

Crabs of the subfamily Ethusinae Guinot, 1977 (Crustacea, Decapoda, Brachyura, Dorippidae) of the Indo-West Pacific region

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Castro P. 2005. — Crabs of the subfamily Ethusinae Guinot, 1977 (Crustacea, Decapoda, Brachyura, Dorippidae) of the Indo-West Pacific region. *Zoosystema* 27 (3) : 499-600.

ABSTRACT

Brachyuran crabs belonging to the subfamily Ethusinae Guinot, 1977, family Dorippidae MacLeay, 1838, are adapted to carry bivalve shells or other objects on their backs by using the hooked dactyli of their last two pairs of pereopods (P4 and P5), which are dorsally located and mobile. Most species inhabit deep water and are infrequently collected. The taxonomy of the 57 known Indo-West Pacific species of ethusines is revised. The subfamily consists of three genera: *Ethusa* Roux, 1830, with 30 species of which four are being described as new, *Ethusina* Smith, 1884, with 25 species of which eight are new, and *Parethusina* Chen, 1997, with two species of which one is new. *Ethusa* and *Ethusina* are worldwide in distribution while *Parethusina* is exclusive to the Indo-West Pacific region. Seven nominal species described by other authors were found to be junior subjective synonyms of other species: *Ethusa major* Chen, 1993, of *Ethusa orientalis* Miers, 1886; *Ethusa makasarica* Chen, 1993, of *Ethusa hirsuta* McArdle, 1900; *Ethusa madagascariensis* Chen, 1987, of *Ethusa zurstrasseni* Doflein, 1904; *Ethusina investigatoris* (Alcock, 1896) and *E. alcocki* Ng & Ho, 2003, of *Ethusina robusta* Miers, 1886; *Ethusina insolita* Ng & Ho, 2003, of *Ethusina dilobotus* Chen, 1993; and *Ethusina saltator* Ng & Ho, 2000, of *Ethusina paralongipes* Chen, 1993.

KEY WORDS

Crustacea,
Decapoda,
Brachyura,
Dorippidae,
Ethusinae,
revision,
biogeography,
carrying behaviour,
Indo-West Pacific,
new species.

RÉSUMÉ

Crabes de la sous-famille Ethusinae Guinot, 1977 (Crustacea, Decapoda, Brachyura, Dorippidae) de la région indo-ouest pacifique.

Les crabes de la sous-famille Ethusinae Guinot, 1977, famille Dorippidae MacLeay, 1838, se trouvent pour la plupart dans des eaux profondes et sont rarement récoltés. Pour se camoufler, ils portent des coquilles de bivalves ou autres objets en utilisant les dactyles en crochet de leurs deux dernières paires de péripodes (P4 et P5), qui sont implantées dorsalement et mobiles. La

MOTS CLÉS
Crustacea,
Decapoda,
Brachyura,
Dorippidae,
Ethusinae,
révision,
biogéographie,
camouflage,
Indo-Ouest Pacifique,
nouvelles espèces.

taxonomie des 57 espèces connues de l'Indo-Ouest Pacifique est révisée. La sous-famille comprend trois genres : *Ethusa* Roux, 1830, avec 30 espèces dont quatre sont décrites comme nouvelles, *Ethusina* Smith, 1884, avec 25 espèces dont huit nouvelles, et *Parethusa* Chen, 1997, avec deux espèces dont une nouvelle. Les genres *Ethusa* et *Ethusina* sont cosmopolites, tandis que *Parethusa* n'a encore été trouvé que dans l'Indo-Ouest Pacifique. Sept espèces sont mises en synonymie avec d'autres espèces : *Ethusa major* Chen, 1993 avec *Ethusa orientalis* Miers, 1886 ; *Ethusa makasarica* Chen, 1993 avec *Ethusa hirsuta* McArdle, 1900 ; *Ethusa madagascariensis* Chen, 1987 avec *Ethusa zurstrasseni* Doflein, 1904 ; *Ethusina investigatoris* (Alcock, 1896) et *E. alcocki* Ng & Ho, 2003 avec *Ethusina robusta* Miers, 1886 ; *Ethusina insolita* Ng & Ho, 2003 avec *Ethusina dilobotus* Chen, 1993 ; et *Ethusina saltator* Ng & Ho, 2000 avec *Ethusina paralongipes* Chen, 1993.

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INTRODUCTION

Members of the subfamily Ethusinae Guinot, 1977, family Dorippidae MacLeay, 1838, are typically small and adapted to carry a bivalve shell, a piece of wood, and most probably other objects on their back with the help of the hooked dactyli of their last two pairs of pereopods (P4 and P5). Most ethusines inhabit deep water, rarely shallower than 100 m and as deep as 5046 m in the case of *Ethusina abyssicola* Smith, 1884 in the Caribbean Sea, which appears to be the deepest ever recorded for a brachyuran crab (Gore 1983). Most species of Ethusinae are found in the Indo-West Pacific region, and one of its three genera (*Parethusa* Chen, 1997), is exclusive of this region.

In contrast, members of the subfamily Dorippinae consist of larger, shallow-water (rarely deeper than 100 m) crabs where the subchelate P4 and P5 are used to carry objects as varied as sea anemones, sea urchins, bivalve shells, stalked barnacles, and leaves (Holthius & Manning 1990; Guinot *et al.* 1995). Both subfamilies are distributed through mostly tropical and subtropical waters of all major ocean basins comprising the Indo-West Pacific, Eastern Pacific, Mediterranean, and tropical Eastern and Western Atlantic biogeographical regions.

Ethusines are rarely collected because of their presence in mostly deep water and, with some exceptions, their small size. The first Indo-West Pacific species to be described was obtained from material collected by the U.S. Exploring Expedition (Stimpson 1858). Four additional species were described from collections made by the *Challenger* (Miers 1886), and six from material obtained by the *Investigator* off the Indian subcontinent (Alcock 1894, 1896; McArdle 1900). Collections made by the *Valdivia* yielded three new species (Doflein 1904), and one each from the *Albatross* (Rathbun 1906) and the *Siboga* (Ihle 1916b) expeditions. Five species were subsequently described from Japan (Parisi 1914; Sakai 1937), the Philippines (Sakai 1983b), and an additional one from the southwestern Indian Ocean (Kensley 1969). French expeditions across

the Indo-West Pacific sponsored by IRD (Institut de Recherche pour le Développement, the successor of Office de la Recherche scientifique et technique d'Outre-mer – ORSTOM) in cooperation with the Muséum national d'Histoire naturelle, Paris, provided material that resulted in the description of 22 species (Chen 1985, 1993, 1997, 2000). Some of these, however, have proven to be identical to species collected more recently. Six additional species were described as new from material collected by IRD expeditions to Taiwan (Ng & Ho 2003). IRD expeditions to the Solomon Islands, Fiji, Tonga, and French Polynesia made available the material that included nine of the 13 species being described in the present work, five from the Solomon Islands, two from Fiji, and two from French Polynesia.

The subfamily Ethusinae consists of three genera with a total of 57 described species. *Ethusa* Roux, 1830 is worldwide in distribution and includes 30 Indo-West Pacific species of which four are described here as new. *Ethusina* Smith, 1884 is also worldwide with 25 Indo-West Pacific species of which eight are new. *Parethusa* Chen, 1997 is exclusive to the Indo-West Pacific and consists of two species, one of which is new.

Seven nominal species described by other authors were found here to be junior subjective synonyms of other species: *Ethusa major* Chen, 1993 of *Ethusa orientalis* Miers, 1886; *Ethusa makasarica* Chen, 1993 of *Ethusa hirsuta* McArdle, 1900; *Ethusa madagascariensis* Chen, 1987 of *Ethusa zurstrasseni* Doflein, 1904; *Ethusina investigatoris* (Alcock, 1896) and *E. alcocki* Ng & Ho, 2003 of *Ethusina robusta* (Miers, 1886); *Ethusina insolita* Ng & Ho, 2003 of *Ethusina dilobotus* Chen, 1993; and *Ethusina saltator* Ng & Ho, 2000 of *Ethusina paralongipes* Chen, 1993.

Most ethusines still remain very rare. Of the 57 described species, five are known only from the holotype, four from two specimens, eight from three specimens, and 19 species from more than three but less than 10 specimens. Thirteen species are known only from male specimens, while five only from females. This significant disparity is puzzling and it remains unexplained.

Although important sexual dimorphism is characteristic of a few ethusines, it is still unlikely that most of these rare species known by specimens of one sex are synonymous of sexually dimorphic species known only by specimens of the opposite sex.

MATERIALS AND METHODS

Most of the material examined was collected by French expeditions in the Indo-West Pacific. The following publications give information on the various expeditions and the stations from which the material examined was collected: BATHUS 1 to BATHUS 4, HALIPRO 1 (Richer de Forges & Chevillon 1996); BIOCAL, BIOGEOCAL, CHALCAL 2, MUSORSTOM 4 to MUSORSTOM 6 (Richer de Forges 1990); BORDAU 1 (Richer de Forges *et al.* 2000b); CORINDON 2 (Moosa 1984); KARUBAR (Crosnier *et al.* 1997); LAGON, CHALCAL 1 (Richer de Forges 1991); MUSORSTOM 1 (Forest 1981); MUSORSTOM 2 (Forest 1985); MUSORSTOM 3 (Forest 1989); MUSORSTOM 5 (Richer de Forges *et al.* 1986); MUSORSTOM 7 (Richer de Forges & Menou 1993); MUSORSTOM 8 and 9 (Richer de Forges *et al.* 1996); MUSORSTOM 10 (Richer de Forges *et al.* 2000a); SAFARI 1 and 2 (Monniot 1984); SMIB 6 (Richer de Forges 1993). Information on stations, including collecting gear, on these and other recent expeditions (BORDAU 2, NORFOLK 1, TAIWAN 2000-2003, BENTHAUS, and PANGLAO 2004) is available on line (<http://www.tropicaldeepsabenthos.org>).

Some of the material examined included specimens previously identified by H. L. Chen but never listed in her publications. A large part of the material already listed in Chen's publications was not included among the material examined unless it was the type material or material that was re-identified.

All depth measurements originally given in the English system were converted into meters. Geographic names in English follow the orthography given in the eighth edition (2005) of *Atlas*

of the World (National Geographic Society, Washington, D.C., USA, iv + 134 p.).

Terms used to refer to the parts of the dorsal surface of the carapace and pereopods are indicated in Figure 1. Pereopods are referred to by the abbreviations P1 (chelipeds) and P2 to P5 (ambulatory legs, although the P5 are not used for walking in ethusines); the first and second pairs of male pleopods by G1 and G2 respectively. The measurements given on the text, unless specified, refer to carapace length (cl) and carapace width (cw). Carapace length was measured across the middle of the carapace from the posterior end of the median frontal sinus to the middle portion of the posterior border of the carapace. The width of the carapace was measured across the widest breadth of the carapace. The total lengths of the eye peduncles and the corneas of the eyes were measured along the main longitudinal axis of the ventral surface, from the location where the peduncle appears behind the antennae or orbit to the distal tip of the cornea. The total lengths of the articles of the first and second pairs of ambulatory legs (P2 and P3) were measured along the dorsal margins; width was measured across the middle of the articles. Unless missing, right pereopods were used in the measurements.

The position of the anterior border of the endostome in relation to the antennular fossae of the basal antennular articles was determined with specimens lying naturally on their back, without the ventral surface of the carapace being pushed up or down. The abdomen was treated as consisting of six somites and a telson.

ABBREVIATIONS

BMNH	The Natural History Museum, London;
CBM	Natural History Museum and Institute, Chiba;
IOAS	Institute of Oceanology, Academia Sinica, Qingdao;
MCSNM	Museo Civico di Storia Naturale di Milano;
MNHN	Muséum national d'Histoire naturelle, Paris;
NTOU	National Taiwan Ocean University, Keelung;
SAM	South African Museum, Cape Town;

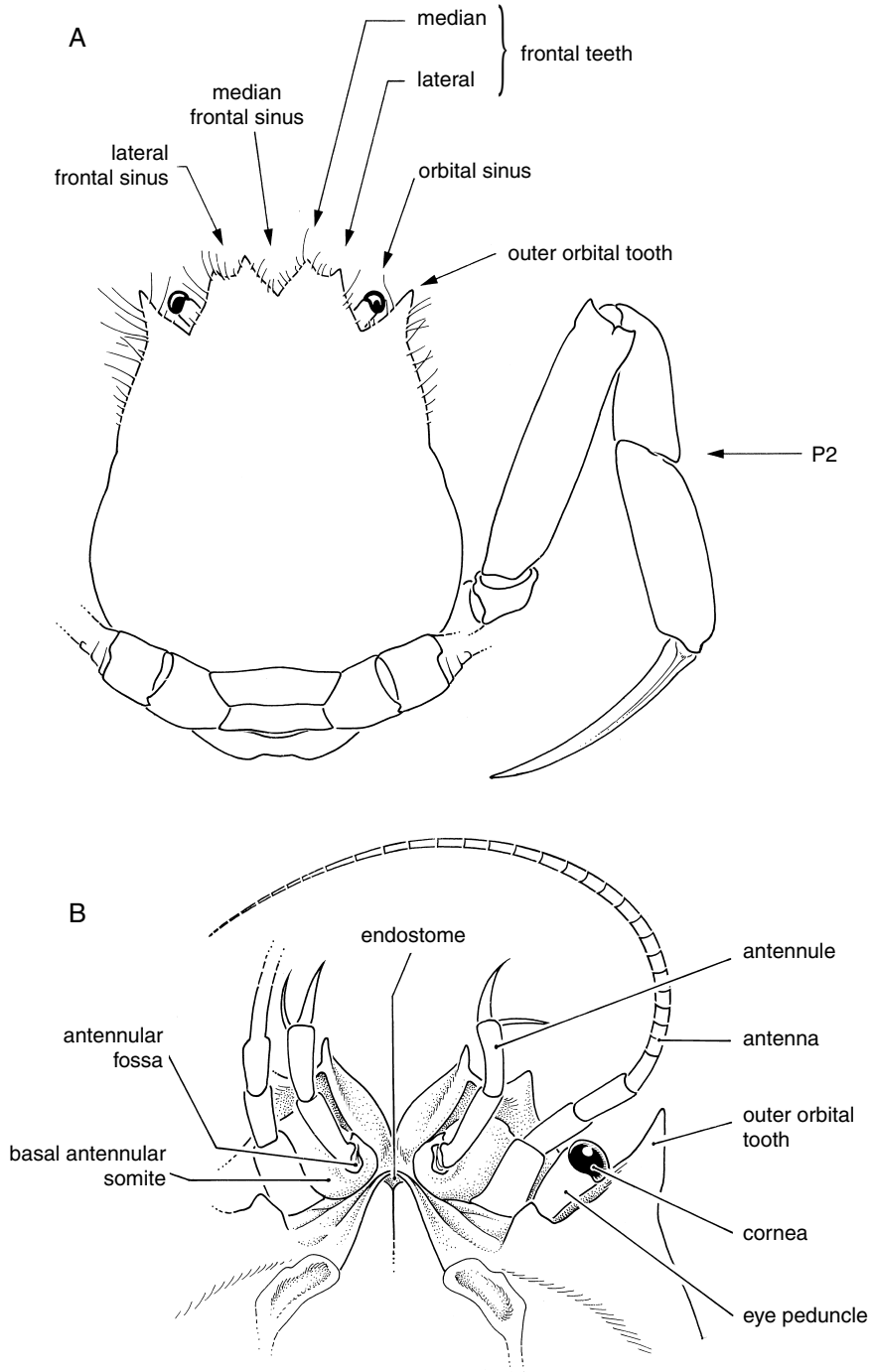


FIG. 1. — Terminology used to describe the carapace of members of the subfamily Ethusinae; **A**, dorsal surface of the carapace; **B**, ventral view of anterior portion of the body.

SMF	Forschungsinstitut Senckenberg, Frankfurt am Main;
USNM	United States National Museum, Smithsonian Institution, Washington, D.C.;
ZMA	Zöologisch Museum, Universiteit van Amsterdam;
ZMB	Museum für Naturkunde (Zoologisches Museum), Humboldt-Universität, Berlin;
ZMUC	Zoologisk Museum, University of Copenhagen;
ZRC	Zoological Reference Collection, Raffles Museum of Biodiversity Research, National University of Singapore.

SYSTEMATICS

Family DORIPPIDAE MacLeay, 1838

Dorypiens H. Milne-Edwards, 1837: 99 (vernacular).

Dorippiens H. Milne-Edwards, 1837: 151, 153 (vernacular).

Dorippina MacLeay, 1838: 69.

Dorippidae – White 1847: 53.

Dorippoidea – Glaessner 1969: R 492. — Guinot 1978: 214, 245; 1979b: 40. — Bowman & Abele 1982: 23. — Bellwood 1996: 186. — Martin & Davis 2001: 74. — Larghi 2004: 534.

KEY TO EXTANT SUBFAMILIES OF DORIPPIDAE

- P4, P5 each with a hook-like dactylus. Afferent branchial openings circular or oval. Cavity of each afferent branchial opening and arthroal cavity of P1 contiguous. Third maxillipeds with epipodite completely occluding afferent branchial opening; exopodite with multiarticulated flagellum. Sternal suture 5/6 straight, without concavity. Male abdomen narrow, with nearly parallel sides Ethusinae Guinot, 1977
- P4, P5 subchelate. Afferent branchial openings narrow, elongated. Cavity of each afferent branchial opening and arthroal cavity of P1 separated from each other. Third maxillipeds with epipodite not occluding afferent branchial opening; absence of a flagellum. Sternal suture 5/6 varying from somewhat straight to sharply curved, with concavity containing press-button (see Guinot & Bouchard 1998: fig. 16). Male abdomen triangular Dorippinae MacLeay, 1838

Subfamily ETHUSINAE Guinot, 1977

Dorippinae Alcock, 1896: 273, 274 (part).

Ethusinae Guinot, 1977: 1052; 1978: 249. — Manning & Holthuis 1981: 29, 38. — Guinot & Bouchard 1998: 651.

TYPE GENUS. — *Ethusa* Roux, 1830.

GENERA INCLUDED. — *Ethusa* Roux, 1830, *Ethusina* Smith, 1884, and *Parethusina* Chen, 1997.

DIAGNOSIS. — Afferent branchial openings circular or oval, placed against bases of chelipeds; cavity of each afferent branchial opening, arthroal cavity of P1 contiguous. Efferent branchial openings formed by triangular anterior prolongation of endostome. Sternal suture 5/6 straight, without concavity. Antennules long, projecting beyond fossae, obliquely folded. Third maxillipeds with epipodite completely occluding afferent branchial opening; exopodite with multiarticulated

flagellum. P2, P3 long, typically slender; P4, P5 shorter, directed dorsally over carapace; dactyli of P4, P5 short, curved, not subchelate (not pressing against tubercle on propodi). First three abdominal somites visible in dorsal view. Male abdomen with six somites plus telson, narrower than sternum, both sides nearly parallel to each other; somites 3-5 fused; locking mechanism with very low to medium-size tubercle at edge of thoracic sternite 5, shallow socket on underside (ventral surface) of abdominal somite 6. Soft, often basally enlarged penis emerging at end of penis tube extending from P5 coxa into thoracic sternite 8. G1 slender to slightly stout; G2 slender, as long as or slightly longer than G1. Abdomen of mature females rounded, broad; triangular in immature females. Vulvae on thoracic sternite 5, large, slightly raised, covered by movable membranes. Locking mechanism persists in adult females as two low to medium-sized tubercles at center of thoracic sternite 4, shallow concavity on underside (ventral surface) of abdominal somite 6.

REMARKS

The genera *Ethusa* Roux, 1830, and *Ethusina* Smith, 1884 were traditionally grouped together with *Dorippe* Weber, 1795, in the nominative subfamily of the Dorippidae. Serène & Romimohtarto (1969) subsequently divided the genus *Dorippe* into three genera and two subgenera, which were raised to genera by Manning & Holthuis (1981). Guinot (1977, 1978) recognized a second subfamily, the Ethusinae, for the genera *Ethusa* and *Ethusina*. A third genus,

Parethusa Chen, 1997, was more recently added.

The type species of both *Ethusa* and *Ethusina* (*Ethusa mascarone* (Herbst, 1785), and *Ethusina abyssicola* Smith, 1884, respectively) are Atlantic in distribution and are therefore not represented among the Indo-West Pacific species listed here. A revision of the Ethusinae, which would encompass the examination of Atlantic and eastern Pacific species, is therefore beyond the scope of this investigation.

KEY TO GENERA OF SUBFAMILY ETHUSINAE

1. Basal antennular article normal, not abnormally enlarged or swollen; eye peduncles, eyes visible dorsally. P2, P3 relatively stout, short, not extending well over frontal teeth when folded *Ethusa* Roux, 1830
 — Basal antennular article moderately or greatly enlarged, swollen, pushing eye peduncles laterally; eye peduncles and eyes usually not visible or only partially visible dorsally. P2, P3 relatively slender, long, extending over or well over frontal teeth when folded 2
2. Dorsal surface of carapace typically granular, with setae or short tomentum; distinct regions of carapace evident; four frontal teeth *Ethusina* Smith, 1884
 — Dorsal surface of carapace smooth, without conspicuous setae or tomentum; regions of carapace not distinct; two or four frontal teeth *Parethusa* Chen, 1997

Genus *Ethusa* Roux, 1830

Ethusa Roux, 1830: pl. 18. — H. Milne-Edwards 1837: 161. — Miers 1886: 328. — Alcock 1896: 281; 1899: 31. — A. Milne-Edwards & Bouvier 1902: 39. — Ihle 1916b: 137, 150 (list). — Balss 1922: 119; 1957: 1610. — Rathbun 1937: 77. — Monod 1956: 84. — China 1966: 255. — Serène & Lohavanijaya 1973: 33. — Guinot 1978: 249; 1979a: 103, 129, 139, 155; 1979b: fig. 2B1, 2B2, 2B3. — Manning & Holthuis 1981: 38. — Williams 1984: 268. — Hendrickx 1997: 61. — Chen & Sun 2002: 237.

Pridope Nardo, 1869: 307.

TYPE SPECIES. — *Cancer mascarone* Herbst, 1785, by subsequent designation (Fowler 1912: 590; see Holthuis 1962: 236; Melville & Smith 1987: 91). Gender: feminine. Name 1622 in Official List (China 1966).

DIAGNOSIS. — Dorsal surface of carapace granular, often tomentose; some regions distinct, limited by grooves. Four frontal teeth. Basal antennular article normal, not large, swollen. Eye peduncles relatively long, clearly “movable”, on inner margin of orbit, clearly visible dorsally. Anterior border of endostome, formed by efferent branchial channels, reaches various levels in relation to posterior border of antennular fossae, from well below fossae to well above it. P2, P3 relatively short (short and stout meri), not extending well over frontal teeth when folded.

REMARKS

The relative mobility of the eye peduncles should not be used to distinguish between *Ethusa* and *Ethusina* because of difficulties in determining their relative mobility (see Remarks for *Ethusina* below). Yet, the eye peduncles are clearly mov-

able when pushed in *Ethusa* due to their relatively greater length.

Serène & Lohavanijaya (1973) placed what they originally identified as *Ethusina gracilipes* Miers, 1886 in the genus *Ethusa* on the basis of the “ambiguity” in the characters they used to separate the two genera (i.e. the relative size of the basal antennular articles and eye peduncles). As a result, these authors placed *Ethusina* as a junior subjective synonym of *Ethusa* (see Remarks of *Ethusina* below).

Their specimen, although apparently lost, most probably belonged to *Ethusa indica* Alcock, 1894 (see Remarks of *E. indica* below).

The presence of arthrobranchs at the base of P3 in *Ethusa* and their absence in *Ethusina* (Smith 1884; A. Milne-Edwards & Bouvier 1902) is a variable character.

Rathbun (1897: 167) clarified the use of *Ethusa* instead of *Aethusa*, which was used by some of the earlier authors.

KEY TO INDO-WEST PACIFIC SPECIES OF *ETHUSA*

1. Anterior border of endostome extends below level of posterior (lower) border of antennular fossae of basal antennular articles, or at most, reaches posterior border of antennular fossae (Fig. 1B) 2
 - Anterior border of endostome extends above (beyond) posterior (lower) border of antennular fossae of basal antennular articles 24
2. Outer orbital teeth reaching higher or almost as high as lateral frontal teeth (at least 3/4 or more height of inner margin of orbital sinus) 3
 - Outer orbital teeth clearly not as high as lateral frontal teeth, only reaching 3/4 or less height of inner margin of orbital sinus 14
3. Outer orbital teeth reaching higher than frontal teeth; if equal or even slightly shorter than frontal teeth, outer orbital teeth slender (not triangular), horn-like, directed outwardly 4
 - Outer orbital teeth nearly as long (at least 3/4 height of inner margin of orbital sinus) as frontal teeth 5
4. Outer orbital teeth slender, acute, conspicuously directed outwardly (Fig. 33C; Chen 1985: figs 8, 9b). Orbital sinuses broad, U-shaped. Typically large-size (cl 15 mm or more) *E. indica*
 - Outer orbital teeth narrowly triangular, may be slightly directed outwardly (Chen 1993: fig. 2a, b). Orbital sinuses V-shaped. Known only from small (max cl 7.3 mm) individuals *E. crosnieri*
5. Dorsal surface of carapace, P2-P5 covered by varying amounts of hair (particularly conspicuous along anterior, anterolateral borders) or long tomentum (hair may be covered by sediment) 6
 - Dorsal surface of carapace naked or only covered by short, sparse setae 7
6. P4, P5 long, slender, with slender dactyli (Chen 1985: fig. 13). Outer orbital teeth typically directed inwardly. Dorsal surface of carapace with coarse granules *E. foresti*
 - P4, P5 relatively short, with short, thick dactyli (Chen 1985: fig. 11; Chen & Sun 2002: fig. 103.1). Outer orbital teeth typically directed outwardly. Dorsal surface of carapace with fine granules, varying amounts of hair *E. izuensis*

- 7. Carapace with lateral borders that are almost parallel to each other, diverging toward posterior border without conspicuous widening of posterior portion 8
- Carapace with lateral borders that diverge toward posterior border by forming noticeable or conspicuous enlargement of carapace on posterior portion, often pear-shaped in appearance (Fig. 2) 12
- 8. Outer orbital teeth not reaching height of frontal teeth; always slender, being longer than wide, slightly oriented outwardly. Western Indian Ocean in distribution 9
- Outer orbital teeth typically reaching height of frontal teeth (or are slightly shorter than frontal teeth); typically (but not exclusively) triangular, being as long as wide at base. Western Pacific Ocean in distribution 10
- 9. G1 each with broad, thick distal end (Chen 1987: fig. 5e) *E. sinespina*
- G1 each with slender distal end (Fig. 15; Chen 1987: fig. 3e, as *E. madagascariensis* Chen, 1987) *E. zurstrasseni*
- 10. G1 stout, each with attenuated distal end (Chen 1993: fig. 5f-h) *E. granulosa*
- G1 slender, each with pointed distal end 11
- 11. Distal end of each G1 with conspicuous notch (Chen 1993: fig. 7e) *E. magnipalmata*
- Distal end of each G1 smooth, without notch (Fig. 14B) *E. orientalis*
- 12. Outer orbital teeth oriented slightly outward, slender, narrow, acute tip *E. machaera* n. sp.
- Outer orbital teeth straight, triangular, proximal width being approximately equal to height 13
- 13. Lateral frontal sinuses U-shaped, nearly symmetrical, outer margins (inner margins of outer orbital teeth) straight (Fig. 2A; Chen 1985: fig. 5, as *E. sexdentata* (Stimpson, 1858)) *E. abbreviata* n. sp.
- Lateral frontal sinuses V-shaped, asymmetrical, outer margins (inner margins of outer orbital teeth) conspicuously swollen (Sakai 1937: fig. 1a; 1965: pl. 11, fig. 2; 1976: fig. 26a; Chen 1993: fig. 14a) *E. sexdentata*
- 14. Outer orbital teeth very short, less than 1/4 height of inner margin of orbital sinus 15
- Outer orbital teeth not reaching frontal teeth but more than 1/4 height of inner margin of orbital sinus 18
- 15. Outer orbital teeth located at outer margins of deep, V-shaped orbital sinuses. Carapace with lateral margins that strongly diverge toward posterior border, forming noticeable enlargement of posterior portion, pear-shaped in appearance (Sakai 1983b: fig. 1a) *E. philippinensis*
- Outer orbital teeth located at outer margins of L-shaped orbital sinuses. Carapace with parallel or near-parallel sides, square or rectangular in appearance 16
- 16. Frontal border with only two (lateral frontal) teeth and two median frontal lobes (Chen 1993: fig. 4a) *E. furca*
- Frontal border with four teeth (two lateral frontal and two median frontal) 17
- 17. Median frontal teeth reaching much higher than lateral frontal teeth; median frontal sinus much wider than lateral frontal sinuses (Fig. 9); outer orbital teeth very small, straight, not directed laterally *E. hawaiiensis*

- Median frontal teeth almost as high as lateral frontal teeth; median frontal sinus slightly wider than lateral frontal sinuses (Sakai 1937: fig. 1c; 1976: fig. 26c; Chen 1985: fig. 10a); outer orbital teeth conspicuous, directed outwardly *E. quadrata*
18. Lateral frontal teeth oriented outwardly (Chen 1997: fig. 4a); inner margins of outer orbital teeth (outer margins of orbital sinuses) sinuous, not straight, often making tips conspicuously narrower than rest of teeth *E. indonesiensis*
- Lateral frontal teeth straight; inner margins of outer orbital teeth (outer margins of orbital sinuses) straight or J-shaped, not sinuous, so that tip not conspicuously constricted 19
19. Orbital sinuses broad, U-shaped (Sakai 1977: fig. 1b; 1976: fig. 26b; Chen 1985: fig. 7a) *E. latidactyla*
- Orbital sinuses V-shaped 20
20. Outer orbital teeth straight (Chen 1997: fig. 3a) *E. dilatidens*
- Outer orbital teeth directed outwardly 21
21. P2, P3 relatively short, thick (Fig. 6A) *E. crassipodia* n. sp.
- P2, P3 slender, not conspicuously thick 22
22. G1 conspicuously bent or curved (Chen 1993: fig. 3e) *E. curvipes*
- G1 straight or only slightly sinuous 23
23. G1 each with small, slightly pointed tubercle at base of distal end (Chen 1993: fig. 13f) *E. pygmaea*
- G1 each with conspicuous, rounded tubercle at base of distal end, giving pleopods foot-like appearance (Chen 1993: fig. 12e) *E. parapygmaea*
24. Outer orbital teeth straight 25
- Outer orbital teeth not straight, directed outwardly or inwardly 27
25. Outer orbital teeth slender; orbital sinuses wide, U-shaped (Chen 1993: fig. 9a, as *E. makasarica* Chen, 1993) *E. hirsuta*
- Outer orbital teeth triangular; orbital sinuses narrow, V-shaped 26
26. Dorsal surface of carapace covered by very conspicuous, long hairs (Fig. 5A); carapace with lateral borders that diverge toward posterior border *E. barbata* n. sp.
- Dorsal surface of carapace without conspicuous, long hairs; carapace with lateral borders that are nearly parallel to each other (Fig. 4) *E. andamanica*
27. Outer orbital teeth directed inwardly (Chen 1993: fig. 11a, b) *E. obliquidens*
- Outer orbital teeth directed outwardly 28
28. Orbital sinuses U-shaped. Surface, margins of carapace with conspicuous granules (Chen 1997: fig. 5a, m) *E. longidentata*
- Orbital sinuses V-shaped (Sakai 1937: fig. 1e; 1965: pl. 11, fig. 2; 1976: fig. 26e; Chen 1993: fig. 10a). Surface of carapace with small granules *E. minuta*

Ethusa abbreviata n. sp.
(Fig. 2)

Ethusa sexdentata – Chen 1985: 185, figs 5, 6, pl. 2, figs 1, 2; 1997: 622. — Chen & Sun 2002: fig. 100 (not *E. sexdentata* (Stimpson, 1858)).

Ethusa makasarica – Chen 2000: 427 (not *E. makasarica* Chen, 1993 = *E. hirsuta* McArdle, 1900).

TYPE MATERIAL. — Holotype: ♂ cl 13.8 mm, cw 14.5 mm, MUSORSTOM 8, stn CP 1124 (MNHN-B 27505); paratypes: other six specimens from MUSORSTOM 8 (Vanuatu) listed under Material examined.

TYPE LOCALITY. — Vanuatu, north of Espiritu Santo island, 15°01.72'S, 166°56.51'E, 532-599 m.

MATERIAL EXAMINED. — **Philippine Islands.** South China Sea, MUSORSTOM 2, stn CP 36, 13°31'N, 121°24'E, 569-595 m, 24.XI.1980, 1 ♂ (MNHN-B 18173). — Stn CP 49, 13°38'N, 121°43'E, 416-425 m, 26.XI.1980, 2 ♂♂, 3 ♀♀ (MNHN-B 18172). — Stn CP 63, 14°31'N, 120°15'E, 215-230 m, 29.XI.1980, 1 ♀ (MNHN-B 18174).

Mindoro Strait. MUSORSTOM 3, stn CP 125, 11°57'N, 121°28'E, 388-404 m, 4.VI.1985, 3 ♂♂, 1 ♀ (MNHN-B 18879).

Bohol. Balicasag island, off Panglao island, tangle nets from local fishermen, XII.2000, 1 ♂ (ZRC 2001.0388).

Indonesia. Tanimbar Islands, KARUBAR, stn CP 79, 09°16'S, 131°22'E, 250-239 m, 3.XI.1991, 1 ♀, 1 ovig. ♀ (MNHN-B 22880).

Vanuatu. MUSORSTOM 8, stn CP 991, 18°51.26'S, 168°52.19'E, 936-910 m, 24.IX.1994, 2 ♂♂ cl 13.3 mm, cw 14.2 mm and cl 15.7 mm, cw 16.9 mm respectively (MNHN-B 27506). — Stn CP 1124, 15°01.72'S, 166°56.51'E, 532-599 m, 9.X.1994, 1 ♂ holotype (MNHN-B 27505), 3 ♂♂ cl 15.7 mm, cw 16.0 mm, cl 14.0 mm, cw 14.6 mm, and cl 14.5 mm, cw 15.5 mm respectively, 1 ♀ cl 17.0 mm, cw 18.2 mm (MNHN-B 28505).

New Caledonia. BATHUS 1, stn CP 663, 20°58.66'S, 165°38.27'E, 730-780 m, 13.III.1993, 2 juv. ♀♀ cl 13.6 mm, cw 14.4 mm and cl 13.3 mm respectively (MNHN-B 28502). — BATHUS 2, stn CP 739, 23°03.4'S, 166°59'E, 452-464 m, 13.V.1993, 1 ♀ cl 13.9 mm, cw 14.5 mm (MNHN-B 28503). — BATHUS 4, stn CP 950, 20°31.93'S, 164°56.11'E, 705-750 m, 10.VIII.1994, 1 ♂ cl 14.8 mm, cw 15.6 mm, 1 juv. ♂ cl 13.7 mm, cw 14.4 mm (MNHN-B 28504).

ETYMOLOGY. — From *brevis* (Latin for short) in reference to a short endostome where the anterior border lies well below the antennular fossae of the basal antennular articles.

DISTRIBUTION. — Philippine Is (Chen 1985, as *Ethusa sexdentata* (Stimpson, 1858)), Indonesia

(Tanimbar Is) (Chen 1997, as *E. sexdentata*), Vanuatu (Chen 2000, as *E. makasarica* Chen, 1993), and now from New Caledonia. Although Chen & Sun (2002: fig. 100) used the illustration of *E. abbreviata* n. sp. from Chen (1985: figs 5, 6, as *E. sexdentata*) in their compendium of primitive crabs from China, their text and records from China actually refer to *E. sexdentata*, not *E. abbreviata* n. sp. Depth: 215-936 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 15.7 mm, cw 16.9 mm (MNHN-B 27506); ♀ cl 17.0 mm, cw 18.2 mm (MNHN-B 28505).

DESCRIPTION

Carapace (Fig. 2A; Chen 1985: fig. 5, as *Ethusa sexdentata* (Stimpson, 1858)) slightly broader than long, particularly females; dorsal surface smooth in larger individuals, short setae in smaller ones; long hairs along anterior, anterolateral borders. Urogastric, cardiac regions slightly elevated, bordered by wide grooves; cervical, branchial grooves indistinct; two distinct, round depressions on protogastric region. Branchial regions slightly inflated along sides.

Anterior border of carapace (Fig. 2A; Chen 1985: fig. 5, as *E. sexdentata*) with slender to broad, nearly triangular, distally acute, straight outer orbital teeth, reaching or nearly reaching shorter frontal teeth. Frontal teeth nearly triangular, equal or nearly-equal. Orbital sinuses broad, U-shaped, nearly symmetrical (inner margins nearly straight, outer margins J-shaped) or symmetrical; lateral frontal sinuses U-shaped; median frontal sinus V-shaped, as wide as lateral frontal sinuses but narrower than orbital sinuses.

Anterior border of endostome (Fig. 2B; Chen 1985: fig. 6a, as *E. sexdentata*) lies below posterior border of antennular fossae of basal antennular articles.

Male chelipeds (P1) smooth (Chen 1985: fig. 6b, c, as *E. sexdentata*), unequal in holotype, equal in other specimens; larger cheliped of holotype with swollen propodi, 1.7 times fingers; fingers with broad cutting edges; smaller chelipeds (holotype) with slender propodi, 0.7-0.9 times fingers; fingers very slender, long, with broadly round teeth or cutting edges. Female chelipeds similar to smallest male cheliped.

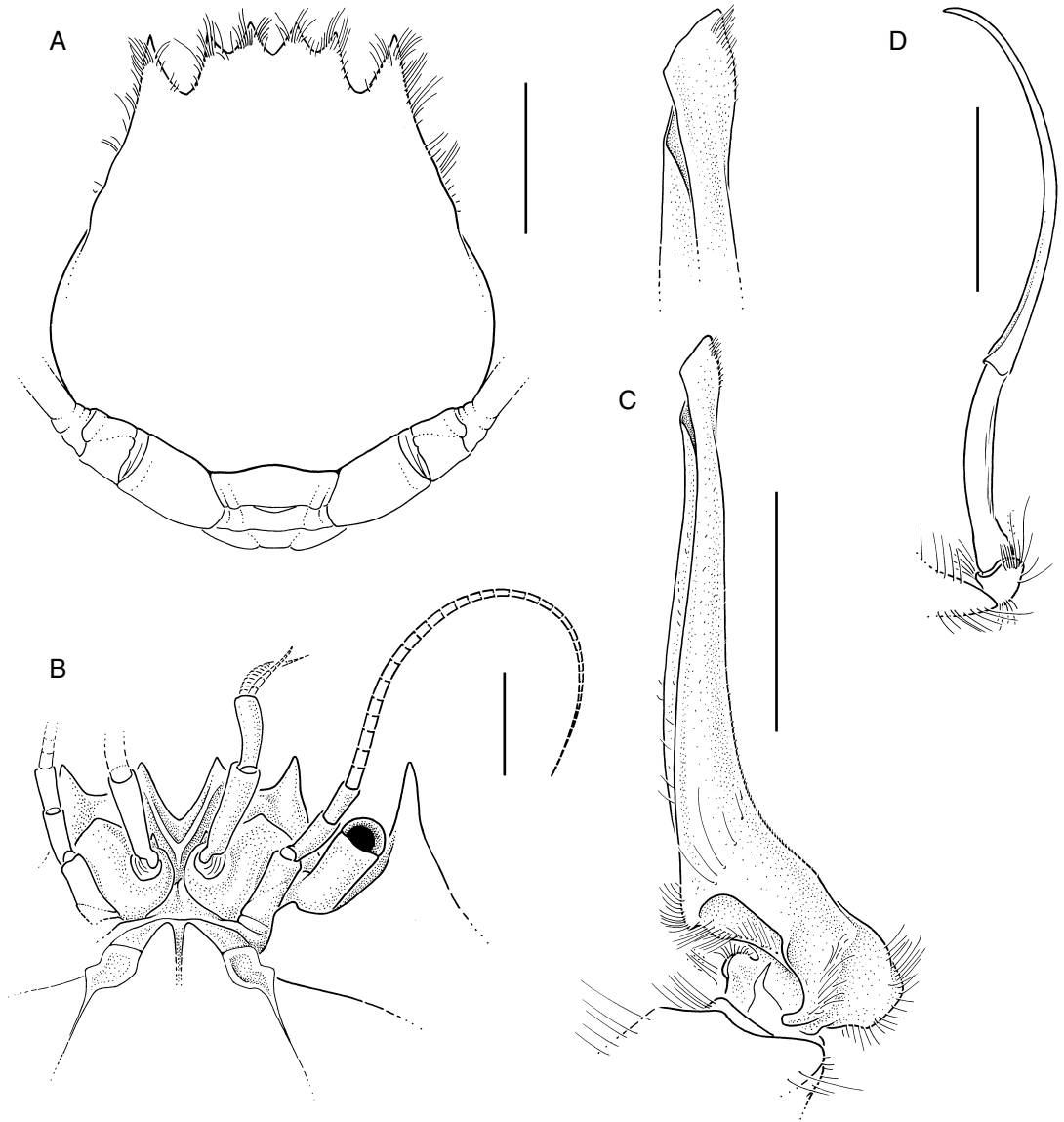


FIG. 2. — *Ethusa abbreviata* n. sp., ♂ holotype cl 13.8 mm, cw 14.5 mm, Vanuatu, N of Espiritu Santo, MUSORSTOM 8, stn CP 1124, 532–599 m (MNHN-B 27505); **A**, dorsal surface of carapace; **B**, ventral view of anterior portion of body; **C**, left G1, dorsal views; **D**, left G2, dorsal view. Scale bars: A, 5 mm; B–D, 2 mm.

P2, P3 relatively short, very thick; meri with small granules; length of P2 meri 0.8–1.0 times cl, P2 meri 3.8–4.6 times longer than broad. P4, P5 with few short hairs on dactyli, propodi; P5 dactyli thick, curved.

Male abdomen (Chen 1985: fig. 6d, as *E. sexdentata*) with four somites (3–5 fused, basal half swollen), triangular telson. Somite 1 length 2.3 times as broad, somite 6 square, slight swelling at each outer corner of distal margin. Female

abdomen (Chen 1985: fig. 6e, as *E. sexdentata*) with six somites, triangular telson; somite 4 broadest, somite 6 longest.

G1 (Fig. 2C; Chen 1985: fig. 6f, g, i, as *E. sexdentata*) slender; each distal end slightly broad and pointed, short spines along dorsal margin; G2 (Fig. 2D; Chen 1985: fig. 6h, as *E. sexdentata*) slender, thin, each distal part narrower, pointed tip.

REMARKS

Ethusa abbreviata n. sp. is very close to *Ethusa hirsuta* McArdle, 1900, in the shape of the anterior border of the carapace, most particularly in the nearly triangular but relatively slender outer orbital teeth that reach nearly as high as the frontal teeth. *Ethusa abbreviata* n. sp. can be distinguished from *E. hirsuta* by having narrower (nearly U-shaped), symmetrical orbital sinuses (Fig. 2A) whereas they are wide, V-shaped and asymmetrical in *E. hirsuta* (Chen 1993: fig. 9a, as *Ethusa makasarica* Chen, 1993, a junior subjective synonym of *E. hirsuta* McArdle, 1900). The most significant difference is that the anterior border of the endostome of the new species extends far below the antennular fossae of the basal antennular articles (Fig. 2B). It extends above the level of the antennular fossae in *E. hirsuta*. Another difference is that the meri of P2 and P3 are clearly thicker and shorter in the new species than in *E. hirsuta*. There are also some slight differences in the G1, which are of similar shape in both species but in *E. abbreviata* n. sp. the distal ends have more numerous and abundant spines (Fig. 2C) than those of *E. hirsuta* (Chen 1993: fig. 9g, h, as *E. makasarica*).

There are also close similarities with *Ethusa sexdentata* (Stimpson, 1858), another large-size species. Both species share a similar shape of carapace (smooth dorsal surface with hairs restricted to the anterior border in the largest specimens), relatively short and thick pereopods, and short anterior border of the endostome. In fact, specimens from the Philippines (Chen 1985) and Indonesia (Chen 1997) were previously identified by Chen as *E. sexdentata*. *Ethusa abbreviata* n. sp. can be easily distinguished from *E. sexden-*

tata, however, by its slender outer orbital teeth (wider at the base in *E. sexdentata*) and broader, U-shaped, symmetrical or nearly symmetrical orbital sinuses (V-shaped and asymmetrical, the outer margins of the sinuses being conspicuously swollen, in *E. sexdentata*; Sakai 1937: fig. 1a; 1976: fig. 26a; Chen 1986: fig. 8-36). The posterior portion of the carapace is slightly wider in *E. sexdentata*, giving it a rounded appearance (Sakai 1976: pl. 23, fig. 1; 1965: pl. 11, fig. 2; Miyake 1983: pl. 6, fig. 5). The anterior border of the endostome is shorter in *E. abbreviata* n. sp. (Fig. 2B; Chen 1985: fig. 6a, as *E. sexdentata*) than in *E. sexdentata* (Ikeda 1998: pl. 16, fig. 6). There are also similarities with *Ethusa indica* Alcock, 1894, particularly in specimens of *E. indica* where the outer orbital teeth are not as slender and outwardly directed as in typical specimens. *Ethusa indica*, however, has noticeably longer and more slender P2 and P3 (Fig. 33C). Specimens may also be confused with *Ethusa orientalis* Miers, 1886, because of the general shape of the carapace and relatively large size (Fig. 14A). In contrast to *E. abbreviata* n. sp., however, *E. orientalis* has broader, strongly triangular outer orbital teeth, a granular carapace, and a slightly longer anterior border of the endostome.

Ethusa cf. *abbreviata*

(Fig. 3)

MATERIAL EXAMINED. — **Solomon Islands**, SALOMON I, stn CP 1783, 08°32.8'S, 160°41.7'E, Wof Molaita, 399-700 m, 29.IX.2001, 2 juv. ♂♂ cl 7.6 mm, cw 7.7 mm and cl 7.5 mm, cw 7.5 mm respectively, 1 juv. ♀ cl 7.5 mm, cw 7.6 mm (MNHN-B 28702).

REMARKS

Three juvenile specimens from the Solomon I shared several characters with *Ethusa abbreviata* n. sp., in particular, a short endostome in which the anterior end is well below the posterior border of the antennular fossae of the basal antennular articles, relatively short and thick P2 and P3 (length of P2 meri 0.8-0.9 times cl, P2 meri 4.6 times longer than broad; 0.8-1.0 and 3.8-4.6

respectively for *E. abbreviata* n. sp.), and broad orbital sinuses.

There are, however, some differences. The outer orbital teeth are triangular and relatively broad and the orbital sinuses are slightly V-shaped (Fig. 3A), while the outer orbital teeth are long and slender and the orbital sinuses U-shaped in *E. abbreviata* n. sp. (Fig. 2A). The G1 (Fig. 3B) are undeveloped and as such of little help in the identification of the specimens. Since all of the material identified as *E. abbreviata* n. sp. is of a relatively large size (males cl 13.3 mm to 15.7 mm, cw 14.2 mm to 16.0 mm; females cl 13.6 mm to 17.0 mm, cw 14.4 mm to 18.2 mm) some of the differences may be due to size. The material is thus left undescribed but with the anticipation that the finding of intermediate-size specimens will help elucidate its identity.

Ethusa andamanica Alcock, 1894

(Fig. 4)

Ethusa andamanica Alcock, 1894: 405; 1896: 284; 1899: 33. — Kemp & Newell 1912: 27. — Ihle 1916b: 153 (list), 155 (list).

Aethusa andamanica – Alcock & Anderson 1895: pl. 14, fig. 8.

?*Ethusa andamanica* – Doflein 1904: 27, 291 (list), pl. 13, figs 7, 8, 64. — Parisi 1914: 302, figs 3, 4.

TYPE MATERIAL. — Unknown (Zoological Survey of India, Calcutta?). The description was based on a male specimen (Alcock 1894: 405), but Alcock (1899) refers to a female specimen. It is not clear if male specimens were not available or if the absence of a male alluded (Alcock 1899: 34) was due to the absence of chelipeds and the second pair of pereopods in a male specimen and not to a male specimen. Kemp & Newell (1912: 29) refer to the “types” of the species. A juvenile female collected by the *Investigator* (stn 238, 13.IV.1898), originally at the Indian Museum but now deposited at BMNH (cl 6.8 mm, cw 7.1 mm; BMNH 1939.9.20.10) carries the label “type”. None of the two specimens measured by Alcock (1894, 1899), however, agree with the size of the BMNH specimen.

TYPE LOCALITY. — Andaman Sea, 362-402 m.

MATERIAL EXAMINED. — **Andaman Sea.** *Investigator*, stn 238, 13°16'N, 93°8'E, 110-137 m, 13.IV.1898, “type”, Indian Museum, 1 juv. ♀ cl 6.8 mm, cw 7.1 mm (BMNH 1939.9.20.10).

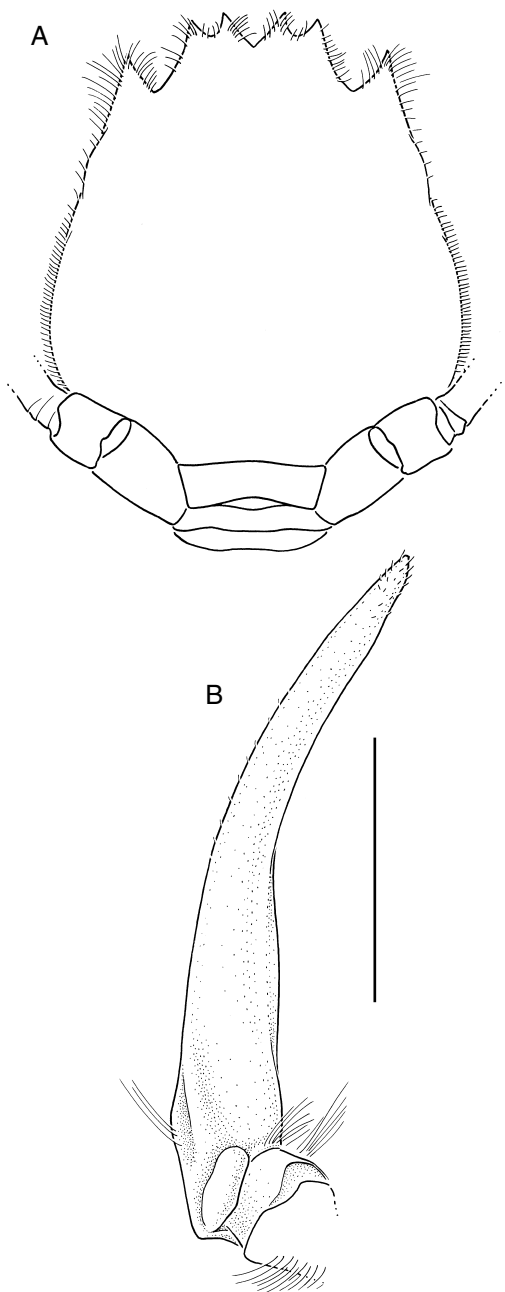


FIG. 3. — *Ethusa* cf. *abbreviata*, juv. ♂ cl 7.6 mm, cw 7.7 mm, Solomon Islands, N of Guadalcanal, SALOMON 1, stn CP 1783, 399-700 m (MNHN-B 28702); **A**, dorsal surface of carapace; **B**, left G1, dorsal view. Scale bars: A, 5 mm; B, 1 mm.

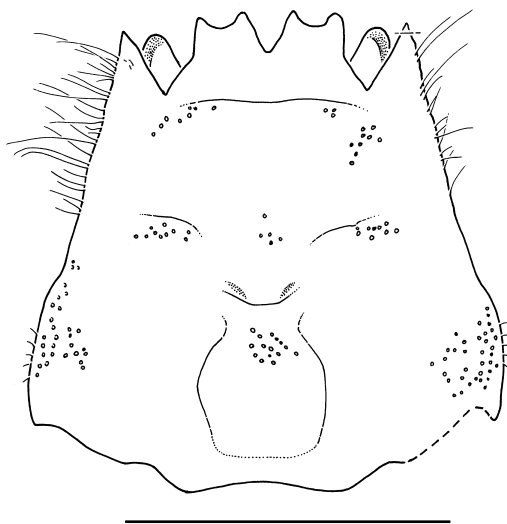


FIG. 4. — *Ethusa andamanica* Alcock, 1894, juv. ♀ “type” cl 6.8 mm, cw 7.1 mm, Andaman Sea off Andaman Islands, *Investigator*, stn 238, 110-137 m (BMNH 1939.9.20.10), dorsal surface of carapace. Scale bar: 5 mm.

?Gulf of Aden. *Meteor*, cruise 5, stn 287 Ku, 12°16'N, 44°8.5'E, 472-479 m, 16.III.1987, 1 juv. ♂ (SMF 29342).

DISTRIBUTION. — Off southwestern India (Kemp & Newell 1912), Andaman Sea (Alcock 1894), and Nicobar Is (Doflein 1904); questionably from Japan (Parisi 1914) and the Gulf of Aden. Depth: 110-439 m (530 m in Doflein 1904) (Fig. 34).

SIZE. — Maximum size: ♀ cl 10 mm (Kemp & Sewell 1912).

REMARKS

Alcock (1894) described the species from the Andaman Sea and placed it close to *Ethusa orientalis* Miers, 1886, and, ultimately, as a “variety” of *E. orientalis* (Alcock 1899: 34). Unfortunately, the description (Alcock 1894), later re-descriptions (Alcock 1896, 1899; Kemp & Newell 1912), and the illustration of the species (Alcock & Anderson 1895) were rather brief and there was no mention of the morphology of the anterior border of the endostome.

