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Short Note

Newly Recorded Symbiotic Crabs (Crustacea: Decapoda: Brachyura) from Southern Taiwan Coral Reefs*

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Ming-Shiou Jeng (1994) Newly recorded symbiotic crabs (Crustacea: Decapoda: Brachyura) from Southern Taiwan coral reefs. *Zoological Studies* **33**(4): 314-318. This paper reports eight symbiotic crabs from inshore waters off the coast of southern Taiwan. Among them, *Xenocarinus tuberculatus* is commensal with a sea whip and the boxing crab *Lybia tessellata*, with sea anemones. The remaining 6 species, *Pseudoliomera speciosa, Cymo andreossyi, Trapezia cymodoce, T. septata, T. guttata*, and *T. rufopunctata*, are symbiotic with several species of branching scleractinian corals. Five species: *X. tuberculatus, L. tessellata, P. speciosa, C. andreossyi*, and *T. guttata* are new records from Taiwan. The above crabs all cling to the coral with their highly modified hooked claws. The diagnostic characters, distribution, photographs, and information on their hosts are provided.

Key words: Symbiosis, Brachyuran.

Coral reef communities contain numerous mutualistic and commensalistic species associations that are often assumed to represent co-adaptive relationships. These symbiotic associations are frequently found, and every species probably has its complement of symbionts. For example, the xanthid crabs are abundant among the branching corals. Among them, two xanthid crab species (*Trapezia* and *Tetralia*) reside as obligate symbionts. Host corals provide crustaceans shelter from predators and mucus as a food source (Galil 1987). Resident crustaceans protect their coral hosts against coral-livores such as the sea star *Acanthaster planci* (Glynn 1983).

Coral reefs are abundant in Taiwan, particularly in the south (Dai 1988). General surveys of the crustaceans associated with branching corals have been conducted in the waters of Taiwan (Soong and Chang 1983, Jeng and Chang 1985, Chang et al. 1987), but there has been no substantial record of symbiotic crabs from Taiwan. An exception is Galil (1983) who reported on two new species of *Trapezia* from Taiwan. Lin (1949) and Chang et al. (1987) listed 3 symbiotic crabs: *Trapezia cymodoce*, *T. septata*, and *T. rufopunctata* from Taiwan, but added no details. Thus, they are briefly described here together with five other newly recorded symbiotic crabs. We hope that the present study can give a better account of the symbiotic crabs from the shallow waters of southern Taiwan.

Materials and Methods—Field work and specimen collection were undertaken along the coast of Kenting National Park in southern Taiwan from Feb. 1988 to May 1993. Specimens were collected by SCUBA diving to a depth of 25 m. Color and habitat of the symbiotic crabs were observed and photographed. The underwater photographs were taken with a Nikon F801 camera. The collection sites are indicated in Fig. 1:

Site 1. Hsia-shui-ku, depth 6-25 m.
Site 2. Wan-li-ton, depth 3-10 m.
Site 3. Lei-ta-shih, depth 3-10 m.
Site 4. Nan-wan, depth 8-12 m.
Site 5. Shan-geo-wan, depth 2-10 m.

The measurements include carapace length (CL) the distance from the anterior margin to the middle of the posterior margin of the carapace, or carapace width (CW): the broadest part of the carapace. Specimens of *Xenocarinus tuberculatus* were measured for carapace length; all other specimen measurements are carapace width. The host species of symbiotic crabs were identified by the author. The specimens were preserved with 10% glycerin and 70% ethyl alcohol. These specimens are catalogued and deposited at the Institute of Zoology, Academia Sinica (ASIZ), R. O. C.

Results—

Family Majidae

***Xenocarinus tuberculatus* White, 1847**

(Figs. 2A, B)

Xenocarinus tuberculatus: Barnard, 1950: 36, fig. 7a, b; Miyake, 1983: 37, pl. 13(4).

Materials: 3 specimens collected from Hsia-shui-ku: 14.0 mm (♂), Dec. 1, 1988, depth 25 m, ASIZ 70057; 20.2 mm

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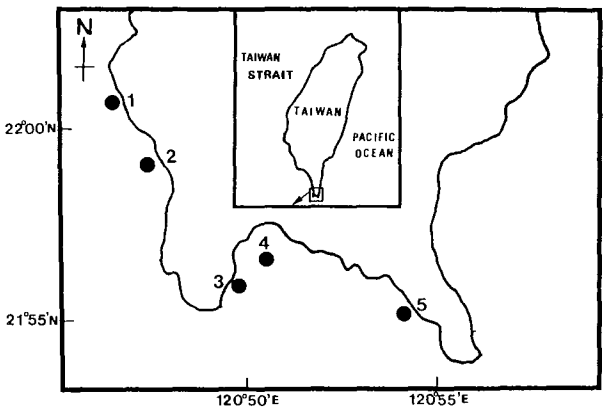

Fig. 1. Map of southern Taiwan: black circles indicate collection sites.

