

**The discovery of *Glyphocrangon stenolepis* Chace
(Decapoda: Caridea: Glyphocrangonidae) from Taiwan and Japan,
with notes on individual variation**

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Abstract.—Abundant material of *Glyphocrangon stenolepis* Chace was found off Taiwan. Supplementary specimens from the South China Sea and Japan have made possible to redescribe this poorly known species. Remarkable sexual differences in body sculpture and coloration are found in this species. The paratype from the Sulu Sea has proven to represent a different as yet undetermined species. Other morphological variations are discussed, and the coloration is illustrated.

In his report on the glyphocrangonid and crangonid shrimps collected by the Philippine *Albatross Expedition* 1907-1910, Chace (1984) described *Glyphocrangon stenolepis*, based on two specimens, one from the South China Sea, off Pratas Islands, and another from north of the Sulu Sea, Philippines. The specimen from the South China Sea is the holotype. The paratype from the Sulu Sea is much smaller than the holotype, and appears to be a juvenile or a young female. Although Chace (1984) noted some differences between the holotype and paratype, he interpreted them as size-related. The species has not been reported since the original description.

Recent investigations by one of us (TYC) has shown that *Glyphocrangon stenolepis* is common in offshore waters of Taiwan. Furthermore, scientists from the Fisheries Research Institute of Taiwan collected four specimens from the type locality, off Pratas Islands in 1996. Through the kind courtesy of Prof. K. Hayashi, a single specimen from the East China Sea, off Japan, has also been made available for examination. All this

material has enabled us to diagnose the species more precisely, and to extend its known geographical range northwards to Japan. The study of the material has shown that the species exhibits marked variation in body sculpture in males. Therefore, we provide a full redescription of the species. Some important differences between the holotype and paratype noted by Chace (1984) indicate that the paratype represents another species, though its exact identity is still uncertain.

The specimens, all collected by bottom trawls, are deposited in institutions indicated by the following abbreviations: CBM, Natural History Museum and Institute, Chiba; NUF, National University of Fisheries, Shimonoseki; NTOU, National Taiwan Ocean University, Keelung; TFRI, Taiwan Fisheries Research Institute, Keelung Branch; USNM, National Museum of Natural History, Smithsonian Institution, Washington, D.C. The terminology for the carinae and spines on the carapace follows Holthuis (1971) and Chace (1984). The abbreviation cl indicates postorbital carapace length.

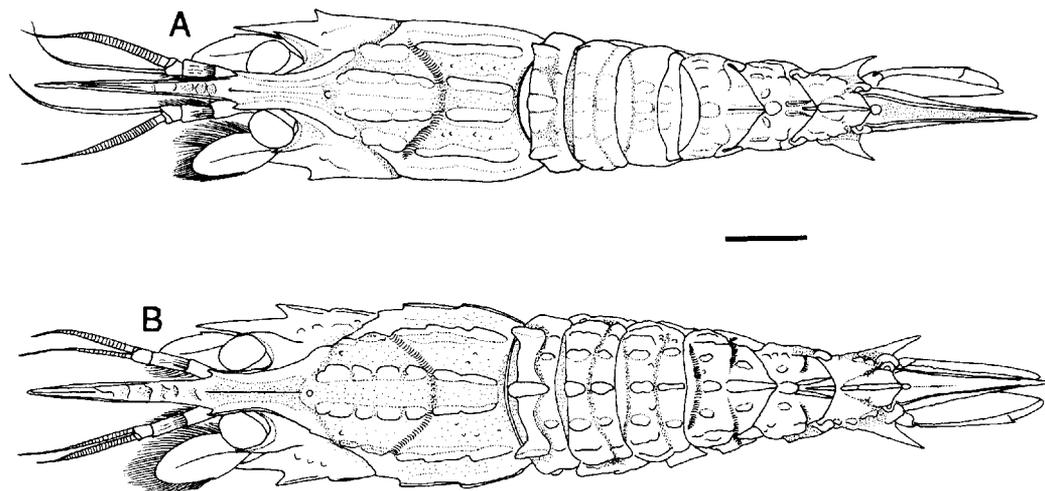


Fig. 1. *Glyphocrangon stenolepis* Chace, 1984. Animals in dorsal view, pereopods omitted. A, male from off Ta-Shi, NE Taiwan, cl 14.1 mm, CBM-ZC 3614; B, female from off Su-Aou, NE Taiwan, cl 14.7 mm, CBM-ZC 2935. Scale bar indicates 5 mm.

