

Systematic status and geographic distribution of *Trapezia formosa* Smith, 1869 (Crustacea, Brachyura, Trapeziidae), a symbiont of reef corals

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ABSTRACT

A revision of *Trapezia formosa* Smith, 1869 has shown that it is found throughout the Indo-West Pacific region and not restricted to the eastern Pacific.

RÉSUMÉ

Position systématique et distribution géographique de Trapezia formosa Smith, 1869 (Crustacea, Brachyura, Trapeziidae), un symbionte des coraux récifaux.
Une révision de *Trapezia formosa* démontre que cette espèce n'est pas limitée au Pacifique oriental mais présente une vaste répartition dans l'Indo-Ouest-Pacifique.

INTRODUCTION

Trapezia formosa, an obligate symbiont of pocilloporid reef corals, is one of four species of the genus that occur in the eastern Pacific region (Fig. 1). It was described from the Gulf of Panama (Smith 1869) and known from the southern Gulf of California in Mexico to northern Ecuador and the Galápagos Islands (Castro 1982, 1996). Castro (1982; 1996) suggested that several Indo-West Pacific records of *T. formosa* had resulted from erroneous identifications and that this species, like *T. corallina* Gerstaecker, 1857, was endemic to the eastern Pacific. Live specimens and museum collections were studied to resolve the taxonomic status of the species and to elucidate its geographic distribution. Holdings of the following institutions were the source of materials:

ASIZ	Academia Sinica, Taipei, Taiwan;
SMF	Forschungsinstitut Senckenberg, Frankfurt;
MNHN	Muséum national d'Histoire naturelle, Paris;
RMNH	Nationaal Natuurhistorisch Museum, Leiden;
BMNH	Natural History Museum, London;
LACM	Natural History Museum of Los Angeles County;
CBM	Natural History Museum and Institute, Chiba, Japan;
SAM	South African Museum, Cape Town;
CHCD	Taiwan Museum, Taipei;
USNM	U.S. National Natural History Museum, Washington;
ZRC	Zoology Reference Collection, National University of Singapore.

TAXONOMY AND GEOGRAPHIC DISTRIBUTION

Trapezia formosa Smith, 1869

Trapezia formosa Smith, 1869: 286 (Panama). — Castro 1996: 544, fig. 4 (synonymy and references for eastern Pacific populations). — Garth 1971: 188 (Maldives Islands). — Ribes 1978: 14 (La Réunion). — Dai *et al.* 1983: 252, 261, fig. 14C, pl. 4, fig. 8 (South China Sea). — Huber 1985: 23 (Marshall Islands). — Chang *et al.* 1987: 215 (Taiwan). — Dai & Yang 1991: 380, 387, fig. 187 (3), pl. 52, fig. 4 (South China Sea). — Castro 1997a: 81 (Coral Sea).

Trapezia digitalis var. *formosa* — Borradaile 1902: 265 (Maldives Islands).

Trapezia ferruginea — Tweedie 1950: 126 (Cocos (Keeling) Islands; part.) (not *Trapezia ferruginea* Latreille, 1828).

Trapezia bella — Serène 1984: 278, fig. 187, pl. 38, fig. F (La Réunion). (not *Trapezia bella* Dana, 1852) not *Trapezia formosa*: see synonymy for *Trapezia globosa* (Castro 1997b).

MATERIAL EXAMINED. — **Eastern Pacific.** Mexico, Clipperton Island, Costa Rica, Panama, Colombia, Ecuador, Galápagos Islands: see Castro (1996).

Marshall Islands. Enewetak Atoll, stn 197, 1965, coll. J. W. Knudsen: 1 ♂, 3 ♀♀ (LACM). — Stn 196, coll. J. W. Knudsen: 7 ♂♂, 10 ♀♀, 1 juv. (LACM); 5.VIII.1967, coll. J. W. Knudsen: 12 ♂♂, 9 ♀♀ (LACM).

Tuvalu. Onotoa Island, 7 m, 8.X.1951, coll. A. H. Banner: 1 ♂ (USNM).

