 2017: figs. 3B–C, 4B, 6C–D) in *P. pungens* (vs. strongly divergent upwardly in *P. moseleyi*) (see Ng et al., 2017: figs. 3A, 4A, 6A–B), the male pleonal somites 4–6 are armed with spines and tubercles (Fig. 7J; see Ng et al., 2017: fig. 9 C–D) in *P. pungens* (vs. with spines in *P. moseleyi*) (see Ng et al., 2017: figs. 9A–B), and the G1 being relatively slender in *P. pungens* (Fig. L–O; see Ng et al., 2017: fig. 10E–H) (vs. proportionately stouter in *P. moseleyi*) (see Ng et al., 2017: fig. 10A–D). *Pleistacantha pungens* is now known from the eastern Bay of Bengal, Andaman Sea and Myanmar (see Ng et al., 2017). The doubtful record of “*Pleistacantha pungens*” by Guinot and Richer de Forges (1981b) from Madagascar was referred to a new species, *P. ori* Ah Yong and Ng, 2007. There is one more species of *Pleistacantha* known only from the Andamans, *P.*

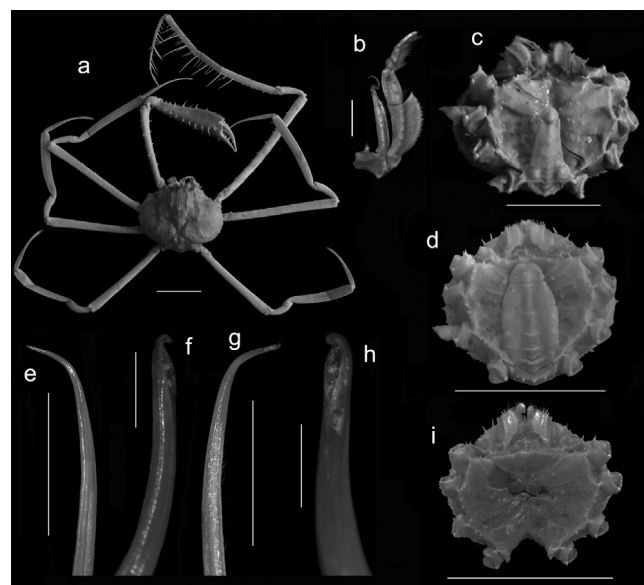


Fig. 8. *Platymaia alcocki* Rathbun, 1918: (A) dorsal view of habitus; (B) right maxilliped 3; (C) ventral view of habitus (male pleon); (D) ventral view of habitus (female pleon); (E) G1 (pleonal view); (F) G1 distal portion (pleonal view); (G) G1 (sternal view); (H) G1 distal portion (sternal view); (I) ventral view of female indicating position of vulvae. Scale: A, C, D, I, 50 mm; B, E, G, 10 mm; F, H, 1 mm.

rubida (Alcock, 1895). The identity of this poorly known species (known only from one type female specimen) has been uncertain, but Ah Yong et al. (2019) recently reappraised its taxonomy and showed it was distinct from the closely allied *P. oryx* (Ortmann, 1892).

3.12.4. Geographical and bathymetric distribution

Andaman Sea, Myanmar (Ng et al., 2017). Depth range: 439–403 m (Wood-Mason and Alcock, 1891), 344–403 m (Alcock, 1894), 238–458 m (Alcock, 1895), 205–457 m (Alcock, 1899a).