Glyphocrangon stenolepis Chace, 1984
(Figs. 1–4)

Glyphocrangon stenolepis Chace, 1984:22
(part), fig. 5 (not fig. 6; =*Glyphocrangon*
sp.).

Type material.—South China Sea. Pratas
Islands (Tungsha Tao), *Albatross* Stn 5300,
20°31'N, 115°49'E, 485 m, 8 Aug 1908, 1

male (cl 11.3 mm), holotype (USNM
205091).

Other material.—South China Sea. R.V.
Fisheries Research I, 19°49.2'N, 114°09.3'E,
512 m, 23 Apr 1996, 1 male (cl 11.1 mm)
(TFRI); exact position unknown, 1996, 3
males (cl 13.6–14.8 mm) (TFRI).

Taiwan. Fishing pots, commercial trawl-
ers, 300–500 m, sandy mud bottoms: Ta-

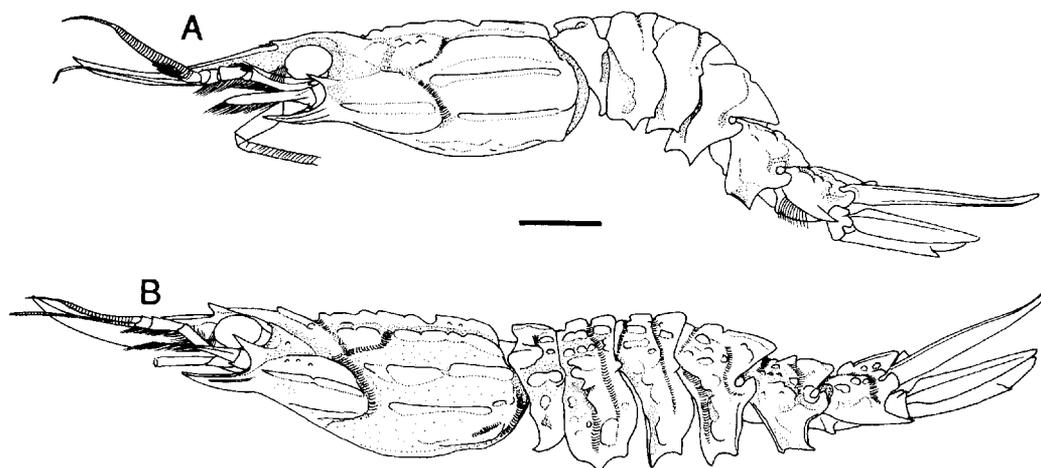


Fig. 2. *Glyphocrangon stenolepis* Chace, 1984. Animals in lateral view, pereopods and pleopods omitted. A, male from off Ta-Shi, NE Taiwan, cl 14.1 mm, CBM-ZC 3614; B, female from off Su-Aou, NE Taiwan, cl 14.7 mm, CBM-ZC 2935. Scale bar indicates 5 mm.

