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A REVISION OF THE BUCKLER CRABS OF THE GENUS *CRYPTOPODIA* H. MILNE EDWARDS, 1834 (CRUSTACEA: DECAPODA: BRACHYURA: PARTHENOPIDAE)

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ABSTRACT. - The parthenopid crab genus *Cryptopodia* H. Milne Edwards, 1834, is revised. *Cryptopodia* H. Milne Edwards, 1834, s. str. is restricted for the Indo-West Pacific taxa, and 12 species are recognised. Two new species, *Cryptopodia patula* and *C. echinosa*, are described from India. *Cryptopodia laevimana* Miers, 1879, is shown to be a valid species. *Cryptopodia pentagona* Flipse, 1930, and *C. sinica* Chen & Xu, 1991, are regarded as junior synonyms of *C. fornicata* (Fabricius, 1781), and *C. pan* Laurie, 1906, respectively. The two American species, *C. concava* Stimpson, 1871, and *C. hassleri* Rathbun, 1925, are redescribed and transferred to a new genus, *Celatopesia*. *Celatopesia* is distinguished from *Cryptopodia* in lacking a dorsal triangular depression and a lateroventral concavity for its legs, having the margins of the antennular fossae granulated, the structure of the shape of the third maxilliped, structures of the fingers and palm of the chelipeds, and male telson shape. Keys to the genera *Cryptopodia* and *Celatopesia* as well as their respective species are provided.

KEYWORDS. - Taxonomy, revision, Parthenopidae, *Cryptopodia*, new species

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INTRODUCTION

The genus *Cryptopodia* H. Milne Edwards, 1834 (Parthenopidae) is currently believed to contain 15 species and subspecies (Flipse, 1930; Gore & Scotto, 1979; Chen & Xu, 1991; Chiong & Ng, 1994; Davie & Turner, 1995). Of these, 13 taxa are from the Indo-West Pacific, viz. *C. fornicata* (Fabricius, 1781), *C. queenslandi* Rathbun, 1918, *C. dorsalis* White, 1847, *C. angulata* H. Milne Edwards & Lucas, 1841, *C. angulata cippifer* Alcock, 1895, *C. collifer* Flipse, 1930, *C. pentagona* Flipse, 1930, *C. pan* Laurie, 1906, *C. spatulifrons* Miers, 1879, *C. fistulosa* Chiong & Ng, 1994, *C. laevimana* Miers, 1879, *C. contracta* Stimpson, 1857, and *C. sinica* Chen & Xu, 1991. The other two species are from the Americas: *C. concava* Stimpson, 1871, and *C. hassleri* Rathbun, 1925, from the Atlantic and Pacific coasts respectively. The most distinctive character of the genus is the expanded margins of the carapace which completely or almost completely covers the ambulatory legs. Alcock (1902: 67) refers to *Cryptopodia angulata* as the "buckler crab", which considering the carapace shape, is an appropriate English vernacular name for these crabs.

The genus *Cryptopodia* was last treated as a whole by Flipse (1930). Many of the taxa, however, were only reviewed and not treated in detail. Gore & Scotto (1979) and Garth (1958) dealt with the two American species in some depth. Chen & Xu (1991) and Chiong & Ng (1994) subsequently described new species from the Spratly Islands and northern Australia respectively, while Davie & Turner (1995) provided a synopsis of the Australian species.

There are a number of taxonomic problems in the genus, and the types of the type species, *C. fornicata*, have never been figured or described in detail before. There is some confusion about the possible conspecificity of *C. angulata* H. Milne Edwards & Lucas, 1841, with *C. angulata cippifer* Alcock, 1895 (see Chopra, 1935; Davie & Turner, 1995). The two American species, *C. concava* Stimpson, 1871, and *C. hassleri* Rathbun, 1925, also differ markedly in their carapace appearance from the Indo-West Pacific species and their retention in *Cryptopodia* is questionable.

The present revision shows that the genus *Cryptopodia* must be restricted for the Indo-West Pacific species, and the two American species must be referred to their own genus. The identity of *C. fornicata* is clarified, and specimens previously referred to this species from the western Indian Ocean are here referred to a new species. The identity of *C. angulata* is clarified, and *C. angulata cippifer* is here regarded as a junior synonym of the species. An Indian species closely allied to *C. angulata* is described as new. *Cryptopodia sinica* and *C. pentagona* are shown to be junior synonyms of *C. pan* and *C. fornicata* respectively.

MATERIAL AND METHODS

Specimens examined are deposited in the following depositories: The Natural History Museum (ex. British Museum (Natural History)) (NHM), London, England; Instituut voor Taxonomische Zoologie (Zoologisch Museum) (ZMA), Amsterdam, The Netherlands; Muséum National d'Histoire Naturelle (MNHN), Paris, France; Rijksmuseum van Natuurlijke Historie (RMNH), Leiden, The Netherlands; Phuket Marine Biological Center (PMBC), Department of Fisheries, Phuket, Thailand; Queensland Museum (QM), Brisbane, Australia; National Museum of Natural History, Smithsonian Institution (USNM), Washington D.C., U.S.A.; Zoological Museum, University of Copenhagen (ZMUC); Beijing Natural History Museum (BNHM), China; Institute of Zoology, Academia Sinica (AS), Beijing, China; and Zoological Reference Collection (ZRC), School of Biological Sciences, National University of Singapore.

The descriptive terms used for the present study are shown on Figure 1. The post-rostral region is defined as the area at the base of the rostrum, between the orbits and gastric region; while the posterior margin is the portion directly behind the abdomen bounded by two notches, which may be less distinct in certain species. The width of the specimens was measured across widest point of the carapace at the edges of the anterolateral margins. The length was measured from the tip of the rostrum to the posterior margin of the carapace. All measurements are in millimetres (mm). The following abbreviations are used: G1, first male gonopod; G2, second male gonopod. To avoid confusion, the abbreviation "*Cry.*" is used for *Cryptopodia* and "*Cel.*" for *Celatopesia.*

TAXONOMY

FAMILY PARTHENOPIDAE MACLEAY, 1838

Genus *Cryptopodia* H. Milne Edwards, 1834

Cryptopodia H. Milne Edwards, 1834: 360; Haswell, 1882: 37; Miers, 1886: 101; Walker, 1887: 109; Alcock, 1895: 281; Stimpson, 1871: 137 (partim); Rathbun, 1925: 553 (partim); Flipse, 1930: 62; Garth, 1958: 470 (partim); Sakai, 1976: 291; Gore & Scotto, 1979: 13 (partim); Williams, 1984: 346 (partim); Tirmizi & Kazmi, 1988: 210; Dai et al., 1986: 158; Dai & Yang, 1991: 175.

Type species. - *Cancer fornicata* Fabricius, 1781, by monotypy.

Diagnosis. - Carapace pentagonal to almost triangular; with large lateral expansions completely concealing ambulatory legs, prolonged posteriorly beyond base of abdomen. Posterolateral margins convex, crenulated, posterolateral angles truncated; Dorsal and ventral surfaces smooth to rough; branchial, cardiac and gastric regions elevated; deep triangular depression in centre of carapace; margins surrounding depression granulated, ridge of granules running from mesobranchial to metabranchial regions. Post-rostral region depressed. Carapace with well developed lateroventral concavity into which ambulatory legs fit (Fig. 1). External surfaces of third maxilliped smooth, pitted or granulated. Posterior expansion of cheliped palm dilated towards distal extremity; anterior and posterior margins of dorsal facet of palm denticulated with prominent teeth; merus flat with wing-like expansion at distal end, upper and lower margins denticulated. Ambulatory legs with upper and lower margins of meri having 1-2 rows of longitudinal carinae; dactylus without setae. G1 stout or 'S'-shaped.

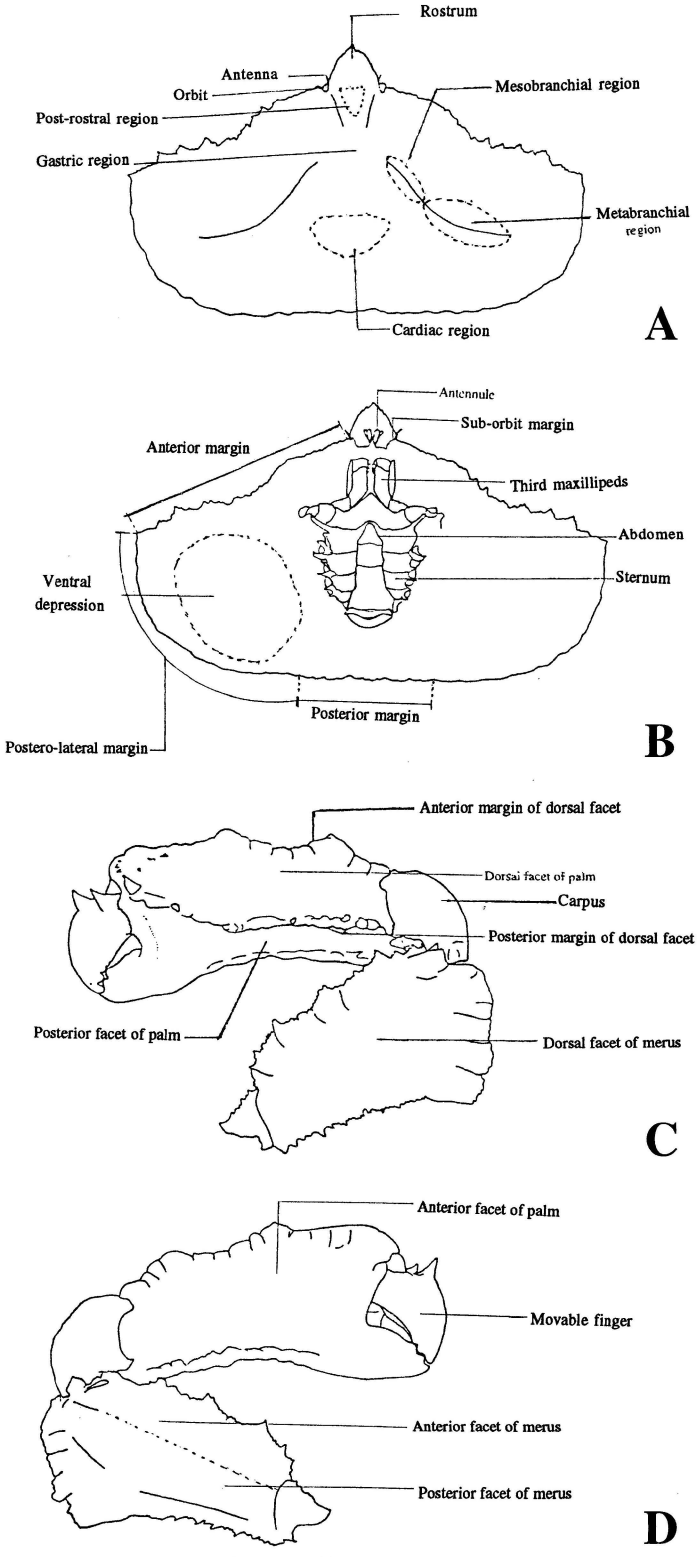

Fig. 1. *Cryptopodia fornicata* (Fabricius, 1781), schematic diagrams. A: dorsal view; B: ventral view; C, D: cheliped.

Habitat. - For most species, the preferred substrate is one of mud and sand, often with broken shell and/or coral, between 10-30 m in depth.

Distribution. - Indo-West Pacific.

Remarks. - *Cryptopodia* was established by H. Milne Edwards (1834) for the type species, *Cancer fornicata* Fabricius, 1781. The genus is currently characterised by its members having a triangular carapace which has a large lateral expansion on each side which covers the ambulatory legs completely, presence of a dorsal triangular depression on the carapace, a triangular and horizontally aligned rostrum, the antennular fossae is narrow and oblique with the basal antennal segment dilated and not reaching the internal hiatus, the pterygostomial region is smooth, the third maxilliped small, the merus of the chelipeds with a wing-like expansion on its distal extermity, and the ambulatory legs are slender, decreasing successively in length (legs 1-4). The male abdomen (as in all parthenopids) has only five movable distinct segments, segments 3 to 5 being fused; with all seven segments (including telson) free in the female (Flipse, 1930).

The two American species (*Cry. concava* and *Cry. hassleri*) are here referred to a new genus, *Celatopesia*. These two species differ from *Cryptopodia* s. str. in many important characters (Table 1). Species of *Celatopesia* are also distinctively smaller in size compared to those in *Cryptopodia* s. str. The largest *Celatopesia* species, *Cel. concava*, is only 11.9 by 8.3 mm whereas the largest *Cryptopodia* s. str., *Cry. dorsalis*, measures 76.0 by 40.7 mm. Their distributions are also distinct, with *Celatopesia* species restricted to the Americas whereas species of *Cryptopodia* s. str. range from the Indian Ocean to the South China Sea, Australia and New Caledonia.

Cryptopodia (and *Celatopesia*) is also closely related to *Heterocrypta* Stimpson, 1871 (type species *H. granulata* Gibbes, 1849, Atlantic) but nevertheless differs in sufficient characters to be regarded as different (see Table 1). Members of *Heterocrypta*, as now recognised, are present in both Indo-West Pacific and Atlantic. Our preliminary studies show that, among other characters, Indo-West Pacific species like *H. transitans* Ortmann, 1893, have their carapace margins strongly expanded and covering the ambulatory legs whereas those of the American species (e.g. *H. maltzani* Miers, 1881, and *H. granulata* Gibbes, 1849) do not. It seems likely that like *Cryptopodia*, the genus *Heterocrypta* as recognised now should be redefined, with *Heterocrypta* restricted for the American species and the Indo-West Pacific species transferred to another new genus. This, however, is outside the scope of the present study.

Cryptopodia fornicata (Fabricius, 1781)
(Figs. 2-7, 10B)

Cancer fornicata Fabricius, 1781: 502 (Tranquebar: India); Herbst, 1790: 204, pl. 13, Figs. 79-80 (list only).

Parthenope (*Cryptopodia*) *fornicata* - de Haan, 1893: 90, pl. 20, Fig. 2, 2a (Japan).

Cryptopodia fornicata - H. Milne Edwards, 1834: 362 (Indian Ocean); Walker, 1887: 109 (list only); Stimpson, 1907: 31 (Hongkong); Zimsen, 1964: 646 (list only); Sakai, 1976: 292, Fig. 163 (Japan); Yang, 1979: 11 (India, Singapore, Indonesia, Mirs Bay: Hong Kong); Tirzimi & Kazmi, 1988: 210 (list only); Dai & Yang, 1991: 175, Pl. 21(7), Fig. 90 (southern China); Chen & Xu, 1991: 81, Fig. 25 (Nansha Islands = Spratly Islands: South China Sea).

Cryptopodia fronicata (sic) - Dai et al., 1986: 159, Pl. 21(7), Fig. 90 (southern China).

Table 1. Differences between *Cryptopodia* H. Milne Edwards, 1834, *Heterocrypta* Stimpson, 1871, and *Celatopesia*, new genus.

Characters	*Cryptopodia*	*Heterocrypta*	*Celatopesia*
Posterior margin of carapace	Prolonged well beyond abdomen (Fig. 5B)	Slightly beyond abdomen	Prolonged well beyond abdomen (Fig. 32B)
Lateral clypeiform expansion of carapace	Greatly produced, completely concealing legs (Fig. 5A)	Less produced, legs seen when extend	Greatly produced, completely concealing legs (Figs. 31A, 32)
Branchial, cardiac and gastric regions	All regions elevated (Fig. 5A)	All regions elevated	Only gastric region elevated (Figs. 31C, 32A)
Triangular depression of carapace	Present (Fig. 5A)	Present	Absent (Figs. 31A, 32A)
Lateroventral concavity of carapace	Present (Fig. 5A)	Present	Absent (Figs. 31B, 32B)
Post-rostral region	Depressed (Fig. 5A)	Depressed	Not depressed (Fig. 32A)
Pterygostomial region	Smooth	Transversed by a granular ridge	Smooth
Antennular fossae	Margins smooth	Margins smooth	Margins granulated
Palm	Anterior and posterior margins of dorsal facet denticulated (Figs. 1, 5a); dilated posteriorly towards distal extremity	Anterior and posterior margins of dorsal facet denticulated; slender throughout length	Anterior and posterior margins of dorsal facet lobulated (Figs. 32, 33A, B); slight expansion near middle
Cheliped fingers	Short	Short	Long, tips crossing
Cheliped merus	Flat with wing-like expansion at distal end	Flat, slender throughout length	Flat, upper surface dilated towards middle
Third maxillipeds	Ischium not produced at its anterointernal angle merus square-shaped, distally truncated (Fig. 1)	Ischium not produced at its anterointernal angle; merus distally truncated	Ischium not produced at its antero-internal angle; merus triangular, distally truncated (Fig. 33G)
Ambulatory legs	Dactylus without setae	Dactylus without setae	Dactylus with setae

Cryptopodia fornicata - Miers, 1884: 403 (part: Indian Ocean ?, Borneo, Philippines, Japan); Alcock, 1895: 128 (part: Palk Straits?, Andamans); Flipse, 1930: 64 (Makassar: Sulawesi).
Cryptopodia pentagona Flipse, 1930: 67, Fig. 42 (Salawati: Irian Jaya: Indonesia).

Material examined. - **SINGAPORE**: 1 male (51.5 by 31.5 mm), 1 female (45.0 by 29.0 mm) (ZRC 1965.51113-4), off Singapore, coll. Shark N.S., Oct.1927. -1 male (56.1 by 35.4 mm) (ZRC 1965.5116), off Changi, 14.4m, coll. Shark N.S., 31 Jan.1926. — 1 male (49.3 by 29.1 mm), 3 females (55.8 by 37.4 mm, 58.5 by 36.1 mm, 55.0 by 35.8 mm) (ZRC 1984.238-241), Horsburgh Lighthouse, South China Sea, coll. Hee Huat, 26 Nov.1982, 15 Nov.1982. — 1 male (54.2 by 34.4 mm), 1 female (46.4 by 30.7 mm) (ZRC 1984.6371-6372), about 30 miles from Horsburg Lighthouse, South China Sea, coll. Hee Haut, 10 Sep.1983. — 1 male (38.6 by 25.3 mm) (ZRC 1965.10.11.81), fish market, presented by V. Jacobs, 24 Nov.1965. — 1 male (30.4 by 20.3 mm) (ZRC 1985.1403), Pulau Bukum P4.5, 9m, on shell gravel, coll. D.S. Johnson, 14 Apr.1952. — 1 male (14.4 by 9.9 mm) (ZRC 1958.1404), Johore Shoals, 18m, crinoid ground, coll. D.S. Johnson, 17 Jun.1954. — 1 male (22.0 by 14.5 mm) (NHM 1900.10.2239), Singapore, coll. Bedford & Lanchester. — 2 males (20.0 by 13.4 mm, 12.8 by 9.5 mm) (ZRC 1987.7853-7854), locality B28 and B41, coll. Singapore Fisheries Research Station, 1 Jul.1954, 27 Aug.1954. —1 female (45.7 by 29.4 mm) (ZRC 1965.5.11.11), Siglap. — 1 female (51.0 by 31.3 mm) (ZRC 1984.6077), kelong off Siglap, 2 Sep.1961. — 1 female (46.1 by 28.0 mm)

(NHM 1984.479), Bedok, coll. A. Fraser-Bruner, 1956. — 1 female (35.5 by 23.2 mm) (ZRC 1984.7852), locality B25, coll. Singapore Fisheries Research Station, 24 Jun.1954. — 1 female (ZRC 1984.5579), Tuas, 1981. — 1 female (50.5 by 39.9 mm) (ZRC 1984.242), South China Sea about 240km off Singapore, coll. H. Huat, 19 Aug.1987. — 1 female, badly damaged (ZRC 1985.1407), off Siglap, coll. D.S. Johnson, 9.0m, thick mud, Mar.1953. — 3 females (51.9 by 33.2 mm, 60.6 by 36.5 mm, 50.9 by 33.5 mm) (ZRC 1965.5.11.7-9), coll. Jun.1933. — 1 female (51.7 by 32.7 mm) (ZRC 1965.5.1.10), Siglap, Jul.1934. — 1 female (40.6 by 28.1 mm) (ZRC 1984.7851), locality B42, coll. Singapore Fisheries Research Station, 3 Sep.1984. **PHILIPPINES**: 2 males (49.1 by 30.0 mm, 52.8 by 31.2 mm) (MNHN B12749), coll. C.L. McLay, 1986. **INDONESIA**: 2 males (29.1 by 14.6 mm, 21.8 by 14.6 mm) (ZRC 1970.1.20.3), Djalandhi, coll. R. Serène, Oct.1964. — 1 male (14.5 by 9.5 mm) (ZMA) (holotype of *Cryptopodia pentagona* Flipse, 1930), Salawati, Irian Jaya. **THAILAND**: 5 males (36.8 by 23.9 mm, 19.4 by 13.4 mm, 52.8 by 33.2 mm, 20.8 by 14.7 mm, 15.6 by 10.9 mm), 2 females (48.5 by 31.4 mm, 59.2 by 35.0 mm) (ZRC), off Pattaya, coll. P.K.L. Ng & L.B. Holthuis. **JAPAN**: 1 female (67.1 by 40.7 mm) (NHM 1862.95), Japan. **MALAYSIA**: 1 female (62.9 by 39.3 mm) (ZRC 1991.93), Pontian, Johore, coll. trawler, 3 Mar.1991. **CHINA**: 1 female (64.6 by 39.1 mm) (ZRC 1968.2.1.39), Kat. O. Chan, Mirs Bay, Hong Kong, coll. A. J. Bruce. — 1 female (BNHM), Beibu Wan, Guangxi Province, coll. 9 Oct.1978. — 1 male (AS 818), Beibu Wan, Guangxi Province, coll. 12 Jan.1978. — 1 male, 3 females (AS 820), Beibu Wan, Guangxi Province, coll. 18 May 1980. — 1 ovigerous female (AS 822), Hainan Island, coll. 22 Mar.1960. — 1 male, 1 female (AS 815), Xang-Wei, Guangdong, coll. 22 Apr.1960. — 1 male, 2 females (AS 821), Xang-Wei, Guangdong, coll. Oct.1956. —1 female (AS 819), Puo-He, Guangdong, coll. 7 Apr.1960. — 1 female (AS 816), Guangdong, coll. 17 Apr.1960. — 1 female (AS 823), no precise data or date.

Size. - The largest specimen seen is a female measuring 67.1 by 40.7 mm (NHM 1862.95).