Coral Sea. Chesterfield Islands, stn DW 92, 19°03.0'S - 158°53.93'E, *Corail 2*, ORSTOM, 8 m, 26.VIII.1988: 4 ♂♂, 4 ♀♀ (MNHN-B 25191).

Japan. Kii, Shionomisaki, on *Pocillopora damicornis*, 10-20 m, 25.V.1995, coll. K. Nomura: 1 ♂ (CBM). — Ryukyu Islands, Yoron Island, 22.VII.1967, coll. T. Sakai: 6 ♂♂, 3 ♀♀ (SMF 23339).

Taiwan. Orchid (Lan-Yu) Island, 26°03'N - 121°32'E, on *P. damicornis*, 6.I.1982, coll. Y.-S. Chen: 1 ♂, 1 ♀ (LACM 82-125.4); 21-22.III.1996: 1 ♀ (CHCD 1054). — Kenting National Park, 26.IV.1986, coll. M.-S. Jeng: 1 ♂, 1 ♀ (ASIZ); 17-20.IV.1996: 1 ♂, 1 ♀ (CHCD).

Guam. Pago Bay, on *Pocillopora meandrina* and *P. verrucosa*, 10-11.IX.1997, coll. P. Castro: 3 ♂♂, 5 ♀♀ (SMF).

Spratly (Nansha) Islands. Taiping Island, 114°22'E - 10°23'N, 20.IV.1994, coll. M.-S. Jeng: 3 ♂♂, 3 ♀♀, 1 juv. (ASIZ).

Indonesia. Ambon, stn 39, Rumphius Biohistorical Expedition, 0.5 m, 8.VII.1990, coll. M. Lavaleye: 1 ♀ (RMNH D 47108). — Stn 27, 26-27.XI.1990: 1 ♂ (RMNH D 47105), 2 ♀♀ (RMNH D 47106).

Cocos (Keeling) Islands. 1941, coll. C. A. Gibson-Hill: 1 ♂, 2 ♀♀ (ZRC 1997.777).

Kenya. Mombasa, Ras Iwatine, 4°01.3'S - 39°44'E, on *Stylophora*, 1 m, 27.II.1971, coll. A. J. Bruce: 1 ♂, 1 ♀ (BMNH). — Mombasa Island, 4°04.5'S - 39°40.5'E, coll. A. J. Bruce: 1 ♂ (BMNH). — Tiwi, 4°15'S - 38°36'E, 2 m, 1.III.1971, coll. A. J. Bruce: 1 ♀ (BMNH); 14.III.1972, coll. N. Bruce: 1 ♂ (MNHN-B 25292).

Seychelles. Aride Island, stn 711, 4°13'S - 55°40'E, NIOP-E Tyro Seychelles Expedition, on *P. verrucosa*, 19.XII.1992: 1 ♂ (RMNH D 47109). — Praslin Island, on small *Pocillopora*, 17.II.1972, coll. A. J. Bruce: 5 ♂♂, 6 ♀♀ (MNHN-B 25289). —