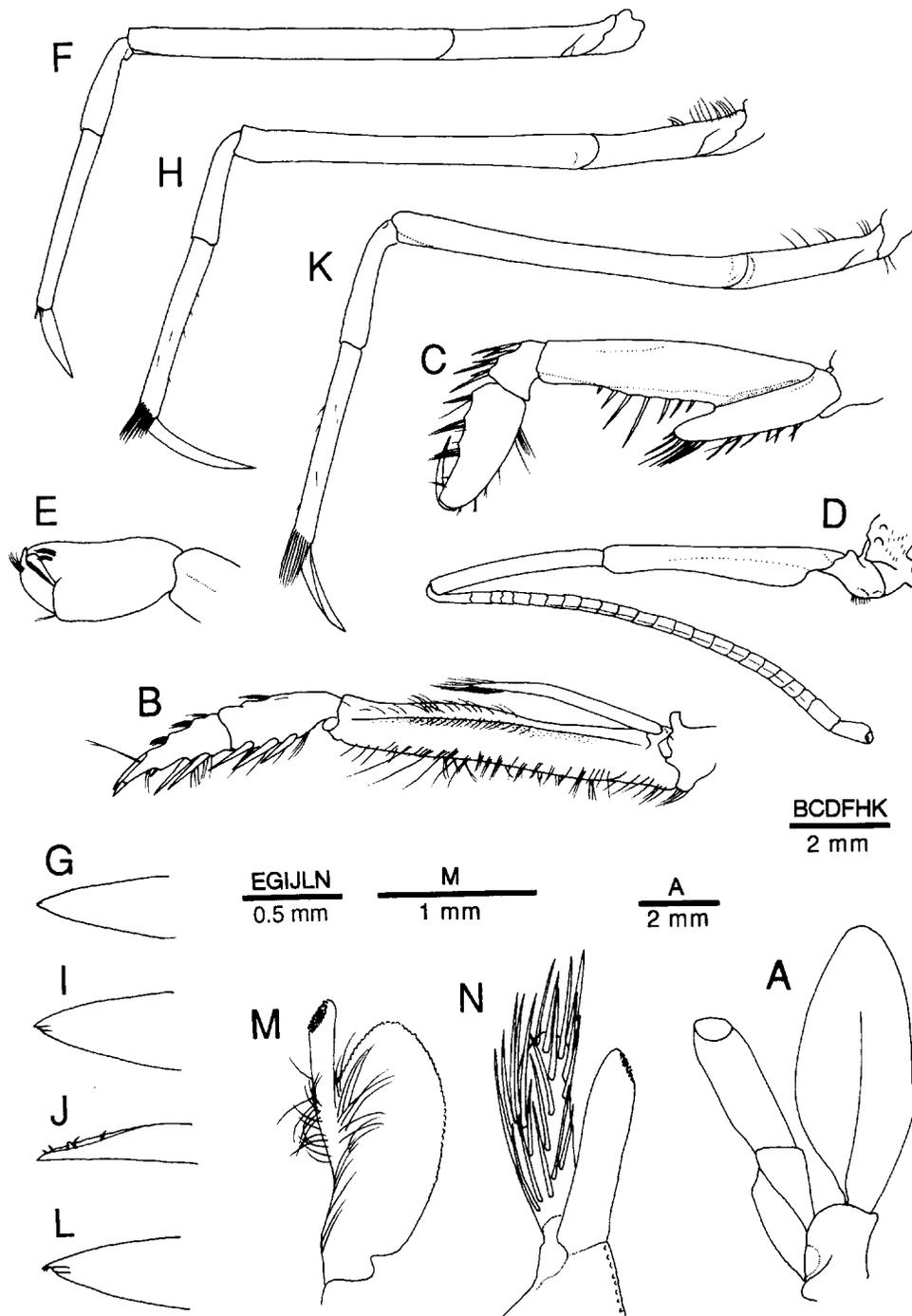


Fig. 3. *Glyphocrangon stenolepis* Chace, 1984. Male from off Ta-Shi, NE Taiwan, cl 14.1 mm, CBM-ZC 3614. Left appendages. A, antenna, ventral, setae omitted; B, third maxilliped, lateral; C, first pereopod, lateral; D, second pereopod, lateral; E, chela of same, lateral; F, third pereopod, lateral; G, tip of dactyl of same, flexor; H, fourth pereopod, lateral; I, tip of dactyl of same, flexor; J, same, lateral; K, fifth pereopod, lateral; L, tip of dactyl of same, flexor; M, endopod of first pleopod, ventral; N, appendices interna and masculina of second pleopod, mesial.

