

## A revision of the genus *Prionocrangon* (Crustacea: Decapoda: Caridea: Crangonidae)

JUNG NYUN KIM<sup>1</sup> & TIN-YAM CHAN<sup>2</sup>

<sup>1</sup>Institute of Fisheries Sciences, Pukyong National University, Busan, Korea, and <sup>2</sup>Institute of Marine Biology, National Taiwan Ocean University, Keelung, Taiwan, ROC

(Accepted 7 October 2004)

### Abstract

Additional specimens belonging to the rare crangonid genus *Prionocrangon* Wood-Mason and Alcock, 1891 collected from recent deep-sea expeditions in the West Pacific enable a revision of this poorly known genus. The four previously described species are all valid. The type species *P. ommatosteres* Wood-Mason and Alcock, 1891, originally known only from the Andaman Sea, is considered to be also distributed in the Philippines and Indonesia. However, the material previously assigned to “*P. ommatosteres*” by de Man (1920) and Chace (1984) from Indonesia and the Philippines actually represents a new species, *P. demani* sp. nov., close to *P. pectinata* Faxon, 1896. *Prionocrangon pectinata* and *P. curvicaulis* Yaldwyn, 1960 are still only known by their types. The distribution of *P. dofleini* Balss, 1913 is now extended from Japan to Taiwan. Two more new species are recognized. *Prionocrangon formosa* sp. nov. from Taiwan is closely related to *P. curvicaulis* while *P. paucispina* sp. nov. from Taiwan and New Caledonia is unique in having very few dorsal carapace spines. The genus *Prionocrangon* is newly diagnosed and a key to the species is provided. Nevertheless, a damaged specimen from the Sulu Sea could not be satisfactorily assigned to any of the above seven species, suggesting that this genus may have even higher diversity.

**Keywords:** Caridea, Crangonidae, Crustacea, Decapoda, new species, Prionocrangon, taxonomy

### Introduction

The rare crangonid genus *Prionocrangon* Wood-Mason and Alcock, 1891 is characterized by having a reduced eyestalk and lacking a cornea. The genus is known from the Indo-West Pacific and Caribbean Sea in 350–1301 m depth with four described species, namely *P. ommatosteres* Wood-Mason and Alcock, 1891, *P. pectinata* Faxon, 1896, *P. dofleini* Balss, 1913 and *P. curvicaulis* Yaldwyn, 1960. However, the limited specimens known of these four species (e.g. 10 specimens of *P. curvicaulis*, two of *P. dofleini*, five of *P. ommatosteres*, and only one of *P. pectinata*) make it difficult to determine the exact taxonomic status of these taxa (see Chace 1984). Yaldwyn (1960) even suggested that these four taxa might merely represent geographical forms of a single wide-ranging species.

---

Correspondence: Tin-Yam Chan, Institute of Marine Biology, National Taiwan Ocean University, Keelung 202, Taiwan, ROC.  
Email: tychan@mail.ntou.edu.tw

Published 18 April 2005

ISSN 0022-2933 print/ISSN 1464-5262 online © 2005 Taylor & Francis Group Ltd

DOI: 10.1080/00222930400016788

Recent deep-sea expeditions in the Pacific (mainly by the French MUSORSTOM expeditions and the National Taiwan Ocean University) have yielded a number of specimens belonging to this rare genus. The present study reviews the genus *Prionocrangon* based on this additional material, with the re-examination of the types or topotypic specimens of three of the four known species. Altogether seven species are recognized. The four previously known species are all valid. The material from Indonesia and the Philippines assigned to “*P. ommatosteres*” by de Man (1920) and Chace (1984) is actually an undescribed species and is herein named as *P. demani* sp. nov. Two other new species, *P. formosa* sp. nov. and *P. paucispina* sp. nov., are found from Taiwan and New Caledonia.

Specimens examined are deposited at the Natural History Museum and Institute, Chiba (CBM, with code ZC), Kitakyushu Museum and Institute of Natural History, Kitakyushu (KMNH, with code IvR), Museum of Comparative Zoology, Harvard University, Cambridge, MA (MCZ), Muséum national d’Histoire naturelle, Paris (MNHN), Museum of New Zealand, Wellington (MNZ, with a code of CR), National Fisheries University, Shimonoseki (NFU), Showa Memorial Institute, National Science Museum, Tokyo (NSMT, with code Cr R), National Taiwan Ocean University, Keelung (NTOU), and the National Museum of Natural History, Smithsonian Institution, Washington, DC (USNM).

To avoid needless repetition, the general characters of *Prionocrangon* species are given in the description of the genus and the species *P. dofleini* is fully illustrated (Figures 4–6). In the species accounts, only descriptions of distinctive characters are provided for each species. The measurements given follow Hayashi and Kim (1999), except for the length of the proximal segment of antennular peduncle (APL) which is measured from the distal margin to the base of the stylocerite. The abbreviation CL is the carapace length, CC is otter trawl and CP is beam trawl.

## Systematic account

### Family CRANGONIDAE Haworth, 1825

#### Genus *Prionocrangon* Wood-Mason and Alcock, 1891

*Prionocrangon* Wood-Mason and Alcock 1891, p 361; Alcock 1901, p 123; Balss 1914, p 71; de Man 1920, p 308; Yaldwyn 1960, p 45; Chace 1984, p 55; Christoffersen 1988, p 46; Holthuis 1993, p 300.

#### *Description*

Body small, laterally compressed; integument not particularly firm, smooth; generally whitish in colour.

Rostrum short, spiniform, slightly ascending. Carapace having only median carina, armed with 4–12 spines; antennal spine small; branchiostegal spine moderately strong, directed forward; hepatic and pterygostomial spines absent; orbital cleft and longitudinal suture absent.

Abdomen lacking median carina or with low median carina on fourth and fifth somites; first to fifth pleura rounded ventrally. Telson tapering to rounded or subtruncated apex, narrowed posterior to mid-length, armed with three pairs of dorsolateral spines; apex bearing several to many long spines. Interlocking mechanism present between telson and uropods.

Thoracic sternum narrow, with small median tubercle posteriorly. Abdominal sternites without distinct median or preanal spine.

Eye lacking cornea; eyestalk triangular or drawn out to bluntly cylindrical or villiform extremity, usually with ventral denticle or tubercle.

Antennular peduncle (Figure 5B) with proximal segment elongate, usually five times as long as second segment, without longitudinal carina on ventral surface; stylocerite leaf-like, tapering to acute spine, but sometimes spine considerably reduced; flagella sexually dimorphic as in other crangonids; dorsal flagellum thicker, longer and subdivided in much more articles in males than in females.

Antenna (Figure 5C) with scaphocerite slender, more than five times as long as wide and with lateral margin concave, distolateral spine terminal; carpocerite elongate, usually reaching beyond distal end of scaphocerite; flagellum much shorter than body.

Mandible (Figure 5D) moderately slender, divided distally into four blunt teeth. Maxillule (Figure 5E) with proximal endite rounded distally, bearing many marginal setae; distal endite strongly curved mesially, mesial margin narrowly truncate with six spines arranged in two rows; palp with somewhat expanded distal part, curved mesially, with several setae distally. Maxilla (Figure 5F) with palp rounded distally, mesial margin bearing short setae; endite poorly developed; scaphognathite with posterior lobe slightly truncate and only bearing short setae. First maxilliped (Figure 5G) with palp elongate and flattened, bearing long distomesial setae; exopod with peduncle shorter than palp, mesial and lateral margins bearing short setae, caridean lobe narrow, lash moderately short; epipod large, triangular, not bilobed. Second maxilliped (Figure 5H) with endopod pediform, dactylus with five long mesial spines and dense setae distally; exopod with peduncle reaching distal margin of carpus of endopod, lash moderately short; rudimentary epipod present. Third maxilliped (Figure 5I) heavily setose especially on dorsal margin, overreaching tip of scaphocerite by distal segment; distal two segments slightly dorsoventrally compressed, ultimate segment slightly longer than penultimate segment, with tip rounded and curved dorsally; antepenultimate segment laterally compressed, subequal to length of distal two segments combined, produced distodorsally into lobe-like projection and bearing small proximoventral tubercle; exopod with short lash; epipod vestigial with fine setae distally.

First pereopod (Figure 5J) without exopod; palm (Figure 5K) slender, more than 3.5 times as long as wide, with fixed distomesial spine ("thumb"), cutting edge strongly oblique; merus with small subdistal spine on dorsal margin but always lacking distolateral and mesial spines. Second pereopod (Figure 5L, M) not chelate, reaching proximal part of chela of first pereopod, setose dorsally and ventrally; merus and ischium partially fused. Third pereopod (Figure 5N) very slender, usually overreaching tip of scaphocerite by dactylus and propodus; carpus longer than distal two segments combined; merus shorter than carpus or ischium. Fourth and fifth pereopods (Figure 5O, Q) robust; dactyli (Figure 5P) short, flattened laterally; propodi to ischia heavily setose dorsally and ventrally; propodi shorter than carpi; meri and ischia partly fused.

Pleurobranches of fourth to eighth thoracic somites inclined forwards.

Second (Figures 5S, 6C) to fifth pleopods with endopods slender, 0.2–0.6 times as long as exopod, lacking appendix interna in both sexes; male second pleopod with appendix masculina (Figure 6D) well developed, but shorter than endopod. Eggs large, 1.12–2.45 × 0.88–1.76 mm in diameter.

Branchial formula as follows (r, rudimentary):

	Maxillipeds			Pereopods				
	1	2	3	1	2	3	4	5
Pleurobranchs	–	–	–	1	1	1	1	1
Arthrobranchs	–	–	–	–	–	–	–	–
Podobbranchs	–	–	–	–	–	–	–	–
Epipods	1	r	–	–	–	–	–	–
Exopods	1	1	1	–	–	–	–	–

### Type species

*Prionocrangon ommatosteres* Wood-Mason and Alcock, 1891 by monotypy. Gender: feminine.

### Species included

*Prionocrangon ommatosteres* Wood-Mason and Alcock, 1891, *P. pectinata* Faxon, 1896, *P. dofleini* Balss, 1913, *P. curvicaulis* Yaldwyn, 1960, *P. formosa* sp. nov., *P. demani* sp. nov., and *P. paucispina* sp. nov.

### Distribution

Bay of Bengal, Andaman Sea, Indonesia, the Philippines, Taiwan, Pacific coast of central Japan, New Caledonia, New Zealand, Caribbean Sea; at depths of 200–2556 m and probably burrowing deep in mud.

### Remarks

The genus *Prionocrangon* is unique in the Crangonidae in the following characters: rostrum spiniform, carapace bearing a row of dorsal spines, lateral surfaces of carapace without any spine or carina, interlocking mechanism present between telson and uropods, eyestalk reduced and lacking cornea, proximal segment of antennular peduncle elongate, scaphocerite with very narrow blade, epipod of second maxilliped vestigial, antepenultimate segment of third maxilliped with lobe-like distal projection, meri and ischia partly fused in second, fourth and fifth pereopods, and propodi shorter than carpi in fourth and fifth pereopods.

The interlocking mechanism between the telson and uropods is developed by the strong median hook on the anterodorsal part of the uropodal exopod together with the anteromedian concavity of the uropodal endopod forming a socket which clips the ventrolateral tubercle of the telson. This mechanism operates when the abdomen is in subcircular form (Figure 4A). Such a mechanism is not known in the other crangonids, as well as other caridean shrimps. Yaldwyn (1960) pointed out that the blind and white coloration, coupled with their stout fourth and fifth pereopods and their spatulate dactyli strongly suggest that *Prionocrangon* has a burrowing habit (see also “Remarks” under *P. dofleini*). The interlocking mechanism may also be related to such a lifestyle.

Chace (1984) mainly used the shape of the degenerated eyes and the telson, as well as the spination along the posterior margin of telson to separate the species within the genus. In the present study the above characters, together with the length of the rostrum and the last two pereopod dactyli, and the presence or absence of a dorsal carina on the abdomen were found to be useful in delineating the species, at least to groups. Several small characters, such as the shape of the posterolateral process on the sixth abdominal somite as well as the presence or absence of lobes or projections on the endopods and protopods of the pleopods, are also helpful in separating species.

Members of this genus shows a typical Tethys distribution, and its geographical range is now slightly expanded in the West Pacific. The bathymetrical distribution is also shown to be much wider. It is interesting to note that species with triangular eyestalks, e.g. *P. pectinata*, *P. demani*, and *P. paucispina*, inhabit deeper waters (1033–2556 m deep) than others with the eyestalks drawn out to bluntly cylindrical or villiform extremities, e.g. *P. ommatosteres*, *P. dofleini*, *P. curvicaulis*, and *P. formosa* (200–891 m deep).

