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# *Glyphocrangon* Shrimps from the Western Pacific Collected by the R/V *Hakuho-Maru* during the KH-72-1 Cruise

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**Abstract** Caridean shrimps of the genus *Glyphocrangon* (Family Glyphocrangonidae) collected from the western Pacific by the R/V *Hakuho-Maru* during the KH-72-1 cruise are identified as *G. rimapes* BATE from off Davao Bay, Mindanao, *G. smithii* WOOD-MASON et ALCOCK from the South China Sea, *G. hakuhoae* TAKEDA et HANAMURA from the Sulu Sea and the Timor Sea, and *G. spinossisima* sp. nov. and *G. faxoni* DE MAN from the Sulu Sea. Majority of the specimens belong to the recently described species *G. hakuhoae*. The new species is represented by two specimens and distinguished from its congeners by spiny armature of the carapace and abdomen.

During the KH-72-1 cruise of the R/V *Hakuho-Maru* of the Ocean Research Institute, University of Tokyo, deep-sea invertebrates of various groups were abundantly collected in the Philippine and Indonesian seas. Of them, most of decapod crustaceans are at present deposited in the National Science Museum, Tokyo, and under the course of systematic studies. For an outline of the KH-72-1 cruise including sampling data with track chart, refer to the *Preliminary Report of the Hakuho-Maru Cruise KH-72-1* (*CSK*, *IBP*) edited by Prof. R. MARUMO, Chief Scientist of the Cruise, and published by the Ocean Research Institute, University of Tokyo in 1975.

The present report dealing with caridean shrimps of the genus *Glyphocrangon* (Family Glyphocrangonidae) is the first of a serial report. Nearly 90 specimens were referred to the following five species including a new species: *G. spinossisima* n. sp. and *G. faxoni* DE MAN from the Sulu Sea, *G. rimapes* BATE from off Davao Bay, Mindanao, *G. smithii* WOOD-MASON et ALCOCK from the South China Sea, and *G. hakuhoae* TAKEDA et HANAMURA from the Sulu Sea and the Timor Sea.

The *Glyphocrangon* shrimps are well known following the excellent study by CHACE (1984), on which our study is generally based. With the exception of the new species and *G. hakuhoae*, the species are listed in the order of CHACE's key.

All the specimens dealt with in this report are in the collections of the National Science Museum, Tokyo (NMST). Descriptions of the carapacial carinae follow CHACE's desigination, and the length of the carapace abbreviated as cl is measured from the level of the posterior margin of the orbit to the posterior margin of the dorsal median line.

## Systematic Accounts

### Family Glyphocrangonidae

### Genus *Glyphocrangon* A. MILNE EDWARDS, 1881

### *Glyphocrangon spinossisima* sp. nov.

(Figs. 1–4)

*Material examined.* R/V *Hakuho-Maru* KH-72-1 cruise, st. 14, Sulu Sea (08°31.6′N, 118°35.7′E–08°32.6′N, 118°36.8′E), 1712–1840 m deep; 1♂ (holotype, cl 18.4 mm), (NSMT-Cr 11958), 1 ovig. ♀ (paratype, cl 22.5 mm) (NSMT-Cr 11959); May 27, 1972.

*Diagnosis.* Rostrum as long as, or slightly longer than carapace, armed with 2 pairs of sharp dorsolateral teeth. Integument smooth, glabrous; anterior 1st (submedian) carina formed by 4 spines followed by 2 blunt tubercles; posterior 1st carina composed of 3 long blunt tubercles; anterior 2nd (intermediate) carina composed of 3 distinct tubercles; posterior 2nd carina divided into 5 lobes; posterior 3rd (antennal) carina long, nearly entire with only an indistinct interruption posteriorly, forming a large sharp anteriorly directed spine just posterior to cervical groove; anterior 4th (lateral) carina forms a very large vertically compressed lamellar ridge that extends anteriorly as a sharp spine continuing beyond branchiostegal spine; posterior 4th carina forms a thick ridge with 2 indistinct notches forming 3 lobes; anterior 5th (sublateral) carina prominent with dimpled margins; posterior 5th carina partial; anterior 6th (submarginal) carina continuous. Abdomen with median dorsal carina on all somites; first 3 abdominal somites armed with sharp distinct spines on dorsal median and submedian carinae; dorsal carina of 2nd somite has a sharp spine followed posteriorly by a large triangular lamellar tooth that is vertically directed; dorsal carina of 3rd somite consists of one sharp forward pointed tooth separated by lateral groove from a posteriorly directed lamellar tooth; 5th somite produces 2 marginal spines; uropod has a distally located marginal tooth.

*Description.* Body moderately robust, with thorny appearance; integument firm, smooth, glabrous without pubescence. Rostrum as long as, or slightly longer