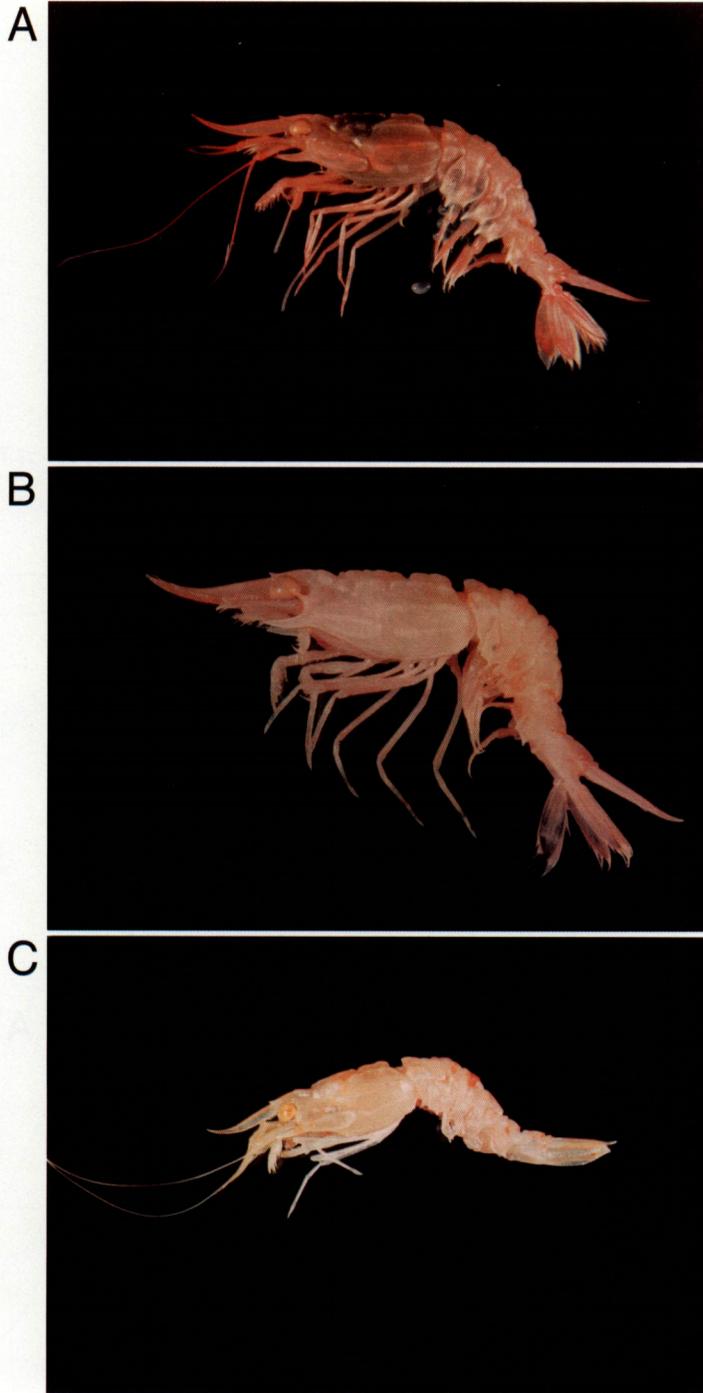


Fig. 4. *Glyphocrangon stenolepis* Chace, 1984. A, ovigerous female from Taiwan; B, male from Taiwan; C, male from Pratas Islands, South China Sea.