Description (Male, ZRC 1965.5116). - Carapace 1.6 times broader than long, pentagonal; with very large lateral expansions completely concealing ambulatory legs, prolonged posteriorly beyond base of abdomen. Posterolateral margins convex, crenulated, posterolateral angles truncated; anterolateral margin denticulated; posterior margins nearly straight, crenulated. Dorsal and ventral surfaces smooth; branchial, cardiac and gastric regions elevated, dome-shaped in frontal view; deep triangular depression in centre of carapace; margins surrounding depression granulated, ridge of granules running from mesobranchial to metabranchial regions. Rostrum prominent, 1.5 times broader than long, triangular, lateral margins gently convex, diverging proximally, crenulated. Post-rostral region depressed. Orbits small, round, with fissure on superior margin; eyes small. Lateroventral carapace concavity deep. pterygostomial region smooth. Epistome well developed; antennular fossae narrow, oblique, margins of fossae smooth. Antennules when folded, occupying fossae almost completely. Surfaces of third maxillipeds smooth.

Chelipeds robust, surfaces smooth except for slight granulation on dorsal and anterior facets of palm; length of palm longer than height, posterior expansion dilated towards distal extremity; anterior and posterior margins of dorsal facet of palm denticulated, anterior margin with 5 prominent teeth; fingers short, smooth, tips not crossing when fingers crossed; dorsal surfaces of movable finger with 2-3 spines at proximal end; carpus small; merus flat with wing-like expansion at distal end, upper and lower margins denticulated; upper margins of meri with 3 similar sized teeth; row of granules running whole length separating anterior and posterior facets of merus.

Ambulatory legs slender, smooth, first pair longest; upper and lower margins of meri with 1-2 rows of longitudinal carinae; dactylus nearly straight without setae.

Abdomen of male rough, elongated, narrow; telson triangular in shape. G1 with stout basal part about 1.8 times length of slender distal part, tip bulbous, fork-shaped, 2 nearly symmetrical lobes; spines mainly on lobes.

Females - The females agree with the males in all important non-sexual features.

Remarks. **-** *Cryptopodia fornicata* (Fabricius, 1781), the type species of *Cryptopodia* H. Milne Edwards, 1834, was described from specimens collected in India. Fabricius (1781) did not indicate how many specimens he had available, but Zimsen (1964) indicated that there are three specimens in the Copenhagen Museum (ZMUC) from the Fabricius collection.

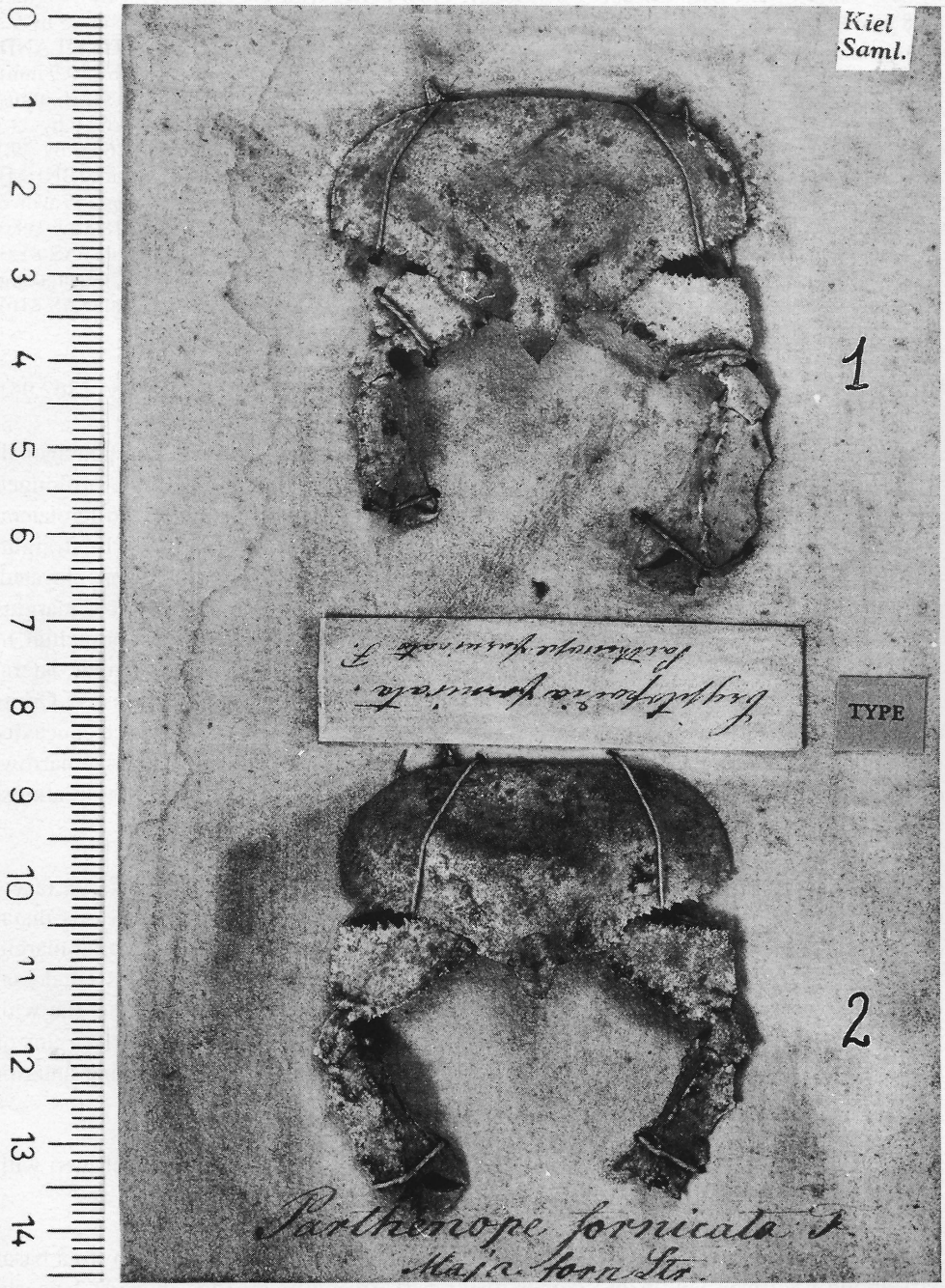

Fig. 2. *Cryptopodia fornicata* (Fabricius, 1781). Syntypes, Kiel collection (ZMUC Cru 396).

We have examined photographs of the three syntypes (one female, 57.5 by 35.2 mm, ZMUC Cru 397), two others (45.8 by 27.9 mm, 48.4 by 27.9 mm sex undetermined as their ventral surfaces are glued to card, ZMUC Cru 396) through the courtesy of the Copenhagen Museum. These photographs confirm the identity of the large series of specimens we have examined from Southeast Asia are *Cry. fornicata*. The female, 57.5 by 35.2 mm (ZMUC Cru 397) is here designated as the lectotype.

Among the specimens examined, the collections from India and western Indian Ocean proved to consist of two species, *Cry. fornicata* s. str. and *Cry. patula*, new species. Both *Cry. fornicata* s. str. and *Cry. patula* are very similar externally. *Cryptopodia patula* differs from *Cry. fornicata* s. str. in the form of the carapace and rostrum, degree of elevation of the branchial, cardiac and gastric regions and G1 structure (Table 2). These differences are reliable and independent of sizes. To this effect, we have examined a large series of specimens of *Cry. fornicata* s. str., as well as specimens of *Cry. patula* ranging from 25.6 to 57.4 mm in carapace width.

Miers's (1884) specimens of *Cry. fornicata* from Port Curtis, Australia (female, NHM 1881.31) and Thursday Island, Australia (male, NHM 1882.7) were re-examined - they are clearly *Cry. queenslandi*. Miers (1884) also mentioned other specimens deposited in the NHM from the Indian Ocean, Borneo and Japan, but we have been able to establish that only those from Japan are clearly *Cry. fornicata*. But since neither the closely related *Cry. queenslandi* and *Cry. patula*, new species, is known to occur in Borneo, his record of *Cry. fornicata* from there is probably correct.

Fig. 3. *Cryptopodia fornicata* (Fabricius, 1781). Lectotype female (ZMUC Cru 397), Spengler collection.

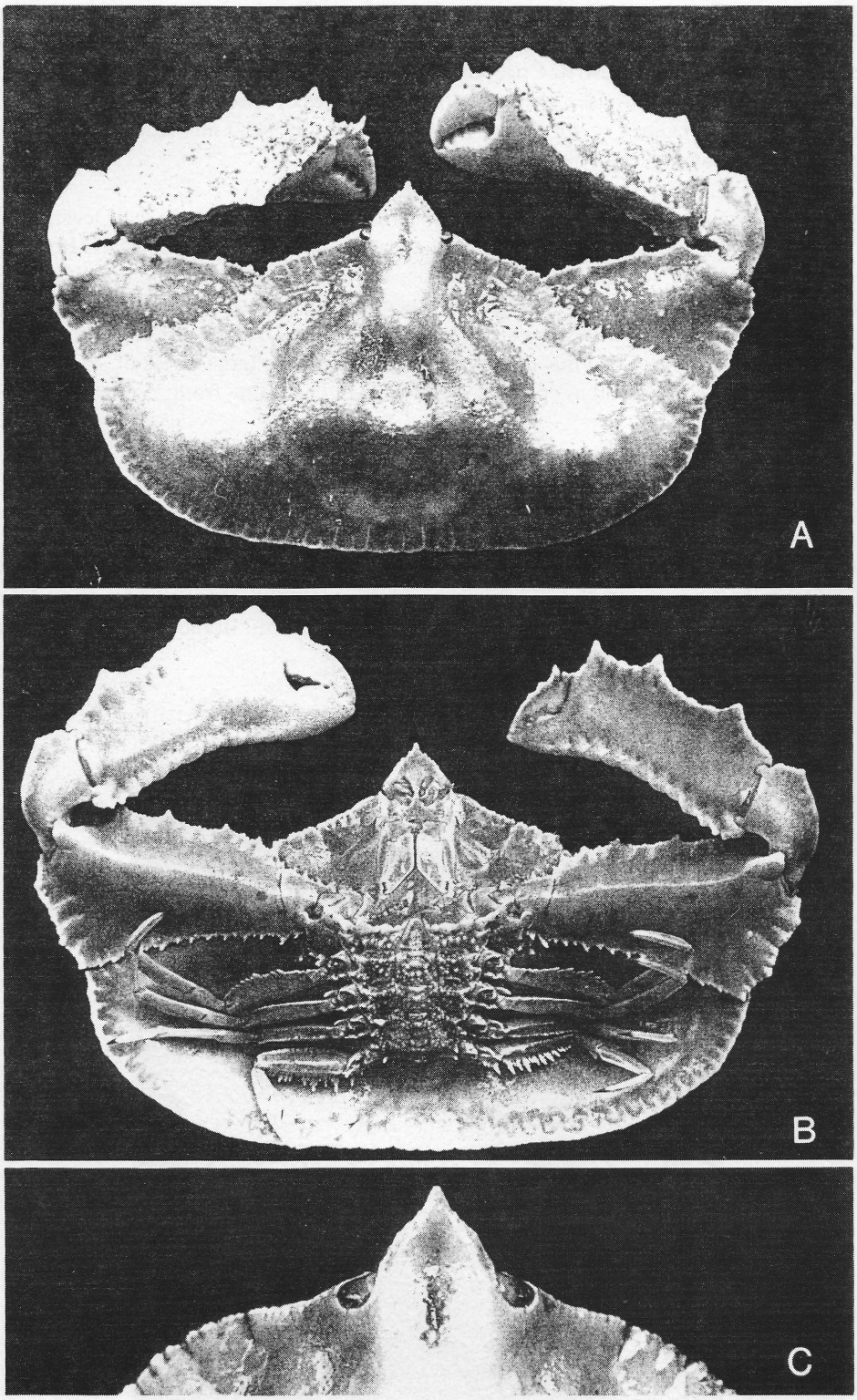

Fig. 4. *Cryptopodia fornicata* (Fabricius, 1781). Male, 56.1 by 35.4 mm (ZRC 1965.5116). A: dorsal view; B: ventral view; C: rostrum.

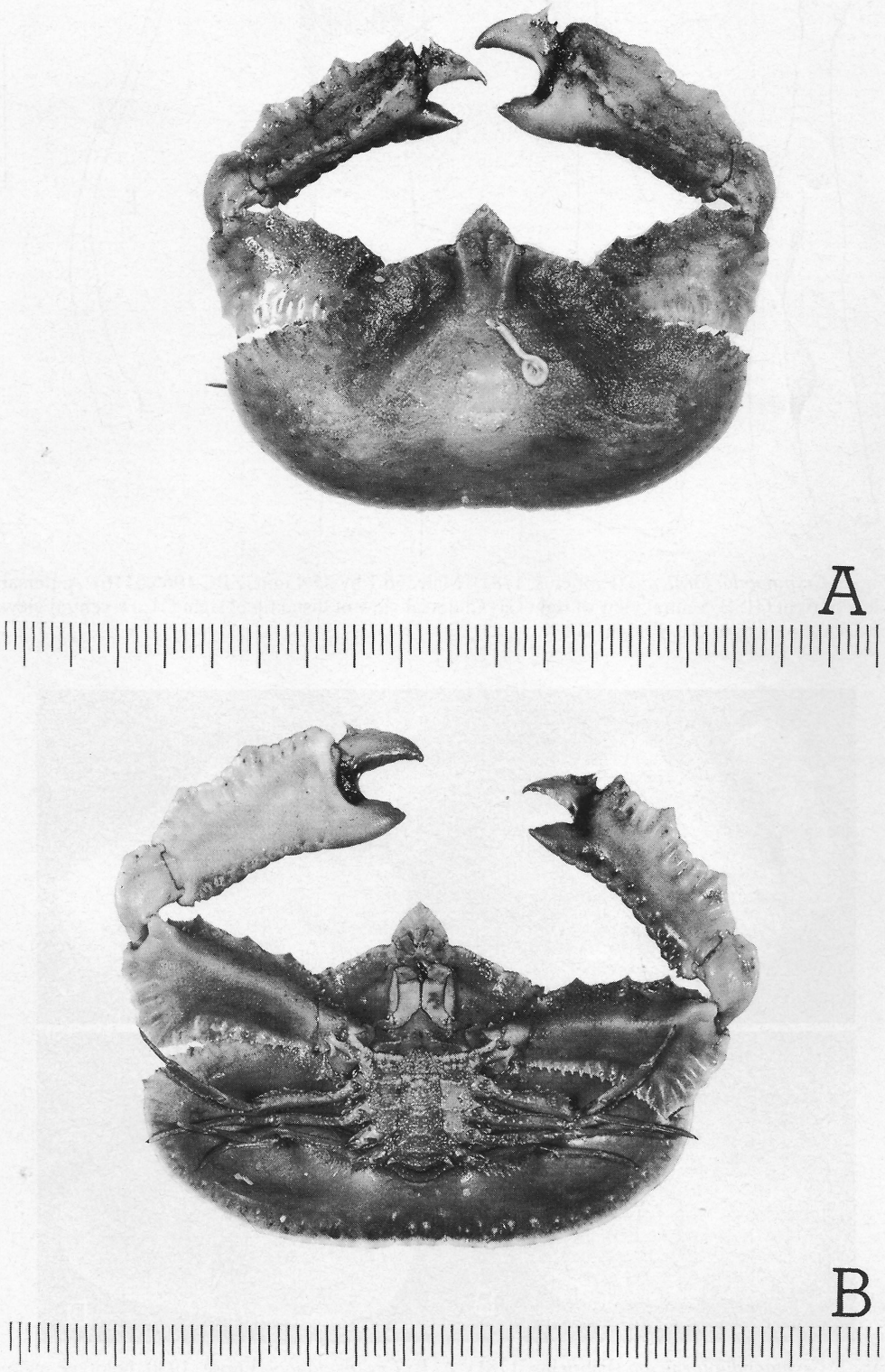

Fig. 5. *Cryptopodia fornicata* (Fabricius, 1781). Male, 54.2 by 34.4 mm (ZRC 1984.6371). A: dorsal view; B: ventral view.

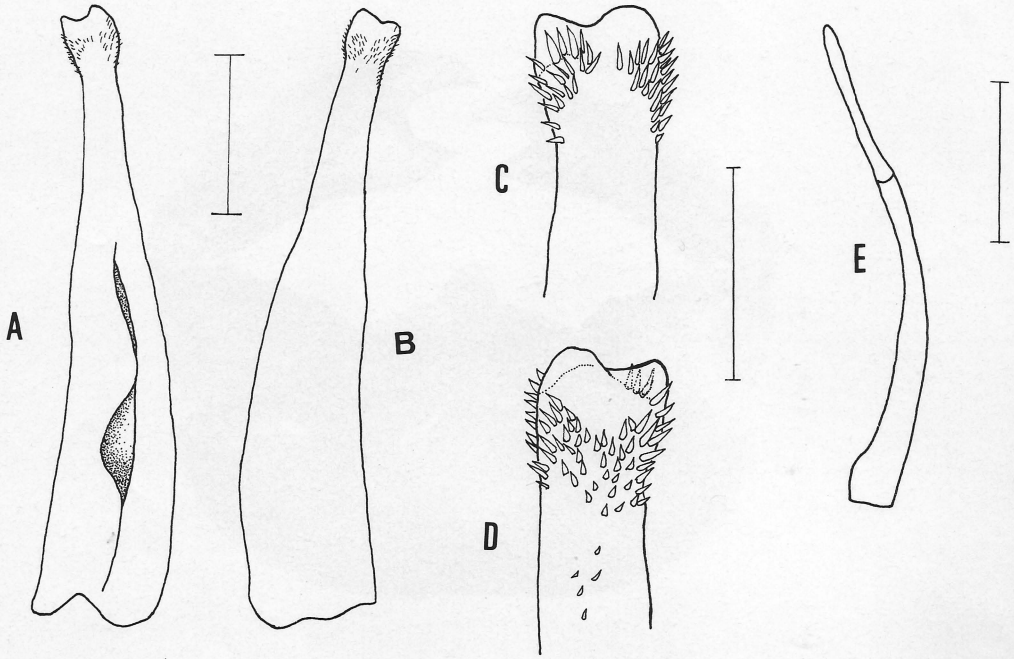

Fig. 6. *Cryptopodia fornicata* (Fabricius, 1781). Male, 56.1 by 35.4 mm (ZRC 1965.5116). A: dorsal view of right G1; B: ventral view of right G1; C: dorsal view of distal tip of right G1; D: ventral view of distal tip of right G1; E: right G2.

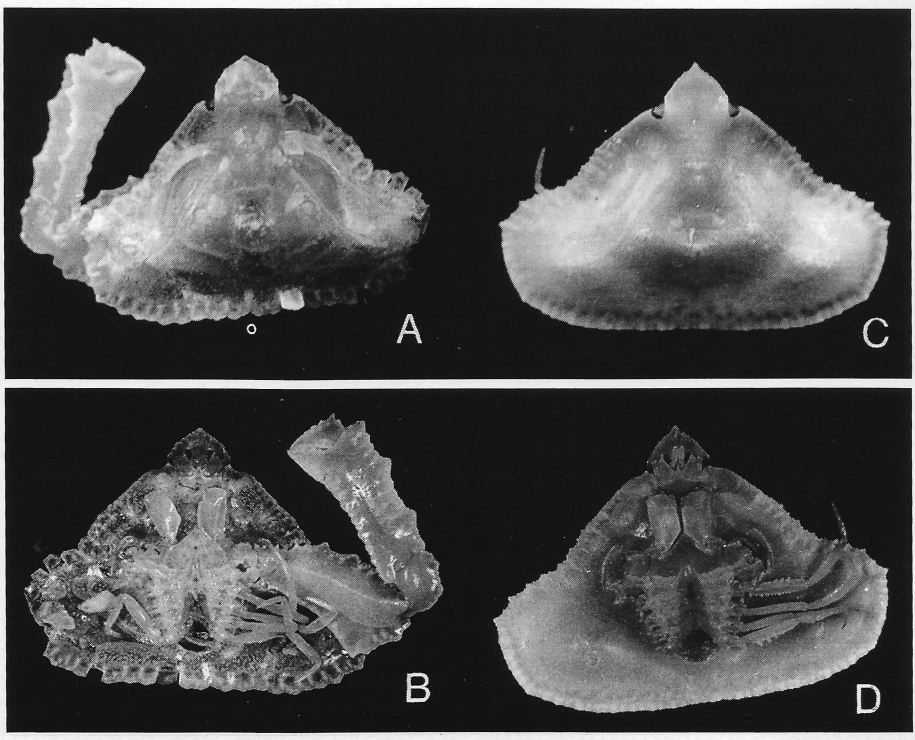

Fig. 7. *Cryptopodia fornicata* (Fabricius, 1781). A, B: *Cry. pentogona* Flipse, 1930, holotype male, 14.5 by 9.5 mm (ZMA); C, D: *Cry. fornicata*, male, 14.4 by 9.9 mm (ZRC 1984.1404). A, C: dorsal views; B, D: ventral views.

Alcock (1895) identified specimens from the Palk Straits, Andamans and Persian Gulf as *Cry. fornicata*. No figures were provided for his specimens, and the identity of his specimens cannot be ascertained. It seems likely though that while those from the Andamans are probably *C. fornicata* s. str., those from Palk Straits (Sri Lanka/India) might be either *Cry. fornicata* s. str. or *Cry. patula*, new species. Certainly, his specimens from the Persian Gulf are very likely *Cry. patula* and have been referred there. This is also true of Stephensen's (1946) record of *Cry. fornicata* from the same area.

Flipse (1930) described a new species, *Cry. pentagona*, on the basis of a young male (14.5 by 9.5 mm) collected from Salawati, Irian Jaya, Indonesia. We have examined the holotype, and it is almost identical to a small male specimen of *Cry. fornicata* (14.4 by 9.9 mm, ZRC 1984.1404) collected from Singapore (Fig. 7). Examination of a large series of specimens shows that in both sexes, the carapace of *Cry. fornicata* expands laterally with growth. In the smaller specimens, the carapace tends to be more triangular (resembling that of *Cry. pentagona*) whereas the larger specimens are more pentagonal in shape. We therefore here consider *Cry. pentagona* to be just a juvenile *Cry. fornicata* and synonymise it under that species.

Juvenile specimens of *Cry. fornicata* have uneven whitish to greyish lines going across the carapace which are missing in adults.

Distribution. - Central Indian Ocean to South China Sea and Japan.

