

## The rare deep-sea shrimp *Bitias brevis* (Rathbun, 1906) (Crustacea: Decapoda: Pandalidae) from the western Pacific

Shiz-Chang Chuang, Tin-Yam Chan,\* and T. Komai

(S-CC and T-YC) Institute of Marine Biology, National Taiwan Ocean University, Keelung,  
Taiwan R.O.C., e-mail (T-YC): tinyamchan@yahoo.com.tw

(TK) Natural History Museum and Institute, Chiba, 955-2 Aoba-cho, Chuo-ku, Chiba 260, Japan

*Abstract.*—During recent deep-sea expeditions in Taiwan, Japan and New Caledonia seven specimens were collected of the rare pandalid shrimp *Bitias brevis* (Rathbun, 1906), a species previously known from only two specimens. The study of this new material showed that characters used in separating *B. brevis* from its sole congeneric species, *B. stocki* Fransen, 1990, are variable. This study provides additional information on this rare shrimp, including coloration.

The recently established pandalid genus *Bitias* Fransen, 1990 contains two species: *B. stocki* Fransen, 1990, type species of the genus, and *B. brevis* (Rathbun, 1906). Both are rare and small species that occur in deep waters from 550 to 1350 m. *Bitias stocki* is known based only on four specimens from the North Atlantic (Fransen 1990, González 1995, González & Santana 1996, González et al. 2001). *Bitias brevis* is known from the holotype originally described as *Pandalus brevis* Rathbun, 1906, collected in Hawaii, and another specimen from Madagascar (Crosnier & Fransen 1994). These two species are very similar, and only slight differences in the shape of rostrum, and length of telson, have been proposed to separate them (see Crosnier & Fransen 1994). However, the limited number of known specimens renders the evaluation of these distinguishing characters difficult.

During recent deep-water expeditions in Taiwan, Japan and New Caledonia, seven more specimens of this genus were obtained. Careful examination showed that they can be assigned to *B. brevis*. The present report provides additional information on this rare shrimp, including a color pho-

tograph. The shape of the rostrum and the length of the telson proved to be variable in the Indo-West Pacific material examined of this species. It is possible that *B. stocki* may be synonymous with *B. brevis*, but more material from the Atlantic is needed for a full evaluation.

The specimens are deposited in the National Taiwan Ocean University, Keelung (NTOU), Natural History Museum and Institute, Chiba (CBM), and the Muséum national d'Histoire naturelle, Paris (MNHN). The following abbreviations are used: cl, postorbital carapace length, measured from the orbital margin to the posterodorsal margin of the carapace; BT, bottom trawl; CP, beam trawl; DW, Warén dredge; stn, station. Expeditions names used are: TAIWAN 2000, joint Taiwanese-French cruise; BATHUS, French expedition named after the Greek word for deep, *bathys*; and HALI-PRO, French expedition named from “halieutique profonde”.

*Bitias brevis* (Rathbun, 1906)

Figs. 1–3

*Pandalus brevis* Rathbun, 1906:916 (in part), fig. 65, pl. 21—fig. 3 (type-locality: Hawaii).—Chace, 1985:44.

\* Corresponding author.