#### Key to species of *Prionocrangon*

1. Eyestalks drawn out to bluntly cylindrical or villiform extremities . . . . . 2
  - Eyestalks triangular . . . . . 5
2. Dactyli of fourth and fifth pereopods 0.70–0.74 times as long as propodi . . . . . 3
  - Dactyli of fourth and fifth pereopods 0.32–0.42 times as long as propodi . . . . . 4
3. Rostrum relatively longer, extending to tip of branchiostegal spine and 0.20 times as long as carapace; posterior margin of posterolateral process of sixth abdominal somite rounded and with deep excavation . . . . . *P. curvicaulis* Yaldwyn, 1960
  - Rostrum very short, extending only to tip of antennal spine and 0.07 times as long as carapace; posterior margin of posterolateral process of sixth abdominal somite truncate and without excavation . . . . . *P. formosa* sp. nov.
4. Fourth abdominal somite with low median carina; posterior margin of telson rounded, armed with 5–12 long spines; palm of first pereopod 3.70–4.55 times as long as wide; females with endopods of pereopods lacking proximolateral lobe . . . . . *P. dofleini* Balss, 1913
  - Fourth abdominal somite without median carina; posterior margin of telson truncate, armed with two pairs of long spines; palm of first pereopod 4.95–5.25 times as long as wide; females with endopods of second to fifth pleopods with proximolateral lobes . . . . . *P. ommatosteres* Wood-Mason and Alcock, 1891
5. Carapace with four or five dorsal spines; posterior margin of telson rounded, armed with 10–13 long spines . . . . . *P. paucispina* sp. nov.
  - Carapace with six to eight dorsal spines; posterior margin of telson truncated, armed with two pairs of long spines. . . . . 6
6. Telson shorter than sixth abdominal somite and 0.44 times as long as carapace; posterior half of telson strongly convergent. . . . . *P. pectinata* Faxon, 1896
  - Telson longer than sixth abdominal somite and 0.64 times as long as carapace; posterior half of telson only slightly convergent . . . . . *P. demani* sp. nov.

*Prionocrangon ommatosteres* Wood-Mason and Alcock, 1891  
(Figure 1)

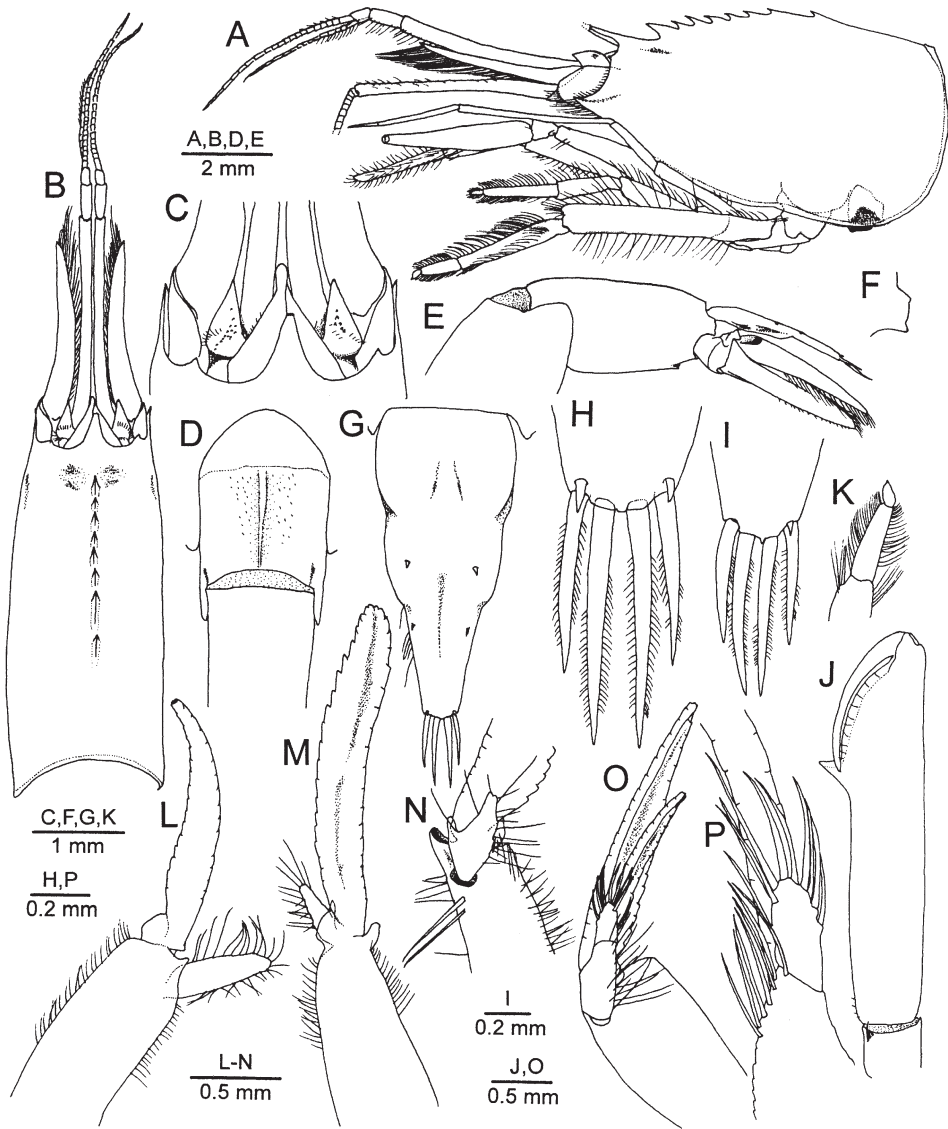


Figure 1. *Prionocrangon ommatosteres* Wood-Mason and Alcock, 1891. (A–H), (J–M), ovigerous female (CL 7.0 mm) from Indonesia, KARUBAR stn CC 57; (I) ovigerous female (CL 6.8 mm, same lot); (N) female (CL 7.5 mm, same lot); (O, P) male (CL 6.9 mm) from Indonesia, KARBUAR stn CP 91. (A) Carapace (tip of rostrum broken) with cephalic and thoracic appendages, lateral; (B) carapace (tip of rostrum broken) and anterior cephalic appendages, dorsal; (C) anterior part of carapace (tip of rostrum broken), eyes, basal parts of antennule and antenna, dorsal; (D) fifth abdominal somite, dorsal; (E) posterior part of abdomen and tailfan, lateral; (F) posterolateral process of sixth abdominal somite, lateral; (G) telson, dorsal; (H, I) posterior part of telson, dorsal; (J) chela of left first pereopod, ventral; (K) dactylus and propodus of left fourth pereopod, lateral; (L) left first pleopod, lateral; (M, O) left second pleopod, lateral; (N) endopod of left third pleopod, mesial; (P) appendix masculina of left second pleopod, ventral.

*Prionocrangon ommatosteres* Wood-Mason and Alcock 1891, p 362 [type locality: south of Port Blair, Andaman Islands]; Alcock and Anderson 1894, p 152; 1895, Plate 9 Figure 4; Alcock 1901, p 123; Holthuis 1993, p 300, Figure 297 (after Alcock and Anderson 1895).

*Prionocrangon curvicaulis*: Chace 1984, p 56 (key), 57, Figure 24 [*non* Yaldwyn 1960].

? *Prionocrangon ommatosteres*: Takeda and Hanamura 1994, p 31.

Not *Prionocrangon ommatosteres*: de Man 1920, p 308, Plate 25 Figure 76, 76a–i; Chace 1984, p 56 (key), 58 [= *Prionocrangon demani* sp. nov.].

Not *Prionocrangon ommatosteres*: Ohta 1983, p 230 (list) [= *Prionocrangon dofleini* Balss, 1913].

#### *Material examined*

**Indonesia.** KARUBAR: stn CC 57, 8°19'S, 131°53'E, 603–620 m, 31 October 1991, 1♂ (CL 5.0 mm), 1♀ (CL 7.5 mm), 5 ovig. ♀♀ (CL 6.8–7.1 mm), MNHN-Na. 15068; stn CP 91, 8°44'S, 131°05'E, 884–891 m, 5 November 1991, 1♂ (CL 6.9 mm), MNHN-Na. 15069.

**Philippines.** *Albatross* stn 5445, 12°44'42"N, 124°59'50"E, 700 m, 3 June 1909, Agassiz beam trawl, 1♂ (CL 6.4 mm), USNM 205089 (id. by Chace, 1984 as *P. curvicaulis*). MUSORSTOM 1, stn 47, 13°40.7'N, 120°30.0'E, 689–757 m, beam trawl, 25 March 1976, 1♂ (CL 6.7 mm), MNHN-Na. 6041. MUSORSTOM 2, stn 78, 13°49'N, 120°28'E, 441–550 m, beam trawl, 1 December 1980, 1♀ (CL 8.0 mm), 1 ovig. ♀ (CL 7.0 mm), MNHN-Na. 6040.

#### *Type material*

Holotype: *Investigator* stn 116, Andaman Sea, 11°25'5"N, 92°47'6"E, 741 m, 1♂ (CL including rostrum about 10 mm), Indian Museum (No. 6744/9). Not examined.

#### *Description*

Rostrum slightly falling short of tip of branchiostegal spine, 0.13–0.16 times as long as carapace (Figure 1A, B). Mid-dorsal carina of carapace armed with six to nine spines (Figure 1A). Fourth abdominal somite without median carina; fifth somite with or without low median carina (Figure 1D); sixth somite 0.56–0.59 times as long as carapace, posterior margin of posterolateral process subtruncate, with slightly produced dorsal and ventral angles (Figure 1F). Telson (Figure 1G) slightly shorter than sixth abdominal somite (Figure 1E), 0.45–0.53 times as long as carapace, posterior half strongly convergent; posterior margin subtruncate, armed with two pairs of long spines, with or without minute median denticle (Figure 1H, I). Eyestalks drawn out to bluntly cylindrical or villiform extremities, slightly downcurved but not reaching in between antennules (Figure 1C). Antennular peduncle with proximal segment greatly elongate, 0.70–0.78 times as long as carapace (Figure 1A, B). Stylocerite with tip elongate and sharp (Figure 1C). Scaphocerite falling short of distal margin of proximal segment of antennular peduncle, 0.52–0.60 times as long as carapace (Figure 1A, B). Palm of first pereopod slender, 4.95–5.25 times as long as wide (Figure 1J). Dactyli of fourth and fifth pereopods short, 0.32–0.42 times as long as propodi (Figure 1K). Females with endopod of second pleopod short, about 0.20 times length of exopod (Figure 1M); second to fifth pleopods each with endopod bearing small proximolateral lobe and protopod having small distoventral projection (Figure 1N).

*Size*

Males CL 5.0–6.9 mm, females CL 7.5–8.0 mm, ovigerous females CL 6.8–7.1 mm. Male holotype CL about 10 mm including rostrum (Wood-Mason and Alcock 1891). Ovigerous female from Bay of Bengal CL 8.5 mm including rostrum (Alcock 1901).

*Distribution*

Andaman Sea and Bay of Bengal off Sri Lanka, 366–741 m (Alcock 1901); Indonesia and the Philippines, 441–891 m (present study).

*Colour in life*

Not known.

*Variations*

Of the 12 specimens examined, two specimens have six spines on the mid-dorsal carina of carapace, three specimens have seven spines, five specimens have eight spines and two specimens have nine spines. With respect to the median carina on the abdomen, eight specimens bear low median carina on the fifth abdominal somite (Figure 1D) while the other four lack this median carina. Of the nine specimens still with intact telsons, four specimens have a minute median denticle on the posterior margin of the telson (Figure 1I) but five others lack such a minute denticle (Figure 1H).

*Remarks*

*Prionocrangon ommatosteres* was originally described based on a somewhat mutilated male from the Andaman Sea collected at a depth of 405 fathoms (=741 m). Subsequently, Alcock and Anderson (1894, 1895) reported and illustrated an additional specimen (ovigerous female, 200–350 fathoms or 366–640 m deep) of this species from the Bay of Bengal off Sri Lanka. De Man (1920) reported one male and one female taken from Indonesia at depths of 1158–1301 m, which he referred to *P. ommatosteres* with some doubts. However, Chace (1984) suspected that de Man's (1920) material might not be the true *P. ommatosteres* because of the different shape of the eyes and because of the rather different depth from which it was collected. An attempt to re-examine the type of *P. ommatosteres* from the Indian Museum was unsuccessful and no topotypic material of this species is available for the present study. Nevertheless, *P. ommatosteres* from the Indian Ocean appears to have the following characteristics: carapace bearing six to seven dorsal spines, telson slightly shorter than sixth abdominal somite, proximal antennular segment about 0.7 times as long as carapace, scaphocerite about 0.5 times as long as the carapace and falling short of the distal margin of the proximal antennular segment (see Wood-Mason and Alcock 1891; Alcock and Anderson 1894; Alcock 1901). In these respects, the present specimens from Indonesia and the Philippines (six to nine dorsal carapace spines, APL/CL ratio 0.70–0.78, SL/CL ratio 0.55–0.60) agree well with *P. ommatosteres* and differ from those reported by de Man (1920). The present specimens were collected from 441–891 m deep, similar to those obtained from the Indian Ocean (366–741 m deep). Nevertheless, some important characters such as the shapes of the eyestalks, pleopods, telson and the length of pereopod dactyli were not described for the Indian Ocean material. Direct



comparisons with topotypic specimens will be necessary to conclude whether the present Indonesian and the Philippines specimens are truly *P. ommatosteres*.