The similarities between the shape of the carapace of *E. andamanica* and *E. orientalis* (Fig. 14A) are indeed very close. Also similar are the relatively short and thick pereopods. The

only differences given by Alcock (1894: 405) were the presence in *A. andamanica* of a smooth carapace, not well defined cervical and branchio-cardiac grooves, and outer orbital teeth that were “not so prominent in relation to the front”. It is not known if the type material is extant but a juvenile female missing all pereopods (cl 6.8 mm, cw 7.1 mm; BMNH 1939.9.20.10) that was collected by the *Investigator* in the Andaman Sea off the Andaman Is and that carries the label “type” (see above) allowed the examination of the endostome. The extension of the anterior border of the endostome above the antennular fossae of the basal antennular articles, in contrast to a shorter endostome that just reaches to the basal antennular articles in *E. orientalis* (Miers 1886: pl. 28, fig. 1a), plus the characters given by Alcock (1894), confirms the status of *E. andamanica* as a separate species.

Doflein (1904: 27) lists additional differences between the males of *E. andamanica* and *E. orientalis*, although the characters could not be confirmed due to the disappearance of Doflein’s male specimen from ZMB and the lack of an adult male specimen of *E. andamanica*. Furthermore, doubts about the identity of Doflein’s specimen as *E. andamanica* were raised by Kemp & Sewell (1912: 29), who had studied the type material of the species. Doflein’s specimen was collected from the Nicobar Is, near the type locality. Although the position of the anterior border of the endostome as shown in Doflein’s photographs (Doflein 1904: pl. 13, figs 7, 8) agrees with the purported type at BMNH, the shape of the outer orbital teeth does not. They are slender, not triangular as in the BMNH specimen and Alcock’s figure (Alcock & Anderson 1895: pl. 14, fig. 8).

Balss (1922: 120) considered *E. andamanica* a junior subjective synonym of *Ethusa sexdentata* (Stimpson, 1858), solely on the basis of its description and illustration (Alcock & Anderson 1895: pl. 14, fig. 8) since there is no evidence that he examined the type material. Balss’ decision was seen by him as so obvious that “it did not need much explanation” (“bedarf keiner langen Beweisführung”). The synonymy was followed by most authors (Sakai 1937, 1976; Chen 1985,

1986, 1993, 1997), even if there were some reservations (Nagai 1995: 59). The most obvious difference between the two species is the broadly triangular outer orbital teeth of *E. sexdentata*. Also diagnostic and clearly visible in the illustration of *E. andamanica* that Balss referred to (Alcock & Anderson 1895: pl. 14, fig. 8) are the almost straight lateral borders that result from branchial regions that “do not bulge laterally”. In *E. sexdentata* the sides of the branchial regions are conspicuously inflated (Sakai 1976: pl. 23, fig. 1; 1965: pl. 11, fig. 2; Miyake 1983: pl. 6, fig. 5; Chen 1985: fig. 5). Similar to *E. sexdentata*, however, are the long hairs along the margins of the frontal teeth.

There are strong similarities between *E. andamanica* and *E. crassipodia* n. sp. Both have relatively short and thick P2 and P3 but there are important differences (see description of *E. crassipodia* n. sp. below). The nearly parallel sides of the carapace and triangular outer orbital teeth of *E. andamanica* are similar to those of *E. izuensis* Sakai, 1937, and *E. zurstrasseni* Doflein, 1904. These two species can be differentiated from *E. andamanica* because the frontal teeth are narrower and the pereopods noticeably shorter and stouter in *E. izuensis*, while the carapace is more granular, the frontal teeth longer, and the outer orbital teeth narrower and pointed in *E. zurstrasseni*.

A specimen from Sagami Bay, Japan, that was identified as *E. andamanica* by Parisi (1914) could not be examined. It is most probably a misidentification since the species has never been recorded from Japan. A juvenile male from the Gulf of Aden (cl 5.7 mm, cw 5.4 mm; SMF 29342) was questionably assigned to *E. andamanica*. The outer orbital teeth were shorter than in the BMNH specimen and Alcock's figure but their tips were much narrower as that shown in the left tooth of Alcock's figure.

Ethusa barbata n. sp.
(Fig. 5)

TYPE MATERIAL. — Holotype: juv. ♀ cl 6.8 mm, cw 6.9 mm, SALOMON 1, stn CP 1804 (MNHN-B 28707).

TYPE LOCALITY. — Solomon Islands, north of Guadalcanal island, 09°32.0'S, 160°37.4'E, 309-328 m.

MATERIAL EXAMINED. — **Solomon Islands.** SALOMON 1, stn CP 1804, 09°32.0'S, 160°37.4'E, 309-328 m, 2.X.2001, 1 ♀ holotype (MNHN-B 28707).

ETYMOLOGY. — From *barba* (Latin for beard) in reference to the very conspicuous and long setae on the dorsal and most of the ventral surfaces of the carapace and on the pereopods.

DISTRIBUTION. — Known only from the Solomon Islands. Depth: 309-328 m (Fig. 34).

SIZE. — Maximum size: ♀ cl 6.8 mm, cw 6.9 mm (MNHN-B 28707), ♂ unknown.

DESCRIPTION

Carapace of females (males unknown) almost as broad as long; dorsal surface covered by very conspicuous, long, abundant hair (consisting of simple plumose setae), particularly longer (up to 1.9 mm) along anterolateral borders (Fig. 5A). Urogastric, cardiac, branchial regions elevated, covered by slightly longer hair consisting mostly of plumose setae. Branchial regions slightly inflated along sides. Lateral borders diverge toward posterior border.

Anterior border of carapace (Fig. 5A) with proximally broad outer orbital teeth with slender, straight tips, not reaching slightly shorter frontal teeth. Frontal teeth short, broadly triangular, nearly equal. Orbital sinuses broad, V-shaped, asymmetrical (inner margins steeper than outer margins); lateral frontal sinuses shallow, U-shaped; median frontal sinus V-shaped, about as wide as lateral frontal sinuses, narrower than orbital sinuses.

Anterior border of endostome (Fig. 5B) well above anterior border of antennular fossae of basal antennular articles, reaching ventral fold of median frontal sinus.

Female chelipeds (P1) (males unknown) small, slender, smooth, nearly equal; dorsal and ventral margins of all articles with simple and plumose setae, number and relative length increasing proximally; fingers 1.1 times longer than propodus, with very short, rounded teeth.

P2, P3 relatively short; dorsal, ventral margins of all articles with simple plumose setae; length of

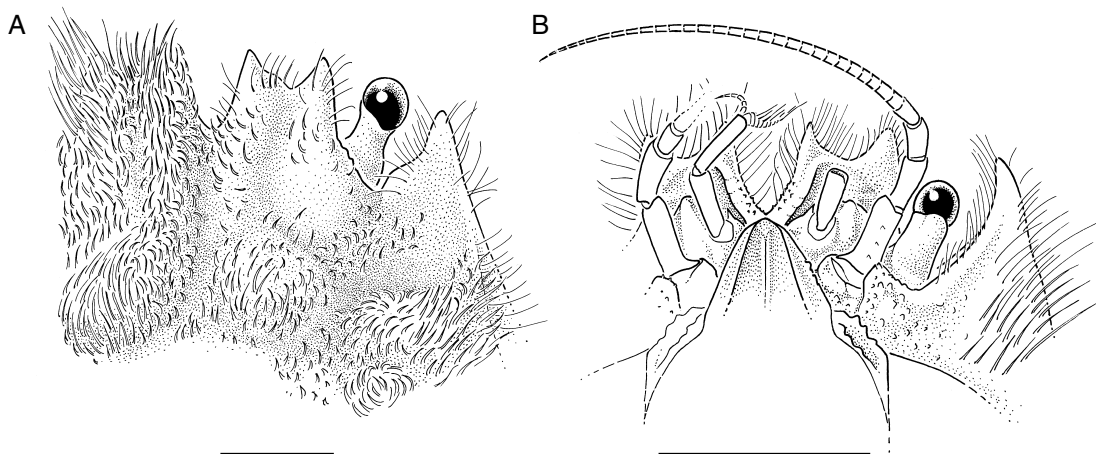


FIG. 5. — *Ethusa barbata* n. sp., juv. ♀ holotype cl 6.8 mm, cw 6.9 mm, Solomon Islands, N of Guadalcanal, SALOMON 1, stn CP 1804, 309-328 m (MNHN-B 28707); **A**, frontolateral portion of dorsal surface of carapace, most setae removed along right anterior margin; **B**, ventral view of anterior portion of carapace. Scale bars: A, 1 mm; B, 2 mm.

P2 meri 1.5 times cl, 4.6 times longer than broad. P4, P5 covered with long, mostly plumose setae, P5 dactyli thick, slightly curved.

Female abdomen (males unknown), with six somites, somites 1-4 covered with short setae, triangular telson with broadly rounded tip; somite 3 broadest, somite 6 longest.

REMARKS

Ethusa barbata n. sp. is being described as a new species even if it is known from only a small female. This female clearly does not belong to any of the seven species of *Ethusa* known so far only from males: *E. crassipodia* n. sp., *E. curvipes* Chen, 1993, *E. furca* Chen, 1993, *E. indonesiensis* Chen, 1997, *E. magnipalmata* Chen, 1993, *E. parapygmaea* Chen, 1993, and *E. philippinensis* Sakai, 1983. Its very conspicuous pubescence is shared with three other species of *Ethusa* (*E. foresti* Chen, 1985, *E. hirsuta* McArdle, 1900, and *E. izuensis* Sakai, 1937) that show a generalized, although not as conspicuous, pubescence over the carapace. None of these three species, however, show the straight, basally expanded, and short outer orbital teeth as well as an endostome with its anterior border that reaches as high as the ventral fold of the median frontal sinus, both characters diagnostic to *E. barbata* n. sp.

Ethusa crassipodia n. sp.

(Fig. 6)

TYPE MATERIAL. — Holotype: ♂ cl 11.0 mm, cw 10.7 mm, SALOMON 1, stn CP 1992 (MNHN-B 28736); paratype: ♂ cl 9.3 mm, cw 8.9 mm, SALOMON 1, stn CP 1783 (MNHN-B 28701).

TYPE LOCALITY. — Solomon Islands, east of Malaita island, 08°32.8'S, 160°41.7'E, 399-700 m.

MATERIAL EXAMINED. — **Solomon Islands.** SALOMON 1, stn CP 1783, 08°32.8'S, 160°41.7'E, 399-700 m, 29.IX.2001, 1 ♂ paratype (MNHN-B 28701). — Stn CP 1792, 09°15.4'S, 160°08.9'E, 477-505 m, 30.IX.2001, 1 ♂ holotype (MNHN-B 28736).

ETYMOLOGY. — From *crassus* (Latin for thick, stout) and *pedis* (Latin for feet) in reference to the characteristically thick, stout P2-P5.

DISTRIBUTION. — Known only from the Solomon Is. Depth: 399-700 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 11.0 mm, cw 10.7 mm (MNHN-B 28736), ♀ unknown.

DESCRIPTION

Carapace of males (females unknown) slightly longer than broad (Fig. 6A); hepatic region granular, rest smooth; short hairs along anterior border, long along anterolateral borders. Urogastric, cardiac regions elevated, bordered by conspicuous grooves; cervical, branchial grooves indistinct;

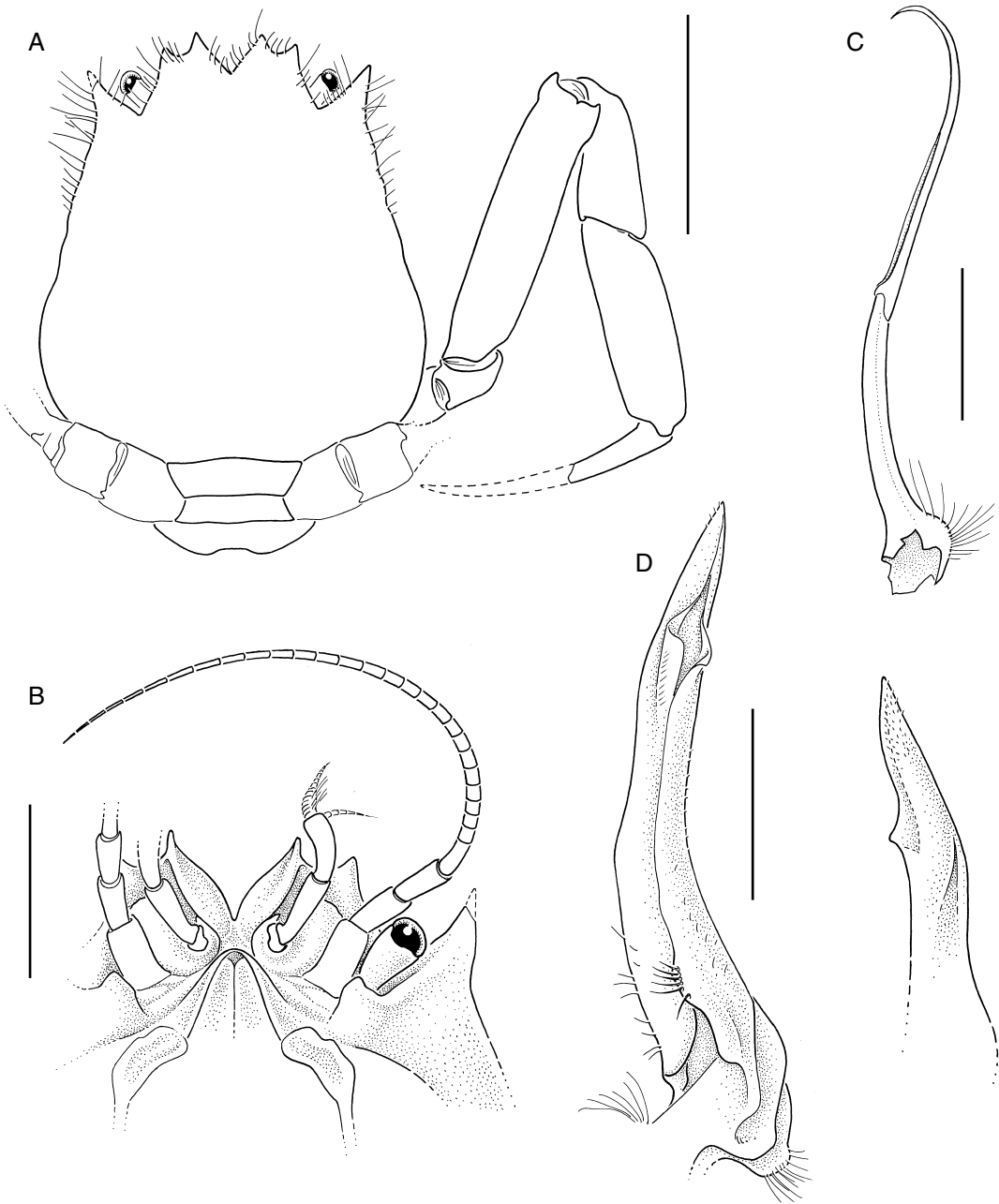


FIG. 6. — *Ethusa crassipodia* n. sp., ♂ paratype cl 9.3 mm, cw 8.9 mm, Solomon Islands, E of Malaita, SALOMON 1, stn CP 1783, 399-700 m (MNHN-B 28701); **A**, dorsal surface of carapace and P2; **B**, ventral view of anterior portion of body; **C**, left G2, ventral view; **D**, left G1, dorsal (left) and ventral (right) views. Scale bars: A, 5 mm; B, 2 mm; C, D, 1 mm.

two distinct, round depressions on each side of distal border of protogastric region, one on each side of urogastric region. Branchial regions slightly inflated along sides.

Anterior border of carapace (Fig. 6A) with slender to broad, triangular, distally acute, outwardly directed, outer orbital teeth, longer than but not reaching frontal teeth. Frontal teeth slender. Orbital sinuses broad, V-shaped, small, short vertical fissure at dorsal lower margin of each sinus, nearly symmetrical (inner and outer margins each with proximal swelling); lateral frontal sinuses U-shaped; median frontal sinus V-shaped, wider than lateral frontal sinuses but narrower than orbital sinuses.

Anterior border of endostome (Fig. 6B), at level of antennular fossae of basal antennular articles.

Male chelipeds (P1) (female unknown) smooth, equal; propodi slender, slightly longer than fingers; fingers without teeth or cutting edges.

P2 (Fig. 6A), P3 relatively short, very thick; meri with very small granules; length of P2 meri 0.7 times cl, P2 meri 4.7 times longer than broad. P4, P5 thick, smooth; P5 dactyli thick, curved.

Male abdomen (female unknown) with four somites (3-5 fused, basal half slightly swollen), triangular telson. Somite 1 trapezoidal, maximum length 3.3 times as broad, somite 6 square. G1 (Fig. 6C) slender, moderately sinuous; each distal end pointed with few very short spines on tip and numerous minute spines along ventral margin, small lip at distal 1/3 of ventral margin; G2 (Fig. 6D) thin, each distal part narrower; curved, pointed tip.

REMARKS

Ethusa crassipodia n. sp. is being described from only two specimens from the Solomon Is, both males. Nevertheless, its diagnostic characters are not found in any of the described species of *Ethusa*. It shares with *Ethusa andamanica* Alcock, 1894, relatively short and thick P2-P5 but the two species differ in the shape of their respective carapaces. In *E. andamanica* the sides of the carapace are nearly straight and the outer orbital teeth are straight (Alcock & Anderson 1895: pl. 14,

fig. 8). The P2-P5 are also relatively short and thick in *Ethusa orientalis* Miers, 1886, but its carapace is very granular and with nearly straight sides (Fig. 14; Miers 1886: pl. 28, fig. 1).

Other species have relatively short and thick P2-P5 but they clearly differ in other characters from *E. crassipodia* n. sp. *E. machaera* n. sp. from Madagascar differs from *E. crassipodia* n. sp. in the morphology of the anterior border of its carapace (Fig. 13A). *E. sexdentata* (Stimpson, 1858) has relatively longer and more slender P2-P5 (Sakai 1976: pl. 23, fig. 1; 1965: pl. 11, fig. 2; Miyake 1983: pl. 6, fig. 5) than *E. crassipodia* n. sp., and has broadly triangular outer orbital teeth (Sakai 1937: fig. 1a; 1976: fig. 26a; Chen 1993: fig. 8a). There are similarities between their G1, however, although they are slightly more slender in *E. crassipodia* n. sp. than in *E. sexdentata*. *E. abbreviata* n. sp. has a much shorter buccal funnel (Fig. 2B) than that of *E. crassipodia* n. sp., more slender outer orbital teeth, broad and U-shaped orbital sinuses (Fig. 2A), and broad-tipped G1 (Fig. 2C).

Ethusa crosnieri Chen, 1993

Ethusa crosnieri Chen, 1993: 317 (key), 319, fig. 2.

TYPE MATERIAL. — Holotype: ♂ cl 6.5 mm, cw 6.5 mm, MUSORSTOM 5, stn DW 296 (MNHN-B 19063); allotype: ♀ cl 8.6 mm, damaged, MUSORSTOM 5, stn DW 256 (MNHN-B 19068); paratypes: ♂, MUSORSTOM 5, stn DW 256 (IOAS); ♂ cl 7.3 mm, cw 7.0 mm, MUSORSTOM 5, stn DW 298 (MNHN-B 19065).

TYPE LOCALITY. — Coral Sea, Chesterfield Islands, 23°12.61'S, 159°36.27'E, 178 m.

MATERIAL EXAMINED. — **Chesterfield Islands.** MUSORSTOM 5, stn DW 256, 25°18.00'S, 159°52.70'E, 290-300 m, 7.X.1986, 1 ♀ allotype (MNHN-B 19068). — Stn DW 296, 22°12.61'S, 159°36.27'E, 178 m, 11.X.1986, 1 ♂ holotype (MNHN-B 19063). — Stn DW 298, 22°44.00'S, 159°22.00'E, 320 m, 11.X.1986, 1 ♂ paratype (MNHN-B 19065).

DISTRIBUTION. — Known only from the Chesterfield Is. Depth: 178-320 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 7.3 mm, cw 7.0 mm (MNHN-B 19065), ♀ cl 8.9 mm, cw 10.0 mm (MNHN-B 19068) (Chen 1993: 320).

REMARKS

Ethusa crosnieri is known from only four specimens, three males and one female. Diagnostic to this species are slender and outwardly directed outer orbital teeth that typically reach beyond the frontal teeth. The endostome is relatively short, with an anterior border that extends to the level of the antennular fossae of the basal antennular articles. The anterior border of the endostome extends well below the antennular fossae in *E. indica* Alcock, 1894 (Sakai 1976: 62, 63 [key]; Chen 1985: fig. 9a), a species that also has slender outer orbital teeth that usually reach beyond the frontal teeth. *Ethusa crosnieri* is close to *E. minuta* Sakai, 1937, from which it is best distinguished by the morphology of its G1 (Chen 1993: fig. 2h).

Ethusa curvipes Chen, 1993

Ethusa curvipes Chen, 1993: 318 (key), 320, fig. 3.

TYPE MATERIAL. — Holotype: ♂, damaged, MUSORSTOM 4, stn CP 169 (MNHN-B 22253); paratype: ♂ cl 5.4 mm, cw 4.9 mm, SMIB 6, stn DW 126 (MNHN-B 22427).

TYPE LOCALITY. — New Caledonia, Grand Passage, 18°54.03'S, 163°11.20'E, 600 m.

MATERIAL EXAMINED. — **New Caledonia.** MUSORSTOM 4, stn CP 169, 18°54.03'S, 163°11.20'E, 600 m, 17.IX.1985, 1 ♂ holotype (MNHN-B 22253).

SMIB 6, stn DW 126, 18°59.1'S, 163°22.7'E, 320-330 m, 3.III.1990, 1 ♂ paratype (MNHN-B 22427).

BATHUS 2, stn DW 717, 22°44'S, 163°13.55'E, 350-393 m, 11.V.1993, 1 ♂ (MNHN-B 28494).

BATHUS 4, stn DW 903, 18°59.93'S, 163°13.55'E, 386-400 m, 4.VIII.1994, 1 ♂ (MNHN-B 28491).

DISTRIBUTION. — Known only from New Caledonia. Depth: 320-600 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 6.6 mm, cw 6.2 mm (MNHN-B 28491), ♀ unknown.

REMARKS

Ethusa curvipes is known from only four male specimens. It is best distinguished by a distinctively curved G1 (Chen 1993: fig. 3e). The endostome is relatively short, its anterior border extending only to the level of the antennular fossae of the basal antennular articles.

Ethusa dilatidens Chen, 1997

(Fig. 7)

Ethusa dilatidens Chen, 1997: 615, fig. 3.

TYPE MATERIAL. — Holotype: ♂ cl 11.8 mm, cw 12.1 mm, KARUBAR, stn CP 83 (MNHN-B 22887).

TYPE LOCALITY. — Indonesia, Tanimbar Islands, 09°23'S, 131°00'E, 285-297 m.

MATERIAL EXAMINED. — **Philippine Islands.** Visayan Sea, MUSORSTOM 3, stn CP 144, 11°12'N, 124°15'E, 379-383 m, 7.VI.1985, 1 ♂ (MNHN-B 18280), 1 ♀ (MNHN-B 18281), 1 ♂, 4 ♀♀ (MNHN-B 18930).

Indonesia. Tanimbar Islands, KARUBAR, stn CP 83, 09°23'S, 131°00'E, 285-297 m, 4.XI.1991, 1 ♂ holotype (MNHN-B 22887).

DISTRIBUTION. — Philippine Is (Visayan Sea) and Indonesia (Tanimbar Is) (Chen 1997). Depth: 285-383 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 18.0 mm, cw 18.0 mm (MNHN-B 18930), ♀ cl 22.1 mm, cw 23.5 mm (MNHN-B 18930).

REMARKS

Ethusa dilatidens was described from a small male (cl 11.8 mm, cw 12.1 mm, MNHN-B 22887) collected in Indonesia. Diagnostic to this species is the shape of the outer orbital teeth: "broad at base, slightly broader than long, outer borders converging inwards" (Chen 1997: 618, fig. 3a). More recent material from the Philippine Islands that was examined is larger in size, and the shape of the outer orbital teeth is slightly different from that given in the description. It is narrower at the distal end, with an acute tip. Nevertheless, the other diagnostic characters found in the holotype (MNHN-B 22887) are evident in all of the specimens: dorsal surface of the carapace covered with very small granules but smooth along the anterior third of its surface, short pubescence through the dorsal surface but long hairs along the anterior and anterolateral borders, moderately inflated branchial regions so that the sides of the carapace are clearly convex, the anterior border of the endostome reaches the level of the posterior border of the antennular fossae of the basal antennular articles, and a semicircular suture between the second and third thoracic sternites (sternal suture

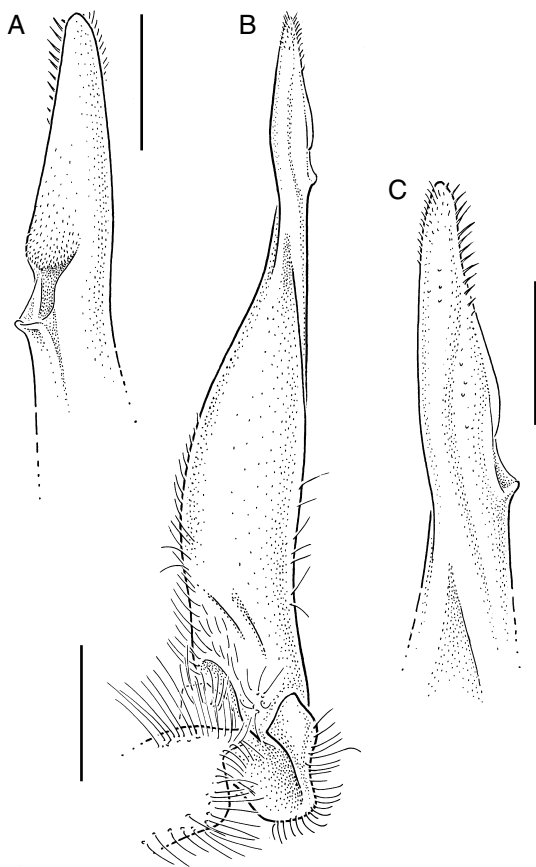


FIG. 7. — *Ethusa dilatidens* Chen, 1997, ♂ cl 18.0 mm, cw 18.0 mm, Philippine Islands, Visayan Sea, MUSORSTOM 3, stn CP 144, 379-383 m (MNHN-B 18930), right G1; **A**, dorsal view; **B**, **C**, ventral views. Scale bars: A, C, 0.5 mm; B, 1.0 mm.

2/3) bordered by a conspicuous anterior prominence. The last two characters were not mentioned in the description.

The G1, however, show some variation. They are short, straight, and slender in the holotype (Chen 1997: fig. 3g, h) but longer and slightly sinuous (Fig. 7) in the other two much larger male specimens that were examined (cl 18.0 mm, cw 18.0 mm, MNHN-B 18930; cl 17.6 mm, cw 17.5 mm, MNHN-B 18280).

Large specimens show similarities with other species. They may be easily separated from *E. latidactyla* Parisi, 1914 by the much-inflated branchial regions of *E. latidactyla*, which gives its

carapace a characteristic rounded appearance (Chen 1985: fig. 7a). In *E. sexdentata* (Stimpson, 1858), in which the proximal region of the outer orbital teeth can be as expanded as in *E. dilatidens*, the P2 and P3 are relatively much shorter and thicker (Sakai 1965: pl. 11, fig. 2; 1976: pl. 23, fig. 1; Miyake 1983: pl. 6, fig. 5) than in *E. dilatidens*.

Ethusa foresti Chen, 1985

(Fig. 8)

Ethusa foresti Chen, 1985: 195, figs 13, 14, pl. 2, figs 7, 8; 1993: 317 (key), 318 (list).

TYPE MATERIAL. — Holotype: ♀ cl 8.1 mm, cw 7.7 mm, MUSORSTOM 2, stn CP 72 (MNHN-B 18166); paratypes: ♀, MUSORSTOM 2, stn CP 10 (IOAS); ♀ cl 7.5 mm, cw 7.5 mm, MUSORSTOM 2, stn CP 20 (MNHN-B 18167); ♀ cl 6.7 mm, cw 6.5 mm, MUSORSTOM 2, stn CP 68 (MNHN-B 18168).

TYPE LOCALITY. — Philippine Islands, South China Sea coast off Luzon, 14°00.7'N, 120°19.4'E, 182-197 m.

MATERIAL EXAMINED. — **Philippine Islands.** MUSORSTOM 2, stn CP 20, 14°00'N, 120°18'E, 185-192 m, 22.XI.1980, 1 ♀ paratype (MNHN-B 18167). — Stn CP 68, 14°01'N, 120°18'E, 195-199 m, 29.XI.1980, 1 ♀ paratype (MNHN-B 18168). — Stn CP 72, 14°00.7'N, 120°19.4'E, 182-197 m, 30.XI.1980, 1 ♀ holotype (MNHN-B 18166).

MUSORSTOM 3, stn CP 96, 14°00'N, 120°18'E, 190-194 m, 1.VI.1985, 1 ♀ (MNHN-B 18882). — Stn CP 97, 14°00'N, 120°16'E, 189-194 m, 1.VI.1985, 1 ♂ (MNHN-B 18278). — Stn CP 101, 14°00'N, 120°19'E, 194-196 m, 1.VI.1985, 1 ♀ (MNHN-B 18881). — Stn CP 145, 11°01'N, 124°04'E, 214-246 m, 7.VI.1985, 2 ♀♀, 1 ♀ parasitized by *Sacculina* sp. (MNHN-B 18880).

DISTRIBUTION. — Known only from the Philippine Is. Depth: 182-246 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 7.8 mm, cw 6.1 mm (MNHN-B 18278), ♀ cl 9.9 mm, cw 10.0 mm (MNHN-B 18880).

REMARKS

Ethusa foresti is close to another small-size species, *E. izuensis* Sakai, 1937. Diagnostic to *E. foresti* are long and slender P4 and P5 dactyli (Chen 1985: fig. 13), coarse granulation on the dorsal

surface of the carapace, and outer orbital teeth that typically are directed inwardly. In contrast, *E. izuensis* is characterized by much shorter P4 and P5 dactyli (Sakai 1965: pl. 12, figs 1, 2; 1976: fig. 29; Chen 1985: fig. 11; Chen & Sun 2002: fig. 103.1), lower and sparser granules on the carapace, and outer orbital teeth that are directed outwardly. In both species the anterior border of the endostome reaches the antennular fossae of the antennular fossae of the basal antennular articles (Chen 1985: fig. 12a; Chen & Sun 2002: fig. 103.2 for *E. izuensis*).

Ethusa foresti may also be confused with small specimens of *E. orientalis* Miers, 1886, from the southwestern Pacific since in some specimens the outer orbital teeth may slightly be directed inwardly. In *E. orientalis* the teeth are typically straight and more triangular, and the granules of the carapace are smaller than in *E. foresti*.

The G1 is here illustrated for the first time (Fig. 8). Each distal end is spade-like, with an acute tip, and sparse, very short spines. In contrast, each G1 of *E. izuensis* has a slender, slightly expanded distal end and a row of longer, more conspicuous spines (Chen 1985: fig. 12f, h; 1986: fig. 12.61; Chen & Sun 2002: fig. 103.7).

Ethusa furca Chen, 1993

Ethusa furca Chen, 1993: 317 (key), 321, fig. 4; 2000: 426.

TYPE MATERIAL. — Holotype: ♂ cl 6.0 mm, cw 5.1 mm, MUSORSTOM 6, stn CP 485 (MNHN-B 21521); paratypes: ♂, damaged, MUSORSTOM 4, stn DW 162 (MNHN-B 18403); ♂, MUSORSTOM 5, stn CP 324 (IOAS).

TYPE LOCALITY. — Loyalty Islands, 21°23.48'S, 167°59.33'E, 350 m.

MATERIAL EXAMINED. — **Vanuatu.** MUSORSTOM 8, stn CP 980, 19°21.02'S, 169°25.22'E, 450-433 m, 22.IX.1994, 1 ♂ (MNHN-B 27493).

New Caledonia. MUSORSTOM 4, stn DW 162, 18°35.0'S, 163°10.3'E, 525 m, 16.IX.1985, 1 ♂ paratype (MNHN-B 18403).

Loyalty Islands. MUSORSTOM 6, stn CP 485, 21°23.48'S, 167°59.33'E, 350 m, 23.II.1989, 1 ♂ holotype (MNHN-B 21521).

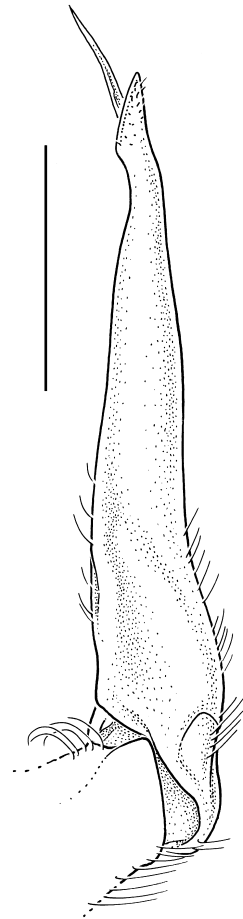


FIG. 8. — *Ethusa foresti* Chen, 1985, ♂ cl 7.8 mm, cw 6.1 mm, Philippine Islands, SW of Luzon, MUSORSTOM 3, stn CP 97, 189-194 m (MNHN-B 18278), right G1 with distal end of G2 in situ, ventral view. Scale bar: 1 mm.

DISTRIBUTION. — Vanuatu, New Caledonia, and Loyalty Is. Depth: 350-970 m (Chen 1993) (Fig. 34).

SIZE. — Maximum size: ♂ cl 6.0 mm, cw 5.1 mm (MNHN-B 21521), ♀ unknown.

REMARKS

Ethusa furca is known from only four male specimens. The carapace has, like *E. quadrata* Sakai, 1937, and *E. hawaiiensis* Rathbun, 1906, straight sides parallel to each other, giving it a distinctive square appearance. In contrast to these two species, *E. furca* has only two frontal teeth, the

median frontal teeth being lobe-like, and the G1 and G2 are uniquely biramous, or forked (Chen 1993: fig. 4g-k). Other differences from *E. hawaiiensis* are given in the Remarks of this species (see below).

Ethusa granulosa Ihle, 1916
(Fig. 33A)

Ethusa granulosa Ihle, 1916b: 143, 151 (list), 152 (list), 153 (list), 156 (list), fig. 76. — Serène 1968: 40 (list). — Serène & Lohavanijaya 1973: 34 (key). — Chen 1993: 318 (key), 323, fig. 5; 2000: 426. — Nagai 1995: 61, pl. 1, fig. 10. — Marumura & Kosaka 2003: 23.

TYPE MATERIAL. — Lectotype: ovig. ♀ cl 7.2 mm, cw 7.4 mm, *Siboga*, stn 59 (ZMA Crust.De 102976); paralectotypes: ♀ cl 7.2 mm, cw 7.1 mm, ♀ cl 7.0 mm, cw 7.0 mm, ♀ cl 6.6 mm, cw 6.8 mm, same location (ZMA Crust.De 102977).

Ihle (1916b) based his description on four female specimens without selecting a holotype. One of the four syntypes, the largest female, is hereby designated the lectotype and the remaining three females are the paralectotypes. One of the paralectotypes was illustrated by Ihle (1916b: fig. 76).

TYPE LOCALITY. — Indonesia, Lesser Sunda Islands, Savu Sea north of Roti island, 10°22.7'S, 123°16.5'E, 390 m.

MATERIAL EXAMINED. — **Japan.** Honshu, Sagami Bay, 5 km SW of Yoga Shima, 300 m, Hatagumo, T. Sakai and Emperor Hirohito coll., 3.III.1964, 1 ovig. ♀ (SMF 28934). — Kii Peninsula, off Sabiura, 90 m, S. Yamaguchi coll., 24.VI.1979, 1 ♀ (CBM-ZC 4391). — Kii Peninsula, off Shiono Misaki, 300 m, S. Nagai coll., X.1996, 1 ♀ (CBM-ZC 3567). — Kii Peninsula, W of Shiono Misaki, 33°25.70'N, 135°40.50'E, 250 m, S. Nagai coll., 30.I.1998, 1 ♂ (CBM-ZC 5707).

Indonesia. Lesser Sunda Islands, *Siboga*, stn 59, Savu Sea, N of Roti island, 10°22.7'S, 123°16.5'E, 390 m, M. Weber coll., 26.IV.1899, 1 ovig. ♀ lectotype (ZMA Crust.De 102976).

Moluccas, *Siboga*, stn 153, Halmahera Sea, N of Kofiau island, 00°59.1'S, 129°48.8'E, 411 m, M. Weber coll., 16.VIII.1899, 3 ♀♀ paralectotypes (ZMA Crust.De 102977).

Solomon Islands. SALOMON 1, stn CP 1783, 08°32.8'S, 160°41.7'E, 399-700 m, 29.IX.2001, 1 juv. ♀ cl 9.5 mm, cw 8.9 mm (MNHN-B 28704).

Vanuatu. MUSORSTOM 8, stn DW 1045, 16°54.50'S, 168°20.37'E, 488-459 m, 30.IX.1994, 1 ♂ (MNHN-B 27497). — Stn DW 1061,

16°14.54'S, 167°20.12'E, 458-512 m, 2.X.1994, 1 ♀ (MNHN-B 28698).

New Caledonia. BATHUS 3, stn DW 793, 23°47.50'S, 169°48.75'E, 731-751 m, 26.XI.1993, 1 undet. sex (MNHN-B 28496).

BATHUS 4, stn CP 910, 18°59.32'S, 163°08.47'E, 560-608 m, 5.VIII.1994, 4 ♂♂, 1 juv. ♀, 2 ♀♀ (MNHN-B 28498). — Stn CP 911, 18°57.80'S, 163°08.47'E, 566-558 m, 5.VIII.1994, 3 ♂♂ (MNHN-B 28499). — Stn CP 921, 18°46.72'S, 163°17.01'E, 613-610 m, 6.VIII.1994, 1 juv. ♀ (MNHN-B 28500).

Wallis and Futuna Islands. MUSORSTOM 7, stn DW 556, 11°49'S, 178°18'W, 440 m, 19.V.1992, 1 ♂, 1 ♀ (MNHN-B 28496).

DISTRIBUTION. — Japan (Nagai 1995; Marumura & Kosaka 2003), Indonesia (Lesser Sunda Islands, Moluccas) (Ihle 1916b), Vanuatu (Chen 2000), New Caledonia (Chen 1993), and now from the Solomon and Wallis and Futuna Is. Depth: 90-751 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 8.9 mm, cw 8.4 mm (MNHN-B 28498), ♀ cl 14.7 mm, cw 14.6 mm (MNHN-B 28698).

REMARKS

Characteristic of *Ethusa granulosa* is a carapace that is as broad as long (Ihle 1916b: fig. 76; Chen 1993: fig. 5a), with nearly straight lateral borders that diverge toward the posterior border, and covered by small, dense granules. The anterior border of the endostome just reaches the posterior border of the antennular fossae of the basal antennular articles. The G1 are stout with an attenuated distal end.

A specimen from the Solomon Is (juvenile ♀, cl 9.5 mm, cw 8.9 mm, MNHN-B 28704) agrees with the diagnostic characters of *E. granulosa* but the granules on the carapace are not as dense as in the more typical specimens. The anterior border of the endostome unusually extended beyond the antennular fossae in a dry specimen from Japan (ovig. ♀ cl 10.5 mm, cw 10.1 mm; SMF 28934). *Ethusa granulosa* is very close to *E. orientalis* Miers, 1886, and *E. magnipalmata* Chen, 1993. The outer orbital teeth are more elongated and acute than in *E. orientalis*, which are typically triangular. The most significant difference between the three species is the shape of their G1, which makes the identification of females a difficult task.



FIG. 9. — *Ethusa hawaiiensis* Rathbun, 1906, ♂ cl 4.9 mm, cw 4.2 mm, French Polynesia, Marquesas Islands, Ua Pou, MUSORSTOM 9, stn DW 1146, 200 m (MNHN-B 28552).

Ethusa hawaiiensis Rathbun, 1906
(Figs 9; 10; 33B)

Ethusa mascarone hawaiiensis Rathbun, 1906: 891, fig. 46, pl. 15, fig. 4. — Ihle 1916b: 153 (list), 155 (list). — Serène 1968: 40 (list).

Ethusa hawaiiensis — Serène & Lohavanijaya 1973: 34 (key). — Chen 1993: 318 (key, list).

TYPE MATERIAL. — Holotype: ♀ cl 7.6 mm, cw 6.9 mm, *Albatross*, stn 4101 (USNM 29930).

TYPE LOCALITY. — Hawaiian Islands, Pailolo Channel between Molokai and Maui, 262-223 m.

MATERIAL EXAMINED. — **Vanuatu.** MUSORSTOM 8, stn CP 963, 20°20.10'S, 169°49.08'E, 400-440 m, 21.IX.1994, 1 ♀ (MNHN-B 28538).

French Polynesia. Marquesas Islands, MUSORSTOM 9, stn DW 1146, 09°19'S, 140°06'W, 200 m, 22.VIII.1997, 1 ♂ (MNHN-B 28552), 1 ♂ (MNHN-B 28553). — Stn DR 1198, 09°50'S, 139°09'W, 290-320 m, 28.VIII.1997, 1 ovig. ♀ (MNHN-B 28550). — Stn CP 1268, 07°56'S, 140°43'W, 285-320 m, 4.IX.1997, 3 ♀♀ (MNHN-B 28551).

Hawaiian Islands. *Albatross*, stn 3810, off south coast of Oahu, 368-97 m, 27.III.1902, 1 ♀ (USNM 29928). — Stn 4101, Pailolo Channel, 262-223 m, 23.VII.1902, 1 ♀ holotype (USNM 29930). — Stn 4045, off west coast of island of Hawaii, 362-269 m, 11.VII.1902, 1 ♂ (USNM 29929).

DISTRIBUTION. — Known from the Hawaiian Is and now from Vanuatu and French Polynesia (Marquesas Is). Depth: 200-440 m (Fig. 34); also collected in a trawl from 97-386 m (Rathbun 1906).

SIZE. — Maximum size: ♂ cl 5.0 mm, cw 4.0 mm (USNM 29929), ♀ cl 7.6 mm, cw 6.9 mm (USNM 29930).

REMARKS

Ethusa hawaiiensis has a rectangular carapace with straight sides that are almost parallel to each other (Fig. 9), a character it shares with *E. quadrata* Sakai, 1937, and *E. furca* Chen, 1993. The outer orbital teeth are much shorter, almost like a tubercle, in contrast to the more

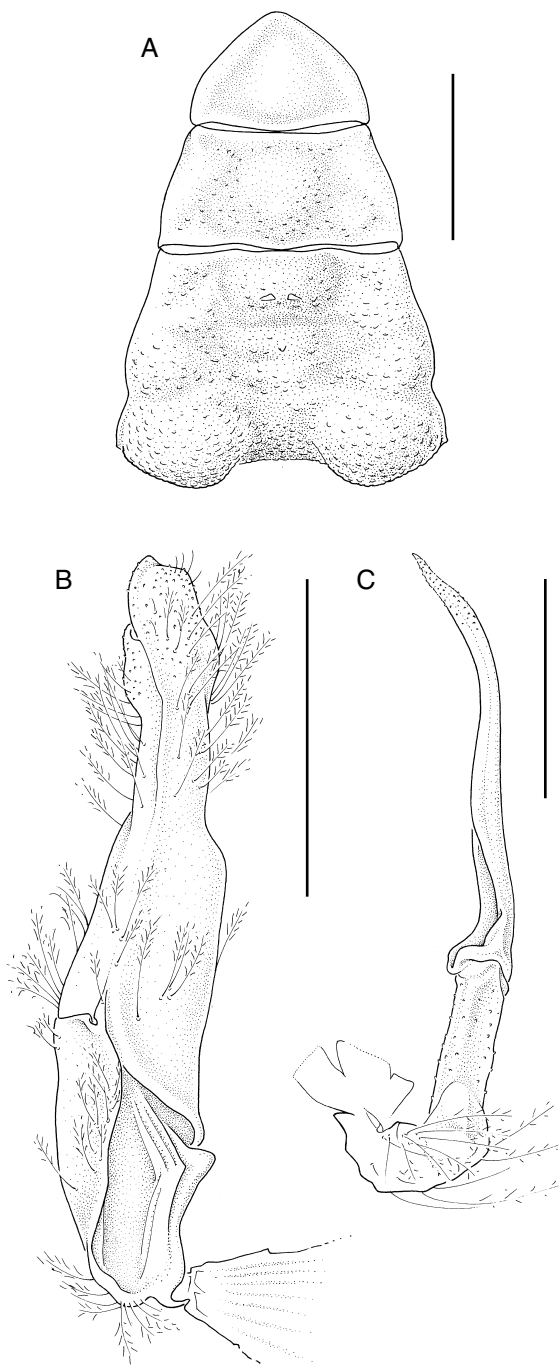


FIG. 10. — *Ethusa hawaiiensis* Rathbun, 1906, ♂ cl 4.9 mm, cw 4.2 mm, French Polynesia, Marquesas Islands, Ua Pou, MUSORSTOM 9, stn DW 1146, 200 m (MNHN-B 28552); **A**, abdomen; **B**, right G1, dorsal view; **C**, right G2, ventral view. Scale bars: 1 mm.

conspicuous teeth in *E. quadrata* (Sakai 1937: fig. 1c; 1965: pl. 12, fig. 3; 1976: fig. 26c; Chen 1985: fig. 10a). The lower margin of the orbital sinus is straight and provided with minute tubercles, not sinuous as in *E. furca* (Chen 1993: fig. 4a). The median frontal teeth are longer than the lateral ones. Both are pointed, unlike *E. furca*, where the median teeth are lobe-like. The anterior border of the endostome reaches the posterior border of the antennular fossae of the basal antennular articles, unlike both *E. quadrata* and *E. furca*, where the border of the endostome is well below the fossae.

The G1 and G2 are here illustrated for the first time. The G1 (Fig. 10B) are short, stout, each with a blunt, rounded tip provided with spinules. Each G2 (Fig. 10C) has a pointed tip also provided with spinules.

Ethusa hirsuta McArdle, 1900
(Fig. 11)

Ethusa hirsuta McArdle, 1900: 474. — Alcock & McArdle 1902: pl. 59, fig. 2, 2a. — Alcock & MacGilchrist 1905: pl. 72, fig. 1, 1a. — MacGilchrist 1905: 257. — Ihle 1916b: 142, 151 (list), 153 (list), 156 (list). — Serène 1968: 40 (list). — Serène & Lohavanijaya 1973: 35 (key). — Chen 1993: 318 (key), 319 (list) (part).

Not *Ethusa* aff. *hirsuta* – Serène & Vadon 1981: 119, 121 (= *E. latidactyla* Parisi, 1914).

Not *Ethusa hirsuta* – Chen 1987: 685, pl. 1, fig. F (= *E. machaera* n. sp.).

Ethusa makasarica Chen, 1993: 318 (key), 327, fig. 9.

Not *Ethusa makasarica* – Chen 2000: 427 (= *E. abbreviata* n. sp.).

TYPE MATERIAL. — Unknown (Zoological Survey of India, Calcutta?).

Type material of *Ethusa makasarica* Chen, 1993: holotype: ♂, damaged, CORINDON 2, stn 276 (MNHN-B 19071); allotype: ♀ cl 7.7 mm, cw 7.2 mm, same station (MNHN-B 22251).

TYPE LOCALITY. — Gulf of Manaar between India and Sri Lanka, 07°02.5'-07°36.0'N, 79°36.00'-78°05.00'E, 914-1097 m.

MATERIAL EXAMINED. — **Indonesia**. Makassar Strait, CORINDON 2, stn 276, 01°54.6'S, 119°13.8'E, 456-395 m, 8.XI.1980, 1 ♂ holotype of *Ethusa*

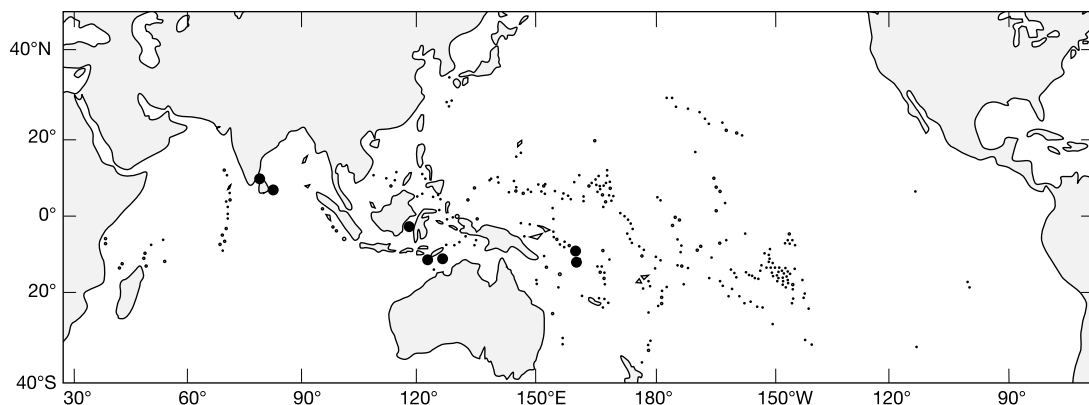


Fig. 11. — Geographical distribution of *Ethusa hirsuta* McArdle, 1900.

makasarica Chen, 1993 (MNHN-B 19071), 1 ♀ allotype (MNHN-B 22251).

Solomon Islands. SALOMON 1, stn CP 1748, 09°20.4'S, 159°58.2'E, 509-522 m, 25.IX.2001, 2 ♀ ♀ (MNHN-B 28539). — Stn CP 1749, 09°20.9'S, 159°56.2'E, 582-594 m, 25.IX.2001, 3 ♂ ♂ (MNHN-B 28543). — Stn CP 1786, 09°21.3'S, 160°24.6'E, 387 m, 30.IX.2001, 3 ♂ ♂ (MNHN-B 28544). — Stn CP 1794, 09°16.1'S, 160°07.7'E, 494-504 m, 30.IX.2001, 2 ♂ ♂ (MNHN-B 28542). — Stn CP 1796, 09°19.2'S, 160°25.4'E, 469-481 m, 1.X.2001, 3 ♂ ♂, 1 juv. ♀, 2 ♀ ♀ (MNHN-B 28541). — Stn CP 1798, 09°21.0'S, 160°29.2'E, 513-564 m, 1.X.2001, 3 ♂ ♂, 1 ♀ (MNHN-B 28540). — Stn CP 1800, 09°21.4'S, 160°23.9'E, 357-359 m, 1.X.2001, 6 ♂ ♂ (MNHN-B 28495). — Stn CP 1859, 09°32.6'S, 160°37.3'E, 283-305 m, 7.X.2001, 1 ♂ (MNHN-B 28523).

DISTRIBUTION. — Gulf of Manaar, between India and Sri Lanka (McArdle 1900), off Sri Lanka (MacGilchrist 1905), Indonesia (Makassar Strait [Chen 1993, as *Ethusa makasarica* Chen, 1993], Timor [Ihle 1916b]), and now from the Solomon Is (Fig. 11). Depth: 112 (Ihle 1916b)-1097 m (McArdle 1900) (Fig. 34).

SIZE. — Maximum size: ♂ cl 15 mm, cw 15 mm (McArdle 1900), ♀ cl 7.7 mm, cw 7.2 mm (MNHN-B 22251).

REMARKS

Ethusa hirsuta was described from a female and a young male collected between Sri Lanka and India (McArdle 1900: 474). The species was first illustrated by Alcock & McArdle (1902: pl. 59, fig. 2, 2a). Two males were then collected from

off Sri Lanka and re-described by MacGilchrist (1905: 257); one of the males was illustrated by Alcock & MacGilchrist (1905: pl. 72, fig. 1, 1a). The type material or MacGilchrist's specimens could not be examined and it is not known if they are still extant but the description of the species, MacGilchrist's re-description, and the illustrations of specimens from both collections, however, provide ample information about the diagnostic characters.

Ihle (1916b) reported *E. hirsuta* from Indonesia. His two specimens, from Timor, were not found with the rest of the *Siboga* material at ZMA. Chen (1987: 685) assigned three specimens from Madagascar to *E. hirsuta*, but they were found to belong to *E. machaera* n. sp. (see below).

Chen (1993) described *E. makasarica* as a new species from Makassar Strait, Indonesia, and found it to be "similar to *E. hirsuta* McArdle" (Chen 1993: 328). At the same time Chen recognized that the Madagascar specimens did not belong to *E. hirsuta*. *E. makasarica* was characterized by slender and acute outer orbital teeth that nearly reach the frontal teeth (Chen 1993: fig. 9a); very broad and nearly U-shaped orbital sinuses, with steeper sides along the inner margins of the outer orbital teeth; relatively straight, lateral borders, the branchial regions not markedly inflated along the sides. The carapace is covered with faint granules and setae along the anterior and anterolateral borders in smaller

individuals. The carapace, however, is covered by abundant coarse setae in larger individuals. One important diagnostic character that was not mentioned was the extension of the anterior border of the endostome, which reaches the antennular fossae of the basal antennular articles.