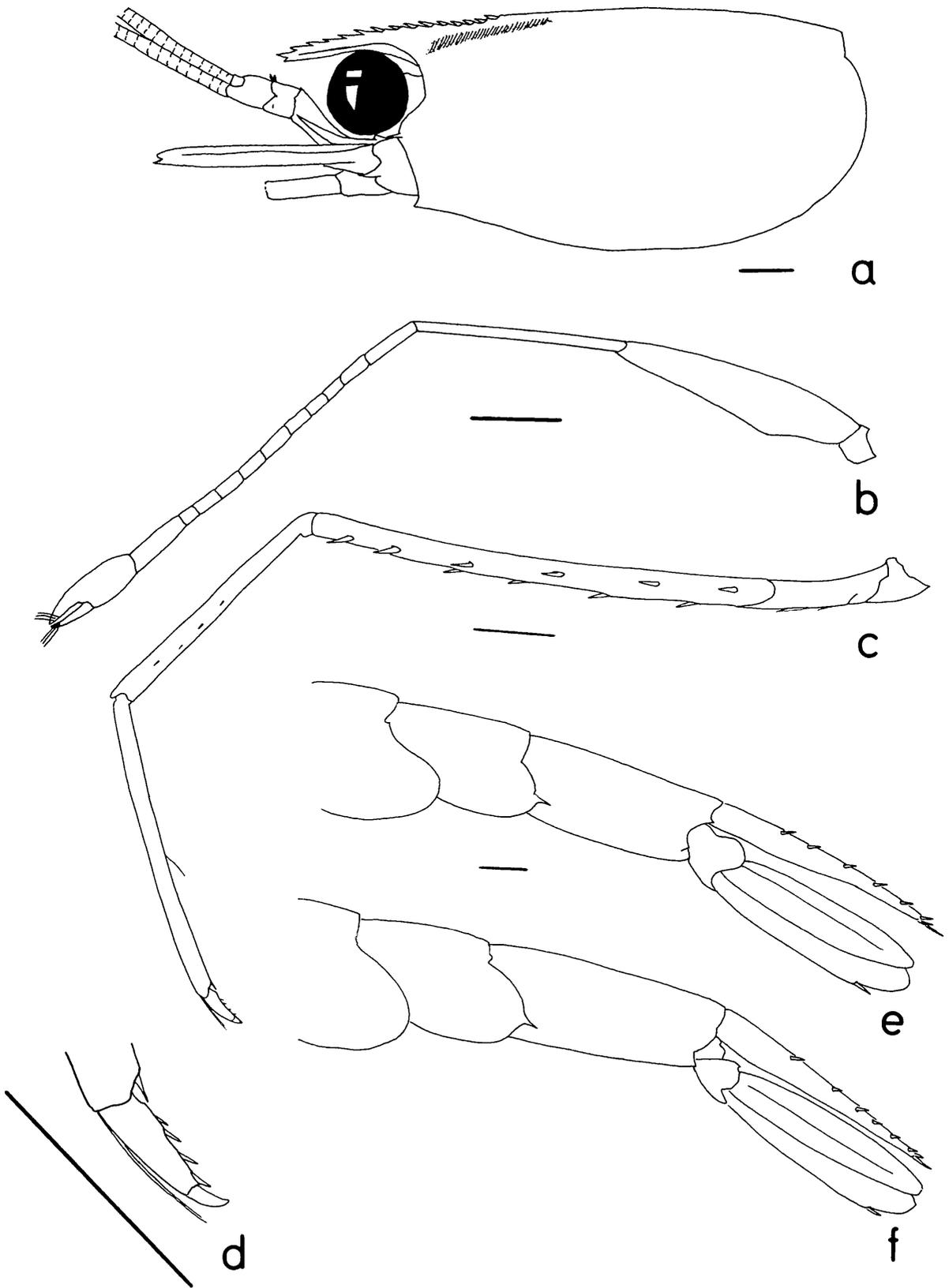


Fig. 1. *Bitias brevis* (Rathbun, 1906). a, b, e, Taiwan, TAIWAN 2000 stn CP 55, female 7.2 mm cl, NTOU 2000-55; c, d, Taiwan, TAIWAN 2000 stn CP 55, 6.3 mm cl, NTOU 2000-55; f, New Caledonia, HALIPRO 2 stn BT 58, female 6.8 mm cl, MNHN-Na. 14970. a, carapace lateral view; b, left second pereiopod; c, left third pereiopod; d, dactylus of left third pereiopod; e, f, posterior abdomen and tail fan, lateral view. Scales equal 1 mm.

*Bitias brevis*—Crosnier & Fransen, 1994: 46, figs. 1, 2a–f, 3a–b.

*Material examined.*—Taiwan. TAIWAN 2000, R/V *Fishery Researcher 1*, stn CP 55, 24°26.9'N, 122°18.1'E, 638 m, 4 Aug 2000, 1 female 7.2 mm cl, 1 carapace 6.3 mm cl, NTOU 2000-55.

Japan. KT 02-03 cruise, R/V *Tansei-maru*, stn B4, SE of Amami-Oshima Island, Ryukyu Islands, 27°56.94'N, 129°31.40'E, 3 m beam trawl, 751–810 m, 16 Apr 2002, 1 male 5.5 mm cl, 2 females 5.3, 6.0 mm cl, CBM-ZC 6469.