3.13. *Platymaia alcocki* Rathbun, 1918

Family Inachidae MacLeay, 1838

Genus *Platymaia* Miers, 1886

Platymaia alcocki Rathbun, 1918

(Fig. 8A–I)

3.13.1. Synonymy

Platymaia alcocki Rathbun, 1916: 530 (comments on relationships with *Platymaia bartschi* Rathbun, 1916) (type locality: Andaman Sea, 188–405 fathoms (344–741 m) depth); Rathbun, 1918: 8 (renaming of *P. wyvillethomsoni* sensu Alcock and Anderson, 1896; Chun, 1903; Doflein, 1904); Dell, 1963: 251; Griffin, 1974: 27; Crosnier, 1976: 242 (cit.); Serène and Vadon, 1981: 123; Guinot and Richer de Forges, 1985: 94, figs. 4 A–G, 10 I–K, pl. 2 fig. D–H; Griffin and Tranter, 1986a: 44 (key), 48 (comparison), figs. 10a, b, 11c; Ng et al., 2008: 112; Promdam, 2011: 10, figs. 3, 4A–F; Dev Roy and Nandi, 2012: table 1; Trivedi et al., 2018: 45.

Platymaia Wyville-Thomsoni (not *Platymaia Wyville-Thomsoni* Miers, 1886): Wood-Mason and Alcock, 1891: 258; Alcock, 1894: 401; Alcock, 1895: 181; Alcock and Anderson, 1896: pl. 16; Alcock, 1899a: 46; Chun, 1903: 399, 400 (photograph), 530.

Platymaia wyville-thomsoni (not *Platymaia wyville-thomsoni* Miers, 1886): Doflein, 1904: 59, 160, 185, pls. 2, 20, 21 figs. 1–4, 22 figs. 1–2, 23, 39 figs. 1–5, 43 figs. 5–6, 50 fig. 2, 5, 6, 51 fig. 3, 53 figs. 1–3, 54 figs. 1–7, 57 fig. 1; Miyake, 1936: 417, fig. 1, pl. 28 fig. 3;

Sakai, 1938: 238, pl. 24 fig. 2; Dev Roy and Nandi, 2012: table 1; Trivedi et al., 2018: 45.

Platymaia Wyville-Thomsoni Alcocki Ihle and Ihle-Landenberg 1931: 149.

Platymaja alcocki: Serène and Lohavanijaya, 1973: 48 (key).

Not *Platymaia alcocki*: Seno and Kenno, 1954: 85, pl. 2; Takeda and Miyake, 1969: 498, fig. 10, 11 a–c; Sakai, 1976: 176, fig. 94a, pl. 57.

3.13.2. Material examined

IO/SS/BRC/00150–00151, 2 males, 58.10–73.80 mm CL, Bay of Bengal, FORVSS stn. 29206, 11.16°N, 92.39°E, 526 m, HSDT (CV), 22.11.2011. IO/SS/BRC/00152, 1 male, 95.93 mm CL, Bay of Bengal, FORVSS stn. 29283, 6.84°N, 93.05°E, 337 m, HSDT (CV), 10.12.2011. IO/SS/BRC/00153, 1 female, 46.94 mm CL, Andaman Sea, FORVSS stn. 367105, 12.49°N, 93.18°E, 314 m, HSDT (CV), 25.11.2017.