If the present identification is correct, *P. ommatosteres* is most similar to *P. dofleini* from Japan and Taiwan in having the eyestalk drawn out to a bluntly cylindrical or villiform extremity, the stylocerite with a long acute tip, the posterior half of the telson strongly convergent, and the dactyli of the fourth and fifth pereopods relatively shorter. Nevertheless, it can be distinguished from *P. dofleini* by the fourth abdominal somite lacking completely a median carina, the posterior margin of the telson truncate and armed with two pairs of long spines (Figure 1H, I), the posterior margin of the posterolateral process of the sixth abdominal somite produced at both the dorsal and ventral angles (Figure 1F), the palm of the first pereopod more slender (Figure 1J, 4.95–5.25 times as long as wide versus 3.70–4.55 times in *P. dofleini*, see Figure 5K), and females with the endopods and protopods of the second to fifth pleopods bearing a small proximolateral lobe and distoventral projection, respectively (Figure 1M, N).

The *Albatross* male from the Philippines identified as “*P. curvicaulis*” by Chace (1984) is essentially identical to the present KARUBAR and MUSORSTOM material, and therefore assigned here to *P. ommatosteres*. However, the other *Albatross* specimen, a damaged female from Indonesia, tentatively assigned to “*P. ommatosteres*” by Chace (1984), actually represents an undescribed species (see under *P. demani* sp. nov.).

It should be pointed out that another damaged female (Figure 2) from the Sulu Sea (Philippines, RV *Hakuho-Maru*, KH-02-04 Cruise, stn 14, 10°00.70'N–10°01.62'N, 120°54.72'E–120°55.27'E, 1482–1488 m, 8 December 2002, 1♀ CL 5.0 mm, CBM-ZC 7842) is generally similar to *P. ommatosteres* in form (e.g. carapace with eight dorsal spines, rostrum nearly reaching to tip of branchiostegal spine, eyestalk drawn out to bluntly cylindrical extremity, stylocerite with tip elongate and acute, scaphocerite 0.64 times as long as carapace, palm of first pereopod more than five times as long as wide, endopod of second pleopod 0.20 times as long as exopod, small proximolateral lobe present on endopods of second to fifth pleopods). However, it is unusual in that the proximal segment of the antennular peduncle is exceptionally long (APL/CL=0.93, Figure 2A, B). Moreover, this Sulu Sea female was collected from a much greater depth. As the telson, distal parts of the antennular peduncle and the last two pairs of pereopods are missing in this specimen, more material will be necessary to determine if it is really distinct from *P. ommatosteres* or not.

The Flores Sea specimen reported by Takeda and Hanamura (1994) is also badly damaged. M. Osawa re-examined this specimen at the National Science Museum, Tokyo (NSMT-Cr 4242) and found that it has the eyestalks drawn out to villiform extremities but with slightly more stout subchela (palm 4.51–4.69 times as long as wide) and longer dactyli (0.48–0.51 times as long as propodi at fourth pereopods). This specimen is tentatively assigned to *P. ommatosteres* for the time being.

### *Prionocrangon pectinata* Faxon, 1896

(Figure 3)

*Prionocrangon pectinata* Faxon 1896, p 157, Plate 2 Figures 4–7 [type locality: Caribbean Sea off Martinique]; de Man 1920, p 257 (list); Chace 1984, p 56 (key).

#### *Material examined*

**Caribbean Sea.** Holotype: “Blake”, stn 201, off Martinique, Lesser Antilles, 14°34'40"N, 61°8'25"W, 1033 m, 1877–1880 survey, 1 ovig. ♀ (CL 8.2 mm), MCZ 4436.

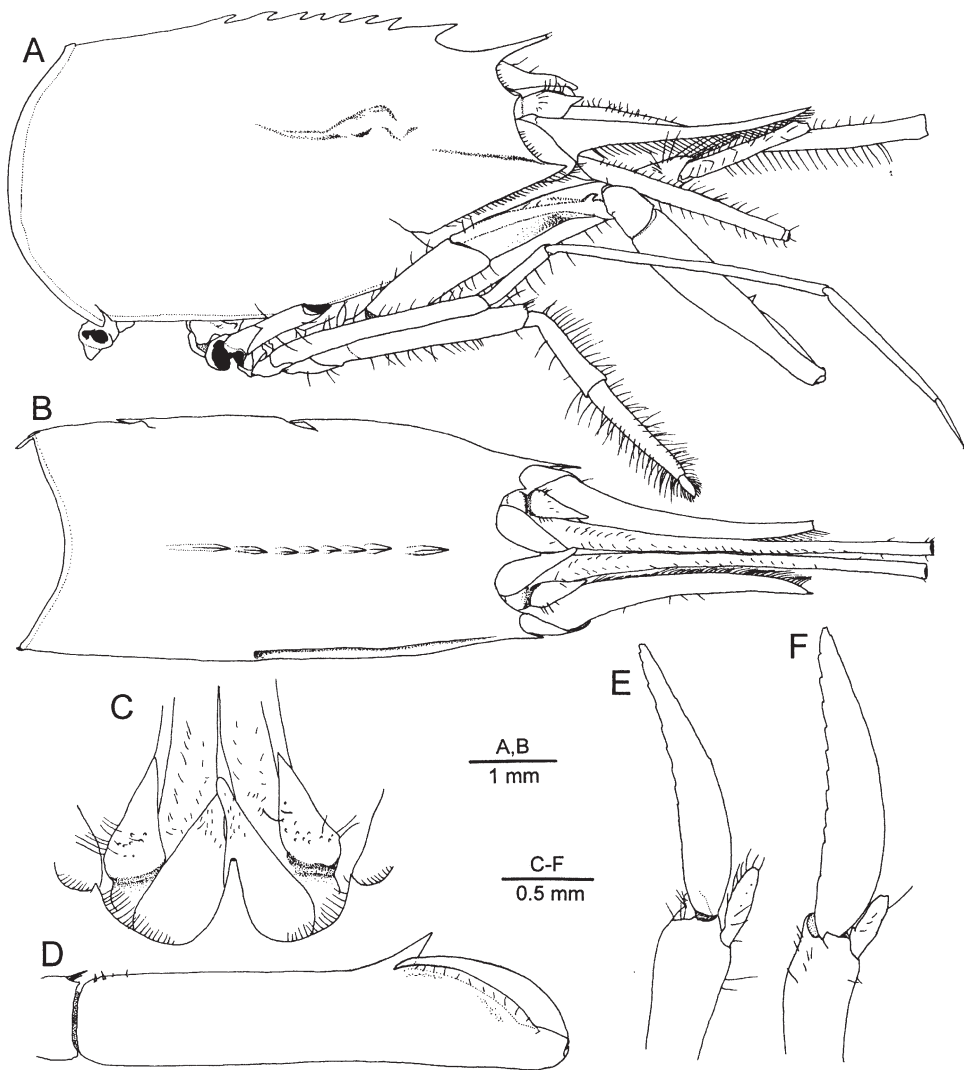


Figure 2. *Prionocrangon* aff. *ommatosteres* Wood-Mason and Alcock, 1891, female (CL 5.0 mm) from Sulu Sea, the Philippines, KH-02-04 Cruise stn 14. (A) Carapace (tip of rostrum broken) with cephalic and thoracic appendages, lateral; (B) carapace (tip of rostrum broken) and anterior cephalic appendages, dorsal; (C) anterior part of carapace (tip of rostrum broken), eyes, basal parts of antennule and antenna, dorsal; (D) chela of left first pereopod, ventral; (E) left first pleopod, dorsal; (F) left second pleopod, dorsal.

*Type material*

See above.

*Description*

Rostrum broken distally in holotype. Mid-dorsal carina of carapace armed with eight spines (Figure 3A). Fourth and fifth abdominal somites without median carina (Figure 3D); sixth somite 0.50 times as long as carapace, posterior margin of posterolateral process subtruncate, lacking minute tooth but slightly produced ventrally (Figure 3A). Telson slightly

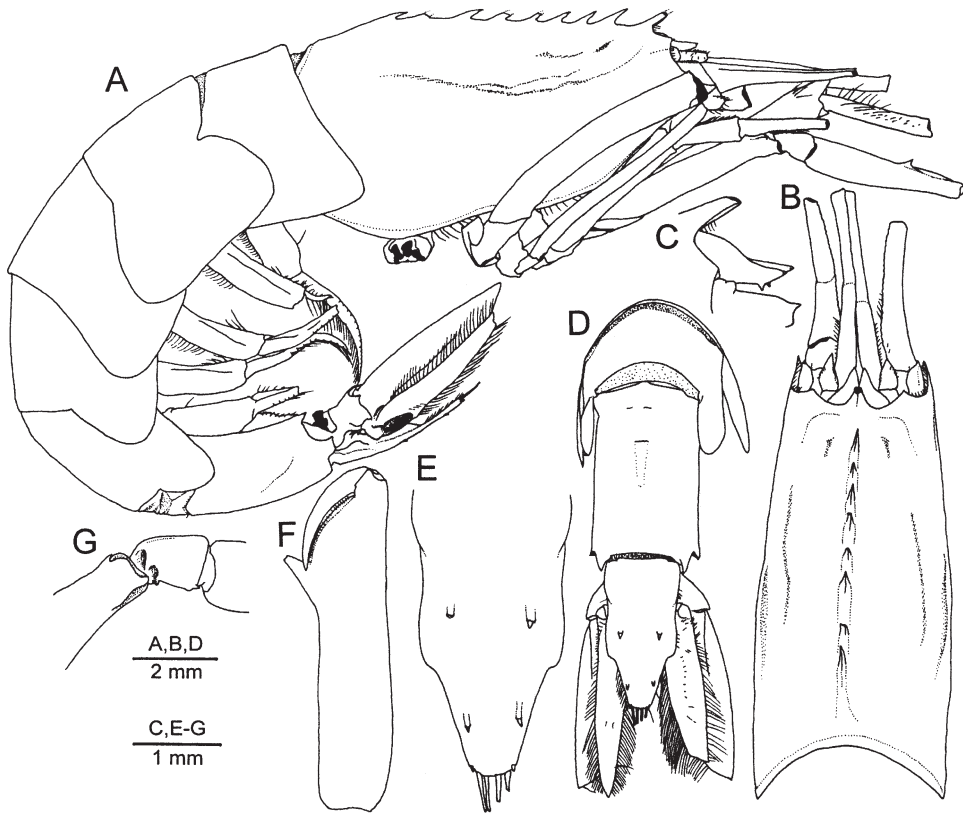


Figure 3. *Prionocrangon pectinata* Faxon, 1896, holotype ovigerous female (CL 8.2 mm) from Caribbean Sea off Martinique, Blake (1877–1880 survey) stn 201. (A) Entire animal (tip of rostrum broken), lateral; (B) carapace (tip of rostrum broken) and anterior cephalic appendages, dorsal; (C) anterior carapace (tip of rostrum broken) and eyes, ventrolateral; (D) posterior part of abdomen and tailfan, dorsal; (E) telson, dorsal; (F) chela of right first pereopod, dorsal; (G) carpus and distal part of merus of right first pereopod, lateral.

shorter than sixth abdominal somite (Figure 3D), 0.44 times as long as carapace, posterior half strongly convergent; posterior margin subtruncate, armed with two pairs of spines but lacking median denticle (Figure 3E). Eyestalks triangular, shortly drawn out to acute extremities, lateral margin sinuous (Figure 3B, C). Antennular peduncle with proximal segment moderately long, 0.61 times as long as carapace (Figure 3B). Stylocerite with tip elongate and sharp (Figure 3B). Palm of first pereopod moderately slender, 4.61 times as long as wide (Figure 3F). Dactyli of fourth and fifth pereopods broken or missing. Holotype ovigerous female with endopod of second pleopod moderately short, 0.33 times as long as exopod; pleopods with endopods and protopods lacking lateral lobe or distal projection.

#### Size

Only one ovigerous female CL 8.2 mm known.

#### Distribution

Caribbean Sea, at depth of 1033 m.

*Colour in life*

Not known.

*Remarks*

The holotype, and only, specimen from the Caribbean Sea is somewhat damaged (Figure 3A, B). Faxon (1896) described the telson of the holotype as short, but this was because he did not realize that the uropods are damaged basally (Figure 3A). The posterior margin of the telson was also described as setiferous by Faxon (1896) but the type actually bears only two pairs of spines (Figure 3E). Supplementary characters observed in the holotype are: telson armed with three pairs of dorsolateral spines (Figure 3E); the eyestalk bearing a small ventral denticle (Figure 3C); and the carpus and merus of the first pereopod are armed with small distolateral and dorsodistal spines, respectively (Figure 3G).