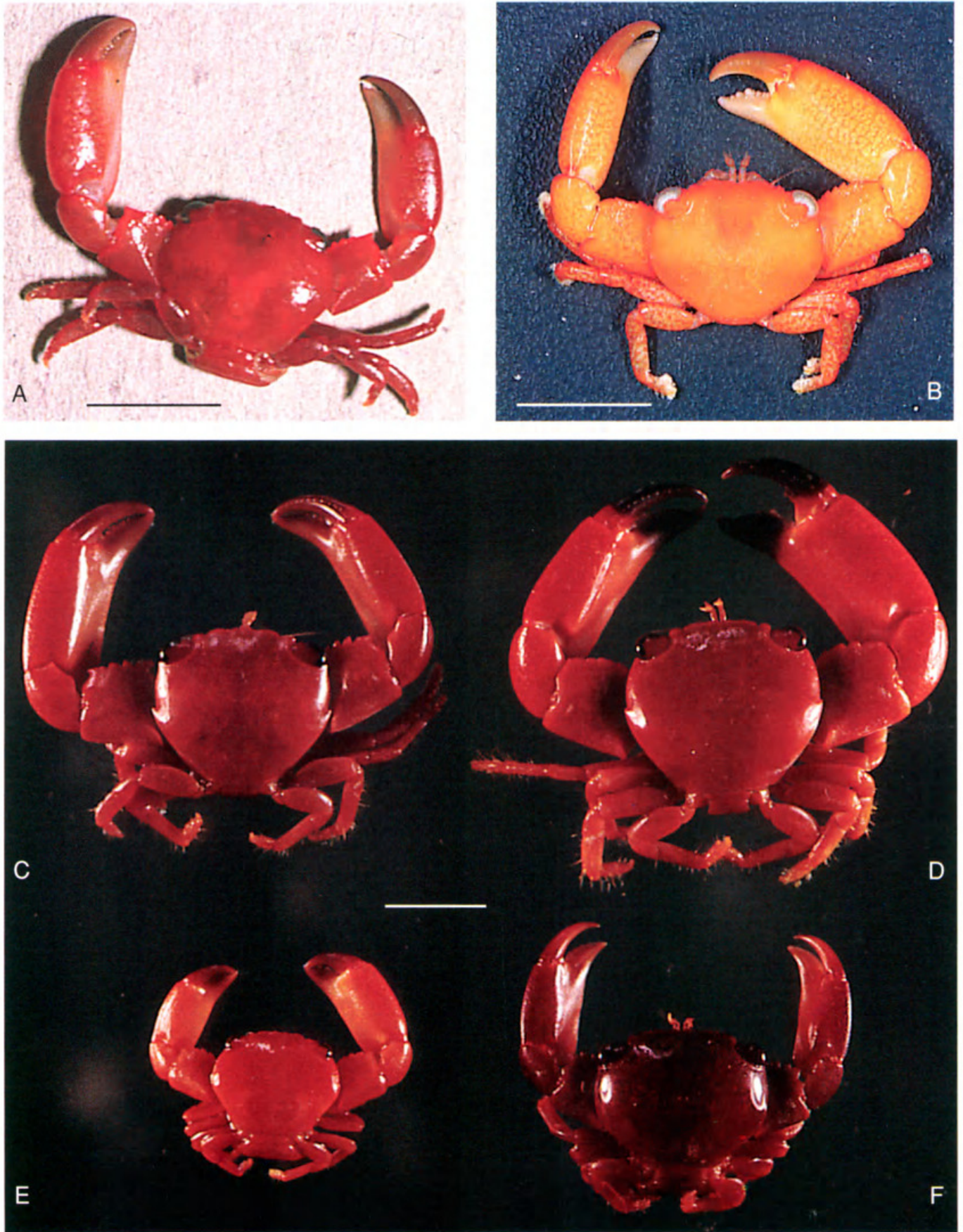


FIG. 1. — **A**, *Trapezia formosa* Smith, 1869: live specimen from Enewetak, Marshall Islands (photograph courtesy of M. Huber); **B**, *Trapezia formosa* Smith, 1869: live specimen from Arid Island, Seychelles (RMNH D 47109). **C-E**, Eastern Pacific species of *Trapezia* (preserved specimens from Gorgona Island, Colombia): **C**, *T. corallina* Gerstaecker, 1857 (top right); **D**, *T. ferruginea* Latreille, 1828 (top left); **E**, *T. formosa* Smith, 1869 (lower right); **F**, *T. digitalis* Latreille, 1828 (lower left). Scale bars: 1 cm.

Stn 27, 4°58'N - 54°59'E, *Reves* 2, ORSTOM, 25 m, 8.IX.1980: 1 ♂ (MNHN-B 25290). — Mahé Island, stn 612, 4°65'S - 55°31'E, NIOP-E *Tyro* Seychelles Expedition, reef flat and slope, on *P. verrucosa*, 12.XII.1992: 2 ♂ (RMNH D 47110). — Remire Reef, 12.II.1972, coll. A. J. Bruce: 1 ♂, 1 ♀ (MNHN-B 25288). — St François Atoll, stn 792, 7°05'S - 52°44'E, NIOP-E *Tyro* Seychelles Expedition, on *P. eydouxii*, outer slope, 5-6.I.1993: 1 ♂, 1 ♀ (RMNH D 47107); 1 ♂ (RMNH D 47111).