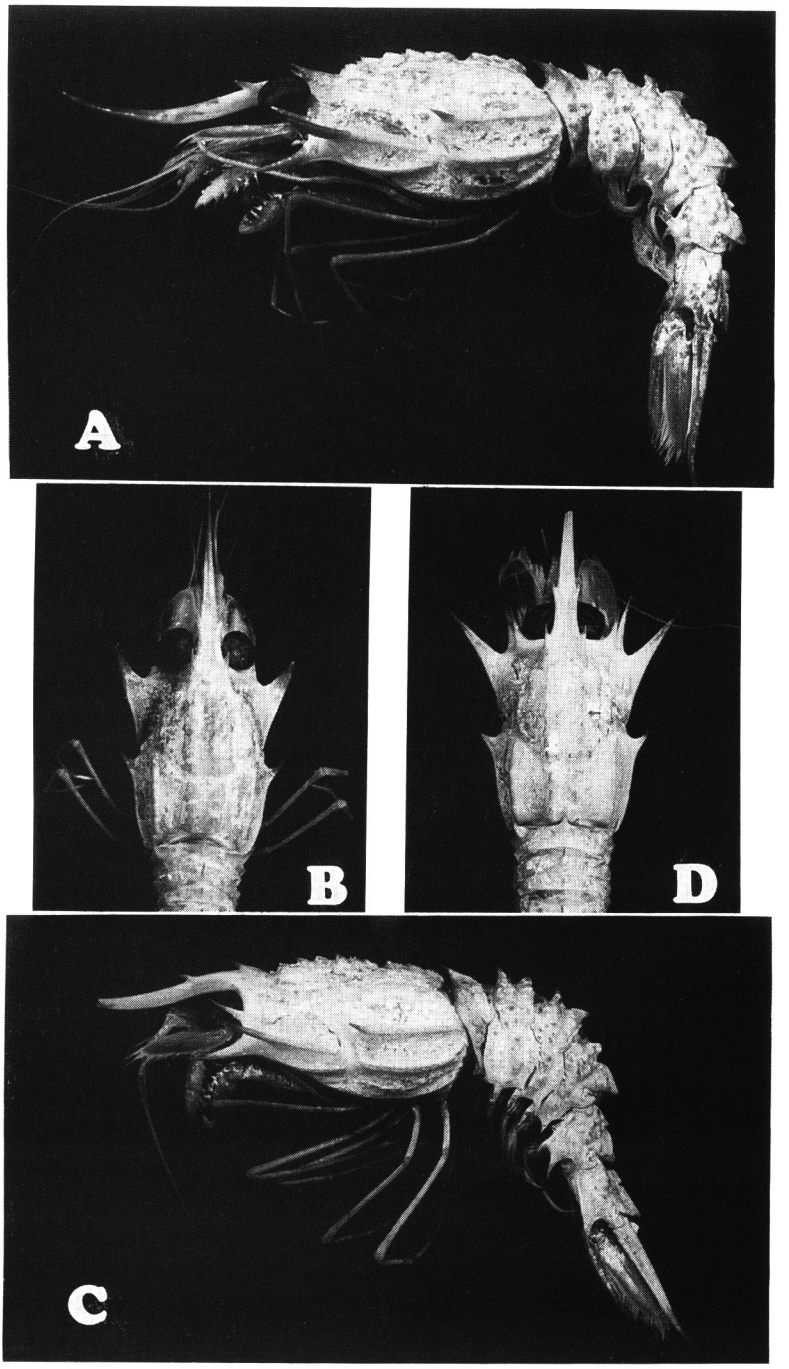


Fig. 1. *Glyphocrangon spinossisima* sp. nov., holotype male (cl 18.4 mm) (A, B) and paratype ovigerous female (cl 22.5 mm) (C, D).

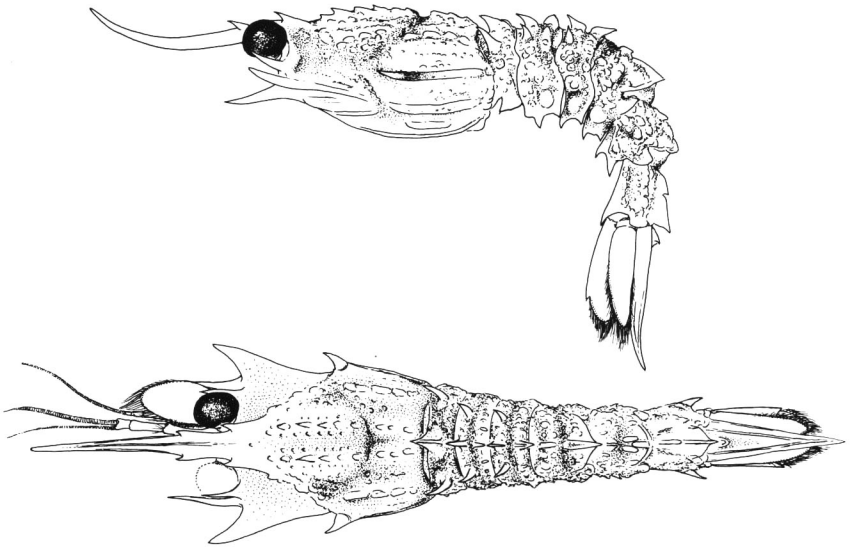

Fig. 2. *Glyphocrangon spinossisima* sp. nov., holotype male (cl 18.4 mm).

than carapace, with thickened dorsolateral and ventrolateral margins, gently curved upward along distal half, armed with 2 pairs of sharp dorsolateral teeth, one originating just anterior to orbit and one terminating over proximal half of orbit in lateral view; dorsal surface concave, not septate, with median longitudinal ridge extending from apex of rostrum to level of 2nd pair of lateral teeth; ventral surface flattened for its distal half; rostrum injured near its tip, with its distal part not detached in holotype, broken off for its distal third in paratype.

Anterior 1st (submedian) carina of carapace formed by 4 spines followed by 2 blunt tubercles; interspace between submedian carinae of both sides smooth, except for a longitudinal row of about 10 small tubercles along each carina. Anterior 2nd (intermediate) carina composed of 3 distinct tubercles, posteriormost of which is somewhat misaligned, being raised along cervical groove. Interspace between 1st and 2nd carinae contains several small indistinct tubercles along base of 1st carina and a few scattered elsewhere. No discernable anterior 3rd (antennal) carina. Anterior 4th (lateral) carina forms a very large vertically compressed lamellar ridge extending anteriorly as a sharp spine that continues beyond branchiostegal spine; this spine extends approximately halfway across orbit protruding out between antennal and branchiostegal spines in lateral view. Anterior 5th (sublateral) carina prominent with dimpled margins. Anterior 6th (submarginal) carina continuous, sweeping down from the rear, then rising prior to lateral groove where it thickens and continues forward beneath posterior half of anterior 5th carina.