*Prionocrangon pectinata* is most similar to the new species *P. demani* in having triangular eyestalks, the posterolateral process of the sixth abdominal somite only sharply produced ventrally, telson armed with two pairs of posterior spines, proximal antennular segment moderately elongate, and stylocerite with elongate and sharp tip. Nevertheless, these two species can be separated by the following characters: (1) the sixth abdominal somite is shorter in *P. pectinata* (Figure 3A) than in *P. demani* (Figure 9D) (0.50 versus 0.60 times as long as carapace); (2) the telson is shorter and more strongly convergent in *P. pectinata* (Figure 3D, E) than in *P. demani* (Figure 9D) (telson 0.44 times as long as the carapace and shorter than sixth abdominal somite versus 0.64 times and longer than sixth abdominal somite); (3) the second to fifth pleopods with the endopods having a small proximolateral lobe and the protopods bearing a small distoventral projection in *P. demani* (Figure 9I, J), but these lobes and projections are absent in *P. pectinata*.

***Prionocrangon dofleini* Balss, 1913**

(Figures 4–6, 11A)

*Prionocrangon dofleini* Balss 1913, p 238 [type locality: Sagami Bay, Japan]; 1914, p 71, Figure 42; de Man 1920, p 257 (list); Yokoya 1933, p 43; Kubo 1965, p 623, Figure 1006; Chace 1984, p 56 (key); Miyake 1998, p 189 (list).

*Prionocrangon ommatosteres*: Ohta 1983, p 230 (list) [*non* Wood-Mason and Alcock 1891].

*Material examined*

**Pacific coast of central Japan.** Sagami Bay, Amadai-ba, 250–450 m, 13 December 1953, 1♂ (CL 7.4 mm), 1♀ (CL 10.0 mm), NSMT-Cr R: 774. Tosa Bay, 200–250 m, 21 January 1963, coll. K. Sakai, 1♀ (CL 9.2 mm), KMNH IvR 000,013. Suruga Bay, 34°46.6'–34°47.5'N, 138°42.0'–138°42.1'E, 355–381 m, beam trawl, 10 June 1973, coll. Ocean Research Institute, University of Tokyo, 2♂♂ (CL 4.4, 5.9 mm), 1 ovig. ♀ (CL 10.7 mm), NFU 530-2-2262 (referred to "*P. ommatosteres*" by Ohta 1983); 34°57.1'–34°57.7'N, 138°44.3'–138°44.4'E, 306–330 m, beam trawl, 12 June 1973, coll. Ocean Research Institute, University of Tokyo, 4♂♂ (CL 3.4–8.1 mm), 8♀♀ (CL 5.3–9.4 mm), NFU 530-2-2263 (referred to "*P. ommatosteres*" by Ohta 1983); 200–300 m, 17 December 1974, coll. H. Mukai, 1♂ (CL 4.9 mm), 1 ovig. ♀ (CL 9.9 mm), NFU 530-2-2264. Locality unknown, 1 ovig. ♀ (CL 9.8 mm), 2♀♀ (CL 9.0, 9.9 mm), KMNH IvR 000,014.

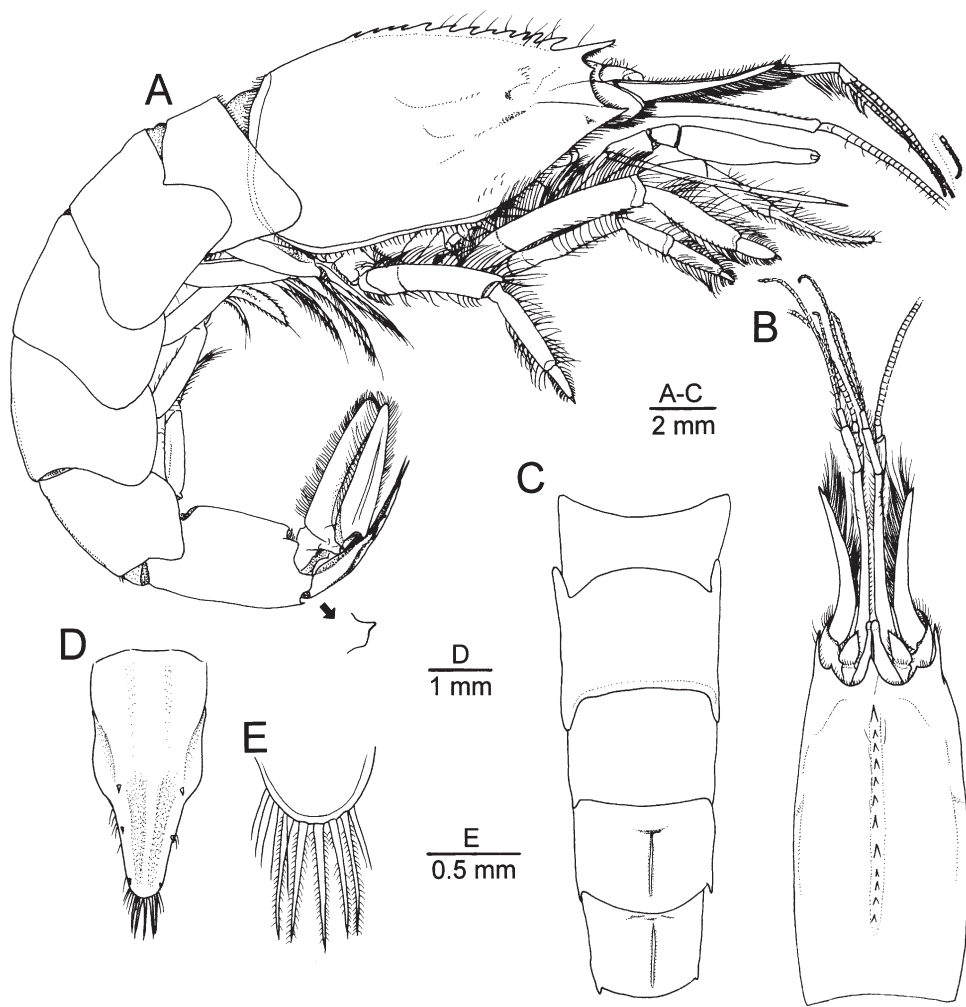


Figure 4. *Prionocrangon dofleini* Balss, 1913, female (CL 9.2 mm) from Tosa Bay, Japan. (A) Entire animal, lateral; (B) carapace and anterior cephalic appendages, dorsal; (C) first to fifth abdominal somites, dorsal; (D) telson, dorsal; (E) distal part of telson, dorsal.

**Taiwan.** TAIWAN 2001, commercial trawler, stn CP 102, 24°48.38'N, 122°7.97'E, 326–331 m, 19 May 2001, 2♀♀ (CL 8.0, 9.1 mm), 1 ovig. ♀ (CL 8.2 mm), NTOUM00587; stn CP 103, 24°48.83'N, 122°6.03'E, 367–424 m, 19 May 2001, 2♀♀ (CL 9.1, 10.6 mm), 3 ovig. ♀♀ (CL 7.9–8.4 mm), NTOUM00588; stn CP 104, 24°48.86'N, 122°5.31'E, 365–447 m, 19 May 2001, 1♂ (CL 7.4 mm), 1♀ (CL 10.0 mm), NTOUM00589 (transferred to MNHN); stn CP 108, 24°48.23'N, 122°7.74'E, 295–337 m, 20 May 2001, 3♂♂ (CL 5.9–7.4 mm), 1 ovig. ♀ (CL 7.4 mm), NTOUM00590.

#### *Type material*

Syntypes: Sagami Bay, Japan, stn 13, 350 m, mud, 1♂, coll. S. Doflein, ZSM Nr. 1218; stn 16, 400–600 m, sandy mud, 1♀, coll. S. Doflein, ZSM Nr. 1216. Not examined.

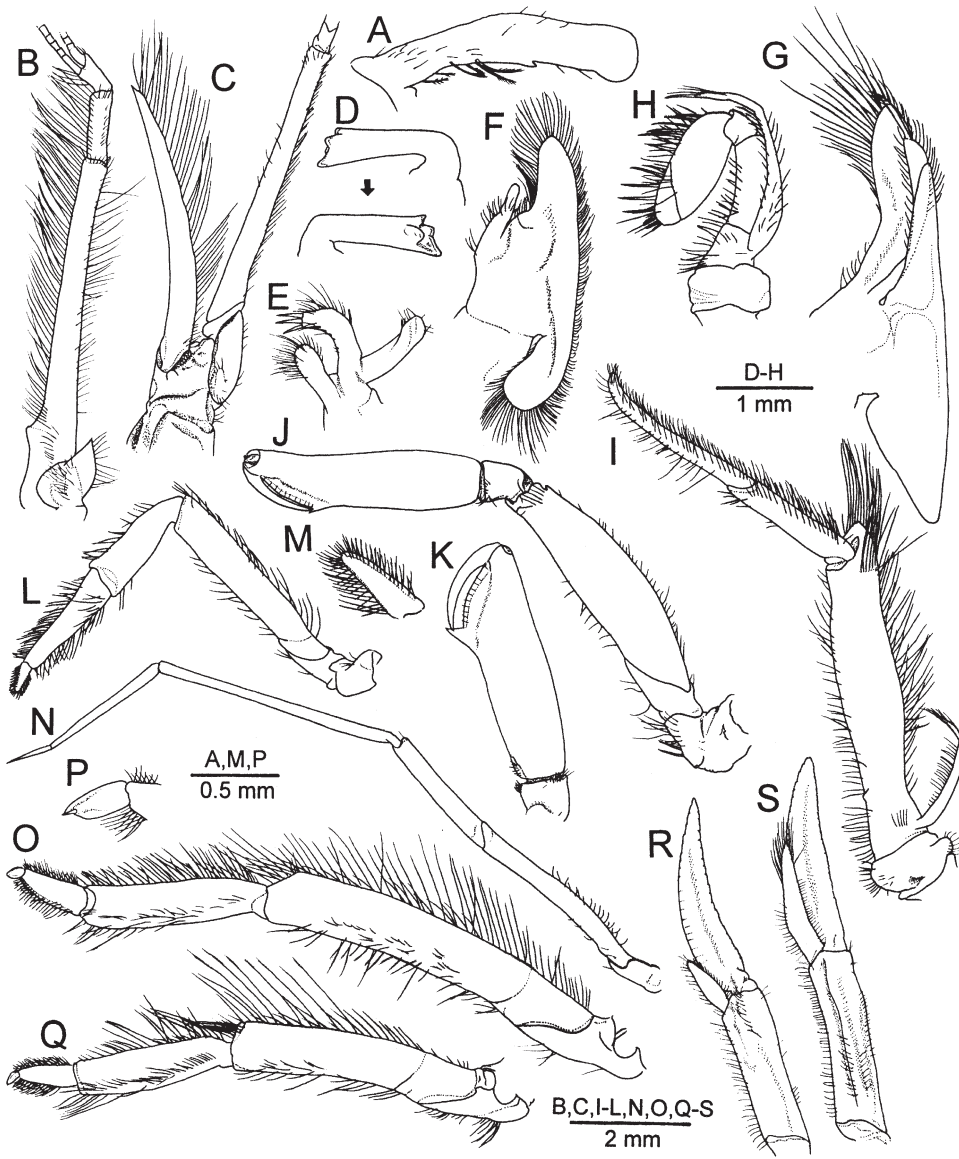


Figure 5. *Prionocrangon dofleini* Balss, 1913, female (CL 9.2 mm) from Tosa Bay, Japan, appendages dissected from left side. (A) Eye, lateral; (B) antennule, lateral; (C) antenna, dorsal; (D) mandible, external and internal; (E) maxillule, external; (F) maxilla, external; (G) first maxilliped, external; (H) second maxilliped, external; (I) third maxilliped, lateral; (J) first pereopod, lateral; (K) chela of first pereopod, ventral; (L) second pereopod, lateral; (M) dactylus, same, lateral; (N) third pereopod, lateral; (O) fourth pereopod, lateral; (P) dactylus, same, lateral; (Q) fifth pereopod, lateral; (R) first pleopod, ventral, exopodal setae omitted; (S) second pleopod, ventral, exopodal setae omitted.