3.13.3. Remarks

There has been considerable ambiguity regarding the taxonomic status of the long-legged inachid crabs of the genus *Platymaia* from Indian waters. Wood-Mason and Alcock (1891) tentatively assigned one male and two ovigerous females collected from off the Andamans in the Bay of Bengal (439–403 m) to *P. wyvillethomsoni* Miers, 1886. Alcock (1894) reported *P. wyvillethomsoni* from the Andaman Sea (344, 403 and 741 m) but without comment. Alcock (1895, 1899a) provided a detailed morphological description supplemented with notes on the ontogenic variations in the carapace ornamentation (see also Alcock and Anderson, 1896). Doflein (1904) provided illustrations of the dorsal and ventral habitus of a male from Great Nicobar (see Doflein, 1904: Plate 23) as well as figures of a female pleon from Dar-es-Salaam (Fig. 4). Rathbun (1916) decided that the material from “*P. wyvillethomsoni*” from the Andaman Sea should be a new species and named it *P. alcocki* but without any description or comparison with *P. wyvillethomsoni* s. str. She did, however, argue for differences with *P. bartschi* Rathbun, 1916, from the South China Sea, including the distance between the branchial regions (very close in *P. alcocki* vs. further apart in *P. bartschi*), the relative length of the pseudorostral spines (subequal to rostral spine in *P. alcocki* vs. much shorter in *P. bartschi*), length: height ratio of cheliped manus (3.0 times in *P. alcocki* vs. 2.0 times in *P. bartschi*), ratio of pereopod length to CL (relatively longer in *P. alcocki*), the shape of the pereopodal dactyli (narrower along the distal half in *P. alcocki*) and ratio of the cheliped dactylus to propodus (relatively longer in *P. alcocki*). The problem of course is that *P. alcocki* is actually closer to *wyvillethomsoni* s. str. and *P. remifera* Rathbun, 1916 (from the Philippines), and the species are not always easy to separate (see discussion in Guinot and Richer de Forges, 1985). Guinot and Richer de Forges (1985) redescribed and figured a juvenile syntype female of *P. alcocki* in the U.S. National Museum (catalogue number USNM 42758) with Griffin and Tranter (1986a) comparing *P. wyvillethomsoni* and *P. alcocki* (including the G1 structures). Promdam (2011) later reported *P. alcocki* from off the Thai coast of the Andaman Sea. The record of “*P. wyvillethomsoni*” by Griffin (1976, 2006) from the Philippines is uncertain and may be a mix of species, including *P. remifera* (see Guinot and Richer de Forges, 1985). The close similarity of *P. alcocki* with *P. remifera*, however, still creates uncertainty over the identities of these two species (see Lee et al., 2017: 30), although both species occur in different oceans for the time being.

3.13.4. Geographical and bathymetric distribution

Off east coast of Africa, Madagascar, Andaman Sea, Great Nicobar Islands (Guinot and Richer de Forges, 1985). Depth range: 238–805 m (Doflein, 1904).

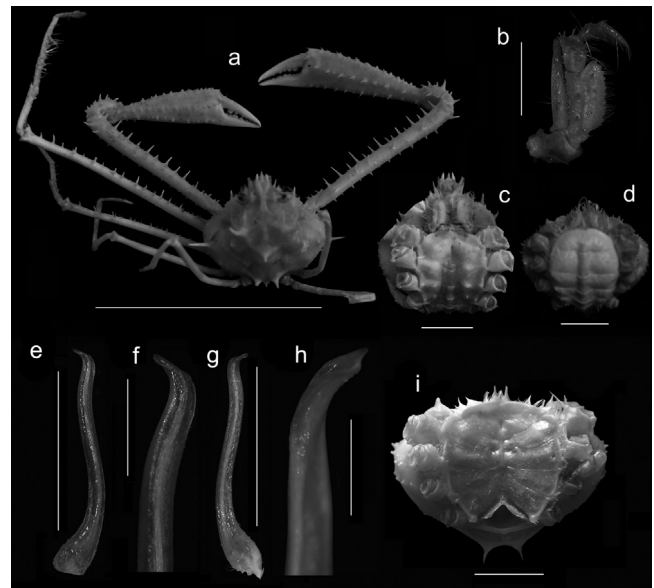


Fig. 9. *Cyrtomaia goodridgei* McArdle, 1900: (A) dorsal view of habitus; (B) right maxilliped 3; (C) ventral view of habitus (male pleon); (D) ventral view of habitus (female pleon); (E) G1 (pleonal view); (F) G1 distal portion (pleonal view); (G) G1 (sternal view); (H) G1 distal portion (sternal view); (I) ventral view of female indicating position of vulvae. Scale: A, 50 mm; C, D, I, 10 mm; B, E, G, 5 mm; F, H, 1 mm.