E. makasarica was distinguished from *E. hirsuta* by six characters, which were given in a table (Chen 1993: 329). Chen did not mention the examination of the type material of *E. hirsuta* so it is assumed that the characters given for this species in the table were taken from the description and from the figures. The first character was the “hirsute and not granular” carapace of *E. hirsuta* in contrast to being “pubescent and granular” in *E. makasarica*. The fine granules of *E. makasarica* are evident in the allotype (MNHN-B 22251) and they can also be seen in one of the drawings of *E. hirsuta* (Alcock & MacGilchrist 1905: pl. 72, fig. 1). The presence or absence of granules is not mentioned in McArdle’s description or in MacGilchrist’s re-description. Relatively long hairs are evident in the figures of *E. hirsuta* by Alcock & McArdle (1902: pl. 59, fig. 2) and Alcock & MacGilchrist (1905: pl. 72, fig. 1).

A second character was the length of the outer orbital teeth, which were described in Chen’s table as “short, falling short of front and directed outwards” in *E. hirsuta* but “long, almost reaching to front and directed forwards [*sic*]”. The figures of *E. hirsuta*, the specimens of *E. makasarica* that were available for examination, and the figure of Chen (1993: fig. 9a) do not show any noticeable differences in the length of the teeth in the two species. The only difference is that the teeth are more slender in *E. makasarica* than those illustrated for *E. hirsuta*. The illustrations by both Alcock & McArdle (1902: pl. 59, fig. 2) and Alcock & MacGilchrist (1905: pl. 72, fig. 1) show V-shaped orbital sinuses and triangular outer orbital teeth. Although the teeth are triangular in the figures, they were described as “long, slender, acutely triangular” and “directed slightly outwards” (McArdle 1900: 475). Furthermore, in explaining the placement of his new species in the key to the Indian species of *Ethusa* (Alcock

1896), *E. hirsuta* was separated from *E. andamanica* Alcock, 1894 (erroneously thought to be a junior subjective synonym of *E. sexdentata* (Stimpson, 1858)), by the outer orbital teeth being “long” and “acute” in contrast to the “broad flat triangular” teeth of *E. andamanica*.

The next four characters in Chen’s table, which involve the relative size of particular articles of pereopods, should not be considered as highly significant since in the case of *E. hirsuta* it is assumed they involved the measurement of articles from illustrations. McArdle (1900) and MacGilchrist (1905) only give the total length of chelipeds, P2, and P3, and there is no indication that Chen examined the type material. Furthermore, the figures are all close enough that it is highly probable that the differences obtained resulted largely because of the small number of specimens that were measured, the large margin of error, and the possibility that some pereopods may have been relatively shorter as a result of regeneration.

One highly significant similarity between *E. hirsuta* and *E. makasarica* is the morphology of the endostome. The anterior border of *E. hirsuta* was clearly shown to extend anteriorly above the level of the antennular fossae of the basal antennular articles (Alcock & MacGilchrist 1905: pl. 72, fig. 1a) so that “there is no distinct epistome” (McArdle 1900: 475). MacGilchrist (1905: 258) clearly described the endostome (“a noteworthy and what appears to be a specific character”) as extending “forward well between the bases of the antennules”.

Other characters are shared by *E. hirsuta* and *E. makasarica*. The frontal teeth of *E. hirsuta* were described as being equal in length, the median ones wider apart from each other than they are from the lateral ones. This is also shown in the two illustrations. MacGilchrist (1905: 258) added that of the frontal teeth, the median ones tended to be “stouter and longer” than the lateral ones, which is shown in the figure of Alcock & MacGilchrist (1905: pl. 72, fig. 1, 1a). The branchial region was illustrated as not being inflated, making the sides of the carapace look almost straight. This is confirmed in the descrip-

tion, where the borders are given as “almost straight” (McArdle 1900: 475).

McArdle (1900: 475) described the carapace as “covered with hairs, which are particularly long and strong over the anterior and lateral borders”, and the illustration of a specimen part of the type material is shown with setae on the carapace as well as on the pereopods, including the chelipeds. This pubescence, however, is not shown in the specimens of *E. makasarica* that were examined. MacGilchrist (1905), however, does not mention the presence of hairs and the illustration of one of his specimens (Alcock & MacGilchrist 1905: pl. 17, fig. 1) only shows long setae along the anterior and anterolateral borders of the carapace (but apparently the result of the cleaning of the carapace) and on the carpi and propodi of P4 and P5.

Only the comparison of the type material of *E. makasarica* with that of *E. hirsuta* will conclusively show if both species are one and the same. The type material of *E. hirsuta*, if still extant, was unfortunately not available. There is ample evidence, however, to consider *Ethusa makasarica* Chen, 1993, as a junior subjective synonym of *Ethusa hirsuta* McArdle, 1900.

There are some similarities between *E. hirsuta* and *E. indica* Alcock, 1894. The outer orbital teeth, which in *E. indica* are long, acute, and are directed outwardly (Chen 1985: fig. 8), can sometimes be nearly straight (Chen 1985: fig. 9b) and thus very similar to those of *E. hirsuta*. The most reliable character to use to differentiate between both species is that the anterior border of the endostome ends well below the antennular fossae of the basal antennular articles in *E. indica* (Sakai 1976: 62, 63 [key]; Chen 1985: fig. 9a) in sharp contrast to *E. hirsuta*, where it extends above the antennular fossae.

Ethusa indica Alcock, 1894
(Figs 12; 33C)

Ethusa indica Alcock, 1894: 405; 1896: 283; 1899: 32. — Doflein 1904: 291 (list), fig. 64. — Ihle 1916b: 138, 151 (list), 153 (list), 155 (list). — Sakai 1965: 24, pl. 12, fig. 4 (colour); 1976: 64, fig. 27. — Serène

1968: 40 (list). — Serène & Lohavanijaya 1973: 34 (key). — Miyake 1983: 198 (list). — Chen 1985: 189, figs 8, 9, pl. 2, fig. 5; 1986: 128, fig. 10; 1993: 317 (key), 324; 1997: 618; 2000: 426. — Dai *et al.* 1986: 52, fig. 27(3-4), pl. 6, fig. 2. — Dai & Yang 1991: 59, fig. 27(3-4), pl. 6, fig. 4. — Nagai 1995: 60, pl. 1, fig. 6. — Ikeda 1998: 26, pl. 15 (colour). — Muraoka 1998: 17. — Takeda 2001: 224, 254, 259. — Chen & Sun 2002: 54, 240, fig. 101, pl. 9, fig. 8. — Marumura & Kosaka 2003: 23.

Aethusa indica – Alcock & Anderson 1895: pl. 14, fig. 2.

Ethusa gracilipes – Serène & Lohavanijaya 1973: 35 (key), 35, figs 56-59, pl. 4, figs C, D (not *Ethusina gracilipes* (Miers, 1886)).

Ethusina gracilipes – Serène & Vadon 1981: 119, 121 (not *Ethusina gracilipes* (Miers, 1886)).

Ethusa serenei Sakai, 1983a: 5, 27.

?*Ethusa* sp. – Turkey 1986: 146, figs 30-32.

TYPE MATERIAL. — Unknown (Zoological Survey of India, Calcutta?).

A specimen (♂ cl 9.1 mm, cw 9.6 mm, ZMUC CRU3727) originally at the Indian Museum, Calcutta (now Zoological Survey of India) but donated to ZMUC by A. Alcock and identified by him as *Ethusa indica* may have been part of the type material.

The location of the type material of *Ethusa serenei* Sakai, 1983, a junior subjective synonym, is unknown.

TYPE LOCALITY. — Andaman Sea, 439 m.

MATERIAL EXAMINED. — ?Red Sea. *Valdivia*, stn VA 22-121 TA, 12°26.5'N, 38°38.3'E, 779-801 m, 15.IV.1979, 1 ♂ (SMF 13587).

Gulf of Aden. *Meteor*, cruise 5, stn 249 Ku, 12°29.5'N, 45°38.7'E, 1299-1314 m, 8.III.1987, 1 ♂ (SMF 29341).

Southwestern Indian Ocean. *Marion Dufresne*, campagne MD/32, stn CA 76, 21°16.0'S, 55°17.6'E, 450-937 m, 24.VIII.1986, 1 ovig. ♀ (MNHN-B 28559).

India. Off Travancore (= Kerala) coast, 743 m, from Indian Museum, A. Alcock ded., 1898, 1 ♂ (ZMUC CRU3727).

Japan. Honshu, Izu Peninsula, Suruga Bay, off Toi, 34°52.05'N, 138°42.63'E, 550 m, T. Komai coll., 21.III.2001, 1 ♂, 1 ♀ (CBM-ZC 6254).

Shikoku, Tosa Bay, ex. T. Sakai, 1 ♀ (BMNH 1961.6.5.21). — Tosa Bay, off Mimase, refuse from fishing nets, XII.1961, K. Sakai coll., 6 ♂♂, 1 ♂ parasitized by bopyrid (SMF 28922). — Tosa Bay, off Mimase, refuse from fishing nets, K. Sakai coll., 1 ovig. ♀ (SMF 28921), 1 ♂ (SMF 28928), 1 ♂ (SMF 28931).

Philippine Islands. South China Sea, MUSORSTOM 2, stn CP 18, 14°00'N, 120°18'E, 188-195 m, 22.XI.1980, 1 ovig. ♀ (MNHN-B 18159). — Stn

CP 25, 13°39'N, 120°42'E, 520-550 m, 23.XI.1980, 1 undet. sex, parasitized by bopyrid (MNHN-Ep). — Stn CP 25?, parasitized by bopyrid, 1 ♂ (MNHN-Ep), parasitized by bopyrids, 2 ♀♀ (MNHN-Ep). — Stn CP 39, 13°03'N, 122°36'E, 1030-1190 m, 25.XI.1980, 2 ♀♀ (MNHN-B 18164).

MUSORSTOM 3, stn CP 106, 13°47'N, 120°30'E, 640-668 m, 2.VI.1985, 2 ♂♂, 1 ♀, 1 ovig. ♀ (MNHN-B 18926).

Indonesia. Makassar Strait, CORINDON 2, stn CH 280, 01°59'S, 119°10'E, 715-800 m, 8.XI.1980, 6 ♂♂, 7 ♀♀ (MNHN-B 19069).

Moluccas, *Siboga*, stn 137, between Makian island and Halmahera, 00°23.8'N, 127°29'E, 472 m, 3.VIII.1899, 3 juv. ♂♂, 1 ♂ (ZMA Crust.De 241682).

Lesser Sunda Islands, *Siboga*, stn 314, Flores Sea, N of Sumbawa, 07°36'S, 117°30.8'E, 694 m, 17.II.1900, 1 ♂ (ZMA Crust.De 241680). — Stn 52, S of western tip of Flores, 09°3.4'S, 119°56.7'E, 959 m, 20.IV.1899, 1 ♂, 1 juv. ♀ (ZMA Crust.De 241681).

Tanimbar Islands, KARUBAR, stn CP 53, 08°18'S, 131°41'E, 1026-1053 m, 30.X.1991, 1 ovig. ♀ (MNHN-B 22871). — Stn CP 89, 08°39'S, 131°08'E, 1084-1058 m, 5.XI.1991, 4 ♂♂, 4 ♀♀, 2 ovig. ♀♀ (MNHN-B 22860).

Kai Islands, KARUBAR, stn CP 12, 05°18'S, 131°41'E, 436-413 m, 23.X.1991, 1 ♂, 3 ♀♀ (MNHN-B 22867).

Solomon Islands. SALOMON 1, stn CP 1783, 08°32.8'S, 160°41.7'E, 399-700 m, 29.IX.2001, 1 juv. ♂ cl 5.4 mm, cw 5.4 mm (MNHN-B 28703), 1 ♂ (MNHN-B 28705). — Stn CP 1858, 09°37.0'S, 160°41.7'E, 435-461 m, 7.X.2001, 1 ♀ (MNHN-B 28571). — Stn CP 1859, 09°32.6'S, 160°37.3'E, 283-305 m, 7.X.2001, 1 ovig. ♀ (MNHN-B 28562).

Vanuatu. MUSORSTOM 8, stn CP 1036, 18°01.00'S, 168°48.20'E, 920-950 m, 29.IX.1994, 1 ♂ (MNHN-B 28560).

New Caledonia. BATHUS 1, stn CP 660, 21°10.48'S, 165°53.19'E, 786-800 m, 13.III.1993, 4 ♂♂, 2 ♀♀ (MNHN-B 28577). — Stn CP 661, 20°05'S, 165°50'E, 960-1100 m, 13.III.1993, 1 ♂ (MNHN-B 28506). — Stn CP 709, 21°41.8'S, 166°37.9'E, 650-800 m, 19.III.1993, 1 ♀ (MNHN-B 28580).

BATHUS 2, stn CP 743, 22°35.56'S, 166°26.23'E, 713-950 m, 14.V.1993, 2 ♂♂ (MNHN-B 28581). — Stn CP 771, 22°09.52'S, 166°01.75'E, 610-800 m, 18.V.1993, 1 ♂ (MNHN-B 28579).

HALIPRO 1, stn CP 854, 21°40'S, 166°38'E, 650-780 m, 19.IV.1994, 1 ♀ (MNHN-B 28578). — Stn CP 867, 21°26'S, 166°18'E, 720-950 m, 22.IV.1994, 1 ♀ (MNHN-B 28582).

BIOGEOCAL, stn CP 232, 21°33.81'S, 166°27.07'E, 760-790 m, 12.IV.1987, 2 ♂♂, 1 ovig. ♀ (MNHN-B 19098).

Loyalty Islands. MUSORSTOM 6, stn CP 438, 20°23.00'S, 166°20.10'E, 780 m, 18.II.1989, 1 ♂ (MNHN-B 21522).

Fiji. MUSORSTOM 10, stn CP 1316, 17°14.8'S, 178°22.0'E, 478-491 m, 6.VIII.1998, 3 ♂♂, 2 ♀♀, 1 ♀ parasitized by *Sacculina* sp. (MNHN-B 28567). — Stn CP 1317, 17°12.0'S, 178°14.1'E, 471-475 m, 6.VIII.1998, 1 ♂, 3 ♀♀, 1 ♀ parasitized by *Sacculina* sp. (MNHN-B 28569). — Stn CP 1332, 16°56.2'S, 178°07.9'E, 640-687 m, 8.VIII.1998, 1 ♂, 1 ♀ (MNHN-B 28566). — Stn CP 1342, 16°46.0'S, 177°39.7'E, 650-701 m, 10.VIII.1998, 1 ♂ (MNHN-B 28561). — Stn CP 1346, 17°19.6'S, 178°32.4'E, 673-683 m, 11.VIII.1998, 1 ♀ (MNHN-B 28570). — Stn CP 1360, 17°59.6'S, 178°48.2'E, 402-444 m, 13.VIII.1998, 1 ♀ (MNHN-B 28564).

BORDAU 1, stn CP 1396, 19°39'S, 179°57'W, 591-596 m, 24.II.1999, 1 ♂, 2 ♀♀ (MNHN-B 28572). — Stn CP 1398, 16°22'S, 179°56'W, 907-912 m, 24.II.1999, 4 ♂♂, 1 juv. ♀, 1 ♀ (MNHN-B 28565). — Stn CP 1400, 16°28'S, 179°50'W, 1004-1012 m, 25.II.1999, 2 ♀♀ (MNHN-B 28625). — Stn CP 1406, 16°39'S, 179°37'W, 360-380 m, 25.II.1999, 1 ♀ (MNHN-B 28563).

Tonga. BORDAU 2, stn CP 1565, 20°58'S, 175°16'W, 869-880 m, 9.VI.2000, 1 ♀, 1 ovig. ♀ (MNHN-B 28568).

DISTRIBUTION. — Maldives, India, Sri Lanka, and Andaman Sea (see Alcock 1896); Japan (see Sakai 1976); East China Sea (Chen 1986); South China Sea (Serène & Lohavanijaya 1973, as *Ethusa gracilipes* Miers, 1886); Philippine Is (Serène & Vadon 1981, as *Ethusina gracilipes* (Miers, 1886); Chen 1985, 1993); Indonesia (Lesser Sunda Is and Moluccas [Ihle 1916b], Makassar Strait, Tanimbar and Kai Is [Chen 1993, 1997]); Vanuatu (Chen 2000); New Caledonia (Chen 1993), and now from the Gulf of Aden, south-western Indian Ocean near La Réunion, Solomon Is, Fiji, and Tonga; questionably from the Red Sea (Türkay 1986, as *Ethusa* sp.) (Fig. 12). Depth: 21-1315 m (Chen 1993) (Fig. 34).

SIZE. — Maximum size: ♂ cl 14.6 mm, cw 15.9 mm (MNHN-B 28505), ♀ cl 16.7 mm, cw 18.3 mm (MNHN-B 28505), no sex indicated: cl 20.1 mm, cw 17.7 mm (Ikeda 1998: pl. 15).

REMARKS

Ethusa indica is best characterized by outer orbital teeth that are typically conspicuously slender, acute, directed outwardly, and reach higher than the frontal teeth (Fig. 33C; Alcock & Anderson 1895: pl. 14, fig. 2; Sakai 1965: pl. 12, fig. 4; 1976: fig. 27; Chen 1985: fig. 8; 1986: fig. 10.46; Chen & Sun 2002: fig. 101.2). The relative length, width, and orientation of the outer orbital teeth, however, vary widely, as pointed out by Chen (1985: 191, fig. 9b). The anterior

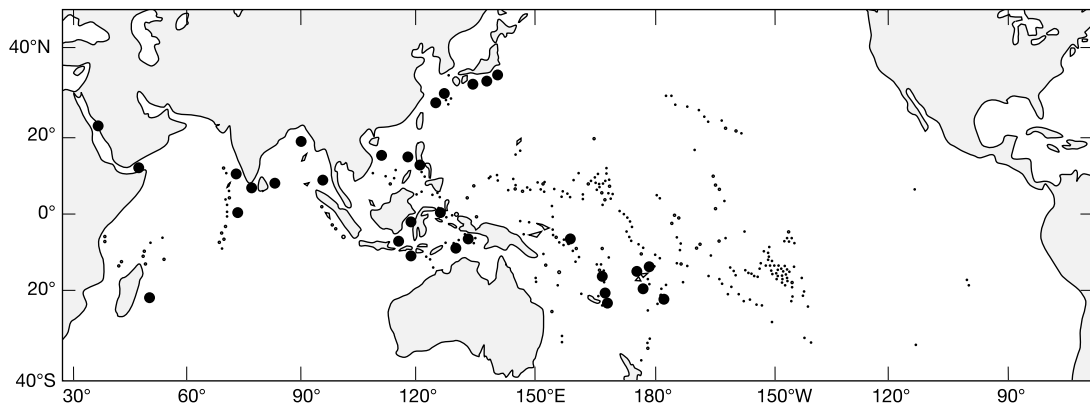


FIG. 12. — Geographical distribution of *Ethusa indica* Alcock, 1894.

border of the endostome extends well below the antennular fossae of the basal antennular articles (Sakai 1976: 62-63 [key]; Chen 1985: fig. 9a). The meri of P2 and P3 are conspicuously long and, when folded, are longer than the carapace (Fig. 33C; Sakai 1976: fig. 27). Their length, however, is also variable (Chen 1985: 191). A good diagnostic character is the G1, each having an expanded, triangular, shovel-like distal end (Chen 1985: fig. 9e, f; 1986: fig. 10.49; Chen & Sun 2002: fig. 101.5). The presence of a minute triangular spine at the inner, distal portion of each of the basal antennular articles, a character mentioned by Serène & Lohavanijaya (1973: 36) for specimens of *E. indica* misidentified as *Ethusa gracilipes* Miers, 1886 (see below), is actually a character of all ethusines.

Ethusa indica is similar to *E. latidactyla* Parisi, 1914, a large-size species. Both species are easily separated by the relative length of their outer orbital teeth, which in *E. latidactyla* (Sakai 1937: fig. 1b; 1976: fig. 26b; Chen 1985: fig. 7; 1986: fig. 9.41; Chen & Sun 2002: fig. 105.1) are shorter and wider than those of *E. indica*. The outer orbital teeth are also slightly shorter than the frontal teeth in *E. latidactyla* in contrast to *E. indica*, where they are longer. The anterior border of the endostome extends to the level of the antennular fossae of the basal antennular articles in *E. latidactyla* but it extends well below the articles in *E. indica*. There are also

some similarities with *E. abbreviata* n. sp. and *E. machaera* n. sp. Differences between the species are given in the respective descriptions of the two species.

A female collected near La Réunion in the southwestern Indian Ocean (MNHN-B 28559) had one unusually long outer orbital tooth (the other tooth was cut off) but all other characters agree with those of *E. indica*.

Specimens identified as *Ethusa gracilipes* by Serène & Lohavanijaya (1973: 35) and as *Ethusina gracilipes* by Serène & Vadon (1981: 119, 121) appear to be conspecific to *E. indica*, as previously indicated by Chen (1985: 189, 191). The specimens, however, could not be located.

Ethusa serenei Sakai, 1983 was described from the (East?) China Sea and considered identical to the specimens identified as *Ethusina gracilipes* by Serène & Lohavanijaya (1973). The type material could not be located but Sakai's illustration (Sakai 1983a: pl. 4, fig. 3) agrees with the diagnostic features of *E. indica*. Chen (1985: 189) listed *E. serenei* as a synonym of *E. indica* without explanation.

A specimen of a small, juvenile ethusid from the Red Sea identified as *Ethusa* sp. by Türkay (1986) may belong to *E. indica*. The specimen (δ , SMF 13587) survives as a soft molt and a much fragmented portion of the ventral surface of the carapace, but a drawing (Türkay 1986: figs 30-32) shows characters similar to those of

E. indica: acute outer orbital teeth that are directed outwardly and G1 each with an expanded, triangular distal end.

Ethusa indonesiensis Chen, 1997

Ethusa indonesiensis Chen, 1997: 619, fig. 4.

TYPE MATERIAL. — Holotype: ♂ cl 7.3 mm, cw 7.1 mm, KARUBAR, stn DW 18 (MNHN-B 22888).

TYPE LOCALITY. — Indonesia, Kai Islands, 05°18'S, 131°41'E, 205-212 m.

MATERIAL EXAMINED. — **Philippine Islands.** Bohol, Balicasag island, off Panglao island, 50-500 m, 28.XI.2001, 1 ♂ (ZRC 2001.0517); local shell fishermen, tangle nets, 200-300 m, VI.2002, 1 ♂ (ZRC 2002.0646), 1 ♂ (ZRC 2002.0647). — Tangle nets of local fishermen, 25-30.VII.2003, 1 ♂ (ZRC 2004.0599). — Maribohoc Bay, tangle nets, 100-300 m, T. J. Arbasto coll., XI.2003-IV.2004, 1 ♂, 1 ♀ (ZRC).

Indonesia. Kai Islands, KARUBAR, stn DW 18, 05°18'S, 131°41'E, 205-212 m, 24.X.1991, 1 ♂ holotype (MNHN-B 22888).

Solomon Islands. SALOMON 1, stn CP 1786, 09°21.3'S, 160°24.6'E, 387 m, 30.IX.2001, 1 juv. ♂ cl 3.2 mm, cw 2.8 mm (MNHN-B 28706).

French Polynesia. Marquesas Islands, MUSORSTOM 9, stn CP 1238, 09°41'S, 139°04'W, 280-370 m, 31.VIII.1997, 1 ♂ (MNHN-B 28545).

DISTRIBUTION. — Known from Indonesia (Kai Is) (Chen 1997) and now from the Philippine Is and French Polynesia (Marquesas Is); questionably from the Solomon Is. Depth: 200-387 m (Fig. 34); also collected from nets lowered to 50-500 m.

SIZE. — Maximum size: ♂ cl 7.6 mm, cw 7.6 mm (MNHN-B 28545), ♀ cl 9.7 mm, cw 9.7 mm (ZRC).

REMARKS

Chen (1997: 619) pointed out that *Ethusa indonesiensis* was closer to *E. parapygmaea* Chen, 1993, another small-size and uncommon species so far known only from two males. Both species are best separated by the shape of their G1: each having a knife-like tip in *E. indonesiensis* (Chen 1997: fig. 4g-i) in contrast to a foot-like tip in *E. parapygmaea* (Chen 1993: fig. 12e). The outer orbital teeth are clearly wider in *E. indonesiensis* (Chen 1997: fig. 4a) than in *E. parapygmaea* (Chen 1993: fig. 12a). *E. parapygmaea* is very

close to *E. pygmaea* Alcock, 1894, and only the study of the type material of the later may clarify their differences (see discussion of *E. pygmaea* below). Also characteristic of *E. indonesiensis* are the relatively long P2 and P3 and the greatly enlarged propodi of the chelipeds (Chen 1997: fig. 4b), probably only characteristic of males.

A very small juvenile with undeveloped G1 and soft exoskeleton collected from the Solomon Is (♂ cl 3.2 mm, cw 2.8 mm, MNHN-B 28706) was questionably identified as *E. indonesiensis* on account of the shape of the anterior border of the carapace. The anterior border of the endostome, however, extended above the antennular fossae of the basal antennular articles, in contrast to the other known specimens of *E. indonesiensis*, where the anterior border only extends below the fossae.

Ethusa izuensis Sakai, 1937

Ethusa izuensis Sakai, 1937: 77 (key), 80, figs 1d, 4; 1956: 7 (list), fig. 8.4; 1965: 23, pl. 12, figs 1, 2 (colour); 1976: 66, figs 26, 29. — Serène 1968: 40 (list). — Takeda & Miyake 1972: 67. — Serène & Lohavanijaya 1973: 35 (key). — Serène & Vadon 1981: 118-121. — Miyake 1983: 18, 199, pl. 6, fig. 6 (colour). — Chen 1985: 193, figs 11, 12, pl. 1, fig. 2; 1986: 131, fig. 12(59-61); 1993: 318 (key), 324; 1998: 233, fig. 4; 2000: 427. — Dai *et al.* 1986: 52, fig. 27(5-6), pl. 6, fig. 5. — Dai & Yang 1991: 60, fig. 27(5-6), pl. 6, fig. 5. — Nagai 1995: 60, pl. 1, fig. 8. — Muraoka 1998: 17. — Takeda 2001: 225, 254, 259. — Chen & Sun 2002: 54, 243, fig. 103, pl. 9, fig. 6. — Marumura & Kosaka 2003: 23.

TYPE MATERIAL. — Holotype: ♀, Japan, Honshu, Sagami Bay, between Ito and Hatsu Shima, Misago, VI.1934. Deposit unknown.

As noted by Chen (1985: 194), the holotype was listed as a female in the description (Sakai 1937: 81) but as a male in the caption of a figure in a later publication (Sakai 1976: fig. 29). The holotype was probably a female because of its large size (cl 11.5 mm, cw 10.4 mm).

TYPE LOCALITY. — Japan, Honshu, Sagami Bay, between Ito and Hatsu Shima.

MATERIAL EXAMINED. — **Japan.** Honshu, Tateyama Bay, Boso Peninsula, 35°00.57'N, 139°41.45'E, 100-258 m, T. Komai coll., 17.VIII.1999, 1 ♂, 1 ♀ (CBM-ZC 4705). — Sagami Bay, Amadaiba Bank, T. Sakai and Emperor Hirohito coll., 150-250 m, 17.XII.1958, 2 ♂♂ (SMF 28926). — Sagami Bay, Hatsu Shima, 30.I.1960, 1 ♀ (SMF 28927).

- Taiwan.** TAIWAN 2002, stn CP 162, 22°09.6'N, 120°37.9'E, 190-200 m, 25.V.2002, 2 ♂♂ (NTOU).
- Philippine Islands.** South China Sea, MUSORSTOM 1, stn CP 24, 14°00'N, 120°18.0'E, 189-209 m, 22.III.1976, 1 ♀ (MNHN-B 18906). — Stn CP 25, 14°02.7'N, 120°20.3'E, 200-191 m, 22.III.1976, 2 ♀♀ (MNHN-B 18910). — Stn CP 30, 14°01.3'N, 120°18.7'E, 186-177 m, 22.III.1976, 1 ♀ (MNHN-B 18912). — Stn CP 32, 14°02.2'N, 120°17.7'E, 193-184 m, 23.III.1976, 1 ♂ (MNHN-B 18911). — Stn CP 34, 14°01.0'N, 120°15.8'E, 191-188 m, 23.III.1976, 1 ♂ (MNHN-B 18905). — Stn CP 36, 14°01.2'N, 120°20.2'E, 210-187 m, 23.III.1976, 1 ♂ (MNHN-B 18904). — Stn CP 57, 13°53.1'N, 120°13.2'E, 107-96 m, 26.III.1976, 1 ♀ (MNHN-B 18901). — Stn CP 64, 14°00.5'N, 120°16.3'E, 194-195 m, 27.III.1976, 1 juv. ♀ (MNHN-B 18900).
- MUSORSTOM 2, stn CP 2, 14°01'N, 120°17'E, 184-186 m, 20.XI.1980, 1 ♀ (MNHN-B 18907). — Stn CP 18, 14°00'N, 120°18'E, 188-195 m, 22.XI.1980, 1 ♀ (MNHN-B 18909), 1 ♀ (MNHN-B 18903). — Stn CP 51, 14°00'N, 120°17'E, 170-187 m, 27.XI.1980, 2 ♂♂, 2 ♀♀ (MNHN-B 18928). — Stn CP 64, 14°01'N, 120°19'E, 191-195 m, 29.XI.1980, 1 juv. ♀ (MNHN-B 18908). — Stn CP 66, 14°00'N, 120°20'E, 192-209 m, 29.XI.1980, 1 ♀ (MNHN-B 18898).
- MUSORSTOM 3, stn CP 87, 14°00.6'N, 120°19.6'E, 191-197 m, 31.V.1985, 1 ♂, 1 ♀ (MNHN-B 28584). — Stn CP 88, 14°01'N, 120°17'E, 183-187 m, 31.V.1985, 1 ♂, 1 ♀ (MNHN-B 18893). — Stn CP 91, 14°00'N, 120°18'E, 190-203 m, 31.V.1985, 1 ♂ (MNHN-B 18894). — Stn CP 92, 14°03'N, 120°12'E, 224 m, 31.V.1985, 2 ♂♂, 1 ♀ (MNHN-B 18895). — Stn CP 108, 14°01'N, 120°18'E, 188-195 m, 2.VI.1985, 1 ♀ (MNHN-B 18896). — Stn CP 109, 14°00'N, 120°18'E, 190-198 m, 2.VI.1985, 2 ♂♂, 1 ♀ (MNHN-B 18892). — Stn CP 111, 14°00'N, 120°18'E, 193-205 m, 2.VI.1985, 1 ♀ (MNHN-B 18897).
- Verde Island Passage, MUSORSTOM 2, stn CP 35, 13°28'N, 121°12'E, 160-198 m, 24.XI.1980, 1 ♂ (MNHN-B 18902).
- Visayan Sea, MUSORSTOM 3, stn CP 143, 11°29'N, 124°11'E, 205-214 m, 7.VI.1985, 1 ♂ (MNHN-B 18899).
- Bohol, Balicasag island, off Panglao island, tangle nets from local fishermen, XII.2000, 1 ♂ (ZRC 2001.0388), 1 ♀ (ZRC 2001.0390); 50-500 m, 28.XI.2001, 6 ♂♂, 4 ♀♀ (ZRC 2001.0517); local shell fishermen, 200-300 m, VI.2002, 3 ♂♂ (ZRC 2002.0643), 2 ♀♀ (ZRC 2002.0644), 1 ♂ (ZRC 2002.0645); purchased from fishermen, P. K. L. Ng *et al.*, 25-30.VII.2003, 2 ♂♂, 3 ♀♀ (ZRC 2003.0297).
- Solomon Islands.** SALOMON 1, stn CP 1837, 10°12.8'S, 161°28.6'E, 381-383 m, 5.X.2001, 1 ♂ (MNHN-B 28593).
- Vanuatu.** MUSORSTOM 8, stn DW 1060, 16°13.82'S, 167°20.80'E, 397-375 m, 2.X.1994, 1 juv. ♀ (MNHN-B 27503).
- New Caledonia.** ORSTOM trawling, 22°40'-22°50'S, 167°10'-167°30'E, 200-350 m, 10.X.1986, 2 ♀♀ (MNHN-B 19095).
- BATHUS 1, stn CP 712, 21°44.26'S, 166°35.34'E, 210 m, 19.III.1993, 1 ♂ (MNHN-B 28589).
- BATHUS 2, stn DW 714, 22°37.79'S, 167°09.71'E, 124 m, 10.V.1993, 1 juv. ♀ (MNHN-B 28586). — Stn DW 732, 22°49.76'S, 166°45.12'E, 236-264 m, 13.V.1993, 1 ♀ (MNHN-B 28583).
- BATHUS 3, stn DW 836, 22°02'S, 166°59'E, 295-306 m, 30.XI.1993, 1 ♀ (MNHN-B 28587).
- HALIPRO 1, stn CP 851, 21°43'S, 166°37'E, 314-364 m, 19.III.1994, 3 ♂♂ (MNHN-B 28588).
- BATHUS 4, stn DW 904, 18°59.85'S, 163°11.76'E, 461 m, 4.VIII.1994, 1 ♀, 1 ovig. ♀ (MNHN-B 28590).
- Loyalty Islands.** LIFOU 2000, stn DW 1650, 20°54.15'S, 167°01.7'E, 120-250 m, 15/18/20.XI.2000, 1 ♀ (MNHN-B 28591).
- Fiji.** MUSORSTOM 10, stn CP 1323, 17°16.1'S, 177°45.7'E, 143-173 m, 7.VIII.1998, 1 ♂ (MNHN-B 28595). — Stn CP 1348, 17°30.3'S, 178°39.6'E, 353-390 m, 11.VIII.1998, 1 ♀ (MNHN-B 28596). — Stn CP 1357, 17°48.5'S, 178°46.7'E, 81-110 m, 13.VIII.1998, 1 ♂ (MNHN-B 28597). — Stn CP 1363, 18°12.4'S, 178°33.0'E, 144-150 m, 15.VIII.1998, 1 ♂, 1 ♀ (MNHN-B 28598). — Stn CP 1366, 18°12.4'S, 178°33.1'E, 149-168 m, 15.VIII.1998, 1 ♀ (MNHN-B 28599). — Stn CP 1385, 18°18.5'S, 178°05.2'E, 227-284 m, 18.VIII.1998, 1 ♀ (MNHN-B 26600). — Stn CP 1387, 18°18.5'S, 178°04.7'E, 229-370 m, 19.VIII.1998, 1 ♂, 1 ♀ (MNHN-B 26601). — Stn CP 1389, 18°18.6'S, 178°04.7'E, 241-417 m, 19.VIII.1998, 1 ♂ (MNHN-B 2602). — Stn CP 1390, 18°18.6'S, 178°05.7'E, 234-361 m, 19.VIII.1998, 2 ♀♀ (MNHN-B 2603).
- BORDAU 1, stn CP 1412, 16°06'S, 179°28'W, 400-407 m, 26.II.1999, 1 ♀ (MNHN-B 28604). — Stn CP 1421, 17°08'S, 178°59'W, 403-406 m, 28.II.1999, 1 ♂ (MNHN-B 28605). — Stn CP 1423, 17°08'S, 178°59'W, 402-410 m, 28.II.1999, 1 ♂ (MNHN-B 28606). — Stn CP 1450, 16°44'S, 179°58'W, 327-420 m, 4.III.1999, 1 juv. ♀ (MNHN-B 28607). — Stn CP 1465, 18°09'S, 178°39'W, 290-300 m, 6.III.1999, 1 ♂ (MNHN-B 28608). — Stn CP 1476, 19°41'S, 178°11'W, 310-420 m, 8.III.1999, 1 juv. ♀ (MNHN-B 28609). — Stn CP 1478, 20°59'S, 178°44'W, 386-396 m, 9.III.1999, 1 juv. ♀ (MNHN-B 28610). — Stn CP 1500, 18°42'S, 178°26'W, 366-389 m, 12.III.1999, 2 ♀♀ (MNHN-B 28611). — Stn CP 1506, 18°09'S, 178°37'W, 294-300 m, 13.III.1999, 2 ♀♀ (MNHN-B 28612).
- Tonga.** BORDAU 2, stn CP 1511, 21°08'S, 175°22'W, 384-402 m, 31.V.2000, 1 ♀ (MNHN-B 28594). — Stn CP 1541, 21°15'S, 175°14'W, 319-333 m, 5.VI.2000, 1 ♂ (MNHN-B 28643). — Stn CP 1567, 21°02'S, 175°19'W, 351-356 m, 10.VI.2000, 1 juv. ♂, 1 ♂, 1 ♀ (MNHN-B 28592).

DISTRIBUTION. — Southern Japan (see Sakai 1976), East China Sea (Takeda & Miyake 1972), South China Sea (Chen 1986), Philippine Is (Chen 1985, 1993), Indonesia (Makassar Strait) (Chen 1993), Vanuatu (Chen 2000), New Caledonia (Chen 1993), and now from Taiwan, Solomon Is, Loyalty Is, Fiji, and Tonga. An earlier record from Taiwan (Fang 1991) is questioned by Ng *et al.* (2001). Depth: 30 (Sakai 1937)-600 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 10.8 mm, cw 10.5 mm (ZRC 2001.0517), ♀ cl 15.0 mm, cw 15.4 mm (ZRC 2001.0517).

REMARKS

There is considerable variation in the characters that are used in part to define *Ethusa izuensis*. The outer orbital teeth vary from triangular and symmetrical to proximally broad. The density of hair also varies, even in material collected from the same location. In fresh material, a considerable amount of sediment may be trapped in the hairs. Morphological variation did not follow any defined geographical patterns that would suggest a cline or even separate species.

Ethusa izuensis may be confused with *E. minuta* Sakai, 1937. Both species have slender and pointed outer orbital teeth but the teeth are more slender and are directed slightly more outwardly in *E. minuta* (Sakai 1937: fig. 1e; 1965: pl. 11, fig. 2; 1976: fig. 26e; Chen 1986: fig. 12.55; 1993: fig. 10a; Chen & Sun 2002: fig. 104.1) than in *E. izuensis* (Sakai 1937: fig. 1d; 1976: fig. 26d; Chen 1985: fig. 11; 1986: fig. 12.59; Chen & Sun 2002: fig. 103.1). A male illustrated by Sakai (1965: pl. 12, fig. 1) is debatably assigned to *E. izuensis*. It has slender outer orbital teeth, with the left one clearly directed outwardly. The sides of the carapace are only slightly broader on the posterior half in *E. izuensis* (Sakai 1965: pl. 12, figs 1, 2; 1976: 29; Miyake 1983: pl. 6, fig. 6; Chen 1985: fig. 11; 1986: fig. 12.59; Chen & Sun 2002: fig. 103.1), whereas there is a conspicuous constriction at the level of the branchial groove in *E. minuta* (Sakai 1965: pl. 11, fig. 2; 1976: pl. 23, fig. 4; Chen 1986: fig. 12.55; 1993: fig. 10a; Chen & Sun 2002: fig. 104.1). The orbital sinuses are only slightly wider or about the same width as the frontal sinuses in *E. izuensis* while they are much wider

in *E. minuta* (Sakai 1937: fig. 1; 1976: fig. 26). The anterior border of the endostome extends only to the anterior margin of the antennular fossae of the basal antennular articles in *E. izuensis* (Chen 1985: fig. 12a; Chen & Sun 2002: fig. 103.2) but in *E. minuta* it extends beyond the antennular fossae in such a way that it reaches the ventral fold of the median central sinus, a character pointed out by Sakai (1937: 77, 82; 1976: 63). Each G1 has a pointed tip and is more slender and longer in *E. izuensis* (Chen 1985: fig. 12f, h; 1986: fig. 12.61; Chen & Sun 2002: fig. 103.7) than in *E. minuta* (Chen 1986: fig. 12.57; 1993: fig. 10f; Dai & Yang 1991: fig. 27.2; Chen & Sun 2002: fig. 104.6). The maximum size reached by adults is bigger in *E. izuensis* than in *E. minuta*. The dorsal surface of the carapace of *E. izuensis* is covered in varying amounts of hair whereas the dorsal surface (except the anterior and anterolateral borders) of *E. minuta* lacks any conspicuous hair, although conspicuous plumose setae are often found along the lateral and posterior borders of the carapace and on the pereopods. The cheliped meri are devoid of conspicuous setae in *E. izuensis*, whereas there are usually setae on the cheliped meri of *E. minuta* (Chen 1986: fig. 12.56).

Ethusa izuensis is found at greater depths than *E. minuta*. All specimens of *E. izuensis* studied during this investigation, from Japan to Tonga, were collected at depths greater than 100 m whereas the opposite is the case for *E. minuta*. Nevertheless, Sakai (1937: 81, 1976: 66) recorded *E. izuensis* at depths of 30-100 m in Japan.

Ethusa izuensis is also similar to *E. foresti* Chen, 1985. Differences between the two species are outlined in the discussion of *E. foresti* (see above).

Ethusa latidactyla Parisi, 1914

Ethusa (Ethusina) latidactyla Parisi, 1914: 305, pl. 13, fig. 1.

Ethusina latidactyla – Ihle 1916b: 152 (list).

Ethusa latidactyla – Ihle 1916b: 139, 151 (list), 153 (list), 156 (list), figs 74, 75. — Sakai 1937: 78, 181, fig. 1b; 1956: 7 (list); 1965: 23, pl. 11, fig. 3 (colour); 1976: 64, fig. 26b, pl. 23, fig. 2 (colour). — Serène

1968: 40 (list). — Miyake 1983: 198 (list). — Chen 1985: 186, fig. 7, pl. 1, fig. 6, pl. 2, figs 3, 6; 1986: 127, fig. 9. — Nagai 1995: 60, pl. 1, fig. 5. — Muraoka 1998: 17. — Chen & Sun 2002: 54, 246, fig. 105. — Marumura & Kosaka 2003: 23.

Ethusa aff. *hirsuta* – Serène & Vadon 1981: 118, 119, 121.

Ethusa latidactylus – Chen 1993: 317 (key), 324, fig. 6.

Ethusa latidactyla [sic] – Serène & Lohavanijaya 1973: 34 (key).

TYPE MATERIAL. — Holotype: ♀ cl 13.5 mm, damaged, A. Owston coll., 1913 (MCSNM 5; see Frogliá & Grippa 1986).

The holotype is badly damaged and could not be mailed (G. Grippa pers. comm.). Photographs, however, showed the characteristic anterior margin of the carapace that is diagnostic to the species.

TYPE LOCALITY. — Japan, Honshu, Sagami Bay.

MATERIAL EXAMINED. — **Japan.** Kyushu, Kagoshima, Furue, 31°23'N, 130°41'E, K. Sakai coll., 200 m, 19.III.1968, 1 ♀ (SMF 28930).

Unknown location, T. Sakai coll., 1 ♂ (SMF 28929).

Taiwan. TAIWAN 2002, stn CP 166, 22°23.8'N, 120°15.3'E, 200 m, 26.V.2002, 1 ♂ (NTOU).

Philippine Islands. South China Sea, MUSORSTOM 1, stn CP 2, 14°02.8'N, 120°18.8'E, 187-182 m, 19.III.1976, 1 ♀ (MNHN-B 18180). — Stn CP 30, 14°01.3'N, 120°18.7'E, 186-177 m, 22.III.1976, 1 ♂ (MNHN-B 18179). — Stn CP 32, 14°02.2'N, 120°17.7'E, 193-184 m, 23.III.1976, 1 juv. ♀ (MNHN-B 18178). — Stn CP 51, 13°49.4'N, 120°04.2'E, 200-170 m, 25.III.1976, 1 ♂, 1 ♀ (MNHN-B 18176).

MUSORSTOM 2, stn CP 41, 13°16'N, 122°46'E, 166-172 m, 25.XI.1980, 5 ♂♂, 1 juv. ♀ (MNHN-B 18181). — Stn CP 64, 14°01'N, 120°19'E, 191-195 m, 29.XI.1980, 2 ♂♂, 1 juv. ♀ (MNHN-B 18175). — Stn CP 67, 14°01'N, 120°19'E, 193-199 m, 29.XI.1980, 2 ♂♂, 1 juv. ♀ (MNHN-B 18177).

MUSORSTOM 3, stn CP 87, 14°00'N, 120°19'E, 191-197 m, 31.V.1985, 1 ♂ (MNHN-B 18017). — Stn CP 97, 14°00'N, 120°18'E, 189-194 m, 1.VI.1985, 1 juv. ♀ (MNHN-B 18890). — Stn CP 98, 14°00'N, 120°18'E, 194-205 m, 1.VI.1985, 2 ♂♂ (MNHN-B 18891). — Stn CP 99, 14°00'N, 120°19'E, 196-204 m, 1.VI.1985, 1 ♂ (MNHN-B 18888). — Stn CP 100, 14°00'N, 120°18'E, 189-199 m, 1.VI.1985, 1 ♂, 1 juv. ♀ (MNHN-B 18884). — Stn CP 109, 14°00'N, 120°18'E, 190-198 m, 2.VI.1985, 1 juv. ♀ (MNHN-B 18883). — Stn CP 111, 14°00'N, 120°18'E, 193-205 m, 2.VI.1985, 1 ♂, 1 juv. ♀ (MNHN-B 18885). — Stn CP 112, 14°00'N, 120°18'E, 187-199 m, 2.VI.1985, 3 ♂♂ (MNHN-B 18887).

Mindoro Strait, stn CP 120, 12°06'N, 121°15'E, 219-220 m, 3.VI.1985, 2 ♂♂, 2 ♀♀ (MNHN-B 18886). Sibuyan Sea, stn CP 139, 11°53'N, 122°14'E, 240-267 m, 6.VI.1985, 1 ♂, 1 juv. ♀, 1 ♀ (MNHN-B 18889).

Indonesia. Makassar Strait, CORINDON 2, stn CH 273, 01°57'S, 119°15'E, 220 m, 7.XI.1980, 1 ♀ (MNHN-B 19073).

Lesser Sunda Islands, *Siboga*, stn 312, Saleh Bay, Sumbawa, 08°19'S, 117°41'E, 274 m, 14.II.1900, 1 ♂, 1 juv. ♀, 2 ♀♀ (ZMA Crust.De 241694).

DISTRIBUTION. — Southern Japan (see Sakai 1976), South China Sea (Chen 1986), Philippine Is (Serène & Vadon 1981 [as *Ethusa* aff. *hirsuta*], Chen 1985), Indonesia (Lesser Sunda Is [Ihle 1916b], Makassar Strait [Chen 1993]), and now from Taiwan. Depth: 50 (Sakai 1976)-274 m (Ihle 1916b) (Fig. 34).

SIZE. — Maximum size: ♂ cl 11.0 mm, cw 12.1 mm (MNHN-B 18891), ♀ cl 14.2 mm, cw 15.8 mm (MNHN-B 18886).

REMARKS

Ethusa latidactyla is recognizable by its broad, rounded, pear-shaped carapace, the lateral borders of which are convex and the branchial region inflated (Sakai 1976: pl. 23, fig. 2; 1965: pl. 11, fig. 2; Chen 1985: fig. 7; 1986: fig. 9.41; 1993: fig. 6; Chen & Sun 2002: fig. 105.1). A somewhat similar shape, however, is also characteristic of *E. sexdentata* (Stimpson, 1858), from which it differs by the presence of two conspicuous vertical rows of setae on each pterygostomial region (absent in *E. sexdentata*), broadly round orbital sinuses (narrow, V-shaped in *E. sexdentata* [Sakai 1937: fig. 1a; 1976: fig. 26a]). Chen (1985: 189), who listed other more subtle differences between the two species, was actually comparing *E. latidactyla* with *E. abbreviata* n. sp., not *E. sexdentata* (see synonymy of *E. abbreviata* n. sp. above).

Differences between *E. latidactyla* and *E. indica*, another large-size species, are mentioned in the Remarks of *E. indica* (see above).

A specimen from MUSORSTOM 1 (Philippines) identified as *Ethusa* aff. *hirsuta* by Serène & Vadon (1981) and not available for examination is possibly *E. latidactyla* since two specimens of this species (and of no other species of *Ethusa*) were identified from the same station (MNHN-B 18176).

Ethusa longidentata Chen, 1997

Ethusa longidentata Chen, 1997: 619, fig. 5.

Ethusa pygmaea – Ihle 1916b: 141, 151 (list), 153 (list), 156 (list) (not *E. pygmaea* Alcock, 1894).

TYPE MATERIAL. — Holotype: ♂ cl 6.5 mm, cw 5.8 mm, damaged, KARUBAR, stn DW 28 (MNHN-B 22884); paratype: ♀ cl 7.0 mm, cw 6.6 mm, same station (MNHN-B 22889).

TYPE LOCALITY. — Indonesia, Kai Islands, 05°31'S, 132°54'E, 448-467 m.

MATERIAL EXAMINED. — **Indonesia.** Lesser Sunda Islands, *Siboga*, stn 51, Flores, south Molo Pass, 69-91 m, 19.IV.1899, 8 ♂♂, 1 juv. ♀, 8 ♀♀, 2 ovig. ♀♀ (ZMA Crust.De 241692). — Stn 289, off south coast of Timor, 09°0.3'S, 126°24.5'E, 112 m, 20.I.1900, 1 ♂ damaged (ZMA Crust.De 241710).

Kai Islands, KARUBAR, stn DW 28, 05°31'S, 132°54'E, 448-467 m, 26.X.1991, 1 ♂ holotype (MNHN-B 22884), 1 ♀ paratype (MNHN-B 22889).

Solomon Islands. SALOMON 1, stn CP 1770, 08°19.6'S, 160°38.7'E, 453-542 m, 1.X.2001, 1 ♂ (MNHN-B 28548). — Stn CP 1795, 09°18.8'S, 160°22.9'E, 442-451 m, 1.X.2001, 1 ♂ (MNHN-B 28549).

DISTRIBUTION. — Indonesia (Celebes, Lesser Sunda Is, Irian Jaya [Ihle 1916b], Kai Is [Ihle 1916b; Chen 1997]), and now from the Solomon Is. Depth: 69-141 m (Ihle 1916b), 442-542 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 8.0 mm, cw 7.6 mm (MNHN-B 28548), ♀ cl 7.0 mm, cw 6.6 mm (MNHN-B 22889).

REMARKS

Ethusa longidentata is a small-size species which is characterized by very long and slender outer orbital teeth (Chen 1997: fig. 5a), U-shaped orbital sinuses, and by short and stout G1 that are slightly bent in the middle portion (Chen 1997: fig. 5f-i). The anterior border of the endostome extends above the level of the antennular fossae of the basal antennular articles.

The *Siboga* material from Indonesia that was identified as *E. pygmaea* Alcock, 1894, by Ihle (1916b), is very close, if not conspecific, to *E. longidentata*. Although the specimens are in poor condition, they clearly share the morphology of their endostomes with *E. longidentata*. They were collected from depths (69-141 m) shallower than those of *E. longidentata* (442-542 m), however.

Ethusa machaera n. sp.

(Fig. 13)

Ethusa hirsuta – Chen 1987: 685, pl. 1, fig. F; 1993: 318 (key), 319 (list) (part) (not *E. hirsuta* McArdle, 1900).

TYPE MATERIAL. — Holotype: ♀ cl 11.0 mm, cw 11.7 mm, *Vauban*, stn CH 94 (MNHN-B 18274); paratypes: other two specimens listed under Material examined.

TYPE LOCALITY. — Madagascar, off southwestern coast, 22°18'S, 43°04.7'E, 400 m.

MATERIAL EXAMINED. — **Madagascar.** *Vauban*, stn CH 50, 15°19.0'S, 46°11.8'E, 405 m, A. Crosnier coll., 8.XI.1972, 1 ovig. ♀ cl 7.8 mm, cw 8.1 mm (MNHN-B 18272). — Stn CH 61, 23°36.1'S, 43°31.0'E, 445-455 m, A. Crosnier coll., 27.II.1973, 1 ovig. ♀ cl 8.8 mm, cw 9.1 mm (MNHN-B 18350). — Stn CH 94, 22°18'S, 43°04.7'E, 400 m, A. Crosnier coll., 27.XI.1973, 1 ♀ holotype (MNHN-B 18274).

ETYMOLOGY. — From *machaera* (Latin for sword or dagger) in reference to the slender, straight, sword-like outer orbital teeth.

DISTRIBUTION. — Known only from Madagascar. Depth: 400-455 m (Fig. 34).

SIZE. — Maximum size: ♀ cl 11.0 mm, cw 11.7 mm (MNHN-B 18274); ♂ unknown.

DESCRIPTION

Carapace of females (males unknown) broader than long (Fig. 13A); dorsal surface covered by small granules, short, abundant hair, particularly longer along anterior third anterolateral borders. Urogastric, cardiac regions distinct, slightly elevated; cervical, branchial grooves indistinct. Branchial regions slightly inflated along sides.

Anterior border of carapace (Fig. 13A) with slender outer orbital teeth, directed slightly outwardly but with straight tips, reaching or nearly reaching shorter frontal teeth. Frontal teeth nearly triangular, equal or nearly equal. Orbital sinuses very broad, U- or nearly V-shaped, asymmetrical (inner margins steeper than outer margins); lateral frontal sinuses U-shaped; median frontal sinus V-shaped, wider than lateral frontal sinuses, narrower than orbital sinuses.

Anterior border of endostome (Fig. 13B) well below posterior border of antennular fossae of basal antennular articles.