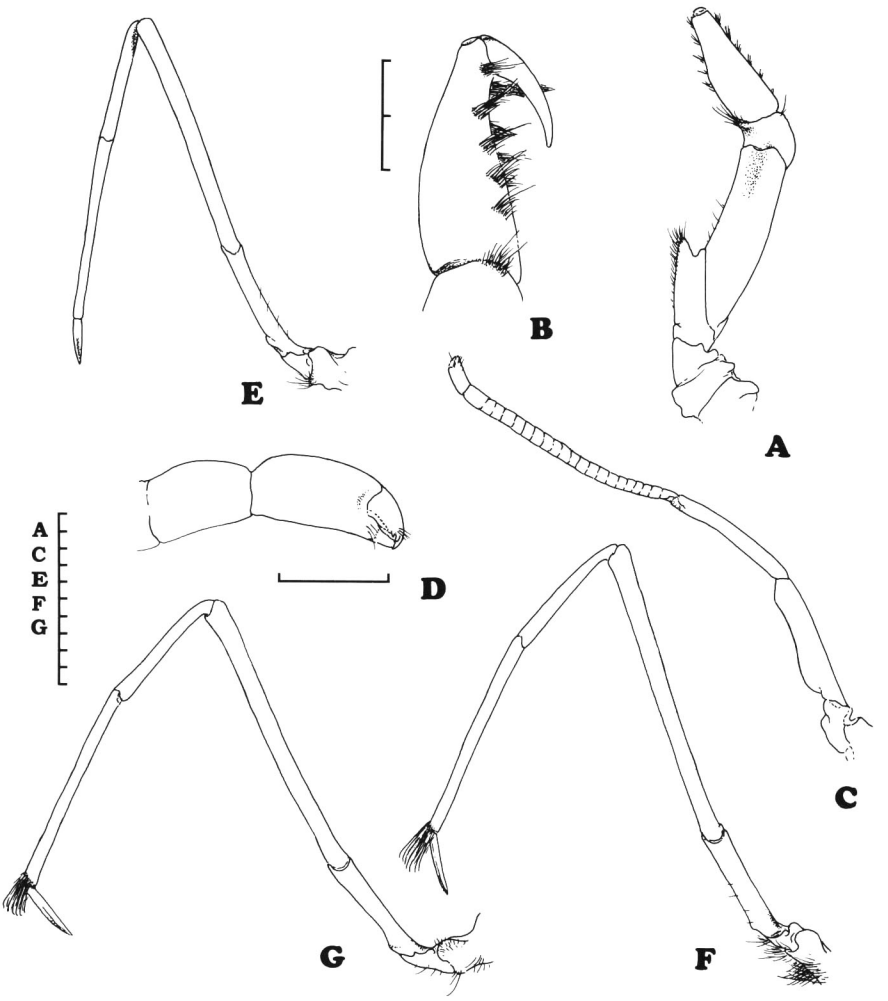


Fig. 3. *Glyphocrangon spinossisima* sp. nov., holotype male (cl 18.4 mm). A, B, first pereopod, lateral view (A) and chela (B); C, D, second pereopod, lateral view (C) and chela (D); E–G, third to fifth pereopods, lateral view. (Scales in mm)

Posterior 1st carina composed of 3 long blunt tubercles with several indistinct tubercles in intercarinal space. Posterior 2nd carina composed of a ridge with 5 lobes, anterior 4 lobes being long and posteriormost very small. Interspace between posterior 1st and 2nd carinae has 2 parallel rows of small tubercles with approximately 5 to 7 small tubercles in each row. Posterior 3rd carina forms a long ridge, with only an indistinct interruption close to posterior margin of carapace, forming a large sharp anteriorly directed spine just posterior to lateral groove. Interspace between posterior 2nd and 3rd carinae has a row of 9 small

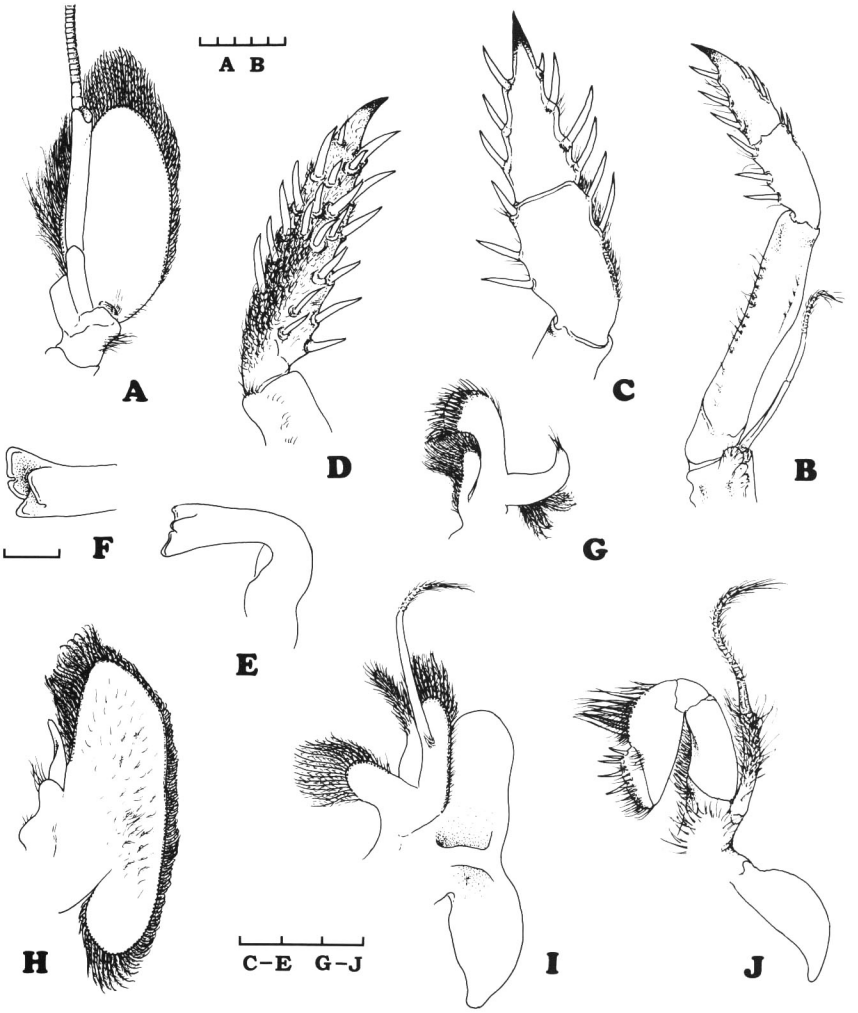


Fig. 4. *Glyphocrangon spinossisima* sp. nov., holotype male (cl 18.4 mm). A, antennal peduncle, with scaphocerite, ventral view; B–D, third maxilliped, lateral view (B), distal two segments in lateral (C) and mesial view (D); E, F, mandible in ventral (E) and dorsal (F) view; G, maxillule; H, maxilla; I, first maxilliped; J, second maxilliped. (Scales in mm)

tubercles in its central part and a less distinct row of tubercles along base of both carinae. Posterior 4th carina forms a thick ridge with 2 indistinct notches posteriorly forming 3 lobes. Posterior 5th carina partial, trails off posteriorly as a row of indistinct tubercles.