3.14. *Cyrtomaia goodridgei* McArdle, 1900

Genus *Cyrtomaia* Miers, 1886

Cyrtomaia goodridgei McArdle, 1900

(Fig. 9A–I)

3.14.1. Synonymy

Cyrtomaia goodridgei McArdle, 1900: 472 (type locality: Laccadive Sea, off the west coast of Sri Lanka, RIMSS Investigator stn. 267, 7°2′30″N, 79°36′E, 500 fathoms (915 m) depth); Alcock and McArdle, 1902: pl. 59 fig. 1, 1a–c; MacGilchrist, 1905: 251; Alcock and Annandale, 1907: pl. 78 fig. 2, 2a; Ihle and Ihle-Landenberg, 1931: 157, 160 (list).

Cyrtomaia goodridgei: Rathbun, 1916: 533 (comments on relationships with *Cyrtomaia horrida* Rathbun, 1916); Bennett, 1964: 30 (list); Guinot and Richer de Forges, 1982: 35, fig. 18; Guinot, 1984: 12, fig. 1E–H, pl. 1A–C; Griffin and Tranter, 1986a: 24 (key), 25, pl. 1; Ng et al., 2008: 111 (list); Dev Roy and Nandi, 2012: table 1; Trivedi et al., 2018: 44.

Cyrtomaja goodrichii: Balss, 1924: 23 (list).

Cyrtomaja goodridgei: Balss, 1929: 4 (discussion).

Cyrtomaja goodrigheri (sic): Serène and Lohavanijaya, 1973: 44, 45, 46 (key).

Cyrtomaia suhmi platyceros Doflein, 1904: 55, pl. 19 fig. 3, pl. 40 figs. 1–7, pl. 43 fig. 4, pl. 45 figs. 1–5.

3.14.2. Material examined

IO/SS/BRC/00154, 1 male, 17.26 mm CL, IO/SS/BRC/00158, 1 ovigerous female, 20.44 mm CL, Bay of Bengal, FORVSS stn. 29289, 7.53°N, 93.25°E, 580 m, HSDT (CV), 11.12.2011. IO/SS/BRC/00155–00157, 3 males, 24.25–25.15 mm CL, IO/SS/BRC/00159, 1 female, 23.03 mm CL, IO/SS/BRC/00160–00161, 2 ovigerous females, 22.98–24.05 mm CL, Andaman Sea, FORVSS stn. 3671108, 13.27°N, 93.26°E, 635 m, HSDT (CV), 26.11.2017.

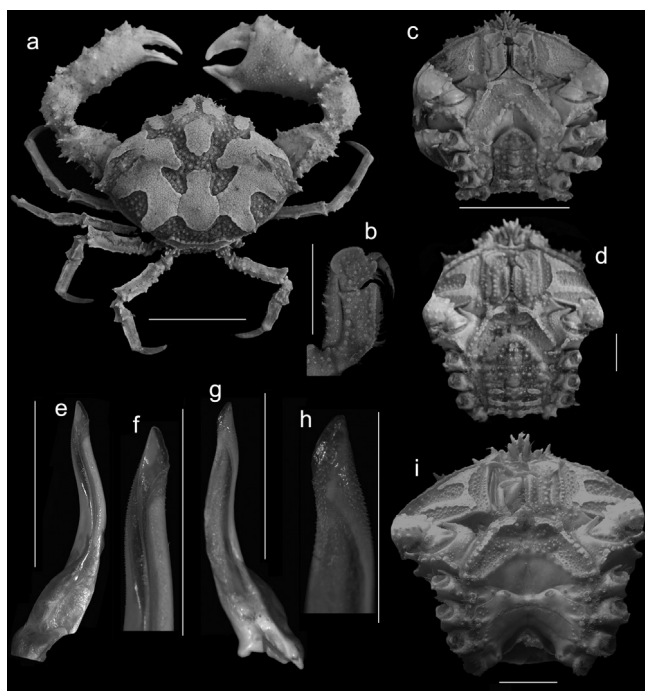


Fig. 10. *Dairoides seafdeci* Takeda and Ananongsuk, 1991: (A) dorsal view of habitus; (B) right maxilliped 3; (C) ventral view of habitus (male pleon); (D) ventral view of habitus (female pleon); (E) G1 (pleonal view); (F) G1 distal portion (pleonal view); (G) G1 (sternal view); (H) G1 distal portion (sternal view); (I) ventral view of female indicating position of vulvae. Scale: A, C, I, 50 mm; B, D–G, I, 10 mm; H, 5 mm.