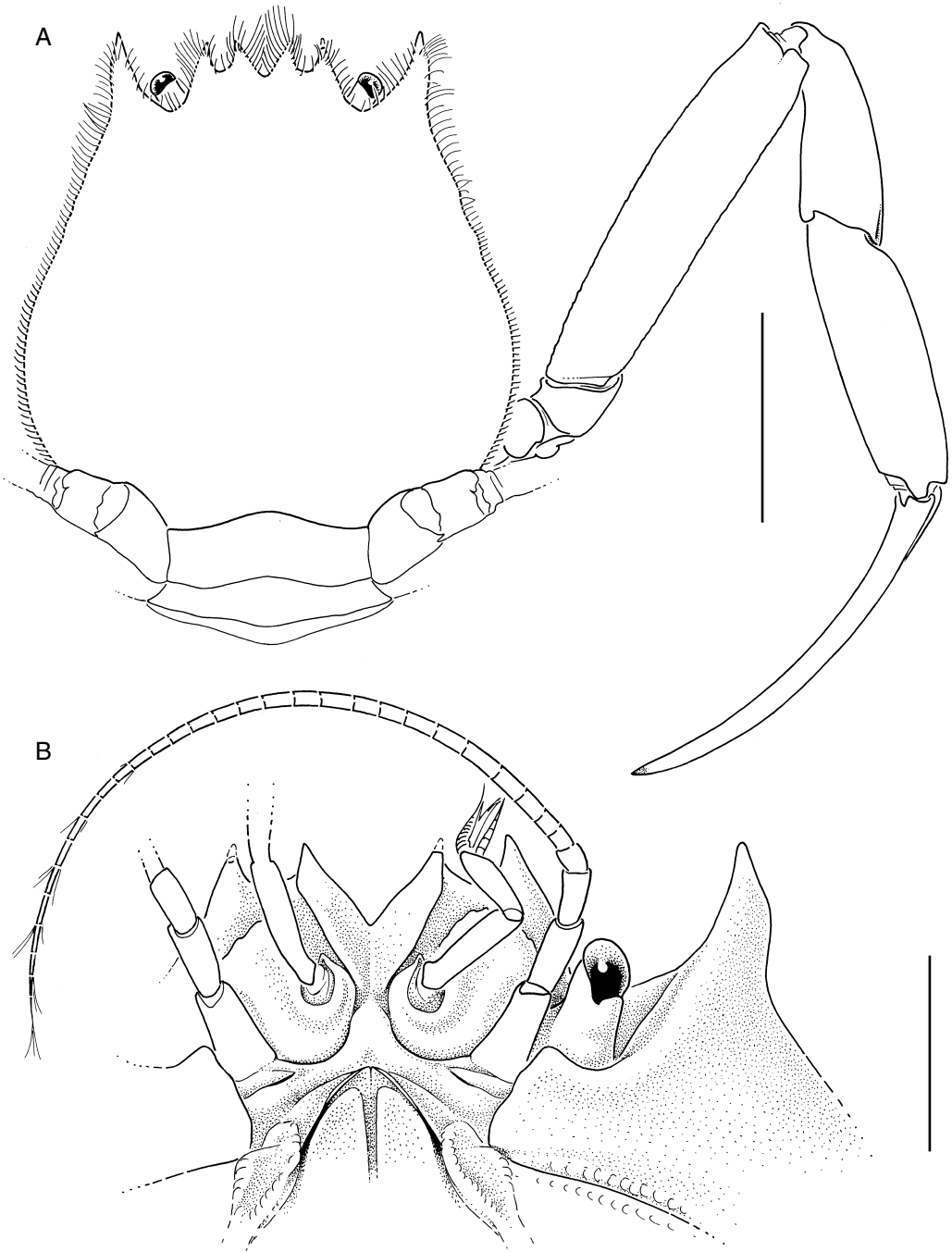


FIG. 13. — *Ethusa machaera* n. sp., ♀ holotype cl 11.0 mm, cw 11.7 mm, off southwestern coast of Madagascar, *Vauban*, stn CH 94, 400 m (MNHN-B 18274); **A**, dorsal surface of carapace and P2; **B**, ventral view of anterior portion of body. Scale bars: A, 5 mm; B, 2 mm.

Female chelipeds (P1) (males unknown) small, slender, smooth, nearly equal; fingers 1.7 times longer than propodus, with very short teeth in holotype, small triangular teeth in two paratypes. P2 (Fig. 13A), P3 relatively short, thick; meri with small granules; length of P2 meri 0.8–0.9 times cl, 4.4–5.0 times longer than broad. P4, P5 covered with short hairs; P5 dactyli slender, slightly curved.

Female abdomen (males unknown) with six somites, triangular telson; somite 3 broadest, somite 6 longest.

REMARKS

Specimens from Madagascar identified by Chen (1987) as *Ethusa hirsuta* McArdle, 1900 clearly do not belong to this species. In the Madagascar specimens (Chen 1987: pl. 1, fig. F) the orbital sinuses are broad and U-shaped, the outer orbital teeth are slender, the branchial regions are inflated laterally, and the anterior border of the endostome lies well below the posterior border of the antennular fossae (Fig. 13B). Although the type material of *E. hirsuta* could not be examined and it is not known if it is still extant, illustrations by Alcock & McArdle (1902) and Alcock & MacGilchrist (1905) show V-shaped orbital sinuses and triangular outer orbital teeth, and the branchial region was not inflated, making the sides of the carapace look almost straight (Alcock & McArdle 1902: pl. 59, fig. 2; Alcock & MacGilchrist 1905: pl. 72, fig. 1). The anterior border of the endostome was clearly shown to extend above the level of the antennular fossae of the basal antennular articles (Alcock & MacGilchrist 1905: pl. 72, fig. 1a) so that “there is no distinct epistome” (McArdle 1900: 475). It was clearly described as such (“extends forward well between the bases of the antennules”) by MacGilchrist (1905: 258). Furthermore, the description refers to the outer orbital teeth as “directed slightly outwards”. None of these characters are found among the Madagascar specimens.

Chen (1987) identified the three Madagascar specimens as *E. hirsuta* since they were thought to agree with McArdle’s description.

Nevertheless, Chen found two differences when the specimens were compared to the figures of Alcock & MacGilchrist (1905): “an oblique indistinct ridge” on the branchial regions instead of a groove in the figure and “the lateral part of the cardiac-intestinal region being swollen” (Chen 1987: 686).

The Madagascar specimens erroneously identified as *E. hirsuta* were recognized by Chen (1987: 66) to have frontal and outer orbital teeth that “closely resemble those of *E. indica*”. Although the shape and relative length of the frontal and outer orbital teeth of *E. indica* vary widely (Chen 1985: fig. 9b), its outer orbital teeth typically are directed outwardly whereas in *E. machaera* n. sp. they are straighter. The meri and propodi of P2 and P3 were found to be “very long” in *E. indica* when compared to those of the Madagascar specimens (Chen 1987: 686). The meri of the Madagascar specimens were described as “4.5–4.8 longer than broad”. When the specimens were measured again the average ratios (N = 3) were 3.8 for P2 propodus, 3.3 for P2 carpus, 3.0 for P3 propodus, and 3.5 for P3 carpus. The average values using the same method in randomly selected male and female specimens (N = 7; 6 ♀♀, 1 ♂) of varying size of *E. indica* from the Philippines (MNHN-B 18926, 18164, 18159) and Indonesia (MNHN-B 22860, 22871) were 5.6 for P2 propodus, 4.5 for P2 carpus, 6.7 for P3 propodus, and 4.9 for P3 carpus. In addition to the difference in the length of P2 and P3, *E. machaera* n. sp. has denser hair on the dorsal surface of the carapace as well as on P4 and P5 than *E. indica*.

Ethusa minuta Sakai, 1937

Ethusa minuta Sakai, 1937: 77 (key), 81, figs 1e, 5, pl. 11, fig. 2; 1956: 7 (list), fig. 8.5; 1965: 23, pl. 11, fig. 4 (colour); 1976: 66, fig. 26e, pl. 23, fig. 4 (colour). — Serène 1968: 40 (list). — Takeda & Miyake 1970: 210; 1972: 68. — Serène & Lohavanijaya 1973: 35 (key). — Miyake 1983: 199 (list). — Dai *et al.* 1986: 52, fig. 27(1-2), pl. 6, fig. 3. — Dai & Yang 1991: 58: fig. 27(1-2), pl. 6, fig. 3. — Chen 1986: 131, fig. 12(55-58); 1993: 318 (key), 329, fig. 10; 2000: 427 (part). — Nagai 1995: 61,

pl. 1, fig. 9. — Muraoka 1998: 17. — Takeda 2001: 225, 254, 259. — Chen & Sun 2002: 54, 245, fig. 104. — Marumura & Kosaka 2003: 23.

TYPE MATERIAL. — Holotype: ♂, Japan, Honshu, Sagami Bay, between Ito and Hatsu Shima, Misago, 80 m, VI.1934. Deposit unknown.

TYPE LOCALITY. — Japan, Honshu, Sagami Bay, between Ito and Hatsu Shima, 80 m.

MATERIAL EXAMINED. — **Japan.** Honshu, Sagami Bay, Kannonzuka-dasi and Amadaiba banks, 35°13'N, 139°33'E, 60–65 m, Hatagumo, T. Sakai and Emperor Hirohito coll., 22.VII.1957, 1 ♂ (SMF 28933). — Sagami Bay, WSW of Joga Shima island, 300 m, T. Sakai and Emperor Hirohito coll., 13.III.1964, 1 ♂ (SMF 28925).

Philippine Islands. Bohol, Balicasag I., off Panglao I., tangle nets of local fishermen, XI.2003, 3 ♂♂, 1 ♀ (ZRC). — Maribohoc Bay, tangle nets, 100–300 m, T. J. Arbasto coll., XI.2003–IV.2004, 1 ♂ (ZRC). — Off Panglao I., tangle nets, 29.V.2004, 1 ♀ (ZRC). PANGLAO 2004, stn T10, Panglao I., San Isidro, 9°33.386'N, 123°49.627'E, 117–124 m, 15.VI.2004, 2 ♂♂ (ZRC).

Indonesia. Moluccas, RUMPHIUS EXPEDITION II, Ambon, dredging, 15–20 m, R. Serène coll., 9.I.1975, 2 ♂♂ (MNHN-B 20196).

Kai Islands, MARIEL KING MEMORIAL EXPEDITION, stn KRVII/113, 05°32'S, 132°46'E, 33–37 m, 11.VI.1970, 1 ♂ (MNHN-B 19085).

Chesterfield-Bellona Plateau. CHALCAL 1, stn DC10, 20°36.09'S, 161°05.82'E, 87 m, 15.VII.1984, 2 ♂♂ (MNHN-B 19066). — Stn DC 53, 21°19.50'S, 158°55.30'E, 60 m, 24.VII.1984, 1 ♀ (MNHN-B 28532).

CORAIL 2, stn DW 21, 20°36.14'S, 161°81.75'E, 86 m, 22.VII.1988, 1 ♀ (MNHN-B 28529).

Vanuatu. MUSORSTOM 8, stn CP 1071, 15°36.63'S, 167°16.34'E, 180–191 m, 4.X.1994, 1 ♂ (MNHN-B 27507).

New Caledonia. LAGON, stn 402, 22°33'S, 167°17'E, 40 m, 23.I.1985, 1 ♀ (MNHN-B 28531).

— Stn 535, 19°11'S, 162°25'E, 46 m, 6.III.1985, 1 ♀ (MNHN-B 28585). — Stn 572, 22°52'S, 167°00'E, 65 m, 17.VII.1985, 1 ♂ (MNHN-B 28535). — Stn DW 1155, 19°09.3'S, 162°15.9'E, 48 m, 30.X.1989, 1 ♀ (MNHN-B 28533). — Stn DW 1163, 19°11.3'S, 163°21.9'E, 48 m, 30.X.1989, 2 ♀♀ (MNHN-B 28534).

MUSORSTOM 4, stn DW 149, 19°07.6'S, 163°22.7'E, 155 m, 14.IX.1985, 1 ovig. ♀ (MNHN-B 28530).

DISTRIBUTION. — Japan (see Sakai 1976), East China Sea (Takeda & Miyake 1970), Indonesia (Moluccas and Kai Is [Chen 1993]), Vanuatu (Chen 2000), Chesterfield Is (Chen 1993), New Caledonia (Chen 1993), and now from the Philippine Is. Depth: 15–300 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 6.5 mm, cw 5.2 mm (Sakai 1937), ♀ cl 9.0 mm, cw 9.0 mm (Takeda & Miyake 1970).

REMARKS

Ethusa minuta is close to *E. izuensis* Sakai, 1937. Differences between the two species are outlined in the Remarks of *E. izuensis* (see above).

A colour photograph of a dead but freshly collected specimen of *E. minuta* from the Philippine Islands (ZRC) shows pink pereopods and pink to tan dorsal carapace.

The placement of a reference to *E. izuensis* ("Chen 1985: 193, figs 11, 12, p. 1 fig. 2") among the references for *E. minuta* (Chen 2000: 427) must have been a mistake and not an implication that both species are synonymous.

Ethusa minuta is characteristic of depths typically less than 100 m (Fig. 34), lower than in most species of *Ethusa*.

Ethusa obliquidens Chen, 1993

Ethusa obliquidens Chen, 1993: 317 (key), 330, fig. 11.

TYPE MATERIAL. — Holotype: ♂ cl 9.1 mm, cw 8.3 mm, MUSORSTOM 4, stn DW 197 (MNHN-B 22429); allotype: ♀ same station (IOAS); paratypes: ♀ cl 11.2 mm, cw 10.8 mm, ♀ cl 11.2 mm, cw 10.6 mm, MUSORSTOM 4, stn CP 169 (MNHN-B 18418); ♀ cl 9.3 mm, cw 8.6 mm, MUSORSTOM 4, stn CP 198 (MNHN-B 18421).

TYPE LOCALITY. — New Caledonia, Grand Passage, 18°51.30'S, 163°21.90'E, 550 m.

MATERIAL EXAMINED. — **Solomon Islands.** SALOMON 1, stn CP 1795, 09°18.8'S, 160°22.9'E, 442–451 m, 1.X.2001, 1 ♀ (MNHN-B 28546).

New Caledonia. MUSORSTOM 4, stn CP 169, 18°54.03'S, 163°11.20'E, 600 m, 17.IX.1985, 2 ♀♀ paratypes (MNHN-B 18418). — Stn DW 197, 18°51.30'S, 163°21.90'E, 550 m, 20.IX.1985, 1 ♂ holotype (MNHN-B 22429). — Stn CP 198, 18°49.40'S, 163°18.80'E, 590 m, 20.IX.1985, 1 ♀ paratype (MNHN-B 18421).

BATHUS 4, stn CP 911, 18°57.80'S, 163°08.47'E, 566–558 m, 5.VIII.1994, 3 ♀♀ (MNHN-B 28576). **Fiji.** MUSORSTOM 10, stn CP 1330, 17°09.5'S, 177°56.3'E, 567–699 m, 8.VIII.1998, 2 ♀♀ (MNHN-B 28547).

Wallis and Futuna Islands. MUSORSTOM 7, stn DW 526, 13°13'S, 176°15'W, 355–360 m,

13.V.1992, 1 ♂ (MNHN-B 28575). — Stn DW 537, 13°30'S, 176°41'W, 325-400 m, 16.V.1992, 1 ♂ (MNHN-B 28573). — Stn DW 601, 13°19'S, 176°17'W, 350 m, 23.V.1992, 1 juv. ♀ (MNHN-B 28574).

DISTRIBUTION. — New Caledonia and now from the Solomon Is, Fiji, and the Wallis and Futuna Is. Depth: 325-699 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 9.1 mm, cw 8.3 mm (MNHN-B 22429), ♀ cl 11.5 mm, cw 10.7 mm (MNHN-B 28547).

REMARKS

Diagnostic to *Ethusa obliquidens* is the inward, oblique orientation of the triangular outer orbital teeth (Chen 1993: fig. 11a, b). The sides of the carapace are slightly oblique rather than straight since the branchial region is somewhat inflated. The border of the endostome extends so much anteriorly that it reaches the ventral fold of the median central sinus and thus occludes a view of the antennular fossae of the basal antennular articles. Also characteristic are the fine, close-set granules, which give the carapace a file-paper texture. In a female specimen from the Solomon Is (MNHN-B 28546), the only outer orbital tooth extant is very slender.

Ethusa orientalis Miers, 1886

(Fig. 14)

Ethusa orientalis Miers, 1886: xxiv, 330, pl. 28, fig. 1, 1a-e. — Doflein 1904: 27, 291 (list), fig. 64. — Ihle 1916b: 153 (list), 155 (list). — Serène 1968: 40 (list). — Serène & Lohavanijaya 1973: 34 (key). — Chen 1993: 318 (key), 319 (list).

Ethusa major Chen, 1993: 318 (key), 326, fig. 8; 2000: 427.

Ethusa minuta — Chen 2000: 427 (part).

TYPE MATERIAL. — Lectotype of *Ethusa orientalis* Miers, 1886, ♂ cl 15.7 mm, cw 15.1 mm, *Challenger*, stn 173A (BMNH 84-44); paralectotype: ♂ cl 17.3 mm, same location (BMNH 84-44).

Miers (1886) based his description on two specimens without selecting a holotype. One of the two syntypes, a male specimen, is hereby designated the lectotype and the second specimen, a male with a damaged carapace, is the paralectotype.

Type material of *Ethusa major* Chen, 1993: holotype: 1 ♀ cl 16.5 mm, cw 15.9 mm, MUSORSTOM 6, stn

DW 413 (MNHN-B 21520); paratype: 1 ♀ cl 17.4 mm, cw 17.3 mm, same station (MNHN-B 22257).

TYPE LOCALITY. — Fiji, E of Kadavu island, 19°9.5'N, 179°41.9'E, 567 m.

MATERIAL EXAMINED. — **Vanuatu.** MUSORSTOM 8, stn CP 963, 20°20.10'S, 169°49.08'E, 400-440 m, 21.IX.1994, 2 ♂♂ (MNHN-B 27508). — Stn CP 1124, 15°01.72'S, 166°56.51'E, 532-599 m, 9.X.1994, 1 ♀ (MNHN-B 27504).

New Caledonia. BATHUS 2, stn CP 737, 23°03.42'S, 166°59.97'E, 350-400 m, 13.V.1993, 1 ♂ (MNHN-B 28626).

BATHUS 3, stn DW 797, 23°35'S, 169°37'E, 657-660 m, 26.XI.1993, 1 ovig. ♀ (MNHN-B 28613).

HALIPRO 1, stn CH 880, 23°03'S, 166°58'E, 450-491 m, 31.III.1994, 1 ♀ (MNHN-B 28627).

Loyalty Islands. MUSORSTOM 6, stn DW 413, 20°40.10'S, 167°03.50'E, 463 m, 15.II.1989, 1 ♀ holotype of *E. major* (MNHN-B 21520), 1 ♀ paratype of *E. major* (MNHN-B 22257).

Fiji. *Challenger*, stn 173A, 19°9.5'N, 179°41.9'E, 567 m, 1 ♂ lectotype, 1 ♂ paralectotype (BMNH 84-44).

MUSORSTOM 10, stn CP 1330, 17°09.5'S, 177°56.3'E, 567-699 m, 8.VIII.1998, 1 ♂ (MNHN-B 28634). — Stn CP 1342, 16°46.0'S, 177°39.7'E, 650-701 m, 10.VIII.1998, 1 ♂ (MNHN-B 28536).

BORDAU 1, stn DW 1408, 16°02'S, 179°30'W, 550-561 m, 26.II.1999, 1 ♂ (MNHN-B 28631). — Stn DW 1409, 16°02'S, 179°30'W, 557-558 m, 26.II.1999, 1 juv. ♂, 4 ♂♂, 1 ♀ (MNHN-B 28632). — Stn DW 1432, 17°20'S, 178°44'W, 477-493 m, 2.III.1999, 2 ♂♂ (MNHN-B 28633). — Stn DW 1460, 18°47'S, 178°47'W, 750-767 m, 6.III.1999, 1 ♂, 1 ♀ (MNHN-B 28630). — Stn DW 1481, 20°57'S, 178°45'W, 441-506 m, 9.III.1999, 1 ♀ (MNHN-B 28628). — Stn CP 1491, 18°50'S, 178°27'W, 777-787 m, 11.III.1999, 2 ♂♂ (MNHN-B 28537). — Stn DW 1496, 18°43'S, 178°23'W, 392-407 m, 12.III.1999, 1 ♀ (MNHN-B 28629).

Wallis and Futuna Islands. MUSORSTOM 7, stn DW 557, 11°48'S, 178°18'W, 600-608 m, 19.V.1992, 1 ♀ (MNHN-B 28700). — Stn DW 594, 12°31'S, 174°20'W, 495-505 m, 24.V.1992, 1 ♂ (MNHN-B 28614).

Tonga. BORDAU 2, stn 1528, 21°14'S, 174°59'W, 587-592 m, 15.VI.2000, 1 ♂, 2 ♀♀ (MNHN-B 28639). — Stn 1541, 21°15'S, 175°14'W, 319-333 m, 5.VI.2000, 1 ♂ (MNHN-B 28640). — Stn 1553, 20°42'S, 174°54'W, 650-676 m, 6.VI.2000, 1 ♀ (MNHN-B 28699). — Stn 1556, 20°11'S, 174°45'W, 589-591 m, 7.VI.2000, 2 ♂♂ (MNHN-B 28635). — Stn 1600, 20°48'S, 174°52'W, 902-907 m, 15.VI.2000, 1 ♂ (MNHN-B 28637). — Stn 1641, 21°09'S, 175°22'W, 395 m, 21.VI.2000, 1 ♂ (MNHN-B 28636). — Stn 1642, 21°05'S, 175°23'W, 532 m, 21.VI.2000, 1 ♂, 1 juv. ♀

(MNHN-B 28641). — Stn 1643, 21°05'S, 175°22'W, 487 m, 22.VI.2000, 1 ♂ (MNHN-B 28638). — Stn 1644, 21°05'S, 175°23'W, 501 m, 22.VI.2000, 2 ♂♂ (MNHN-B 28642).

DISTRIBUTION. — Vanuatu (Chen 2000, as *Ethusa major* Chen, 1993), Fiji (Miers 1886) and now from New Caledonia, Loyalty Is, Wallis and Futuna Is, and Tonga. Chen (2000: 427) erroneously recorded it (as *E. major*) from Indonesia, Chesterfield Is, and New Caledonia. The type locality of *E. major* is the Loyalty Is. Depth: 319-907 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 15.9 mm, cw 15.6 mm (MNHN-B 28628), ♀ cl 17.4 mm, cw 17.3 mm (MNHN-B 22257).

REMARKS

The description and the illustration of *Ethusa orientalis* by Miers (1886) clearly show its diagnostic features: broadly triangular and pointed outer orbital teeth that are almost as long as the frontal teeth and a granular carapace with nearly straight lateral borders that diverge toward the posterior border (Fig. 14A; Miers 1886: pl. 29, fig. 1). The dense and conspicuous granulation of the dorsal and ventral surfaces of the carapace is also observed on the abdomen of both sexes and on the third maxillipeds. Also characteristic is the endostome, in which the anterior border reaches the proximal border of the antennular fossae of the basal antennular articles (Miers 1886: pl. 29, fig. 1a). These diagnostic features were confirmed in the type material.

The outer orbital teeth, which are nearly symmetrical in small specimens, become clearly asymmetrical in the largest individuals. In many of these specimens the inner margin of both or one of the teeth becomes swollen. The tip of the teeth may also become narrower and more acute, as in the case of a female from the Wallis and Futuna Is (cl 10.9 mm, cw 10.2 mm, MNHN-B 28700).

A suture is present between the second and third thoracic sternites (sternal suture 2/3). Although fused in the largest individuals, the suture is made apparent by the presence of a prominence running along its anterior border. The P2 and P3 are relatively short and thick. Although the male abdomen was described as “distinctly seven-jointed”

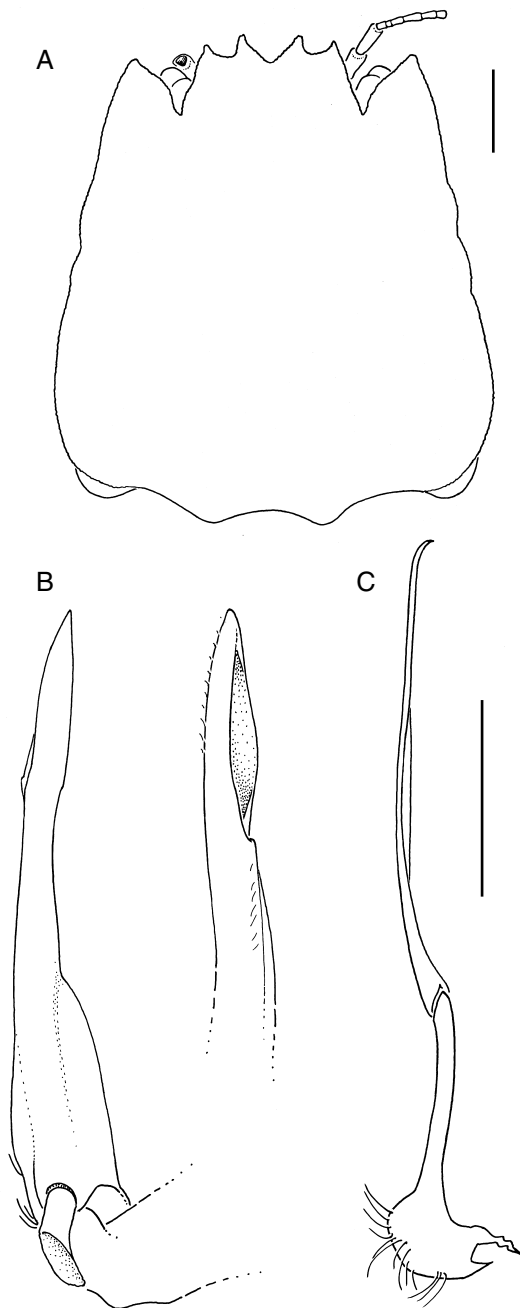


FIG. 14. — *Ethusa orientalis* Miers, 1886, ♂ lectotype cl 15.7 mm, cw 15.1 mm, Fiji, E of Kadavu, *Challenger*, stn 173A, 567 m (BMNH 84-44); A, dorsal surface of carapace; B, left G1, ventral (left) and dorsal (right) views; C, right G2, dorsal view. Scale bars: A, 3 mm; B, C, 2 mm.

and shown as such in two figures (Miers 1886: 330, pl. 28, fig. 1b, e), the lectotype and paralectotype specimens have somites 3-5 fused. The fused sutures do show faintly in the type specimens but the somites are undoubtedly fused and rigid when observed underneath the abdomen. Somite 6 was found to be fused to somites 3-5 in a few other specimens.

Ethusa major Chen, 1993 was described from two females collected in the Loyalty Is, although the type locality was erroneously given as "New Caledonia" (Chen 1993: 327). *E. major* was described as being "very similar" to *E. orientalis* but it was separated from the latter by having a carapace that was "entirely covered with pubescence, sparse short setae, and indistinct granules" (Chen 1993: 327). There is no evidence that Chen examined the type material of *E. orientalis*. Long, thin hairs fringe the anterior and anterolateral borders of the carapace of *E. orientalis*, a character that was not mentioned or illustrated by Miers nor clearly shown by the type specimens, where only the proximal portions of some of the hairs remain. Pubescence is certainly a variable character in *E. orientalis*. The conspicuous pubescence shown in Chen's drawing of the holotype of *E. major* (Chen 1993: fig. 8) could not be confirmed in the actual specimen, even if Chen stated that her species has "indistinct granules". Furthermore, the type specimens of *E. major* actually showed the conspicuous granulation characteristic of *E. orientalis*. The placement of *E. major* as a junior subjective synonym of *E. orientalis* is confirmed by the examination of the type material of both species (see Material examined) as well as material identified as *E. major* by Chen (♀, MNHN-B 27504 [Chen 2000: 427]; ♂, MNHN-B 28626; ♀, MNHN-B 28627). A comparison of the G1 and G2 of both species confirms the synonymy.

The G1 and G2 of *E. orientalis* are illustrated here for the first time. The G1 (Fig. 14B) are slender, straight, each with a slightly pointed tip, distal ends smooth, without a notch; each G2 (Fig. 14C) has a simple, slightly curved, pointed tip. The morphology of the G1 is the most reliable way to separate *E. orientalis* from *E. magni-*

palmata Chen, 1993, and *E. granulosa* Ihle, 1916, all three of which are very similar in their general morphology (see discussion of these two species). Similarities between *E. orientalis* and *E. foresti* are outlined in the discussion of *E. foresti* (see above). Doflein (1904: 27) compared the males of *E. orientalis* with those of *E. andamanica*.

Ethusa magnipalmata Chen, 1993

Ethusa magnipalmata Chen, 1993: 318 (key), 325, fig. 7.

TYPE MATERIAL. — Holotype: ♂ cl 12.4 mm, cw 11.6 mm, BIOGEOCAL, stn DW 289 (MNHN-B 21594).

TYPE LOCALITY. — Loyalty Islands, 20°36.35'S, 167°00.31'E, 830-840 m.

MATERIAL EXAMINED. — Loyalty Islands. BIOGEOCAL, stn DW 289, 20°36.35'S, 167°00.31'E, 830-840 m, 27.IV.1987, 1 ♂ holotype (MNHN-B 21594).

DISTRIBUTION. — Known only from the Loyalty Is. Depth: 830-840 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 12.4 mm, cw 11.6 mm (MNHN-B 21594), ♀ unknown.

REMARKS

Ethusa magnipalmata is thus far known only from the male holotype (MNHN-B 21594). It is almost undistinguishable from *Ethusa orientalis* Miers, 1886, except for the morphology of its G1. Each pleopod has a large notch on the distal third of its length and a pointed, knife-like tip (Chen 1993: fig. 7e). The notch, however, most probably resulted from the insertion of the G2. The relatively large overall size of the holotype is evidence that the specimen is not the juvenile stage of another species. The anterior border of the endostome reaches the proximal border of the antennular fossae of the basal antennular articles. The holotype was collected from the Loyalty Is, a location where *E. orientalis* is known to occur (see Remarks of *E. orientalis* above).

Ethusa parapygmaea Chen, 1993

Ethusa parapygmaea Chen, 1993: 318 (key), 332, fig. 12.

TYPE MATERIAL. — Holotype: ♂ cl 5.9 mm, cw 5.5 mm, CHALCAL 2, stn DW 73 (MNHN-B 19092).

TYPE LOCALITY. — New Caledonia, Norfolk Ridge, 24°39.9'S, 168°38.1'E, 573 m.

MATERIAL EXAMINED. — **New Caledonia.** CHALCAL 2, stn DW 73, 24°39.9'S, 168°38.1'E, 573 m, 29.X.1986, ♂ holotype (MNHN-B 19092). NORFOLK 1, stn 1699, 24°40'S, 168°40'E, 581-600 m, 24.VI.2001, 1 ♂ (MNHN-B 28555).

DISTRIBUTION. — Known only from New Caledonia. Depth: 573-600 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 5.9 mm, cw 5.5 mm (MNHN-B 19092), ♀ unknown.

REMARKS

Ethusa parapygmaea is known only from the male holotype (MNHN-B 19092) and a second male specimen. It was described as being very close to *E. pygmaea* Alcock, 1894, the main difference being their G1. The most distinctive character of *E. parapygmaea* is the foot-like shape of its G1 (Chen 1993: fig. 12e). The G1 of a second specimen (MNHN-B 28555) were slightly thicker at the tip than those of the holotype, but their general shape was very similar. In *E. pygmaea* the G1 have less slender, nearly triangular tips and a pointed prominence along each inner margin of the proximal portion of the tips (Chen 1993: fig. 13f).

E. parapygmaea is also close to *E. indonesiensis* Chen, 1997. Their differences are outlined in the discussion of *E. indonesiensis* (see above).

Ethusa philippinensis Sakai, 1983

Ethusa philippinensis Sakai, 1983b: 623, fig. 1a, b.

TYPE MATERIAL. — Holotype: ♂, poor condition, cl 11.3 mm, cw 9.5 mm (Sakai 1983b), damaged, *Albatross*, stn 5453 (USNM 195051).

TYPE LOCALITY. — Philippine Islands, Luzon, San Bernardino Strait, 13°12'N, 123°49'E, 72 m.

MATERIAL EXAMINED. — **Philippine Islands.** *Albatross*, stn 5453, Luzon, San Bernardino Strait, 13°12'N, 123°49'E, 72 m, 7.VI.1909, 1 ♂ holotype (USNM 195051).

DISTRIBUTION. — Known only from the Philippine Is. Depth: 72 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 11.3 mm, cw 9.5 mm (Sakai 1983b), ♀ unknown.

REMARKS

Ethusa philippinensis is known from only one specimen, the male holotype (USNM 195051). This specimen is soft and in a very poor condition. The left half of the anterior border of the carapace is still intact, however, so some important diagnostic characters are still discernible. The outer orbital teeth are very short, triangular, pointed, and are directed anteriorly, while the frontal teeth are also triangular but not as large and pointed as indicated by Sakai (1983b: fig. 1a). The median frontal sinus is actually deeper and wider than the orbital sinus. Sakai's illustration also shows that the lateral borders of the carapace are straight, even if the branchial regions are slightly inflated. The G1 (Sakai 1983b: fig. 1b) are also diagnostic to this species, having a foot-like shape but much different than that of *E. parapygmaea* Chen, 1993 (Chen 1993: fig. 12e). Not indicated in the description is that the slender chelipeds are provided with many triangular, pointed teeth and that the anterior border of the endostome reaches the antennular fossae of the basal antennular articles.

Ethusa pygmaea Alcock, 1894

Ethusa pygmaea Alcock, 1894: 406; 1896: 284; 1899: 33. — Doflein 1904: 291 (list), fig. 64. — Chen 1993: 318 (key), 333, fig. 13.

Aethusa pygmaea – Alcock & Anderson 1895: pl. 14, fig. 5.

Ethusa pygmaea [sic] – Serène 1968: 40 (list). — Serène & Lohavaniyaya 1973: 34 (key).

Not *Ethusa pygmaea* – Ihle 1916b: 141, 151 (list), 153 (list), 156 (list) (= *E. longidentata* Chen, 1997?).

TYPE MATERIAL. — Unknown (Zoological Survey of India, Calcutta?).

TYPE LOCALITY. — India, Andaman Islands.

MATERIAL EXAMINED. — **New Caledonia.** BIOCAL, stn DW 33, 23°10'S, 167°10'E, 675-680 m, 29.VIII.1985, 1 juv. ♀ (MNHN-B 18402).

MUSORSTOM 4, stn DW 197, 18°51.3'S, 163°21.0'E, 650 m, 20.IX.1985, 1 ♀ (MNHN-B 18420).

CHALCAL 2, stn DW 74, 24°40.36'S, 168°38.38'E, 650 m, 29.X.1986, 1 ♂ (MNHN-B 19090), 1 ♂, 1 ovig. ♀ (MNHN-B 19091). — Stn DW 75, 24°39.31'S, 168°39.67'E, 600 m, 29.X.1986, 1 ♂, 2 ovig. ♀♀ (MNHN-B 19089).

NORFOLK 1, stn DW 1700, 24°40'S, 168°40'E, 572-605 m, 24.VI.2001, 1 ♂ (MNHN-B 28554).

DISTRIBUTION. — Andaman Is (Alcock 1894), New Caledonia (Chen 1993). Depth: 155 (Alcock 1896)-680 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 5.7 mm, cw 5.3 mm (MNHN-B 19089), ♀ cl 8.9 mm, cw 8.7 mm (MNHN-B 18420).

REMARKS

Material collected from New Caledonia agrees with the description and illustration of *Ethusa pygmaea* Alcock, 1894 (Alcock 1894: 406; Alcock & Anderson 1895: pl. 14, fig. 5) and particularly with specimens previously identified as such by Chen (1993: fig. 13). Unfortunately, the type material could not be located.

The *Siboga* material identified by Ihle (1916a) does not agree with Alcock's description or with the New Caledonia specimens. It is very close and most probably conspecific to *E. longidentata* Chen, 1997 (see above).

Other than its small size, diagnostic to this species are outer orbital teeth that are relatively slender, directed outwardly, and shorter than the frontal teeth (Alcock & Anderson 1895: pl. 14, fig. 5; Chen 1993: fig. 13a, b). The two portions of the anterior border proximal to the frontal teeth are swollen, as evidenced by the distended inner side of each orbital sinus. The anterior border of the endostome just reaches the proximal edge of the antennular fossae of the basal antennular articles. Alcock (1894: 406) describes the carapace and pereopods as "finely and closely granular". These characters, however, are also present in *E. parapygmaea* Chen, 1993. The only reliable way of differentiating between these two species are their G1 (see Remarks of *E. parapygmaea* above). Only the examination of the type material of *E. pygmaea* may show if the Western Pacific specimens described here actually belong to Alcock's species.

The granulation of the pereopods, which was given as a difference between *E. pygmaea* and

E. indica Alcock, 1894, was observed in the New Caledonia specimens. Also noticeable is the "better definition of the regions of the carapace" in *E. pygmaea*. A more noticeable difference is the shape of the outer orbital teeth: very slender and typically outwardly projecting in *E. indica* (Alcock & Anderson 1895: pl. 14, fig. 2) in contrast to slightly widened at the base, hence slightly triangular, in *E. pygmaea* (Alcock & Anderson 1895: pl. 14, fig. 5). The P4 and P5 are described by Alcock (1894: 406) as "more robust" in *E. pygmaea* than in *E. indica*. This difference, however, is not evident in the illustrations or in the actual specimens. Furthermore, their G1 are different and the meri of P2 and P3 are relatively longer in *E. indica* than in *E. pygmaea*. These differences and the presence of ovigerous females preclude the possibility that *E. pygmaea* actually represents the juvenile stage of *E. indica*.

Ethusa quadrata Sakai, 1937

Ethusa quadrata Sakai, 1937: 76 (key), 78, figs 1c, 3; 1956: 7 (list), fig. 8.6; 1965: 24, pl. 12, fig. 3 (colour); 1976: 65, figs 26c, 28, pl. 23, fig. 3 (colour). — Serène 1968: 40 (list). — Takeda & Miyake 1970: 209; 1972: 68. — Serène & Lohavanijaya 1973: 35 (key). — Miyake 1983: 18, 198, pl. 6, fig. 4 (colour). — Serène & Vadon 1981: 120, 121. — Chen 1985: 191, fig. 10, pl. 1, fig. 7; 1986: 129, fig. 11; 1993: 318 (key), 319 (list). — Nagai 1995: 60, pl. 1, fig. 7. — Muraoka 1998: 17. — Takeda 2001: 225, 254, 259. — Chen & Sun 2002: 54, 241, fig. 102. — Komai *et al.* 2002: 20. — Marumura & Kosaka 2003: 23.

TYPE MATERIAL. — Holotype: ♂, Japan, Honshu, Sagami Bay, between Ito and Hatsu Shima, Misago, stn 10, 80 m, VI.1934. Deposit unknown.

TYPE LOCALITY. — Japan, Honshu, Sagami Bay, between Ito and Hatsu Shima, 80 m.

MATERIAL EXAMINED. — **Japan.** Honshu, Kii Peninsula, W of Shionomisaki, 130 m, S. Nagai coll., VI.1998, 1 ♂ (CBM-ZC 5026). — Sagami Bay, Kameki reef, 120 m, T. Sakai and Emperor Hirohito coll., 19.VI.1964, undet. sex (SMF 28924). Izu Islands, Hyotan-se Bank, 34°20.93'N, 139°04.78'E, 160-200 m, T. Komai coll., 22.X.1996, 1 ♂ (CBM-ZC 4602).

Philippine Islands. South China Sea, MUSORSTOM 1, stn CP 62, 13°59.5'N, 120°15.6'E, 179-194 m, 27.III.1976, 1 ♂ (MNHN-B 18170).

MUSORSTOM 2, stn CP 26, 13°49'N, 120°50'E, 299-320 m, 23.XI.1980, 1 ♀ (MNHN-B 18171).

Bohol, Balicasag island, off Panglao island, tangle nets from local fishermen, 50-500 m, 28.XI.2001, 1 ♂ (ZRC 2001.0517).

New Caledonia. BATHUS 2, stn DW 717, 22°44.82'S, 167°16.58'E, 350-393 m, 11.V.1993, 1 ♂ (MNHN-B 28556).

BATHUS 4, stn DW 895, 20°15.40'S, 163°51.70'E, 315-350 m, 3.VIII.1994, 1 ♀ (MNHN-B 28557).

NORFOLK 1, stn DW 1679, 24°43'S, 168°10'E, 298-324 m, 22.VI.2001, 1 ♂ (MNHN-B 28558).

DISTRIBUTION. — Japan (see Sakai 1976), East China Sea (Takeda & Miyake 1970; Chen 1986), Philippine Is (Serène & Vadon 1981; Chen 1985), and now from New Caledonia. Depth: 35 (Sakai 1965)-393 m (Fig. 34). It was also collected from fishing nets at depths of 50-500 m.

SIZE. — Maximum size: ♂ cl 6.9 mm, cw 5.8 mm (MNHN-B 28556), ♀ cl 8.4 mm, cw 7.3 mm (MNHN-B 18171).

REMARKS

Ethusa quadrata is easily identified by the rectangular, nearly-square appearance of its carapace, with the sides straight and nearly parallel to each other (Sakai 1937: fig. 3; 1965: pl. 12, fig. 5; 1976: fig. 28; Miyake 1983: pl. 6, fig. 4; Chen 1985: fig. 10; Chen & Sun 2002: fig. 102.1). The orbital sinuses are L-shaped, thus reinforcing the square appearance. Differences from *E. furca* Chen, 1993, and *E. hawaiiensis* Rathbun, 1906, which also have rectangular carapaces, are given in the respective discussions of these two species (see above).

Sakai (1937: 80) mentioned that “the animal is protected by a piece of bivalves”.

Ethusa sexdentata (Stimpson, 1858)

Dorippe sexdentata Stimpson, 1858: 163. — Bouvier 1906: 482.

Ethusa sexdentata — Stimpson 1907: 168, pl. 19, fig. 4. — Ihle 1916b: 153 (list), 156 (list). — Balss 1922: 120. — Yokoya 1933: 109, 211, 220. — Sakai 1936: 42, pl. 6, fig. 1 (colour); 1937: 76 (key), 77, 180, figs 1a, 2, pl. 11, fig. 1 (colour); 1956: 7 (list), fig. 8.3; 1965: 22, pl. 11, fig. 2 (colour); 1976: 63, fig. 26a, pl. 23, fig. 1 (colour). — Serène 1968: 40 (list). — Matsuzawa 1977: pl. 88 (colour). — Serène & Lohavaniyaya 1973: 34 (key). — Takeda 1982:

fig. 275 (colour). — Miyake 1983: 18, 198, pl. 6, fig. 5 (colour). — Chen 1986: 126, fig. 8; 1993: 318 (key), 335, fig. 14. — Nagai 1995: 59, pl. 1, fig. 4. — Ng & Huang 1997: 267, fig. 3G (colour), 3H (colour). — Ikeda 1998: 26, pl. 16 (colour). — Muraoka 1998: 17. — Ng *et al.* 2001: 8. — Takeda 2001: 225, 254, 259. — Chen & Sun 2002: 54, 238 (part). — Marumura & Kosaka 2003: 23.

Not *Ethusa sexdentata* — Chen 1985: 185, figs 5, 6, pl. 2, figs 1, 2; 1997: 622. — Chen & Sun 2002: fig. 100 (= *E. abbreviata* n. sp.).

TYPE MATERIAL. — Most probably lost, like most of the type material of species described by Stimpson.

TYPE LOCALITY. — Kagoshima, Honshu, Japan.

MATERIAL EXAMINED. — **Japan.** Honshu, near Tokyo, Y. Harmand coll., 1906, 1 ♂ (MNHN-B 24147). — Boso Peninsula, W of Katsuyama Uki Shima Islet, 120-180 m, M. Aizawa coll., 24.IV.1995, 2 ♂♂ (CBM-ZC 1246). — Sagami Bay, Haberer leg, 1 juv. ♀ (ZMB 17811). — Sagami Bay, Hayama, 120 m, H. Ikeda coll., 1 ♂ (SMF 15128). — Sagami Bay, Kannonzuka-dasi and Amadaiba banks, 35°13'N, 139°33'E, 60-65 m, Hatagumo, T. Sakai and Emperor Hirohito coll., 22.VII.1957, 1 ♂ (SMF 28932). — Aichi Prefecture, Off Mikawa, Mitani, R. Kamota coll., 18.II.1968, 1 ♂, 1 ♀ (SMF 28923). Shikoku, Tosa Bay, K. Sakai coll., 1 ♂ (SMF 11813). **Taiwan.** TAIWÁN 2000, stn CP 58, 24°35.1'N, 122°05.8'E, 221 m, 4.VIII.2000, 2 ♀♀ (MNHN-B 28684).

TAIWÁN 2001, stn CP 68, 24°49.6'N, 122°00.8'E, 370 m, 6.V.2001, 1 ♂, 1 ♀, 1 ♀ parasitized by *Sacculina* sp. (MNHN-B 28695). — Stn CP 73, 24°52.9'N, 122°01.0'E, 220-330 m, 7.V.2001, 1 ♀ (MNHN-B 28692). — Stn CP 75, 24°56.7'N, 120°01.8'E, 139 m, 7.V.2001, 1 ♂ feminized by *Sacculina* sp. (MNHN-B 28685). — Stn CP 77, 24°54.2'N, 122°02.5'E, 360 m, 7.V.2001, 1 ♀, 1 ♀ parasitized by *Sacculina* sp. (MNHN-B 28691). — Stn CP 79, 24°50.4'N, 121°59.9'E, 145-200 m, 8.V.2001, 1 ♀ (MNHN-B 28687). — Stn CP 91, 24°50.6'N, 122°01.4'E, 400 m, 8.V.2001, 2 ♀♀ (MNHN-B 28690). — Stn CP 94, 24°53.4'N, 121°58.1'E, 153 m, 10.V.2001, 1 ♀ (MNHN-B 28688). — Stn CP 98, 24°54.2'N, 122°02.9'E, 362-400 m, 18.V.2001, 1 ovig. ♀ (MNHN-B 28693). — Stn CP 100, 24°53.2'N, 122°59.8'E, 223 m, 18.V.2001, 1 ♀ (MNHN-B 28689). — Stn CP 104, 24°48.9'N, 122°05.3'E, 365-447 m, 19.V.2001, 1 ♀, 1 ♀ parasitized by *Sacculina* sp. (MNHN-B 28686). — Stn CP 113, 24°50.8'N, 121°59.9'E, 281 m, 21.V.2001, 1 ♂ (MNHN-B 28694).

TAIWÁN 2003, stn CP 214, 24°28.59'N, 122°12.66'E, 490-1027 m, 27.VIII.2003, 3 ♂♂, 1 ♀ (NTOU).

Philippine Islands. Sibuyan Sea, MUSORSTOM 3, stn CP 138, 11°54'N, 122°15'E, 252-370 m,

6.VI.1985, 1 juv. ♀ (MNHN-B 28018). — Stn CP 143, 11°29'N, 124°11'E, 205-214 m, 7.VI.1985, 2 ♀♀ (MNHN-B 18929).

Bohol, Balicasag island, off Panglao island, tangle nets from local fishermen, XII.2000, 4 ♂♂ (ZRC 2001.0388); 50-500 m, 28.XI.2001, 2 ♂♂, 4 ♀♀ (ZRC 2001.0517); local shell fishermen, 200-300 m, VI.2002, 1 juv. ♀, 1 ♀ (ZRC 2002.0642); purchased from fishermen, P. K. L. Ng *et al.*, 25-30.VII.2003, 5 ♀♀ (ZRC 2003.0296).

DISTRIBUTION. — Japan (see Sakai 1976), East China and South China seas (Chen 1986), Taiwan (Ng & Huang 1997), and Philippine Is (Chen 1993). Depth: 30 (Sakai 1976)-447 m (Fig. 34). Also collected in tangle nets lowered to depths of 50-500 m.

SIZE. — Maximum size: ♂ cl 25 mm, cw 24 mm (Sakai 1976), ♀ cl 23.4 mm, cw 24.2 mm (ZRC 2001.0517); no sex indicated: cl 30.7 mm, cw 28.1 mm (Ikeda 1998: pl. 16).

REMARKS

Ethusa sexdentata is a large-size species that is known from depths that are shallower than in the most species of ethusines. The outer orbital teeth are broadly triangular (Sakai 1937: fig. 1a; 1965: pl. 11, fig. 2; 1976: fig. 26a; Chen 1993: fig. 14a). The endostome only extends to a point below the posterior border of the antennular fossae of the basal antennular articles. The G1 and G2 are illustrated by Chen (1986: fig. 8.39, 8.40).

Ethusa sexdentata has been confused with *E. abbreviata* n. sp. (Chen 1985). Differences between the two species are discussed in the description of *E. abbreviata* n. sp. (see above).

Live specimens collected in gill nets in Chiba, Japan, as well as similarly collected specimens kept in aquaria were observed to carry bivalve shells or pieces of wood (T. Komai pers. comm.).

Ethusa sinespina Kensley, 1969

Ethusa sinespina Kensley, 1969: 151, 161, 177, fig. 4; 1974: 63; 1981b: 38 (list). — Chen 1987: 686, fig. 5, pl. 2, fig. C; 1993: 318 (key), 319 (list).

?*Ethusa sinespina* – Marumura & Kosaka 2003: 23.

?*Ethusa* sp. – Kensley 1981a: 60.

TYPE MATERIAL. — Holotype: ♀ cl 7.0 mm, cw 6.8 mm, Anton Bruun, stn BRU 390 E (SAM

A12648); paratype: ♀ cl 4.9 mm, cw 5.0 mm, Anton Bruun, stn BRU 390 S (SAM A12649).

TYPE LOCALITY. — South Africa, off Natal, 29°42'S, 31°38'E, 350 m.

MATERIAL EXAMINED. — **South Africa.** Anton Bruun, stn BRU 390 E, 29°42'S, 31°38'E, 350 m, 8.IX.1964, 1 ovig. ♀ holotype (SAM A12648). — Stn BRU 390 S, 29°35'S, 31°42'E, 138 m, 9.IX.1964, 1 juv. ♀ paratype (SAM A12649).

Madagascar. Vauban, trawling, 12°40.0'S, 48°09.5'E, 185-205 m, A. Crosnier coll., 1.VIII.1973, 1 ♂ (MNHN-B 18361).

DISTRIBUTION. — South Africa (Kensley 1969) and Madagascar (Chen 1993). Depth: 138-350 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 6.3 mm, cw 6.3 mm (MNHN-B 18361), ♀ cl 7.0 mm, cw 6.8 mm (SAM A12648).

REMARKS

Ethusa sinespina is very close to *E. zurstrasseni* Doflein, 1904, from East Africa. Kensley (1969: 162) separated his new species from *E. zurstrasseni* by the absence of a “minute spine between the pairs of frontal teeth”, the outer orbital teeth not being dorsoventrally flattened, and shallower grooves on the dorsal surface of the carapace.

A comparison of the type material of *E. sinespina* with the holotype of *E. zurstrasseni* (♂ cl 7.2 mm, cw 6.8 mm, ZMB 13629) shows that these differences are minor if not erroneous. The holotype does not show the minute spine mentioned in the description, the outer orbital teeth are triangular and certainly dorsoventrally flattened in both species, and there are no clear, obvious differences in the definition of the regions of the carapace. Not mentioned in the description of either species is the anterior border of the endostome. In both species it extends well above the antennular fossae in such a way that it almost reaches the ventral fold of the median central sinus (Chen 1987: fig. 5b). The only outstanding difference between the two species are the G1. Each pleopod has many minute spines and a widened tip in *E. sinespina* (Chen 1987: fig. 5e), whereas it has a slender, pointed tip in *E. zurstrasseni* (Fig. 15; Chen 1987: fig. 3e, as *E. madagascariensis*).

Ethusa zurstrasseni Doflein, 1904

(Fig. 15)

Ethusa zurstrasseni Doflein, 1904: 28, 291 (list), pl. 13, figs 3, 4, 64. — Ihle 1916b: 153 (list), 156 (list). — Serène 1968: 40 (list). — Chen 1987: fig. 4; 1993: 318 (key), 319 (list).

Ethusa madagascariensis Chen, 1987: 683, fig. 3, pl. 2, figs A, B; 1993: 318 (key), 319 (list).

TYPE MATERIAL. — Holotype of *Ethusa zurstrasseni* Doflein, 1904: ♂ cl 7.2 mm, cw 6.8 mm, Deutsche Tiefsee Expedition, *Valdivia*, stn 254 (ZMB 13629). Type material of *Ethusa madagascariensis* Chen, 1987: holotype: ♂ cl 7.0 mm, cw 6.6 mm, *Vauban*, stn CH 52 (MNHN-B 18271); allotype: ♀ cl 8.9 mm, cw 8.9 mm, *Vauban*, same station (MNHN-B 18366); paratypes: 1 ♂ cl 6.1 mm, cw 5.4 mm; 1 ♀ cl 8.6 mm, cw 9.2 mm, same station (MNHN-B 18360).

TYPE LOCALITY. — Somalia, off southern coast, 0°29.3'S, 42°47.6'E, 977 m.

MATERIAL EXAMINED. — **Somalia.** Deutsche Tiefsee Expedition, *Valdivia*, stn 254, 0°29.3'S, 42°47.6'E, 977 m, 1 ♂ holotype (ZMB 13629).

Madagascar. *Vauban*, stn CH 52, 15°21.0'S, 46°12.5'E, 150 m, 8.XI.1972, 1 ♂ holotype of *E. madagascariensis* (MNHN-B 18271), 1 ♀ allotype of *E. madagascariensis* (MNHN-B 18366), 1 ♂ paratype of *E. madagascariensis*, 1 ♀ paratype of *E. madagascariensis* (MNHN-B 18360).

DISTRIBUTION. — Somalia (Doflein 1904) and Madagascar (Chen 1987). Depth: 150-977 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 7.0 mm, cw 6.6 mm (MNHN-B 18271), ♀ cl 8.9 mm, cw 8.9 mm (MNHN-B 18366).