Shi, I-Lan County (northeastern coast), 25 Nov 1994, 3 males (cl 12.1–13.2 mm), 4 ovig. females (cl 12.2–14.5 mm) (NTOU); 27 Apr 1995, 1 ovig. female (cl 13.9 mm), 1 female (cl 15.4 mm) (NTOU); 13 June 1995, 2 males (cl 13.3, 14.5 mm), 1 ovig. female (cl 15.0 mm) (CBM-ZC 3614); 3 July 1995, 2 ovig. females (cl 13.6, 14.6 mm); 11 Mar 1997, 18 males (cl 11.4–16.1 mm), 35 ovig. females (cl 12.3–16.0 mm), 12 females (cl 11.0–16.0 mm) (NTOU); 10 males (cl 11.8–16.7 mm), 7 ovig. females (cl 13.6–17.5 mm), 3 females (CL 13.0–13.4 mm) (CBM-ZC 3918); 25 Feb 1997, 1 ovig. female (cl 14.2 mm) (NTOU); 4 Dec 1997, 1 female (cl 11.7 mm) (CBM-ZC 3882); 1 June 1998, 3 males (cl 9.2–13.0 mm), 1 ovig. female (cl 15.7 mm) (NTOU). Su-Aou, I-Lan County (northeastern coast), 20 Apr 1985, 5 males (cl 12.4–15.0 mm), 4 ovig. females (cl 13.0–16.0 mm) (CBM-ZC 3615); 2 May 1985, 4 males (cl 12.5–13.1 mm), 5 ovig. females (cl 12.4–13.3 mm), 1 female (cl 11.4 mm) (NTOU); 6 Aug 1996, 1 male (cl 13.9 mm), 2 females (cl 14.7, 15.3 mm) (CBM-ZC 2935); 7 Aug 1996, 1 male (cl 16.6 mm) (NTOU); 18 Nov 1997, 1 male (cl 9.5 mm) (NTOU); 5 Dec 1997, 7 males (cl 10.3–14.4 mm), 1 ovig. female (cl 15.2 mm) (CBM-ZC 3901). Tong-Kong, Ping-Tong County (southwestern coast), 25 Feb 1995, 1 male (cl 12.5 mm) (NTOU); 30 May 1997, 1 male (cl 10.5 mm) (NTOU).

East China Sea. R. V. *Tenryo-Maru*, west of Tokara Islands, southern Japan, Stn T-2, 29°20'N, 127°26'E, 488 m, 1 male (cl 12.8 mm) (NUF).

Redescription.—Integument not pubescent. Rostrum (Figs. 1, 2) curved dorsad anteriorly, 0.95–1.23 times as long as carapace, armed with 2 pairs of lateral teeth, posterior pair (arising from posterior to level of posterior margin of orbit) more or less reduced, sometimes barely discernible, never acute; series of distinct transverse septa on anterior part of dorsal surface, median carina present on distal portion and posterior portion between eyes. Carapace (Figs.

1, 2) with anterior first (submedian) carina varying from slightly uneven to distinctly 5-lobed; median area anterior to submedian carina with single tubercle in midline; posterior first (submedian carina) composed of 2 elongate ridges. Anterior second (intermediate) carina composed of 3 obtuse lobes; posterior second (intermediate) carina also 3- or 4-lobed. Intercarinal space between posterior first and second carinae usually with row of tubercles. Hepatic region with 2 or 3 tubercles; posterior third (antennal) carina 3- or 4-lobed. Anterior fourth (lateral) carina forming bilobate, wing-like expansion, terminating anteriorly in sharp point independent of branchiostegal spine, arising from posterior to level of orbit, posterior lobe in line with non-dentate anterior portion; posterior fourth (lateral) carina interrupted posteriorly, most part neither dentate nor lobate. Anterior fifth (sublateral) carina not prominent, nearly linear; posterior fifth (sublateral) carina very short. Sixth (submarginal) carina absent anteriorly, indistinct posteriorly. Margins of carinae faintly erose. Antennal spines unarmed marginally, less than 0.5 as long as and diverging little more than anteriorly directed branchiostegal spines.

Abdomen (Figs. 1, 2) with ridges and tubercles on dorsal surface blunt or obsolete; prominence of ridges and tubercles variable in males, well developed in females. First somite with distinct submedian tubercles on posterior section of tergum in females, sometimes faint in males; median carina obsolete to distinct; transverse groove moderately shallow to faint. Broad median, submedian and lateral carinae on second and third somites interrupted by transverse groove, distinct in females, sometimes obsolete or absent in males; median carina on fourth somite distinct in both sexes, more or less notched at anterior 0.3; fifth somite with prominent anterior tubercle and sharp carina posteriorly along midline, latter flanked by posteriorly divergent sharp carinae; sixth somite with median carina divided in 2 by shallow, sometimes very

Table 1.—*Glyphocrangon stenolepis* Chace, 1984. Branchial formula.