3.14.3. Remarks

Cyrtomaia goodridgei was described from the Laccadive Sea off Sri Lanka (McArdle, 1900) (see also Alcock and McArdle, 1902; Alcock and Annandale, 1907) and has since been reported from off Somalia (Doflein, 1904). Guinot and Richer de Forges (1982) discussed at length the taxonomy of *C. goodridgei* and Guinot (1984) redescribed an *Investigator* specimen from the Andaman Sea. Guinot (1984) mistakenly indicated her specimen was a type. However, McArdle (1900) only had one specimen from off Sri Lanka when he described the species. Griffin and Tranter (1986a) reported this species off the Philippines and Kai Islands and noted that their specimens differed from *C. goodridgei* in possessing a spine on the supraorbital margin (the margin is entire in *C. goodridgei* s. str.). Their material needs to be re-examined to ascertain if it is really *C. goodridgei* or more likely, another allied species.

3.14.4. Geographical and bathymetric distribution

Off east coast of Africa, west coast of Sri Lanka, Andamans (Guinot and Richer de Forges, 1982). Depth range: 511–1362 m (MacGilchrist, 1905; Doflein, 1904).

3.15. *Dairoides seafdeci* Takeda and Ananongsuk, 1991

Superfamily Eriphioidea MacLeay, 1838

Family Dairoididae Števíč, 2005

Genus *Dairoides* Stebbing, 1920

Dairoides seafdeci Takeda and Ananongsuk, 1991 (Fig. 10A–I)

3.15.1. Synonymy

Dairoides seafdeci Takeda and Ananongsuk, 1991: 94, figs. 2–4 (type locality: Andaman Sea off Thailand, M.V. Paknam cruise no. 79-3/1987, 400 m depth); Wisespongpan, 2011: pl. 3 fig. A; Ng et al., 2008: 63.

3.15.2. Material examined

IO/SS/BRC/00162, 1 female, 52.74 mm CL, Andaman Sea, FORVSS stn. 29234, 13.22°N, 93.18°E, 299 m, HSDT (CV), 27.11.2011. IO/SS/BRC/00163, 1 male, 79.32 mm CL, Andaman Sea, FORVSS stn. 29238, 13.00°N, 93.11°E, 308 m, HSDT (CV), 28.11.2011. IO/SS/BRC/00164, 1 male, 72.34 mm CL, Bay of Bengal, FORVSS stn. 334II03A2, 9.52°N, 92.60°E, 633 m, HOT, 27.01.2015. IO/SS/BRC/00165, 1 male, 100.95 mm CL, Andaman Sea, FORVSS stn. 349II05, 12.54°N, 93.15°E, 300 m, HSDT (CV), 10.04.2016.

3.15.3. Remarks

Dairoides seafdeci is a rare species confined to the Andaman Sea and the eastern fringes of the Bay of Bengal. It was originally described from the Andaman Sea (400 m) off Thailand (Takeda and Ananongsuk, 1991), and can be easily distinguished from its two congeners, *D. margaritatus* Stebbing, 1920 from the southwestern Indian Ocean and *D. kusei* (Sakai, 1938) from the Western Pacific in having large scab-like granular plates dorsally on carapace (Fig. 10A). In comparison, *D. margaritatus* possesses thickly tuberculate carapace (see Stebbing, 1920: plate 98; Barnard, 1950: fig. 47g), and *D. kusei* has a largely eroded carapace (see Sakai, 1938: plate 41, figs. 5, 7). Additionally, *D. seafdeci* lacks spines on the pereopods whereas congeners possess spinose ambulatory legs.