New Caledonia. BATHUS 3, stn DW 809, 23°39.39'S, 167°58.94'E, 650–730 m, 27 Nov 1993, 1 female (posterior part of abdomen missing) 6.8 mm cl, MNHN-Na. 14969; HALIPRO 2, stn BT 58, 25°4.13'S, 168°45.21'E–25°4.99'S, 168°44.86'E, 1303–1500 m, 17 Nov 1996, 1 female 6.8 mm cl, MNHN-Na. 14970.

*Description.*—Tegumental scales absent.

Rostrum short, slightly shorter than half carapace length, nearly horizontal, extending to second segment of antennular peduncle, dorsal margin densely serrated with 11–16 teeth, including 4–6 on carapace posterior to level of orbital margin; dorsal rostral teeth generally movable but distal 1–6 teeth may lack complete basal suture; ventral margin of rostrum usually armed with 1 subdistal fixed tooth (rarely unarmed); rostral lateral carina well marked and continuous with orbital margin. Carapace with orbital margin concave; suborbital lobe poorly developed; antennal spine well developed, pterygostomial spine small.

Eye pyriform, with well developed, darkly pigmented cornea, lacking ocellus. Antennule with peduncle slightly overreaching midlength of scaphocerite; stylocerite terminating sharply, extending nearly to distal margin of basal segment of peduncle; basal segment with plumose setae and bristles on dorsodistal margin, ventromesial ridge without tooth; second segment with 3 or 4 spinules on dorsodistal margin. Antenna with scaphocerite about 0.7 as long as car-

apace, lateral margin nearly straight, distolateral tooth reaching distal margin of lamella; basicerite with moderately large ventrolateral distal spine extending to proximal end of outer margin of scaphocerite.

Third maxilliped with endopod overreaching scaphocerite by about half length of ultimate segment; penultimate segment slightly longer than ultimate segment; ultimate segment with several slender spinules on lateral and dorsal surfaces; exopod absent. Pereiopods slender, but not extremely elongate. First pereopod not chelate, exceeding scaphocerite by 0.3–0.4 length of propodus; ischium not expanded ventrally, lacking spinules on ventral margin; carpus with few spinules on lateral surface; propodus shorter than carpus, with few spinules on lateral surface; dactylus minute. Second pereopods subequal, overreaching scaphocerite by length of chela and 0.5–0.1 length of carpus; carpus composed of 10 or 11 articles; chela rather large, about half length of carpus; dactylus slightly shorter than palm, terminating in 2 unguis corresponding to simple unguis of fixed finger. Third to fifth pereopods similar, but decreasing in length posteriorly. Third pereopod overreaching scaphocerite by length of dactylus, propodus about 0.1 length of carpus; ischium with 2 ventral spines; merus almost as long as carapace, armed with 5–7 lateral and 4 ventral spines; carpus slightly shorter than propodus, with few minute spinules on lateral surface and 6–8 (rarely 0) slender spinules on ventral surface; dactylus about 0.2 as long as propodus, laterally compressed, not notably curved ventrally, bearing 4 or 5 accessory spinules on ventral margin. Fourth pereopod overreaching scaphocerite by length of dactylus and 0.8 length of propodus; ischium with 2 ventral spines; merus slightly shorter than carapace, armed with 6 lateral and 4 or 5 ventral spines; carpus with 3 or 4 ventral spinules. Fifth pereopod overreaching scaphocerite by length of dactylus and 0.4 length of propodus; ischium without ventral spine; merus about 0.7 of carapace length,