Aldabra Island. 1 ♂, 1 ♀ (MNHN-B 14034).

Îles Glorieuses. 16.IX.1958, coll. A. Crosnier & J. Millot: 2 ♂♂, 1 ♀ (MNHN-B 25291).

La Réunion. La Saline, on *P. verrucosa*, outer reef slope, 5 m, coll. S. Ribes: 1 ♂, 1 ♀ (MNHN-B 8345); on *Stylophora*, outer reef slope, 5 m, coll. S. Ribes: 3 ♂♂, 2 ♀♀ (MNHN-B 23096); on *P. verrucosa*, coll. S. Ribes: 1 ♂, 1 ♀ (MNHN-B 23097); on *P. verrucosa*, outer reef slope, 15 m, coll. S. Ribes: 2 ♂♂, 2 ♀♀ (MNHN-B 23098). — St Gilles, reef flat, 17.IX.1982, coll. M. de St Laurent: 1 ♀ (MHN 26).

Mozambique. Coconut Bay, 17.V.1973, coll. B. Kensley: 1 ♀ (SAM A43242).

DISCUSSION

Trapezia formosa, together with five other species (*T. bella* Dana, 1852, *T. cheni* Galil, 1983,

T. garthi Galil, 1983, *T. globosa* Castro, 1997 and *T. speciosa* Dana, 1852), is characterized by its small size, relatively thick chelipeds with short and stubby fingers, carapace with rounded anterolateral borders, reduced or absent epibranchial teeth and the absence, except in juveniles, of a suture between the second and third thoracic sternites. The six species are best differentiated by their colour patterns (see Castro 1997b). *T. formosa* is most common in small colonies and live coral fragments.

There are no morphological differences between Indo-West Pacific and eastern Pacific populations of *T. formosa*. Apparent differences in the morphology of the male gonopod were found to be a function of size. It becomes rounder with increasing size in all populations studied.

Slight colour differences, nevertheless, distinguish eastern Pacific populations from Indo-West Pacific ones. Examination of live individuals from Guam, freshly-preserved ones from Okinawa and colour photographs of live individuals from Taiwan (Fig. 2A, B), the Marshall Islands (Fig. 1A) and the Seychelles (Fig. 1B) shows that the carapace and chelipeds are bright