3.15.4. Geographical and bathymetric distribution

Andaman Sea off Thailand (Takeda and Ananongsuk, 1991). Depth range: 400 m (Takeda and Ananongsuk, 1991). This is the first record for Indian waters.

3.16. *Benthochascon hemingi* Alcock and Anderson, 1899

Superfamily Portunoidea Rafinesque, 1815

Family Geryonidae Colosi, 1923

Genus *Benthochascon* Alcock and Anderson, 1899

Benthochascon hemingi Alcock and Anderson, 1899 (Fig. 11A–H)

3.16.1. Synonymy

Benthochascon hemingi Alcock and Anderson, 1899: 10 (type locality: Andaman Sea, 185 fathoms (338 m) depth); Alcock, 1899a: 4, 5, 69, pl. 3 fig. 2; Alcock, 1899b: 15; Doflein, 1904: 90, pls. 29, 41 figs. 1, 2; Alcock and MacGilchrist, 1905: pl. 76 figs. 4, 4a; Sakai, 1965: 39, 44, pl. 6 fig. 2; Serène, 1968: 67; Sakai, 1976: 333, pl. 114; Miyake, 1983: 79, pl. 27 fig. 3; Davie and Short, 1989: 183, fig. 14D; Moosa, 1996: 513, figs. 9d, e; Ng, 2000: 311; Ng et al., 2008: 149; Dev Roy and Nandi, 2012: table 1; Trivedi et al., 2018: 41.

Carcinonectes pacificus Stephenson, 1972a: 129, fig. 3; Stephenson, 1972b: 3; Ng et al., 2008: 149.

3.16.2. Material examined

IO/SS/BRC/00166–00167, 2 males, 47.87–55.36 mm CL, IO/SS/BRC/00170, 1 female, 49.22 mm CL, IO/SS/BRC/00171, 1 ovigerous female, 51.97 mm CL, Andaman Sea, FORVSS stn. 29283, 6.84°N, 93.05°E, 337 m, HSDT (CV), 10.12.2011. IO/SS/BRC/00168, 1 male, 50.76 mm CL, IO/SS/BRC/00169, 1 ovigerous female, 51.58 mm CL, Bay of Bengal, FORVSS stn. 29290, 7.75°N, 93.21°E, 395 m, HSDT (CV), 13.12.2011. IO/SS/BRC/00172, 1 female, 42.55 mm CL, Bay of Bengal, FORVSS stn. 29291, 8.52°N, 93.02°E, 574 m, HSDT (CV), 14.12.2011.

3.16.3. Remarks

Benthochascon hemingi was described from the Andaman Sea (339 m) by Alcock and Anderson (1899) (see also Alcock and MacGilchrist, 1905) and has been reported from the eastern Indian and Western Pacific regions. Ng (2000) revised the genus and restricted *Benthochascon* to only one species, *B. hemingi*, transferring the American taxon to another genus.