*Description*

Rostrum nearly extending to tip of branchiostegal spine, 0.10–0.18 times as long as carapace (Figure 4A). Mid-dorsal carina of carapace armed with 7–12 spines (Figure 4A,

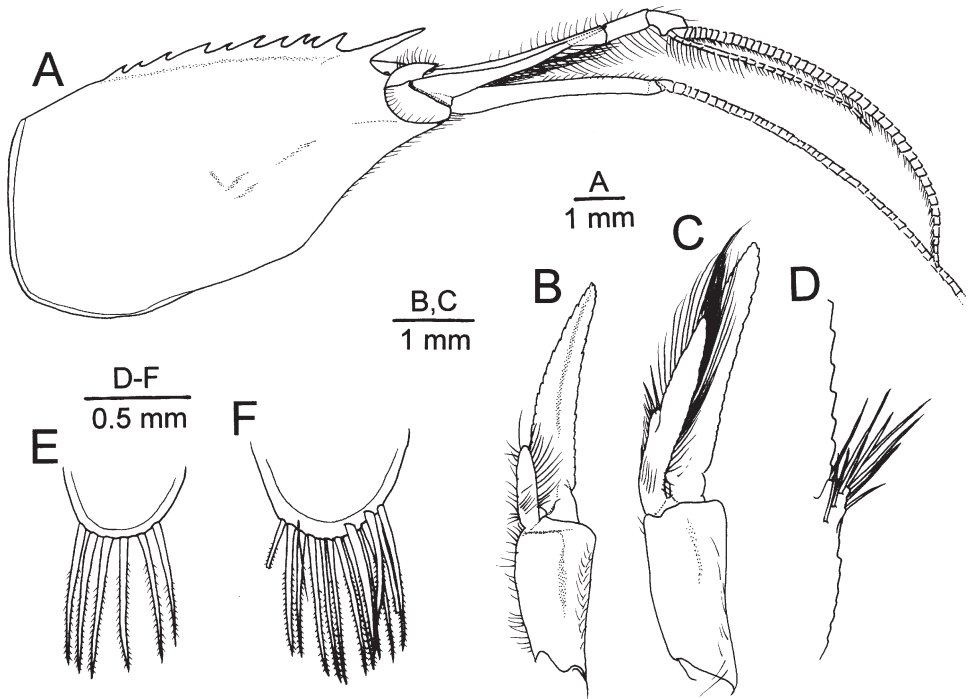


Figure 6. *Prionocrangon dofleini* Balss, 1913. (A) Male (CL 7.4 mm) from Taiwan, TAIWAN 2001 stn CP 104; (B–D) male (CL 7.4 mm) from Sagami Bay, Japan; (E) ovigerous female (CL 9.8 mm) from unknown locality in Japan; (F) female (CL 9.9 mm, same lot). (A) Carapace and anterior cephalic appendages, lateral; (B) left first pleopod, ventral; (C) left second pleopod, ventral; (D) appendix masculina, same, dorsal; (E, F) distal part of telson, dorsal.

B). Fourth and fifth abdominal somites with low median carina (Figure 4C); sixth somite 0.45–0.54 times as long as carapace, posterior margin of posterolateral process subtruncate, lacking minute tooth but produced ventrally (Figure 4A). Telson more or less as long as sixth abdominal somite, 0.45–0.53 times as long as carapace, posterior half strongly convergent; posterior margin rounded, armed with 5–12, mostly six, long spines but lacking median denticle (Figure 4D, E). Eyestalks drawn out to villiform extremities (Figure 5A), downcurved, reaching or not reaching in between antennules (Figure 4B). Antennular peduncle with proximal segment moderately long, 0.53–0.74 times as long as carapace (Figure 4B). Stylocerite with tip sharp and elongate (Figure 5B). Scaphocerite more or less extending to distal margin of proximal segment of antennular peduncle, 0.47–0.56 times as long as carapace (Figure 4B). Palm of first pereopod relatively stout, 3.70–4.55 times as long as wide (Figure 5J, K). Dactyli of fourth and fifth pereopods short, 0.38–0.40 times as long as propodi (Figure 5O, Q). Females with endopods and protopods of pleopods lacking lateral lobe or distal projection (Figure 5R). In adult females (more than CL 7.4 mm), endopod of second pleopod long, about 0.67 length of exopod (Figure 5S). Eggs about 1 × 1.5 mm in diameter.

#### Size

Males CL 3.4–8.1 mm, females CL 5.3–10.6 mm, ovigerous females CL 7.4–10.7 mm.

*Distribution*

Pacific coast of central Japan and Taiwan, at depths of 200–600 m (Balss 1913, 1914; present study).

*Colour in life*

Body entirely greenish ivory and semi-translucent (Figure 11A). Eggs yellowish ivory.

*Variations*

Of the 36 specimens examined, the variations in the number of dorsal carapace spines are: three specimens with seven spines, six with eight spines, 12 with nine spines, nine with 10 spines, four with 11 spines, and two with 12 spines. In 25 specimens still with intact telson, the number of posterior spines is: two specimens with five spines (Figure 6E), 13 with six spines (Figure 4E), four with seven spines, three with eight spines, one with nine spines, and one with 12 spines (Figure 6F, this specimen also with two additional subdistal dorsal spines). The two specimens from Sagami Bay (NSMT-Cr R: 774) have the telson slightly longer than the sixth abdominal somite and with a longer proximal antennular segment (0.71–0.74 carapace length). In the other specimens, the telson is slightly shorter than the sixth abdominal somite and the proximal antennular segment is somewhat shorter (0.53–0.66 carapace length).

*Remarks*

Although we did not manage to re-examine the type material of *P. dofleini* from the München Museum, the many topotypic specimens from Japan enable a re-description of this supposed uncommon species. All the specimens from Japan (including two from the type-locality Sagami Bay) are essentially identical and agree well with Balss' (1913, 1914) original and subsequent descriptions of the two syntypes. Moreover, all the Japanese material in the present study bears a low but distinct median carina on the fourth abdominal somite, a character absent in congeners. To this effect, the material identified as "*P. ommatosteres*" by Ohta (1983) from Suruga Bay should be considered as *P. dofleini*. *P. dofleini* is indeed closely related to *P. ommatosteres* but can be separated from it in having a low median carina on the fourth abdominal somite, the telson bearing more posterior spines, the posterolateral process of the sixth abdominal somite is ventrally produced, and the endopods and protopods of the second to fifth pleopods lack a proximolateral lobe or distoventral projection.

At present only *P. dofleini* of this genus is known from Japanese waters. But on the other hand, many specimens collected from a recent cruise off the north-east coast of Taiwan are found to be identical to the Japanese material, thus extending the distribution of this supposed Japanese endemic southwards to Taiwan. It is interesting that despite extensive surveys in the last 20 years on the catches of Taiwanese commercial trawlers using otter trawls, no *Prionocrangon* has ever been found. However, after employing a beam trawl, a collecting gear that can dig deeper in mud, to collect deep-sea benthos of Taiwan in the last few years, a number of specimens belonging to this genus were obtained. All the 14 Taiwanese *P. dofleini* specimens were collected from a very busy local fishing ground (i.e. the fishing ground of Tai-Shi fishing port in north-east Taiwan) further suggesting that *Prionocrangon* has deep burrowing habits that generally allow it to avoid the catches of otter trawls.



***Prionocrangon curvicaulis*** Yaldwyn, 1960

(Figure 7)

*Prionocrangon* n. sp.: Richardson and Yaldwyn 1958, p 39, Figure 41.*Prionocrangon curvicaulis* Yaldwyn 1960, p 46, Figure 10 [type locality: Chatham Rise, New Zealand].Not *Prionocrangon curvicaulis*: Chace 1984, p 56 (key), 57, Figure 24 [= *Prionocrangon ommatosteres* Wood-Mason and Alcock, 1891].*Material examined***New Zealand.** Catham Rise, CIE (Catham Islands 1954 Expedition), stn 6, 43°40'S, 179°28'E, 402 m, 24 January 1954, beam trawl and large dredge, fine grey sandy mud, 1♂ (CL 6.5 mm), paratype, MNZ CR 7378.*Type material*

Holotype: New Zealand, Catham Rise, CIE, stn 6, 43°40'S, 179°28'E, 402 m, 24 January 1954, beam trawl and large dredge on bottom fine grey sandy mud, 1 ovig. ♀ (CL 9 mm), Canterbury Museum. Paratypes: New Zealand, Catham Rise, CIE, same data as holotype, 1♂ (CL 6.5 mm, stated in original description as 6 mm), MNZ CR 7378, 1♀ (CL 7.5 mm), Canterbury Museum; stn 7, 43°42'S, 179°55'E, 509 m, 24 January 1954, beam trawl, fine grey sandy mud, 1♀ (CL 7 mm), 2 ovig. ♀♀ (stated as CL 8 mm), Canterbury Museum; stn 41, 44°35.5'S, 176°04'E, 600 m, 3 February 1954, otter trawl, fine green muddy sand, 1♀ (CL 8 mm), Canterbury Museum; stn 52, 44°04'S, 178°04'E, 473 m, 10 February 1954, beam trawl and large dredge, fine green sandy mud, 1♀ (CL 9 mm), 1 ovig. ♀ (CL 8 mm), Canterbury Museum. Only the male paratype examined.

*Description*

Rostrum extending to tip of branchiostegal spine, 0.20 times as long as carapace (Figure 7A). Mid-dorsal carina of carapace armed with 7–11 spines (Figure 7A). Fourth and fifth abdominal somites without median carina; sixth somite 0.58 times as long as carapace, posterior margin of posterolateral process rounded, with minute tooth and deep excavation ventrally (Figure 7E). Telson slightly shorter than sixth abdominal somite (Figure 7D), 0.53 times as long as carapace, posterior half strongly convergent (Figure 7F); posterior margin bearing six to seven long spines and with or without minute median denticle (Figure 7G). Eyestalks drawn out to bluntly cylindrical extremities and curving ventrally in between antennules (Figure 7C). Antennular peduncle with proximal segment relatively short, 0.58 times as long as carapace (Figure 7B). Stylocerite with tip elongate and sharp (Figure 7C). Scaphocerite overreaching distal margin of second segment of antennular peduncle, 0.69 times as long as carapace (Figure 7B). Palm of first pereopod moderately slender, 4.97 times as long as wide (Figure 7H). Dactyli of fourth and fifth pereopods relatively long, 0.74 times as long as propodi (Figure 7J).

*Size*

Male CL 6.5 mm, females CL 7–9 mm, ovigerous females CL 8–9 mm (Yaldwyn 1960).

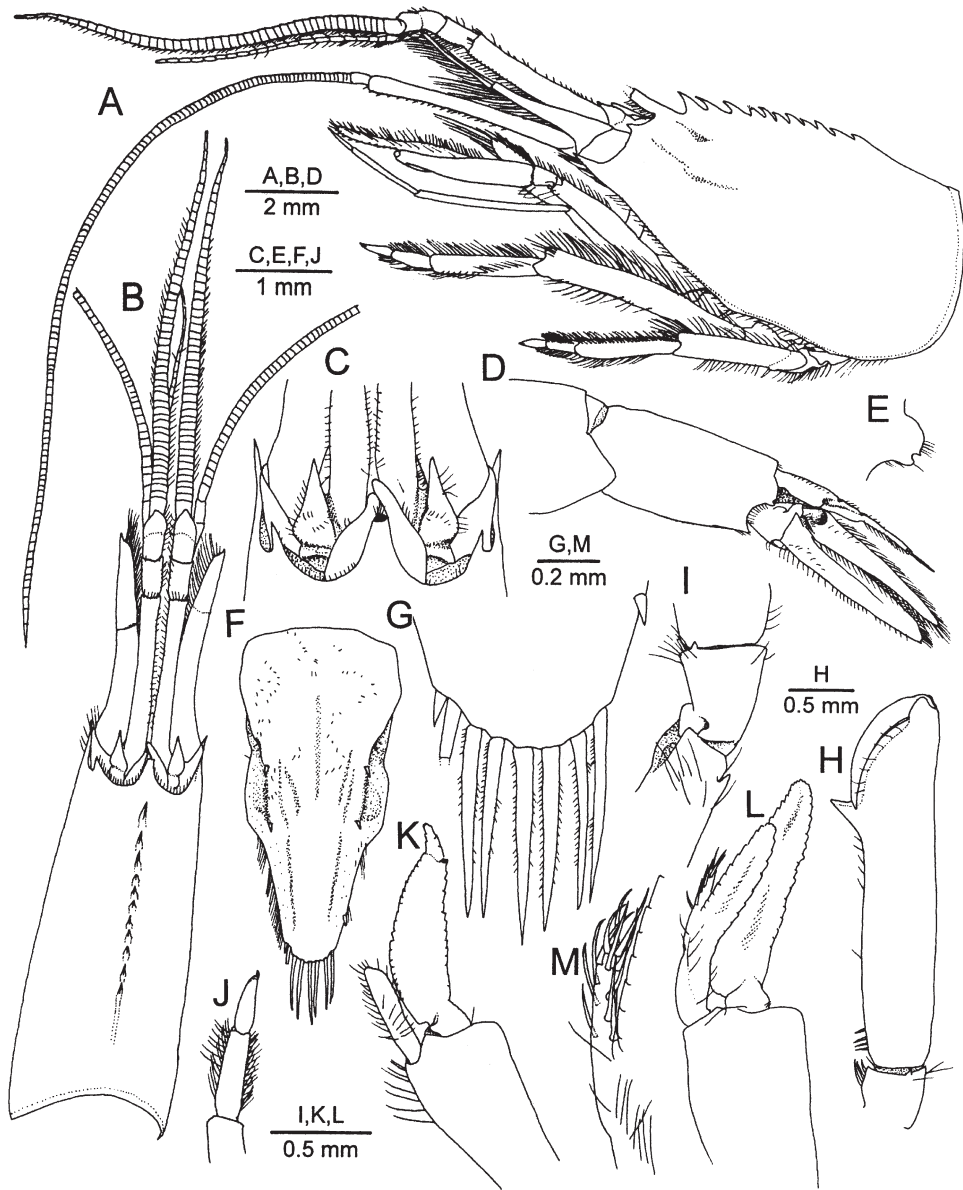


Figure 7. *Prionocrangon curvicaulis* Yaldwyn, 1960, paratype male (CL 7.0 mm) from Chatham Rise, New Zealand, CIE stn 6. (A) Carapace (tip of rostrum broken) with cephalic and thoracic appendages, lateral; (B) carapace (tip of rostrum broken) and anterior cephalic appendages, dorsal; (C) anterior part of carapace (tip of rostrum broken), eyes, basal parts of antennule and antenna, dorsal; (D) posterior part of abdomen and tailfan, lateral; (E) posterolateral process of sixth abdominal somite, lateral; (F) telson, dorsal; (G) posterior part of telson, dorsal; (H) chela of left first pereopod, ventral; (I) carpus and distal part of merus of left first pereopod, lateral; (J) dactylus and propodus of left fourth pereopod, lateral; (K) left first pleopod, ventral; (L) left second pleopod, ventral; (M) appendix masculina, same, ventral.