Abdomen with median dorsal carina on all somites. First 3 abdominal somites armed with anteriorly directed sharp spines on dorsal median and

submedian carinae. First somite has a reduced tergum with dorsal carina armed with one large sharp anteriorly directed spine; also just posterior to posterior 2nd carina of carapace lies one anteriorly directed submedian spine and 2 blunt tubercles on same somite, forming a continuation of posterior 3rd carina of carapace. Dorsal carina of 2nd somite has one sharp anteriorly directed spine followed posteriorly by a large triangular lamellar tooth that is vertically directed; in a continuation of 2nd carina is a large submedian anteriorly directed spine; 2nd somite also has a lateral groove down center of somite that divides it into anterior and posterior parts. Dorsal midline armature of 3rd somite consists of one sharp forward pointed spine separated by lateral groove from a posteriorly directed spine. Fourth somite has a broad lamellar dorsal spine posteriorly directed, being separated by a lateral groove from an anterior small vertical spine; it also produces a submedian carina composed of small lamellar ridges. Fifth somite produces 2 marginal spines; its dorsal carina bifurcate anteriorly, but single and central posteriorly. Uropod has a distally located marginal tooth.

Eye moderately large, with pigmented cornea.

Antennule with peduncular segments exceeding anterior margin of scaphocerite by distal third of second segment; peduncular segments fringed with soft hairs, with distal 2 segments combined subequal in length to basal segment; antennular flagella subequal in length to peduncular segments combined.

Scaphocerite ovate, only weakly tapering, unarmed, with an indistinct interruption of regular curve of outer margin at posterior fourth; carpocerite reaching just to distal margin of blade.

Mouthparts as figured, usual in *Glyphocrangon.* Third maxilliped stout, not reaching beyond anterior margin of scaphocerite; distal 2 segments with strong spines on ventromesial margins and mesial surfaces, and also with long thick setae on mesial faces; ultimate segment with a distal horny claw.

First pereopod incompletely subchelate; palm abruptly narrowed distally, with some tufts of stout setae mesially; carpus short, provided with setae dorsomesially; ischium with broad laminar expansion ventrally, distal margin obtusely angulated. Carpus of second pereopod subdivided into many articles, right with 30 and left with 20 both in holotype and paratype; chela small, only slightly longer than distalmost article of carpus; immovable finger short, with corneous tip; movable finger broad, terminating in 2 unequal corneous tips receiving tip of immovable finger between them; merus and ischium subequal in length, with ventral margin of ischium somewhat expanded. Following 3 pereopods similar to each other in their basic formation; dactylus of 3rd pereopod provided with row of setae on dorsolateral and dorsomesial margins of distal 2/5; in 4th and 5th pereopods each dactylus with marginal setae on distal 1/3, and propodus with long setae on dorsodistal margin.

Uropod not reaching posterior end of telson, distally leaving 1/4 length of

telson.

*Remarks.* In the larger specimen (ovigerous female, paratype) the hepatic spine formed by the anterior fourth carina extends almost as far anteriorly as the branchiostegal spine and easily overreaches the length of the orbital spine. On the other hand, in the smaller specimen (male, holotype) this spine is slightly less acute and broader, does not extend beyond the orbital spine and reaches only about half the length of the branchiostegal spine.

The reason we consider these specimens represent a new species is the distinctive pattern of strong spines on the abdomen, specifically on the first three abdominal somites which produce submedian carinae with paired spines pointing anteriorly. Also the dorsal carina on the third abdominal somite forms one anteriorly pointing spine and one posteriorly pointing spine.

In the key made by CHACE (1984), the present new species is keyed out to *G. aculeata* A. MILNE EDWARDS and *G. juxtaculeata* CHACE which differ from each other in the characters of the rostrum and posterior antennal carina. As well as the prominent spines on the carapace and abdomen, the lack of septa on the rostrum distinguishes this species from *G. juxtaculeata.* Thus the present new species is closest to *G. aculeata*, but differs from it in the strong armature of the carapace and abdomen, the long rostrum and the tuberculate, not compressed submedian carinae of the carapace. In addition, the posterior submarginal carina is partial, but not divided into four tubercles as in *G. aculeata.* BURUKOVSKY (1990) described *G. wagini* from the eastern Pacific which is also very close to *G. aculeata* in its general appearance. However, the discrimination of the present new species from *G. wagini* may be justified by the posterior antennal carinae being nearly entire, not bilobate and also by the different armature of abdominal somites.

Under the heading of Discussion (p. 277) is prepared a key to the new and allied species following CHACE's key.

### *Glyphocrangon hakuhoae* TAKEDA et HANAMURA, 1994

(Fig. 5B, C)

*Glyphocrangon hakuhoae* TAKEDA & HANAMURA, 1994, Bull. Natn. Sci. Mus., Tokyo, (A), 20: 24, figs. 11–13.

*Material examined.* R/V *Hakuho-Maru* KH-72-1 cruise, st. 11, Sulu Sea (08°12.7′N, 117°59.6′E–08°11.8′N, 117°58.4′E), 285–306 m; 23♂♂ (cl 7.7–9.7 mm), 20 ovig.♀♀ (cl 10.4–14.0 mm), 4♀♀ (cl 8.2–12.0 mm) (NSMT-Cr 11956); May 26, 1972.

St. 28, Timor Sea (09°34.4′S, 128°06.0′E–09°33.5′S, 128°03.4′E), 295–296 m; 16♂♂ (cl 9.6–12.75 mm), 13♀♀ (cl 11.5–15.25 mm), 8 ovig.♀♀ (cl 9.5–