Cryptopodia queensldndi Rathbun, 1918
(Figs. 8, 9, 10A)

Cryptopodia Queenslandi Rathbun, 1918: 26, pl. 12 (Cape of Gloucester: Queensland: Australia).
Cryptopodia fornicata - Haswell, 1879: 454 (partim) (Brook Island, Cape Grenville, Port Dension: Australia); Haswell, 1882: 37 (partim) (no new record); Miers, 1884: 203 (partim) (Port Curtis, Thursday Island, Lizard Island, Moreton Bay: Australia) (not *Cancer fornicata* Fabricius, 1781).
? *Cryptopodia fornicata* var. *Queenslandi* - Flipse, 1930: 65-66 (Java Sea; Torres Strait: Australia).
? *Cryptopodia spatulifrons* - Haswell, 1879: 454 (Port Jackson, Australia) (not *Cryptopodia spatulifrons* Miers, 1879).
Cryptopodia queenslandi - Davie & Turner, 1995: 456, Figs. 1C, D; 5A, B; 6A, B; 7A, B (Queensland, Northern Territory: Australia).

Material examined. - **AUSTRALIA**: 1 male (48.8 by 29.4 mm), 1 female (37.8 by 23.7 mm) (MNHN B8570), Broome, northwest Australia, sand belt opposite jetty, coll. R.W. George on R.V. 'Dorothea', 16 Nov.1962. — 1 male (38.3 by 23.9 mm) (MNHN B8565), Broome, Western Australia, coll. W. Murray, Nov.1963. 1 male (31.9 by 19.3 mm) (NHM 1932.11.30.99), northwest Australia. — 1 female (46.8 by 28.9 mm) (MNHN B8555), between Gidley et Rosemary Island, Dampier Archipelago, Western Australia, Honolulu dredge, 35.2m, coll. Royce on R.V. 'Davena', 31 Oct.1960. — 1 female, badly damaged (MNHN B8551), Port Walcoh, sand and occassional sponge and coral, Honolulu dredge, coll. Royce on R.V. 'Davena', 3 Jun.1960. — 1 female (42.5 by 26.3 mm) (MNHN B8560), 146.4km west of Eagle Hawk Island, Dampier Archipelago, Western Australia, coll. B.R. Wilson on R.V. 'Davena', 14 Jun.1960. — 1 male, 1 female, badly damaged (MNHN B8559), Weipa, north Queensland, coll. E. Yanbey, Nov.1961. — 1 male (23.8 by 15.3 mm) (NHM 1882.7), Thursday Island, Torres Strait. — 1 male (32.5 by 19.8 mm) (NHM 1892.3.26.50), coll. H.M.S. 'Penguin', 69.4-70.2m, Holothuria Bank, coll. H.M.S. 'Penguin'. 1 female (NHM 1891.6.20.9), damaged, Cossack Island (= ?Cassini Island), coll. H.M.S. 'Penguin'. — 1 female (44.4 by 28.1 mm) (NHM 1881.31), Port Curtis, 9.8m. **NEW GUINEA**: 1 female (28.9 by 18.6 mm) (NHM 1884.31), 50.4m, coll. H.M.S. 'Challenger'.

Size. - The largest specimen seen is a male measuring 48.8 by 29.4 mm (MNHN B8570).

Description (Male, MNHN B8570). - Carapace 1.6 times broader than long, pentagonal; with very large lateral expansions completely concealing ambulatory legs and prolonged posteriorly beyond base of abdomen. Posterolateral margins less convex, crenulated, posterolateral angles truncated; anterolateral margin denticulated; posterior margins nearly straight, crenulated. Dorsal and ventral surfaces smooth; branchial, cardiac and gastric regions less elevated; deep triangular depression on centre of carapace; margins surrounding depression granulated, ridge of granules running from mesobranchial to metabranchial regions. Rostrum prominent, 1.5 times broader than long, triangular, lateral margins gently convex, diverging proximally, crenulated. Post-rostral region depressed. Orbits small, round, fissure on superior margin; eyes small. Lateroventral carapace concavity shallow. pterygostomial region smooth. Epistome well developed; antennular fossae narrow, oblique; margins of fossae smooth. Antennules when folded, occupying fossae almost completely. Surfaces of third maxillipeds smooth.

Chelipeds robust, surface smooth except slight granulation on the dorsal and anterior facets of palm; length of palm longer than height, posterior expansion dilated towards distal extremity; anterior and posterior margins of dorsal facet of palm denticulated, anterior margin with 5 prominent teeth; fingers short, smooth, not crossing when fingers crossed; dorsal surfaces of movable finger with 2-3 spines at proximal end; carpus small; merus flat with wing-like expansion at distal end, upper and lower margins denticulated; upper margins of meri with 1 large tooth and 2 reduced teeth; row of granules running whole length separating anterior and posterior facets of merus.

Ambulatory legs slender, smooth, first pair longest; upper and lower margins of meri with 1-2 rows of longitudinal carinae; dactylus nearly straight, without setae.

Abdomen of male rough, elongated, narrow; telson triangular in shape. G1 not strongly tapered; stout basal part about 4.5 times length of slender distal part, tip bulbous, fork-shaped, 2 asymmetrical lobes; spines mainly on lobes.

Females - The females agree with the males in all key non-sexual characteristics.

Remarks. - *Cryptopodia queenslandi* was described by Rathbun (1918) from a single male specimen. The specimen (49.3 by 27.4 mm) was collected from 32 km northeast of Cape of Gloucester, Queensland, Australia. The series of specimens examined here agree well with the description and figures of the holotype provided by Rathbun (1918) and the redescription of the species by Davie & Turner (1995).

Haswell (1879, 1882) reported *Cry. fornicata* (no figures given) from Brook Island, Cape Grenville and Port Dension, Australia. From the current distribution pattern, Haswell's specimens are most likely *Cry. queenslandi*. Miers (1884) remarked that the young male from Thursday Island, Australia he examined which he referred as *Cry. fornicata* possesses a shallower gastric region and lacks any trace of the ridges on the branchial regions. The former feature is now recognised as of *Cry. queenslandi* (Table 2). As for the absence of the ridge of granules on the specimen, this is usually observed in juveniles. Although there is variation in the degree of this granulation in specimens of *Cry. queenslandi* and *Cry. fornicata*, the granules of *Cry. queenslandi* are often less distinct than those of *Cry. fornicata* when specimens of similar sizes are compared. In any case, Miers's specimens from Port Curtis and Thursday Island, Australia have been re-examined and are here identified as *Cry. queenslandi*.

Flipse (1930) regarded *Cry. queenslandi* as a variety of *Cry. fornicata* and he reported it from the Java Sea and Torres Strait, Australia. He did not provide any figures for the specimens examined, and therefore, it is not certain if all his specimens are *Cry. queenslandi*. From what is now known, his Java Sea records are probably *C. fornicata*, whilst those from Torres Strait are *C. queenslandi*.

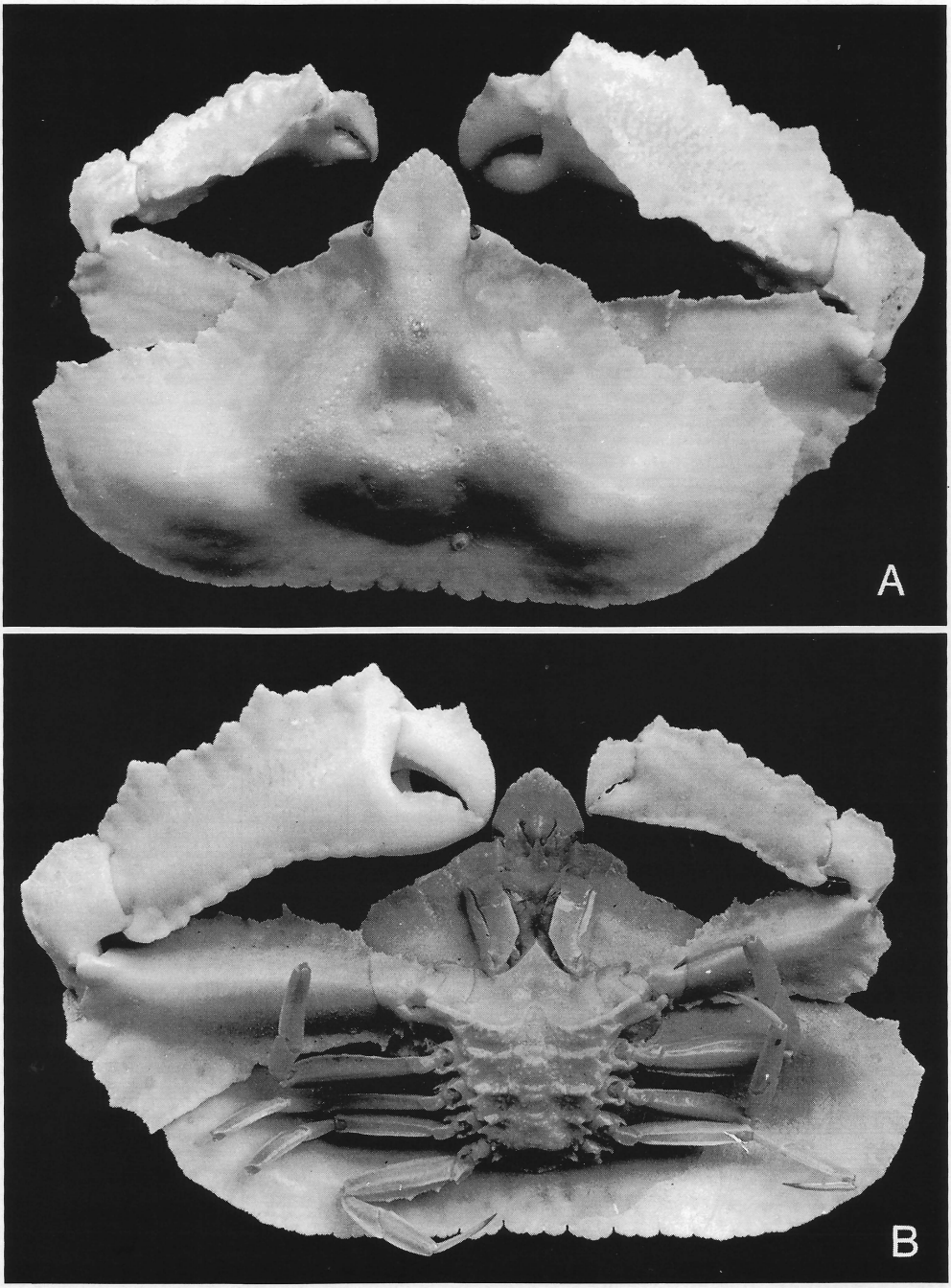

Fig. 8. *Cryptopodia queenslandi* Rathbun, 1918. Male, 48.8 by 29.4 mm (MNHN B8570). A: dorsal view; B: ventral view.

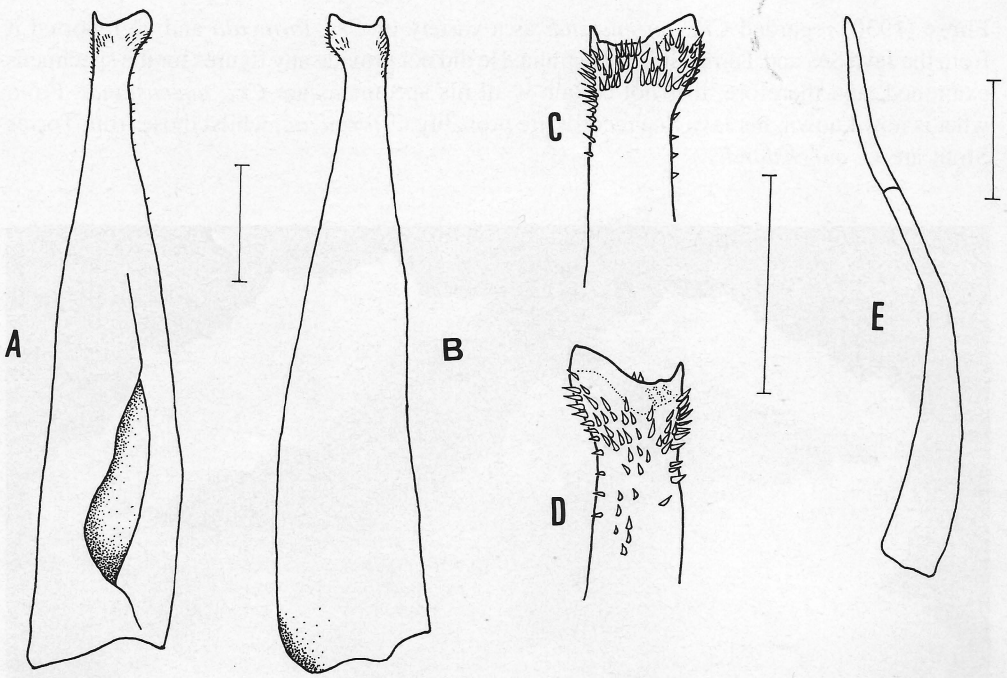

Fig. 9. *Cryptopodia queenslandi* Rathbun, 1918. Male, 48.8 by 29.4 mm (MNHN B8570). A: dorsal view of right G1; B: ventral view of right G1; C: dorsal view of distal tip of right G1; D: ventral view of distal tip of right G1; E: right G2. Scales = 1.0mm.

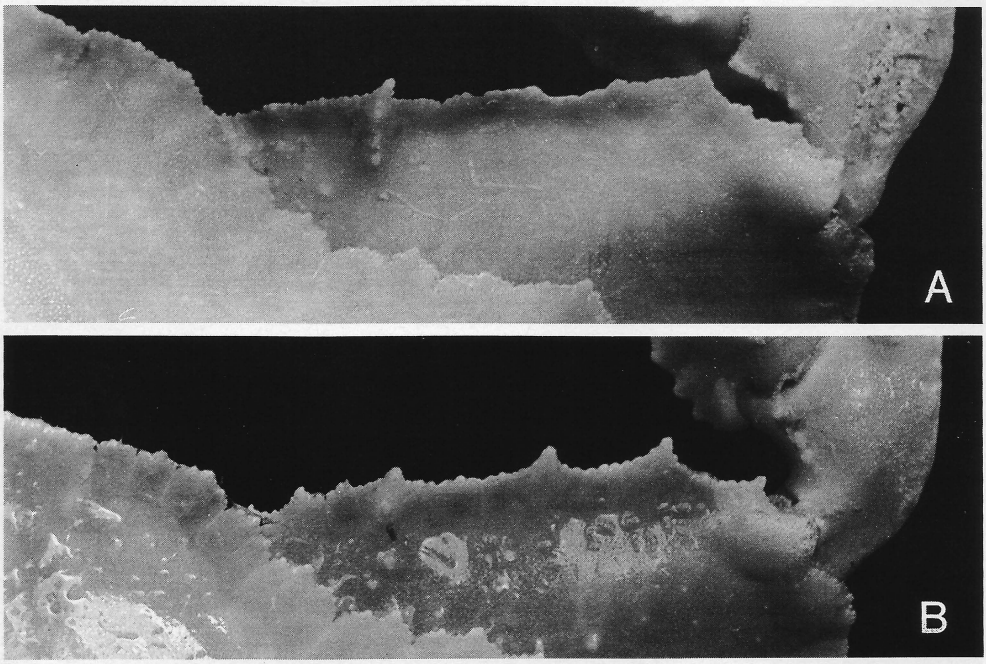

Fig. 10. Dorsal views of meri of right chelipeds. A: *Cry. queenslandi* Rathbun, 1918, male, 48.8 by 29.4 mm (MNHN B8570); B: *Cry. fornicata* (Fabricius, 1781), male, 56.1 by 35.4 mm (ZRC 1965.5116).

Table 2. Differences between *Cry. fornicata* Fabricius, 1781, *Cry. patula*, new species, and *Cry. queenslandi* Rathbun, 1918

Characters	*Cry. fornicata*	*Cry. patula*, new species	*Cry. queenslandi*
Branchial, cardiac and gastric regions	Strongly inflated (Fig. 5A)	Not strongly inflated (Fig. 11A)	Not strongly inflated (Fig. 8A)
Posterior margin of carapace	Nearly straight (Fig. 5A)	Nearly straight (Fig. 11A)	Slightly concave (Fig. 8A)
Lateroventral carapace depression	Deep (Fig. 5B)	Shallow (Fig. 11B)	Shallow (Fig. 8B)
Rostrum	Broader than long, convex margins (Fig. 5A)	Longer than broad, straight margins (Fig. 11A)	Broader than long, convex margins (Fig. 8A)
Anterior margins of merus of cheliped	3 prominent teeth of equal size (Fig. 10B)	3 prominent teeth of equal size (Fig. 11A)	1 prominent tooth with 2 reduced teeth (Fig. 10A)
G1	Stout basal part about 1.8 times length of slender distal part	Stout basal part about 2.0 times length of slender distal part	Less tapered; stout basal part about 4.5 times length of slender distal part
G1 tip	bulbous and fork-shaped with 2 nearly symmetrical lobes, numerous spine on lobes (Fig. 6C, D)	bulbous and fork-shaped with 2 asymmetrical lobes, inner lobe smaller with sharp teeth, outer lobe bigger, numerous spines on lobes, subdistal with scattered spines (Fig. 13C, D)	less bulbous and fork-shaped with 2 asymmetrical lobes. inner lobe reduced, outer lobe bigger, numerous spines on lobes (Fig. 9C, D) surface

Davie & Turner (1995) disagreed with Flipse (1930) that *Cry. queenslandi* is a variety, and noted that *Cry. queenslandi* differed from *Cry. fornicata* distinctly in the form of the G1 and cheliped proportions. They observed that in *Cry. queenslandi*, the tip of the G1 is divided into two lobes, one of which is distinctly smaller than the other (against tip with two subsymmetrical lobes in *Cry. fornicata*), and the cheliped length is about twice the length of the carapace (against cheliped distinctly less than twice length of the carapace in *Cry. fornicata*). They also noted that the two features recorded by Flipse (1930) to separate the two taxa, the greater carapace width to length and greater concavity of the posterior margin of carapace in in *Cry. queenslandi*, are possibly unreliable characters. Comparisons of the specimens of *Cry. queenslandi* and *Cry. fornicata* on hand indicate that the form of the posterior region of the carapace is useful in most instances. It is usually slightly concave in *Cry. queenslandi* compared to *Cry. fornicata*. In addition, the degree of inflation of the branchial, cardiac and gastric regions, and the depth of the lateroventral carapace concavity are also different in the two species (Table 2). The most useful new character is the number of teeth on the anterior margin of the merus of the cheliped, with *Cry. queenslandi* having one prominent tooth with two reduced teeth, whereas in *Cry. fornicata*, all three teeth are prominent and subequal in size (Table 2). With all these diiferences, we are confident that the two taxa are separate species.

Haswell (1879) reported a small specimen from Port Jackson, Australia which he identified as *Cry. spatulifrons* Miers, 1879. We suspect his specimen is probably *Cry. queenslandi* instead, as it closely resembles another specimen reported by Davie & Turner (1995) from the Gulf of Carpentaria, Western Australia. Both specimens possess numerous spots on the carapace. Both these individuals are smaller than our current specimens of *Cry. queenslandi*. It is possible that this patterning is a size-associated character, disappearing as the specimen matures. Juvenile and young specimens of *Cry. fornicata* have uneven whitish lines going across the carapace which are missing in adults (present study). It thus seems possible that the juveniles of these two species may be separated thus in addition to the morphological characters listed in Table 2.

Distribution. - Known only for certain from Australian waters.

Cryptopodia patula, new species
(Figs. 11-13)

Cryptopodia aff. *queenslandi* - Yang, 1979: 11 (Ceylon) (not *Cryptopodia queenslandi* Rathbun, 1918).
Cryptopodia fornicata - Alcock, 1895: 128 (part: Palk Straits?; Persian Gulf); Stephensen, 1946: 110 (Persian Gulf) (not *Cancer fornicata* Fabricius, 1781).

Material examined. - Holotype - male (38.3 by 24.7 mm) (NHM 1962.8.30.7), Persian Gulf, coll. Dr. Graham-Evans, Imperial coll. py/oh 102/62.

Paratypes - **PERSIAN GULF**: 1 female (57.4 by 37.0 mm) (ZRC 1970.1.7.1), Madras, India, coll. R. Serène, don. 875, 15 Apr.1965. **ARABIA**: 1 male (37.5 by 23.8 mm), 1 female (40.8 by 27.7 mm) (MNHN B22735), 1905, Coast of Arabia. **OMAN**: 2 females (36.6 by 25.0 mm, 27.3 by 24.6 mm) (NHM 1971.231), Gulf of Oman, 32.4-45m, coll. A.W. White. **SRI LANKA**: 1 male (45.1 by 27.4 mm) (ZRC 1970.1.7.5), Colombo, Ceylon, 1918, coll. R. Serène, don 876, 15 Apr.1965. — 1 male (25.6 by 17.7 mm) (NHM 1934.1.16.65), Gulf of Manaar.

Size. - The largest specimen known is a female measuring 57.4 by 37.0 mm (ZRC 1970.1.7.1).

Description (Holotype male). - Carapace 1.5 times broader than long, pentagonal; with very large lateral expansions completely concealing ambulatory legs, prolonged posteriorly beyond base of abdomen. Posterolateral margins convex, crenulated, posterolateral angles truncated; anterolateral margin denticulated; posterior margins nearly straight, crenulated. Dorsal and ventral surfaces smooth; branchial, cardiac and gastric regions less elevated, giving a flattened appearance in front view; deep triangular depression in centre of carapace; margins surrounding depression granulated, ridge of granules running from mesobranchial to metabranchial regions. Rostrum prominent, 1.1 times broader than long, triangular, lateral margins nearly straight, diverging proximally, crenulated. Post-rostral region depressed. Orbits small, fissure on superior margin; eyes small. Lateroventral carapace concavity shallow. pterygostomial region smooth. Epistome well-developed; antennular fossae narrow, oblique, margins of fossae smooth. Antennules when folded, occupying fossae almost completely. Surfaces of third maxillipeds smooth.