(ovig. ♀) and 15.3 mm (♂), Jan. 13, 1993, depth 20 m, ASIZ 70006.

Diagonsis: Rostrum stout, conical, apically notched. Carapace narrow, with more or less prominently raised tubercles, typically in transverse rows. Eyes completely sunk in carapace. No supra- or post-ocular spines. Antennae completely hidden beneath rostrum. Chelipeds not much shorter or stouter than second legs; fourth and fifth legs short; a single row of serrations on inner margins of dactylus of second to fifth legs.

Distribution: This species has been recorded in Japan, Hong Kong, Taiwan, Ceylon, Andaman Sea, Cargados Carajos, Chagos Archipelagos, and South Africa.

Hosts: The host species of this crab is the sea whip *Cirripathes anguina* (Dana). The crabs cling to the sea whip with specially hooked claws and long legs.

Family Xanthidae

Pseudoliomera speciosa (Dana, 1852)

(Fig. 3A)

Actaeodes speciosa Dana, 1852: 198, figs. 4a-c, pl. 11.

Actaea speciosa: Alcock, 1898: 143; Barnard, 1950: 232, fig. 43d.

Pseudoliomera speciosa: Dai and Yang, 1991: 319, fig. 164A(1), pl. 41(5).

Materials: 4 specimens: Hsia-shui-ku, 13.5 mm (♂), Jan. 6, 1989, depth 4-10 m, ASIZ 70062, Shan-geo-wan, 12.5 mm (ovig. ♀), 13.2 mm (♂), 7.0 mm (♂), Jul. 25, 1989, depth 6 m, ASIZ 70064.

Diagnosis: Carapace convex and regions well defined, each region subdivided into lobules and covered with beaded granules. Front slightly protuberant and deflected downwards, with a V-shaped median notch. Anterolateral margin composed of 4 lobes. Chelipeds and ambulatory legs covered with beaded granules and symmetrical. Fingers black and the pigment extends to the ventral surface of the manus in the male. First ambulatory leg with dactylus thickly covered at the tip with brush-like hairs.

Distribution: This species has been recorded in Japan, Hawaii, Taiwan, Indian Ocean, Red Sea, Eastern Africa, and Xisha Is. (China).

Hosts: This species was collected from the host corals *Seriatopora hystrix* Dana and *Pocillopora damicornis* (Linnaeus).

Cymo andreossyi (Audouin, 1826)

(Fig. 3B)

Cymo andreossyi: Alcock, 1898: 173-174; Serène, 1984: 33, fig. 7, pl. 2c; Dai and Yang, 1991: 345-346, fig. 171A(2), pl. 46(3).

Materials: 2 specimens: Lei-ta-shih, 9 mm (♀), 5 mm (♂), Dec. 8, 1988, depth 3 m, ASIZ 70054.

Diagnosis: Carapace subcircular; surface flat, covered with short pubescence. Protogastric region with large granules arranged in transverse series. Dorsal border of orbit granulated, inner angle and orbital region covered with larger granules, outer angle obtusely round, ventral border of orbit bearing large, acute teeth, with inner angle sharp but the outer one obtuse. Chelipeds quite asymmetrical, covered with tomenta and dentiform granules along anterior margin. Carpus with acute barb at the inner-distal angle. Finger white and with 2 stout barbs on each inner margin, but lacking barb at smaller cheliped.

Distribution: This species is known from Japan, Taiwan, Polynesia, Andaman Is., Nicobar Is., Sri Lanka, Red Sea, and Xisha Is. (China).

Hosts: These samples were collected from the host coral, *Seriatopora hystrix* Dana.

Lybia tessellata (Latreille, 1812)

(Figs. 4A, B)

Lybia tessellata: Barnard, 1950: 249, figs. 46a, b; Serène, 1984: 28-29, fig. 3, pl. 1d, e; Dai and Yang, 1991: 379, fig. 184(2), pl. 51(1).

Materials: 1 specimen: Lei-ta-shih, 9.8 mm (♂), May 9, 1993, depth 4 m, ASIZ 70052.