REMARKS

Diagnostic to *Ethusa zurstrasseni* are slender, almost triangular and distinctively acute outer orbital teeth that almost reach as high as the frontal teeth (Doflein 1904: pl. 13, fig. 3; Chen 1987: figs 3a, 4a, as *E. madagascariensis*), the anterior border of the endostome extends above the antennular fossae of the basal antennular articles, and the presence of conspicuous granules throughout the carapace and abdomen.

The G1 of the holotype (ZMB 13629) were illustrated by Chen (1987: fig. 3e) but no details of the distal portion were given. Details of the tip of the same holotype pleopod are given in Figure 15. The G1 remains the most reliable way

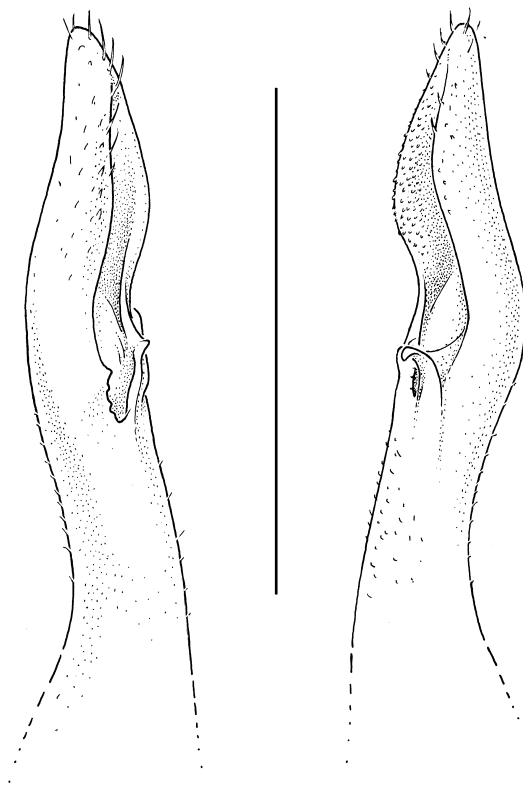


FIG. 15. — *Ethusa zurstrasseni* Doflein, 1904, ♂ holotype cl 7.2 mm, cw 6.8 mm, southern Somalia, Deutsche Tiefsee Expedition, *Valdivia*, stn 254, 977 m (ZMB 13629), right G1, distal part, ventrolateral (left) and dorsolateral (right) views. Scale bar: 1 mm.

to differentiate between *E. zurstrasseni* and *E. sinespina* Kensley, 1969, another western Indian Ocean species.

Ethusa madagascariensis Chen, 1987 is clearly a junior subjective synonym of *E. zurstrasseni*. The two species were differentiated only by the presence of swollen cheliped propodi in *E. madagascariensis*, a character that varies widely with size, sex, and particularly if the chelipeds were regenerated. The cheliped propodi are indeed swollen in the holotype of *E. madagascariensis* (MNHN-B 18271; Chen 1987: fig. 3c) but not in the cheliped of the smaller male paratype (MNHN-B 18360) of the same species or in the holotype of *E. zurstrasseni*, which was examined by Chen (1987: fig. 4b).

Genus *Ethusina* Smith, 1884

Ethusina Smith, 1884: 349. — A. Milne-Edwards & Bouvier 1902: 39. — Miers 1886: 331. — Ihle 1916b: 150 (in list). — Rathbun 1937: 77 (in key), 89. — Monod 1956: 84. — Balss 1957: 1610. — Guinot 1978: 249; 1979b: fig. 3. — Manning & Holthuis 1981: 42. — Hendrickx 1997: 73. — Chen & Sun 2002: 248. — Ng & Ho 2003: 71.

Ethusa – Alcock 1896: 281 (part). — Serène & Lohavanijaya 1973: 33 (part).

TYPE SPECIES. — *Ethusina abyssicola* Smith, 1884, by monotypy. Gender: feminine.

DIAGNOSIS. — Dorsal surface of carapace granular, with setae or short tomentum; some regions distinct, limited by grooves. Four frontal teeth. Basal antennular article very large, swollen, pushing antennae, eye peduncles, eyes laterally to near oblique position under orbits. Eye peduncles typically short or very short, often but not always immovable, on ventral surface of carapace, often not visible dorsally (rarely very long, enough to make eyes or considerable part of eye peduncles visible dorsally or, in males, beyond outer margins of the outer orbital teeth). Anterior border of endostome always well below posterior border of antennular fossae of basal antennular articles. P2, P3 relatively long (with long, slender meri), often reaching well over frontal teeth when folded.

REMARKS

The relative immobility of the eye peduncles in *Ethusina* in contrast to their mobility in *Ethusa* is a character difficult to assess and should not be used in their separation. The eye peduncles are certainly shorter in most species of *Ethusina* as a result of the expansion of the basal antennular article. The eye peduncles, however, do attain a considerable length in species like *E. gracilipes*

(Miers, 1886) (Miers 1886: pl. 29, fig. 1, 1a) and *E. exophthalma* n. sp. (Fig. 21A, B), where the basal antennular article is greatly expanded as in other members of the genus. Obviously, the eyes in these species are “mobile” when pushed by the use of needles or forceps because of their length. The same can be said about other species where the eye peduncles are relatively long and in species where in the males the eyes protrude beyond the outer orbital teeth, as in the case of *E. longipes* Chen, 1987, *E. paralongipes* Chen, 1993, and *E. robusta* (Miers, 1886).

The presence in *Ethusina desciscens* (Alcock, 1896) of eye peduncles that are relatively mobile was considered by Alcock (1899: 35) as “the connecting-link between *Ethusa* and *Ethusina*”. Such alleged mobility, however, was not noticed in any of the specimens of *E. desciscens* that were examined (see Remarks of *E. desciscens* below). Obviously, the apparent “mobility” of eye peduncles is also related to how long specimens have been fixed.

The allegedly ambiguous nature of *Ethusa* and *Ethusina* led Alcock (1896) and Serène & Lohavanijaya (1973) to consider *Ethusina* as a junior synonym of *Ethusa*. Serène & Lohavanijaya (1973) had a very limited amount of material at their disposal (only one specimen, which was misidentified) and they based their decision on the description and illustrations of the various species in the literature. The use of the relative mobility of the eyes as a character separating both genera also led Gore (1983: 211) to comment on the possible overlap between both genera.

KEY TO INDO-WEST PACIFIC SPECIES OF *ETHUSINA*

1. Outer orbital teeth short (less than 1/3 height of inner margin of orbital sinus), tubercle-like, or absent 2
- Outer orbital teeth conspicuous, at least 1/2 height of inner margin of orbital sinus 7
2. Frontal teeth in the form of two acute, triangular lateral frontal teeth and two sinuous, lobe-like or slightly pointed median teeth 3
- Frontal teeth in the form of four clearly defined acute or obtuse teeth 4

3. Outer orbital teeth in the form of a rounded tubercle. G1 each with rounded tip, band of numerous setae near tip (Fig. 16B). Eyes large, oval (Fig. 16A) *E. challengerii*
 — Outer orbital teeth acute. G1 arrow shaped, with smooth sides. Eyes small
 *E. dofleini*
4. Orbital sinus very elongated, merging with anterolateral borders of carapace. Outer orbital teeth may be absent in large females (Chen 2000: figs 1a, 2a, 5) *E. microspina*
 — Orbital sinus V-shaped, clearly demarcated from anterolateral borders of carapace. Outer orbital teeth small but always well defined 5
5. Outer orbital teeth about 1/3 height of outer margin of orbital sinus. G1 each with bilobbed tip (Chen 1997: fig. 6g, h) *E. bicornuta*
 — Outer orbital teeth very short, less than 1/4 height outer margin of orbital sinus. G1 each with single tip 6
6. Lateral frontal teeth almost as high as median frontal teeth. Eye peduncles not short so eyes visible dorsally (Chen 1993: fig. 16a, b). Dorsal surface of carapace granular *E. brevidentata*
 — Lateral frontal teeth much shorter than median frontal teeth. Eye peduncles very short so eyes not visible dorsally (Fig. 23A). Dorsal surface of carapace smooth
 *E. ocellata* n. sp.
7. Complete cornea of eye and distal portion of eye peduncle visible, projecting vertically or slightly obliquely above lower margin of each orbital sinus 8
 — Cornea of eye not visible or only partially visible (together with part of eye peduncle) above lower margin of each orbital sinus (if completely or partially visible, eye oriented laterally, not vertically or obliquely above margin) 9
8. Eye peduncles not greatly elongated (Miers 1886: pl 29, fig. 1). Orbital sinuses V-shaped. Meri of P2, P3 very slender (P2 meri 10 times longer than broad)
 *E. gracilipes*
 — Eye peduncles greatly elongated (Fig. 21A). Orbital sinuses very broad, U-shaped. Meri of P2, P3 long but stout in appearance (P2 meri 6.1-7.6 times longer than broad) *E. exophthalma* n. sp.
9. Dorsal surface of lower margin of each orbital sinus with short vertical fissure (Fig. 28A) 10
 — Dorsal surface of lower margin of each orbital sinus entire, without a vertical fissure 11
10. Very short, thick P2, P3 (P2 meri 5-6 times longer than broad) *E. crenulata* n. sp.
 — More slender P2, P3 (P2 meri 8-9 times longer than broad) *E. isolata* n. sp.
11. Anterior and anterolateral borders of carapace bordered by conspicuous long hairs (Fig. 18A) *E. ciliacirrata* n. sp.
 — Anterior and anterolateral borders of carapace not bordered by conspicuous long hairs 12
12. Outer orbital teeth almost as high, nearly as high, or higher than frontal teeth (reaching only around 1/2 height of inner margin of orbital sinuses in very small males) 13
 — Outer orbital teeth do not reach as high as frontal teeth, only reaching 1/2 to 3/4 height of inner margin of orbital sinuses 18

- 13. P2, P3 very slender (P2 meri 11 times longer than broad), exceptionally long, reaching much higher than frontal teeth when folded (Doflein 1904: pl. 13, figs 5, 6) *E. somalica* n. comb.
- P2, P3 stout or moderately slender (P2 meri less than 10 times longer than broad) not exceptionally long (just reaching or reaching slightly over frontal teeth when folded) 14
- 14. Outer orbital teeth triangular, much broader proximally 15
- Outer orbital teeth needle-like, only slightly broader proximally 17
- 15. Outer orbital teeth conspicuous, high, reaching or nearly reaching frontal teeth (Fig. 19A) *E. coronata* n. sp.
- Outer orbital teeth small, not reaching frontal teeth 16
- 16. Orbital sinuses narrow (Ng & Ho 2003: fig. 1). Median frontal teeth often not acute, sinuous, lobe-like (Ng & Ho 2003: figs 12, 13A, as *E. insolita* Ng & Ho, 2003). Male abdomen with transverse ridge on somite 5 *E. dilobotus*
- Orbital sinuses broad, U-shaped (Ng & Ho 2003: figs 6, 7A). Median frontal teeth acute. Male abdomen unknown but most probably smooth, without transverse ridge on somite 5 *E. chenae*
- 17. P2, P3 slender, relatively long (Fig. 25A; Ng & Ho 2003: figs 4, 5C, as *E. alcocki* Ng & Ho, 2003). Eye peduncle slender, typically extending beyond sides of carapace in males *E. robusta*
- P2, P3 stout, relatively short (Ng & Ho 2003: figs 8, 10B). Eye peduncle short, not extending beyond sides of carapace in males *E. macrospina*
- 18. Outer orbital teeth triangular, much broader proximally 19
- Outer orbital teeth needle-like, long and slender, only slightly broader proximally 21
- 19. P2, P3 slender, relatively long, reaching much higher than frontal teeth when folded *E. pubescens*
- P2, P3 stout, relatively short, just reaching frontal teeth when folded 20
- 20. Anterolateral borders of carapace and outer margins of outer orbital teeth with delicate hairs; outer orbital, frontal teeth prominently acute (Ng & Ho 2003: figs 2, 3A) *E. taiwanensis*
- Anterolateral borders of carapace and outer margins of outer orbital teeth without hairs; outer orbital, frontal teeth not prominently acute (Fig. 26A) *E. stenommata* n. sp.
- 21. Outer orbital teeth not straight, proximal portions directed inwardly (Chen 2000: fig. 4a) *E. vanuatuensis*
- Outer orbital teeth straight 22
- 22. P2, P3 relatively short, just reaching frontal teeth when folded (Alcock & MacGilchrist 1905: pl. 72, fig. 2; Chen 1987: pl. 2, fig. F). Distal ends of G2 thick, stout (Chen 1987: fig. 7d) *E. desciscens*
- P2, P3 relatively long, reaching much higher than frontal teeth when folded. Distal ends of G2 long, slender 23
- 23. Meri of P2, P3 noticeably thicker (Fig. 29), 7.0-8.5 times longer than broad. Eye peduncles short, eyes not visible beyond outer margins of outer orbital teeth (Fig. 30A) *E. huilianae* n. sp.

- Meri of P2, P3 noticeably slender (Chen 1987: pl. 2, figs D, E), more than 10 times longer than short. Eye peduncles relatively long, making eyes visible beyond outer margins of outer orbital teeth in males (Chen 1993: fig. 18a) 24
24. Meri of P2, P3 13.8 times longer than broad, 1.4 carapace length. G1 each with simple, rounded tip (Chen 1987: fig. 6d) *E. longipes*
- Meri of P2, P3 10.0-11.0 times longer than broad, 1.1-1.2 carapace length. G1 each with spur-like structure at tip (Chen 1993: fig. 18d) *E. paralongipes*

Ethusina bicornuta Chen, 1997

Ethusina bicornuta Chen, 1997: 622, fig. 6. — Ng & Ho 2003: 72 (list).

TYPE MATERIAL. — Holotype: ♂, cl 7.2 mm, cw 7.0 mm, KARUBAR, stn CP 87 (MNHN-B 22885).

TYPE LOCALITY. — Indonesia, Tanimbar Islands, 09°37'S, 160°41.7'E, 1017-1024 m.

MATERIAL EXAMINED. — **Indonesia.** Tanimbar Islands, KARUBAR, stn CP 87, 08°47'S, 130°49'E, 1017-1024 m, 5.XI.1991, 1 ♂ holotype (MNHN-B 22885).

Solomon Islands. SALOMON 1, stn CP 1751, 09°10.4'S, 156°53'E, 749-790 m, 25.IX.2001, 1 ♂ (MNHN-B 28674). — Stn CP 1858, 08°47'S, 130°49'E, 435-461 m, 7.X.2001, 1 ♂ (MNHN-B 28669).

DISTRIBUTION. — Tanimbar Is, Indonesia (Chen 1997) and now from the Solomon Is. Depth: 435-1024 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 7.8 mm, cw 7.6 mm (MNHN-B 28674); ♀ unknown.

REMARKS

Ethusina bicornuta is known from only three male specimens. Diagnostic to this species is the presence of two distal horn-like structures on each G1 (Chen 1997: fig. 6g, h). The first two abdominal somites are nearly equal in the holotype (MNHN-B 22885) but the first somite is longer than the second in larger individuals. The eye peduncles are very short (Chen 1997: fig. 6b). The inner margin of the orbital sinus has a very slight but noticeable elevation that gives the margin a slightly uneven appearance.

Ethusina brevidentata Chen, 1993

Ethusina brevidentata Chen, 1993: 336 (key), 337, fig. 16. — Ng & Ho 2003: 72 (list).

Not *Ethusina brevidentata* – Chen 1997: 624 (= *E. ocellata* n. sp.).

TYPE MATERIAL. — Holotype: ♂ cl 8.5 mm, cw 8.0 mm, BIOGEOCAL, stn CP 283 (MNHN-B 19099); paratypes: ♀ cl 10.0 mm, cw 10.0 mm, BIOCAL, stn CP 72 (MNHN-B 18401); ♂, same location (IOAS); juv. ♂ cl 5.4 mm, cw 4.9 mm, BIOGEOCAL, stn CP 272 (MNHN-B 19096).

TYPE LOCALITY. — Loyalty Islands, 21°22.25'S, 166°31.07'E, 2370-2375 m.

MATERIAL EXAMINED. — **New Caledonia.** BIOCAL, stn CP 72, 22°10'S, 167°33'E, 2100-2110 m, 4.IX.1985, 1 ♀ paratype (MNHN-B 18401).

Loyalty Islands. BIOGEOCAL, stn CP 272, 21°00.04'S, 166°56.94'E, 1615-1710 m, 20.IV.1987, 1 juv. ♂ paratype (MNHN-B 19096). — Stn CP 283, 21°22.25'S, 166°31.07'E, 2370-2375 m, 26.IV.1987, 1 ♂ holotype (MNHN-B 19099).

DISTRIBUTION. — Known only from New Caledonia and the Loyalty Is (Chen 1993). Depth: 1615-2375 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 9.1 mm, cw 9.0 mm (Chen 1993), ♀ cl 10.0 mm, cw 10.0 mm (MNHN-B 18401).

REMARKS

Chen (1993: 337) distinguished her new species, *Ethusina brevidentata*, from *E. dofleini* Ihle, 1916, by the presence of a conspicuously granular carapace and arched lateral borders, outer orbital teeth that are directed outwardly, broader than long telson, and meri of P2 and P3 that are “about 7 times” as long as high. There is no

evidence, however, that she examined the type material of *E. dofleini*, and some of the *E. brevidentata* material she examined proved to belong to a new species, *E. ocellata* n. sp. The granular carapace of *E. brevidentata* is indeed a very diagnostic character that readily separates the two species. Differences with *E. ocellata* n. sp. are discussed in the description of the new species (see below).

Ethusina challengerii (Miers, 1886)
(Figs 16; 17; 33D)

Ethusina (*Ethusina*) *challengerii* Miers, 1886: xxxi, 331, pl. 28, fig. 2, 2a-c.

Ethusina (*Ethusina*) *sinuatifrons* – Miers 1886: 329, 332 (*nomen nudum*).

?*Aethusina challengerii* – Faxon 1895: 36 (= *Ethusina faxoni* Rathbun, 1933?).

Ethusina abyssicola challengerii – Ihle 1916a: 360; 1916b: 147, 153 (list), 156 (list). — Serène 1968: 40 (list). — Sakai 1937: 82, fig. 1f; 1956: 7 (list); 1976: 67, fig. 26f. — Miyake 1983: 199 (list) (not *Ethusina abyssicola* Smith, 1884).

Ethusina challengerii – Doflein 1904: 292 (list), fig. 65. — Chen 1993: 336 (key).

TYPE MATERIAL. — Holotype: ♀ cl 12.9 mm, cw 12.9 mm, *Challenger*, stn 237 (BMNH 84.44).

TYPE LOCALITY. — Pacific Ocean off Japan, 34°37'N, 140°32'E, 3429 m.

MATERIAL EXAMINED. — **Indian Ocean.** Mozambique Basin, SAFARI 1, stn 1, trawl CP 01, 29°52.6'S, 34°32.7'E-29°52.3'S, 34°33.1'E, 2608 m, 20.VIII.1979, 1 ♂ (MNHN-B 8775).

Mid-Indian Basin, SAFARI 2, stn 35, trawl CP 29, 12°56.8'S, 79°36.6'E-12°55.0'S, 79°35.6'E, 4950-4928 m, 20.VIII.1981, 1 ♀ (MNHN-B 28697).

Japan. *Challenger*, stn 237, 34°37'N, 140°32'E, ♀ holotype (BMNH 84.44).

Pacific Ocean. Shatskiy Rise, Hakuho-maru, cruise KH93-03, stn BT-3, 3274-3287 m, 8.XI.1996, 1 ♂ (CBM-ZC 6468).

Material of *Ethusina abyssicola* Smith, 1884:

Atlantic Ocean. Off Massachusetts, *Albatross*, stn 2713, 38°20'N, 70°08.5'W, 3400 m, 17.IX.1886, 1 ♂, 1 ♀ (MNHN-B 24048).

Off Azores, *Talisman*, stn 131, 38°38'N, 25°06'W, 2995 m, 22.VIII.1883, 3 ♂♂, 1 ♀ (MNHN-B 24152). — Stn 133, 42°15'N, 21°17'W, 3975 m, 24.VIII.1883, 3 ♂♂, 1 ♀ (MNHN-B 24149). — Stn 134, 42°19'N, 21°16'W, 4060 m, 24.VIII.1883,

4 ♂♂, 3 ♀♀ (MNHN-B 24146), 1 ♂ (MNHN-B 24151), 1 ♂ (MNHN-B 24150).

DISTRIBUTION. — Japan and now from the Northwest Pacific Basin (Shatskiy Rise) and Indian Ocean (Mozambique and Mid-Indian basins) (Fig. 17). Depth: 2608 and 4928-4950 m (Fig. 34).

SIZE. — Maximum size: ♀ cl 25.9 mm (MNHN-B 28697), ♂ cl 12.6 mm, cw 12.1 mm (MNHN-B 8775).

REMARKS

Miers referred to his new species by a second name, as "*Ethusina* (*Ethusina*) *sinuatifrons* n. sp." in the list of the seven species of *Ethusina* known at that time (Miers 1886: 329) and as "*Ethusina sinuatifrons*" in a comparison with another of his new species, *Ethusina gracilipes* (Miers 1886: 332). The name "*Ethusina* (*Ethusina*) *challengerii*", however, was used first in the list of species collected in the *Challenger* stations (Miers 1886: xxxi). This name was the one used in the formal description of the species and in the plate and legend that illustrated it (Miers 1886: 331, pl. 28).

Ethusina challengerii can be distinguished from most other known Indo-West Pacific species of *Ethusina* by the shape of the frontal portion of its carapace: sinuous, concave median lobes without terminal teeth (Fig. 16A; Miers 1886: pl. 28, fig. 2, 2a; Sakai 1937: fig. 1f; 1976: fig. 26f), hence the alternate name used by Miers to name his species (see above). A sinuous front is also the case of *E. dofleini* Ihle, 1916 (see above) and in some specimens of *E. dilobotus* Chen, 1993 (see below). The eye peduncles are relatively large and oval, typically but not always tapering anteriorly toward the eye. They are clearly visible dorsally (Fig. 16A; Miers 1886: pl. 28, fig. 2). The retina, however, is much smaller than in other Indo-West Pacific species of *Ethusina* (Fig. 16B). The outer orbital teeth are tubercle-like, being short and obtuse. The G1 and G2 are illustrated here for the first time. The G1 are relatively short and stout, each with a band of many plumose setae near the tip (Fig. 16C).

Two specimens from the Indian Ocean, a large, fragmented female (cl 25.9 mm, MNHN-B

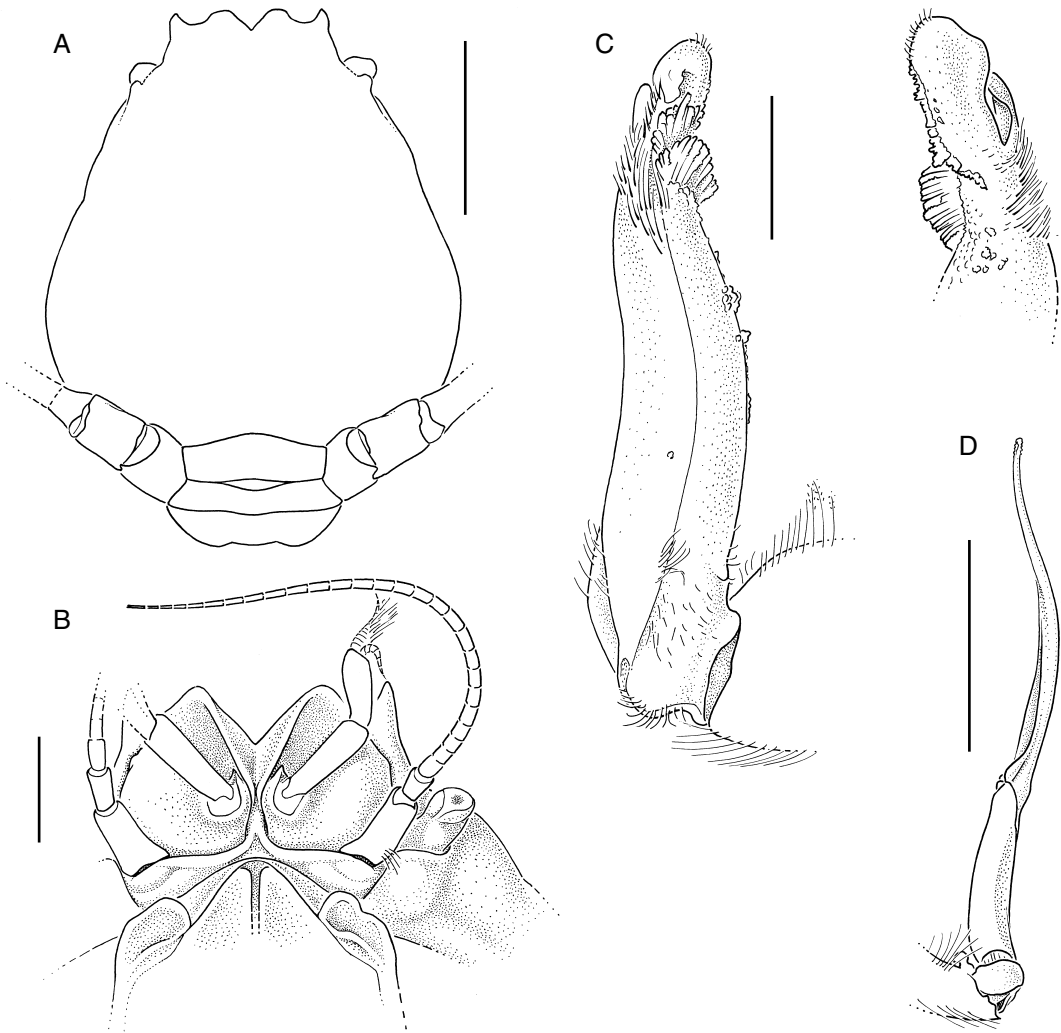


FIG. 16. — *Ethusina challengerii* (Miers, 1886), ♂ cl 12.6 mm, cw 12.1 mm, Mozambique Basin, SAFARI 1, stn 1, trawl CP 01, 2608 m (MNHN-B 8775); **A**, dorsal surface of carapace; **B**, ventral view of anterior portion of body; **C**, right G1, ventral (left) and dorsal (right) views; **D**, left G2, dorsal view. Scale bars: A, 5 mm; B, D, 2 mm; C, 1 mm.

28697) and a male (cl 12.6 mm, cw 12.1 mm, MNHN-B 8775; Fig. 16), agree well with the female holotype (BMNH 84.44) and a male from the northwestern Pacific Ocean (cl 13.0 mm, cw 12.3, CBM-ZC 6468). Although there are some differences (G1 of the Indian Ocean male each with a rounded tip and a slight reduction of the band of setae in contrast to slightly pointed tips, each with a band of setae that circles the dis-

tal end of the G1 in the Pacific Ocean male; G2 of the Indian Ocean male each with an irregular tip [Fig. 16D] in contrast to a simple margin on the tip of the Pacific Ocean male; outer orbital teeth that are slightly larger in the Indian Ocean male than in the Pacific Ocean male), the differences are remarkably minor considering the widespread geographical distribution of the specimens.

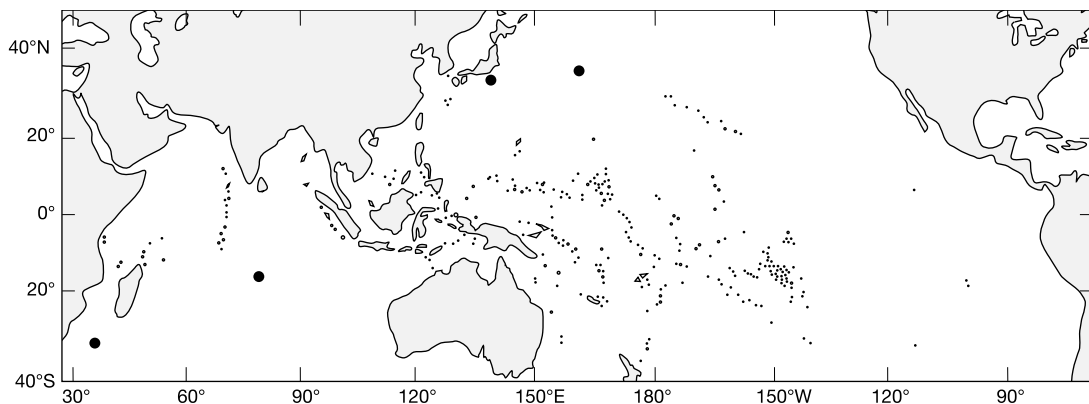


FIG. 17. — Geographical distribution of *Ethusina challengerii* (Miers, 1886).

Gore (1983: 211) commented on the apparent morphological overlap between *E. challengerii* and *E. abyssicola* Smith, 1884, the type species of *Ethusina*. *Ethusina abyssicola* is restricted to very deep water in the tropical and temperate Atlantic Ocean, including the Caribbean Sea. Examination of a series of specimens of *E. abyssicola* from the Atlantic (material at MNHN originally identified by E.-L. Bouvier, A. Milne-Edwards, and M. Rathbun) has demonstrated that both species are clearly different from each other, however. The frontal teeth of *E. abyssicola* (Smith 1884: pl. 2, fig. 1, 1a) are much more prominent and acute than in *E. challengerii*, where the median lobes actually lack teeth (Fig. 16A). The P2 and P3 are thicker and shorter in *E. abyssicola* (Smith 1884: pl. 2, fig. 1) than in *E. challengerii* (Miers 1886: fig. 2), clearly extending well over the anterior border of the carapace in *E. challengerii* but only slightly over the anterior border in *E. abyssicola*. The G1 of *E. abyssicola* have a pointed tip and the setae at the base of the tips are long and plumose (Gore 1983: fig. 3), whereas the tips are distinctively rounded and the setae at the base of the tips are short, thick, and arborescent in *E. challengerii* (Fig. 16C). The tip of the G1 of *E. abyssicola* illustrated by Manning & Holthuis (1981: fig. 9e) is more truncated than that of the specimens of the same species examined here but is nevertheless different from

that of *E. challengerii*. The tips of the G2 are acute in *E. abyssicola* but wide and truncated in *E. challengerii*. Both species share a very small retina (see Doflein 1904: pl. 44, figs 1-3 for *E. abyssicola*).

The identity of a female specimen collected from a depth of 4082 m in the Eastern Pacific and questionably referred to as *E. challengerii* by Faxon (1895) still remains uncertain since the specimen was not available for identification. Rathbun (1937: 93) questionably identified it as *E. faxoni* Rathbun 1933, an Eastern Pacific species. The wide geographical distribution of *E. challengerii* (Fig. 17) and the great depths it inhabits, however, do not preclude its restriction to the Indo-West Pacific region.

Ethusina chenae Ng & Ho, 2003

Ethusina desciscens – Chen 1985: 197, figs 15, 16, pl. 1, figs 4, 5 (not *E. desciscens* (Alcock, 1896)).

?*Ethusina desciscens* – Marumura & Kosaka 2003: 23.

Ethusina robusta – Chen 1986: 133, fig. 13. — Chen & Sun 2002: 248, fig. 106 (not *E. robusta* (Miers, 1886)).

Ethusina chenae Ng & Ho, 2003: 75, figs 6, 7.

TYPE MATERIAL. — Holotype: ♀ cl 10.6 mm, cw 10.9 mm, TAIWAN 2000, stn CP 39 (NTOU); paratype: ♀ cl 8.4 mm, cw 8.5 mm, same station as holotype (ZRC).

TYPE LOCALITY. — Taiwan, off southwestern coast, 21°57.5'N, 121°03.2'E, 1316-1317 m.

MATERIAL EXAMINED. — **Taiwan.** TAIWAN 2000, stn CP 39, 21°57.5'N, 121°03.2'E, 1316-1317 m, 1.VIII.2000, 1 ♀ holotype (NTOU); 1 ♀ parasitized with *Sacculina* sp. (MNHN-B 28827).

TAIWAN 2002, stn CP 189, 21°39.91'N, 118°20.94'E, 1649-1629 m, 27.VIII.2002, 1 juv. ♀, 1 ♀ (NTOU). — Stn CD 191, 21°41.04'N, 118°21.95'E, 1630-1623 m, 28.VIII.2002, 1 ♀ (NTOU).

TAIWAN 2003, stn CD 209, 24°40.69'N, 122°11.18'E, 509-522 m, 31.V.2003, 1 ♀ (NTOU).

Philippine Islands. South China Sea, MUSORSTOM 2, stn CP 55, 13°54'N, 119°58'E, 865 m, 27.XI.1980, 1 ♀ (MNHN-B 18169).

DISTRIBUTION. — Known from the East China Sea (Chen 1986, as *Ethusina robusta* (Miers, 1886)), Taiwan (Ng & Ho 2002), and the Philippine Is (Chen 1985, as *E. desciscens* (Alcock, 1896)). Depth: 509-1649 m (Fig. 34).

SIZE. — Maximum size: ♀ cl 11.6 mm, cw 11.4 mm (NTOU); ♂ unknown.

REMARKS

Diagnostic to *Ethusina chena* are slender outer orbital teeth that are slightly oriented outwardly and do not reach the frontal teeth, median frontal teeth that are shorter and less acute (usually ending in an obtuse tip) than the lateral frontal teeth, wide, shallow, nearly straight, oblique orbital sinuses, and relatively short, thick P2 and P3 (Ng & Ho 2003: figs 6, 7; Chen 1985: figs 15, 16, as *E. desciscens* (Alcock, 1896)). *Ethusina chena* is known only from females.

Ng & Ho (2003: 76) commented on the resemblance of their new species to *E. robusta* (Miers, 1886). The examination of the type material of Miers' species, however, leaves no doubt that they are different. Unfortunately, neither Chen, Ng, nor Ho examined the type material of *E. robusta*.

The identity of the two specimens of *E. desciscens* from Japan (Marumura & Kosaka 2003) needs to be verified.

Ethusina ciliacirrata n. sp.

(Fig. 18)

Ethusina robusta – Chen 2000: 430 (part) (not *E. robusta* (Miers, 1886)).

TYPE MATERIAL. — Holotype: ♂ cl 12.0 mm, cw 11.8 mm, MUSORSTOM 8, stn CP 1111 (MNHN-B 27518); paratype: ♀ cl 14.0 mm, cw 14.6 mm, BATHUS 1, stn CP 651 (MNHN-B 28615).

TYPE LOCALITY. — Vanuatu, NW of Espiritu Santo island, 14°51.09'S, 167°14.00'E, 1210-1250 m.

MATERIAL EXAMINED. — **Vanuatu.** MUSORSTOM 8, stn CP 1111, 14°51.09'S, 167°14.00'E, 1210-1250 m, 8.X.1994, 1 ♀ (MNHN-B 27518).

?MUSORSTOM 8, stn DW 1128, 16°02.14'S, 166°38.39'E, 778-811 m, 10.X.1994, 1 juv. ♀ (MNHN-B 27515).

New Caledonia. BATHUS 1, stn CP 651, 21°41.80'S, 166°40.10'E, 1080-118 m, 11.III.1993, 1 ♀ paratype parasitized by *Sacculina* sp. (MNHN-B 28615).

ETYMOLOGY. — From *cilium*, Latin for eyelash, and *cirrus*, Latin for fringe, in reference to the characteristic fringe of long hairs along the anterior and anterolateral borders of the carapace.

DISTRIBUTION. — Known from Vanuatu and New Caledonia. Depth: 1210-1250 m (Fig. 34); also collected in bottom trawl from 118-1080 m.

SIZE. — Maximum size: ♂ cl 12.0 mm, cw 11.8 mm (MNHN-B 27518), ♀ cl 14.0 mm, cw 14.6 mm (MNHN-B 28615).

DESCRIPTION

Carapace (Fig. 18A) slightly longer than broad; dorsal surface with very short setae, small granules; long hairs along anterior, anterolateral borders. Urogastric, cardiac regions elevated, urogastric region bordered by conspicuous lateral grooves; branchial grooves very shallow. Branchial regions slightly inflated along sides.

Anterior border of carapace (Fig. 18A) with triangular, slender, acutely tipped, outer orbital teeth, reaching slightly below frontal teeth in male holotype, slightly above in female paratype; outer orbital teeth slightly outwardly directed in male holotype, right one inwardly directed in female paratype. Frontal teeth with acute tips; lateral frontal teeth slender, slightly longer than triangular, acutely tipped median frontal teeth. Orbital sinuses very broad, V-shaped; inner margins oblique, outer nearly straight; lateral frontal sinuses U-shaped, asymmetrical; median frontal sinus U-shaped, wider than lateral frontal sinuses but much narrower than orbital sinuses.

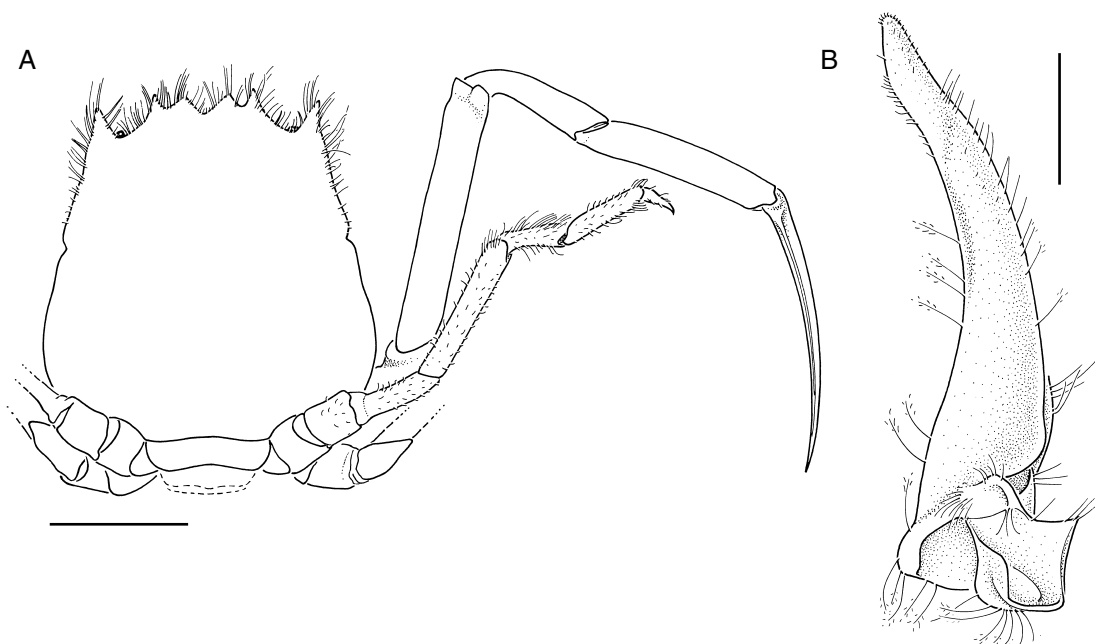


FIG. 18. — *Ethusina ciliacirrata* n. sp., ♂ holotype cl 12.0 mm, cw 11.8 mm, Vanuatu, NW of Espiritu Santo, MUSORSTOM 8, stn CP 1111, 1210–1250 m (MNHN-B 27518); **A**, dorsal surface of carapace, P2, and P4; **B**, left G1, ventral view. Scale bars: A, 5 mm; B, 1 mm.

Eye peduncles wide, slightly longer than cornea, immobile. Slight portion of peduncles, eyes visible dorsally in male holotype.

Anterior border of endostome well below posterior border of antennular fossae of basal antennular articles.

Chelipeds (P1) of male holotype smooth, nearly equal; propodi swollen, almost as long as fingers; fingers slender, with rounded teeth. Chelipeds of female paratype similar to male chelipeds except slightly more slender propodi; broad, ill-defined teeth on fingers.

P2, P3 relatively long, slender in male holotype, slightly thicker in female paratype; smooth; length of P2 meri 0.8 times cl, P2 meri 6.6 times longer than broad in male holotype, 6.4 times longer in female paratype; P4, P5 with numerous long hairs on all articles except dactyli; dactyli long, slender, slightly curved.

Abdomen of male holotype missing. Abdomen of female paratype with six somites, broad, triangular telson; somite 3 broadest, somite 6 longest.

G1 (Fig. 18B) stout, distal third narrower than proximal; slightly twisted, slightly curved, fringed by setae, each tip slightly rounded, short spines along dorsal surface; G2 missing in holotype.

REMARKS

The male holotype (MNHN-B 28615) of *Ethusina ciliacirrata* n. sp. was identified as *Ethusina robusta* (Miers, 1886) by Chen (2000: 430), who mistakenly referred to it as a female. It is part of a collection of five Vanuatu specimens, none of which actually belong to *E. robusta*. In contrast to *E. robusta*, the holotype has broadly triangular, straight or nearly straight outer orbital teeth, and small eyes that are barely seen dorsally. Diagnostic to *E. robusta* are needle-shaped, outwardly oriented outer orbital teeth (Fig. 25A) and males with V-shaped orbital sinuses and eyes that can be partially seen dorsally (Chen & Xu: fig. 9.1, as *E. investigatoris* (Alcock, 1896)). It shares with *E. robusta*, however, long and slender pereopods and P4 and P5 dactyli, although they

are all slightly more slender in *E. robusta*. Also distinctive of the holotype of *E. ciliacirrata* n. sp. is the presence of long hairs along the frontal border of the carapace, and rounded teeth along the cheliped fingers.

There are strong similarities with *E. coronata* n. sp. in regards to the morphology of the G1. As in *E. ciliacirrata* n. sp. (Fig. 18B), the G1 of *E. coronata* n. sp. are stout, twisted, slightly curved, each with a slightly rounded tip (Fig. 19B). In *E. coronata* n. sp., however, the twist or bend of the G1 is a lot more conspicuous. Furthermore, the triangular outer orbital and frontal teeth are longer and more slender, and the P2 and P3 are shorter and stouter (Fig. 19A) than in *E. ciliacirrata* n. sp.

The soft and incomplete specimen of a juvenile female (MNHN-B 27515) from Vanuatu, which was also identified as *E. robusta* by Chen (2000: 430), is questionably identified as *E. ciliacirrata* n. sp. on account of the broadly triangular, straight, and relatively short outer orbital teeth. Only the P4 and P5 remain complete. They are slender and with slender dactyli as in *E. ciliacirrata* n. sp.

Ethusina coronata n. sp.
(Fig. 19)

Ethusina robusta – Chen 2000: 430 (part), fig. 3 (not *E. robusta* (Miers, 1886)).

TYPE MATERIAL. — Holotype: ♂ cl 12.1 mm, cw 12.0 mm, SOLOMON 1, stn CP 1764 (MNHN-B 28734); paratype: ♂ cl 11.4 mm, cw 10.9 mm, MUSORSTOM 8, stn CP 1037 (MNHN-B 27516). The holotype is a male parasitized by *Sacculina* sp. but there was no evidence of morphological abnormalities. The carapace of two other males in the collection were badly damaged; a third male had already been illustrated by Chen (2000: fig. 3).

TYPE LOCALITY. — Solomon Is, Indispensable Strait W of Malaita island, 08°36.6'S, 160°07.4'E, 1327-1598 m.

MATERIAL EXAMINED. — **Solomon Islands.** SALOMON 1, stn CP 1764, 08°36.6'S, 160°07.4'E, 1327-1598 m, 27.IX.2001, 1 ♂ holotype, parasitized by *Sacculina* sp. (MNHN-B 28734). ?SALOMON 1, stn CP 1752, 09°06.9'S, 159°53.2'E, 896-912 m, 25.IX.2001, 1 ♀ (MNHN-B 28675).

Vanuatu. MUSORSTOM 8, stn CP 992, 18°52.34'S, 168°55.16'E, 775-748 m, 29.IX.1994, 1 ♂ parasitized by *Sacculina* sp. (MNHN-B 28662). — Stn CP 1037, 18°03.70'S, 168°54.40'E, 1058-1086 m, 24.IX.1994, 1 ♂ paratype (MNHN-B 27516).

New Caledonia. BATHUS 1, stn CP 651, 21°41.80'S, 166°40.10'E, 1080 m, 11.III.1993, 1 ♂ (MNHN-B 28663). BATHUS 4, stn DW 884, 22°05.03'S, 165°56.63'E, 1100-1200 m, 1.VIII.1994, 1 ♀ (MNHN-B 28664).

ETYMOLOGY. — From *corona*, Latin for crown, in reference to the long, slender, typically outwardly oriented outer orbital teeth, which, together with the long and acute frontal teeth, give the anterior end of the carapace a crown-like appearance.

DISTRIBUTION. — Known from Vanuatu (Chen 2000, as *E. robusta*) and here from the Solomon Is and New Caledonia. Depth: 748-1598 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 12.1 mm, cw 12.0 mm (MNHN-B 28734), ♀ cl 13.7 mm, cw 14.1 mm (MNHN-B 28664).

DESCRIPTION

Carapace (Fig. 19A; Chen 2000: fig. 3, as *Ethusina robusta* (Miers, 1886)) slightly longer than broad in males, wider in single female specimen; dorsal surface with very short setae, small granules. Urogastric, cardiac regions elevated, urogastric region bordered by conspicuous lateral grooves; branchial grooves shallow. Branchial regions inflated along sides, particularly in female specimen. Anterior border of carapace with triangular, slender, acutely tipped, outwardly directed (except in male paratype; Chen 2000: fig. 3, as *E. robusta*) outer orbital teeth, reaching as high or nearly as high as frontal teeth. Frontal teeth longer, more conspicuous in males than female specimen, acute tips; lateral frontal teeth slender, nearly equal or slightly longer than triangular, acutely tipped (obtusate in female specimen) median frontal teeth. Orbital sinuses broad, V-shaped; inner margins slightly curved, outer nearly straight; lateral frontal sinuses U-shaped, asymmetrical in males, symmetrical in female specimen; median frontal sinus V-shaped, wider than lateral frontal sinuses but narrower than orbital sinuses.

Eye peduncles wide, slightly longer than or as long as cornea, immobile. Distalmost portion of peduncles, most of eyes visible dorsally.

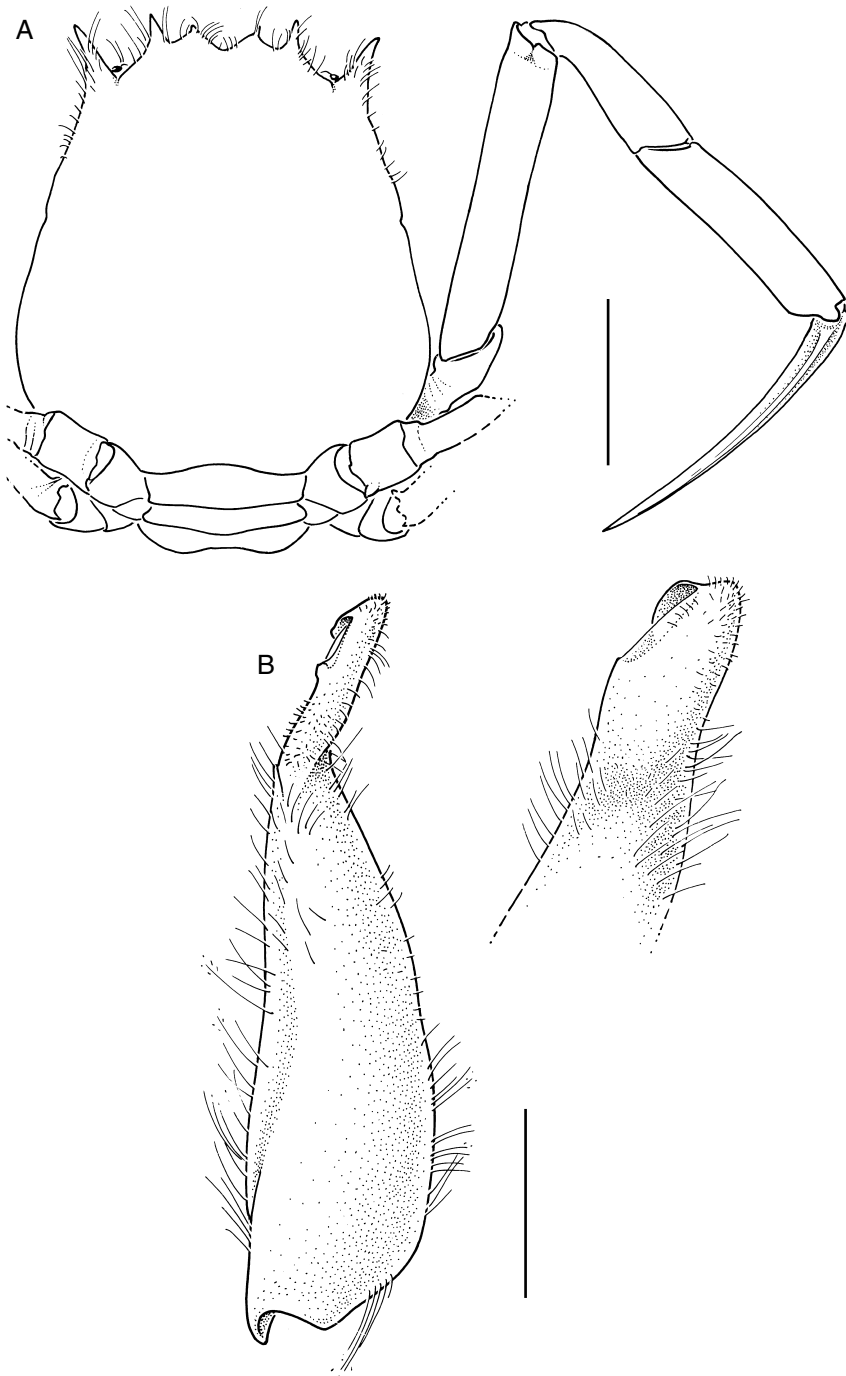


FIG. 19. — *Ethusina coronata* n. sp., ♂ holotype cl 12.1 mm, cw 12.0 mm, Solomon Islands, Indispensable Strait west of Malaita, SOLOMON I, stn CP 1764, 1327-1598 m (MNHN-B 28734); **A**, dorsal surface of carapace and P2; **B**, right G1, ventrolateral (left) and dorsal (right) views. Scale bars: A, 5 mm; B, 1 mm.

Anterior border of endostome lies well below posterior border of antennular fossae of basal antennular articles.

Male chelipeds (P1) smooth, equal or nearly equal (Chen 2000: fig. 3b, c, as *E. robusta*); propodi swollen, almost as long as fingers; fingers slender, with broad cutting edges. Chelipeds of female specimen similar to male chelipeds except more slender propodi, no defined cutting edges on fingers.

P2, P3 (Fig. 19A; Chen 2000: fig. 3d, as *E. robusta*) relatively short and thick; smooth; length of P2 meri 0.8-0.9 times cl, P2 meri 6.1-6.3 times longer than broad in males, 7.9 in female specimen. P4, P5 with short hairs; P5 dactyli relatively slender, curved (Chen 2000: fig. 3e, as *E. robusta*). Male abdomen (Chen 2000: fig. 3f, as *E. robusta*) with four somites (3-5 fused, basal half swollen), triangular telson. Somite 1 length three times as broad, somite 6 rectangular. Female abdomen with six somites, broad, triangular telson; somite 3 broadest, somite 6 longest.

G1 (Fig. 19B; Chen 2000: fig. 3g, as *E. robusta*) stout; distal third narrower than proximal, conspicuously twisted, slightly curved, fringed by setae, each tip slightly pointed, short spines along dorsal surface; G2 (Chen 2000: fig. 3h, as *E. robusta*) relatively short, distal third straight, broad distal ends, blunt tips.

REMARKS

Ethusina coronata n. sp. shares prominent, slender but triangular outer orbital and frontal teeth with *E. pubescens* Chen, 1993 (Chen 1993: fig. 19a). Nevertheless, the outer orbital teeth are much shorter, P2 and P3 more slender, and the carapace is covered by a more distinctive pubescence in *E. pubescens*.

A male specimen of the new species (cl 10.9 mm, cw 9.8 mm, MNHN-B 27516) was identified as *E. robusta* (Miers, 1886) by Chen (2000: 430, fig. 3). It is clearly not conspecific with *E. robusta*, having wider, triangular outer orbital teeth and shorter, stouter P2-P5 dactyli than Miers' species (Fig. 25A; Miers 1886: pl. 29, fig. 2). There are also differences in the G1 and G2, the G1 being flattened, not twisted, in *E. robusta*

(Fig. 25B; Chen & Xu 1991: fig. 9.2). In fact, none of the other material identified by Chen (2000) as *E. robusta* proved to belong to Miers' species but to *E. coronata* n. sp. and two other species, *E. vanuatuensis* Chen, 2000, and *E. ciliacirrata* n. sp.

A female from the Solomon Is (cl 13.7 mm, cw 14.1 mm, MNHN-B 28664), the only female in the collection, had more slender P2 and P3, the meri of P2 7.9 times longer than broad in contrast to 6.1-6.3 in the males. A similar sexual dimorphism, however, was observed in *Ethusina stenommata* n. sp. (see below), where more than one female specimen were available. A second, incomplete female from the same location (cl 12.2 mm, cw 12.3 mm, MNHN-B 28675) was questionably identified as belonging to *E. coronata* n. sp. The carapace, P2, and P3 were similar to the first female but of the partially severed outer orbital teeth only the left one is slightly directed outwardly and the right one is straight.

Ethusina desciscens (Alcock, 1896)

(Fig. 20)

Ethusina (*Ethusina*) *desciscens* Alcock, 1896: 286; 1899: 35.

Ethusina desciscens – Alcock & MacGilchrist 1905: pl. 72, fig. 2, 2a.