*Distribution*

New Zealand (Chatham Rise), at depths of 402–600 m.

*Colour in life*

Described by Yaldwyn (1960, p 48) as entire animal purely white.

*Remarks*

*Prionocrangon curvicaulis* is known only from the type series. Except for the male paratype deposited now at the Museum of New Zealand, the holotype and other paratypes deposited at the Canterbury Museum were not located by the present study. A re-examination of the male paratype found that its telson has the posterior margin bearing seven long spines and lacking a median denticle (Figure 7G, versus bearing three pairs of long spines and with a minute median denticle as described for the holotype). Other characters present in the paratype male but not mentioned by Yaldwyn (1960) are: (1) posterior margin of posterolateral process of sixth abdominal somite rounded, with a minute denticle and a deep excavation ventrally (Figure 7E); (2) first pereopod with carpus having a small distolateral spine (Figure 7I) and merus bearing a small subdistal spine on dorsal margin (Figure 7I).

*Prionocrangon curvicaulis* appears to be related to the new species *P. formosa* in having a cylindrical eyestalk with rounded tip (Figure 7C), the rounded posterior margin of the telson (Figure 7G), the proportionally shorter proximal antennular segment (Figure 7A, B) and the relatively longer dactyli of the fourth and fifth pereopods (Figure 7J). However, the rostrum of *P. curvicaulis* (0.20 times carapace length and extending to tip of branchiostegal spine, Figure 7A) is distinctly longer than that of *P. formosa* (0.07 times carapace length and only reaching tip of antennal spine, Figure 8A). The branchiostegal spine is also much better developed in *P. curvicaulis* (Figure 7A) than in *P. formosa* (Figure 8A). The shape of the posterolateral process of the sixth abdominal somite is also different between these two species (Figures 7E versus 8E) and the telson is posteriorly more convergent in *P. curvicaulis* (Figure 7F) than in *P. formosa* (Figure 8F).

***Prionocrangon formosa* sp. nov.**  
(Figures 8, 11B)

*Material examined*

**Taiwan.** TAIWAN 2001, commercial trawler, stn CP 104, 24°48.86'N, 122°5.31'E, 365–447 m, 19 May 2001, 1♀ (CL 4.9 mm), holotype, NTOUM00591.

*Description*

Rostrum very short, extending only to tip of antennal spine and 0.07 times as long as carapace (Figure 8A). Mid-dorsal carina of carapace armed with six spines (Figure 8A). Fourth and fifth abdominal somites without median carina (Figure 8B); sixth somite 0.57 times as long as carapace, posterior margin of posterolateral process truncate and armed with minute denticle (Figure 8E). Telson slightly shorter than sixth abdominal somite

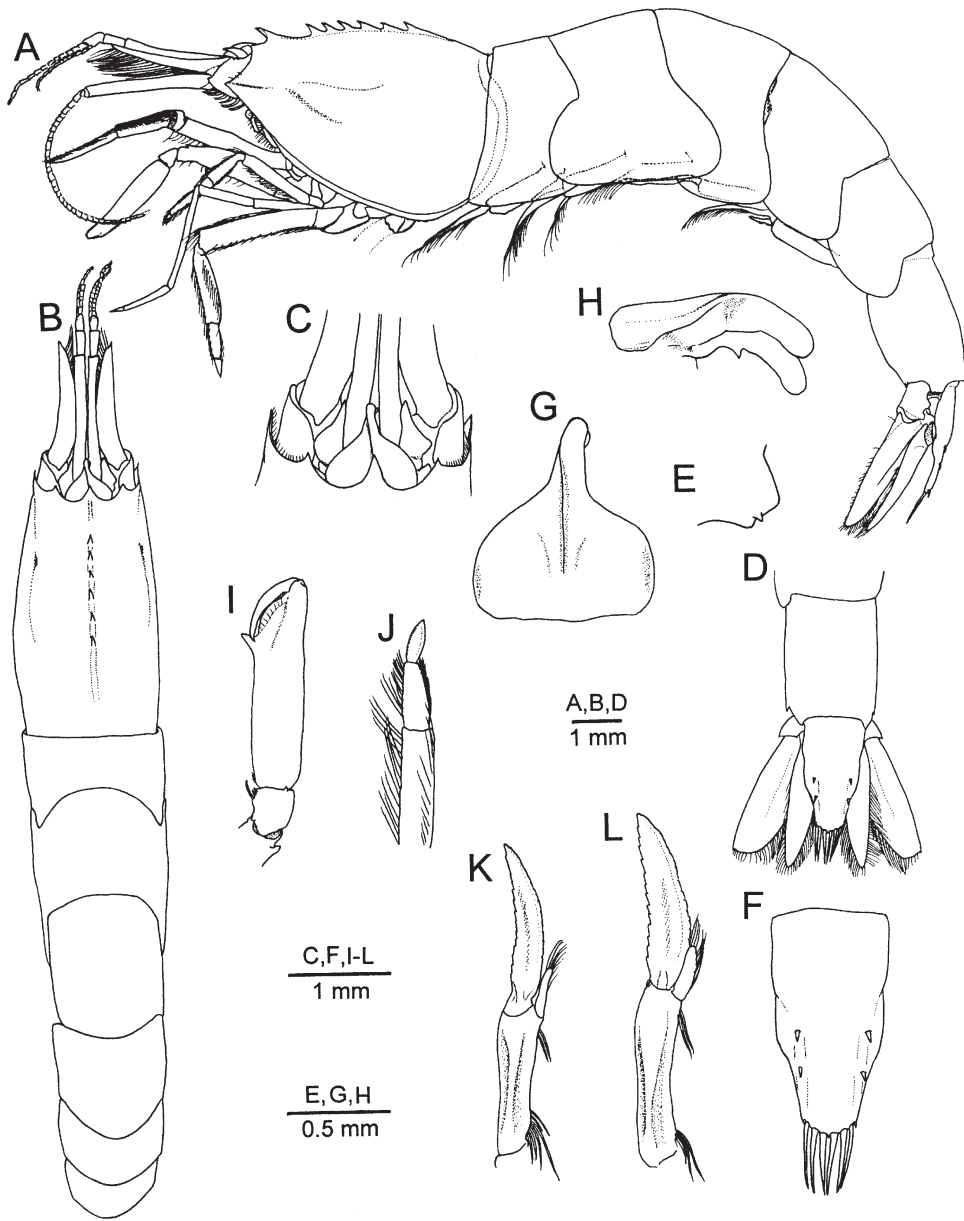


Figure 8. *Prionocrangon formosa* sp. nov., holotype female (CL 4.9 mm) from Taiwan, TAIWAN 2001 stn CP 104. (A) Entire animal, lateral; (B) same, dorsal; (C) anterior part of carapace, eyes, basal parts of antennule and antenna, dorsal; (D) sixth abdominal somite and tailfan, dorsal; (E) posterolateral process of sixth abdominal somite, lateral; (F) telson, dorsal; (G) eyes, dorsal; (H) same, lateral; (I) chela and carpus of right pereopod, dorsal; (J) dactylus and propodus of right fourth pereopod; (K) right first pleopod, ventral; (L) right second pleopod, ventral.

(Figure 8D), 0.53 times as long as carapace, posterior half slightly convergent; posterior margin rounded but armed with minute median denticle, bearing three pairs of long spines (Figure 8F). Eyestalks drawn out to bluntly cylindrical extremities (Figure 8G, H), curving ventrally and reaching in between antennules (Figure 8C). Antennular peduncle with

proximal segment relatively short, 0.57 times as long as carapace (Figure 8B). Stylocerite with tip elongate and sharp (Figure 8C). Scaphocerite overreaching distal margin of proximal segment of antennular peduncle, 0.63 times as long as carapace (Figure 8B). Palm of first pereopod moderately slender, 4.13 times as long as wide (Figure 8I). Dactyli of fourth and fifth pereopods relatively long, 0.70 times as long as propodi (Figure 8J). Only holotype female known, endopod of second pleopod about 0.25 times as long as exopod (Figure 8L); endopods and protopods of pleopods without lateral lobe or distoventral projection (Figure 8K, L).

#### *Size*

Only one female CL 4.9 mm known.

#### *Distribution*

Known only from north-eastern Taiwan between 365 and 447 m depth.

#### *Colour in life*

Entire animal ivory white and somewhat translucent (Figure 11B).

#### *Etymology*

This new species is named after its type locality; Formosa is the old name for Taiwan.

#### *Remarks*

This small specimen from Taiwan shows a close resemblance with *P. curvicaulis* but is unique in the genus in having a very short rostrum and much less-developed branchiostegal spine (see also “Remarks” under *P. curvicaulis*). Although this Taiwanese specimen has a rather small size, it is very unlikely that the shape of the rostrum is size-related since no such variation has been observed in *P. dofleini* of which many specimens of a large size range have been examined (i.e. CL 3.4–10.7 mm). Therefore, it seems justified in giving a new name to this short rostrum form.

#### ***Prionocrangon demani* sp. nov.**

(Figure 9)

*Prionocrangon ommatosteres*: de Man 1920, p 308, Plate 25 Figure 76, 76a–i [*non* Wood-Mason and Alcock, 1891]

? *Prionocrangon ommatosteres*: Chace 1984, p 56 (key), 58 [*non* Wood-Mason and Alcock, 1891].

#### *Material examined*

**Philippines.** Sulu Sea, RV *Hakuho-Maru*, KH-02-4 Cruise, stn 14, 10°00.70'–10°01.62'N, 120°54.72'–120°55.27'E, 1482–1488 m, 8 December 2002, 1♂ (CL 4.1 mm), holotype, CBM-ZC 7841.