Chelipeds robust, surfaces smooth except slight granulation on dorsal and anterior facets of palm; length of palm longer than height, posterior expansion dilated towards distal extremity; anterior and posterior margins of dorsal facet of palm denticulated, anterior margin with 5 prominent teeth; fingers short, smooth, not crossing when fingers crossed; dorsal surfaces of movable finger with 2-3 spines at proximal end; carpus small; merus flat, with wing-like

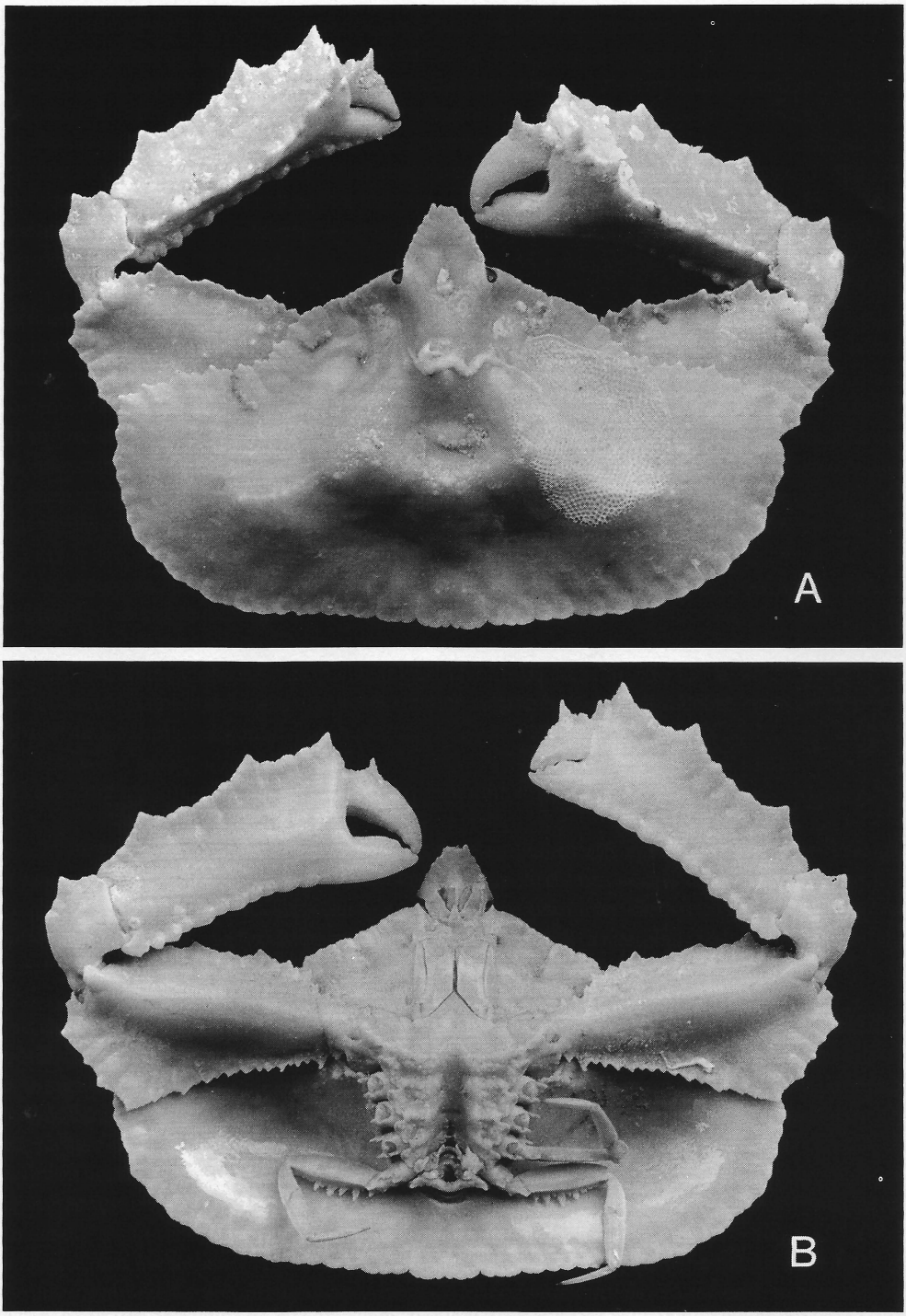

Fig. 11. *Cryptopodia patula*, new species. Holotype male, 38.3 by 24.7 mm (NHM 1962.8.30.7). A: dorsal view; B: ventral view.

expansion at distal end, upper and lower margins denticulated; upper margins of meri with 3 similar size teeth; row of granules running whole length separating anterior and posterior facets of merus.

Ambulatory legs slender, smooth, first pair longest; upper and lower margins of meri with 1-2 rows of longitudinal carinae; dactylus nearly straight without setae.

Abdomen of male rough, elongated, narrow; telson triangular in shape. G1 with stout basal part about 2.0 times length of slender distal part, tip bulbous and fork-shaped, 2 asymmetrical

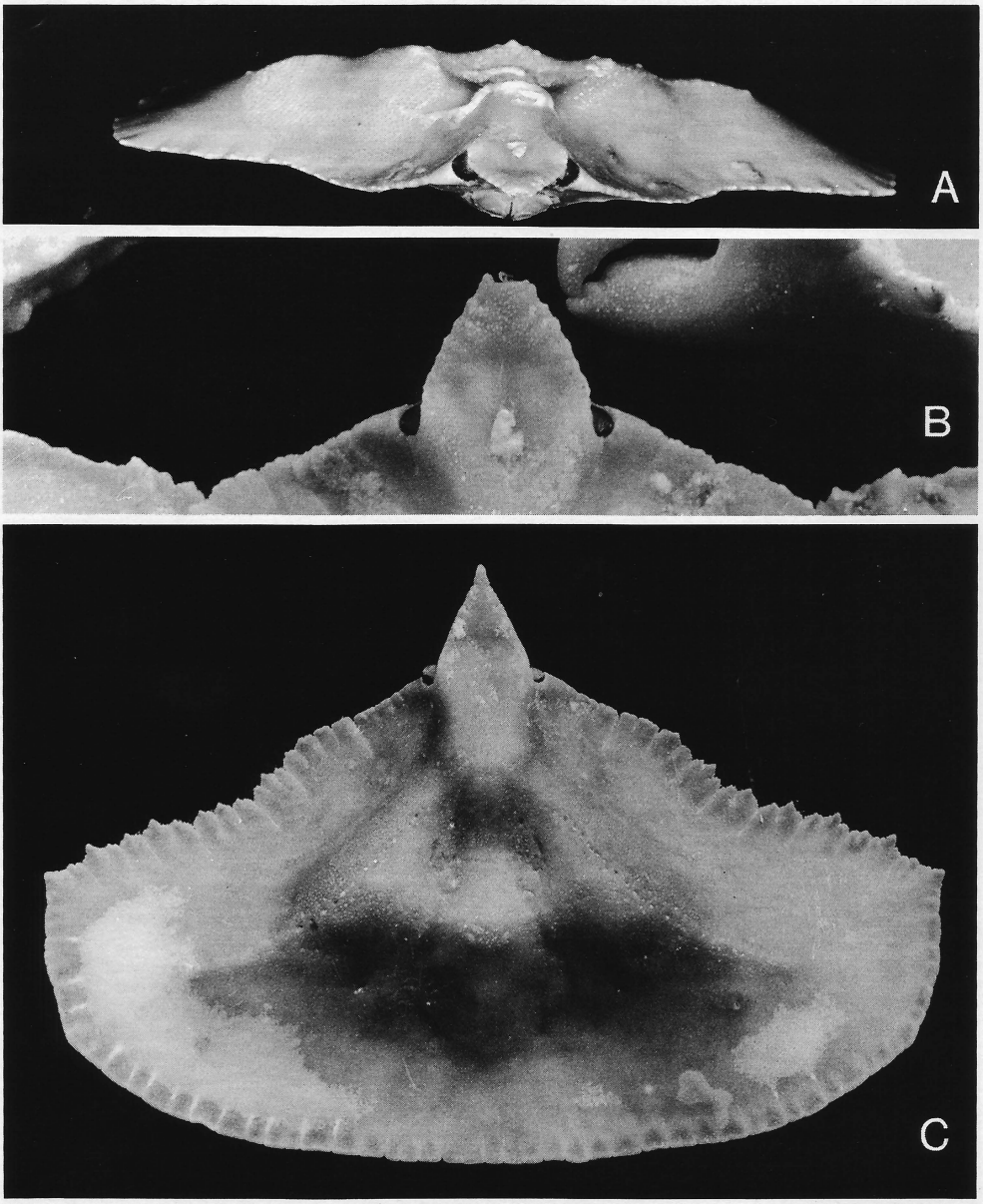

Fig. 12. *Cryptopodia patula*, new species. A, B, holotype male, 38.3 by 24.7 mm (NHM 1962.8.30.7); C, paratype female, 57.4 by 37.0 mm (ZRC 1970.1.7.1). A: frontal view; B: rostrum; C: dorsal view of carapace.

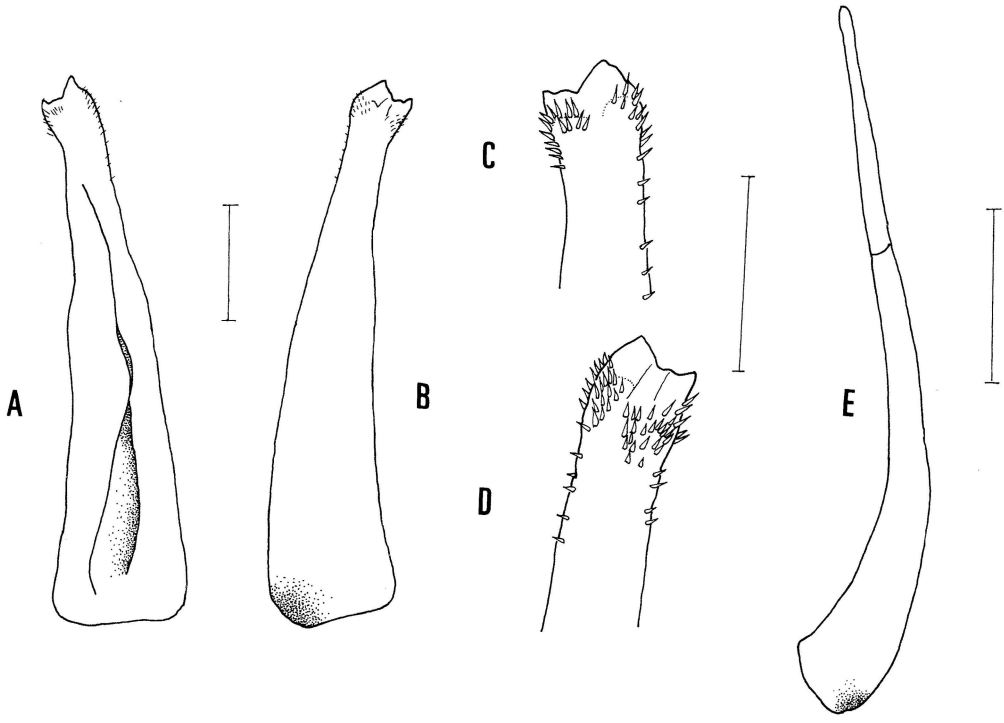

Fig. 13. *Cryptopodia patula*, new species. holotype male, 38.3 by 24.7 mm (NHM 1962.8.30.7). A: dorsal view of right G1; B: ventral view of right G1; C: dorsal view of distal tip of right G1; D: ventral view of distal tip of right G1; E: right G2. Scales = 1.0mm.

lobes, inner lobe smaller, with a sharp tooth; spines mainly on lobes.

Females - The females agree with the males in all non-sexual characters.

Remarks. - The differences between *Cry. patula*, new species, and *Cry. fornicata* have been discussed earlier under *Cry. fornicata*. The rostrums of the holotype and some of the other specimens appear similar to those of *Cry. fornicata* s. str., being broader than long. These rostrums, however, were all broken at the tips (Fig. 12B).

There is slight variation seen in two lots of specimens collected together: one male (37.5 by 23.8 mm) and one female (40.8 by 27.7 mm) (MNHN B22735); and two females (36.6 by 25.0 mm, 27.3 by 24.6 mm) (NHM 1971.231). The branchial, cardiac and gastric regions of these specimens appear more elevated because their carapaces are more dome-shaped than the other specimens examined. This is, however, still distinctly less elevated compared to specimens of *Cry. fornicata* s. str. The G1 of the 37.5 by 23.8 mm male (MNHN B22735) is, however, similar to that of the holotype. One paratype 57.4 by 37.0 mm female (ZRC 1970.1.7.1) has the proportionately longest rostrum among the specimens examined, with the lateral margins appearing straight (Fig. 12C).

Cryptopodia patula is known from northwestern to southern India, reaching to the Gulf of Oman and Arabia. It overlaps the distribution of *Cry. fornicata* s. str. (type locality Tranquebar, India) in India, but is not yet known to extend eastwards of India. The records of *Cry. fornicata* by Alcock (1895) and Stephensen (1946) from the Persian Gulf almost certainly refer to *Cry. patula* instead.

Cryptopodia dorsalis White, 1847
(Figs. 14, 15)

Cryptopodia dorsalis White, 1847a: 125 (Sulu Sea, Philippines) (nomen nudum).
Cryptopodia dorsalis White, 1847b: 205 (Sulu Sea, Philippines); Adams & White, 1848: 30, pl. 6, Fig. 5 (no new record); Flipse, 1930: 63 (key only); Davie & Turner, 1995: 453, Figs. 1I, J; 3A, B (northern Australia, North West Shelf, Arafura Sea, north of Cape Bowling Green (Townsville): Australia).
Lambrus sp. - Jones & Morgan, 1994: 155, colour fig. (Australia).

Material examined. - Holotype - female (51.7 by 30.4 mm) (NHM 1847.21), Sulu Sea, Philippines.

Others - **THAILAND**: 1 male (74.7 by 40.6 mm) (ZRC 1995.4), Pattani Province Harbour, coll. D.E.B.Team, Oct.1983. — 1 female (76.0 by 40.7 mm) (RMNH 36528), Gulf of Thailand, Pattani Bay, coll. L. B. Holthius, 14 Nov.1985.

Size. - The largest specimen seen is a female measuring 76.0 by 40.7 mm (RMNH 36528).

Description (Holotype female). - Carapace 1.7 times broader than long, pentagonal; with very large lateral expansions completely concealing ambulatory legs posteriorly beyond base of abdomen. Posterolateral margins convex, crenulated, posterolateral angles truncated; anterolateral margin denticulated; posterior margins nearly straight, crenulated, posterior part of carapace with 2 deep, lyre-shaped grooves placed longitudinally. Dorsal surfaces smooth with scattered granules, ventral surfaces smooth; branchial, cardiac and gastric regions elevated, dome-shaped in front view; deep triangular depression in centre of carapace; margins surrounding depression granulated, ridge of granules running from mesobranchial to metabranchial regions. Rostrum prominent, 1.3 times broader than long, triangular, lateral margins gently convex, diverging proximally, crenulated. Post-rostral region depressed. Orbits small, round, fissure on superior margin; eyes small. Lateroventral carapace concavity shallow. pterygostomial region smooth. Epistome well-developed; antennular fossae narrow, oblique, margins of fossae smooth. Antennules when folded, occupying fossae almost completely. Surfaces of third maxillipeds smooth.

Chelipeds robust, surfaces smooth except slight granulation on dorsal and anterior facets of palm; length of palm longer than height, posterior expansion dilated towards distal extremity; anterior and posterior margins of dorsal facet of palm lobulated; fingers short, smooth, not crossing when fingers crossed; dorsal surfaces of movable finger with 1 spine at proximal end; carpus small; merus flat with wing-like expansion at distal end, upper and lower margins of meri denticulated; row of granules running whole length separating anterior and posterior facets of merus. Ambulatory legs slender, smooth, first pair longest; upper margins of meri of first pair of leg with 3-4 blunt teeth, upper and lower margins of last pair of legs with 1-2 rows of longitudinal carinae; dactylus nearly straight without setae.

Abdomen of holotype smooth, sixth segment widest.

Males - The abdomen of the male is smooth and similar in shape to other species of *Cryptopodia*. G1 with stout basal part about 1.8 times length of slender distal part; tip taper, bilobed, inner lobe slightly larger, spines only on lobes, more spines on outer lobe.

Remarks. - Davie & Turner (1995) commented that the authorship of this species should be White & Adams, in White, 1847b. The International Code of Zoological Nomenclature (ICZN) (Article 50a), however, states that it must be clear that the author is in fact the person

who formally described the taxon in question. Ng (1994) discussed this matter in some depth and argued that merely putting a person's name (other than the person who authors the paper and the description contained within) in the "authorship" citation following a taxon's name does not really constitute valid authorship. To this effect, White (1847b) did not state anywhere that both he and Adams described *Cry. dorsalis*. Placing Adams name in the "authorship credits" after the species name does not really mean that Adams contributed in the description. In those days, it was common practice to credit discovers or collectors or even esteemed

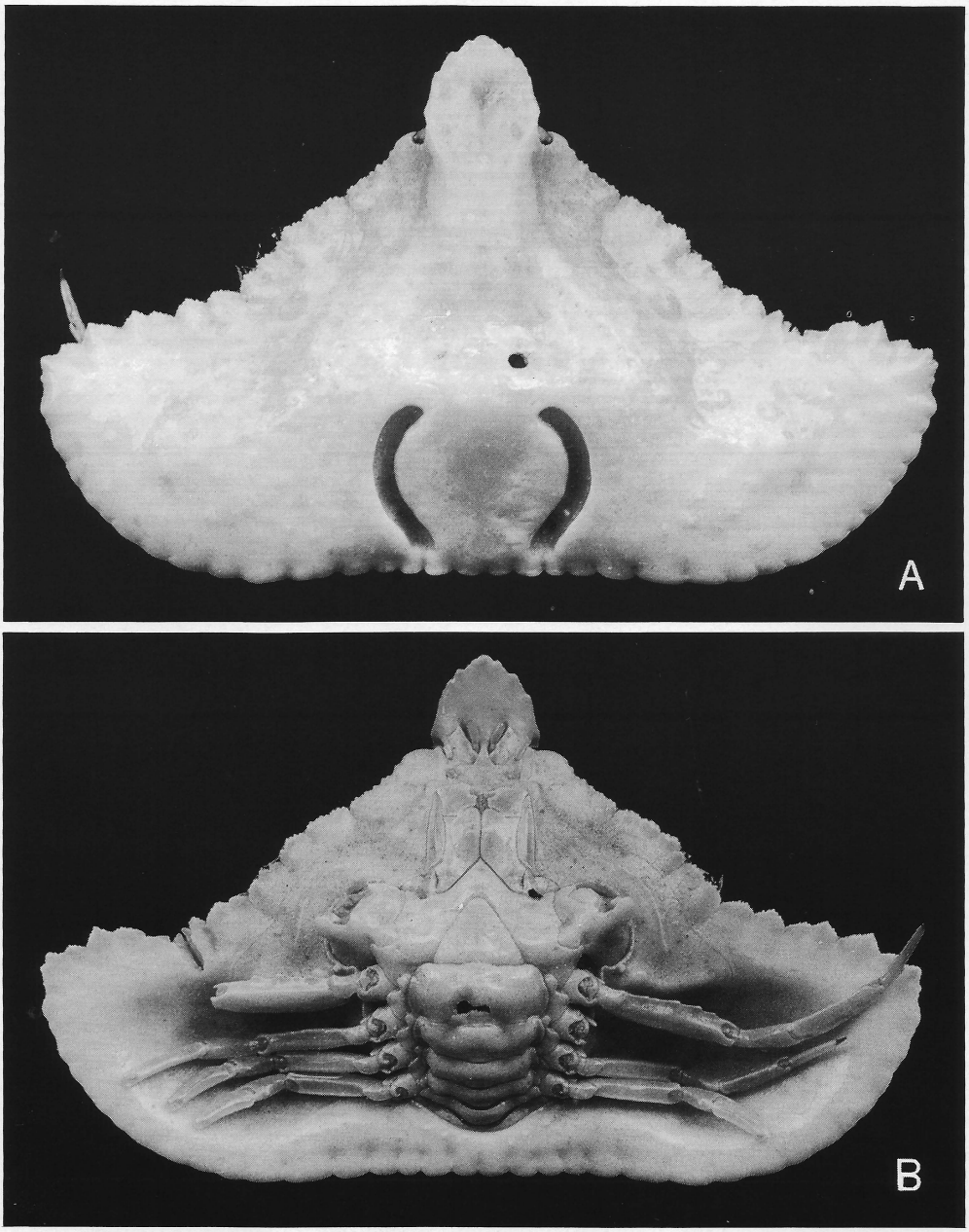

Fig. 14. *Cryptopodia dorsalis* White, 1847. Holotype female, 51.7 by 30.4 mm (NHM 1847.21). A: dorsal view; B: ventral view.

colleagues who provided advice by placing their names in the species' authorship. This, however, does not fulfil the requirements of ICZN Article 50a for true authorship. No where in White's (1847b) paper was it stated that Adams contributed to the description. Neither was his name mentioned anywhere else, and the credits to the paper on the title page only carried White's name. We thus feel that a strict interpretation of Article 50a would exclude Adams' name from the authorship for *Cry. dorsalis*.

Davie & Turner (1995) also commented on the confusion as to when the name *Cry. dorsalis* was first validly published (the name being used four times between 1847 and 1848). We concur with their observations that the first valid date is White (1847b).

Jones & Morgan (1994) identified a specimen from Australia as *Lambrus* sp. Based on the figure provided, especially the presence of the two deep groves of lyre-form on its carapace, it is likely to be *Cry. dorsalis* as well.

White (1847b) and Adams & White (1848) described the lateral margins of rostrum as having three sharp crenulations and ambulatory legs being slender and equal in length. Reexamination of the holotype and other specimens showed that the number of crenulations are variable, from 3-4 per lateral margin. The lengths of the ambulatory legs are not really equal, but as with other *Cryptopodia* species, has the first pair longest. The smooth abdomen of this species is a unique character in *Cryptopodia* - all congeners have granulated ones.

The lyre-shaped grooves on the carapace are the most interesting feature of this species, although its function remains unknown. No other species of *Cryptopodia* (indeed no known parthenopid) possesses these unusual structures. These lyre-shaped grooves are not directly connected to the internal parts and are completely external in origins. The posterior part of the grooves is at the lowest point of the carapace (just anterior to the posterior carapace

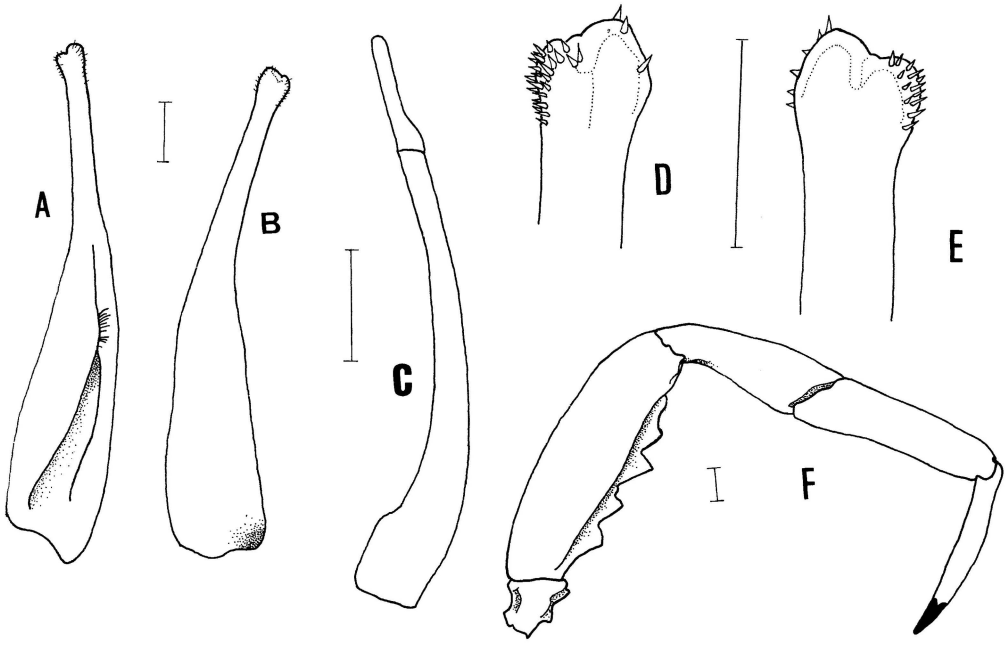

Fig. 15. *Cryptopodia dorsalis* White, 1847. Male, 74.7 by 40.6 mm (ZRC 1995.4). A: dorsal view of right G1; B: ventral view of right G1; C: right G2; D: dorsal view of distal tip of right G1; E: ventral view of distal tip of right G1; F: ventral view of first ambulatory leg. Scales = 1.0mm.

margin) and presumably, it may serve to channel clean water downwards to the rear of the carapace and then laterally to the base of the legs. Certainly, the margins of the lyre-shaped grooves in the present specimens have numerous short setae which might serve a filtration function. Ng & Chia (1994) has made similar speculations for grooves on the posterior edge of the carapace for deep water xanthids of the subfamily Antrocarcininae.