Diagnosis: Carapace orbicularly square, convex, and smooth. Postfrontal lobe and both sides of gastric region each with short setae bundle. Front broad and slightly deflected, anterior truncated and cut into 2 lobes by a V-shaped shallow depression. Chelipeds smaller and thinner than ambulatory legs. Manus slender and thin. Fingers armed with 8-9 acute teeth along the cutting edges with pubescence bundle between the two fingers.

Distribution: This species is found in Japan, Taiwan, Hawaii, Tuamotu Is., Cocos Is., Gilbert Is., Coetivy, Mauritius, Seychelles, Reunion, Aldbra Is., Red Sea, South Coast of Africa, and Xisha Is. (China).

Hosts: This species always carries a small sea anemone in each chela. It inhabitats the underside of rocks or coral reefs in shallow waters. The small boxing crabs rarely grow to be more than 3 cm (CW) long. The boxing crabs are the only examples of invertebrates known to use tools (Haywood and Wells 1989). It collects tiny anemones (*Boloceractis prehensa*) and places one in each claw. The crab actively waves the anemones at approaching predators as a warning. Furthermore, even though these crabs use their first pair of walking legs to search the substrate detritus for food, they also collect food from the anemones. Only when molting will *Lybia tessellata* deliberately release the anemones, setting them aside untill the new shell hardens, then reattaching them.

Trapezia cymodoce (Herbst, 1801)

(Figs. 5A, B)

Trapezia cymodoce: Alcock 1898: 219; Barnard, 1950: 276, figs. 52a, b; Edmondson, 1962: 279; Serène, 1984: 272-273, fig. 179, pl. 38b; Dai and Yang, 1991: 380-381, fig. 185(2), pl. 51(3).

Fig. 2. *Xenocarinus tuberculatus* White, lateral (A) and dorsal (B) view, 20.2 mm CL (ovig. ♀), and its host sea whip, *Cirripathes anguina* (Dana) (C).

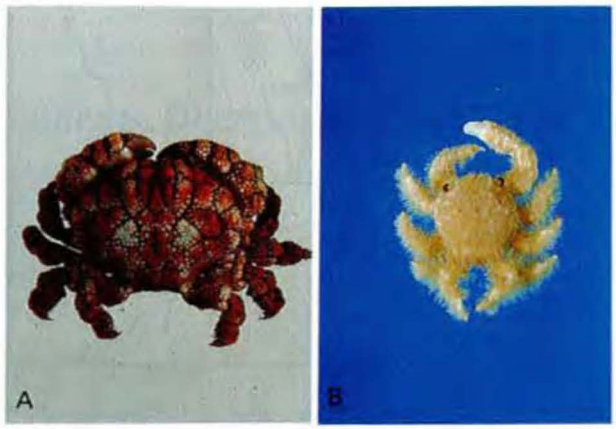

Fig. 3. (A) *Pseudoliomera speciosa* (Dana), 13.5 mm CW (♂), (B) *Cymo andreossyi* (Audouin), 9.0 mm CW (♀).

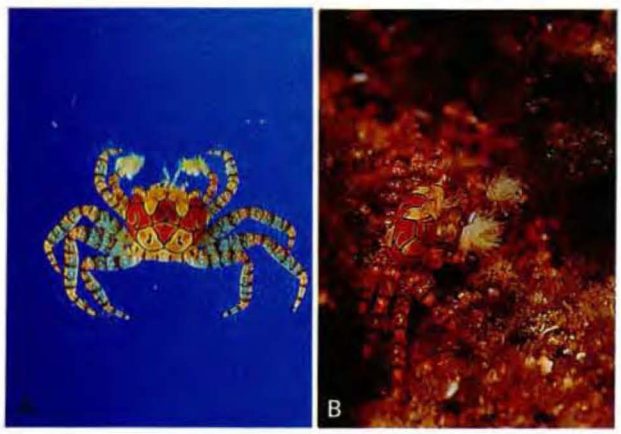

Fig. 4. *Lybia tessellata* (Latreilla) 9.8 mm CW (♂) (A), and its symbiotic anemones, *Boloceractis prehensa* (Moebius) (B).

Fig. 5. *Trapezia cymodoce* (Herbst), 10.2 mm CW (♂) (A), and its host coral, *Stylophora pistillata* (Esper) (B).