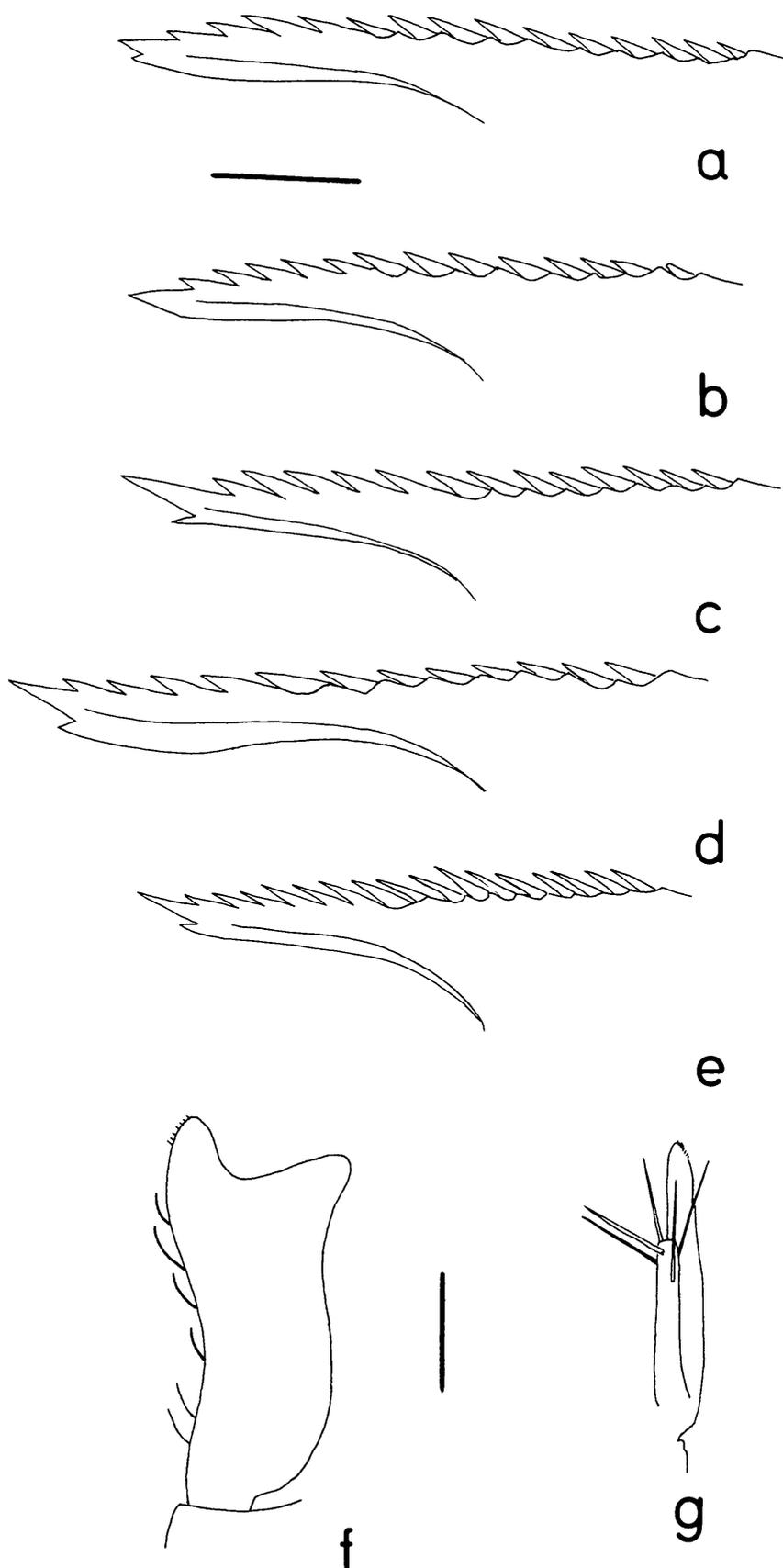


Fig. 2. *Bitias brevis* (Rathbun, 1906). a, Taiwan, TAIWAN 2000 stn CP 55, female 7.2 mm cl, NTOU 2000-55; b, Taiwan, TAIWAN 2000 stn CP 55, 6.3 mm cl, NTOU 2000-55; c, New Caledonia, BATHUS 3 stn DW 809, female 6.8 mm cl, MNHN-Na. 14969; d, New Caledonia, HALIPRO 2 stn BT 58, female 6.8 mm cl, MNHN-Na. 14970; e, Japan, KT 02-03 stn B4, female 6.0 mm cl, CBM-ZC 6469; f, g, Japan, KT 02-03 stn B4, male 5.5 mm cl, CBM-ZC 6469: a-e, lateral view of rostrum; f, endopod of first pleopod; g, appendix masculina and appendix interna of second pleopod. Scales a-d = 1 mm, f, g = 0.5 mm.