Cryptopodia angulata H. Milne Edwards & Lucas, 1841
(Figs. 16, 17, 21A)

Cryptopodia angulata H. Milne Edwards & Lucas, 1841: 481, pl. 28, Figs. 16-19 (type locality unknown); Alcock, 1895: 282 (partim) (Orissa coast: India); Flipse, 1930: 62 (key only); Yang, 1979: 11 (Indonesia); Tirmizi, 1980: 107 (list); Banu & Nurul Huda, 1987: 646 (Batu Ferringi: Penang Island: Malaysia); Ahmad et al., 1993: 15 (list); Tirmizi, 1980: 107 (list only); Tirmizi & Kazmi, 1983: 369 (list only); Tirmizi & Kazmi, 1991: 211 (Karachi: Pakistan); Davie & Turner, 1995: 450, Figs. 1E, F; 2A, B (Gulf of Carpentaria, Arafura Sea: Australia).

? *Cryptopodia angulata* - Chopra, 1935: 473 (partim?) (Sandheads: India).

Cryptopodia angulata var. *cippifer* Alcock, 1895: 283, pl. 23, Fig. 4 (Karachi: Pakistan); Flipse, 1930: 62 (key only); Stephensen, 1946: 110 (Iranian Gulf).

Material examined. - **BANGLADESH**: 1 male (49.4 by 28.6 mm) (ZRC 1987.450), Chittagong, coll. Nurul-Huda, 1981-1982. **INDONESIA**: 1 male (15.6 by 9.6 mm) (ZRC 1970.1.7.4), Djalandhi, coll. R Serène. **THAILAND**: 1 male, 35.5 by 21.0 mm (PMBC 2248), Phuket, bottom trawl, Phuket, coll. Phuket Marine Biological Center, Dept. Fisheries, 21 Apr.1972.

Size. - The largest specimen seen is a male measuring 49.4 by 28.6 mm (ZRC 1987.450).

Description (Male, ZRC 1987.450). - Carapace 1.7 times broader than long, pentagonal; with very large lateral expansions completely concealing ambulatory legs prolonged posteriorly beyond base of abdomen; carapace margins deeply denticulated, teeth simple to less distinctively bifurcated. Posterior margin straight; 2 spines on posterior margin at centre of carapace. Posterolateral margins convex, crenulated, posterolateral angles truncated; all angles of carapace produced into curved spines; second spine in front of both anterolateral angles. Dorsal surfaces granulated, ventral surfaces smooth; branchial, cardiac and gastric regions elevated; deep triangular depression in centre of carapace; margins surrounding depression granulated, ridge of granules running from mesobranchial to metabranchial regions. Rostrum prominent, 1.2 times broader than long, triangular, lateral margins gently convex, diverging proximally, crenulated. Post-rostral region shallow. Orbits small, round, fissure on superior margin; eyes small. Lateroventral carapace concavity deep. Epistome well-developed; antennular fossae narrow, oblique, margins of fossae smooth. Antennules when folded, occupying fossae almost completely. Surfaces of third maxillipeds smooth.

Chelipeds robust, surfaces granulated; length of palm longer than height, posterior expansion dilated towards distal extremity; anterior and posterior margins of dorsal facet of palm denticulated, anterior margin with 5 prominent teeth; fingers short, smooth, not crossing when fingers crossed; dorsal surfaces of movable finger with 2-3 spines at proximal end; carpus semi-globular, slightly granulated; merus flat, with wing-like expansion at distal end, upper and lower margins denticulated; upper margins of meri with 2 prominent teeth; row of granules running whole length, separating anterior and posterior facets of merus.

Ambulatory legs slender, smooth, first pair longest; upper margins of meri of first pair of leg denticulated, lower margin of meri carinated; upper and lower margins of meri of second

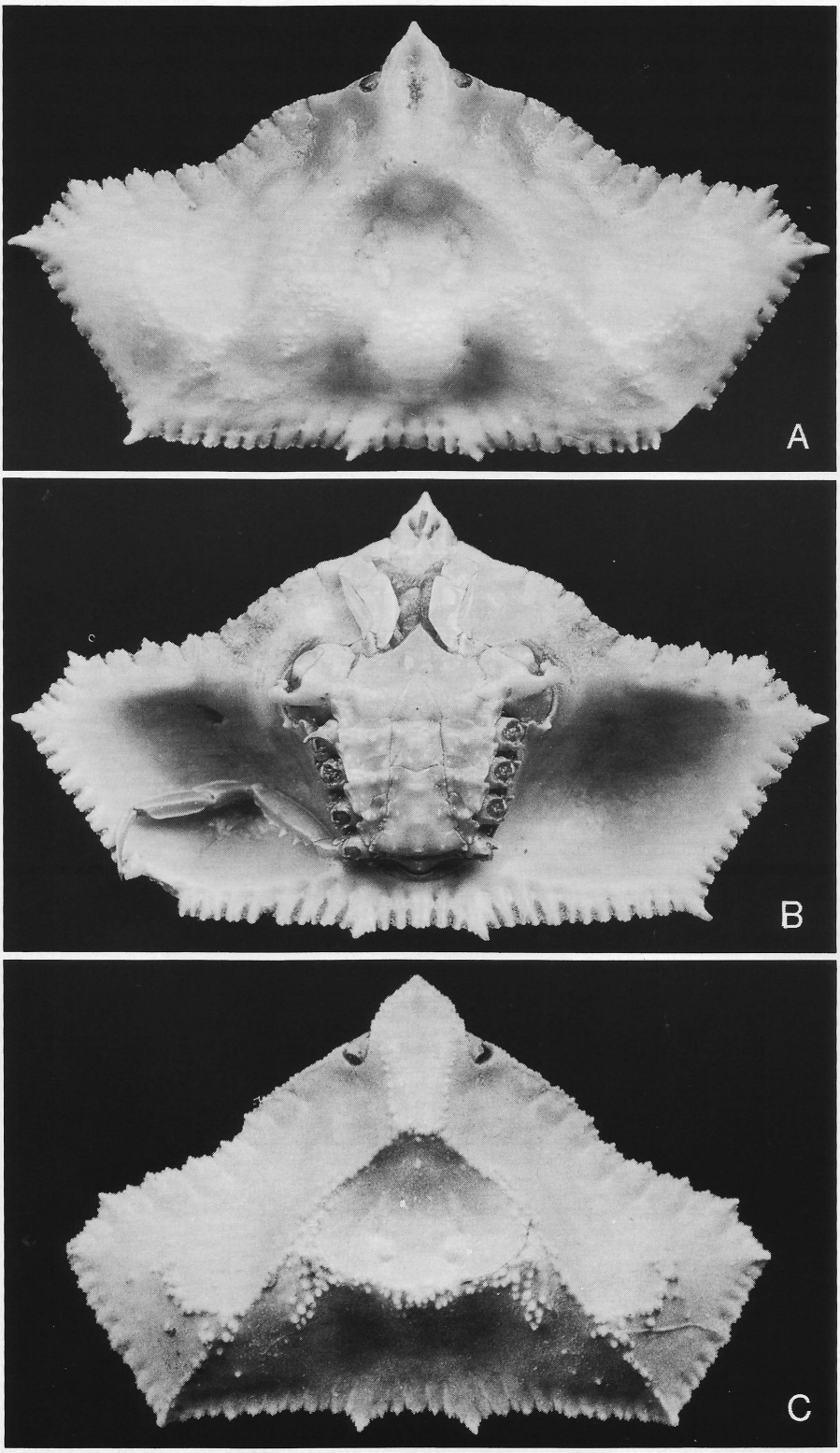

Fig. 16. A, B, *Cryptopodia angulata* H. MIlne Edwards & Lucas, 1841. Male, 49.4 by 28.6 mm (ZRC 1987.450); C, male 15.6 by 9.6 mm (ZRC 1970.1.7.4). A, C: dorsal view; B: ventral view.

and third pairs of legs carinated; upper margin of meri of last pair of legs carinated, lower margin of meri denticulated; dactylus strongly carinated on both margins, appears somewhat foliaceous.

Abdomen of male rough, elongated, narrow; sixth segment with vertical spine; telson triangular in shape. G1 S-shaped, stout basal part about 2.9 times length of slender distal part, tip tapered, bilobed; spines mainly on lobes.

Remarks. - The exact provenance of the type specimen (a male) is not known. Alcock (1895) reported specimens from Orissa and Malabar Coasts. Except for one single specimen from Malabar Coast, all are referrable to *Cry. angulata*. From the figures provided by the various reports of H. Milne Edwards & Lucas (1841), Banu & Nurul Huda (1987), Tirmizi and Kazmi (1988) and Davie & Turner (1995), the identity of their specimens are clearly *Cry. angulata*.

Among the specimens we examined which have been referred to *Cry. angulata* are actually two related species, viz. *Cry. angulata* s. str. and a new species, *Cry. echinosa*. *Cryptopodia echinosa* is very similar to *Cry. angulata* s. str. externally, but these species differ from each other in several characters, viz. the degree of elevation of branchial, cardiac and gastric regions, depth of the triangular carapace depression, degree of granulation on the dorsal surface, depth of the post-rostral region depression, carapace shape and the structure of the G1 (Table 3). The largest *Cry. echinosa* is 51.6 by 31.8 mm, whilst the largest *Cry. angulata* s. str. is 49.4 by 28.6 mm. The characters used in Table 3 are stable, independent of size and sex among the specimens examined.

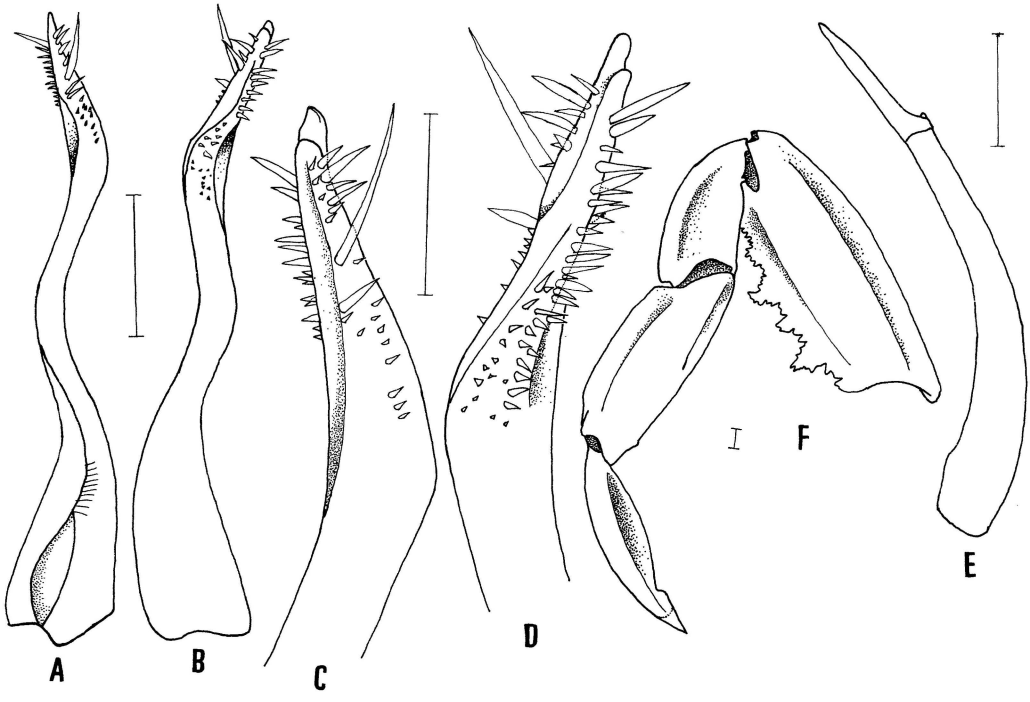

Fig. 17. *Cryptopodia angulata* H. Milne Edwards & Lucas, 1841. Male, 49.4 by 28.6 mm (ZRC 1987.450). A: dorsal view of right G1; B: ventral view of right G1; C: dorsal view distal tip of right G1; D: ventral view of distal tip of right G1; E: right G2; F: ventral view of left ambulatory leg. Scales = 1.0mm.

Alcock (1895) reported a large male from the Malabar coast as being more granular and the spinature of chelipeds more acute and granular than the rest, but no figure was provided. Chopra (1935) and Chhapgar (1957) referring to Alcock (1895) suggested that this specimen could be a new species. Based on the original description by Alcock (1895), we believe that Alcock's specimen is probably *Cry. echinosa.*

The identity of Chopra's (1935) specimens from Sandheads, India, which he identified as *Cry. angulata* cannot be ascertained since no figure was provided. Chhapgar (1957) reported a male specimen from the Gulf of Cutch and figures of the specimen and its G1 were given. From his figure of the specimen, it appears to be to *Cry. echinosa* especially in its carapace shape. However, the drawing of the G1 is too small to confirm its identity.

Alcock (1895) described *Cry. angulata* var. *cippifer* from a male specimen collected from Karachi, Pakistan. This variety differs from *Cry. angulata* in that the semi-globular carpus of the chelipeds are slightly granulated, the triangular depression of the carapace is deeper and there are six large erect spines on the ridges of this triangular depression. The figure provided by Alcock (1895: pl. 23 Fig. 4) agrees with his description very well. There are six other specimens of both sexes collected by Alcock (1895), and all are with spines but he did not state the degree of variation amongst these specimens.

Specimens reported by Banu & Nurul-Huda (1987) and Tirmizi & Kazmi (1988) from Penang (Malaysia) and Karachi (Pakistan) respectively help clarify the status of Alcock's variety *cippifer.* Their specimens were reported to vary greatly in the granulation on the carpus of their chelipeds and the depth of the triangular depression on the carapace. They have characteristics ranging from those of *Cry. angulata* s. str. to *Cry. angulata cippifer.* Some specimens have the spines on the ridges of the triangular depression replaced by sharp or blunt tubercles. However, none of them have the full complement of six spines seen in *Cry. angulata cippifer.* Our specimens of *Cry. angulata* have blunt tubercles on their ridges as well. The smallest specimen (15.6 by 9.6 mm) (ZRC 1970.1.7.4) examined by us from Indonesia agrees very well to the figure of *Cry. angulata cippifer* provided by Alcock (1895) except it lacks the six spines on the ridges. Instead, the spines are replaced by blunt tubercles.

The available evidence thus suggests that *Cry. angulata* is a highly variable species and we believe that *Cry. angulata* var. *cippifer* is no more than one extreme end of this variation. Davie & Turner (1995) felt that *Cry. angulata cippifer* could not be effectively distinguished from the nominal subspecies and synonymised the two names. We concur, and *Cry. angulata* var. *cippifer* Alcock, 1895, is here regarded as a junior synonym of *Cry. angulata* H. Milne Edwards & Lucas, 1841.

The record by Stephensen (1946) of *Cry. angulata* var. *cippifer* from the Iranian Gulf is also tentatively referred to *Cry angulata* s. str.

***Cryptopodia echinosa*, new species**

(Figs. 18-20, 21B, C)

Cryptopodia angulata - Alcock, 1895: 282 (partim) (Malabar Coast: India); Flipse, 1930: 62 (key only).

? *Cryptopodia angulata* - Chhapgar, 1957: 415, pl. 4 (Gulf of Cutch: Bombay, India).

Material examined. - Holotype - male (51.6 by 31.8 mm) (ZRC 1970.1.7.3), Madras, India, coll. R. Serène.

Paratype - 1 female (50.2 by 30.4 mm) (RMNH 32719), Port Cochin, India, from trawl, coll. J.C. Miquel, 12 Feb.1980.

Size. - The largest specimen seen is the holotype male measuring 51.6 by 31.8 mm (ZRC 1970.1.7.3).

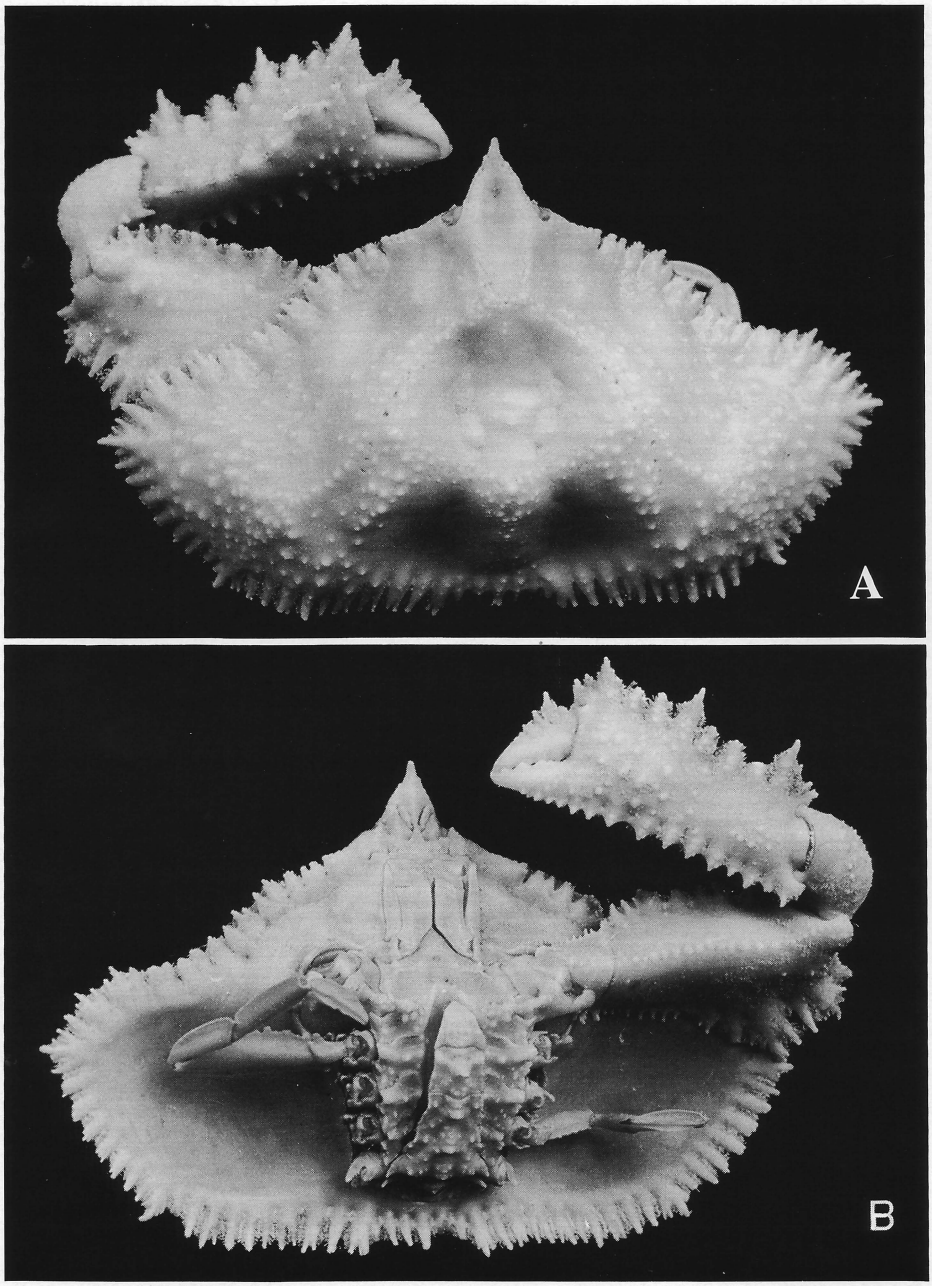

Fig. 18. *Cryptopodia echinosa*, new species. Holotype male, 51.6 by 31.8 mm (ZRC 1970.1.7.3). A: dorsal view; B: ventral view.