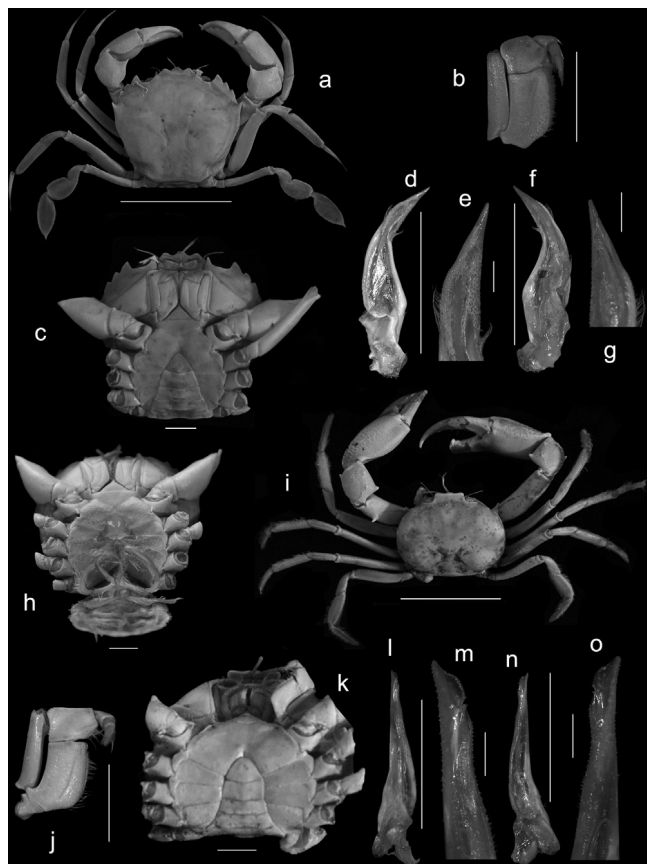


Fig. 11. *Benthochascon hemingi* Alcock and Anderson, 1899: (A) dorsal view of habitus; (B) right maxilliped 3; (C) ventral view of habitus (male pleon); ventral view of habitus (berried female pleon); (D) G1 (pleonal view); (E) G1 distal portion (sternal view); (F) G1 (sternal view); (G) G1 distal portion (sternal view); (H) ventral view of female indicating position of vulvae. *Carcinoplax indica* Doflein, 1904: (I) dorsal view of habitus; (J) right maxilliped 3; (K) ventral view of habitus (male pleon); (L) G1 (pleonal view); (M) G1 distal portion (pleonal view); (N) G1 (sternal view); (O) G1 distal portion (sternal view). Scale: A, I, 50 mm; B–D, F, H, J–L, N, 10 mm; E, G, M, O, 1 mm.

3.16.4. Geographical and bathymetric distribution

Andaman Sea, Nicobars, Indonesia, Japan, Philippines, New Caledonia, eastern Australia (Ng, 2000). Depth range: 150–770 m depth (Ng, 2000).

3.17. *Carcinoplax indica* Doflein, 1904

Superfamily Goneplacoidea MacLeay, 1838

Family Goneplacidae MacLeay, 1838

Genus *Carcinoplax* Milne Edwards, 1852

Carcinoplax indica Doflein, 1904

(Fig. 11I–O)

3.17.1. Synonymy

Carcinoplax longimanus indicus Doflein, 1904: 114, pl. 35 figs. 1, 2 (type locality: Nicobar Is., 6°54'N, 93°28.8'E, 226 m depth).

Carcinoplax longimana indica: Tesch, 1918: 154 (list); Serène, 1968: 89.

Carcinoplax indica: Guinot, 1969: 524, figs. 75–76 (remarks for *Carcinoplax* Milne Edwards, 1852, *sensu lato*; Guinot, 1970: 1081 (list); Serène and Lohavanijaya, 1973: 62 (list), 63 (key); Sakai, 1977: 55, figs. 1, 2, pl. 4 fig. 1; Serène and Vadon, 1981: 118, 119, 123, 126, pl. 4 figs. A, B; Guinot, 1989: 276, figs. 5A–C, 7A, B, pl. 1 figs. E–H, pl. 2 figs. E–G; Matsuzawa, 1993: 21, fig. 1; Ng et al.,

2001: 33, fig. 7c; Hsueh and Huang, 2002: 119 (key), 119, figs. 6, 8B; Ng and Davie, 2002: 378; Karasawa and Kato, 2003: 130 (list); Castro, 2007: 634; Ng et al., 2008: 80; Trivedi et al., 2018: 41.

Carcinoplax confragosa: Zarenkov, 1972: 241, fig. 7–1 (not *Carcinoplax confragosa* Rathbun, 1914).