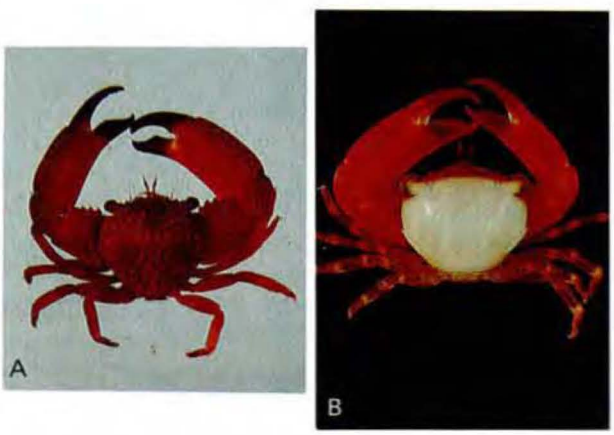

Fig. 6. (A) *Trapezia septata* Dana, 15.5 mm CW (♂); (B) *Trapezia guttata* Püpell, 8.3 mm CW (♂).

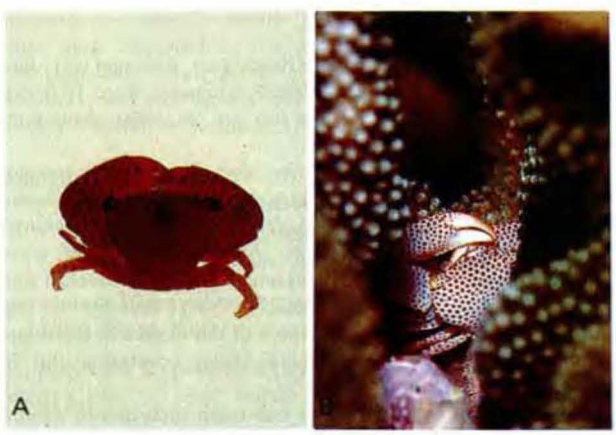

Fig. 7. *Trapezia rufopunctata* Herbst 18.4 mm CW (♂) (A), its host coral, *Pocillopora eydouxi* Edwards and Haime (B).

Materials: 5 specimens: Lei-ta-shih, 13.2 mm (ovig. ♀), 5.9 mm (♀), and 11.5 mm (♂), Aug. 23, 1989, depth 3-6 m, ASIZ 70059; Hsia-shui-ku, 11.1 mm (ovig. ♀), 10.2 mm (♂), Jan. 6, 1990, depth 4 m, ASIZ 70068.

Diagnosis: Carapace slightly broader than long, suboval. Chelipeds stout, asymmetrical, with smooth surface. Merus with 5-6 rectangular teeth along anterior margin. Carpus with rounded inner-distal angle but inner-proximal angle obtusely triangular; outer surface covered with pubescence. Manus bluntly round on dorsal margin and sharp on ventral margin. Fingers dark-brown at distal quarter, armed with barbs of various sizes on inner margins of major chela and with fine barbs on those of the minor chela; movable finger of minor chela with 2 rather large triangular barbs at base of inner edge.

Distribution: This species is widely found in the Indo-West Pacific Ocean from Japan, Hawaii, Taiwan, and Polynesia through the Indian Ocean to the Red Sea and the east coast of Africa.

Hosts: Specimens were collected from host corals, *Seriatopora hystrix* Dana and *Stylophora pistillata* (Esper).

Trapezia septata Dana, 1852
(Fig. 6A)

Trapezia septata Dana 1852: 260; Galil and Lewinsohn, 1985: 288-289, fig. 2.
Trapezia areolata? var. Dana, 1855: 6, pl. 15, fig. 9.

Materials: 27 specimens, Lei-ta-shih, range from 4.3 to 18.2 mm CW, Jul. 25, 1989, depth 3-8 m, ASIZ 70061; 8 specimens, Hsia-shui-ku, range from 3.6 to 15.5 mm CW, Jan. 6, 1990, depth 4 m, ASIZ 70066.

Diagnosis: Carapace lenticular, surface smooth, glossy, and covered with a meshwork pattern of deep reddish lines; a similar pattern is also present on the ventral surface of the carapace and dorsal surface of the chelipeds. Front not quite prominent, but advanced beyond rounded superior inner orbital angle and divided into four lobes. Merus of outer maxilliped quadrate, its outer distal angle slightly produced, and rounded, inner distal angle obliquely truncated. Chelipeds unequal, massive and long. Merus quadrate, projecting beyond carapace with serrated anterior border. Carpus rounded, with two equally blunt tubercles at inner angle.