Fig. 3. *Bitias brevis* (Rathbun, 1906), Taiwan, TAIWAN 2000 stn CP 55, female 7.2 mm cl, NTOU 2000-55.

armed only with 2–4 lateral, and 0 or 1 ventral spines; carpus with 2 ventral spinules.

Strap-like epipods on third maxilliped through fourth pereopods, and corresponding setobranchs on first to fifth pereopods. Gill formula identical to that of *B. stocki* (see Fransen 1990: table 1).

Abdomen with third somite dorsally rounded, without posterior spine. Fourth abdominal pleuron rounded, fifth abdominal pleuron bearing distinct posteroventral denticle. Sixth somite 2.2–2.5 times as long as height, distinctly shorter than telson. Telson reaching or falling short of posterior end of uropods, armed with 6 pairs (sometimes 7 on one side) of dorsolateral spines and 2 pairs of terminal spines (inner pair shorter). Uropod with endopod slightly shorter than exopod; exopod with movable spinule just mesial to small posterolateral tooth.

*Coloration* (Fig. 3).—Carapace reddish

except translucent rostrum. Eyes black. Antennules and antennae translucent except basal parts of latter somewhat reddish. Thoracic appendages reddish. Abdomen including tail fan translucent.

*Size*.—Males ranging 5.5–7.8 mm cl, and females 5.3–7.2 mm cl.

*Distribution*.—Indo-West Pacific; known from Madagascar, Taiwan, Japan, Hawaii and New Caledonia, at depths of 580–1500 m.

*Remarks*.—Crosnier & Fransen (1994) reported that *B. brevis* can be distinguished from *B. stocki* by the shape of the rostrum, and the length of the telson. The seven specimens of *B. brevis* reported here all have complete rostrum, but the telson and/or uropods are broken off in four specimens. One specimen from Taiwan (Fig. 2a), and one from New Caledonia (Fig. 2d), have the rostrum moderately deep, and with the ventral margin convex, somewhat sim-

ilar to those of the holotype and allotype of *B. stocki* (Fransen 1990: fig. 1a, c; Crosnier & Fransen 1994: fig. 3c, d). The rostrum of the other specimens (Fig. 2b, c, e) are rather slender, and similar to those of the holotype of *B. brevis*, and the Madagascar specimen of this species reported by Crosnier & Fransen (1994: fig. 3a, b). The lateral carina of the rostrum is distinct in all the material reported in the present study. Moreover, the rostrum of the paratype of *B. stocki* is also rather slender (Crosnier & Fransen 1994: fig. 3e). Therefore, the shape of the rostrum can not be used to separate *B. brevis* from *B. stocki* as suggested by Crosnier & Fransen (1994).

The other distinguishing character proposed by Crosnier & Fransen (1994) is the length of the telson, being shorter than the uropods in *B. stocki*, and reaching the posterior end of the uropods in *B. brevis*. The three specimens of *B. brevis* reported herein with complete tail fan have the telson (excluding the terminal spines) falling short of the posterior end of the uropods (Fig. 1e, f). Crosnier & Fransen (1994) had only one specimen of *B. brevis* and one of *B. stocki* with a complete telson. It should be pointed out that the paratype of *B. stocki* mentioned by Crosnier & Fransen (1994) as having the telson broken, is illustrated with a complete telson in Holthuis (1993: fig. 261), and the telson does not reach the posterior end of the uropods.

Although both characters proposed by Crosnier & Fransen (1994) for separating *B. brevis* from *B. stocki* are variable, careful comparison of our specimens with the original description of *B. stocki* shows that there are still minor differences between them. The specimens of the type series of *B. stocki* have 13–18 dorsal teeth on the rostrum (Fransen 1990, but Crosnier & Fransen 1994: fig. 3c–e illustrated a maximum of 17 dorsal teeth on the rostrum), which are slightly more numerous than the 11–16 dorsal rostral teeth in *B. brevis*. The carpi of the third to fifth pereopods bear only a few minute spinules on the lateral