Ethusina desciscens – Doflein 1904: 292 (list), fig. 65. — Ihle 1916b: 153 (list), 156 (list). — Serène 1968: 40 (list). — Chen 1987: 689, fig. 7, pl. 2, fig. F; 1993: 336 (key). — Ng & Ho 2003: 72 (list).

Not *Ethusina desciscens* – Chen 1985: 197, figs 15, 16, pl. 1, figs 4, 5 (= *E. chenae* Ng & Ho, 2003).

Not *Ethusina desciscens* – Chen 1986: 136, fig. 15; 1993: 336 (key). — Chen & Sun 2002: 54, 251, fig. 108 (= *E. taiwanensis* Ng & Ho, 2003?).

Not *Ethusina desciscens* – Chen 1993: 336 (key), 337; 1997: 624; 2000: 427 (= *E. robusta* (Miers, 1886)).

Not *Ethusina desciscens* [*sic*] – Chen 1998: 234 (= *E. taiwanensis* Ng & Ho, 2003?).

TYPE MATERIAL. — Unknown (Zoological Survey of India, Calcutta?).

TYPE LOCALITY. — India, Andaman and Laccadive seas.

MATERIAL EXAMINED. — Madagascar. *Vauban*, stn CH 127, 18°00'S, 43°00'E, 1715-1750 m,

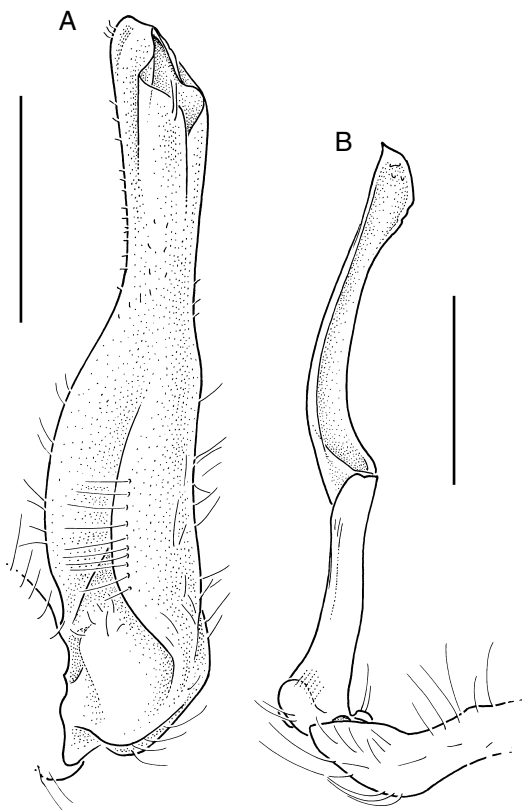


FIG. 20. — *Ethusina desciscens* (Alcock, 1896), ♂ cl 7.2 mm, cw 7.4 mm, Madagascar, off northwest coast, *Vauban*, stn CH 142, 1250-1300 m (MNHN-B 18277); **A**, left G1, dorsal view; **B**, left G2, ventral view. Scale bars: 1 mm.

A. Crosnier coll., 16.I.1975, 1 ♂ (MNHN-B 18364). — Stn CH 131, 13°46'S, 47°33'E, 1490-1600 m, A. Crosnier coll., 20.I.1975, 1 ♀ (MNHN-B 18357). — Stn CH 138, 13°48.8'S, 47°29.4'E, 1800-2000 m, A. Crosnier coll., 27.II.1975, 2 ♀♀ (MNHN-B 18354). — Stn CH 142, 13°45.6'S, 47°34.2'E, 1250-1300 m, A. Crosnier coll., 28.II.1975, 1 ♂ (MNHN-B 18277).

DISTRIBUTION. — Madagascar (Chen 1987), eastern India (Alcock 1896, 1899). Depth: 485 (Alcock 1896)-2000 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 7.2 mm, cw 7.4 mm (MNHN-B 18277), ♀ cl 12.3 mm, cw 11.7 mm (MNHN-B 18354).

REMARKS

In his description, Alcock characterized *Ethusina desciscens* as close to *E. investigatoris* (Alcock,

1896), a junior subjective synonym of *E. robusta* (Miers, 1886), except for three differences: eye peduncles that are more mobile than in *E. investigatoris* sensu Alcock, a smaller size, and male chelipeds that are dissimilar in size (Alcock 1896: 286). Another character not mentioned by Alcock but apparent in drawings of his material is the shape and length of the outer orbital teeth: longer in *E. robusta*, almost reaching the lateral frontal teeth (Alcock & MacGilchrist 1905: pl. 72, fig. 3, 3a, as *E. investigatoris*), than in *E. desciscens*, where the outer orbital teeth reach only a short distance above the base of the lateral frontal teeth. The outer orbital teeth of *E. robusta*, however, were described as each having a tip that “falls considerably short of the tips of the rather long acute frontal spines” (Alcock 1896: 285, as *E. investigatoris*). In fact, the length of the outer orbital teeth varies widely, a case similar to that of *Ethusina indica* Alcock, 1894 (see above). Large specimens that agree with the definition of *E. desciscens* (♀ cl 11.0 mm, cw 11.0 mm, ♀ cl 12.3 mm, cw 11.7 mm, MNHN-B 18354) have outer orbital teeth that are longer than the lateral frontal teeth. A similar condition, however, is found in *E. investigatoris* sensu Alcock (see Remarks of *E. robusta* below). Another, and more significant, difference shown in the drawings of Alcock's material is the length of the eye peduncles, much longer in *E. robusta* (Alcock & MacGilchrist 1905: pl. 72, fig. 3a, as *E. investigatoris*) than in *E. desciscens* (Alcock & MacGilchrist 1905: pl. 72, fig. 2a). Alcock (1899: 35) considered the presence in *E. desciscens* of eye peduncles that are relatively mobile as “the connecting-link between *Ethusina* and *Ethusina*”. This, however, was not noticed in any of the Madagascar specimens that were examined. The apparent “mobility” of eye peduncles could simply depend on how long specimens have been fixed. There are also some very slight differences in the G1, being relatively more slender and narrow distally in *E. desciscens* (Fig. 20A) than in *E. robusta* (Fig. 25A). The G2 also show some differences, being relatively shorter and stouter in *E. desciscens* (Fig. 20B) than in *E. robusta* (Fig. 25C).

Alcock (1896: 286) described *E. desciscens* as a separate species but explained that he “should have regarded it as a variety of *E. investigatoris* but that two specimens coming from very different localities and depths present the same peculiarities”. One of his specimens came from the Andaman Sea at a depth of 485 m and the second from the Laccadive Sea at a depth of 1669-1703 m. The examination of the type material of both species, however, could clarify the problem. The material, if extant, is supposedly at the Zoological Survey of India, Calcutta, and it could not be examined. Nevertheless, different specimens agree well with the definition of the two species as given by Alcock as well as with the differences shown in his illustrations so that the two species are regarded here as clearly distinct.

Examination of most of the specimens identified as *E. desciscens* by Chen (1985: 197; 1993: 337; 1998: 234; 2000: 427) revealed that they do not agree with Alcock's descriptions (Alcock 1896: 286; 1899: 35) and illustrations (Alcock & MacGilchrist 1905: pl. 72, fig. 2, 2a) of *E. desciscens* but that they belong instead to two species, *E. robusta* (Miers, 1886), and *E. chenaie* Ng & Ho, 2003 (see synonymy above). Some of her material could not be examined, however, but Chen's figures of *E. desciscens* from the East China Sea (Chen 1986: fig. 15; Chen & Sun 2002: fig. 108) indicate that her material most probably belongs to a third species, *E. taiwanensis* Ng & Ho, 2003, a view previously expressed by Ng & Ho (2002: 74).

The Madagascar specimens identified as *E. desciscens* by Chan (1987) have close similarities to *E. robusta* in terms of the shape of the carapace and eyes, and are more unlike the specimen of *E. desciscens* illustrated by Alcock & MacGilchrist (1905: pl. 72, fig. 2, 2a). The outer orbital teeth of these specimens are slightly longer than those of *E. robusta*, although this is a variable character in this last species. The G1 and G2 of a Madagascar male (Fig. 20) are characteristic enough, however, to consider the Madagascar specimens different from *E. robusta* (Fig. 25B, C). The examination of the type material of *E. desciscens* and its comparison with

those of *E. investigatoris* and *E. robusta* should shed light on the status of these species. Alcock's material of the first two species, however, was unavailable.

Ethusina dilobotus Chen, 1993

Ethusina dilobotus Chen, 1993: 336 (key), 338, fig. 17. — Ng & Ho 2003: 72, fig. 1.

Ethusina insolita Ng & Ho, 2003: 81, figs 12, 13.

TYPE MATERIAL. — Holotype of *Ethusina dilobotus* Chen, 1993: ♂ cl 9.0 mm, cw 8.5 mm, BIOCAL, stn CP 62 (MNHN-B 22428).

Type material of *Ethusina insolita* Ng & Ho, 2003: holotype: ♂ cl 9.7 mm, cw 9.2 mm, TAIWAN 2000 (NTOU).

TYPE LOCALITY. — New Caledonia, Norfolk Ridge, 24°19'S, 167°49'E, 1395-1410 m.

MATERIAL EXAMINED. — **Taiwan.** TAIWAN 2000, stn CP 53, 24°15.7'N, 122°11.6'E, 2947-2903 m, 3.VIII.2000, 1 ♂ holotype of *E. insolita* Ng & Ho, 2003 (NTOU).

TAIWAN 2001, stn CD 129, 22°05.89'N, 121°05.21'E, 1271-1275 m, 21.VIII.2001, 1 ♂ (NTOU).

TAIWAN 2002, stn CP 189, 21°39.91'N, 118°20.94'E, 1649-1629 m, 27.VIII.2002, 2 ♂♂ (NTOU). — Stn CP 190, 21°35.01'N, 118°15.02'E, 1650-1665 m, 28.VIII.2002, 1 ♂ (NTOU).

New Caledonia. BIOCAL, stn CP 62, 24°19'S, 167°49'E, 1395-1410 m, 2.IX.1985, 1 ♂ holotype (MNHN-B 22428).

DISTRIBUTION. — Known from Taiwan (Ng & Ho 2003, in part as *E. insolita* Ng & Ho, 1993) and New Caledonia (Chen 1993). Depth: 1271-2947 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 9.7 mm, cw 9.2 mm (NTOU), ♀ unknown.

REMARKS

Ethusina dilobotus is known only from male specimens. Diagnostic is a distinctive transverse ridge on somite 5 of the male abdomen (Ng & Ho 2003: fig. 13F, as *E. insolita* Ng & Ho, 2003) and G1 each with two flattened terminal lobes (Chen 1993: fig. 17d-f; Ng & Ho 2003: fig. 13H, as *E. insolita*). The eyes are clearly visible at the proximal margin of the orbital sinuses (Chen 1993: fig. 17a; Ng & Ho 2003: fig. 12, as *E. insolita*).

Comparison of the holotypes of both *E. dilobotus* (MNHN-B 22428) and *E. insolita* (NTOU) showed that the two are clearly conspecific. *E. insolita* was described as a distinct species on account of the presence of transverse ridges across the abdominal somite 5 of the male holotype. These were found in the holotype of *E. dilobotus* but unfortunately not shown in the illustration of Chen (1993: fig. 17c). The holotype was not examined by Ng & Ho. Other differences (having outer orbital teeth that are directed anteriorly rather than slightly outward, the telson being more elongated, and the G1 “shorter and stouter”) are minor and, as agreed by Ng & Ho (2003: 81), most probably the result of variation in a species known from only two specimens. *E. dilobotus* is certain to be found outside Taiwan and New Caledonia.

Ng & Chen (2003), however, correctly identified a second, slightly smaller specimen from Taiwan (♂ cl 8.7 mm, cw 8.2 mm, NTOU) as *E. dilobotus*, even if its median frontal teeth end as distinct acute teeth instead of being sinuous, lobe-like as in the holotype (Chen 1993: fig. 17a) and the holotype of *E. insolita*. Similar sinuous median frontal teeth are diagnostic to *E. challengerii* (Miers, 1886) (Fig. 16A). Very unusual about this specimen is the presence of a very slight notch on the posterior margin of each orbital sinus, a characteristic shared with *E. crenulata* n. sp. (see below). The morphology of the G1 and the distinct abdominal ridges, however, confirm its identity as *E. dilobotus*.

Ethusina dofleini Ihle, 1916

Ethusina abyssicola dofleini Ihle, 1916a: 360; 1916b: 147, 151 (list), 153 (list), 156 (list). — Serène 1968: 40 (list).

Ethusina (*Ethusina*) *abyssicola* – Doflein 1904: 31, pl. 13, figs 1, 2 (not *Ethusina abyssicola* Smith, 1884).

Ethusina abyssicola – Gore 1983: 211 (not *Ethusina abyssicola* Smith, 1884).

Ethusina dofleini – Chen 1993: 336 (key).

TYPE MATERIAL. — Holotype of *Ethusina abyssicola dofleini* Ihle, 1916: ♂ cl 6.4 mm, cw 6.8 mm, *Siboga*,

stn 210a, 05°26'S, 121°18'E, 1944 m (ZMA Crust.De 100714).

TYPE LOCALITY. — Indonesia, Celebes, Gulf of Bone, 05°26'S, 121°18'E, 1944 m.

MATERIAL EXAMINED. — Indonesia, Celebes, *Siboga*, stn 210a, 1944 m, 1 ♂ holotype (ZMA Crust.De 100714).

DISTRIBUTION. — Zanzibar (Doflein 1904, as *Ethusina* (*Ethusina*) *abyssicola*) and Celebes, Indonesia (Ihle 1916b). Depth: 1944 m (Ihle 1916b), 2950 m (Doflein 1904) (Fig. 34).

SIZE. — Maximum size: ♂ cl 6.4 mm, cw 6.8 mm (ZMA Crust.De 100714), ♀ unknown.

REMARKS

Ihle (1916b) described *Ethusina dofleini* as a subspecies of *E. abyssicola* Smith, 1884, an Atlantic species (see discussion of *E. challengerii* above), based on a male specimen collected by the *Valdivia* expedition off Zanzibar, East Africa (Doflein 1904) and a second male specimen he identified from Celebes, Indonesia. Doflein's specimen, originally deposited at ZMB, is no longer extant. His description and photograph (Doflein 1904: 31, pl. 13, figs 1, 2), however, for the most part conforms to Ihle's holotype (ZMA Crust.De 100714).

Ethusina dofleini is very close to *E. challengerii* (Miers, 1886). It can be separated from *E. challengerii* by the expanded, arrow-shaped tips of the G1 (narrow and with rounded tips in *E. challengerii*; Fig. 16C) and by the small eyes that are barely visible dorsally (much larger, oval eye peduncles that taper anteriorly toward the eye and eyes that are visible dorsally in *E. challengerii*; Fig. 16A; Miers 1886: pl. 28, fig. 2).

The outer orbital teeth, much reduced in *E. dofleini*, are similar to those of *E. brevidentata* Chen, 1993, and *E. ocellata* n. sp.

Ethusina exophthalma n. sp. (Fig. 21)

TYPE MATERIAL. — Holotype: ♂ cl 7.1 mm, cw 6.9 mm, MUSORSTOM 10, stn CP 1331 (MNHN-B 28710); paratypes: ♂ cl 7.6 mm,

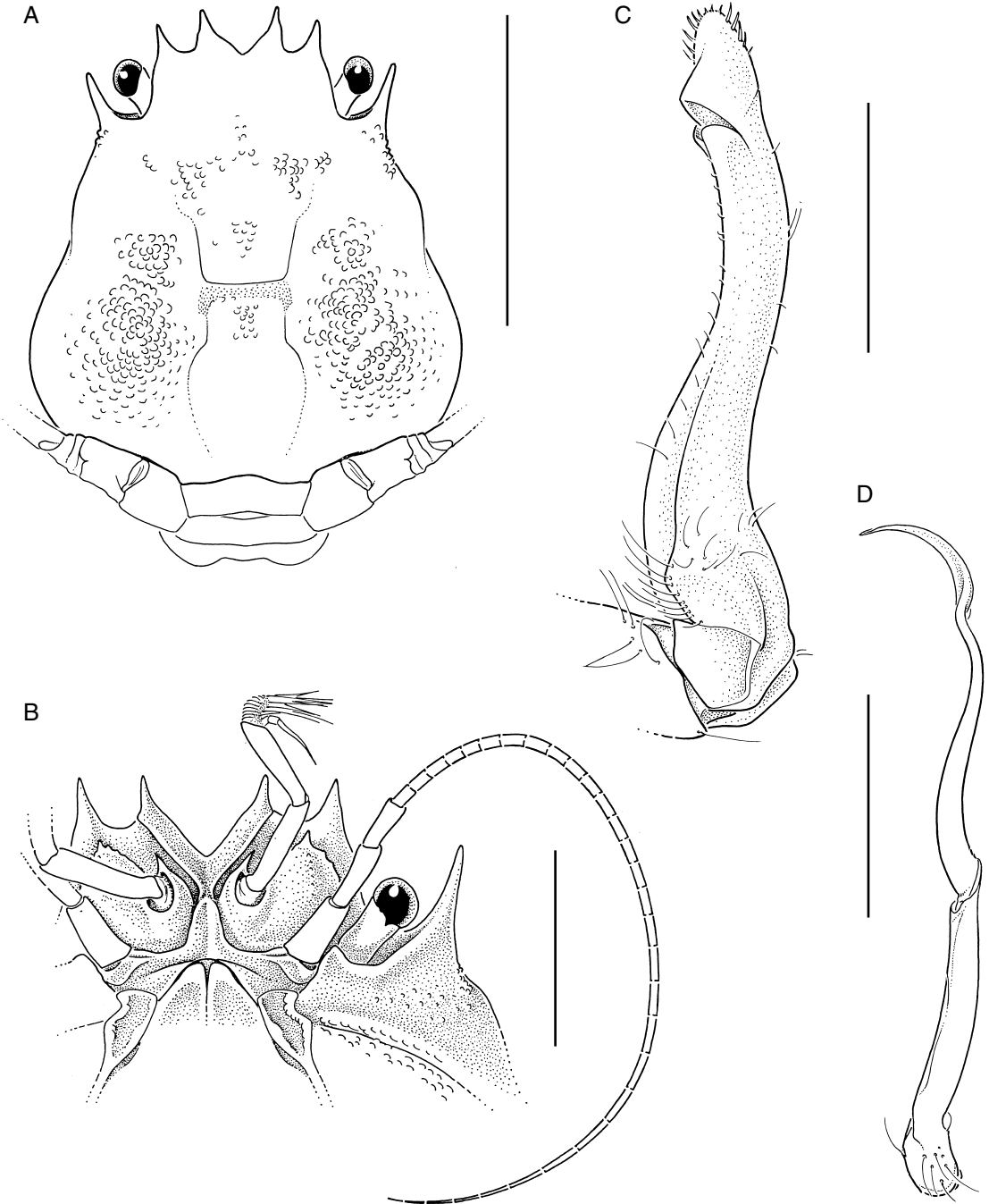


FIG. 21. — *Ethusina exophthalma* n. sp., ♂ holotype cl 7.1 mm, cw 6.9 mm, Fiji, Bligh Water between Viti Levu and Vanua Levu islands, MUSORSTOM 10, stn CP 1331, 694–703 m (MNHN-B 28710); **A**, dorsal surface of carapace; **B**, ventral view of anterior portion of body; **C**, left G1, ventral view; **D**, left G2, ventral view. Scale bars: A, 5 mm; B, 2 mm; C, D, 1 mm.

damaged; ♀ cl 8.2 mm, cw 8.6 mm, same station (MNHN-B 28711).

TYPE LOCALITY. — Fiji, Bligh Water between Viti Levu and Vanua Levu islands, 17°02.4'S, 178°01.8'E, 694-703 m.

MATERIAL EXAMINED. — Fiji. MUSORSTOM 10, stn CP 1331, 17°02.4'S, 178°01.8'E, 694-703 m, 8.VIII.1998, 1 ♂ holotype (MNHN-B 28710), 1 ♂ paratype, 1 ovig. ♀ paratype (MNHN-B 28711).

ETYMOLOGY. — From *exo* and *ophthalmos* (Greek for out and eye, respectively) in reference to the protruding eyes that extend well outside the lower margins of the orbits and can be clearly seen dorsally, a unique character among the species of *Ethusina*.

DISTRIBUTION. — Known only from Fiji. Depth: 694-703 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 7.6 mm (MNHN-B 28710), ♀ cl 8.2 mm, cw 8.6 mm (MNHN-B 28711).

DESCRIPTION

Carapace (Fig. 21A) almost as broad as long in males, slightly broader than long in paratype female; dorsal surface with conspicuous, small granules. Urogastric, cardiac regions slightly elevated, bordered by conspicuous grooves; cervical, branchial grooves shallow. Branchial regions inflated along sides.

Anterior border of carapace (Fig. 21A) with acute, straight outer orbital teeth, longer than but not reaching frontal teeth. Frontal teeth nearly triangular, acute to obtuse tips, lateral frontal teeth nearly equal or slightly shorter than median frontal teeth. Orbital sinuses very broad, U-shaped, nearly symmetrical, inner margins almost straight, outer J-shaped; lateral frontal sinuses U-shaped; median frontal sinus V-shaped, wider than lateral frontal sinuses (nearly equal in paratype female) but much narrower than orbital sinuses.

Eye peduncles (Fig. 21B) much longer than cornea, 1.3-1.6 times eye diameter; very mobile. Eyes and most of eye peduncles visible dorsally across orbits.

Anterior border of endostome (Fig. 21B) lies well below posterior border of antennular fossae of basal antennular articles.

Male chelipeds (P1) smooth, equal; propodi slender, 0.7 as long as fingers; fingers slender, with broad cutting edges. Chelipeds of female paratype similar to male chelipeds except few broad, round teeth.

P2, P3 relatively long; length of P2 meri 1.0-1.4 times cl, P2 meri 6.1-7.6 times longer than broad. P4, P5 with few short hairs, more conspicuous in female paratype; P5 dactyli thick, curved.

Male abdomen with four somites (3-5 fused, basal half swollen), rounded telson. Somite 1 length 3.6 times as broad, somite 6 slightly trapezoidal. Female abdomen with six somites, broad, rounded telson; somite 3 broadest, somite 6 longest.

G1 (Fig. 21C) slender; each distal end rounded, symmetrical, laterally expanded on each inner margin, fringes of spines; G2 (Fig. 21D) relatively long, each distal part narrower; curved distal end, pointed tip.

REMARKS

Together with *Ethusina gracilipes* (Miers, 1886), *E. exophthalma* n. sp. is unique among the known species of *Ethusina* by having greatly elongated eye peduncles, which allow the eyes to project well outside the lower margin of the orbital sinuses and are therefore not concealed or mostly concealed by the carapace as in most species of *Ethusina*.

The eye peduncles are also long in *E. gracilipes* (Miers 1886: pl. 29, fig. 1, 1a) but not nearly as long as in *E. exophthalma* n. sp. Also in contrast to *E. gracilipes*, the orbital sinuses are very broad and U-shaped (wider than in *E. gracilipes*) and the dorsal surface of the carapace conspicuously more granular. The P2 and P3 are much more slender in *E. gracilipes* (P2 meri 10 times longer than broad) than in *E. exophthalma* n. sp. (P2 meri 6.1-7.6 times longer than broad). There are also differences in the G1, which are asymmetrical and spade-like, being broadened along the inner margins and having pointed tips in *E. gracilipes*, in contrast to nearly symmetrical and round-tipped in *E. exophthalma* n. sp. (Fig. 21C).

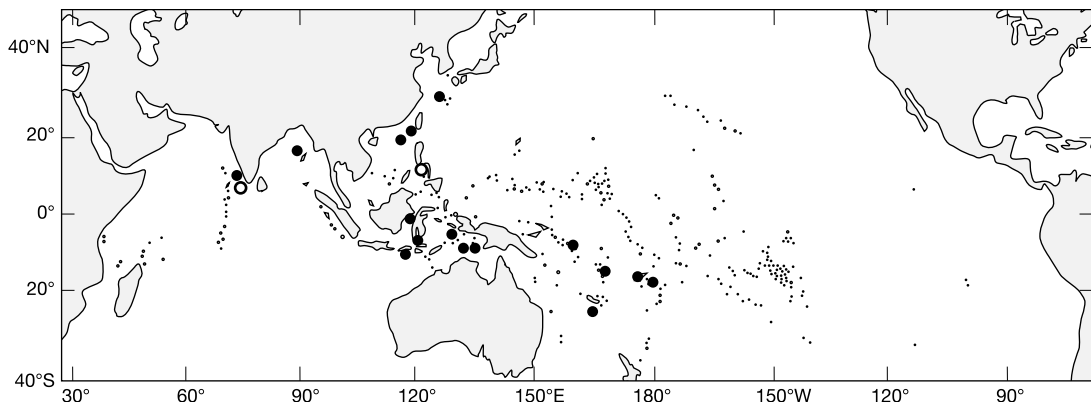


FIG. 22. — Geographical distribution of *Ethusina gracilipes* (Miers, 1886) (○) and *Ethusina robusta* (Miers, 1886) (●).

Ethusina gracilipes (Miers, 1886)
(Fig. 22)

Ethusina (*Ethusina*) *gracilipes* Miers, 1886: xxviii, 332, pl. 29, fig. 2, 2a-c. — Alcock 1899: 34.

Not *Aethusina gracilipes* – Faxon 1895: 36.

Ethusina gracilipes – Doflein 1904: 292 (list), fig. 65 (part). — Serène 1968: 40 (list). — Chen 1993: 336 (key). — Ng & Ho 2003: 72 (list).

Not *Ethusina gracilipes* – Rathbun 1906: 891 (= *E. isolata* n. sp.).

Not *Ethusina gracilipes* – Rathbun 1937: 94, pl. 30, fig. 4, pl. 31, fig. 4 (= *E. isolata* n. sp. [part]).

Not *Ethusina gracilipes* – Ihle 1916b: 146, 151 (list), 152 (list), 153 (list) (part), 156 (list) (part) (= *E. robusta* (Miers, 1886)).

Not *Ethusina gracilipes* – Serène & Lohavanijaya 1973: 35 (key), 35, figs 56-59, pl. 4, figs C, D. — Serène & Vadon 1981: 119, 121 (= *E. indica* Alcock, 1894).

Not *Ethusina gracilipes* – Luke 1977: 33. — Lemaitre & Álvarez-León 1992: 50. — Hendrickx 1995: 128; 1997: 166. (= *Ethusina* sp.)

?*Ethusina gracilipes* – Marumura & Kosaka 2003: 23.

TYPE MATERIAL. — Lectotype: ♂ cl 8.2 mm, cw 8.3 mm; paralectotypes: ♀ cl 8.2 mm, cw 8.5 mm, ovig. ♀ cl 8.1 mm, cw 8.6 mm, *Challenger*, stn 207, 1280 m (BMNH 84.44).

Miers (1886) based his description on four specimens without selecting a holotype. One of the extant three syntypes, the only male (a second male mentioned by Miers is missing), is hereby designated the lectotype and the remaining two specimens, both females, are the paralectotypes.

TYPE LOCALITY. — Philippine Islands, Sibuyan Sea, 12°21'S, 122°15'E, 1280 m.

MATERIAL EXAMINED. — **Philippine Islands.** Sibuyan Sea, *Challenger*, stn 207, 12°21'S, 122°15'E, 1280 m, 1 ♂ lectotype, 1 ♀ paralectotype, 1 ovig. ♀ lectotype (BMNH 84.44).

DISTRIBUTION. — Western India (Alcock 1899) and Philippine Is (Miers 1886) (Fig. 22). Depth: 1280 m (Miers 1886), 1520 m (Alcock 1899) (Fig. 34).

SIZE. — Maximum size: ♂ cl 8.2 mm, cw 8.3 mm (BMNH 84.44), ♀ cl 8.2 mm, cw 8.5 mm (BMNH 84.44).

REMARKS

Very characteristic of *Ethusina gracilipes* is the elongated, highly mobile eye peduncles, 1.1 times the eye diameter. The eye peduncles allow the eyes to project well outside the edge of the orbit (Miers 1886: pl. 29, fig. 1, 1a) and are therefore not concealed or mostly concealed by the carapace as in most species of *Ethusina*. Nevertheless, the eyes were described as “small” and tapering “very slightly, if at all” (Miers 1886: 332). Also diagnostic are the very slender chelipeds, P2, and P3, conspicuously swollen branchial and pterygostomial regions, and a conspicuously demarcated and depressed gastric region, all of which are visible in Miers’ figures (Miers 1886: pl. 29, fig. 1, 1a).

The G1 of the lectotype (cl 8.2 mm, cw 8.3 mm, BMNH 84.44) are slender, each with a pointed

distal end, laterally expanded on the inner margins, and fringes of relatively thick spines along both edges of the distal ends.

One of the differences Miers used to distinguish between *E. gracilipes* and *E. robusta* (Miers, 1886) was the relative length and width of the pereopods. Indeed, the pereopods of the specimens illustrated by Miers (1886: pl. 29, fig. 1, 2) are visibly much longer and more slender in *E. gracilipes* than in *E. robusta*. The folded P2 and P3 clearly extended well over the anterior border of the carapace in the type material of *E. gracilipes* but only slightly over the anterior border in the type material of *E. robusta*. The length of P2 meri was 1.2 times cl in the type material (N = 2) of *E. gracilipes*, 0.9–1.0 (mean of 1.0) times cl in the type material (N = 4) of *E. robusta*; P2 meri 10 times longer than broad in *E. gracilipes* in contrast to 8.4 to 10.2 (mean of 9.1) in *E. robusta*. The differences between the eye peduncles and eyes of *E. gracilipes* and *E. robusta* can be clearly observed in Miers' figures and were confirmed in the type material. The wide, short, rounded eye peduncles of the type material of *E. robusta* were 2.7 times the eye diameter in contrast to 1.1 times the eye diameter in *E. gracilipes*. The frontal teeth, which are of similar size in both species, are shown to be much longer in *E. gracilipes* than in *E. robusta* in Miers' figures (Miers 1886: pl. 29, figs 1, 2) but only because the teeth had been severed in the large female of *E. robusta* that was illustrated (cl 15.2 mm, cw 15.6 mm, BMNH 84.44; see Remarks of *E. robusta* below). Rathbun (1906, 1937) synonymized *E. gracilipes* with *E. robusta* and used the name *E. gracilipes* to refer to species from the Americas (following Faxon 1895) and the Hawaiian Is that belong to other species. The Hawaiian Is specimens are being described as a new species, *E. isolata* n. sp. (see below). Material from the Eastern Pacific region (Lemaitre & Álvarez-León 1992; Hendrickx 1997) probably belongs to an Eastern Pacific endemic species absent in the Indo-West Pacific. The two specimens from the Galápagos Is shown in a photograph by Rathbun (1937: pl. 30, fig. 4, pl. 31, fig. 4) are definitely not *E. gracilipes*. In these specimens the eyes are not visible

dorsally and the teeth along the anterior border of the carapace are much shorter than in Miers' species.

Two of the four extant *Siboga* specimens from Indonesia identified by Ihle (1916b) as *E. gracilipes* proved to be *E. robusta* (see Remarks of *E. robusta* below). Specimens from the South China Sea identified as *E. gracilipes* by Serène & Lohavanijaya (1973) and Serène & Vadon (1981) appear to be identical to *E. indica* Alcock, 1894, as previously mentioned by Chen (1985: 189, 191). The identity of a specimen of *E. gracilipes* from Japan (Marumura & Kosaka 2003) needs to be verified.

Ethusina longipes Chen, 1987

Ethusina longipes Chen, 1987: 687, fig. 6, pl. 2, figs D, E; 1993: 336 (key). — Ng & Ho 2003: 72 (list).

Not *Ethusina longipes* – Chen 2000: 428 (= *E. paralongipes* Chen, 1993).

TYPE MATERIAL. — Holotype: ♂ cl 6.0 mm, cw 5.9 mm, *Vauban*, stn CH 142 (MNHN-B 18270); paratypes: ♂ cl 5.8 mm, cw 5.6 mm, *Vauban*, trawling 142 (MNHN-B 18362); ♂ cl 6.0 mm, cw 5.7 mm, *Vauban*, stn CH 131 (MNHN-B 18355).

TYPE LOCALITY. — Madagascar, off northwest coast, 13°45.6'S, 47°34.2'E, 1250–1300 m.

MATERIAL EXAMINED. — Madagascar. *Vauban*, stn CH 131, 13°46'S, 47°33'E, 1490–1600 m, A. Crosnier coll., 28.II.1975, 1 ♂ paratype (MNHN-B 18355). — Stn CH 142, 13°45.6'S, 47°34.2'E, 1250–1300 m, A. Crosnier coll., 28.II.1975, 1 ♂ holotype (MNHN-B 18270), 1 ♂ paratype (MNHN-B 18362).

DISTRIBUTION. — Known only from Madagascar (Chen 1987). Depth: 1250–1600 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 6.0 mm, cw 5.9 mm (MNHN-B 18270), ♀ unknown.

REMARKS

Diagnostic to *Ethusina longipes* are median frontal teeth that are large and triangular, typically forming L-shaped lateral frontal sinuses and giving the anterior border a high, crown-like appearance (Chen 1987: fig. 6a). The P2 and P3 are particularly long and slender. There are close similarities with *E. paralongipes* Chen, 1993, a

species known only from the western Pacific. *Ethusina longipes* has noticeably longer and more slender pereopods: the meri of P2 and P3 are 13.8 times longer than broad and 1.4 times the carapace length (Chen 1987: pl. 2, figs D, E) in contrast to meri of P2 and P3 10.5-10.8 times longer than broad and 1.1-1.2 times carapace length in *E. paralongipes*. The frontal teeth are more slender in *E. longipes* than in *E. paralongipes* and there are some differences in the morphology of the G1 (see Chen 1987: fig. 6c, d for *E. longipes* and Chen 1993: fig. 18d for *E. paralongipes*).

Ethusina macrospina Ng & Ho, 2003
(Fig. 33E)

Ethusina macrospina Ng & Ho, 2003: 77, figs 8-11.

Ethusina robusta – Chen 1993: 342 (part) (not *E. robusta* (Miers, 1886)).

TYPE MATERIAL. — Holotype: ♂ cl 7.7 mm, cw 7.6 mm, TAIWAN 2001, stn CD 135 (NTOU); paratypes: ♀ cl 9.4 mm, cw 9.7 mm, same station as holotype (NTOU); ♀ cl 9.0 mm, cw 8.8 mm, same station as holotype (ZRC 2003.0228); ♀ cl 10.0 mm, cw 10.0 mm, TAIWAN 2001, stn CD 134 (NTOU); ♂ cl 7.2 mm, cw 7.3 mm, TAIWAN 2001, stn CD 141 (ZRC 2003.0229); 1 ♀ cl 10.9 mm, cw 11.0 mm, TAIWAN 2000, stn CP 38 (ZRC 2003.0227).

TYPE LOCALITY. — Taiwan, off southwestern coast, 22°17.21'N, 120°00.28'E, 961-1112 m.

MATERIAL EXAMINED. — **Taiwan.** TAIWAN 2000, stn CP 38, 22°31.1'N, 120°48.1'E, 1314-1317 m, 31.VII.2000, 1 ♀ paratype (ZRC 2003.0227), 1 ♂, 1 ♀ (MNHN-B 28825).

TAIWAN 2001, stn CP 135, 22°17.21'N, 120°00.28'E, 961-1112 m, 22.XI.2001, 1 ♂ holotype (NTOU), 1 ♀ paratype (NTOU), 1 ♀ paratype (ZRC 2003.0228). — Stn CD 134, 22°16.56'N, 120°06.11'E, 736-1040 m, 22.XI.2001, 1 ♀ paratype (NTOU). — Stn CD 141, 22°12.04'N, 119°59.96'E, 1110-985 m, 24.XI.2001, 1 ♀ paratype (ZRC 2003.0229).

TAIWAN 2002, stn CP 179, 22°21.22'N, 119°54.78'E, 1212-1063 m, 25.VIII.2002, 2 ♂♂, 1 ♀ (NTOU). — Stn CD 189, 21°39.91'N, 118°20.94'E, 1649-1629 m, 27.VIII.2002, 1 ♀, 1 ovig. ♀ (NTOU). — Stn CD 191, 21°41.04'N, 118°21.95'E, 1630-1623 m, 28.VIII.2002, 1 ♀ (NTOU).

TAIWAN 2003, stn CD 203, 22°00.2'N, 120°28.31'E, 635-868 m, 29.V.2003, 1 ♀ (NTOU).

Philippine Islands. South China Sea, ESTASE 2, stn CP 02, 14°05.28'N, 120°02.17'E, 1980-1960 m, 14.XI.1984, 1 ♀ (MNHN-B 19078).

Solomon Islands. Stn CP 1755, 08°58.2'S, 159°41.6'E, 1288-1313 m, 26.IX.2001, 1 ♀ (MNHN-B 28715), 1 ovig. ♀ (MNHN-B 28696).

DISTRIBUTION. — Known from Taiwan (Ng & Ho 2003) and now from the Philippine Is and Solomon Is. Depth: 635-1980 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 7.7 mm, cw 7.6 mm (NTOU), ♀ cl 12.4 mm, cw 13.2 mm (MNHN-B 28696).

REMARKS

Diagnostic to *Ethusina macrospina* is conspicuous, needle-like outer orbital teeth that reach as high as or, as in most specimens, higher than the orbital teeth (Ng & Ho 2003: figs 8, 9, 10A). It has relatively short P2 and P3 (Fig. 33E; Ng & Ho 2003: figs 8, 10B).

Ethusina microspina Chen, 2000

Ethusina microspina Chen, 2000: 428, figs 1, 2, 5. — Ng & Ho 2003: 72 (list).

TYPE MATERIAL. — Holotype: ♂ cl 5.9 mm, cw 6.0 mm, MUSORSTOM 8, stn CP 992 (MNHN-B 27512); paratypes: ♂ cl 6.2 mm, cw 5.8 mm, MUSORSTOM 8, stn CP 1074 (MNHN-B 27514); ♀ cl 8.7 mm, cw 8.6 mm; ♀ cl 8.3 mm, cw 8.4 mm, MUSORSTOM 8, stn CC 996 (MNHN-B 27513).

TYPE LOCALITY. — Vanuatu, E of Erromango island, 18°52.34'S, 168°55.16'E, 775-1200 m.

MATERIAL EXAMINED. — **Solomon Islands.** SALOMON 1, stn CP 1783, 08°32.8'S, 160°41.7'E, 399-700 m, 29.IX.2001, 1 juv. ♀ (MNHN-B 28650).

Vanuatu. MUSTORSTOM 8, stn CP 992, 18°52.34'S, 168°55.16'E, 775-748 m, 24.IX.1994, 1 ♂ holotype (MNHN-B 27512). — Stn CC 996, 18°52.41'S, 168°55.73'E, 764-786 m, 24.IX.1994, 1 ♀ paratype, 1 ovig. ♀ paratype (MNHN-B 27513). — Stn CP 1074, 15°48.42'S, 167°24.27'E, 775-798 m, 4.X.1994, 1 ♂ paratype (MNHN-B 27514).

Fiji. MUSORSTOM 10, stn CP 1330, 17°09.5'S, 177°56.3'E, 567-699 m, 8.VIII.1998, 1 ovig. ♀ (MNHN-B 28651).

BORDAU 1, stn CP 1392, 16°49'S, 179°54'E, 545-651 m, 23.II.1999, 1 ♂, 2 ♀♀ (MNHN-B 28652). — Stn DW 1397, 16°33'S, 179°52'W, 674-688 m, 24.II.1999, 1 ♀ (MNHN-B 28653). — Stn CP 1413, 16°10'S, 179°24'W, 669-676 m, 26.II.1999, 2 ♂♂, 1 ♂ feminized by *Sacculina* sp. (MNHN-B 28654). — Stn DW 1419, 17°05'S, 178°55'W, 654-656 m, 28.II.1999, 1 ♀ (MNHN-B 28655). — Stn DW 1491, 18°50'S, 178°27'W, 778-787 m, 11.III.1999, 1 ♂ (MNHN-B 28656). — Stn DW 1493, 18°43'S, 178°24'W, 429-440 m, 11.III.1999, 1 ♀ (MNHN-B 28657).

French Polynesia. Austral Islands, BENTHAUS, stn DW 1889, 27°36.8'S, 144°15.7'W, 600-620 m, 7.XI.2002, 6 juv. ♀♀ (MNHN-B 28831). — Stn DW 1898, 27°34.3'S, 144°26.6'W, 580-820 m, 8.XI.2002, 1 juv. ♀ (MNHN-B 28833). — Stn DW 1910, 27°38.2'S, 144°15.4'W, 840-1200 m, 10.XI.2002, 1 juv. ♀, 1 ovig. ♀ (MNHN-B 28835). — Stn CP 1909, 27°38.6'S, 144°15.6'W, 783-1000 m, 10.XI.2002, 1 ♂ (MNHN-B 28830). — Stn DW 1923, 27°01.3'S, 146°05.3'W, 360-840 m, 11.XI.2002, 1 juv. ♀ (MNHN-B 28832). — Stn DW 1943, 23°48.7'S, 147°39.1'W, 950 m, 15.XI.2002, 1 ♂ (MNHN-B 28829).

DISTRIBUTION. — Known from Vanuatu (Chen 2000) and now from the Solomon Is, Fiji, and French Polynesia (Austral Is). Depth: 360-798 m; also collected in a trawl from 840 to 1200 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 10.5 mm, cw 10.5 mm (MNHN-B 28829), ♀ cl 12.5 mm, cw 12.3 mm (MNHN-B 28830).

REMARKS

As in *Ethusina brevidentata* Chen, 1993, the outer orbital teeth of *E. microspina* are minute. In *E. microspina*, however, the width of the orbital sinuses is greatly reduced and the sinuses are oriented at the same angle as the sides of the carapace so that the outer orbital teeth appear as minute lateral teeth, giving the appearance that there is a total of only four teeth along the anterior border (Chen 2000: figs 1a, 2a, 5). The outer orbital teeth are very small or even absent in large females (Chen 2000: figs 2a, 5b). In contrast, in *E. brevidentata* the orbital sinuses are clearly demarcated beyond the lateral teeth so that there are six teeth along the anterior border (Chen 1993: fig. 16a, b), the same number as in the remaining Indo-West Pacific species of *Ethusina*. Chen (2000: 428) lists other difference between the two species.

Ethusina ocellata n. sp.

(Fig. 23)

Ethusina brevidentata – Chen 1997: 624 (not *E. brevidentata* Chen, 1993).

TYPE MATERIAL. — Holotype: ♂ parasitized by *Sacculina* sp., cl 5.9 mm, cw 5.9 mm, SALOMON 1, stn CP 1783 (MNHN-B 28708); paratypes: ♀ cl 7.3 mm, cw 7.2 mm, SALOMON 1, stn 1858 (MNHN-B 28624); ♂ parasitized by *Sacculina* sp. cl 5.8 mm, cw 5.8 mm, ♀ cl 8.5 mm, cw 8.9 mm, ♀ cl 8.4 mm, cw 9.0 mm, ♀ cl 7.6 mm, cw 8.2 mm, SALOMON 1, stn CP 1783 (MNHN-B 28709).

The specimen chosen as the holotype was a male parasitized by *Sacculina* sp. It was nevertheless the only male specimen with a complete set of pereopods. There was no evidence of abnormalities in the G1 and G2.

TYPE LOCALITY. — Solomon Islands, Indispensable Strait W of Malaita island, 08°32.8'S, 160°41.7'E, 399-700 m.

MATERIAL EXAMINED. — **Indonesia.** Kai Islands, KARUBAR, stn CC 21, 05°14'S, 133°00'E, 688-694 m, 25.X.1991, 1 ♀ damaged (MNHN-B 22882).

Solomon Islands. SALOMON 1, stn CP 1783, 08°32.8'S, 160°41.7'E, 399-700 m, 29.IX.2001, 1 ♂ holotype parasitized by *Sacculina* sp. (MNHN-B 28708), 1 ♂, 1 juv. ♀, 1 ♀, 2 ovig. ♀♀ paratypes (MNHN-B 28709), 1 juv. ♀ cl 5.9 mm damaged, 1 ovig. ♀ cl 8.6 mm, cw 9.1 mm, 2 ♀♀ parasitized by *Sacculina* sp. cl 8.7 mm, cw 9.3 mm and cl 8.7 mm, cw 9.0 mm respectively (MNHN-B 28676). — Stn CP 1858, 09°37.0'S, 160°41.7'E, 435-461 m, 7.X.2001, 1 ♀ paratype (MNHN-B 28624).

ETYMOLOGY. — From *oculus* and *ocellata* (Latin for eye and having small eyes, respectively) in reference to the relatively small, concealed eyes that result from shorter eye peduncles, a character that clearly separates the new species from *Ethusina brevidentata* Chen, 1993, a close species.

DISTRIBUTION. — Indonesia (Kai Is) (Chen 1997) and the Solomon Is. Depth: 399-700 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 5.9 mm, cw 5.9 mm (MNHN-B 28708), ♀ cl 8.7 mm, cw 9.3 mm (MNHN-B 28676).

DESCRIPTION

Carapace (Fig. 23A) almost as broad as long in males, small females, slightly broader than long in large females; dorsal surface with microscopic granules. Urogastric, cardiac regions slightly elevated, bordered by grooves, deep along lateral borders of metagastric region and posterior

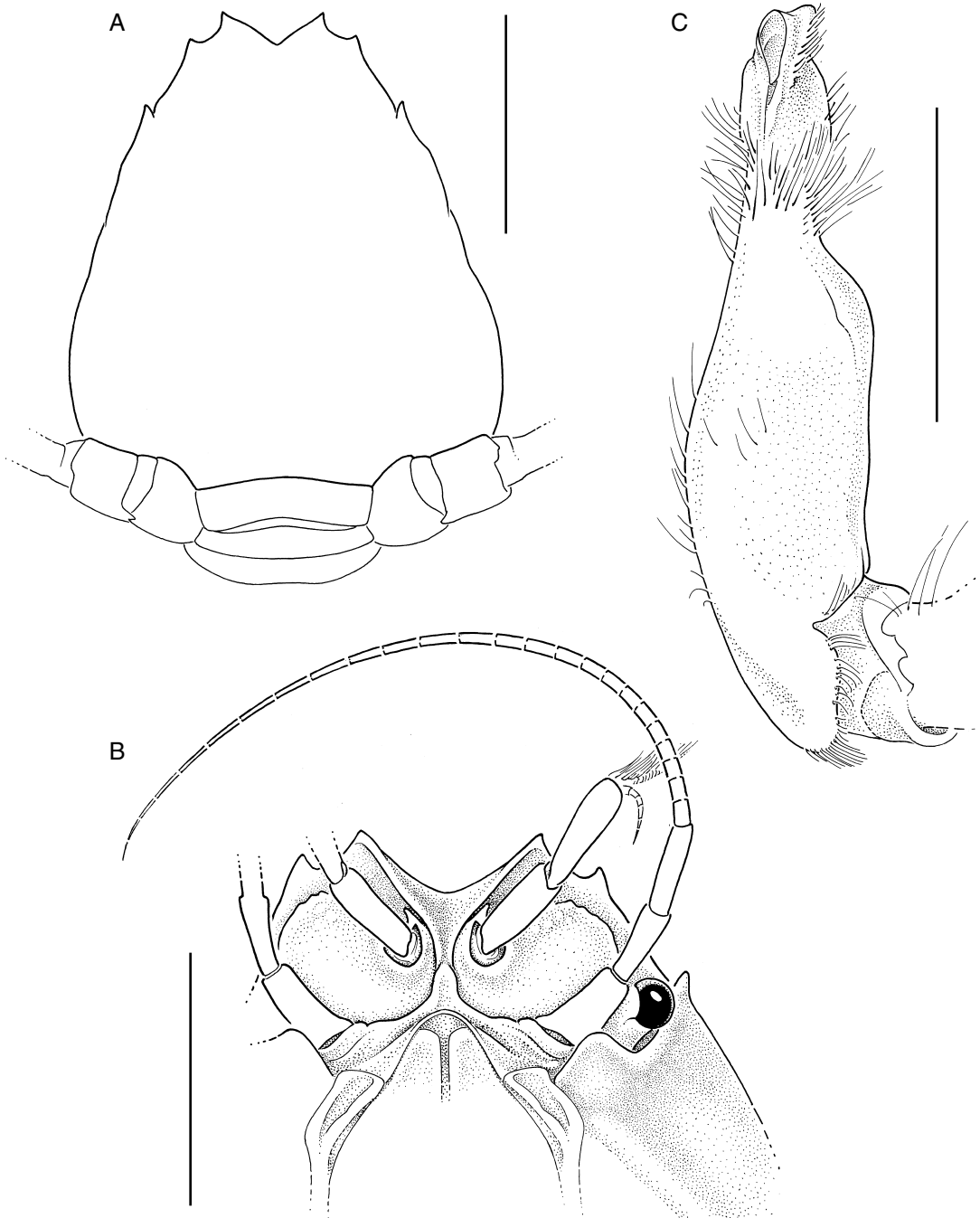


FIG. 23. — *Ethusina ocellata* n. sp., ♂ holotype cl 5.9 mm, cw 5.9 mm, Solomon Islands, west of Malaita, SALOMON 1, stn CP 1783, 399-700 m (MNHN-B 28708); **A**, dorsal surface of carapace; **B**, ventral view of anterior portion of body; **C**, left G1, ventral view. Scale bars: A, 3 mm; B, 2 mm; C, 1 mm.

borders of protogastric region; two distinct, often round depressions on posterior protogastric region, more conspicuous in large individuals; cervical, branchial grooves shallow. Branchial regions slightly inflated along sides.

Anterior border of carapace (Fig. 23A) with small, obtuse to slightly acute, straight outer orbital teeth, slightly shorter or nearly equal than but not reaching lateral frontal teeth. Frontal teeth nearly triangular, lateral frontal teeth much shorter than median frontal teeth. Orbital sinuses broad, oblique, slightly sinuous in males, rounded in large females; lateral frontal sinuses U-shaped; median frontal sinus V-shaped, wider than lateral frontal sinuses but slightly narrower than orbital sinuses.

Eye peduncles (Fig. 23B) shorter than cornea, 0.6-0.7 times eye diameter, mobile. Eyes completely concealed by outer orbital margin, not visible dorsally.

Anterior border of endostome (Fig. 23B) lies well below posterior border of antennular fossae of basal antennular articles.

Male chelipeds (P1) smooth, equal; slightly swollen propodi, almost as long as fingers; fingers with broad, round teeth. Female chelipeds similar to male chelipeds but slightly unequal in some specimens, no teeth but broad cutting edges on fingers of some.

P2, P3 relatively short; length of P2 meri 1.0-1.2 times cl, P2 meri 8.1-8.6 times longer than broad. P4, P5 with few short hairs on dactyli, propodi; P5 dactyli thick, curved.

Male abdomen with four somites (3-5 fused, basal half swollen), rounded telson. Somite 1 length 3.2 times as broad, somite 6 square. Female abdomen with six somites, broad, rounded telson; somite 3 broadest, somite 6 longest.

G1 (Fig. 23C) short, stout; each distal end slightly blunt with two lateral fringes of spines; G2 relatively short, each distal part narrower; thick, flattened, pointed tip.

REMARKS

There are close similarities between *Ethusina ocellata* n. sp. and *E. brevidentata* Chen, 1993, on account of their very small outer orbital teeth and

the morphology of their G1. Close examination, however, reveals several important differences. Diagnostic to *E. ocellata* n. sp. are very short eye peduncles (Fig. 23B) that conceal the eyes from dorsal view (longer eye peduncles, thus eyes are visible dorsally beyond inner margins of orbital sinus in *E. brevidentata* [Chen 1993: fig. 16a, b]); lateral frontal teeth (Fig. 23A) that are much smaller than the median frontal teeth (only slightly smaller or about the same size in *E. brevidentata* [Chen 1993: fig. 16a, b]); outer orbital teeth directed dorsally (directed outwardly in *E. brevidentata*); lateral frontal sinus very narrow, much narrower than median frontal sinus (lateral frontal sinus wide, almost as wide as median frontal sinus in *E. brevidentata*); dorsal surface of carapace, frontal and anterolateral borders, and P2 and P3 (particularly meri) smooth (all conspicuously granular in *E. brevidentata*); slightly thicker P2 and P3, merus of P2 8.1-8.6 times longer than broad (8.9-9.0 in *E. brevidentata*); and relatively short dactyli of P4 and P5 (longer and more slender in *E. brevidentata*). The G1 are very similar. Setation in the G1 of *E. ocellata* n. sp., however, is more conspicuous (Fig. 23C) than in *E. brevidentata* (Chen 1993: fig. 16g-i).

Ethusina paralongipes Chen, 1993

Ethusina paralongipes Chen, 1993: 336 (key), 339, fig. 18. — Ng & Ho 2003: 72 (list).

Ethusina longipes – Chen 2000: 428 (not *E. longipes* Chen, 1987).

Ethusina saltator Ng & Ho, 2000: 81, figs 14, 15.

TYPE MATERIAL. — Holotype of *Ethusina paralongipes* Chen, 1993: ♂ cl 6.1 mm, cw 5.7 mm, MUSORSTOM 5, stn CP 324 (MNHN-B 22254); allotype: ♀ cl 7.1 mm, cw 7.6 mm, MUSORSTOM 5, stn CP 324 (MNHN-B 22255).

Type material of *Ethusina saltator* Ng & Ho, 2003: holotype: ♂ cl 6.4 mm, cw 6.4 mm, TAIWAN 2001, stn CD 139 (NTOU).

TYPE LOCALITY. — Chesterfield Islands, Coriolis Bank, 21°15.01'S, 157°51.33'E, 970 m.