Distribution: This species has been recorded in Japan, Taiwan, Sri Lanka, Indonesia, Australia, Hawaii, Samoa Is., and New Caledonia.

Hosts: Specimens were collected from host corals *Seriatopora hystrix* Dana, *Pocillopora damicornis* (Linnaeus), and *Stylophora pistillata* (Esper).

Trapezia guttata Rüppell, 1830
(Fig. 6B)

Trapezia guttata: Miyake, 1983: 139, pl. 47(2); Serène, 1984: 271, fig. 178, pl. 38A; Dai and Yan, 1991: 383-384, fig. 186(2), pl. 51(7).

Materials: Shan-geo-wan, 20 specimens, range from 3.6 to 7.0 mm CW, Jul. 25, 1989, depth 3-10 m, ASIZ 70065; Lei-ta-shih 8 specimens, range from 2.7 to 8.3 mm CW, Aug. 23, 1989, depth 3-8 m, ASIZ 70060.

Diagnosis: Carapace yellowish brown or whitish, surface somewhat convex, smooth, and glossy. Chelipeds elongate, asymmetrical, and smooth. Merus with 7-8 serrations along anterior margin. Carpus with 2 processes on inner margin. Ambulatory legs covered with numerous long setae, dactylus of distal 2 pairs are furnished with 2 longitudinal series of spinules at distal half of ventral surface and tipped with short claw, but those of proximal 2 pairs are tipped with a longer claw. A specimen preserved in alcohol is marked with pink spots on its ambulatory leg.

Distribution: This species is found throughout the tropical Indo-West-Pacific.

Hosts: The specimens of this species were collected from the host corals, *Seriatopora hystrix* Dana, *Stylophora pistillata* (Esper), and *Pocillopora damicornis* (Linnaeus).

Trapezia rufopunctata (Herbst, 1799)
(Figs. 7A, B)

Trapezia rufopunctata: Alcock, 1898: 222; Serène, 1984: 276-277, fig. 184, pl. 39a; Dai and Yang, 1991: 385, fig. 187(1), pl. 52(1).

Materials: 2 specimens, Lei-ta-shih, 18.4 mm (♀), 12.6 mm (♂), Dec. 6, 1988, depth 6 m, ASIZ 70063.

Diagnosis: Carapace, chelipeds, and ambulatory legs marked with large symmetrical red spots. Chelipeds asymmetric. Merus with 6-7 barbs along anterior margin. Carpus with sharp tooth at inner-distal angle. Dorsal margin of manus bluntly round, outer surface smooth, ventral margin granulated or bluntly serrated. Immovable finger with irregular barbs along the inner margin. Dorsal margin of carpus, propodus, and dactylus of ambulatory legs with setae.

Distribution: This species has been recorded in Japan, Taiwan, Hawaii, Sri Lanka, and Xisha Is. (China).

Hosts: The specimens of this species were collected from the host coral, *Pocillopora eydouxi* Edward and Haime.

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Appendix:

The Chinese collected localities used in the context in contrast to their Romanizations are listed as follows:

Romanization	Chinese	Romanization	Chinese	Romanization	Chinese
Hsia-shui-ku	下水堀	Nan-wan	南灣	Wan-li-ton	萬里桐
Lei-ta-shin	雷打石	Shan-geo-wan	香蕉灣		

南臺灣珊瑚礁共生蟹(甲殼綱：十足目：短尾類)之研究

鄭 明 修[1]

本研究描述南台灣海域亞潮帶產的八種共生蟹，包括疣背扁異蟹(*Xenocarinus tuberculatus*)和海鞭的片利共生，花紋細熊蟹(*Lybia tessellata*)和海葵的互利共生，其餘六種爲美麗假花瓣蟹(*Pseudoliomera speciosa*)，白指波紋蟹(*Cymo andreossyi*)，毛掌梯形蟹(*Trapezia cymodoce*)，網紋梯形蟹(*T. septata*)，紅點梯形蟹(*T. guttata*)，紅斑梯形蟹(*T. rufopunctata*)等，分別與許多種分枝狀石珊瑚共生，其中疣背扁異蟹、花紋細熊蟹、美麗假花瓣蟹、白指波紋蟹和紅點梯形蟹等五種爲台灣首次記錄種。上述共生蟹都以它們特化的鉤狀熊腳抱住宿主或共生物。各種共生蟹的形態特徵、分佈、照片以及其共生生物在文中皆有記述。

關鍵詞：共生，短尾類。

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