Description (Holotype male). - Carapace 1.6 times broader than long, pentagonal; with very large lateral expansions completely concealing ambulatory legs prolonged posteriorly beyond base of abdomen; carapace margins very deeply denticulated, teeth distinctively bifurcated. Posterior margin straight; 2 spines present on posterior margin directly in centre of carapace. Posterolateral margins convex, crenulated, posterolateral angles truncated; all angles of carapace produced into curved spines; a second spine in front of both anterolateral angles. Dorsal surfaces very granulated, ventral surfaces smooth; branchial, cardiac and gastric regions highly elevated; deep triangular depression in centre of carapace; margins surrounding depression granulated, ridge of granules running from mesobranchial to metabranchial regions. Rostrum prominent, 1.0 times broader than long, triangular, lateral margins gently convex,

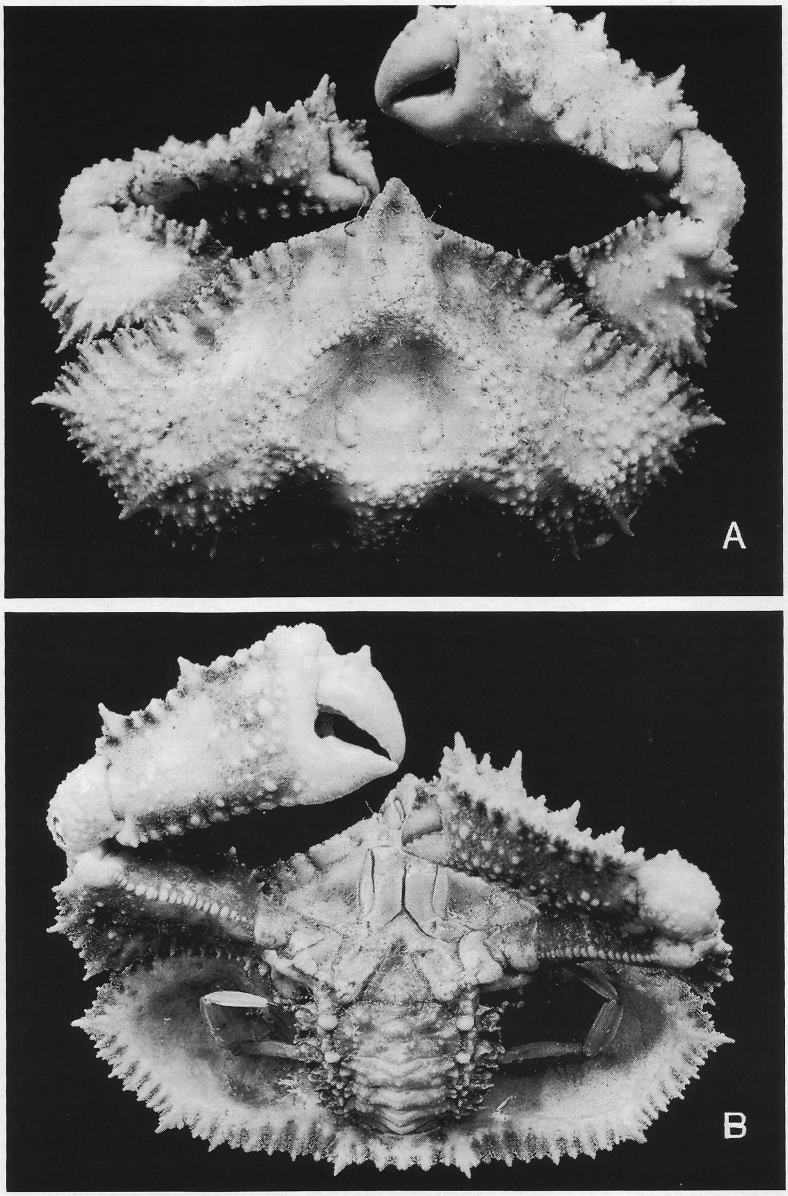

Fig. 19. *Cryptopodia echinosa*, new species. Paratype female, 50.2 by 30.4 (RMNH 32719). A: dorsal view; B: ventral view.

diverging proximally, crenulated. Post-rostral region deep. Orbits small, round, fissure on superior margin; eyes small. Lateroventral carapace concavity very deep. pterygostomial region smooth. Epistome well-developed; antennular fossae narrow, oblique, margins of fossae smooth. Antennules when folded, occupying fossae almost completely. Surfaces of third maxillipeds smooth.

Chelipeds robust, surfaces heavily granulated; length of palm longer than height, posterior expansion dilated towards distal extremity; anterior and posterior margins of dorsal facet of palm lined with numerous prominent teeth; fingers short, smooth, not crossing when fingers crossed; dorsal surfaces of of movable finger with 2-3 spines at proximal end; carpus semi-globular, heavily granulated; merus flat with wing-like expansion at distal end, upper and lower margins denticulated; upper margins of meri with 2 prominent teeth; row of granules running length separating anterior and posterior facets of merus.

Ambulatory legs slender, smooth, first pair longest; upper margins of meri of first pair of leg denticulated, lower margin of meri carinated; upper and lower margins of meri of second and third pairs of legs carinated; upper margin of meri of last pair of legs carinated, lower margin of meri denticulated; dactylus strongly carinated on both margins, somewhat foliaceous.

Abdomen of male rough, elongated, narrow; sixth segment with a upright spine; telson triangular shape. G1 S-shaped, stout basal part about 4.7 times length of slender distal part, tip more tapered, bilobed; spines mainly on lobes.

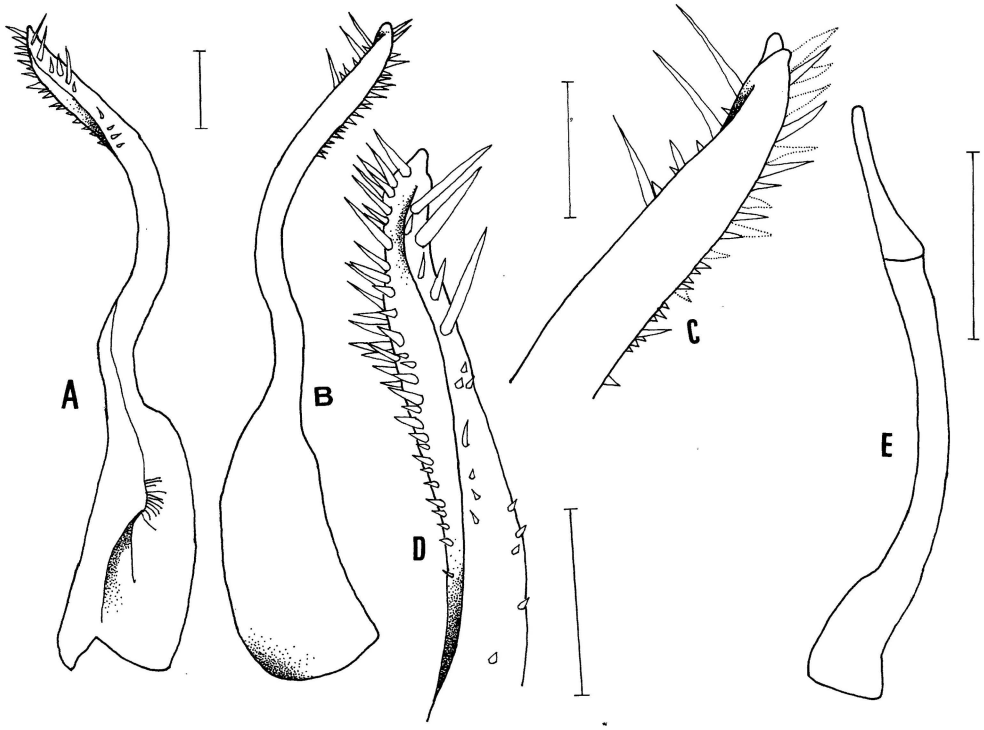

Fig. 20. *Cryptopodia echinosa*, new species. Holotype male, 51.6 by 31.8 mm (ZRC 1970.1.7.3). A: dorsal view of right G1; B: ventral view of right G1; C: ventral view of distal tip of right G1; D: dorsal view of distal tip of right G1; E: right G1. Scales = 1.0mm.

Females - The female paratype (Fig. 19) is more granulated and more swollen than the male holotype (Fig. 18). Due to the limitation of specimen numbers, we cannot verify if sexual dimorphism is present in this species.

Remarks. **-** The differences between *Cry. angulata* s. str. and *Cry. echinosa*, new species, have been discussed earlier (see Table 3). There is a slight variation in the degree of granulation on the dorsal surfaces of the carapace and chelipeds, and also in the degree of elevation of the branchial, cardiac and gastric regions between the two specimens of *Cry. echinosa* examined. On the whole, *Cry. echinosa* is a more granulated and swollen (higher elevation of branchial, gastric and cardiac regions) species as compared to *Cry. angulata*. The most granulated and swollen specimen of *Cry. angulata* (ZRC 1987.450) does not even come close to the condition in *Cry. echinosa*.

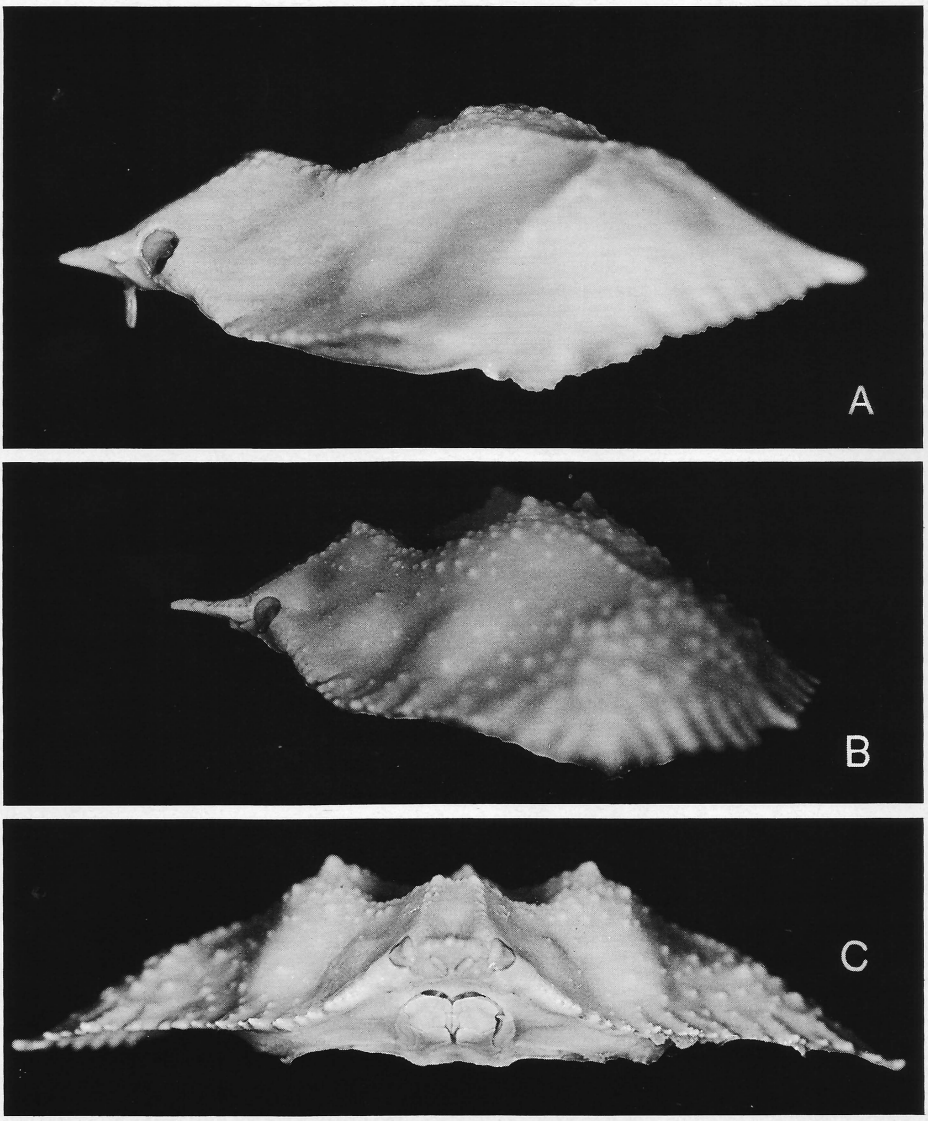

Fig. 21. A, *Cryptopodia angulata* H. Milne Edwards & Lucas, 1841. Male, 49.4 by 28.6 mm (ZRC 1987.450); B, C, *Cry. echinosa*, new species, holotype male, 51.6 by 31.8 mm (ZRC 1970.1.7.3).

Table 3. Differences between *Cry. angulata* s. str. and *Cry. echinosa*, new species

Characters	*Cry. angulata* s. str.	*Cry. echinosa*, new species
Branchial, cardiac and gastric regions	Not strongly inflated (Figs. 16A, 21A)	Strongly inflated (Figs. 18A, 19A, 21B, C)
Triangular depression on carapace	Less depressed (Fig. 16A)	More depressed; spines on ridges (Figs. 18A, 19A)
Degree of granulation of dorsal surface	Less granulated (Fig. 16A)	More granulated (Figs. 18A, 19A)
Postrostral region	Shallow (Fig. 16A)	Deep (Figs. 18A, 19A)
Carapace shape	Shapely pentagonal (Fig. 16A)	More triangular (Figs. 18A, 19A)
G1	Basal part less broad; basal part about 2.9 times length of slender of distal part; distal part more tapered, tip bilobed, less spines located at distal part (Fig. 17A-D)	Basal part broader; basal part about 4.7 times length of slender distal part, tip bilobed, with more spines at distal part (Fig. 20A-C)

Cryptopodia collifer Flipse, 1930
(Fig. 22)

Cryptopodia collifer Flipse, 1930: 66-67, Fig. 41 (between Womoni and Nuton Islands); Shen et al., 1982: 144, pl. I: 8 (southern China); Dai et al., 1986: 160, Pl. 21(8), Fig. 91 (no new record); Dai & Yang, 1991: 176, Pl. 21(8), Fig. 91 (no new record).

Material examined. - Holotype - female (14.0 by 9.3 mm) (ZMA), between the Womoni and Nuton Islands, Stn. 204, 4°20'S, 122°58'E, 75-94m, coll. Siboga Expedition.

Description (holotype female). - Carapace 1.6 times broader than long, triangular; with large lateral expansions completely concealing ambulatory legs and prolonged posteriorly beyond base of abdomen. Anterolateral and posterior margins subequal in length to each other. Posterolateral margins convex, crenulated, posterolateral angles truncated; anterolateral margin straight, denticulated; posterior margins nearly straight, crenulated. Dorsal and ventral surfaces smooth; branchial, cardiac and gastric regions elevated; shallow triangular depression in centre of carapace. Slight granulation on gastric region, branchial and cardiac regions more granulated; margins surrounding depression granulated, ridge of granules running from mesobranchial to metabranchial regions absent. Rostrum prominent, 1.9 times broader than long, triangular, lateral margins straight, diverging proximally, crenulated. Post-rostral region depressed. Orbits small, round, suture on superior margin; eyes small. Lateroventral carapace concavity deep. pterygostomial region granulated. Epistome well-developed; antennular fossae narrow, oblique, margins of fossae smooth. Antennules when folded, occupying fossae almost completely. Surfaces of third maxillipeds granulated.

Chelipeds robust, surfaces smooth except slight granulation on dorsal and anterior facets of palm; length of palm longer than height, posterior expansion dilated towards distal extremity; anterior and posterior margins of dorsal facet of palm tuberculated; fingers short, smooth, not crossing when fingers crossed; dorsal surfaces of of movable finger with 1 spine at proximal end; carpus small; dorsal and ventral surfaces of merus granulated, flat, with wing-like expansion at distal end, upper and lower margins denticulated; a row of ganules running whole length separating anterior and posterior facets of merus.

All ambulatory legs detached and missing.

Abdomen elongated, narrow, telson semi-circular shape.

Males - Males of this species have not been reliably reported as yet.

Remarks. - Flipse (1930) described *Cry. collifer* from a single female specimen. Flipse (1930) commented that the dactylus of the ambulatory legs of *Cry. collifer* is compressed but no figure was given. Upon examination of the holotype, the ambulatory legs were found to be

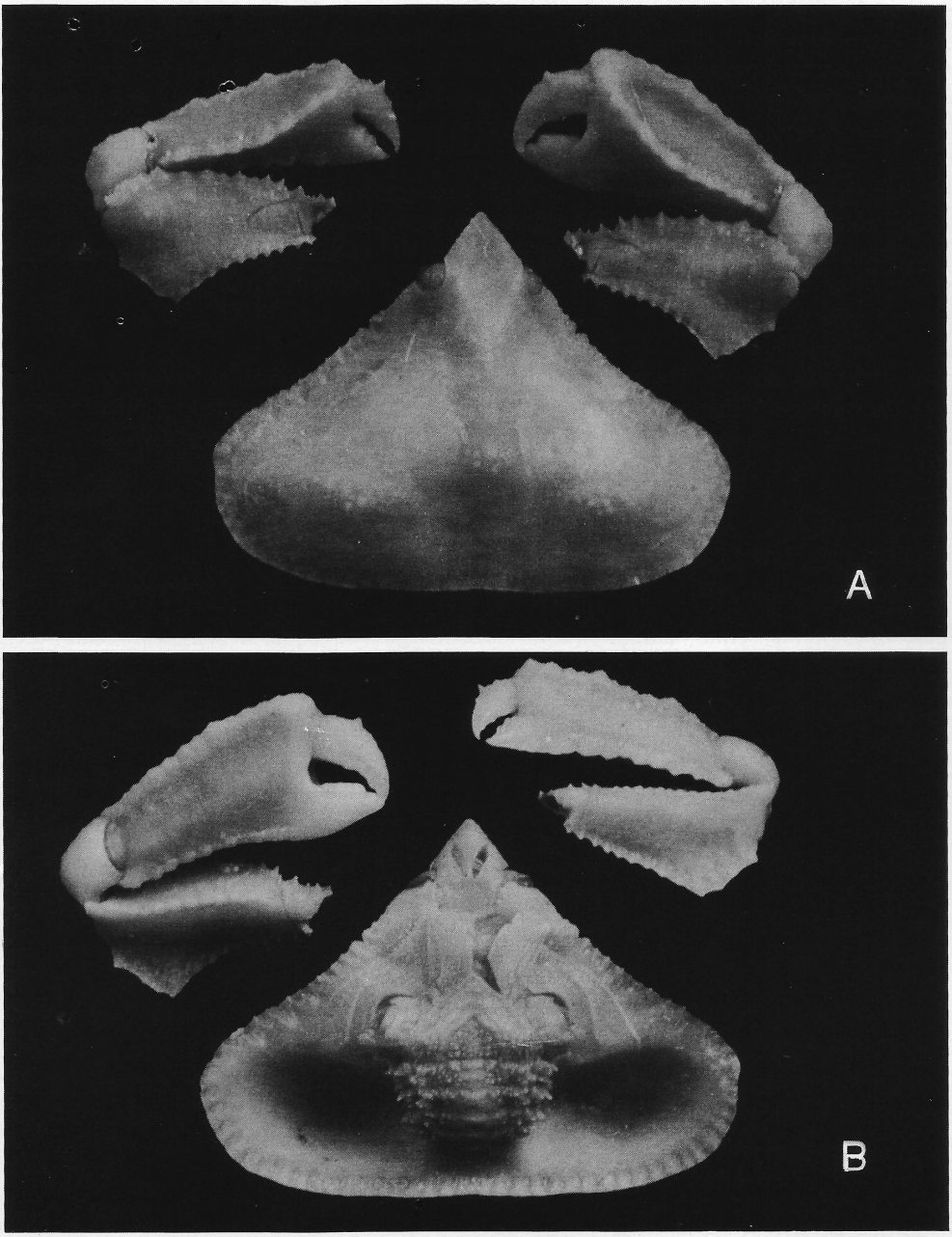

Fig. 22. *Cryptopodia collifer* Flipse, 1930. holotype female, 14.0 by 9.3 mm (ZMA). A: dorsal view; B: ventral view.

missing. We were unable to assess the validity of this character. In all other respects, however, the holotype agrees well with Flipse's description (1930).

The telson of the female abdomen seems to be different from the other *Cryptopodia* species. The telson of *Cry. collifer* is semi-circular in shape whereas those of females of other species (both adult and juvenile) are triangular in shape, approaching those of males. The abdomen of *Cry. collifer* appears to be elongated and narrow. But because there is only one specimen available, we cannot ascertain if there will be an increase in abdominal width with growth as in other parthenopids (Gore & Scotto, 1983).

Shen et al. (1982) identified a female specimen collected in China Seas as *Cry. collifer*. The figures of this specimen given by Shen et al. (1982) appear very similar to the holotype in terms of the carapace and abdomen shapes. However, the rostrum of the holotype is more triangular, with very straight lateral margins and diverging proximally. Unlike the holotype, the rostrum of Shen's specimen has its lateral margins gently convex. Due to scarcity of material, we can only attribute these differences as intraspecific variation, albeit with doubts.

Cryptopodia pan Laurie, 1906
(Figs. 23, 24)

Cryptopodia pan Laurie, 1906: 392, pl.1, Fig. 6, text-Fig. 4 (Gulf of Manaar: west of Periya Paar: India); Rathbun, 1911: 259 (list only); Flipse, 1930: 62-68 (key only); Tan & Richer de Forges, 1993: 131, Figs. 6E, F; Davie & Turner, 1995: 453, Figs. 1A, B; 4A, B (North West Shelf: Australia)
Cryptopodia sinica Chen & Xu, 1991: 82, 105, Figs. 26-27 (Nansha Islands = Spratly Islands)

Material examined. - Holotype - female (31.8 by 22.4 mm) (NHM 1907.5.22.192), coral reefs, Gulf of Manaar, west of Periya Paar, Ceylon (= Sri Lanka), coll. W. A. Herdman.

Paratypes - 2 females (24.8 by 18.2 mm, 17.6 by 13.3 mm) (NHM 1934.1.16.63.64), west of Periya Paar, Ceylon (= Sri Lanka), 31-44m, coll. W. A. Herdman.

Others - **MACCLESFIELD BANK**: 1 male (21.8 by 15.3 mm) (NHM 1892.8.28.334), coll. H.M.S. 'Penguin'. — 1 female (32.7 by 22.8 mm) (NHM 1892.8.28.330), 23.4m, coll. H.M.S. 'Penguin'. **NEW CALEDONIA**: 1 male (13.9 by 10.7 mm), Navire Alis, Stn DW 7774, coll. O.R.S.T.O.M., 31 Oct.1989. **SEYCHELLES**: 1 female (22.3 by 15.2 mm) (RMNH 42933), Southwest of La Digue Island, 4023'S-55049'E, rectangular dredge, 30m, Stn 734, coll. NIOP-E "Tyro" Seychelles Expedition 1992/3, 23 Dec.1992. — 1 male (8.2 by 6.9 mm) (MNHN), Stn. 38, 13/09, coll. O.R.S.T.O.M-Seychelles 1980-Reves 2. — 1 male (17.1 by 12.1 mm) (ZRC), 4°5'0S 56°37'7E, Stn. 39, 50m, 13/09, coll. O.R.S.T.O.M-Seychelles 1980-Reves 2. — 1 male (16.5 by 12.1 mm) (MNHN), Stn. 60, 19/09, coll. O.R.S.T.O.M-Seychelles 1980-Reves 2.

Size. - The largest specimen seen is a female measuring 32.7 by 22.8 mm (NHM 1892.8.28.330).

Description (holotype female). - Carapace 1.4 times broader than long, triangular; with very large lateral expansions completely concealing ambulatory legs, prolonged posteriorly beyond base of abdomen. anterolateral and posterior margins are subequal in length to each other. Posterolateral margins convex, crenulated, posterolateral angles truncated; anterolateral margin straight, denticulated; posterior margins nearly straight, crenulated. Dorsal and ventral surfaces heavily granulated; branchial, cardiac and gastric regions elevated, cardiac region slightly pitted; shallow triangular depression in centre of carapace; ridge of granules running from mesobranchial to metabranchial regions absent. Rostrum prominent, 1.9 times broader

than long, triangular, lateral margins gently convex, diverging proximally, crenulated. Post-rostral region depressed. Orbits small, round, fissure on superior margin; eyes small. Lateroventral carapace concavity deep. pterygostomial region granulated. Epistome well-developed; antennular fossae narrow and oblique, margins of fossae smooth. Antennules when folded, occupying fossae almost completely. Third maxillipeds form a bulge; thickening of ischium, outer two-thirds thickened, inner one-third granulated; merus granulated at proximal portion, distal protion smooth; most of exopodite concealed by ischium.