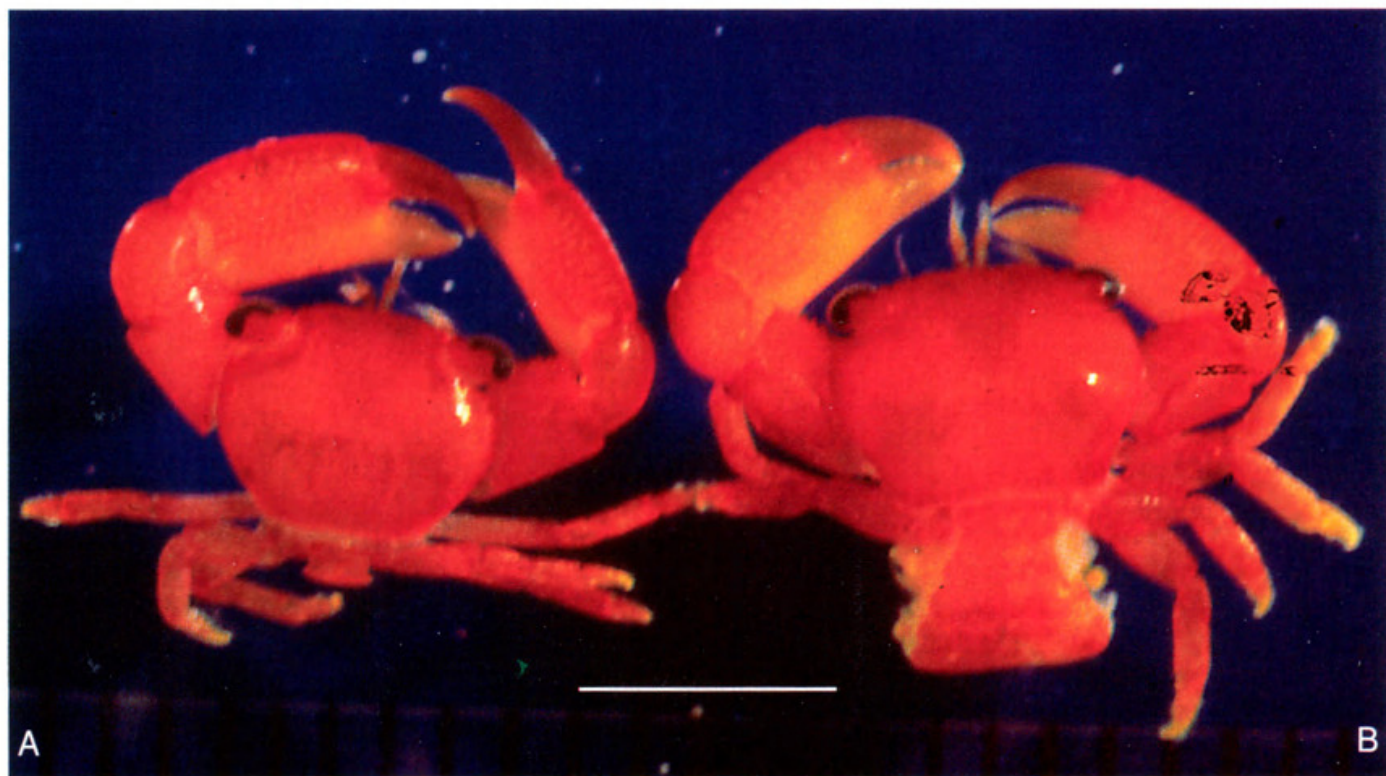


FIG. 2. — A, B, *Trapezia formosa* Smith, 1869: live specimens from Orchid Island, Taiwan (LACM 82-125.4). Scale bars: 1 cm.

orange throughout the range of the species. The walking legs of Indo-West Pacific individuals, however, show fine, net-like red lines, a character never reported from live eastern Pacific specimens (Castro 1996). Color photographs of live specimens from Panama and close observation of preserved specimens from this and other eastern Pacific locations revealed a similar, though not equally noticeable pattern. Another difference is that, with the exception of eastern Pacific and Guam individuals, the anterolateral and anterior borders of the carapace and anterior and distal borders of the cheliped merus and carpus are orange red. The colour of preserved specimens from the South China Sea was given as "orange red" with dark "net-like markings" on the dorsal surface of the appendages (Dai *et al.* 1983) and orange "outlined by dark orange lines" with an "obscure meshwork pattern" on the appendages (Dai & Yang 1991).

Throughout its range, *T. formosa* shows square to irregular orange red to dark brown reticulations that cover the upper half of the inner border of the cheliped propodus. The lower half is orange yellow; the fingers brown. The eyes are greenish grey. In spite of similarities in morphology and colour pattern, the genetic distance between Panama and Enewetak populations of *T. formosa* were found to be similar to genetic distance between morphologically close but distinct species of *Trapezia* (see Huber 1985). Little or no gene flow appears to take place between the Panama and Enewetak populations. Further studies of gene-enzyme systems and DNA may ultimately provide evidence to show that geographically isolated populations of *T. formosa* and other widely distributed species of trapeziids such as *T. ferruginea* Latreille, 1828 and *T. digitalis* Latreille, 1828 are genetically isolated species. These species could perhaps be distinguished by small differences in colour patterns, not by morphological characters used in traditional taxonomy.

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