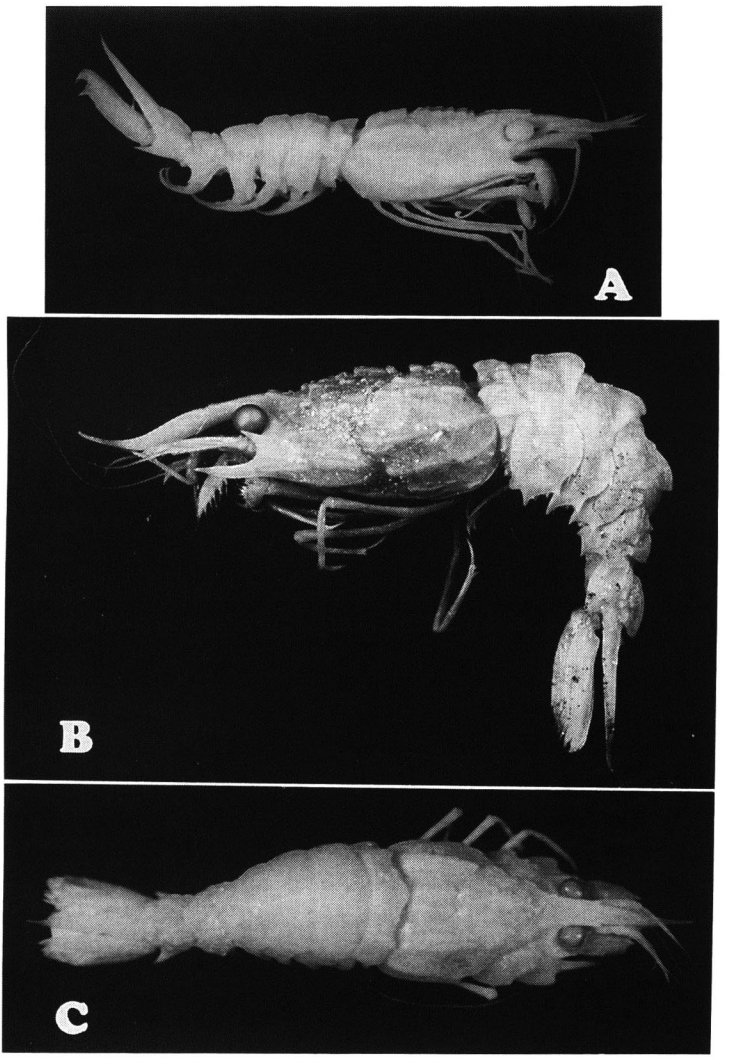


Fig. 5. A, *Glyphocrangon faxoni* DE MAN, male (cl 9 mm); B, C, *Glyphocrangon hakuhoae* TAKEDA et HANAMURA, ovigerous female (cl 13.3 mm).

13.7 mm) (NSMT-Cr 11957); June 19, 1972.

*Remarks.* These specimens do exhibit some differences from the original description; the first (submedian) carina of carapace does not appear as distinct as in the type specimens; the posterior second (intermediate) carina of our current specimens (KH-72-1) is not subdivided by three distinct notches; the abdominal dorsal carinae are less distinct than described.

The original authors were not always correct in dealing with *G. hakuhoae* as

the nearest kin of *G. granulosis* BATE and *G. priononota* WOOD-MASON, but partly reasonable that its general appearance is rather close to those of *G. megalophthalma* DE MAN, *G. pugnax* DE MAN and *G. stenolepis* CHACE.

The following are the diagnostic characters mentioned mainly in the original description and partly amended in the present study.

Rostrum with 2 dorsolateral teeth, thickened at median part, without transverse septa on its dorsal surface. Body with depressed smooth tubercles, not pubescent; anterior 1st (submedian) carina weak, composed of 2 large and some smaller tubercles; posterior 1st carina with 2 elongated tubercles; anterior 2nd (intermediate) carina with 2 or 3 depressed tubercles; posterior 2nd carina prominent, truncated, divided into 3 parts; anterior 3rd (antennal) carina only with 2 or 3 obsolete tubercles, not continuous with antennal spines; posterior 3rd carina bears a small inconspicuous tooth pointing anteriorly at anterior end; anterior 4th (lateral) carina with a vertically compressed lamella that barely reaches level of orbital margin, with its outer margin cut into 2 lobes; posterior 4th carina only with obscure interruption at anterior 1/4. Well developed, thickened dorsal carina on all abdominal somites; 5th somite with 2 teeth on its margin; no dividing notch on dorsal carina of 6th somite.

*Distribution.* Originally described from the Flores Sea, 280 m deep.

### *Glyphocrangon rimapes* BATE, 1888

(Fig. 6C, D)

*Glyphocrangon rimapes* BATE, 1888, Rep. Voy. Challenger, Zool., 24: 523, pl. 94 fig. 4. —— Rice, 1981, Bull. Br. Mus. Nat. Hist., (Zool.), 40: 276, figs. 1–4.

*Material examined.* R/V *Hakuho-Maru* KH-72-1 cruise, st. 7, off Davao Bay, Mindanao (05°37.9′N, 125°50.0′E–05°39.5′N, 125°50.7′E), 3229–3230 m deep; 1 ovig. ♀ (cl 24.4 mm) (NSMT-Cr 11884); May 23, 1972.

*Description.* Integument glabrous, covered with small spines on carapace and abdominal somites. Eyes pigmented. Antennal scale does not produce a lateral tooth. Rostrum has 3 pairs of dorsolateral teeth, partially ciliated along its margin anterior to anteriormost rostral tooth, slightly shorter than carapace; rostrum curves downward along its basal half and upward along its distal half, but does not emerge beyond upper level of orbit, extending beyond antennal peduncle and scaphocerite, distal 1/5 bends upward (more so than in holotype); median dorsal ridge on rostrum breaks to form only 2 small spines just posterior to eyes; a small spine between posteriormost pair of rostral teeth. Antennal scale twice as long as wide, with no visible lateral tooth.

Carinal and intercarinal tubercles of carapace laterally compressed and anteriorly directed. Carinae composed of small flattened tubercles slightly larger