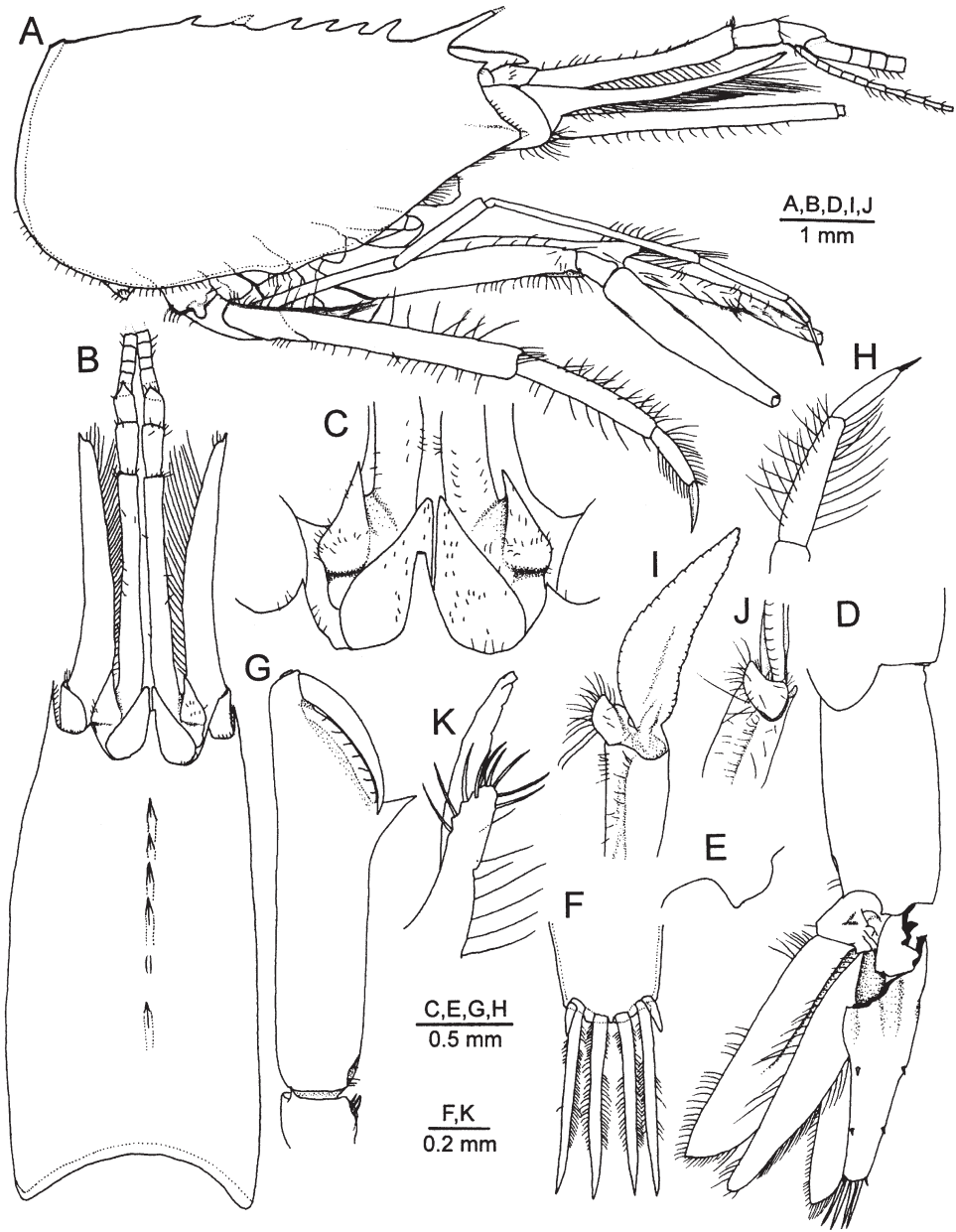


Figure 9. *Prionocrangon demani* sp. nov. (A–H, K) holotype male (CL 4.1 mm) from Sulu Sea, the Philippines, KH-02-04 Cruise stn 14; (I, J) paratype female from Indonesia off south of Buru, *Albatross* stn 5637. (A) Carapace (tip of rostrum broken) with cephalic and thoracic appendages, lateral; (B) carapace (tip of rostrum broken) and anterior cephalic appendages, dorsal; (C) anterior part of carapace (tip of rostrum broken), eyes, basal parts of antennule and antenna, dorsal; (D) posterior part of abdomen and tailfan, lateral; (E) posterolateral process of sixth abdominal somite, lateral; (F) posterior part of telson, dorsal; (G) chela of left first pereopod, ventral; (H) dactylus and propodus of right fourth pereopod, lateral; (I) left second pleopod, ventral; (J) endopod and distal part of protopod of right second pleopod, mesial; (K) appendix masculina of left second pleopod, mesial.

**Indonesia.** *Albatross* stn 5637, off south of Buru, 3°53'20"S, 126°48'00"E, 1280 m, 10 December 1909, Agassiz beam trawl, 1♂ without carapace, paratype, USNM 205088 (referred to “? *P. ommatosteres*” in Chace 1984).

### *Description*

Rostrum reaching tip of branchiostegal spine, 0.11–0.16 times as long as carapace (Figure 9A). Mid-dorsal carina of carapace armed with six to eight spines (Figure 9A). Fourth and fifth abdominal somites without median carina; sixth somite 0.60 times as long as carapace, posterior margin of posterolateral process subtruncate, lacking minute denticle but slightly produced ventrally (Figure 9E). Telson slightly longer than sixth abdominal somite (Figure 9D), 0.64 times as long as carapace, posterior half slightly convergent; posterior margin subtruncate, armed with two pairs of long spines and with or without minute median denticle (Figure 9F). Eyestalks triangular, drawn out to subacute extremities, lateral margin slightly sinuous (Figure 9C). Antennular peduncle with proximal segment moderately long, 0.61 times as long as carapace (Figure 9B). Stylocerite with tip elongate and sharp (Figure 9C). Scaphocerite overreaching proximal segment of antennular peduncle, 0.67 times as long as carapace (Figure 9B). Palm of first pereopod moderately stout, 4.45–4.48 times as long as wide (Figure 9G). Dactyli of fourth and fifth pereopods relatively long, 0.65–0.79 times as long as propodi (Figure 9H). Females with endopod of second pleopod about 0.25 times as long as exopod (Figure 9I); endopods and protopods of second to fifth pleopods with small proximolateral lobe and distoventral projection, respectively (Figure 9J).

### *Size*

The two males known are CL 4.1 and 6.4 mm, the only intact female is CL 7.5 mm (de Man 1920; present study).

### *Distribution*

Indonesia and the Philippines, at depths of 1158–1488 m.

### *Colour in life*

Not known.

### *Etymology*

The species is named after J. G. de Man for his important contributions to the taxonomy of the Crangonidae and for providing detailed illustrations on the “Siboga” material of this form.

### *Remarks*

Although attempts to borrow the two Indonesian specimens reported by de Man (1920) as *P. ommatosteres* from the Zoological Museum of Amsterdam were unsuccessful, the detailed illustrations given by de Man (1920, Plate 25 Figure 76, 76a–i) show that the “Siboga”

material is not true *P. ommatosteres* but actually belongs to the present new species. *P. demani* is most similar to *P. pectinata* except in having a longer and less convergent telson. Moreover, females of *P. demani* have the second to fifth pleopods with a small proximolateral lobe on the endopods and a small distoventral projection on the protopods, while these lobes and projections are absent in *P. pectinata*.

The badly damaged female collected by the *Albatross* and tentatively assigned to *P. ommatosteres* by Chace (1984) has triangular eyestalks, a longer and less convergent telson, the dactyli of the last two pereopods are rather long, and the posterolateral process of the sixth abdominal somite is only produced ventrally. All these characters show that this specimen is *P. demani*.

***Prionocrangon paucispina* sp. nov.**

(Figures 10, 11C)

*Material examined*

**Taiwan.** TAIWAN 2002, "Ocean Researcher 1", stn CP 183, 21°58.22'N, 119°27.99'E, 2519–2556 m, 26 August 2002, 2♀♀ (CL 4.4 mm, other one abdomen only), paratypes, NTOUM00594; stn CP 185, 22°0.54'N, 119°27.94'E, 2334–2543 m, 26 August 2002, 1♂ (CL 7.6 mm), holotype, NTOUM00592, 1♂ (CL 7.2 mm), 2♀♀ (CL 5.8, 8.1 mm, large one with bopyrid parasite probably *Eragia profunda* attached on abdomen), paratypes, NTOUM00593.

**New Caledonia.** BIOCAL, stn CP 72, 22°10'S, 167°33'E, 2100–2110 m, 4 September 1985, 2♀ (CL 8.8, 9.0 mm, small one bearing the holotype of the bopyrid parasite *Eragia profunda* Markham, 1994), paratypes, MNHN-Na. 15070. BIOGEOCAL, stn CP 273, 21°01'53"S, 166°57'41"E, 1920–2040 m, 20 April 1987, 1♀ (CL 8.0 mm), paratype, MNHN-Na. 15071.

*Description*

Rostrum extending slightly beyond tip of antennal spine, 0.08–0.10 times as long as carapace (Figure 10A). Mid-dorsal carina of carapace armed with four to five spines (Figure 10A). Fourth and fifth abdominal somites without median carina; sixth somite 0.58–0.70 times as long as carapace, posterior margin of posterolateral process subtruncate, usually with median excavation as well as dorsal and ventral minute denticles or blunt processes (Figure 10F, G, rarely median excavation and/or denticles indistinct). Telson slightly longer than sixth abdominal somite (Figure 10E), 0.69–0.72 times as long as carapace, posterior half slightly convergent (Figure 10H); posterior margin rounded, armed with 10–13 long spines and without median denticle (Figure 10J). Eyestalks triangular, shortly drawn out to blunt extremities, lateral margin slightly sinuous (Figure 10C). Antennular peduncle with proximal segment relatively short, 0.53–0.59 times as long as carapace (Figure 10B). Stylocerite broadly triangular, with tip stout (rarely with minute denticle) and not protruded (Figure 10C, D). Scaphocerite extending to second segment of antennular peduncle, 0.57–0.70 times as long as carapace (Figure 10B). Palm of first pereopod relatively stout, 3.87–4.48 times as long as wide (Figure 10K). Dactyli of fourth and fifth pereopods short, 0.41–0.46 times as long as propodi (Figure 10L). Adult females (more than CL 8.0 mm) with endopod of second pleopod about 0.40 times length of exopod (Figure 10M). Females with endopods and protopods of pleopods without lateral lobe or distoventral projection (Figure 10M).



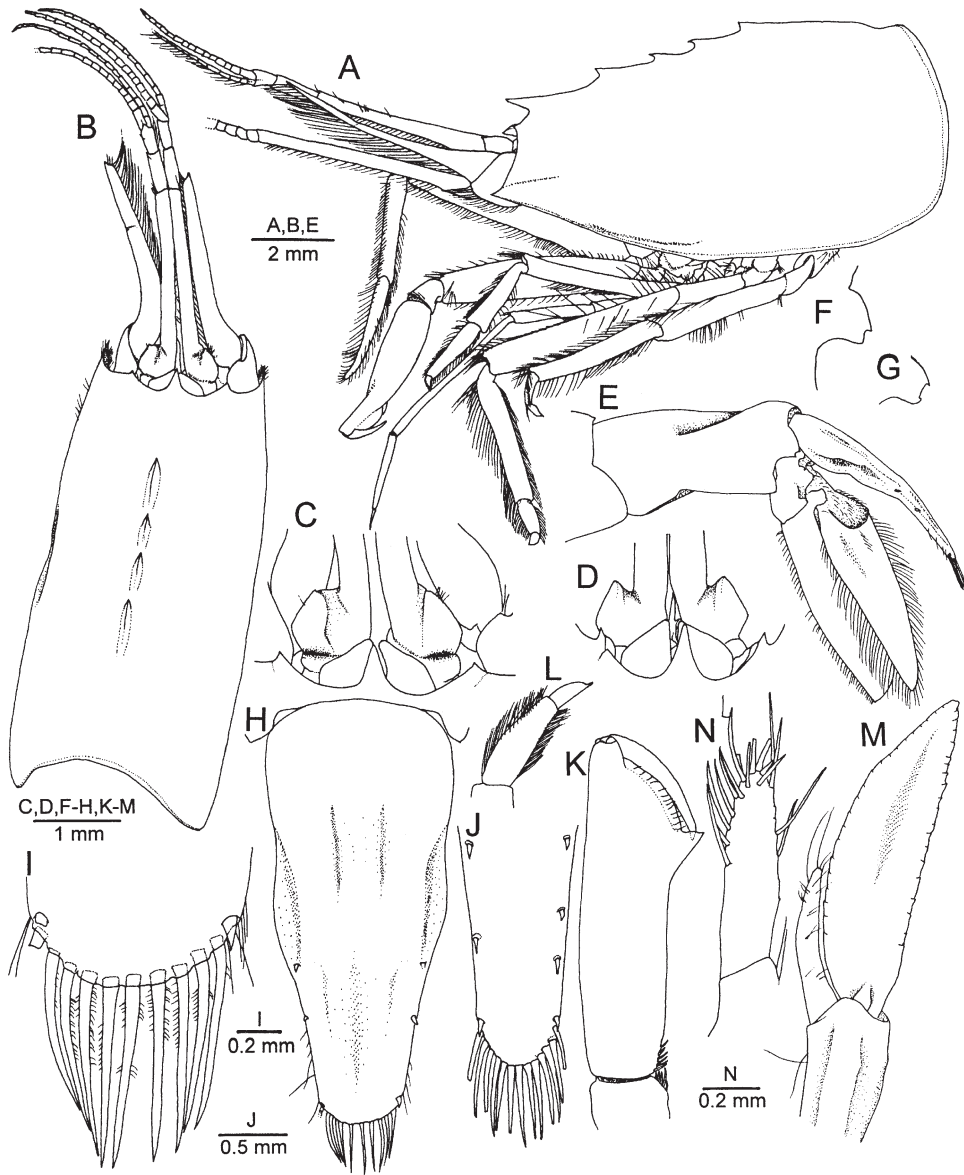


Figure 10. *Prionocrangon paucispina* sp. nov. (A–C, E, F, H, I, K–M) Paratype female (CL 9.0 mm) from New Caledonia, BIOCAL stn CP 72; (D) paratype male (CL 7.2 mm) from Taiwan, TAIWAN 2002 stn CP 185; (G) paratype female (CL 8.0 mm) from New Caledonia, BIOGEOCAL stn CP 273; (J) paratype female (CL 5.8 mm) from Taiwan, TAIWAN 2002 stn CP 185; (N) holotype male (CL 7.6 mm) from TAIWAN 2002 stn CP 185. (A) Carapace with cephalic and thoracic appendages, lateral; (B) carapace and anterior cephalic appendages, dorsal; (C, D) anterior part of carapace, eyes, basal parts of antennule and antenna, dorsal; (E) posterior part of abdomen and tailfan, lateral; (F, G) posterolateral process of sixth abdominal somite, lateral; (H) telson, dorsal; (I, J) posterior part of telson, dorsal; (K) chela of right first pereopod, ventral; (L) dactylus and propodus of left fourth pereopod, lateral; (M) left second pleopod, ventral; (N) appendix masculina of left second pleopod, mesial.