	Maxillipeds			Pereopods				
	1	2	3	1	2	3	4	5
Pleurobranchs	—	—	—	1	1	1	1	1
Arthrobranchs	—	—	2	1	1	1	1	—
Podobranch	—	—	—	—	—	—	—	—
Epipods	1	1	—	—	—	—	—	—
Exopods	1	1	1	—	—	—	—	—

weak, notch anteriorly. Second somite with pleuron bearing 2 short, sometimes blunt teeth and inconspicuous anterior lobe; pleura of third, fourth and fifth somites each with 2 moderately short marginal teeth.

Eyes (Figs. 1, 2) moderately large for genus, cornea lightly pigmented.

Antennular peduncle (Figs. 1, 2) overreaching distal margin of scaphocerite by 0.2–0.3 length of intermediate segment; outer flagellum longer and thicker in males than in females. Scaphocerite (Fig. 3A) elongate oval, 1.95–2.37 times longer than wide, with small lateral tooth arising slightly posterior to level of mid-length, marginal setae confined to blade distal to lateral tooth; carapacerite not overreaching distal margin of blade.

Mouthparts typical of species in genus. Third maxilliped (Fig. 3B) moderately stout, reaching or overreaching distal margin of scaphocerite; antepenultimate segment distinctly carinate dorsolaterally.

First pereopod (Fig. 3C) incompletely subchelate; ischium with distoventral portion strongly produced. Second pereopods (Fig. 3D) nearly equal, each with 23–27 carpal articles; chela (Fig. 3E) flattened, with short fixed finger and strongly oblique cutting edge. Third to fifth pereopods (Fig. 3F, H, K) moderately slender, each with subspatulate dactyl and merus longer than carpus and propodus combined. Third pereopod (Fig. 3F) with dactyl 0.4–0.5 times as long as propodus, terminating in simple unguis (Fig. 3G); propodus with terminal or subterminal setae. Fourth pereopod (Fig. 3H) with dactyl 0.6 times as long as propodus, terminating in small lobe mesiad to

small subterminal spine, bearing few short bristles on extensor surface distally (Fig. 3J); propodus with distal setae. Fifth pereopod (Fig. 3K, L) generally similar to fourth pereopod; dactyl 0.4–0.5 times as long as propodi, lacking bristles on extensor surface.

Thoracic sternite deeply depressed in both sexes, anterior part of sixth thoracic sternite produced anteriorly as subtriangular lobe; eighth sternite posteriorly with obtuse median tubercle in males, unarmed in females.

Interlocking mechanism of carapace and thoracic sternum well developed.

First pleopod of male with well-developed appendix interna on endopod (Fig. 3M), bearing rows of long setae basally. Appendix masculina of second pleopod (Fig. 3N) reaching or slightly overreaching appendix interna, bearing numerous long bristles terminally and mesially.

Branchial formula as shown in Table 1.

Eggs large and elongate oval, ranging from 1.2 to 1.5 and 2.2 to 2.5 mm in short axis and long axis respectively.

Coloration.—Females with body orange brown, ridges and carinae somewhat orange to reddish. Antennular and antennal flagella, distal parts of pereopods, posterior margin of abdominal tergites and posterior parts of tail-fan reddish. Meri of posterior pereopods and ventral parts of abdominal pleura slightly whitish. Eyes golden brown. Eggs blue, and developed ovaries visible inside carapace deep blue. Males with body light brown to slightly whitish, and generally with color paler than females, particu-

larly those with less developed abdominal sculpture.

Size.—Males: cl 9.2–16.7 mm; females: cl 11.0–17.5 mm; ovigerous females: cl 12.2–17.5 mm.

Distribution.—East and South China Seas; 300–512 m; inhabiting soft bottoms.

Remarks.—As previously mentioned, *Glyphocrangon stenolepis* was described based on two specimens, the holotype from off Pratas Islands, South China Sea, and the paratype from the Sulu Sea, the Philippines. The present material extends its geographical range to southern Japan. Furthermore, this species is a common by-catch of the deep-sea commercial trawlers in Taiwan.