Chelipeds robust, surfaces smooth except slight granulation on dorsal and anterior facets of palm; length of palm longer than height, posterior expansion dilated towards distal extremity; anterior and posterior margins of dorsal facet of palm denticulated, anterior margin with 6 prominent blunt teeth; fingers short, smooth, not crossing when fingers crossed; dorsal surfaces of of movable finger with 2-3 spines at proximal end; carpus small; dorsal and ventral surfaces of merus granulated, flat, with wing-like expansion at distal end, upper and lower margins denticulated; a row of granules running whole length separating anterior and posterior facets of merus.

Abdomen rough, sixth segment wider than others; telson triangular.

Males - The abdomen of a male specimen (NHM 1892.8.28.334) is elongated and narrow; wiht segments 3-5 fused, the telson being triangular shape. G1 S-shaped; stout basal about 0.7 times length of slender distal part; tip taper, spines at the distal tip.

Remarks. - *Cryptopodia pan* was described from a female holotype collected by Laurie (1906) in the Gulf of Manaar, Ceylon. He also recorded two paratypes (one young female and one young male) collected from the same locality. We have examined the types and found that the paratypes are in fact two young females. The male characters featured here are based on male specimens from the Seychelles.

Chen & Xu (1991) described a new species, *Cry. sinica*, from the Nansha Islands (= Spratlys), China. From the description and figures given, the specimen closely resembles the holotype of *Cry. pan* especially in the structure of the swollen third maxillipeds and G1. Therefore, *Cry. sinica* Chen & Xu, 1991, is here regarded as a junior subjective synonym of *Cry. pan* Laurie, 1906.

Davie & Turner (1995) reported many of their specimens as having the granulation on the third maxillipeds slightly different from the description of Laurie (1906). Their specimens have their ischium of the third maxillipeds completely granulated and a few of them have the outer two-third of the granules coalesced. Examination of the holotype and other present specimens do not show much variation. The G1 of the specimen figured by Davie & Turner's (1995), however, is identical to those illustrated here and we regard all the specimens as conspecific. The differences observed in the mouthparts are here regarded as infraspecific variations.

There are other variations amongst the specimens examined, viz. 1) in the degree of elevation of the branchial, cardiac and gastric regions; 2) depth of the ventral carapace and post-rostral region depression; and 3) the degree of granulation on the dorsal and ventral surfaces of the carapace. A smaller male specimen (21.8 by 15.3 mm) (NHM 1892.8.28.334) has a higher degree elevation of branchial, cardiac and gastric regions compared to the larger female paratype (24.8 by 18.2 mm) (NHM 1934.1.16.63.64). One female specimen (NHM

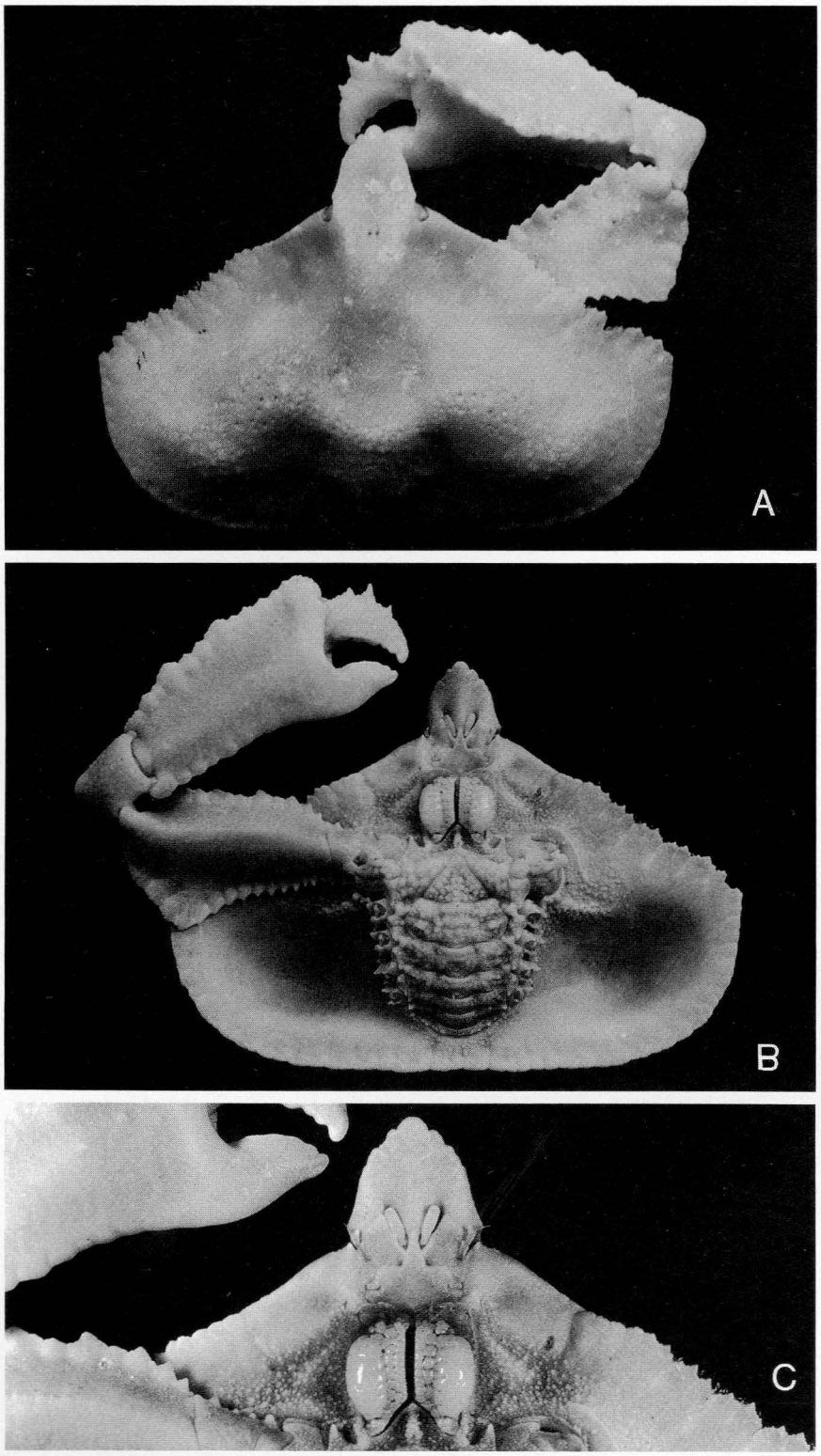

Fig. 23. *Cryptopodia pan* Laurie, 1906. Holotype female, 31.8 by 22.4 mm (NHM 1907.5.22.192). A: dorsal view; B: ventral view; C: swollen external third maxillipeds.

1892.8.28.330) is also distinctively more granulated than the holotype. The variations seem to be independent of size and sex.

The G1s of the five male specimens examined also showed variations. Three G1s are S-shaped (Figs. 24A, B, I-L) whereas that of one specimen (13.9 by 10.7 mm) is C-shaped (Figs. 24G, H). We believe that this difference could be age-dependent because the specimens with the S-shaped G1s are larger, being of similar size (21.8 by 15.3 mm, 16.5 by 12.1 mm and 17.1 by 12.1 mm).

There is one young male specimen measuring 8.2 by 6.9 mm (MNHN) collected from Seychelles which is rather unusual. In the shape and granulation of the ischium of its third maxilliped and the carapace shape, it falls within the current understanding of *Cry. pan.* However, there are several differences, viz.: 1) the ischium of the third maxillipeds is not as swollen, just slightly granulated but still more swollen than other species in the genus such as *Cry. fornicata*; 2) the sub-orbital margin is smooth and without spines, which are present in the other specimens; 3) the ventral depression is distinctively more shallow than other specimens examined; 4) the margins of the ambulatory legs are smooth without any longitudinal carinae which are present in other specimens; and 5) the G1 (Fig. 24M) is stout

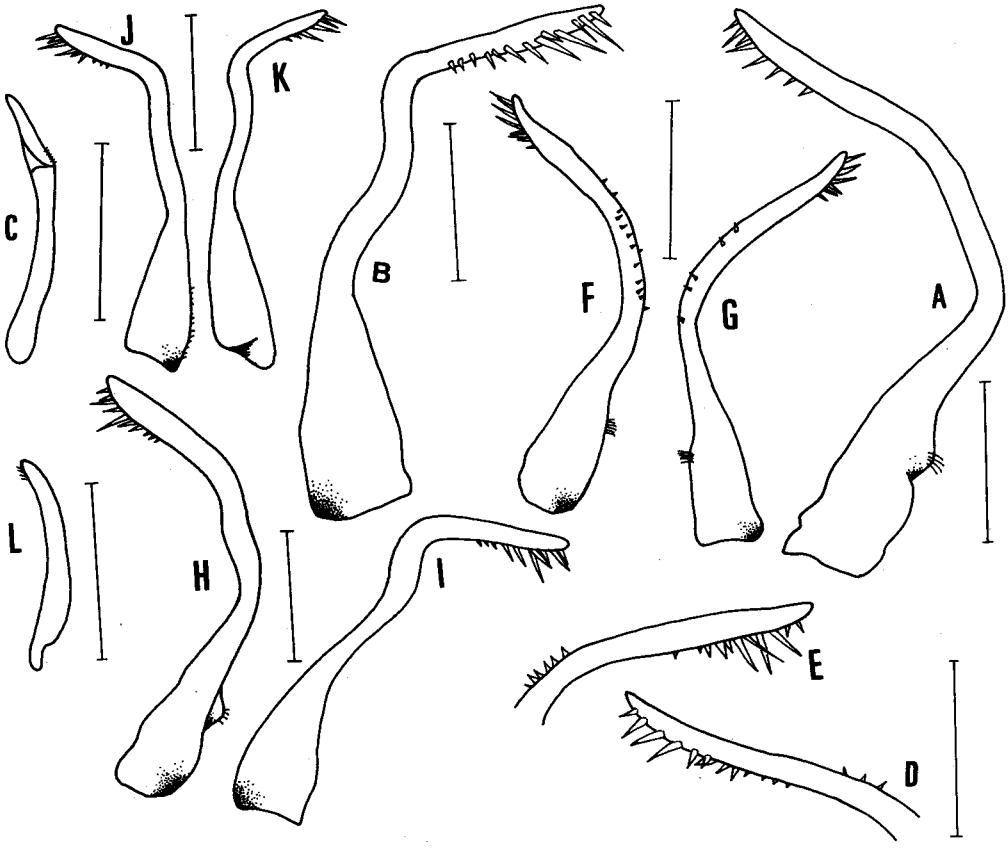

Fig. 24. *Cryptopodia pan* Laurie, 1906. A-C, male, 21.8 by 15.3 mm (NHM 1892.8.28.334); D, E, male, 13.9 by 10.7 mm (MNHN); F, G, male, 21.8 by 15.3 mm (NHM 1892.8.28.334); H, I, male, 17.1 by 12.1 mm (MNHN); J, K, male, 16.5 by 12.1 mm (MNHN); L, juvenile male, 8.2 by 6.9 mm (MNHN). A, D, F, H, J, L: dorsal view of right G1; B, E, G, I, K: ventral view of right G1; C: right G2. Scales = 1.0mm.

whereas the other G1s are slender and curved. It might well be a separate species, but considering that it is a juvenile and only one specimen is available, we feel that it is better to identify it with *Cry. pan* for the time being.

Cryptopodia spatulifrons Miers, 1879
(Figs. 25, 26, 28B)

Cryptopodia spatulifrons Miers, 1879: 26, pl. 5, Fig. 10 (Shark Bay: Western Australia); Ortmann, 1894: 48 (list only); Flipse, 1930: 63, 78, 82 (key only); Serène, 1968: 62 (list only); Jones, 1990: 194 (Shark Bay: Western Australia); Chiong & Ng, 1994: 949-959 (no new record); Davie & Turner, 1995: 461 (no new record).

? *Cryptopodia spatulifrons* - Haswell, 1879: 454 (Port Jackson: Australia); Haswell, 1882: 37 (no new record)

Cryptopodia spatulifrons var. *laevimana* - Miers, 1884: 203-204 (part), (Thursday Island: Torres Strait: Australia)

Material examined. - Holotype - 1 male (48.8 by 31.3 mm) (NHM 1858.172), Shark Bay, West Australia, coll. H.M.S. 'Herald', 1879.

Others. - 1 female (27.1 by 19.9 mm) (NHM 1882.7), Thursday Island, Torres Strait, Australia, coll. Coppinger, 1884.

Description (holotype male)**:** - Carapace 1.6 times broader than long, pentagonal; with very large lateral expansions completely concealing ambulatory legs and prolonged posteriorly beyond base of abdomen. Posterolateral margins convex, crenulated, posterolateral angles truncated; anterolateral margin denticulated; posterior margins nearly straight, crenulated. Dorsal and ventral surfaces granulated, pitted; granules larger and denser on branchial and cardiac regions, and on lower surfaces of palm; branchial, cardiac and gastric regions elevated; deep triangular depression in centre of carapace; margins surrounding depression granulated, ridge of granules running from mesobranchial to metabranchial regions. Rostrum prominent, 1.0 times broader than long, triangular, lateral margins gently convex, diverging proximally, crenulated. Post-rostral region relatively flat. Orbits small, round, a suture on superior margin; eyes small. Lateroventral carapace concavity shallow. pterygostomial region strongly pitted, eroded. Epistome well-developed; antennular fossae narrow, oblique, margins of fossae smooth. Antennules when folded, occupying fossae almost completely. Surfaces of third maxillipeds pitted.

Chelipeds robust, surfaces strongly granulated, pitted, especially on outer surface of palm; length of palm longer than height, posterior expansion dilated towards distal extremity; anterior and posterior margins of dorsal facet of palm denticulated, anterior margin with 5 prominent teeth; fingers short, smooth, not crossing when fingers crossed; dorsal surfaces of movable finger with 2-3 spines at proximal end; carpus small; merus flat, with wing-like expansion at distal end, upper and lower margins denticulated; row of granules running whole length separating anterior and posterior facets of merus.

Ambulatory legs slender, smooth, first pair longest; upper and lower margins of meri with 1-2 rows of longitudinal carinae; dactylus nearly straight without setae.

Abdomen of male rough, elongated, narrow; telson triangular. G1 with stout basal part about 2.5 times length of slender distal part, tip bulbous, with 2 subequal lobes; subdistal surfaces with scattered spines.

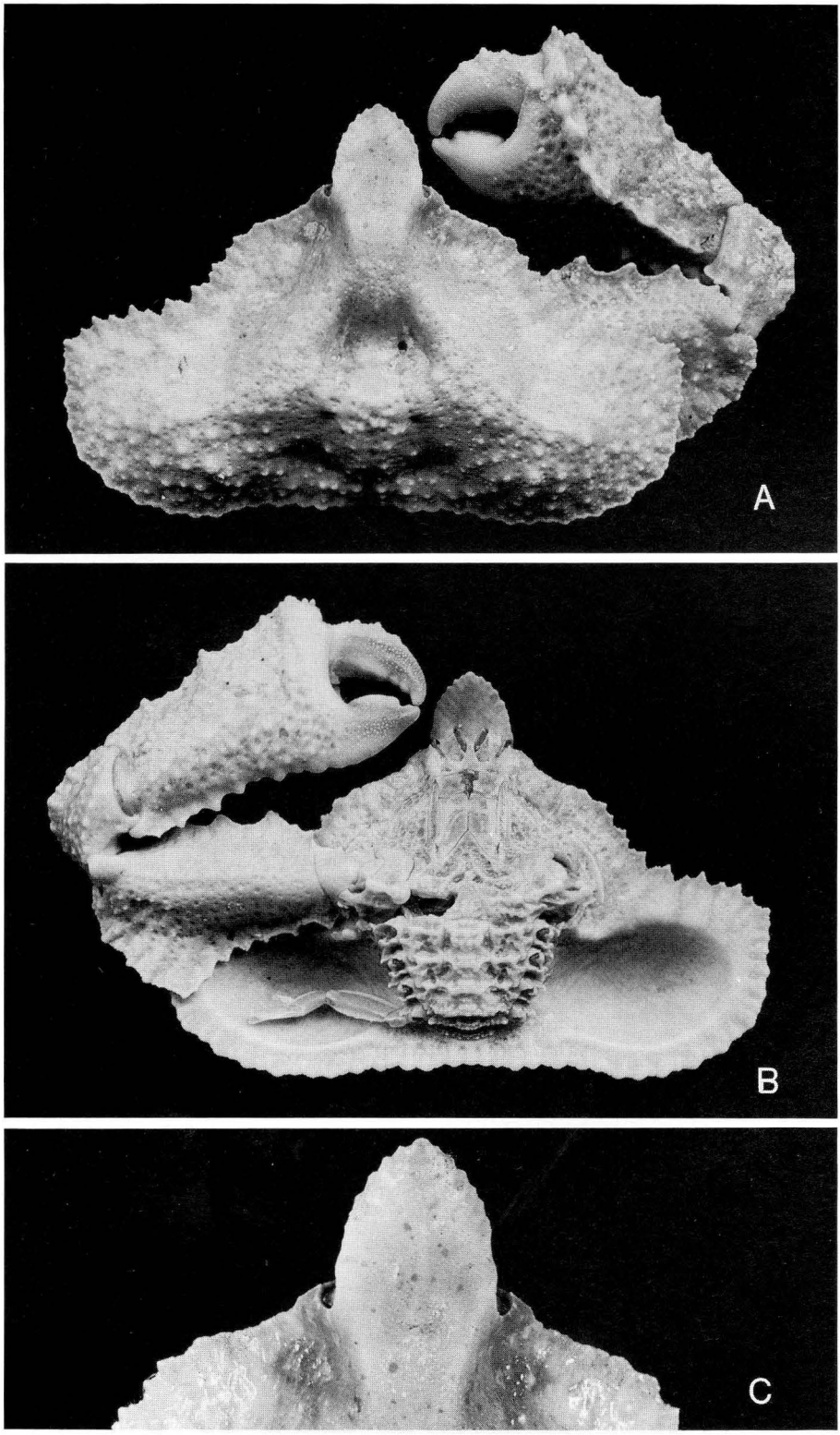

Fig. 25. *Cryptopodia spatulifrons* Miers, 1879. Holotype male, 48.8 by 31.3 mm (NHM 1858.172). **A**: dorsal view; **B**: ventral view; **C**: rostrum.

Remarks. - *Cryptopodia spatulifrons* was briefly described from a single male specimen collected from Shark Bay, Western Australia. The taxonomy of this species (and its confusion with *Cry. fistulosa*) has been treated in detail by Chiong & Ng (1994).

Miers (1879: 27) had also described a variety of *Cry. spatulifrons*, var. *laevimana*, on the basis of two specimens from the coast of Borneo and an unknown locality. Miers (1884: 203-204) subsequently reported two male specimens of *Cry. spatulifrons* from Thursday Island and Prince of Wales Channel, Australia. The smaller specimen from the Prince of Wales Channel was identified as *Cry. spatulifrons* var. *laevimana*, while the larger specimen from Thursday Island was referred to *Cry. spatulifrons* s. str. Haswell (1879: 454) reported a specimen of *Cry. spatulifrons* with numerous circular brown spots on its surface but as no figure was provided, it cannot be ascertained that it was really this species or in fact *Cry. queenslandi*.

Chiong & Ng (1994) have examined all Miers' specimens, as well as a good series of specimens in the NHM, MNHN and QM which had been identified to *Cry. spatulifrons* or *Cry. spatulifrons* var. *laevimana*. Chiong & Ng (1994) considered *Cry. spatulifrons* var. *laevimana* to be a good species, differing from *Cry. spatulifrons* s. str. in many characters (see *Cry. spatulifrons* var. *laevimana*). *Cryptopodia laevimana* is also a wholly Southeast Asia taxon. Chiong & Ng (1994) referred most Australian specimens previously referred to *Cry. spatulifrons* and *Cry. spatulifrons* var. *laevimana* to *Cry. fistulosa* Chiong & Ng, 1994, instead. The differences between *Cry. spatulifrons*, *Cry. laevimana* and *Cry. fistulosa* are detailed in Tables 4 and 5.

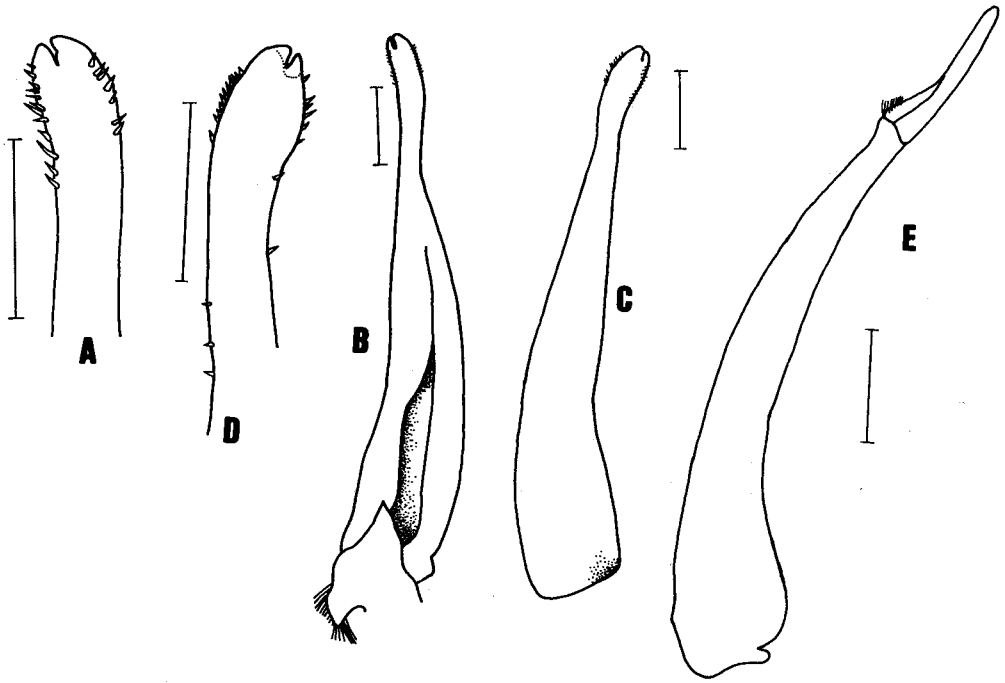

Fig. 26. *Cryptopodia spatulifrons* Miers, 1879. Holotype male, 48.8 by 31.3 mm (NHM 1858.172). A: dorsal view of distal tip of right G1; B: dorsal view of right G1; C, ventral view of right G1; D, ventral view of distal tip of right G1; E: right G2. Scales = 1.0mm.