3.17.2. Material examined

IO/SS/BRC/00173, 1 male, 43.52 mm CL, Andaman Sea, FORVSS stn. 29234, 13.22°N, 93.18°E, 299 m, HSDT (CV), 27.11.2011.

3.17.3. Remarks

Carcinoplax indica was originally described by Doflein (1904) as a subspecies of *C. longimanus* (De Haan, 1833). Guinot (1969) recognized *C. indica* as a distinct species. Guinot's (1989) revision of the genus *Carcinoplax* included a comprehensive morphological comparison between *C. longimanus* and *C. indica*; with *C. indica* differing in having a more narrow and arched carapace, with the frontal margin much advanced (vs. wider, less vaulted carapace with a concave frontal margin in *C. longimanus*), relatively smaller orbits lacking an external orbital tooth (vs. larger orbits with a tooth in *C. longimanus*), the presence of two subdistal spinules on ventral margin of cheliped merus (vs. absent in *C. longimanus*), two teeth on the internal margin of the cheliped carpus (vs. only one in *C. longimanus*), the absence of a pointed protuberance on the inner surface of the cheliped palm (vs. prominent protuberance present in *C. longimanus*), the black colouration on the cheliped fingers is restricted to the distal half (vs. entirely brownish in *C. longimanus*), male pleonal somite 2 has rounded lateral extremities (vs. tapering in *C. longimanus*), and the G1 has a more inflated subdistal lobe (vs. less inflated in *C. longimanus*). Castro (2007) provided a comprehensive synonymy and further commented on the diagnostic characters of this species. The records of "*Carcinoplax indica*" by Guinot (1969) were referred to a new species, *C. monodi*, by Guinot (1989). Similarly, the record of "*Carcinoplax longimana indica*" by Takeda (1975) was also shown to be *C. longimana* s. str. (Guinot, 1989).

3.17.4. Geographical and bathymetric distribution

Andaman Sea, Taiwan, Vietnam, Philippines, Indonesia (Castro, 2007). Depth range: 110–418 m (Castro, 2007).

4. Conclusions

The study of seventeen deep-sea brachyuran crabs from the FORV Sagar Sampada surveys off the Andaman and Nicobar archipelagos has revealed new information pertaining to these species. The rare carrier crab *Homolochunia valdiviae*, previously known only from the Western Indian and Western Pacific Ocean regions, is recorded for the first time from the Northern Indian Ocean. *Dairoides seafdeci*, described from the Andaman Sea in the Thai EEZ, is recorded for the first time from the Indian EEZ with a wider depth range of 299–633 m.

Parilia pattersoni described from the western part of the Bay of Bengal, is recorded for the first time from the Andaman Sea as well as Arabian Sea. The presence of *Platymaia alcocki* is confirmed in the Indian waters.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

CRediT authorship contribution statement

V.P. Padate: Conceptualization, Formal analysis, Methodology, Writing - review & editing. **K.M. Amritha:** Formal analysis, Methodology, Writing - original draft. **Sherine Sonia Cubelio:** Conceptualization, Formal analysis, Investigation, Methodology, Project administration, Writing - original draft. **Narayanane Saravanane:** Conceptualization, Investigation, Project administration, Resources, Supervision. **Maruthadu Sudhakar:** Funding acquisition, Project administration. **P.K.L. Ng:** Conceptualization, Validation, Visualization, Writing - review & editing.

Acknowledgements

The first two authors are grateful to the Director, CMLRE, Kochi (India) for providing an opportunity and facilities to carry out taxonomic studies of deep-water brachyura. The last author thanks A. B. Biju Kumar and Bijoy Nandan from DABFUK and CUSAT, respectively, for permission to examine the specimens in their collections. We are grateful to the two anonymous reviewers for their valuable comments towards improving the manuscript. The study has been a part of the "Resource Exploration and Inventorization System" Project and the authors are grateful to the scientific staff and crew members of the FORV Sagar Sampada.

Ethical approval

This article does not contain any experimental studies with animals performed by any of the authors.

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