surfaces in our specimens, while the carpi are armed with numerous spinules in *B. stocki* (Fransen 1990: fig. 3a–c). The shape of the endopod of the male first pleopod seems to be quite different in our male specimen, and the male holotype of *B. stocki*. In our male specimen, the endopod is narrower, the distal part is distinctly bilobed with a well differentiated appendix interna, and a mesially directed rounded lobe (Fig. 2f). In the holotype of *B. stocki*, the endopod is noticeably broadened distally and not bilobed (Fransen 1990: fig. 3g). However, our male (5.5 mm cl) is considerably smaller than the holotype of *B. stocki* (7.9 mm cl), and the appendix masculina is distinctly shorter than the appendix interna (Fig. 2g), whereas the appendix masculina and the appendix interna are subequal in length in the holotype of *B. stocki* (Fransen 1990: fig. 3h). Therefore, the observed differences in the shape of the endopod of the first pleopod may merely reflect the maturity of the specimens. More material from the Atlantic is needed to determine whether or not *B. stocki* is distinct from *B. brevis*. A specimen of *B. stocki* has been reported from the Canary Island by González (1995), González & Santana (1996) and González et al. (2001). However, only a photograph of a preserved specimen probably with a broken rostrum was provided by González (1995: Foto 41), without any descriptive details. An attempt to borrow this Canary Island specimen has been unsuccessful.

As mentioned by Crosnier & Fransen (1994), it is often difficult to determine whether the small anterior, dorsal teeth on the rostrum are movable or not. In our specimens, the anterior four to six dorsal rostral teeth appear to lack a complete basal suture, and are probably fixed (Fig. 2a–e). Therefore, it is necessary to modify the key characters of *Bitias* given in Holthuis (1993: 262) to “Rostrum short, not reaching the end of antennular peduncle; dorsal teeth densely packed and more or less movable. Second pereopods equal. Stylocerite point-

ed. Proximal lobe of scaphognathite truncate.”

### Acknowledgments

Grateful acknowledgment is extended to A. Crosnier (MNHN) for entrusting us to report the New Caledonian material, and for his warmest hospitality to the second and third authors during their stays in Paris. We would also like to thank the MNHN for providing short term research grants to the second (T-YC) and third (TK) authors to work in the MNHN, and therefore make this work possible. The cruise “TAIWAN 2000” was supported by the Taiwan Fisheries Research Institute, National Science Council, Taiwan, R.O.C., MNHN, and the Institut de Recherche pour le Développement, France. The third author (TK) thanks all participants of the KT02-03 cruise of R/V *Tansei-maru* and the ship personnel for their generous help and assistance at sea. This work is a contribution from a research grant supported by the National Science Council, Taiwan, R.O.C.

### Literature Cited

Chace, F. A., Jr. 1985. The caridean shrimps (Crustacea Decapoda) of the *Albatross* Philippines expe-

- dition, 1907–1910, part 3. Families Thalassocarididae and Pandalidae.—*Smithsonian Contributions to Zoology* (411):1–143.
- Crosnier, A., & C. H. J. M. Fransen. 1994. Découverte de *Bitias brevis* (Rathbun, 1906) à Madagascar (Decapoda, Pandalidae).—*Crustaceana* 66(1): 45–52.
- Fransen, C. H. J. M. 1990. *Bitias stocki*, a new genus and new species of Pandalid shrimp (Crustacea, Decapoda, Caridea) in the Eastern Atlantic Ocean.—*Beaufortia* 41(10):67–73.
- González, J. A. 1995. Catálogo de los Crustáceos Decápodos de las Islas Canarias. Publicaciones Turquesa, Santa Cruz de Tenerife, 282 pp.
- González, J. A., J. A. Quiles, V. M. Tuset, M. M. García-Díaz, & J. I. Santana. 2001. Data on the family Pandalidae around the Canary Islands, with first record of *Plesionika antigai* (Caridea).—*Hydrobiologia* 449:71–76.
- González, J. A., & J. I. Santana. 1996. Shrimps of the family Pandalidae (Crustacea, Decapoda) off the Canary Islands, eastern central Atlantic.—*South African Journal of Marine Science* 17: 173–182.
- Holthuis, L. B. 1993. The recent genera of the caridean and stenopodidean shrimps (Crustacea, Decapoda), with an appendix on the order Amphionidacea. Nationaal Natuurhistorisch Museum, Leiden, 328 pp.
- Rathbun, M. J. 1906. The Brachyura and Macrura of the Hawaiian Islands.—*Bulletin of the United States Fish Commission* (1903), 23(3):827–930, pls. 1–24.