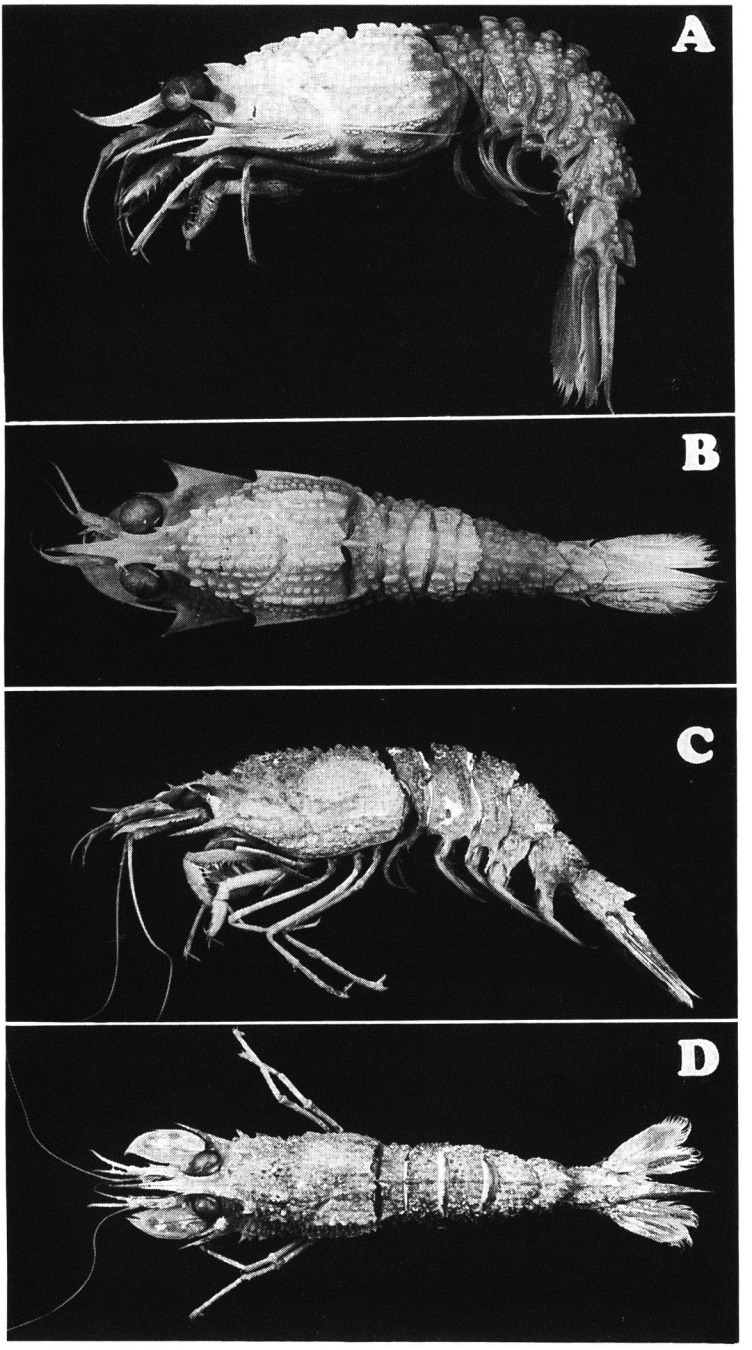


Fig. 6. A, B, *Glyphocrangon smithii* WOOD-MASON et ALCOCK, male (cl 19.0 mm); C, D, *Glyphocrangon rimapes* BATE, ovigerous female (cl 24.4 mm).

than intercarinal tubercles, angled anteriorly. Anterior 1st (submedian) carina composed of 8 acute tubercles, with 3rd tubercle from front being the largest; posterior 1st carina composed of 5 acute tubercles, with posteriormost tubercle forming a small rounded vertical spine. Anterior 2nd (intermediate) carina composed of 5 acute tubercles; posterior 2nd carina composed of 5 or 6 large rounded tubercles. Anterior 3rd (antennal) carina not present; posterior 3rd carina forms a very distinct ridge, with 2 long low tubercles interspersed by smaller ones, descending anteriorly from lateral groove/cervical groove confluence for about 1/5 of its length after which it ascends posteriorly. Anterior 4th (lateral) carina forms 2 or 3 acute spines (only one present in holotype); anteriormost spine outward directed and posteriormost acute anteriorly; posterior 4th carina composed of a distinct ridge covered with low tubercles. Intercarinal surfaces covered with low conical tubercles, pointing vertically—not anteriorly directed. Fifth (sublateral) and 6th (submarginal) carinae present but indistinct.

Dorsal carina present on all abdominal somites, notched. Carina of 1st somite produces a large lamellar acute spine anteriorly directed, followed by a groove and a smaller spine also acute and anteriorly directed; on this somite just behind posterior 2nd carina of carapace is a large lamellar spine that is vertical and acute. Pleuron of 2nd somite armed with a long spine medially; posterolateral margin forms a small spine, anterolateral angle rectangular but unarmed. Pleuron of 3rd somite armed with 2 teeth, anterior being ca. 3 times as large as posterolateral spine and essentially continuous with anterior margin of pleuron. Pleuron of 4th somite appears to have only 2 spines, anterior being the largest. Bosses of 3rd and 4th pleurons lack distinctive spines of holotype, produce large tubercles that do not show any spine-like development. Pleuron of 5th somite produces 3 marginal spines, median being the longest and posterolateral the shortest. Dorsal surface of telson carries a large and a small conical spine anteriorly on midline; submedian with approximately 18 serrations that become more widely spaced posteriorly. Telson just slightly exceeds posterior end of uropods.

There are 35 to 40 ova, each with ca. 3.0 mm in diameter.

*Remarks.* This species is widely distributed throughout the world oceans, and is the only species of the genus *Glyphocrangon* recorded from both the Atlantic and the Indo-Pacific. RICE (1981) examined the type specimens as well as some additional specimens from the Atlantic, the Porcupine Sea-Bight area to the southwest of Ireland. In his examination of *G. rimapes*, RICE found the species varies greatly in the details of the armature. Specifically, the pleurae of the fourth and fifth abdominal somites usually have two and three spines respectively, though there are some variations between specimens. The rostrum usually has at least three dorsolateral teeth, though the posterior tooth may be reduced. At least one specimen (the smaller female from Juan Fernandez) lacks the bifid dactyli of

the fourth and fifth pereopods, which is consistent with our own specimen.

Our specimen differs from the holotype in several aspects. The posterior tubercle on the first abdominal somite is not acute; the bosses of the third and fourth somites are not armed with spines; the median dorsal ridge of the rostrum breaks up into two small spines instead of a series of seven or eight spines; the fourth anterior carina consists of two spines on one side and three on the other, while the other known specimens apparently bear only one spine on each side.

*Distribution.* Previously recorded from northwestern Pacific off Japan (3431 m), southeastern Pacific near Juan Fernandez (2516 m), southwestern Atlantic between Buenos Aires and Tristan da Cunha (3238 m), and northeastern Atlantic off Ireland (3022–4104 m). HOLTHUIS (1971) gave several references to this species, but none of them deal with new specimens, and also HAYASHI (1986) mentioned that most of the Japanese specimens previously identified as this species are probably referred to *G. smithii* WOOD-MASON et ALCOCK.

## *Glyphocrangon smithii* WOOD-MASON et ALCOCK, 1891

(Fig. 6A, B)

*Glyphocrangon smithii* WOOD-MASON & ALCOCK, 1891, Ann. Mag. Nat. Hist., (6), 8: 357. —— WOOD-MASON & ALCOCK, 1894, Illust. Investigator, pl. 7 fig. 3. —— DE MAN, 1920, Siboga-Exp., 39a$^3$: 215 (in list), 216 (in key). —— CHACE, 1984, Smiths. Contr. Zool., 397: 6 (in key). —— HAYASHI, 1986, *Decapod Crustaceans from Continental Shelf and Slope around Japan*, pp. 149, 279, 1 fig.