MATERIAL EXAMINED. — Taiwan. TAIWAN 2001, stn CD 139, 22°10.73'N, 120°14.1'E, 852-718 m, 23.XI.2001, 1 ♂ holotype of *E. saltator* Ng & Ho, 2003 (NTOU).

Solomon Islands. SALOMON 1, stn CP 1753, 09°02.7'S, 159°49.4'E, 1001-1012 m, 26.IX.2001, 1 ♂ (MNHN-B 28677). — Stn CP 1754, 09°00.1'S, 159°49.0'E, 1169-1203 m, 26.IX.2001, 1 ♀, 1 undet. sex (MNHN-B 28678). — Stn CP 1755, 08°58.2'S, 159°41.6'E, 1288-1313 m, 26.IX.2001, 1 ♂ (MNHN-B 28713). — Stn CP 1807, 09°42.2'S, 160°52.8'E, 1077-1135 m, 2.X.2001, 2 ♀♀ (MNHN-B 28679), 1 ♂, 1 ♀ (MNHN-B 28683). — Stn CP 1858, 09°37.0'S, 160°41.7'E, 435-461 m, 7.X.2001, 1 ovig. ♀ (MNHN-B 28668).

Vanuatu. MUSORSTOM 8, stn CP 956, 20°33.41'S, 169°35.95'E, 1175-1210 m, 20.IX.1994, 1 ♂ (MNHN-B 27511). — Stn CP 1110, 14°49.16'S, 167°15.18'E, 1360 m, 8.X.1994, 1 ♂ (MNHN-B 27510).

Chesterfield Islands. MUSORSTOM 5, stn CP 324, 21°15.01'S, 157°51.33'E, 970 m, 14.X.1986, 1 ♂ holotype (MNHN-B 22254), 1 ♀ allotype (MNHN-B 22255).

New Caledonia. BATHUS 1, stn CP 651, 21°41.80'S, 166°40.10'E, 1080-1180 m, 11.III.1993, 1 ♂ (MNHN-B 28658), 2 ♂♂ (MNHN-B 29427). BATHUS 2, stn CP 767, 22°10.47'S, 165°59.10'E, 1050-1450 m, 17.V.1993, 1 ♂ (MNHN-B 28659).

DISTRIBUTION. — Taiwan (Ng & Ho 2003, as *E. saltator*), Vanuatu (Chen 2000, as *E. longipes*), Chesterfield Is (Chen 1993), and now from the Solomon Is and New Caledonia. Depth: 435-1450 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 8.6 mm, cw 8.1 mm (MNHN-B 28713), ♀ cl 7.1 mm, cw 7.6 mm (MNHN-B 22255).

REMARKS

Ethusina paralongipes is very close to *E. longipes* Chen, 1997, which is known only from Madagascar. Both species are characterized by very long and slender P2 and P3 that extend well over the frontal teeth when folded and long outer orbital teeth that are directed outwardly. Morphological differences between the two species are given in the discussion of *E. longipes* (see above). An additional diagnostic character of *E. paralongipes* is eye peduncles that are longer than in *E. longipes*. The peduncles and the eyes are visible in dorsal view, even sometimes extending outside the outer orbital teeth in the case of males (Chen 1993: fig. 18a). The G1 are characterized by a small, spur-like processes at each tip. The G1 are more pointed than the pleopod illustrated by Chen (1993: fig. 18d).

As in *E. robusta* (Miers, 1886), the carapace of males is characterized by a raised anterior border, which is accentuated by the presence of a groove that forms a bilobed region just posterior to the frontal teeth. Also similar to the males of *E. robusta* are long eye peduncles that may be visible beyond the outer margins of the outer orbital teeth. *E. paralongipes* is easily distinguished from *E. robusta* by its characteristic long and slender P2 and P3.

Comparison of the holotype (NTOU) of *E. saltator* Ng & Ho, 2003, with the holotype (MNHN-B 22255) and several other specimens of *E. paralongipes* has shown that both are conspecific. *E. saltator* was described from one specimen. It was distinguished from other Indo-West Pacific species of *Ethusina* by differences in the length of the median frontal teeth ("being much shorter than the lateral spine") and the morphology of the G1 ("medially twisted", "tip is prominently clefted medially") of the holotype (Ng & Ho 2003: 83). The relative length of the frontal teeth is clearly a variable character. No difference was found on the apparent twisting of the G1, and the cleft observed in the G1 of the holotype of *E. saltator* seems to be the result of the insertion of the G2 in both G1.

Ethusina pubescens Chen, 1993

(Fig. 24)

Ethusina pubescens Chen, 1993: 336 (key), 341, fig. 19; 1997: 624. — Ng & Ho 2003: 72 (list).

TYPE MATERIAL. — Holotype: ♂ cl 9.6 mm, cw 9.6 mm, MUSORSTOM 5, stn CP 323 (MNHN-B 19060); paratypes: ♂ cl 9.6 mm, cw 9.5 mm, MUSORSTOM 5, stn CP 323 (MNHN-B 22256); ♂ cl 9.7 mm, cw 9.6 mm, MUSORSTOM 5, stn CP 324 (MNHN-B 19061); ♂, same station (IOAS).

TYPE LOCALITY. — Chesterfield Islands, 21°18.52'S, 157°57.62'E, 970 m.

MATERIAL EXAMINED. — **Chesterfield Islands.** MUSORSTOM 5, stn CP 323, 21°18.52'S, 157°57.62'E, 970 m, 14.X.1986, 1 ♂ holotype (MNHN-B 19060), 1 ♂ paratype (MNHN-B 22256). — Stn CP 324, 21°15.01'S, 157°51.33'E, 970 m, 14.X.1986, 1 ♂ paratype (MNHN-B 19061). **New Caledonia.** BATHUS 3, stn CP 842, 23°05'S, 166°48'E, 830 m, 1.XII.1993, 1 ♂ (MNHN-B

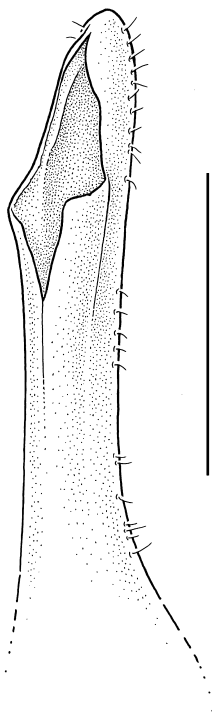


FIG. 24. — *Ethusina pubescens* Chen, 1993, ♂ holotype cl 9.6 mm, cw 9.6 mm, Chesterfield Islands, Coriolis Bank, MUSORSTOM 5, stn CP 323, 970 m (MNHN-B 19060), left G1, ventral view. Scale bar: 1 mm.

22878), 1 ♂, 1 ♀ (MNHN-B 28660). — Stn CP 844, 23°06'S, 166°46'E, 908 m, 1.XII.1993, 2 ♂♂, 1 ♂ parasitized by *Sacculina* sp. (MNHN-B 28661). **Wallis and Futuna Islands.** MUSORSTOM 7, stn DW 565, 11°47.4'S, 178°25.3'W, 900 m, 20.V.1992, 1 ♂ (MNHN-B 22879).

DISTRIBUTION. — Known from the Chesterfield Is (Chen 1993), New Caledonia (Chen 1997), and Wallis and Futuna Is (Chen 1997). Depth: 830-970 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 9.7 mm, cw 9.6 mm (MNHN-B 19061), ♀ cl 10.8 mm, cw 10.9 mm (MNHN-B 28660).

REMARKS

Ethusina pubescens was named after the very short, very sparse pubescence on the dorsal surface of the carapace and abdomen, which unfortunately was emphasized in the illustration of the holotype (Chen 1993: fig. 19a). More character-

istic is the very slender, acute outer orbital teeth that nevertheless do not reach the frontal teeth. The P2 and P3 are long and slender. The branchial regions are conspicuously more expanded laterally than the anterior portion of the carapace, giving the carapace of both sexes a pear-shaped appearance.

The G1 were unfortunately drawn incorrectly. They were shown to have a slight extension close to the tip, thus making them look like a foot (Chen 1993: fig. 19d). One of the two first pleopods of the holotype (MNHN-B 19060), the one that was drawn by Chen, is no longer extant but the second shows a slimmer, symmetrical tip (Fig. 24).

Ethusina robusta (Miers, 1886)
(Figs 22; 25)

Ethusina (Ethusina) gracilipes var. *robusta* Miers, 1886: xxvii, 333, pl. 29, fig. 2.

Ethusina (Ethusina) investigatoris Alcock, 1896: 285; 1899: 34.

Ethusina investigatoris – Alcock & MacGilchrist 1905: pl. 72, fig. 3, 3a.

Ethusina investigatoris – Doflein 1904: 292 (list), fig. 65. — Ihle 1916b: 146, 151 (list), 153 (list), 156 (list).

Ethusina gracilipes – Ihle 1916b: 146, 151 (list) (part), 152 (list), 153 (list) (part), 156 (list) (part) (not *E. gracilipes* (Miers, 1886)).

?*Ethusina investigatoris* – Menon 1937: 37, figs 166-201.

Ethusina gracilipes robusta – Serène 1968: 40 (list).

Not *Ethusina robusta* – Chen 1986: 133, fig. 13 (= *E. chenae* Ng & Ho, 2003).

Ethusina investigatoris – Serène 1968: 40 (list). — Chen 1986: 135, fig. 14; 1997: 624. — Chen & Xu 1991: 60, fig. 9. — Chen & Sun 2002: 54, 250, fig. 107, pl. 9, fig. 5. — Ng & Ho 2003: 72 (list).

?*Ethusina* aff. *investigatoris* – Serène & Vadon 1981: 119, 121.

Not *Ethusina robusta* – Manning & Holthuis 1981: fig. 9b. — Wicksten 1989: 316. — Hendrickx 1995: 128; 1997: 76, fig. 65 (= *Ethusina* sp.).

Ethusina desciscens – Chen 1993: 336 (key), 337; 1997: 624; 2000: 427 (not *E. desciscens* (Alcock, 1896)).

Ethusina investigator [sic] – Chen 1993: 336 (key).

Not *Ethusina robusta* – Chen 1993: 336 (key), 342 (= *E. macrospina* Ng & Ho, 2003; = *E. stenommata* n. sp.; = *E. vanuatuensis* Chen, 1993); 2000: 430 (= *E. ciliacirrata* n. sp.; = *E. coronata* n. sp.; = *E. vanuatuensis* Chen, 1993), fig. 3 (= *E. coronata* n. sp.). — Chen & Sun 2002: 54, 248, fig. 106 (= *E. chenae* Ng & Ho, 2003).

Ethusina robusta – Ng & Ho 2003: 72 (list).

Ethusina alcocki Ng & Ho, 2003: 74, figs 4, 5.

?*Ethusina robusta* – Marumura & Kosaka 2003: 23.

TYPE MATERIAL. — Lectotype of *Ethusina robusta* (Miers, 1886): ♀ cl 10.0 mm, cw 10.1 mm, *Challenger*, stn 191 (BMNH 84.44); paralectotypes: ♀ cl 15.2 mm, cw 15.6 mm, *Challenger*, stn 195 (BMNH 84.44), ♀ cl 10.1 mm, cw 10.2 mm, ♀ cl 10.6 mm, cw 10.9 mm, *Challenger*, stn 191 (BMNH 84.44).

Miers (1886) based his description on four female specimens without selecting a holotype. One of the four syntypes, the most complete of the three smaller females, is hereby designated the lectotype and the remaining three specimens are the paralectotypes.

Type material of *Ethusina investigatoris* (Alcock, 1896): unknown (Zoological Survey of India, Calcutta?).

Type material of *Ethusina alcocki* Ng & Ho, 2003: holotype: ♀ cl 8.4 mm, cw 8.6 mm, TAIWAN 2000, stn CP 32 (NTOU).

TYPE LOCALITY. — Arafura Sea, 05°41'S, 134°04.5'E, 1463 m.

MATERIAL EXAMINED. — **Taiwan.** TAIWAN 2000, stn CP 23, 22°11.9'N, 120°02.9'E, 876 m, 29.VII.2000, 1 ♀ parasitized by *Sacculina* sp. (MNHN-B 28826). — Stn CP 32, 22°01.7'N, 120°11.1'E, 910-1129 m, 30.VII.2000, 1 ♀ holotype of *E. alcocki* (NTOU).

TAIWAN 2002, stn CP 189, 21°39.91'N, 118°20.94'E, 1649-1629 m, 27.VIII.2002, 1 ♀ (NTOU). — Stn CP 190, 21°35.01'N, 118°15.02'E, 1650-1665 m, 28.VIII.2002, 1 ♀ (NTOU).

TAIWAN 2003, stn CD 226, 22°19.15'N, 121°04.63'E, 1171-1212 m, 29.VIII.2003, 1 ♀ (NTOU).

Indonesia. Makassar Strait, CORINDON 2, stn 220, 00°13.6'N, 118°12.3'E, 2350 m, 2.XI.1980, 1 ♀ (MNHN-B 19077). — Stn 231, 00°04.9'N, 119°47.8'E, 1080-980 m, 4.XI.1980, 2 ♀♀ (MNHN-B 19070).

Lesser Sunda Islands, *Siboga*, stn 48, off eastern tip of Sumbawa island, Bali Sea, 08°04.7'S, 118°44.3'E, 2060 m, 13.IV.1899, 1 ♀ (ZMA Crust.De. 241702). Celebes, *Siboga*, stn 211, N of northern tip of Selayar island, southern Celebes, 05°40.7'S, 120°45.5'E, 1158 m, 25.IX.1899, 1 ♂ (ZMA Crust.De. 241689).

?*Siboga*, stn 208, S of Buna island, 05°39'S, 122°12'E, 1886 m, 22.IX.1899, 1 ♂ (ZMA Crust.De 241709). Banda Sea, *Challenger*, stn 195, 04°21'S, 129°07'E, 2624 m, 3.X.1874, 1 ♀ paralectotype (BMNH 84.44).

Tanimbar Islands, KARUBAR, stn CP 53, 08°18'S, 131°41'E, 1026-1053 m, 30.X.1991, 1 ♀ (MNHN-B 22876). — Stn CP 87, 08°47'S, 130°49'E, 1017-1024 m, 5.XI.1991, 1 ♂ (MNHN-B 22883), 1 ♀ (MNHN-B 22875). — Stn CP 89, 08°39'S, 131°08'E, 1084-1058 m, 5.XI.1991, 3 ovig. ♀♀ (MNHN-B 22877).

Arafura Sea, *Challenger*, stn 191, 05°41'S, 134°04.5'E, 1463 m, 23.IX.1874, 1 ♀ lectotype, 2 ♀♀ paralectotypes (BMNH 84.44).

Solomon Islands. SALOMON 1, stn CP 1764, 08°36.6'S, 160°07.4'E, 1327-1598 m, 27.IX.2001, 1 ♂ (MNHN-B 28712).

Vanuatu. MUSORSTOM 8, stn CP 1109, 14°52.20'S, 167°18.00'E, 1550-1620 m, 8.X.1994, 1 ♀ (MNHN-B 27509).

New Caledonia. BATHUS 3, stn CP 844, 23°06'S, 166°46'E, 908 m, 1.XII.1993, 1 ♀ (MNHN-B 28528).

Fiji. MUSORSTOM 10, stn CP 1353, 17°30.9'S, 178°53.3'E, 879-897 m, 12.VIII.1998, 1 ♂ (MNHN-B 28673). — Stn CP 1354, 17°42.6'S, 178°55.0'E, 959-963 m, 12.VIII.1998, 1 ♀ (MNHN-B 28671). — Stn CP 1361, 18°00.0'S, 178°53.7'E, 1058-1091 m, 13.VIII.1998, 3 ♂♂ (MNHN-B 28672).

BORDAU 1, stn CP 1458, 17°22'S, 179°28'W, 1216-1226 m, 5.III.1999, 3 ♂♂ (MNHN-B 28670).

DISTRIBUTION. — Known from Eastern and Western India (Alcock 1896, as *Ethusina investigatoris* (Alcock, 1896)), East China Sea (Chen 1986, as *Ethusina investigatoris*), Taiwan (Ng & Ho 2003, as *Ethusina alcocki* Ng & Ho, 2003), South China Sea (Chen & Xu 1991, as *Ethusina investigatoris*), Indonesia: Makassar Strait (Chen 1993, as *Ethusina desciscens* (Alcock, 1896)), Lesser Sunda Is and Celebes (Ihle 1916b, as *Ethusina gracilipes* (Miers, 1886) and *Ethusina investigatoris*), Tanimbar Is (Chen 1997, as *Ethusina desciscens* and *E. investigatoris*), and Banda and Arafura seas (Miers 1886), Vanuatu (Chen 2000, as *Ethusina desciscens*), and now from the Solomon Is, New Caledonia, and Fiji (Fig. 22). Depth: 876-2624 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 10.9 mm, cw 11.0 mm (ZMA Crust.De 241709), ♀ cl 15.2 mm, cw 15.6 mm (BMNH 84.44).

REMARKS

Ethusina robusta was described from four females as *Ethusina* (*Ethusina*) *gracilipes* var. *robusta* Miers, 1886, a “variety” of *Ethusina* (*Ethusina*) *gracilipes* Miers, 1886. The variety was distinguished by

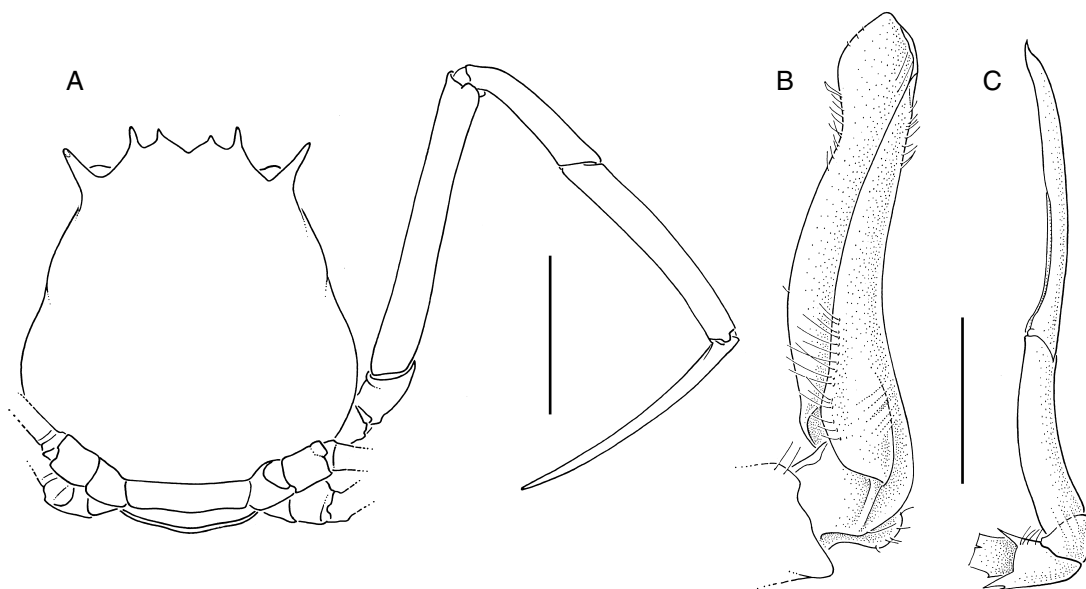


FIG. 25. — *Ethusina robusta* (Miers, 1886); **A**, ♀ lectotype cl 10.0 mm, cw 10.1 mm, *Challenger*, stn 191, Arafura Sea, 1463 m (BMNH 84.44), dorsal surface of carapace and P2; **B**, **C**, ♂ cl 8.6 mm, cw 8.2 mm, Solomon Islands, east of Malaita, SALOMON 1, stn CP 1764, 1327-1598 m (MNHN-B 28712); **B**, left G1, dorsal view; **C**, left G2, dorsal view. Scale bars: A, 5 mm; B, C, 1 mm.

having: 1) “more dilated bases of the antennules”; 2) “the slightly tapering, not cylindrical [i.e. not flattened] eye-peduncles”; and 3) “the more robust chelipedes and ambulatory legs” (Miers 1886: 333). These three differences are clearly shown in Miers’ figures (Miers 1886: pl. 29). The examination of the type materials of both *Ethusina gracilipes* and its purported variety showed that these are clearly species-level differences. These and additional differences between *E. robusta* and *E. gracilipes* are further analyzed in the discussion of *E. gracilipes* (see above).

Of the four females studied by Miers, the most complete specimen (Fig. 25A; cl 10.0 mm, cw 10.1 mm, BMNH 84.44) has been designated the lectotype; a large female (cl 15.2 mm, cw 15.6 mm, BMNH 84.44), which was illustrated by Miers (1886: pl. 29, fig. 2), and the two remaining small females are the paralectotypes (see Type material above). The outer orbital and frontal teeth of the large female paralectotype were unfortunately severed and/or were worn out. As a result, the outer orbital teeth are shown

in Miers’ figure as short and triangular rather than long and needle-like as in the other smaller females in the type material (Fig. 25A). Much confusion has resulted from the use of Miers’ illustration of this atypical, large specimen as a reference for *E. robusta*. Further sources of confusion have been the misinterpretation of Miers’ comparison with *E. gracilipes* and his use of the name “robusta” to imply that thick, short pereopods are diagnostic to *E. robusta*. More importantly, no investigators after Miers appear to have examined the type material, which also includes the three more typical females. The description of males and females of *E. robusta* as different species as a result of sexual dimorphism was an additional source of confusion.

Ambiguity about the identity of Miers’ species has led to numerous misidentifications and the description of two separate species: *E. investigatoris* (Alcock, 1896), and *E. alcocki* Ng & Ho, 2003. Specimens referred to these two species show the diagnostic characters of *E. robusta*: very slender, needle-like, dorsally-directed outer

orbital teeth that reach (and sometimes go beyond) the frontal teeth, slender P2 and P3, relatively long eye peduncles that, often in males and very rarely in females, are visible beyond the outer margins of the outer orbital teeth (as a result of a narrower carapace in contrast to the more inflated carapace of females), and characteristic, stout, nearly symmetrical G1.

Ethusina investigatoris was described by Alcock (1896: 286) from the Bay of Bengal and the Laccadive Sea. In its description Alcock stated that his new species “may possibly be only a variety of *Ethusa (Ethusina) gracilipes*, Miers”. Alcock (1899: 35), however, distinguished *E. investigatoris* from *E. gracilipes* by the presence in *E. investigatoris* of: 1) a transverse “groove or crease” in the form of a flattened region along the anterior portion of the carapace (clearly visible in Alcock & MacGilchrist 1905: pl. 72, fig. 3); and 2) longer eye peduncles, which allow the eyes to be typically visible beyond the outer margins of the outer orbital teeth and certainly above the lower margin of the orbital sinuses (Alcock 1899: 35; Alcock & MacGilchrist 1905: pl. 72, fig. 3, 3a). Also characteristic and clearly visible in Alcock & MacGilchrist’s figure is the presence of a narrow, vertical depression that extends from the posterior edge of the median frontal sinus to the flattened region along the anterior portion of the carapace, thus clearly demarcating the anterior portion of the carapace into two lobed regions. Alcock (1896: 285) also added in his description that each outer orbital tooth is “long and needle-like, but its teeth falls considerably short of the tips of the rather acute frontal spines” (Alcock & MacGilchrist 1905: pl. 72, fig. 3, 3a). The relative lengths of the outer orbital teeth, however, have been found to vary with body size.

The eye peduncles of *E. investigatoris* are long, indeed markedly longer than in *E. desciscens* (Alcock, 1896), a close species from the Indian Ocean, as illustrated by Alcock & MacGilchrist (1905: pl. 72, fig. 3a for *E. investigatoris*, fig. 2a for *E. desciscens*). Alcock (1896: 286) described *E. desciscens* as a possible “variety” of *E. investigatoris* but the two are clearly different species (see Remarks of *E. desciscens* above).

Alcock’s description of *E. investigatoris* was based only on male specimens and all of the specimens that were eventually identified and recorded in the literature that agree with Alcock’s description and figures happen to be males. Although the type material of *E. investigatoris*, supposedly at the Zoological Survey of India in Calcutta, is unavailable, numerous male specimens from Taiwan, Indonesia, the Solomon Is, Vanuatu, New Caledonia, and Fiji agree with its description and figures by Alcock (Alcock 1896; Alcock & MacGilchrist 1905). Although there was no actual “groove” demarcating the anterior border from the rest of the carapace, there was a clear flat border between the bilobed anterior border and the remaining, arched posterior portion of the carapace. The eye peduncles were always long in these specimens. The P2 and P3 were similarly long and slender.

The re-examination of the material (all males) previously identified as *E. investigatoris* s.s. by Ihle (1916b) and Chen (1997) has shown that they are *E. robusta* (Miers, 1886). Similarly, a male from the South China Sea originally identified as *E. investigatoris* by Chen was found by Ng & Ho (2003: 75) to be conspecific with *E. alcocki* Ng & Ho, 2003, a junior subjective synonym of *E. robusta*. The Chinese material described by Chen (1986: fig. 14), Chen & Xu (1991: fig. 9), and Chen & Sun (2002: fig. 107) as *E. investigatoris* has yet to be re-examined (see Ng & Ho 2003: 75) but the figures (all of males) indicate the diagnostic characters of *E. robusta*.

The shape of the outer orbital and frontal teeth of *E. robusta* and *E. investigatoris* are practically identical, except that the outer orbital teeth are shorter in male *E. investigatoris*. Only male specimens of *E. investigatoris* could be distinguished from female specimens of *E. robusta*, and male specimens sharing the diagnostic characteristic of female *E. robusta* were yet to be found. The flat area between the anterior portion and the rest of the carapace, the bilobed character of the anterior portion of the carapace, and eye peduncles that are long and visible beyond the outer margins of the outer orbital teeth, the diagnostic characters of *E. investigatoris*, are indeed those characters

that distinguish female from male *E. robusta*. *E. investigatoris* (Alcock, 1896) is therefore a junior subjective synonym of *E. robusta* (Miers, 1886), and the differences between the two are the result of sexual dimorphism in *E. robusta*.

A similar sexual dimorphism in the shape of the carapace is observed in *E. paralongipes* Chen, 1993 (see Remarks of this species above). Indeed, males of *E. paralongipes* can be easily confused with males of *E. robusta* since both species share long outwardly directed outer orbital teeth. Males and females of both species can be separated by the presence of unusually long P2 and P3 (1.1-1.2 times carapace length) in *E. paralongipes*, much longer than in *E. robusta*.

A large male collected by the *Siboga* expedition in Indonesia (cl 10.9 mm, cw 11.0 mm, ZMA Crust.De 241709) and identified as *E. investigatoris* by Ihle (1916b: 146) is cautiously referred to *E. robusta*. Its eyes were barely visible dorsally, although this may be the result of the larger carapace of the specimen. The G1, however, were clearly stouter and wider at the tip like those of *E. robusta* (Fig. 25B). A female from the same *Siboga* collection clearly belongs to *E. robusta*; two other specimens are not extant. A male specimen from the Philippine Is identified as *Ethusa* aff. *investigatoris* by Serène & Vadon (1981) is missing from the MNHN collection so its identity could not be verified.

The two of the five specimens from Indonesia described by Ihle (1916b) as *E. gracilipes* that are extant (♂ cl 4.0 mm, cw 4.1 mm, ZMA Crust.De. 241689; ♀, ZMA Crust.De. 241702) were found to belong to *E. robusta*. They have much shorter eye peduncles than Miers' type material of *E. gracilipes*, which allow the eyes to be barely seen dorsally (Ihle 1916b: fig. 77), and much narrower (V-shaped rather than U-shaped) orbital sinuses. Chen (1985: 197) identified Ihle's specimens as *E. desciscens* apparently based only on Ihle's figure since there is no mention of an examination of Ihle's material at ZMA. Indeed, neither Ihle's nor Chen's figures (Chen 1985: fig. 15) conform to Alcock's figure of *E. desciscens* (Alcock & MacGilchrist 1905: pl. 72, fig. 2, 2a), nor there is mention of the

examination of Alcock's type material by either Ihle or Chen.

Two females, one from Taiwan and a second from the South China Sea, originally described as a new species, *E. alcocki* Ng & Ho, 2003, are conspecific with *E. robusta*. Ng & Ho (2003: 75) agreed that their new species was close to *E. investigatoris* but opted to describe it as new based on three differences observed when comparing their two female specimens with Alcock's figures (Alcock & MacGilchrist 1905: pl. 72, fig. 3). Their specimens showed less prominent median frontal teeth, a relatively wider supraorbital margin, and P2 and P3 dactyli "about one-third" longer and narrower than in the male of *E. investigatoris* figured by Alcock. These characters are clearly the result of individual variation and sexual dimorphism. One major difference between their type material and Alcock's figures, the much longer eye peduncles of Alcock's male, remained nevertheless unnoticed. Ng & Ho, however, correctly recognized that specimens previously identified by Chen as *E. investigatoris* belong to their new species. Four additional specimens of *E. robusta*, three females and one male, have been identified from Taiwan since the description of *E. alcocki*.

The G1 of *E. robusta* (Fig. 25B; Chen 1986: fig. 14.70; Chen & Xu 1991: fig. 9; Chen & Sun 2002: fig. 107.5, all as *E. investigatoris*) are relatively stout, dorsoventrally flattened, nearly symmetrical, and with slightly pointed tips. The distal ends of the G2 (Fig. 25C) are pointed.

The identity of a specimen of *E. robusta* from Japan (Marumura & Kosaka 2003) needs to be verified. The status of specimens from the Eastern Pacific region referred to as *E. robusta* remains questionable. Rathbun (1906) synonymized *Ethusina gracilipes* with *E. gracilipes* var. *robusta*. The specimen from the Galápagos Is illustrated by Hendrickx (1997: fig. 65) is definitely not *E. robusta* and it does not appear to be an Indo-West Pacific species. The eyes are not visible dorsally and the teeth along the anterior border of the carapace are much longer than in *E. robusta*. This Eastern Pacific species has been reported from Baja California to Ecuador (Hendrickx 1997: 76).

Material from the Eastern Pacific previously synonymized with *E. gracilipes* by Rathbun (1937: 94) was referred to as *E. robusta* by Wicksten (1989: 316) and Hendrickx (1995: 128; 1997: 76). A photograph of a female specimen from the Galápagos Is (Rathbun 1937: pl. 30, fig. 4, pl. 31, fig. 4, as *E. gracilipes*) and a line drawing of a male from the same location (Hendrickx 1997: fig. 65) demonstrate that the specimens do not belong to Miers's species. Although there are similarities in the shape and relative size of the outer orbital and frontal teeth (longer in the male, however), the P2 and P3 in the photographed specimen are short and thick. The Galápagos Is specimens may belong to an undescribed Eastern Pacific endemic. Manning & Holthuis (1981: fig. 9b) illustrate the tip of the G1 from a specimen referred to as *E. robusta* and collected from the Galápagos Is. It presumably belongs to the material similarly identified by Rathbun from the same area. Its shape, however, is different from that of the Indo-West Pacific *E. robusta* (Miers, 1886).

Ethusina somalica (Doflein, 1904) n. comb.

Ethusina somalica Doflein, 1904: 30, 210, 211, 213, 151, 291 (list), pl. 13, figs 5, 6, 64, pl. 44, figs 4, 5. — Ihle 1916b: 153 (list), 155 (list). — Serène 1968: 40 (list). — Chen 1993: 317 (key), 319 (list).

TYPE MATERIAL. — Holotype: ♀ cl 7.3 mm, cw 7.2 mm, Deutsche Tiefsee Expedition, *Valdivia*, stn 258 (ZMB 13628).

TYPE LOCALITY. — Somalia, off southern coast, 2°58.5'S, 46°50.8'E, 1362 m.

MATERIAL EXAMINED. — **Somalia.** Deutsche Tiefsee Expedition, *Valdivia*, stn 258, 2°58.5'S, 46°50.8'E, 1362 m, 1 ♀ holotype (ZMB 13628).

DISTRIBUTION. — Known only from southern Somalia. Depth: 1362 m (Fig. 34).

SIZE. — Maximum size: ♀ cl 7.3 mm, cw 7.2 mm (ZMB 13628), ♂ unknown.

REMARKS

Ethusina somalica n. comb., known only from the female holotype (ZMB 13628), was erroneously described as a species of *Ethusina*. It clearly

belongs to *Ethusina* as the basal antennular article is enlarged and swollen, making the eye peduncles and eyes only partially visible dorsally. The P2 and P3 are slender and long, clearly extending well over the frontal teeth when folded (Doflein 1904: pl. 13, figs 5, 6).

There are very close similarities with *E. robusta*, from which it can be differentiated by having much longer P2 and P3 (in holotype, P2 meri 1.2 times cl, meri 11 times broad as long). These pereopods extend a considerable distance over the frontal teeth when folded (Doflein 1904: pl. 13, figs 5, 6), whereas in *E. robusta* they extend to just above the frontal teeth. The outer orbital teeth are slender and are directed outwardly, and the lateral frontal teeth are particularly slender, longer than the triangular frontal teeth and almost as long as the outer orbital teeth (teeth barely visible in Doflein 1904: pl. 13, fig. 5).

Ethusina stenommata n. sp.

(Fig. 26)

Ethusina robusta – Chen 1993: 342 (part) (not *E. robusta* (Miers, 1886)).

TYPE MATERIAL. — Holotype: ♂ cl 12.0 mm, cw 11.1 mm, MUSORSTOM 7, stn CP 564 (MNHN-B 28731); paratypes: ♂ cl 11.7 mm, cw 11.1 mm, MUSORSTOM 7, stn CP 567 (MNHN-B 28732); ♀ cl 13.3 mm, cw 13.7 mm, ♀ cl 12.3 mm, cw 12.6 mm, MUSORSTOM 5, stn CP 323 (MNHN-B 19062).

TYPE LOCALITY. — Wallis and Futuna Is, Tuscarora Bank, 11°46'S, 178°27'W, 1015-1020 m.

MATERIAL EXAMINED. — **New Caledonia.** MUSORSTOM 5, stn CP 323, 21°18.52'S, 157°57.62'E, 970 m, 14.X.1986, 2 ♀ paratypes (MNHN-B 19062).

Fiji. BORDAU 1, stn CP 1460, 16°47'S, 178°47'W, 750-767 m, 6.III.1999, 1 ♀ (MNHN-B 28666).

Wallis and Futuna Islands. MUSORSTOM 7, stn CP 564, 11°46'S, 178°27'W, 1015-1020 m, 20.V.1992, 1 ♂ holotype (MNHN-B 28731), 1 ♂, 2 juv. ♀ ♀ (MNHN-B 28730), 1 ♂ (MNHN-B 28733). — Stn CP 567, 11°47'S, 178°27'W, 1010-1020 m, 20.V.1992, 1 ♂ paratype parasitized by *Sacculina* sp. (MNHN-B 28732). — Stn DW 620, 12°34'S, 178°11'W, 1280 m, 28.V.1992, 1 ♀ (MNHN-B 28665).

ETYMOLOGY. — From *stenos*, Greek for narrow, and *omma*, Greek for eye, in reference to the relatively narrow eyes.

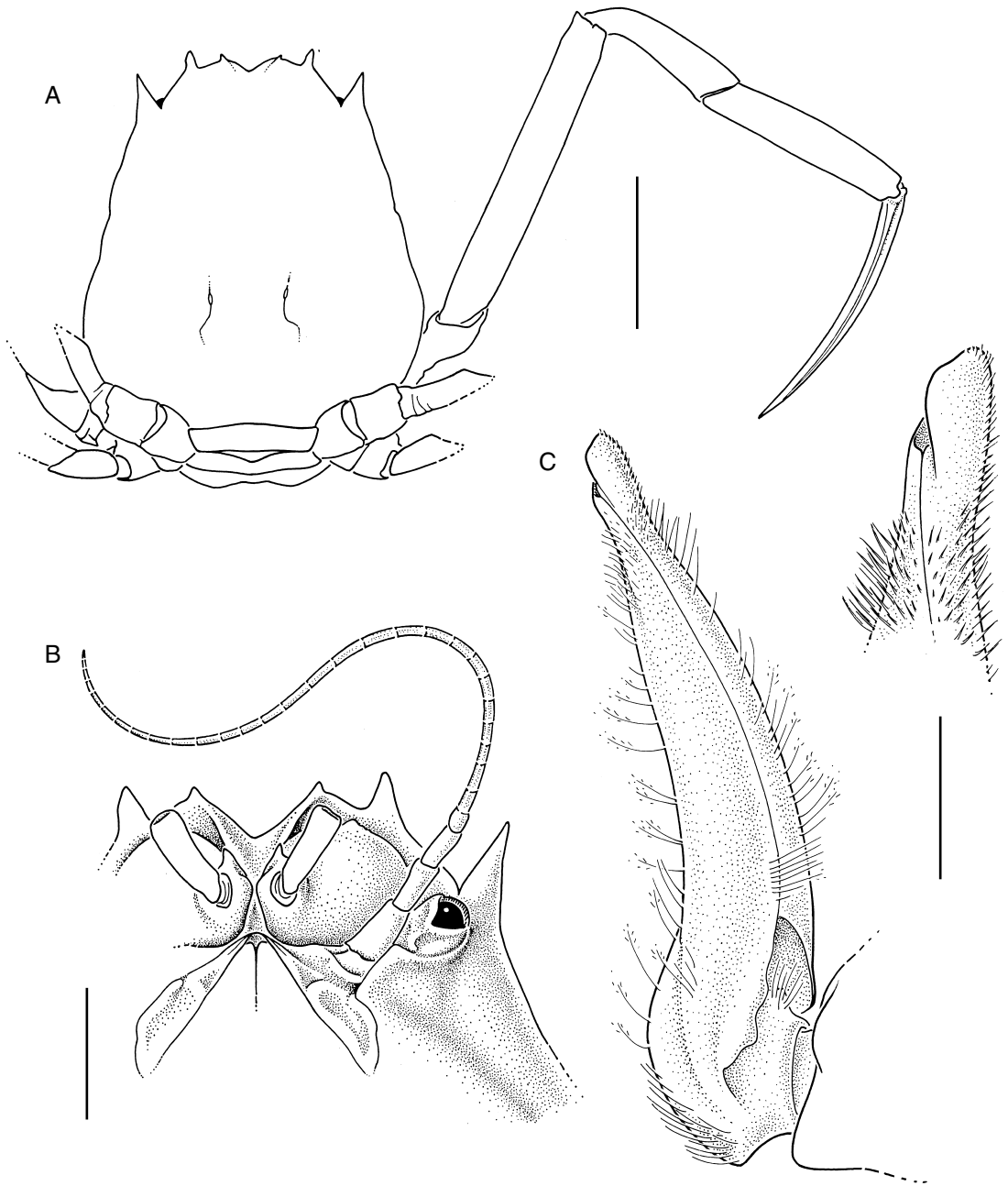


FIG. 26. — *Ethusina stenommata* n. sp., ♂ holotype cl 12.0 mm, cw 11.1 mm, Wallis and Futuna Islands, Tuscarora Bank, MUSORSTOM 7, stn CP 564, 1015-1020 m (MNHN-B 28731); **A**, dorsal surface of carapace and P2; **B**, ventral view of anterior surface of carapace; **C**, right G1, ventral views. Scale bars: A, 5 mm; B, 2 mm; C, 1 mm.

DISTRIBUTION. — Known from New Caledonia, Fiji, and the Wallis and Futuna Is. Depth: 750-1280 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 12.0 mm, cw 11.1 mm (MNHN-B 28731), ♀ cl 14.0 mm, cw 14.8 mm (MNHN-B 28666).

DESCRIPTION

Carapace (Fig. 26A) slightly longer than broad in males, slightly broader than long in females; dorsal surface with very short, scant setae, small granules. Urogastric, cardiac regions elevated, urogastric region bordered by conspicuous lateral grooves; branchial grooves very shallow. Branchial regions slightly inflated along sides.

Anterior border of carapace (Fig. 26A) with triangular, slender, acutely tipped, slightly outwardly directed outer orbital teeth, reaching about half as high in males, juvenile females, or slightly below frontal teeth in adult females. Frontal teeth slightly longer in males than in females; lateral frontal teeth slender, nearly equal in females, slightly longer than triangular in males, acutely tipped median frontal teeth, obtuse in some females. Orbital sinuses broad, V-shaped in males, juvenile females, U-shaped in adult females; inner margins nearly straight and with slight basal swelling in males, juvenile females, slightly curved in adult females, outer J-shaped to nearly straight, not prominently acute; lateral frontal sinuses U-shaped, broader, shallower in females than in males; median frontal sinus V-shaped, broader in females, wider than lateral frontal sinuses but as wide as orbital sinuses. Anterolateral borders and outer margins of outer orbital teeth without hairs. Eye peduncles (Fig. 26B) relatively narrow, slightly longer than cornea, immobile. Most of eye peduncles, eyes visible dorsally.

Anterior border of endostome lies well below posterior border of antennular fossae of basal antennular articles.

Male chelipeds (P1) smooth, equal or nearly equal; propodi slightly swollen, almost as long as fingers; fingers slender, no teeth or defined cutting edges. Female chelipeds similar to male chelipeds except more slender propodi, broad cutting edges in juveniles.

P2, P3 (Fig. 26A) relatively slender and thin; smooth; length of P2 meri 0.8-1.0 times cl, P2 meri 8.6-8.8 times longer than broad in males, 7.3-7.7 in adult females. P4, P5 with few hairs; dactyli relatively slender, curved, dactyli of P5 with thick, slender spines.

Male abdomen with four somites (3-5 fused, basal half swollen), circular telson. Somite 1 very narrow, length 5.7 times as broad, somite 6 rectangular. Female abdomen with six somites, broad, triangular telson; somite 3 broadest, somite 6 longest.

G1 (Fig. 26C) slender; distal third much narrower than proximal, straight, fringed proximally by long setae, few spines, each tip obtuse, short spines along ventral surface; G2 long, distal third straight, each distal end with acute tip.

REMARKS

Ethusina stenommata n. sp. shares the presence of relatively short and triangular outer orbital teeth with *E. crenulata* n. sp. (see below). They can be differentiated, however, by the presence in *E. crenulata* n. sp. (Figs 26; 27) of a vertical fissure at the dorsal lower margin of each orbital sinus, a granular carapace, and stouter P2 and P3. Two female specimens of the new species (cl 13.3 mm, cw 13.7 mm, cl 12.3 mm, cw 12.6, paratypes, MNHN-B 19062) were erroneously identified as *E. robusta* (Miers, 1886) by Chen (1993: 342). *E. stenommata* n. sp. can be differentiated from *E. robusta* by having nearly straight, more slender, and longer outer orbital teeth, longer and relatively more slender P2 and P3, and slightly shorter, stouter P2-P5 dactyli than *E. robusta* (Miers 1886: pl. 29, fig. 2).

All preserved specimens were very light in colour, almost cream white, in contrast to various shades of light yellow or tan in specimens of the other species that had been preserved for approximately the same time.

Ethusina taiwanensis Ng & Ho, 2003

Ethusina taiwanensis Ng & Ho, 2003: 72, figs 2, 3.

?*Ethusina desciscens* — Chen 1986: 136, fig. 15. — Chen & Sun 2002: 251, fig. 108 (not *E. desciscens* (Alcock, 1896)).

?*Ethusina descisces* [sic] – Chen 1998: 234 (not *E. desciscens* (Alcock, 1896)).

TYPE MATERIAL. — Holotype: ♂ cl 8.7 mm, cw 8.5 mm, TAIWAN 2000, stn CP 61 (NTOU); paratype: ♂ cl 9.0 mm, cw 8.1 mm, TAIWAN 2001, stn CD 129 (ZRC 2003.0230).

TYPE LOCALITY. — Taiwan, off northwestern coast, 24°47.5'N, 122°17.4'E, 1134 m.

MATERIAL EXAMINED. — **Japan.** Honshu, SW of Shionomisaki, Kii Peninsula, 33°23.9'N, 135°38.9'E, 700 m, 2.X.1997, 1 ♂ (CBM-ZC 3871).

Taiwan. TAIWAN 2000, stn CP 61, 24°47.5'N, 122°17.4'E, 1134 m, 4.VIII.2000, 1 ♂ holotype (NTOU).

TAIWAN 2001, stn CD 129, 22°05.89'N, 121°05.21'E, 1275 m, 21.VIII.2001, 1 ♂ paratype (ZRC 2003.0230).

TAIWAN 2002, stn CD 192, 22°17.19'N, 120°01.01'E, 2800-1302 m, 28.VIII.2002, 1 ♂ (MNHN-B 28828).

DISTRIBUTION. — Known from Taiwan (Ng & Ho 2003) and now from Japan. Depth: 700-1302 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 8.7 mm, cw 8.5 mm (NTOU), ♀ unknown.

REMARKS

Ethusina taiwanensis is known only from four male specimens. Diagnostic are very slender, acutely triangular outer orbital teeth that are directed outwardly but that do not reach the frontal teeth (Ng & Ho 2003: figs 2, 3A) and relatively short and thick legs.

Specimens from the East China and South China seas referred to as *E. desciscens* (Alcock, 1896), by Chen (1986: 135, fig. 15; 1998: 234 as *E. descisces* [sic]) and Chen & Sun (2002: 251, fig. 108) are probably identical to *E. taiwanensis* (Ng & Ho 2003: 74; see Remarks of *E. desciscens* above).

Ethusina vanuatuensis Chen, 2000

Ethusina vanuatuensis Chen, 2000: 430, fig. 4. — Ng & Ho 2003: 72 (list).

Ethusina robusta – Chen 1993: 342 (part); 2000: 430 (part) (not *E. robusta* (Miers, 1886)).

TYPE MATERIAL. — Holotype: ♂ cl 5.6 mm, cw 5.3 mm, MUSORSTOM 8, stn CP 1026

(MNHN-B 27520); paratype: ♂ cl 5.5 mm, cw 5.4 mm, MUSORSTOM 8, stn CP 1029 (MNHN-B 27521).

TYPE LOCALITY. — Vanuatu, SE of Éfaté island, 17°50.35'S, 168°39.35'E, 437-504 m.

MATERIAL EXAMINED. — **Solomon Islands.** SALOMON 1, stn CP 1781, 08°31.2'S, 160°37.7'E, 1036-1138 m, 20.IX.2001, 3 ♂♂ (MNHN-B 28714).

Vanuatu. MUSORSTOM 8, stn CP 1125, 15°17.63'S, 166°38.43'E, 1160-1220 m, 28.IX.1994, 1 ♀ parasitized by *Sacculina* sp. (MNHN-B 27517). — Stn CP 992, 18°52.34'S, 168°55.16'E, 775-748 m, 29.IX.1994, 1 ovig. ♀ (MNHN-B 28735). — Stn CP 1026, 17°50.35'S, 168°39.35'E, 437-504 m, 28.IX.1994, 1 ♂ holotype (MNHN-B 27520); 1 ♀ (MNHN-B 27519). — Stn CP 1129, 16°00.73'S, 166°39.94'E, 1014-1050 m, 10.X.1994, 1 ♂ paratype (MNHN-B 27521).

New Caledonia. BIOGEOCAL, stn CP 317, 20°48.38'S, 166°53.16'E, 1630-1620 m, 2.V.1987, 1 ♀ (MNHN-B 19097).

Fiji. BORDAU 1, stn CP 1398, 16°22'S, 179°56'W, 907-912 m, 24.II.1999, 1 ♂, 1 ♂ feminized by *Sacculina* sp., 2 ♀♀, 1 ovig. ♀ (MNHN-B 28644). — Stn CP 1400, 16°28'S, 179°50'W, 1004-1012 m, 26.II.1999, 2 ♂♂, 1 juv. ♀, 7 ♀♀, 2 ovig. ♀♀ (MNHN-B 28645). — Stn CP 1413, 16°10'S, 179°24'W, 669-676 m, 26.II.1999, 1 ♂ parasitized by *Sacculina* sp. (MNHN-B 28646). — Stn CP 1415, 16°31'S, 179°00'W, 670-682 m, 27.II.1999, 1 ♂ (MNHN-B 28647). — Stn CP 1458, 17°22'S, 179°28'W, 1216-1226 m, 5.III.1999, 2 ♀♀ (MNHN-B 28648). — Stn DW 1459, 17°18'S, 179°33'W, 820-863 m, 5.III.1999, 1 undet. sex (MNHN-B 28649).

DISTRIBUTION. — Known from Vanuatu (Chen 2000) and New Caledonia (Chen 1993, as *E. robusta* (Miers, 1886) [part]), now from the Solomon Is and Fiji. Depth: 437-1226 m. and 1620-1630 m (Fig. 34).

SIZE. — Maximum size: ♂ 9.5 cl mm, cw 9.4 mm (MNHN-B 28647), ♀ cl 8.1 mm, cw 8.2 mm (MNHN-B 28645).

REMARKS

Diagnostic to *Ethusina vanuatuensis* is the presence in small males and juvenile females of slender outer orbital teeth that are directed slightly inwardly (Chen 2000: fig. 4a) and, in males, G1 that have slightly pointed distal ends (Chen 2000: fig. 4h). The G1 are very similar to those of *E. dilobotus* Chen, 1993 (Chen 1993: fig. 17d-f). In *E. dilobotus*, however, the median lobes of the front are sinuous, concave, and lack terminal teeth.



FIG. 27. — *Ethusina crenulata* n. sp., ♀ paratype cl 10.1 mm, cw 10.0 mm, French Polynesia, Marquesas Islands, Eiao, MUSORSTOM 9, stn CP 1276, 800-805 m (MNHN-B 28718).

In adult females, described here for the first time, the outer orbital teeth are relatively longer and the outer orbital sinus shallower than in males and juvenile females. The outer orbital teeth are directed slightly outwardly, a character also observed in the largest males. The median frontal sinus is broad in both sexes, the result of having medial frontal teeth that, at least in some small males (as in the holotype [MNHN-B 27521], Chen 2000: fig. 4a), slightly directed outwardly. A large female from New Caledonia (cl 10.0 mm, cw 10.1 mm, MNHN-B 19097) parasitized by *Sacculina* sp. agrees with all diagnostic characters for *E. vanuatuensis* except that the outer orbital and frontal teeth are shorter than normal.

Ethusina crenulata n. sp.
(Figs 27; 28)

TYPE MATERIAL. — Holotype: ♂ cl 9.8 mm, cw 9.6 mm, MUSORSTOM 9, stn 1282 (MNHN-B

28717); paratypes: ♂ cl 11.1 mm, cw 10.6 mm, ♀ cl 10.1 mm, cw 10.0 mm, MUSORSTOM 9, stn CP 1276 (MNHN-B 28718); ♂ cl 10.2 mm, cw 9.8 mm, ♀ cl 10.9 mm, cw 10.9 mm, same station (MNHN-B 28720); ♂ cl 10.4 mm, cw 10.1 mm, ♀, cl 10.8 mm, cw 10.4 mm, same station (USNM 1024422).

TYPE LOCALITY. — French Polynesia, Marquesas Islands, off Eiao island, 07°52'S, 140°31'W, 416-460 m.

MATERIAL EXAMINED. — **French Polynesia.** Marquesas Islands, MUSORSTOM 9, stn CP 1270, 07°56'S, 140°43'W, 497-508 m, 4.IX.1997, 1 ♀ (MNHN-B 28722). — Stn CP 1272, 07°55'S, 140°44'W, 660-680 m, 4.IX.1997, 1 ♂ (MNHN-B 28723). — Stn DW 1275, 07°53'S, 140°38'W, 627 m, 5.IX.1997, 1 ♂ (MNHN-B 28721). — Stn CP 1276, 07°52'S, 140°37'W, 800-805 m, 5.IX.1997, 8 ♂♂, 2 ♂♂ parasitized by *Sacculina* sp., 5 ♀♀, 11 ♀♀ parasitized by *Sacculina* sp. (MNHN-B 28724), 1 ♂ paratype, 1 ♀ paratype (MNHN-B 28718), 1 ♂ paratype, 1 ♀ paratype (MNHN-B 28720), 1 ♂ paratype, 1 ♀ paratype (USNM 0000). — Stn DW 1277, 07°52'S, 140°39'W, 1000-1100 m, 5.IX.1997, 2 ♀♀ (MNHN-B 28726). — Stn 1278,

07°52'S, 140°39'W, 1000 m, 5.IX.1997, 2 ♂♂, 3 ♀♀, 2 ♀♀ parasitized by *Sacculina* sp. (MNHN-B 28719). — Stn 1282, 07°52'S, 140°31'W, 416-460 m, 7.IX.1997, 1 ♂ holotype (MNHN-B 28717).

ETYMOLOGY. — From *crenula*, diminutive of *crena* (Latin for notch or fissure), in reference to the small vertical fissure at the dorsal lower margin of each of the orbital sinuses in this species.

DISTRIBUTION. — Known only from the Marquesas Islands, French Polynesia. Depth: 416-1100 m (Fig. 34).

SIZE. — Maximum size: ♂ 11.1 cl mm, cw 10.6 mm (MNHN-B 28718), ♀ cl 13.0 mm, cw 12.5 mm (MNHN-B 28724).

DESCRIPTION

Carapace (Fig. 27) slightly longer than broad in males, most females; dorsal surface with conspicuous, short setae, small granules. Urogastric, cardiac regions elevated, urogastric region bordered by conspicuous lateral grooves; branchial grooves shallow. Branchial regions slightly inflated along sides.

Anterior border of carapace (Fig. 27) with triangular, straight, acutely tipped outer orbital teeth, longer than but not reaching as high as frontal teeth. Frontal teeth longer and more conspicuous in males, acute to obtuse tips; lateral frontal teeth slender, nearly equal or slightly shorter than triangular median frontal teeth. Orbital sinuses broad, V-shaped, small, short vertical fissure at dorsal lower margin of each sinus; inner margins J-shaped, outer oblique except slightly rounded proximal portion anterior to orbital fissure; lateral frontal sinuses U-shaped, asymmetrical; median frontal sinus V-shaped, wider than lateral frontal sinuses but as wide as orbital sinuses.