This study has shown that the sculpture of the carapace and abdomen of the species is generally similar in females, whereas it is rather variable in males. In females, teeth, tubercles, carinae and grooves on the carapace and body are distinct (Figs. 1B, 2B), whereas in males, these structures are frequently obsolete to faint (Figs. 1A, 2A), or occasionally as distinct as in females. Also, there seems to be a relationship between body color and degree of development of abdominal sculpture in this species. The coloration of females is always orange to orange brown (Fig. 4A). In males, however, those with distinct abdominal sculpture have a similar coloration as in females, although those with eroded sculpture have a much paler coloration (Fig. 4B), and those of intermediate sculpture have intermediate coloration. The holotype represents an example of variation with least developed body sculpture, with short longitudinal ridges on the anterior abdominal tergites completely eroded, and the median carina of the fourth abdominal tergite not interrupted (see Chace 1984:fig. 5). Although the least sculptured Taiwanese specimens still have some traces of short longitudinal ridges on the abdominal tergites (Fig. 1A) and a small notch on the median carina of the fourth abdominal tergite, the abdominal sculpture of the three larger specimens from the type locality Pratas Islands (similar to

those shown in Figs. 1A, 2A) fit well within the range observed in the Taiwanese material. In addition, the coloration of the small Pratas male is very similar to that of some males from Taiwan (Fig. 4B, C). Therefore, it is concluded that the Taiwanese and South China Sea specimens are conspecific. Nevertheless, it seems that for similar size males, those from Taiwan are generally more sculptured than those from the South China Sea. Perhaps more specimens, particularly females, from the South China Sea, will provide better insights on the geographical variations of this species. In addition to the variability of the body sculpture, the material reported herein displays variation in other important features: the proportional length of the rostrum varies from 0.95 to 1.23 times as long as the carapace; the posterior pair of the lateral rostral teeth are sometimes barely discernible, as noted by Chace (1984), or are sometimes more prominent, showing as dentiform tubercles (Fig. 2B); the posterior fourth carina is usually interrupted at near the posterior end, and is rarely continuous.

As mentioned by Chace (1984), the elongate oval antennal scaphocerite, the configuration of the anterior fourth (lateral) carina, the long branchiostegal spine and the septate rostrum immediately separate *G. stenolepis* from most other species of the genus. Chace (1984) also noted that the juvenile or female paratype was different from the holotype in the more outstanding anterior tooth on the anterior fourth (lateral) carina, the more strongly lobate posterior first, second and third carinae, and the more strongly sculptured abdomen. Except for the sculpture of the abdomen, the present study found that those differences are constant between the paratype and the present material of *G. stenolepis*, not associated with growth as Chace suggested. The smallest specimen in the present material is a male of cl 9.2 mm from Taiwan, slightly larger than the paratype (cl 8.1 mm, USNM 205091). The smallest Taiwanese male has a well developed abdominal sculpture as in

females, and the appendix masculina of the second pleopod is only slightly shorter than the appendix interna. Therefore, if the paratype belongs to the same species as the holotype, it should be a female. However, none of the abundant females examined in the present study show a prominent anterior tooth on the anterior fourth carina as in the paratype. In addition to above differences, the posterior part of the third abdominal somite is more strongly elevated in the paratype than in the holotype or all other specimens of *G. stenolepis*. These differences indicate that the paratype represents a different species. More material from the Sulu Sea is needed to determine the exact identity of Chace's (1984) paratype.

Acknowledgments

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Natural History, Smithsonian Institution, Washington, D.C., for sending us the type material of *Glyphocrangon stenolepis* on loan, and Prof. K. Hayashi of National Fishery University, Shimonoseki, for making available the specimen of the species from Japanese waters for study. The present study is supported by a research grant on the decapod crustaceans of Taiwan from the National Science Council, Taiwan, R.O.C.

Literature Cited

- Chace, F. A., 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.
- Holthuis, L. B., 1971. The Atlantic species of the deep-sea genus *Glyphocrangon* A. Milne Edwards, 1881. Biological results of the University of Miami Deep-Sea Expeditions, 75.—Bulletin of Marine Science 21(1):267–373.