*Material examined.* R/V *Hakuho-Maru* KH-72-1 cruise, st. 54, South China Sea (7°50.0′N, 109°23.8′E–07°50.3′N, 109°25.1′E), 760–777 m deep; 1♂ (cl 19.0 mm) (NSMT-Cr 11885); July 11, 1972.

*Diagnosis.* Rostrum shorter than carapace, with 2 pairs of lateral teeth; between posterior pair of rostral teeth are 2 small tubercles aligned along dorsal median; posterior one lies in, or posterior to cervical groove. Anterior and posterior 1st (submedian) carinae composed of 6 and 3 or 4 ridges in front of and behind cervical groove, respectively; a longitudinal row of many tubercles on intercarinal space along each carina. Anterior 2nd (intermediate) carina with 3 or 4 ridges, and posterior 2nd carina with 4 rather long lobes. Anterior 3rd (antennal) carina not present, and posterior 3rd carina forms 3 lobes; anterior the longest, forming a sharp spine just posterior to lateral groove, posterior the smallest. Anterior 4th (lateral) carina forms an acute lamina slightly overreaching posterior margin of orbit. Fifth (sublateral) carina composed of a single lobe. Tubercles on intercarinal spaces aligned almost completely in neat rows. Abdominal somites all bear a median dorsal carina, with those on 2nd to 4th somites each notched by a lateral groove; dorsal carina notched anteriorly on 6th somite. Telson forms a small tooth anteriorly with dorsal surface becoming concave

posteriorly.

*Distribution.* Known from Japan, the East China Sea, off New Caledonia, the Bay of Bengal, the Andaman Sea and the Arabian Sea, 340–1010 m deep.

## *Glyphocrangon faxoni* DE MAN, 1918

(Fig. 5A)

*Glyphocrangon* (*Plastocrangon*) *Faxoni* DE MAN, 1918, Tijds. Nederl. Dierk. Ver., (2), 16: 298. —— DE MAN, 1920, Siboga-Exp., 39a$^3$: 243, pl. 20 fig. 62.

*Glyphocrangon faxoni* —— CHACE, 1984, Smiths. Contr. Zool., 397: 8 (in key), 10.

*Material examined.* R/V *Hakuho-Maru* KH-72-1 cruise, st. 12, Sulu Sea (08°19.0′N, 118°09.1′E–08°18.7′N, 118°08.5′E), 495–500 m deep; 2♂♂ (cl 9 mm), 1 juv. (cl 5.5 mm) (NSMT-Cr 11886); May 27, 1972.

*Description.* Rostrum slightly longer than carapace, at least twice as long as antennal scale, armed with 2 pairs of dorsolateral teeth, with posterior pair barely discernable; upper surface transversely septate (4 septa) anterior to anterior pair of rostral teeth, median longitudinal ridge very faint not elevated above dorsolateral margins. Integument naked, glabrous. Eyes not pigmented. Intercarinal spaces of carapace free of tubercles. Antennal spine extends about halfway across orbit. Branchiostegal spine much larger than antennal spine, greatly exceeding orbit. Antennal scale produces a lateral tooth.

Anterior 1st (submedian) carina composed of 6 low obtuse tubercles. Our specimens have the tiny median tubercle just posterior to anterior groove, but lack the pair of tubercles that frequently accompany it; posterior 1st carina composed of 2 long low ridges. Anterior 2nd (intermediate) carina composed of 3 low tubercles with anteriormost raised slightly along cervical groove; posterior 2nd carina composed of 3 or 4 low tubercles. Anterior 3rd (antennal) carina not continuous with antennal spine, composed of a barely discernable tubercle; posterior 3rd carina consists of 2 elongate lobes with a small tubercle located anteriorly. Anterior 4th (lateral) carina divided into 2 sharpened spines that are anteriorly directed and slightly out of line with each other; neither of these spines exceed anterior margin of carapace; posterior 4th carina continuous, consists of one elongate ridge and a reduced tubercle anteriorly.

Abdomen with distinct dorsal carina on all somites, also produces one indistinct lateral carina on all somites and 2 indistinct sublateral carinae; all somites smooth surfaced, only with few tubercles. On 1st somite are 3 large blunt lamellar teeth anteriorly directed; largest one located on dorsal midline, on either side of which is one tiny sharp spine, other 2 directly posteriorly to posterior 2nd and posterior 3rd carinae respectively. First somite bears an anteriorly directed small spine just posterior to 4th posterior carina of carapace. Second somite with median carina reduced and notched, bearing 5 indistinct tubercles on each side

along thickened median portion and 2 reduced tubercles along anterior margin. Fifth somite armed with 2 marginal spines. Lateral tooth present on distal margin of uropod.

*Distribution.* Previously known from Philippine waters (247–719 m), and Indonesian waters (Bali Sea, 289 m; Selat Roti, 520 m).

## Discussion

In the second part of a serial report on the caridean shrimps of the *Albatross* Philippine Expedition, 1907–1910, CHACE (1984) made a key to all the species of the genus *Glyphocrangon*. Subsequent to his epoch-making work, six species were added to the 38 species then recognized; KENSLEY *et al.* (1987) described *G. holthuisi*, *G. lowryi* and *G. novacastellum* from eastern Australia, and then BURUKOVSKY (1990), TAKEDA and HANAMURA (1994), and KOMAI and TAKEUCHI (1994) described *G. wagini* from the eastern Pacific, *G. hakuhoae* from the Flores Sea, and *G. fimbriata* from the central Pacific, respectively. These six species, as well as *G. spinossisima* described in this report may be inserted in CHACE's key as follows.