Eye peduncles (Fig. 28A) short, wide, slightly longer than or as long as cornea, immobile. Only tips of eyes barely visible dorsally.

Anterior border of endostome (Fig. 28A) lies well below posterior border of antennular fossae of basal antennular articles.

Male chelipeds (P1) smooth, equal or nearly equal, short setae on all articles, except fingers (scant on proximal portion of dorsal margin of dactyli); propodi slender, almost as long as fingers; fingers slender, with broad cutting edges.

Female chelipeds similar to male chelipeds except few broad, round teeth on fingers.

P2, P3 (Fig. 27) short, thick; scant, short setae on all articles (very scant, short on proximal portion of dactyli); length of P2 meri 0.8 times cl, P2 meri 5.2-5.7 times longer than broad. P4, P5 with short hairs; P5 dactyli relatively slender, curved.

Male abdomen (Fig. 28B) with four somites (3-5 fused, basal half swollen), triangular telson. Somite 1 length 2.2-2.8 times as broad, somite 6 rectangular. Female abdomen with six somites; broad, triangular telson; somite 3 broadest, somite 6 longest.

G1 (Fig. 28C) very slender; distal third narrow, straight, tips slightly rounded, short spines along tips, inner margins; G2 relatively short, each distal part broad; straight distal end, blunt tip.

REMARKS

Characteristic of *Ethusina crenulata* n. sp. is the presence of a small vertical fissure on the dorsal lower margin of each orbital sinus and the presence of short but conspicuous setae throughout the dorsal surface of the carapace and pereopods. One or both orbital fissures are sometimes absent or difficult to see, particularly in small females. Similar orbital fissures are present in *Ethusa crassipodia* n. sp. and in *Ethusina isolata* n. sp.

Similar to *E. crenulata* n. sp. are *E. huilianae* n. sp. and *E. isolata* n. sp. *E. huilianae* n. sp. is being described from the same deep-water stations in French Polynesia where *E. crenulata* n. sp. was collected (see below). Although only four large (cl 11.8 mm-13.3 mm, MNHN-B 28727-28729, 28834) male specimens of *E. huilianae* n. sp. are known, there is ample morphological evidence to support the description of the two as separate species, even if both have similarly slender G1 (Figs 27C; 29C). The main differences (see Table 1) are triangular, straight outer orbital teeth in *E. crenulata* n. sp. (slender, much longer, directed outwardly in *E. huilianae* n. sp.; Fig. 29), a fissure at the dorsal lower margin of each orbital sinus in *E. crenulata* n. sp. (absent in *E. huilianae* n. sp.), carapace with moderately inflated branchial regions in *E. crenulata* n. sp.

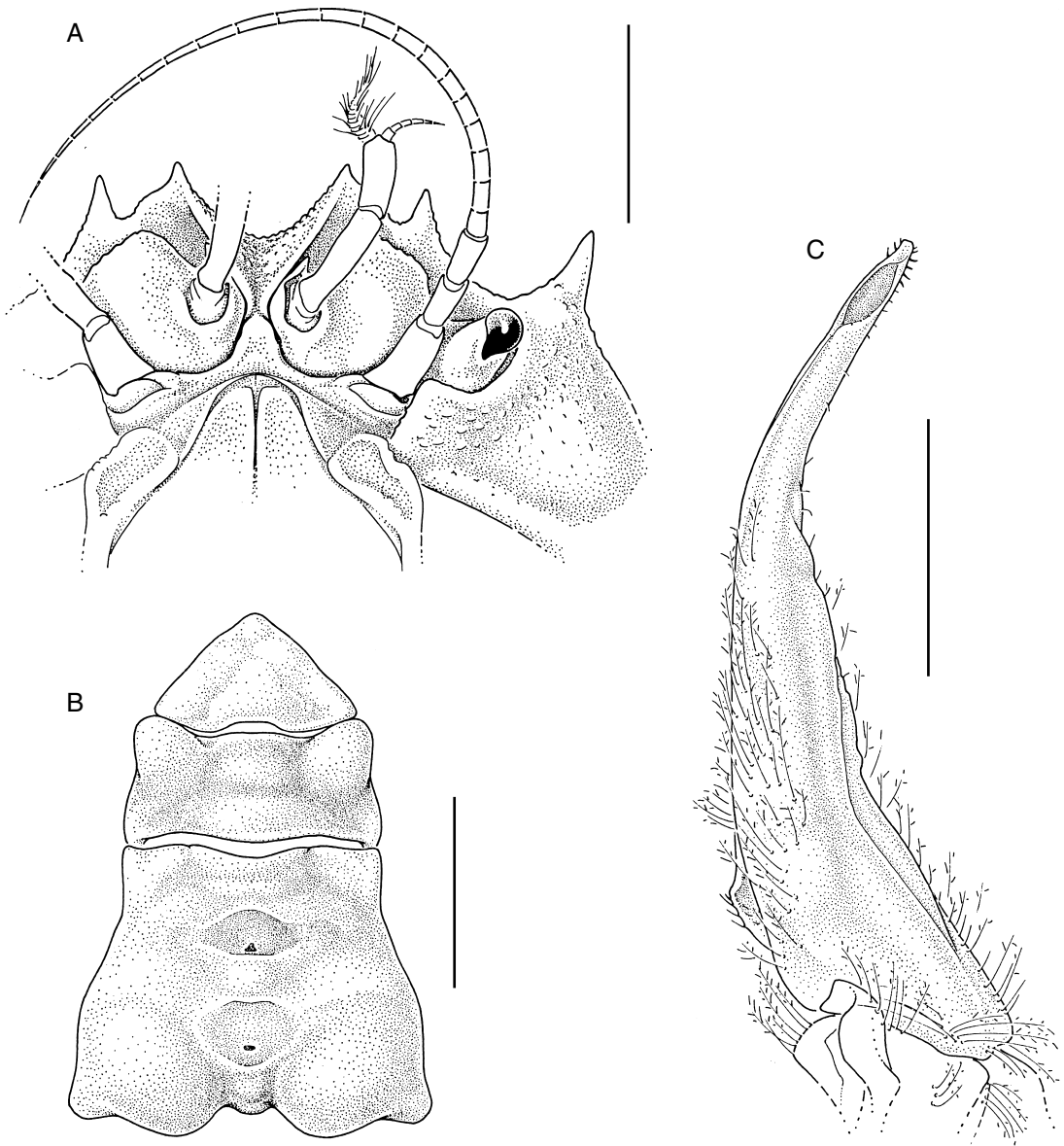


FIG. 28. — *Ethusina crenulata* n. sp., ♂ holotype cl 9.8 mm, cw 9.6 mm, French Polynesia, Marquesas Islands, Eiao, MUSORSTOM 9, stn 1282, 416-460 m (MNHN-B 28717); **A**, ventral view of anterior portion of body; **B**, abdomen; **C**, left G1, ventral view (left), dorsal view (right). Scale bars: A, B, 2 mm; C, 1 mm.

(conspicuously inflated in *E. huilianae* n. sp.; Fig. 29), eye peduncles that are slightly shorter in *E. crenulata* n. sp. (slightly longer or as long as cornea, 2.1 times eye diameter in *E. huilianae* n. sp.), and shorter, thicker P2 and P3 in

E. crenulata n. sp. (P2 meri 0.8 times cl in contrast to 1.0-1.1 times cl in *E. huilianae* n. sp.). Similarities with *E. isolata* n. sp., being described from the Hawaiian Is, are more marked since both species share the presence of a fissure at each

TABLE 1. — Differences among the three species of *Ethusina* Smith, 1884 endemic to the eastern limits of the Indo-West Pacific region.

Characters	<i>Ethusina crenulata</i> n. sp.	<i>Ethusina huilianae</i> n. sp.	<i>Ethusina isolata</i> n. sp.
Carapace	Short setae	Few short setae	Few short setae
Branchial region	Slightly inflated	Conspicuously inflated	Slightly inflated
Ocular fissure	Present	Absent	Present
Orbital teeth	Triangular, straight in both sexes	Slender, directed outwardly in males (females unknown)	Triangular, straight in females; slender, directed outwardly in males
P2, P3	Very short, thick (P2 meri 5.2-5.7 longer than broad)	Slender (P2 meri 7.5-8.2 longer than broad)	Short, thick (P2 meri 8.3-8.9 longer than broad)

orbital sinus and females have relatively short and triangular outer orbital teeth (Fig. 31A). Differences between the three species are summarized in Table 1.

Ethusina huilianae n. sp.
(Figs 29; 30)

TYPE MATERIAL. — Holotype: ♂ cl 12.7 mm, cw 13.0 mm, MUSORSTOM 9, stn CP 1277 (MNHN-B 28727); paratypes: ♂ cl 11.8 mm, cw 11.9 mm, MUSORSTOM 9, stn CP 1278 (MNHN-B 28728); ♂ cl 12.6 mm, cw 12.6 mm, same station (MNHN-B 28729).

TYPE LOCALITY. — French Polynesia, Marquesas Islands, off Eiao island, 07°52'S, 140°39'W, 1000-1100 m.

MATERIAL EXAMINED. — **French Polynesia.** Marquesas Islands, MUSORSTOM 9, stn CP 1277, 07°52'S, 140°39'W, 1000-1100 m, 5.IX.1997, 1 ♂ holotype (MNHN-B 28727). — Stn CP 1278, 07°52'S, 140°39'W, 1000 m, 5.IX.1997, 1 ♂ paratype (MNHN-B 28728), 1 ♂ paratype (MNHN-B 28729).

Austral Islands, BENTHAUS, stn CP 1966, 23°21.3'S, 149°34'W, 636-1200 m, 19.XI.2002, 1 ♂ (MNHN-B 28834).

ETYMOLOGY. — This new species is named after Huilian Chen (Chen Hui-Lian), who lead the way to this and other studies on Indo-West Pacific dorippid crabs and who first recognized this species as a new one.

DISTRIBUTION. — Known only from the Marquesas and Austral islands, French Polynesia. Depth: 1000-1100 m; also collected in a trawl from 636-1200 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 12.7 mm, cw 13.0 mm (MNHN-B 28727), ♀ unknown.

DESCRIPTION

Carapace (Fig. 29) slightly broader than long or as broad as long in males (females unknown); dorsal surface with sparse setae, small, conspicuous granules. Mesogastric, urogastric, cardiac regions elevated, mesogastric region bordered by conspicuous lateral grooves; cervical groove shallow and partially visible; branchial grooves shallow but conspicuous at sides. Branchial regions conspicuously inflated along sides.

Anterior border of carapace (Fig. 29) with very slender, outwardly directed, acutely tipped outer orbital teeth, longer than but not reaching frontal teeth. Lateral frontal teeth slender, acutely tipped, equal or slightly longer than triangular median frontal teeth. Orbital sinuses broad, V-shaped; asymmetrical, inner margins oblique, outer margin nearly straight; lateral frontal sinuses U-shaped, asymmetrical; median frontal sinus V-shaped, as wide as lateral frontal sinuses but narrower than orbital sinuses.

Eye peduncles (Fig. 30A) wide, longer than cornea, 2.1 times eye diameter. Eyes and distal portion of eye peduncles visible dorsally.

Anterior border of endostome (Fig. 30A) lies well below posterior border of antennular fossae of basal antennular articles.

Male chelipeds (P1) (Fig. 29; females unknown) smooth, equal or nearly equal; propodi swollen, as long as or slightly longer than fingers; fingers slender, with broad cutting edges.

P2, P3 (Fig. 29) slender, articles granular except dactyli; length of P2 meri 1.0-1.1 times cl, P2 meri 7.5-8.2 times longer than broad. P4, P5



FIG. 29. — *Ethusina huilianae* n. sp., ♂ holotype cl 12.7 mm, cw 13.0 mm, French Polynesia, Marquesas Islands, Eiao, MUSORSTOM 9, stn CP 1277, 1000-1100 m (MNHN-B 28727).

with short hairs; P5 dactyli relatively slender, curved.

Male abdomen (Fig. 30B) with four somites (3-5 fused, basal half swollen), triangular telson. Somite 1 length 2.5-2.7 times as broad, somite 6 rectangular.

G1 (Fig. 30C) very slender; distal third narrow, straight, each tip slightly rounded, short spines along tip, inner margins; G2 (Fig. 30D) relatively short, each distal part broad; curved distal end, pointed tip.

REMARKS

Ethusina huilianae n. sp. is known from four male specimens. It is close to *E. crenulata* n. sp., a seemingly sympatric species from French Polynesia, and to *E. isolata* n. sp., known only from the Hawaiian Is. Differences between the three species are discussed in the description of *E. crenulata* n. sp. (see above) and in Table 1. There are also similarities with *E. stenommata* n. sp. Differences are discussed in the description of the latter species (see above).

A male from the Austral Is, French Polynesia (cl 13.3 mm, cw 13.0 mm, MNHN-B 28834) shares all diagnostic characters with the remaining three Marquesas Is males except for slightly shorter and stouter P2 and P3 (P2 meri 0.9 times cl, P2 meri 6.9 times longer than broad), slightly stouter G1 and G2, and slightly shorter frontal teeth. The collection of additional specimens is needed to test for the possibility that these are species-specific differences.

Ethusina isolata n. sp.

(Fig. 31)

Ethusina gracilipes – Rathbun 1906: 891; 1937: 94 (part) (not *E. gracilipes* (Miers, 1886)).

TYPE MATERIAL. — Holotype: ♀ cl 9.2 mm, cw 9.2 mm, *Albatross*, stn 4028 (USNM 29933); paratypes: ♂ cl 6.3 mm, cw 5.9 mm, *Albatross*, stn 4132 (USNM 29934); ♂ cl 6.4 mm, cw 6.1 mm, *Albatross*, stn 3909 (USNM 29932).

The female specimen was selected as the holotype because it is the only specimen with all pereopods attached.

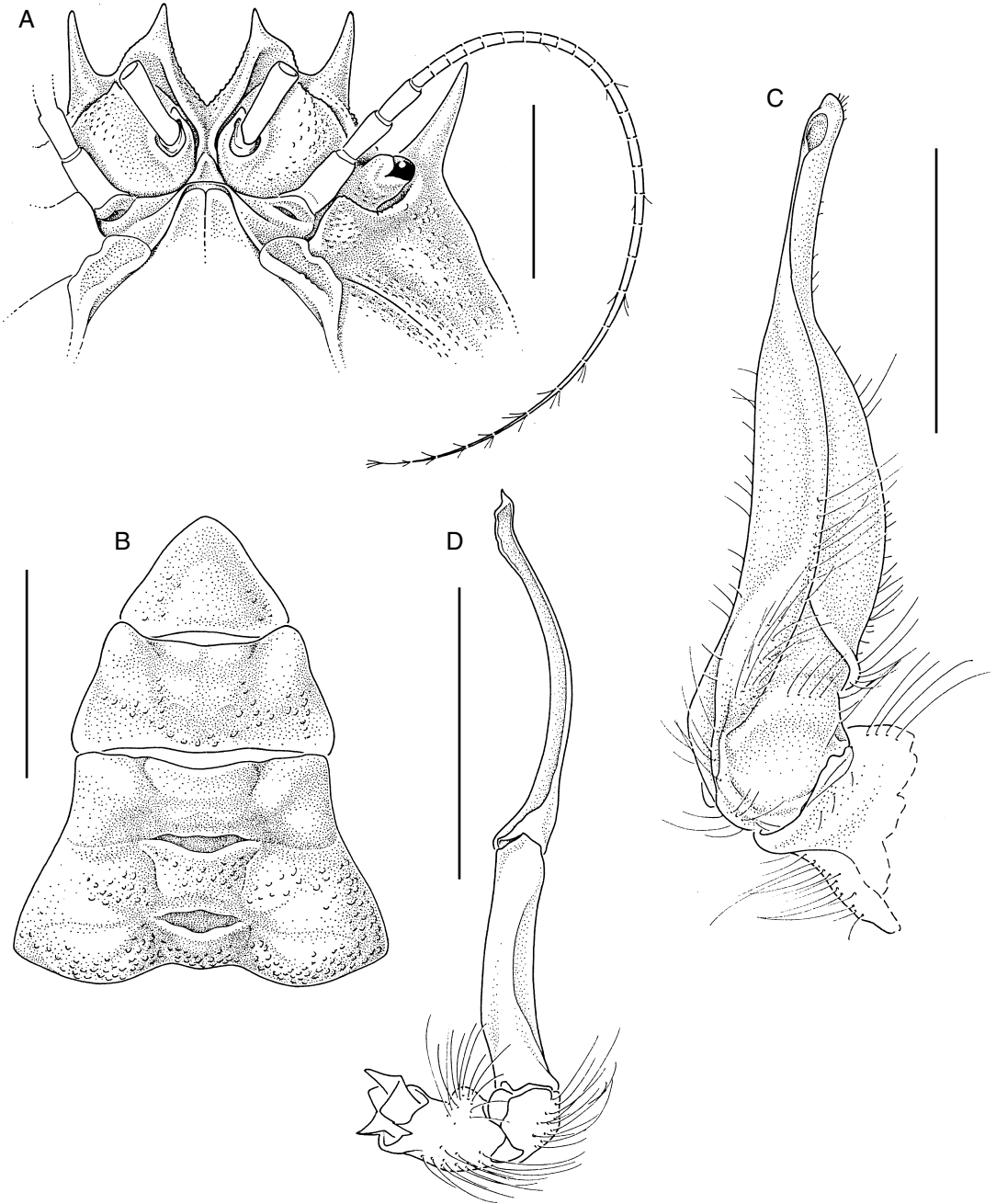


FIG. 30. — *Ethusina huilianae* n. sp., ♂ holotype cl 12.7 mm, cw 13.0 mm, French Polynesia, Marquesas Islands, Eiao, MUSORSTOM 9, stn CP 1277, 1000-1100 m (MNHN-B 28727); **A**, ventral view of anterior portion of body; **B**, abdomen; **C**, right G1, ventral view; **D**, right G2, ventral view. Scale bars: A, B, 3 mm; C, D, 2 mm.

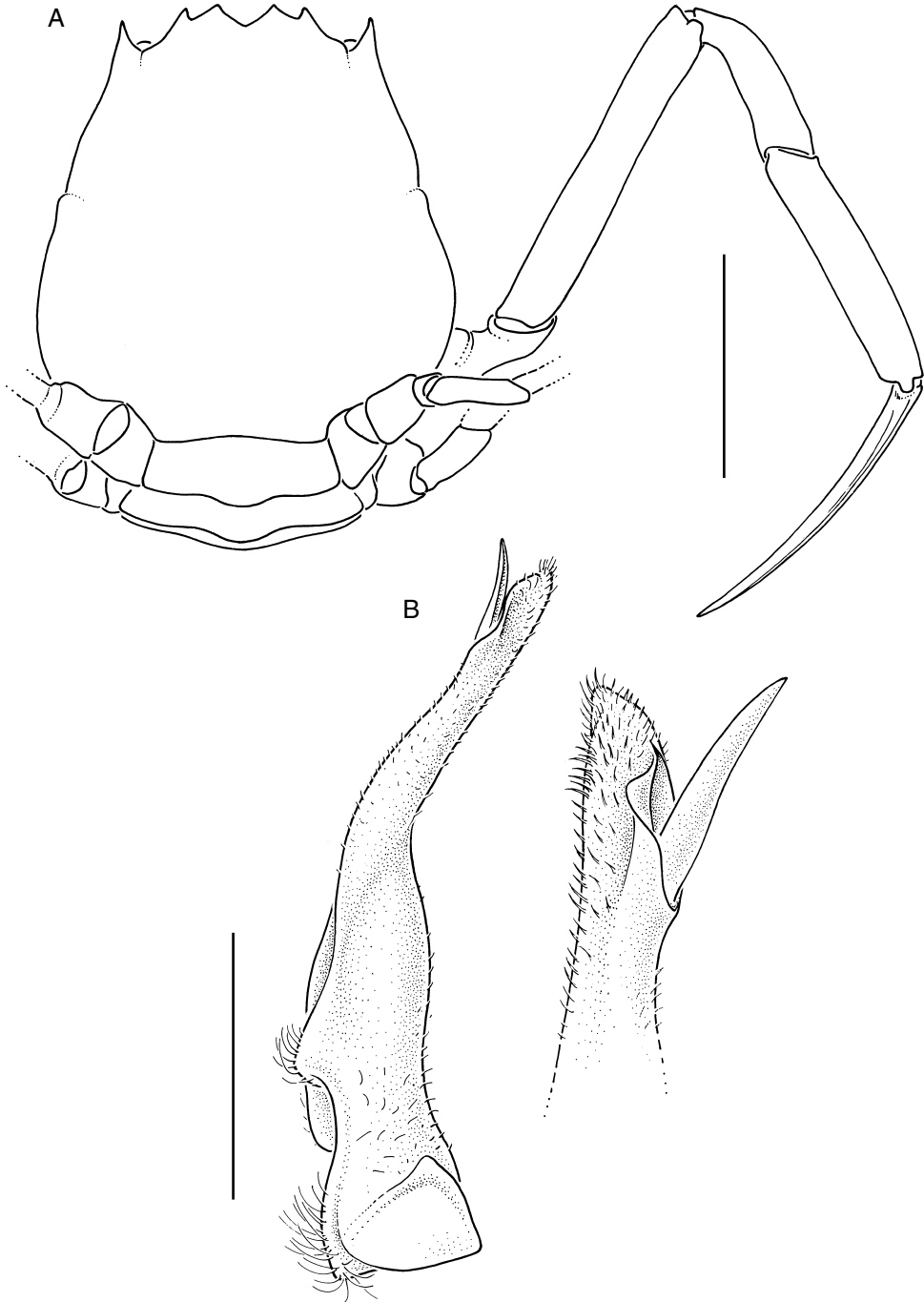


FIG. 31. — *Ethusina isolata* n. sp.; **A**, ♀ holotype cl 9.2 mm, cw 9.2 mm, Hawaiian Islands, Kauai, *Albatross*, stn 4028, 812-873 m (USNM 29933), dorsal surface of carapace and P2; **B**, ♂ paratype, 6.3 mm, cw 5.9 mm, Hawaiian Islands, Kauai, *Albatross*, stn 4132, 470-573 m (USNM 29934), left G1 ventral view with G2 *in situ* (left), dorsal view (right). Scale bars: A, 5 mm; B, 1 mm.

TYPE LOCALITY. — Hawaiian Is, Kauai, off Kokole Pt, 21°54.58'N, 159°49.58'W, 470-573 m.

ETYMOLOGY. — From *isolatus* (Latin for isolated) in reference to the isolated geographical location of the species, so far known only from the Hawaiian Is.

MATERIAL EXAMINED. — **Hawaiian Islands.** *Albatross*, stn 3909, Oahu, off Diamond Head, 564-589 m, 5.V.1902, 1 ♂ paratype (USNM 29932). — Stn 4028, Kauai, off Kokole Pt, 21°54.58'N, 159°49.58'W, 812-873 m, 24.VI.1902, 1 ♀ holotype (USNM 29933). — Stn 4132, Kauai, off Hanamaulu, 22°01.5'N, 159°21.16'W, 470-573 m, 1.VII.1902, 1 ♂ paratype (USNM 29934).

DISTRIBUTION. — Known only from the Hawaiian Is. Depth: 416-1100 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 6.4 mm, cw 6.1 mm (USNM 29932), ♀ cl 9.2 mm, cw 9.2 mm (USNM 29933).

DESCRIPTION

Carapace (Fig. 31A) as long as broad in female holotype, slightly longer than broad in males; dorsal surface with few short, sparse setae, conspicuous small granules. Urogastric, cardiac regions elevated, urogastric region bordered by conspicuous lateral grooves; branchial grooves very shallow. Branchial regions slightly inflated along sides. Anterior border of carapace (Fig. 31A) with triangular, acutely tipped outer orbital teeth, straight in female holotype, directed outwardly in males, longer than but not reaching as high as frontal teeth. Frontal teeth longer and more conspicuous in males; lateral frontal teeth slender, slightly shorter than triangular median frontal teeth in female holotype, shorter than acute median frontal teeth. Orbital sinuses broad, U-shaped in female holotype, V-shaped in males; small, short vertical fissure at dorsal lower margin of each sinus; inner margins J-shaped, outer oblique; lateral frontal sinuses asymmetrical, obliquely U-shaped; median frontal sinus U-shaped in female holotype, V-shaped in males, wider than lateral frontal sinuses but narrower than orbital sinuses.

Eye peduncles wide, slightly longer than or as long as cornea, immobile. Most of eyes visible dorsally. Anterior border of endostome lies well below posterior border of antennular fossae of basal antennular articles.

Chelipeds (P1) smooth, equal or nearly equal; propodi slender, almost as long as fingers; fingers very slender, margin nearly smooth in female paratype, broad cutting edges in males.

P2, P3 (Fig. 31A) relatively short, granular articles except dactyli; length of P2 meri 0.8 times cl in female holotype, 1.1 in males, P2 meri 8.3-8.9 times longer than broad. P4, P5 with very sparse, short hairs; P5 dactyli relatively slender, curved.

Male abdomen with four somites (3-5 fused, basal half swollen), triangular telson. Somite 1 length 2.3 times as broad, somite 6 rectangular. Female abdomen with six somites, broad, triangular telson; somite 3 broadest, somite 6 longest. G1 (Fig. 31B) very slender; distal third narrow, each tip straight, slightly rounded, short spines along tip, inner margins; G2 relatively short, each distal part broad; straight distal end, blunt tip.

REMARKS

Ethusina isolata n. sp. is known from only three specimens collected from the Hawaiian Is by the *Albatross* and identified by Rathbun (1906: 891) as *E. gracilipes* (Miers, 1886). The Hawaiian specimens are not conspecific with Miers' species, which is characterized by elongated, highly mobile eye peduncles that project the eyes well outside the orbits and the presence of conspicuously inflated branchial and pterygostomial regions (Miers 1886: pl. 29, fig. 1, 1a). The specimens do not agree with any of the described species of *Ethusina* and are therefore regarded as undescribed.

Ethusina isolata n. sp. shares several characters with the two other species of *Ethusina* that are found only along the eastern limits of the Indo-West Pacific region, *E. crenulata* n. sp. and *E. huilianae* n. sp. They all share a similar shape of carapace, P2 and P3, and very slender G1. Differences among the three species are summarized in Table 1.

Genus *Parethusia* Chen, 1997

Parethusia Chen, 1997: 614.

TYPE SPECIES. — *Parethusia glabra* Chen, 1997 by monotypy. Gender: feminine.

DIAGNOSIS. — Dorsal surface of carapace smooth, flat, without conspicuous setae and tomentum; regions not distinct, grooves shallow. Two or four frontal teeth. Basal antennular article moderately large and swollen. Eye peduncles short, “movable”; on ventral surface of carapace. Anterior border of endostome lies well below posterior border of antennular fossae of basal antennular articles.

REMARKS

The presence of four frontal teeth along the anterior border of the carapace in *Parethusa hylophora* n. sp. (see description below) instead of two in *P. glabra*, the only known species when the genus was established (Chen 1997: 614), necessitates an amendment to the diagnosis of the genus. The number of frontal teeth can therefore be two or four instead of the four in the other two genera in the Ethusinae, *Ethusa* Roux, 1830 and *Ethusina* Smith, 1884.

The basal antennular article is larger than that of *Ethusa* but smaller than in *Ethusina*. It was described as “not swollen” by Chen (1997: 614, 615).

The genus was described from only one male specimen of *P. glabra*. The finding of female specimens since the description of the genus now allows the description of additional characters. As in *Ethusa* and *Ethusina* (see Guinot & Bouchard 1998: 651), the abdomen-locking mechanism of adult females consists of two low, medium-size tubercles in the middle portion of thoracic sternite 5 and two shallow concavities at each border of the underside (ventral surface) of abdominal somite 6 (level of P2). The paired vulvae are large, slightly raised, and covered by a thin, movable membrane.

KEY TO SPECIES OF *PARETHUSA*

- Frontal border of carapace with two teeth; lateral borders inflated, not straight *P. glabra*
- Frontal border of carapace with four teeth; lateral borders of carapace nearly straight, diverging toward posterior border *P. hylophora* n. sp.

Parethusa glabra Chen, 1997

Parethusa glabra Chen, 1997: 614, figs 1, 2.

TYPE MATERIAL. — Holotype: ♂ cl 8.2 mm, cw 7.9 mm, KARUBAR, stn CP 35 (MNHN-B 22886).

TYPE LOCALITY. — Indonesia, Kai Islands, 06°08'S, 132°45'E, 390-502 m.

MATERIAL EXAMINED. — **Indonesia.** Kai Islands, KARUBAR, stn CP 35, 06°08'S, 132°45'E, 390-502 m, 27.X.1991, 1 ♂ holotype (MNHN-B 22886). **Fiji.** BORDAU 1, stn CP 1393, 16°45'S, 179°59'E, 426-487 m, 23.II.1999, 1 juv. ♀ cl 4.9 mm, cw 4.5 mm (MNHN-B 28680). — Stn CP 1395, 16°45'S, 179°59'E, 423-500 m, 23.II.1999, 2 ♂♂, 2 ♀♀ cl 9.9 mm, cw 10.2 mm and 10.8 mm, cw 10.5 mm respectively (MNHN-B 28681). — Stn CP 1447, 16°45'S, 179°59'E, 420-513 m, 4.III.1999, 1 ♂ (MNHN-B 28682).

DISTRIBUTION. — Indonesia (Kai Is [Chen 1997]) and now from Fiji. Depth: 390-513 m (Fig. 34).

SIZE. — Maximum size: ♂ cl 8.7 mm, cw 8.0 mm (MNHN-B 28682), ♀ cl 10.8 mm, cw 10.5 mm (MNHN-B 28681).

REMARKS

Both the genus and the species were described from only one specimen, a male. The finding of three females from other locations now permits their description.

The carapace of females is, like that of males, of an inflated appearance, dorsally flat and smooth, and slightly longer than broad. In a small juvenile female (cl 4.9 mm, cw 4.5 mm, MNHN-B 28680) the outer orbital teeth are straight (not

slightly directed inwardly as in the adults), the distal ends of the frontal teeth are acute, and the outer angles of the frontal teeth (distalmost tip of the inner margins of the orbital sinuses) are acuminate but clearly do not form distinct teeth. Otherwise, the anterior border of the carapace of the adult females is identical to that of the male holotype (MNHN-B 22886; Chen 1997: fig. 1a, b). The chelipeds are nearly equal, smooth, the propodi 2.8 times as long as high and only slightly longer than the fingers. The broad abdomen (narrow in a juvenile female) consists of six somites and a rounded telson, with somite 4 the broadest and somite 6 the longest. All other details agree with those given by Chen (1997: 615) in the description of the male holotype.

Parethusa hylophora n. sp.

(Fig. 32)

TYPE MATERIAL. — Holotype: ♂ cl 5.2 mm, cw 4.7 mm, SALOMON 1, stn CP 1851 (MNHN-B 28667); paratype: ♂ cl 5.1 mm, cw 4.7 mm, SALOMON 1, stn CP 1783 (MNHN-B 28716).

MATERIAL EXAMINED. — **Solomon Islands.** SALOMON 1, stn CP 1783, 08°32.8'S, 160°41.7'E, 399-700 m, 29.IX.2001, 1 ♂ paratype (MNHN-B 28716). — Stn CP 1851, 10°27.6'S, 162°00'E, 297-350 m, 6.X.2001, 1 ♂ holotype (MNHN-B 28667).

TYPE LOCALITY. — Solomon Islands, N of San Cristobal island, 10°27.6'S, 162°00'E, 297-350 m.

ETYMOLOGY. — From *hyle* (Greek for wood) and *-phor* (Greek suffix meaning to carry) in reference to the holotype being collected under a piece of wood.

DISTRIBUTION. — Known only from the Solomon Islands. Depth: 297-700 m (Fig. 34).

SIZE. — Maximum size: ♂ 5.2 cl mm, cw 4.7 mm (MNHN-B 28667), ♀ unknown.

DESCRIPTION

Carapace (Fig. 32A) slightly longer than broad in males (females unknown); dorsal surface smooth, flat; carapace regions indistinct, only urogastric region defined by very slight groove. Nearly straight lateral borders that diverge toward poste-

rior border, slight indentation at the level of branchial groove.

Anterior border of carapace (Fig. 32A) with four teeth. Outer orbital teeth triangular, straight, longer but not reaching frontal teeth. Lateral frontal teeth with oblique anterior borders almost parallel to anterior edge of carapace, much shorter than median frontal, outer orbital teeth. Median frontal teeth oblique, obtuse tip. Orbital sinuses V-shaped; lateral frontal sinuses oblique, U-shaped; median frontal sinus V-shaped, wider than lateral frontal and orbital sinuses.

Eyes ventral, visible dorsally (Fig. 32B). Eye peduncles twice eye diameter, mobile, visible dorsally.

Basal antennular article relatively large and swollen. Anterior border of endostome (Fig. 32B) lies well below posterior border of antennular fossae of basal antennular articles.

Male chelipeds (P1) (females unknown) smooth, equal; slender propodi, slightly longer than fingers, with broad cutting edges.

P2, P3 relatively short; length of P2 meri 0.9 times cl, P2 meri 8.0 times longer than broad. P4, P5 with few short hairs; P5 (Fig. 32C) dactyli thick, very strongly curved.

Male abdomen (females unknown) with four somites (3-5 fused, basal half swollen), rounded telson. Somite 1 length 2.1 times as broad, somite 6 square.

G1 (Fig. 32D) short, stout; each distal end with slight dorsolateral swelling with gonopore, pointed tip fringed with spines; G2 (Fig. 32E) relatively short, slightly sinuous, each distal parts narrower; pointed tip.

REMARKS

Parethusa hylophora n. sp. is distinguished from *P. glabra* Chen, 1997, the other known species in the genus, by the presence of four frontal teeth instead of the two in *P. glabra* (Chen 1997: fig. 1a, b). Only two specimens of the new species are known, both males. The lateral borders of the carapace of the males of *P. hylophora* n. sp. are straight, and diverge toward the posterior border in contrast to the inflated lateral borders of male and female *P. glabra* (Chen 1997: fig. 1a). The

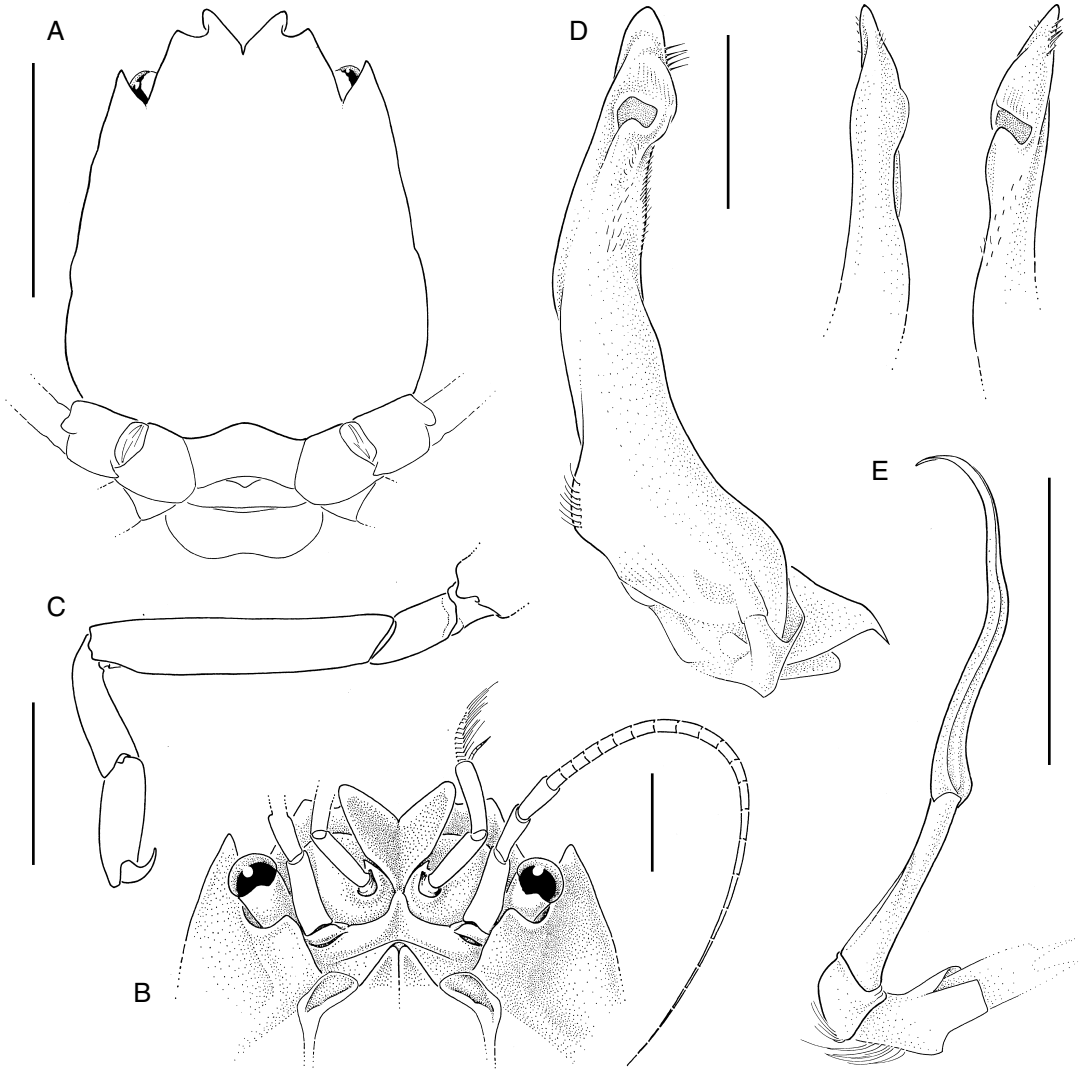


Fig. 32. — *Parethusa hylophora* n. sp., ♂ holotype cl 5.2 mm, cw 4.7 mm, Solomon Islands, north of San Cristobal, SALOMON 1, stn CP 1851, 297–350 m (MNHN-B 28667); **A**, dorsal surface of carapace; **B**, ventral view of anterior portion of body; **C**, P5, dorsal view; **D**, left G1, ventral views (left and right), dorsal view (center); **E**, left G2, ventral view. Scale bars: A, 5.0 mm; B, E, 1.0 mm; C, 2.0 mm; D, 0.5 mm.

eyes of *P. hylophora* n. sp. lack the thick, ventral process characteristic of the eyes of *P. glabra* (Chen 1997: fig. 1b).

The holotype (MNHN-B 28667) was found under a piece of wood that had been dredged

north of San Cristobal island in the Solomon Is. In this location, trees are easily carried into deep water along coasts that are not bordered by the shallow lagoons of fringing reefs (*P. Bouchet pers. comm.*).

CARRYING BEHAVIOUR AMONG INDO-WEST PACIFIC ETHUSINES

There is very little information on the ability of ethusines to carry an object with the hook-like dactyli of their P4 and P5. Crabs most probably release any objects they may have been carrying during collection so there are very few reliable records. Some of the few observations that do exist are from crabs kept in aquaria after collection. The closely-related, shallow-water dorippid crabs (subfamily Dorippinae), however, are known to carry a large variety of organisms, even leaves, with their dorsal, highly mobile, subchelate P4 and P5 (Fenizia 1937; Wicksten 1986; Holthuis & Manning 1990; Guinot *et al.* 1995; Chen & Sun 2002). They are commonly known as “carrier” or “porter” crabs.

Photos show an individual of *Ethusa mascarone* (Herbst, 1785), a Mediterranean and Atlantic species, covering itself with a bivalve shell (Gruner 1969). Sakai (1937: 80) commented on *Ethusa izuensis* Sakai, 1937 using bivalve shells in Japan. Individuals of *Ethusa sexdentata* (Stimpson, 1858) kept in an aquarium in Japan were also observed taking and carrying a bivalve shell or small pieces of wood with their P4 and P5 (T. Komai pers. comm.). One of the two known specimens of *Parethusa hylophora* n. sp. was collected under a piece of wood in the Solomon Is.

There are no obvious differences in the morphology of the P4 and P5 among ethusines that would suggest morphological adaptations for carrying particular objects. Differences in carapace size observed among species, however, most probably call for the carrying of different sizes and types of objects.

DEPTH DISTRIBUTION OF INDO-WEST PACIFIC ETHUSINES

There are striking differences between the three genera of ethusines in terms of their depth distributions. Practically all species of *Ethusa* and *Parethusa* have been collected from depths that

are lower than the shallowest values ever recorded for *Ethusina* species (Fig. 34). Only two of the 30 species of *Ethusa* (*E. hirsuta* and *E. indica*) and *Parethusa* have been found in material collected at depth of more than 1000 m. Conversely, only five of the 25 species of *Ethusina* (*E. exophthalma* n. sp., *E. ocellata* n. sp., *E. pubescens*, *E. vanuatuensis*, and *E. crenulata* n. sp.) have never been found in samples collected at depths greater than 1000 m. This may certainly change with more extensive collecting.

Miers (1886: 332), in his description of *E. challengerii*, commented that at 1875 fathoms (3429 m), the holotype was obtained from “the greatest depth hitherto recorded for any species of Crab”. A female specimen of the same species was dredged from 4928–4950 m in the Indian Ocean (MNHN-B 28697; Fig. 33D). Two specimens of *Ethusina abyssicola* Smith, 1884, however, were collected from a depth of 5046 m in the Caribbean Sea (Gore 1983: 213). Both *E. challengerii* and *E. abyssicola* are therefore true abyssal species, having been found at depths exceeding 4000 m.

BIOGEOGRAPHY OF INDO-WEST PACIFIC ETHUSINES

Little can be said about the biogeography of Indo-West Pacific ethusines because of the relatively limited distribution of deep-water collections. Nevertheless, some patterns emerge from what we know, particularly in the Western Pacific, where collections have been relatively more frequent and extensive than elsewhere in the region.

Most species of ethusines show a relatively narrow geographical distribution. It may be speculated that such pattern may result from short larval development. The most obvious exception of a limited distribution is *Ethusa indica*, which has been collected from the Gulf of Aden (and possibly the Red Sea) to the Western Pacific from Japan to Fiji (Fig. 12), a distributional pattern followed by many Indo-West Pacific shallow-water brachyurans. *Ethusina challengerii* also

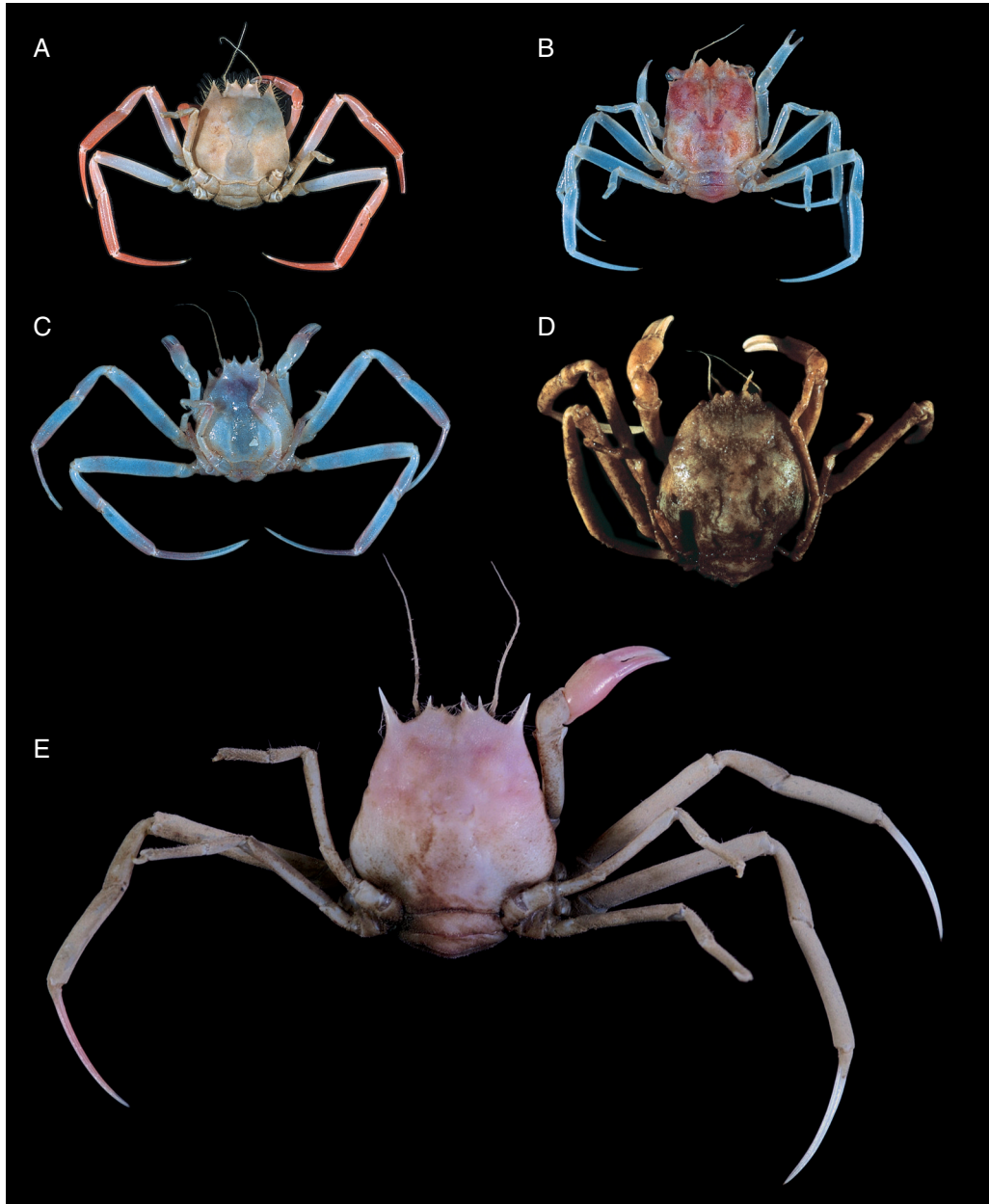


FIG. 33. — **A**, *Ethusa granulosa* Ihle, 1916, ♀ cl 14.7 mm, cw 14.6 mm, Vanuatu, west coast of Malekula, MUSORSTOM 8, stn DW 1061, 458-512 m (MNHN-B 28698) (photograph by J.-L. Menou, IRD, Nouméa); **B**, *Ethusa hawaiiensis* Rathbun, 1906, ♀ cl 6.7 mm, cw 6.2 mm, Vanuatu, S of Anatom, MUSORSTOM 8, stn CP 963, 400-440 m (MNHN-B 28538) (photograph by J.-L. Menou, IRD, Nouméa); **C**, *Ethusa indica* Alcock, 1894, ♂ cl 7.8 mm, cw 7.8 mm, Vanuatu, SE of Éfaté, MUSORSTOM 8, stn CP 1036, 920-950 m (MNHN-B 28560) (photograph by J.-L. Menou, IRD, Nouméa); **D**, *Ethusina challengerii* (Miers, 1886), ♀ cl 25.9 mm, Mid-Indian Basin, SAFARI 2, stn 35, trawl CP 29, 4950-4928 m (MNHN-B 28697) (photograph by P. Briand, IFREMER); **E**, *Ethusina macrospina* Ng & Ho, 2003, ♀ cl 10.4 mm, cw 11.0 mm, Taiwan, off southwest coast, TAIWAN 2003, stn CD 203, 635-868 m (NTOU) (photograph by T.-Y. Chan, NTOU).

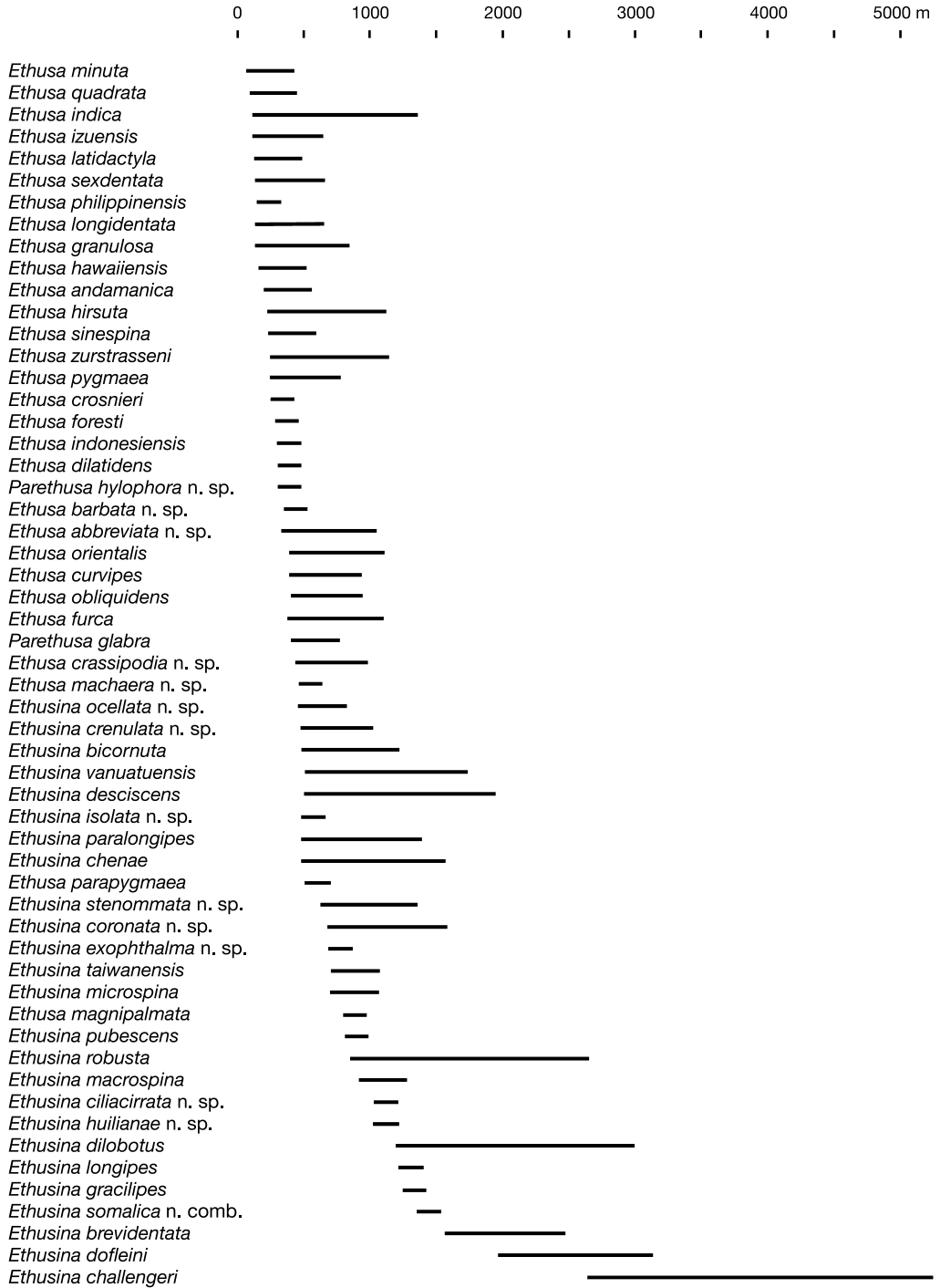


Fig. 34. — Bathymetric distribution of Indo-West Pacific ethusine crabs.

shows a wide although discontinuous distribution in both oceans (Fig. 17), most probably because it is rarely collected due to the great depths it inhabits (Fig. 34).

Very few other ethusines are known from both the Indian and Pacific oceans: *Ethusa hirsuta* (Fig. 11), *Ethusina dofleini*, *Ethusina gracilipes*, and *Ethusina robusta* (Fig. 22).

What may appear as peripheral endemism along the southwestern and western Indian Ocean (for *Ethusa machaera* n. sp., *E. sinespina*, *E. zurstrasseni*, *Ethusina longipes*, and *E. somalica*) and the eastern limits of the Indo-West Pacific (*Ethusina crenulata* n. sp., *E. huilianae* n. sp., and *E. isolata* n. sp.) could be the result of the more intense collecting in these areas in contrast to very few from most of the Indian Ocean and the central Pacific, respectively.

Acknowledgements

My deep appreciation to A. Crosnier (MNHN) and the MNHN for their continuous support. B. Richer de Forges (IRD, Nouméa) provided an almost constant flow of valuable material. Two reviewers provided very meticulous and detailed comments that greatly improved the quality of the manuscript. The rich MNHN collections, plus generous advice, were made available as usual by D. Guinot (MNHN). M. S. Tavares (University of São Paulo, Brazil) provided valuable comments. Thanks to D. Defaye (MNHN) and R. Cléva (MNHN) for their precious support. The artwork, skillfully done by J.-F. Dejouannet (MNHN), added much to my work. The black-and-white photographs were taken by R. von Cosel (MNHN) and the maps prepared by M. Tortelier (IRD, Nouméa). Many colleagues sent specimens on loan and/or welcomed me to their collections: C. O. Coleman (ZMB), G. Grippa (MCSNM), E. Hoenson (SAM), T. Komai (CBM), R. Lemaitre and K. Reed (USNM), M. Loewe (BMNH), J. Olesen (ZMUC), D. Platvoet (ZMA), and M. Türkay and A. Allspach (SMF). Very special thanks to T.-Y. Chan (National Taiwan Ocean University) and P. K. L. Ng (National University

of Singapore) for their hospitality and for their loans of material on recently described species from Taiwan as well as valuable material from the Philippines.

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Submitted on 12 February 2004;
accepted on 1st September 2004.

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