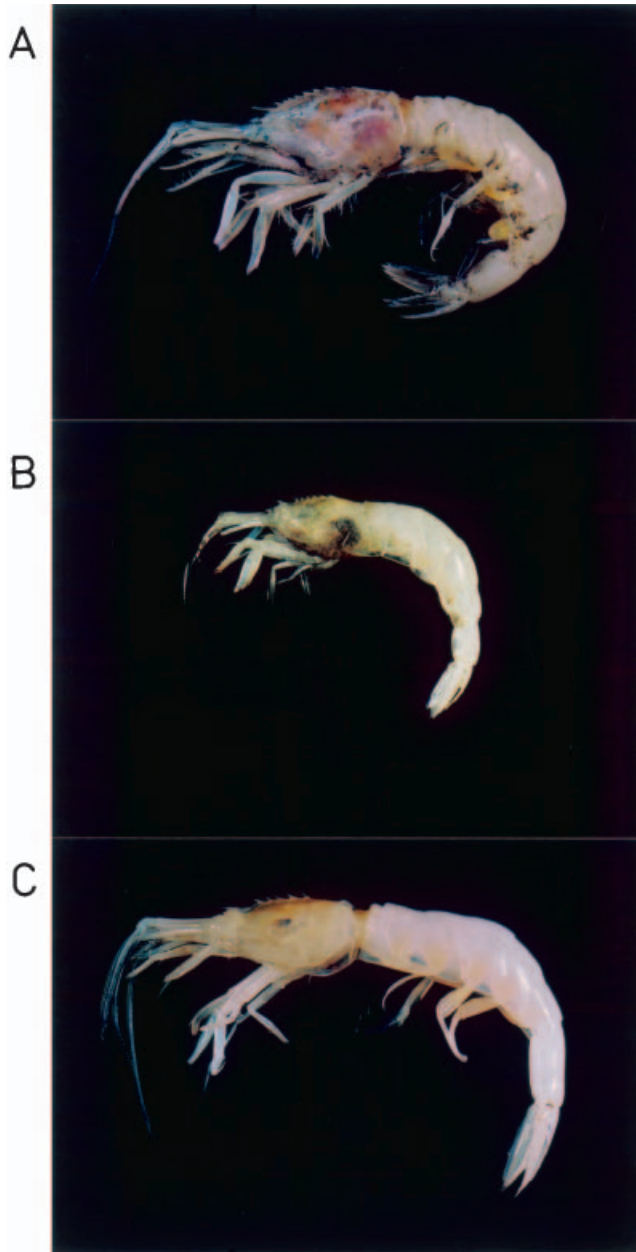


Figure 11. (A) *Prionocrangon dofleini* Balss, 1913, ovigerous female (CL 8.2 mm) from Taiwan (TAIWAN 2001 stn CP 102); (B) *Prionocrangon formosa* sp. nov., holotype female (CL 4.9 mm) from Taiwan (TAIWAN 2001 stn CP 104); (C) *Prionocrangon paucispina* sp. nov., holotype male (CL 7.6 mm) from Taiwan (TAIWAN stn CP 185).

*Size*

Males CL 7.2–7.6 mm, females CL 4.4–9.0 mm.

*Distribution*

Taiwan and New Caledonia, at depths of 1920–2556 m.

*Colour in life*

Body generally ivory white and somewhat translucent. Internal organs visible inside carapace as greenish brown (Figure 11C).

*Variations*

Of the nine specimens examined: the three specimens from New Caledonia all have four dorsal carapace spines while the five specimens from Taiwan with carapace all have five dorsal spines. The tip of the stylocerite is obscure (Figure 10C) in two specimens but clearly defined (Figure 10D) in six specimens. Of the five specimens still with intact telsons, three bear 10 long posterior spines (Figure 10I) and one has 12 posterior spines and one has 13 posterior spines (Figure 10J).

*Etymology*

The Latin *paucispina* refers to the fewer dorsal carapace spines in this species.

*Remarks*

Although from rather disjunct localities, the present Taiwanese and New Caledonian material agree well with each other. The only difference observed is the number of dorsal carapace spines, being four in all three New Caledonian specimens and five in the five intact Taiwanese specimens. The short rostrum, low number of dorsal carapace spines, triangular eyestalks drawn out slightly to form blunt extremities, a stylocerite in which the tip is not elongate (Figure 10C, D), and the posterolateral process on the sixth abdominal somite usually bearing a median excavation and dorsal and ventral denticles or blunt processes (Figure 10F, G), easily distinguish the present form from congeners. Moreover, this form has a much deeper known bathymetric range (1920–2556 m deep) than the other species (at depths of less than 1488 m). There is little doubt that this deep-water form is an undescribed species and warrants a new name.

The female abdomen from TAIWAN 2001 stn CP 183 lacks a median carina on the abdomen and has 12 long posterior spines on the telson, and was collected from very deep waters together with a small female *P. paucispina*. Therefore, it is clear that this abdomen is not *P. dofleini* or *P. formosa* and can be safely considered as representing *P. paucispina*.

**Acknowledgements**

Grateful acknowledgements are extended to A. Crosnier (MNHN), K. I. Hayashi (NFU), A. B. Johnston (MCZ), R. Lemaitre (USNM), T. Komai (CBM), H. Namikawa

(NSMT), R. Webber (MNZ), and Y. Yabumoto (KMNH) for loans of specimens in this study. We also thank P. F. Clark of the Natural History Museum, London for kindly helping us to check the collection of his museum for the types and topotypic material of *P. ommatosteres* though none was found there, M. Osawa of the National Science Museum, Tokyo for kindly examining for us the Flores Sea specimen reported in Takeda and Hanamura (1994), T. Komai again for kindly reviewing the drafts and offering helpful comments, and P. K. L. Ng of the National University of Singapore for reading the final draft. The cruise "TAIWAN 2001" was supported by the National Museum of Marine Science & Technology, Keelung (NMMST), National Science Council, Taiwan, ROC (NSC), MNHN, and the Institut de Recherche pour le Développement, France (IRD). The cruise "TAIWAN 2002" was supported by the NSC, NMMST, MNHN, IRD and the National Museum of Marine Biology & Aquarium, Pingtung.

## References

- Alcock A. 1901. A descriptive catalogue of the Indian deep-sea Crustacea Decapoda Macrura and Anomala, in the Indian Museum, being a revised account of the deep-sea species collected by the Royal Indian Marine Survey Ship Investigator. Calcutta: Indian Museum. 286 p, Plates 1–3.
- Alcock A, Anderson AR. 1894. Natural history notes from H.M. Indian Marine Survey Steamer "Investigator," Commander C.F. Oldham, R.N., commanding, 14: an account of a recent collection of deep sea Crustacea from the Bay of Bengal and Laccadive Sea. Journal of the Asiatic Society of Bengal (Series 2) 63:141–185, Plate 9.
- Alcock A, Anderson AR. 1895. Crustacea, Part III: illustration of the zoology of the Royal Indian Marine Surveying Steamer "Investigator," under the command A. Carpenter, R.N., D.S.O., of the late Commander R.F. Hoskyn, R.N., and of Commander C.F. Oldham, R.N. Calcutta: Indian Museum, Plates 9–15.
- Balss H. 1913. Diagnosen neuer ostasiatischer Macruren. Zoologischer Anzeiger 42(5):234–239.
- Balss H. 1914. Ostasiatische Decapoden II. Die Natantia und Reptantia. In: Beiträge zur Naturgeschichte Ostasiens, herausgegeben von Dr. F. Doflein. Abhandlungen der Bayerischen Akademie der Wissenschaften, München Suppl. 2(10):1–101, Plate 1.
- Chace FA Jr. 1984. The caridean shrimps (Crustacea: Decapoda) of the *Albatross* Philippine Expedition, 1907–1910, Part 2: Families Glyphocrangonidae and Crangonidae. Smithsonian Contributions to Zoology 397: i–iv+1–63.
- Christoffersen ML. 1988. Genealogy and phylogenetic classification of the world Crangonidae (Crustacea, Caridea), with a new species and new records for the south western Atlantic. Revista Nordestina de Biologia 6:43–59.
- de Man JG. 1920. Decapoda of the Siboga Expedition. IV: Families Pasiphaeidae, Styliodactylidae, Hoplophoridae, Nematocarcinidae, Thalassocaridae, Pandalidae, Psalidopodidae, Gnathophyllidae, Processidae, Crangonidae and Glyphocrangonidae. Siboga Expeditie Monographie 39a3:1–318, Plates 1–25.
- Faxon W. 1896. Reports on the results of dredging, under the Supervision of Alexander Agassiz, the Gulf of Mexico and the Caribbean Sea, and on the east coast of the United States, 1877 to 1880, by the U.S. Coast Survey Steamer "Blake," during 1891, Lieut.-Commander C.D. Sigsbee, U.S.N., and Commander J.R. Bartlett, U.S.N. commanding, XXXVII. Supplementary notes on the Crustacea. Bulletin of the Museum of Comparative Zoology, Harvard 30(3):153–168, Plates 1, 2.
- Haworth AH. 1825. A new binary arrangement of the macrurous Crustacea. Philosophical Magazine 65:183–184.
- Hayashi KI, Kim JN. 1999. Revision of the East Asian species of *Crangon* (Decapoda: Caridea: Crangonidae). Crustacean Research 28:62–103.
- Holthuis LB. 1993. The recent genera of the caridean and stenopodidean shrimps (Crustacea, Decapoda) with an appendix on the order Amphionidacea. Leiden: Nationaal Natuurhistorisch Museum. 328 p.
- Kubo I. 1965. Decapoda Macrura. In: Okada YK, Uchida T, et al., editors. New illustrated encyclopedia of the fauna of Japan (part 2) Tokyo: Hokuryukan Publishing Co. Ltd. p 592–629. (Jpn).
- Markham JC. 1994. Crustacea Isopoda: Bopyridae in the MUSORSTOM collections from the tropical Indo-Pacific I: Subfamilies Pseudioninae (in part), Argeiinae, Orbioninae, Athelginae and Entophilinae. In:

- Cronsier A, editor. Résultats des Campagnes MUSORSTOM. Volume 10, Mémoires du Muséum national d'Histoire naturelle 161:225–253.
- Miyake S. 1998. Japanese crustacean decapods and stomatopods in color. Volume 1, Macrura, Anomura and Stomatopoda. Osaka: Hoikusha, vii+261 p, Plates 1–56. (Jpn).
- Ohta S. 1983. Photographic census of large-sized benthic organisms in the bathyal zone of Suruga Bay, central Japan. Bulletin of the Ocean Research Institute, University of Tokyo 15:1–244.
- Richardson LR, Yaldwyn JC. 1958. A guide of the natant decapod Crustacea (shrimps and prawns) of New Zealand. Tuatara 7:17–41.
- Takeda M, Hanamura Y. 1994. Deep-sea shrimps and lobsters from the Flores Sea collected by the R.V. *Hakuho-Maru* during KH-85-1 Cruise. Bulletin of the National Science Museum (Series A) 20:1–37.
- Wood-Mason J, Alcock A. 1891. Natural history notes from H.M. Indian Marine Survey Steamer *Investigator*, Commander R.F. Hoskyn, R.N., commanding, Series II, No. 1: on the results of deep-sea dredging during the season 1890–91. Annals and Magazine of Natural History (Series 6) 8:353–362.
- Yaldwyn JC. 1960. Biological results of the Chatham Islands 1954 Expedition. Part 1. Crustacea Decapoda Natantia from the Chatham Rise: a deep water bottom fauna from New Zealand. New Zealand Department of Scientific and Industrial Research Bulletin 139(1):13–53.
- Yokoya Y. 1933. On the distribution of decapod crustaceans inhabiting the continental shelf around Japan, chiefly based upon the materials collected by S.S. *Sōyō-Maru*, during the years 1923–1930. Journal of the College of Agriculture, Tokyo Imperial University 12:1–222.