14 Rostrum without transverse septa on anterior part of dorsal surface ..14a
— Rostrum with incomplete transverse septa on anterior part of dorsal surface .....14c
14a Posterior 3rd (antennal) carina bilobate, with an indistinct interruption posteriorly .....*G. wagini* BURUKOVSKY, 1990
— Posterior 3rd (antennal) carina entire, only with an indistinct interruption posteriorly .....14b
14b Rostrum half as long as carapace; 1st (submedian) carina with compressed teeth .....*G. aculeata* A. MILNE EDWARDS, 1881
— Rostrum as long as, or slightly longer than carapace; 1st (submedian) carina with tuberculate teeth .....*G. spinossisima* sp. nov.
14c Posterior 1st (submedian) carina with 3 blunt teeth; antennal scale with small lateral tooth.....*G. juxtaculeata* CHACE, 1984
— Posterior 1st (submedian) carina with 4–5 blunt tubercles; antennal scale without lateral tooth ....*G. lowryi* KENSLEY, TRANTER et GRIFFIN, 1987

16 Posterior 3rd (antennal) carina usually armed anteriorly with distinct acute tooth .....16a
— Posterior 3rd (antennal) carina usually terminating anteriorly in right angle, at most .....17
16a Rostrum without transverse septa; dorsal carina on 5th somite not notched .....*G. smithii* WOOD-MASON et ALCOCK, 1891

— Rostrum with indistinct or faint transverse septa; dorsal carina on 5th somite notched .....*G. novacastellum* KENSLEY, TRANTER et GRIFFIN, 1987

17 Integument naked, glabrous; intercarinal spaces of carapace densely covered with linearly arranged, sharply defined tubercles .....*G. investigatoris* WOOD-MASON, 1891

— Integument covered with scurfy pubescence; intercarinal spaces of carapace sparsely and rather obscurely granulate .....17a

17a Posterior 4th (lateral) carina with usually 3 notches but varying from 2 to 4 .....*G. regalis* BATE, 1888

— Posterior 4th (lateral) carina entire.....*G. holthuisi* KENSLEY, TRANTER et GRIFFIN, 1987

26 Rostrum transversely septate on dorsal surface anterior to anterior pair of lateral teeth .....27

— Rostrum not transversely septate on dorsal surface.....28a

27 Anterior 4th (lateral) carina with 2 divisions not in line with each other .. .....*G. faxoni* DE MAN, 1918

— Anterior 4th (lateral) carina with 2 divisions in line with each other .... .....*G. stenolepis* CHACE, 1984

28a Branchiostegal spine more than twice as long as antennal spine ..... .....*G. hakuhoae* TAKEDA et HANAMURA, 1994

— Branchiostegal spine less than twice as long as antennal spine .....28

30 Antennal spines subparallel with each other, little if any more divergent than branchiostegal spines .....*G. sicaria* FAXON, 1893

— Antennal spines much more divergent than branchiostegal spines.....30a

30a Anterior 2nd (intermediate) carina not produced anteriorly as a strong tooth .....*G. vicaria* FAXON, 1896

— Anterior 2nd (intermediate) carina produced anteriorly as a strong tooth .....*G. fimbriata* KOMAI et TAKEUCHI, 1994

The genus *Glyphocrangon* inclusive of the present new species is composed of 27 Indo-West Pacific, 6 East Pacific, 9 West Atlantic, 2 Amphi-Atlantic and 1 cosmopolitan species. Most of the species are not always biogeographically clarified due to the scarcity of specimens as can be expected from the fact that there are certain difficulties in collecting active benthic shrimps from the deep-sea bottom. This dearth of specimens, however, may also be a reflection of limited natural populations. Of the 27 Indo-West Pacific species, 6 species are restricted to the Indian Ocean only, and 14 species are restricted to the western Pacific, and only 7 species are known from both the Pacific Ocean and the Indian Ocean. Considering the general distribution pattern of marine decapod crustaceans as

well as other benthic invertebrates, it is difficult to say that the genus is well represented in the Indian Ocean. Therefore, further exploration of the deep-sea benthos in the Indian Ocean will likely result in the finding of additional specimens to be described as new species or to be recorded as range extensions from the Pacific.

The *Glyphocrangon* species are known as deep-sea inhabitants. In the following list are the recorded bathymetric ranges of all the species separated into groups by depth and geographic range.

< 500 m

Indo-West Pacific – ***G. hakuhoae*** (280–306 m)

> 500 m

Indo-West Pacific – *G. stenolepis* (485–571 m)/***G. faxoni*** (247–719 m)/*G. holthuisi* (153–720 m)/*G. lowryi* (720 m)/*G. dentata* (490–800 m)/*G. novacastellum* (576–891 m)/*G. juxtaculeata* (946 m)

East Pacific – *G. wagini* (570–580 m)/*G. loricata* (605–770 m)

West Atlantic – *G. spinicauda* (256–692 m)/*G. aurantiaca* (410–733m)/*G. longleyi* (300–837 m)/*G. haematonotus* (247–966 m)

> 1000 m

Indo-West Pacific – *G. pugnax* (293–1013 m)/***G. smithii*** (344–1026 m)/*G. investigatoris* (258–1087 m)/*G. regalis* (366–1097 m)/*G. sibogae* (794–1112 m)/*G. hastacauda* (622–1114 m)/*G. caeca* (924–1026 m)/*G. fimbriata* (1300–1312 m)/*G. cerea* (1315 m)/*G. granulosis* (195–1719 m)/*G. unguiculata* (1353–1732 m)/*G. assimilis* (539–?1789 m)/*G. spinossisima* (1712–1840 m)/*G. priononota* (1582–1849 m)

East Pacific – *G. spinulosa* (1097–1875 m)/*G. alata* (600–1335 m)

West Atlantic – *G. neglecta* (365–1050 m)/*G. aculeata* (707–1760 m)/*G. alispina* (548–1865 m)

> 2000 m

Indo-West Pacific – *G. gilesii* (564–2021 m)/*G. megalophthalma* (1719–2160 m)/*G. podager* (2414 m)/*G. acuminata* (2468 m)

West Atlantic – *G. nobilis* (410–2150 m)

Amphi-Atlantic – *G. longirostris* (1280–2500 m)

> 3000 m

Indo-West Pacific – *G. caecescens* (3197 m)

East Pacific – *G. sicaria* (1454–3279 m)/*G. vicaria* (3880–3938 m)

Amphi-Atlantic – *G. sculpta* (1645–3219 m)

> 4000 m

Cosmopolitan – ***G. rimapes*** (3022–4104 m)

> 6000 m

Amphi-Atlantic – *G. atlantica* (3885–6364 m)

As recorded above, the bathymetric range of the *Glyphocrangon* shrimps is

from 153 to 6364 m as a whole, although the bathymetric range of each species may possibly be extended down to further depths by future explorations. As for the four known species recorded in this report (in bold in the preceding list), it is apparent that the geographic and bathymetric ranges do not deviate from the precedent records.

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