Cryptopodia fistulosa Chiong & Ng, 1994

(Figs. 27, 28A, 29)

Cryptopodia fistulosa Chiong & Ng, 1994: 949-959 (Shark: Bay, Western Australia); Davie & Turner, 1995: 461, Figs. 1G, H; 8A, B) (Northwest Shelf: Australia).
Cryptopodia spatulifrons - Miers, 1884: 203-204 (partim) (Thursday Island, Torres Strait: Australia).

Material examined. - Holotype - male (55.6 by 34.6 mm) (MNHN B8563), near areas of 8th passage of Shark Bay, western Australia, coll. R.W. George on 'Davena', 14 May 1960.

Paratypes - 2 males (36.3 by 24.0 mm, 45.2 by 28.9 mm) (NHM 1932.11.30.97.98), Roebuck Bay, northwest Australia, Western Australia. — 1 male (16.1 by 11.3 mm) (QM W18994), northwest Shelf, Western Australia, 20°00.2'S 117°00.5'E, epibenthic sledge, 52m, station 04B17S, coll. CSIRO, R.V. 'Soela', 4 Sep.1983. — 1 male (33.3 mm by 21.3 mm) (QM W18980), North West Shelf, western Australia, 19°28.4'S 118°55.2'E, trawled, 39m, Station 04B09BT, coll. CSIRO, R.V. 'Soela', 31 Aug.1983. — 1 male (37.0 by 23.3 mm) (MNHN B8558), between Onslow and Point Samson, North West Australia, Honolulu dredge, coll. B.R. Wilson on R.V.'Davena', Jun.1960. — 1 male (25.5 by 17.7 mm) (MNHN B8553), West of Gordon Bay, North West Australia, 37m, corals and sponge, coll. R.W. George on R.V.'Dorothea', 14 Oct.1962.

Others — 1 female (23.8 by 16.1 mm) (QM W18995), northwest Shelf, Western Australia, 19°55.2'S 117°56.0'E, trawled, 40m, station 05B03BT, coll. Commonwealth Scientific and Industrial Research Organisation (CISRO), R.V. 'Soela', 26 Oct.1983. — 1 female (52.1 by 35.7 mm) (NHM 1882.7), Thursday Island, Torres Strait, Australia. — 1 female (49.5 by 34.3 mm) (MNHN B8548), Shark Bay, Western Australia, trawled, coll. Non Pode on R.V.'Bluefin', 1 Sep.1963. — 1 female (46.4 by 30.5 mm) (MNHN B8561), Maho's Landing, northwestern Australia, Western Australia, Honolulu dredge, 18m, weed, sand, coll. Royce on R.V.'Davena', 20 May 1960.

Description (holotype male). - Carapace 1.6 times broader than long, pentagonal; with very large lateral expansions completely concealing ambulatory legs, prolonged posteriorly beyond base of abdomen. Posterolateral margins convex, crenulated, posterolateral angles truncated; anterolateral margin denticulated; posterior margins nearly straight, crenulated. Dorsal and ventral surfaces granulated, pitted; granules larger, denser on branchial and cardiac regions, and on lower surfaces of palm; branchial, cardiac and gastric regions highly elevated; deep triangular depression in centre of carapace; margins surrounding depression granulated, ridge of granules running from mesobranchial to metabranchial regions. Rostrum prominent, 1.0 times broader than long, lateral margins subparallel proximally, crenulated. Post-rostral region deep. Orbits small, round, fissure on superior margin; eyes small. Lateroventral carapace concavity very deep. pterygostomial strongly pitted, eroded. Epistome well-developed; antennular fossae narrow, oblique, margins of fossae smooth. Antennules when folded, occupying fossae almost completely. Surfaces of third maxillipeds pitted.

Chelipeds robust, surfaces strongly granulated, pitted especially on outer surface of palm; length of palm longer than height, posterior expansion dilated towards distal extremity; anterior and posterior margins of dorsal facet of palm denticulated, anterior margin with 6 prominent teeth; fingers short, smooth, not crossing when fingers crossed; dorsal surfaces of movable finger with 2-3 spines at proximal end; carpus small; merus flat with wing-like expansion at distal end, upper and lower margins denticulated; row of granules running whole length separating anterior and posterior facets of merus.

Ambulatory legs slender, smooth, first pair longest; upper and lower margins of meri with 1-2 rows of longitudinal carinae; dactylus nearly straight without setae.

Abdomen of male rough, elongated; telson triangular shape. G1 with stout basal part about

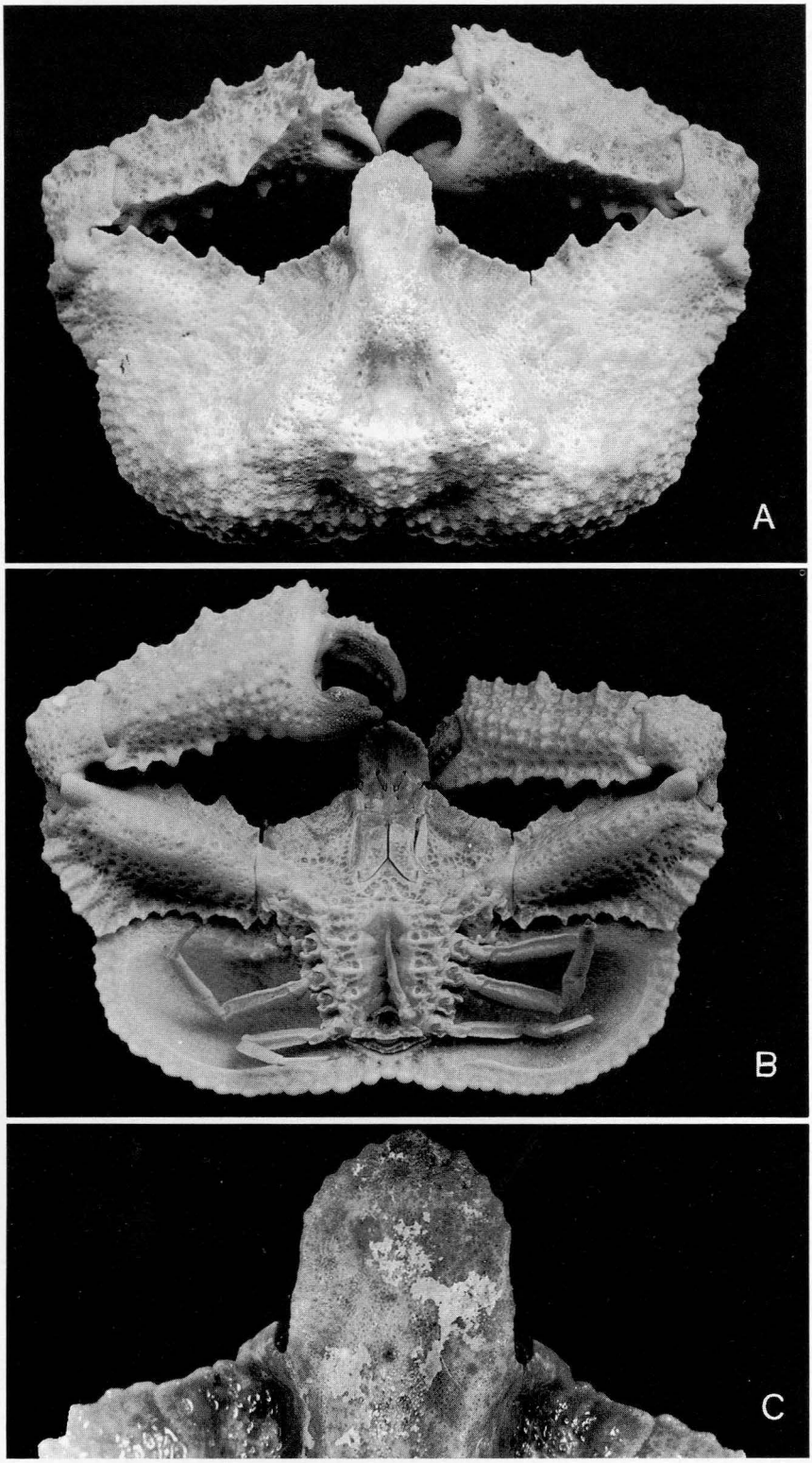

Fig. 27. *Cryptopodiella fistulosa* Chiong & Ng, 1994. Holotype male, 55.6 by 34.6 mm (MNHN B8563). A: dorsal view; B: ventral view; C: rostrum.

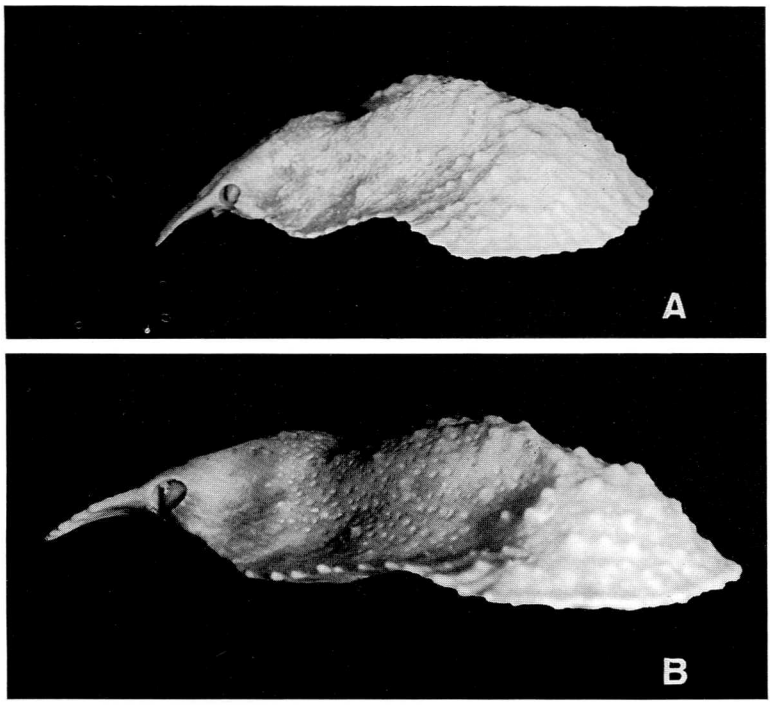

Fig. 28. Side views of carapaces. A, *Cryptopodia fistulosa* Chiong & Ng, 1994, holotype male, 55.6 by 34.6 mm (MNHN B8563); B, *Cry. spatulifrons* Miers, 1879, holotype male, 48.8 by 31.3 mm (NHM 1858.172).

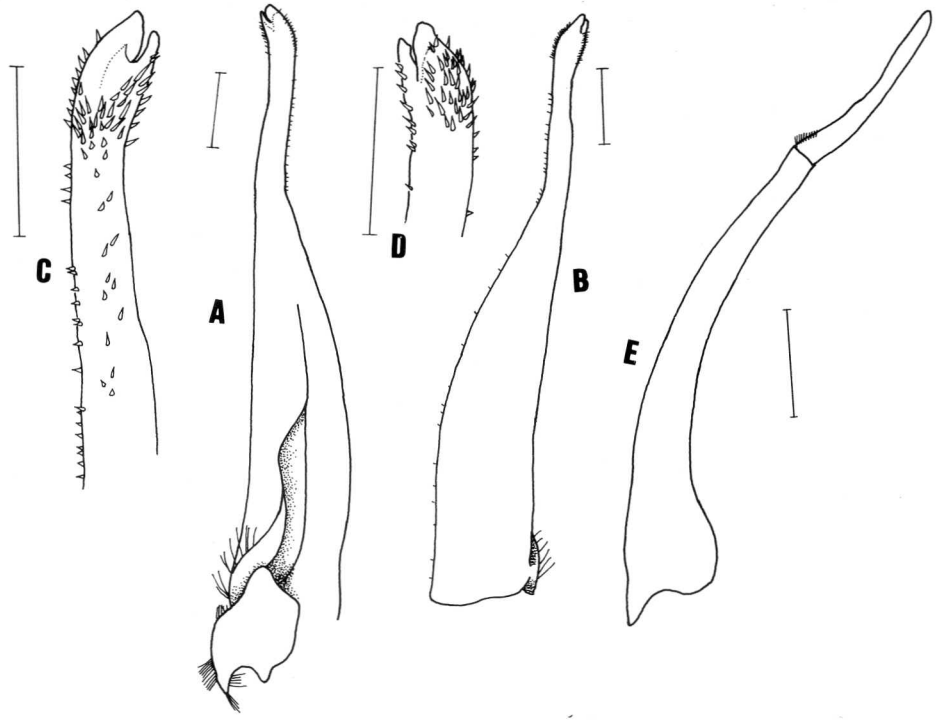

Fig. 29. *Cryptopodia fistulosa* Chiong & Ng, 1994. Holotype male, 55.6 by 34.6 mm (MNHN B8563). A: dorsal view of right G1; B: ventral view of right G1; C: ventral view of distal tip of right G1; D: dorsal view of distal tip of right G1; E: right G2. Scales = 1.0mm.

2.0 times length of slender distal part, tip tapering, with 2 subequal lobes, inner lobe distinctly larger; subdistal surfaces with numerous spines.

Females - Female specimens agree with the males in all key non-sexual characters.

Remarks. - The taxonomy of this species has been discussed in some depth by Chiong & Ng (1994) (see also *Cry. spatulifrons*). *Cryptopodia fistulosa* and *Cry. spatulifrons* can be differentiated by their 1) carapace surface; 2) degree of elevation of the branchial, cardiac and gastric regions; 3) structure of the post-rostral region; 4) rostrum shape; 5) depth of ventral carapace depression and 6) structure of the G1 (Table 4). These diagnostic characters are independent of size and sex.

Cryptopodia fistulosa is known from the northwestern and northern coasts of Australia, and is apparently sympatric with *Cry. spatulifrons* in a few sites like Shark Bay.

Table 4. Differences between *Cry. fistulosa* Chiong & Ng, 1994 and *Cry. spatulifrons* Miers, 1879.

Characters	*Cry. fistulosa*	*Cry. spatulifrons*
Carapace surface	Heavily eroded, numerous granules and pits (Fig. 27A)	Slightly eroded, few granules and pits (Fig. 25A)
Branchial, cardiac regions	Strongly inflated (Figs. 27A, 28A)	Not strongly inflated and gastric (Figs. 25A, 28B)
Post-rostral region	Very depressed (Fig. 27C)	Slightly depressed (Fig. 25C)
Rostrum	Rough, margins parallel to each other (Fig. 27C)	Smooth, triangular shape with convex margins (Fig. 25C)
Lateroventral carapace depression	Deep (Fig. 27B)	Shallow (Fig. 25B)
G1	Slender, less bulbous at proximal end, pointed tip, outer distal lobe larger, higher and tilted towards inner lobe, more spines at the tip (Fig. 29A-D)	Stout, more bulbous at proximal end, blunt tip, both lobes similar sizes, less spines at the tip (Fig. 26A-D)

Cryptopodia laevimana Miers, 1879
(Fig. 30)

Cryptopodia spatulifrons var. *laevimana* Miers, 1879: 27 (coast of Borneo, another locality unknown); Rathbun, 1910: 20, pl. I, Fig. 5 (Koh Mesan and Koh Chuen: Thailand); Flipse, 1930: 63 (key only); Yang, 1979: 11 (Singapore).
Cryptopodia fornicata - Adams & White, 1848: 32, pl. 6, Fig. 4 (China Sea); Henderson, 1893: 351 (list only).
Cryptopodia laevimana - Chiong & Ng, 1994: 949 (coast of Borneo).

Material examined. - Lectotype - male (18.6 by 13.7 mm) (NHM 1847.21), coast of Borneo.

Paralectotype - 1 female (27.3 by 20.4 mm) (NHM 1939.5 8.11), locality unknown.

Others - **SINGAPORE**: 1 female (26.1 by 18.7 mm) (ZRC 1984.7855), west of Pulau Pawai, dredge, 9 m depth, haul on shell, gravel, coll. D.S. Johnson, Dec.1952. — 1 female (34.4 by 23.6 mm) (ZRC 1965114), west of Pulau Pawai, dredge, 9 m depth, haul on shell, gravel, coll. D.S. Johnson, Dec.1952.

Description (Lectotype male). - Carapace 1.4 times broader than long; anterolateral angles truncated; posterolateral and posterior margins crenulated. Dorsal surface more granulated than ventral surface; granules larger, denser on branchial and cardiac regions; branchial and cardiac regions elevated; deep triangular depression in centre of carapace; surfaces behind anterolateral margin and posterior margin nearly straight; surfaces behind anterolateral margin and posterior margin straight. Lateroventral carapace concavity deep. pterygostomial region slightly eroded, appearing almost smooth. Rostrum 1.1 times prominent and smooth, triangular, with convex margins, margins crenulated, post-rostral region relatively flat. Surfaces of third maxillipeds smooth.

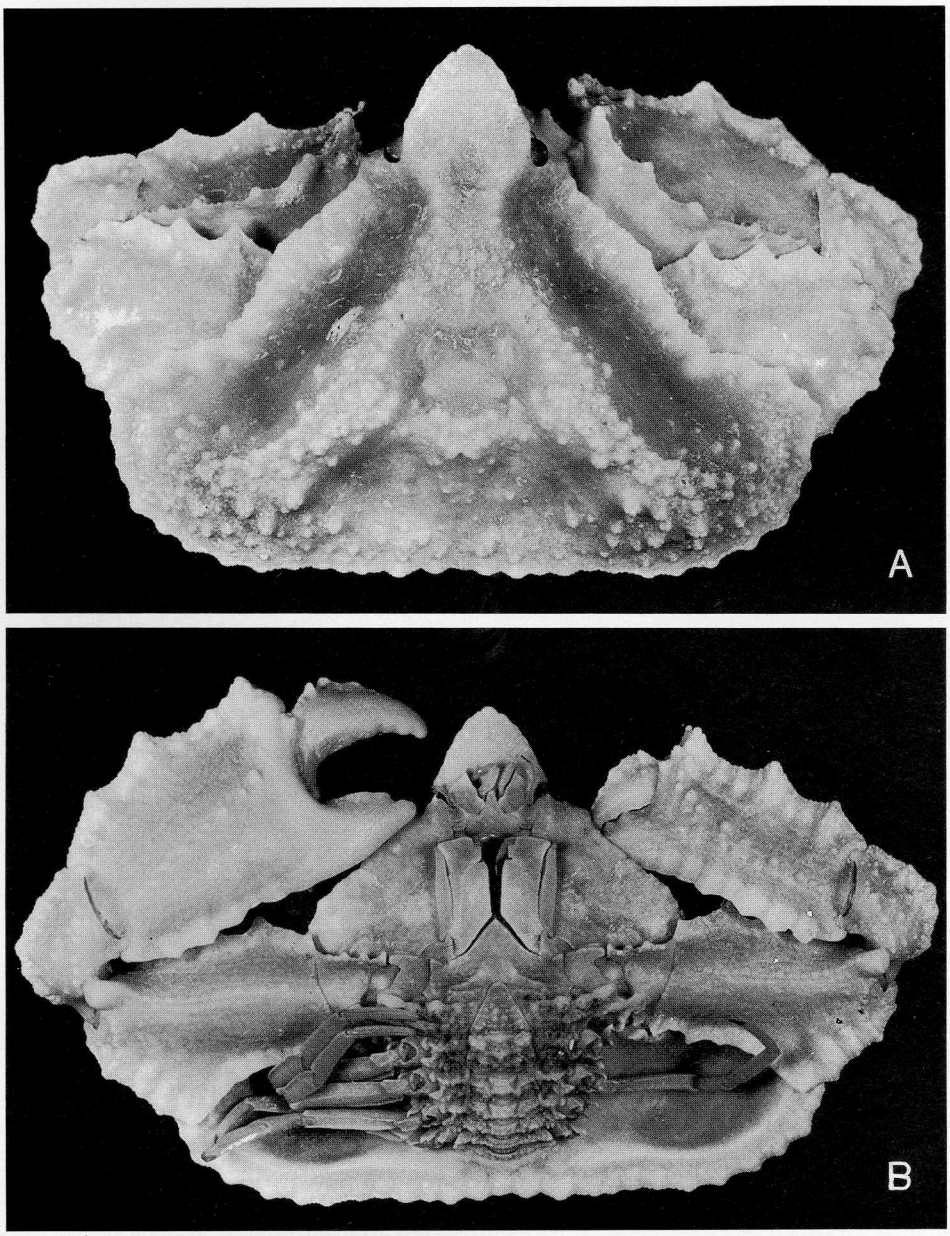

Fig. 30. *Cryptopodia laevimana* Miers, 1879. Lectotype male, 18.6 by 13.7 mm (NHM 1847.21). A: dorsal view; B: ventral view.

Table 5. Differences between *Cry. spatulifrons* Miers, 1879, and *Cry. laevimana* Miers, 1879.

Characters	*Cry. spatulifrons*	*Cry. laevimana*
Carapace shape	Posterior margin longer or less equivalent to lateral margins (Fig. 25A)	Posterior margin more than lateral margins (Fig. 30A)
Carapace surface	Granulation on the overall surface (Fig. 25A)	Granulation only on elevated branchial, gastric and and cardiac regions, with scattered pits (Fig. 30A)
Pterygostomial region	Rough and eroded (Fig. 25B)	Slightly eroded (Fig. 30B)
Ambulatory legs	Merus with one or two longitudinal carinae	Merus without longitudinal carinae
Lower surface of	Heavily granulated with pits (Fig. 25B)	Smooth, slightly palm granulated (Fig. 30B)
Length of palm	Longer than broad (Fig. 25B)	Stouter and broader (Fig. 30B)

Chelipeds short, very robust, surface slightly granulated; length of palm subequal to height; posterior expansion dilated towards extremity; anterior and posterior margins of dorsal facet of palm denticulated, anterior margin with 6 prominent teeth.

Ambulatory legs smooth; upper and lower margins of merus without longitudinal carinae.

Male abominal telson triangular in shape. G1 and G2s not developed.

Females - Agrees with males in all main characters identified here.

Remarks. - Miers (1879) did not designate a holotype for *Cry. spatulifrons* var. *laevimana*, and the smaller syntype male (18.6 by 13.7 mm, NHM 1847.21) was designated as the lectotype by Chiong & Ng (1994). Unfortunately, the male lectotype is still a juvenile and its gonopods have not yet developed.

Adams & White (1848) reported a young specimen which they identified as the young of *Cry. fornicata*. The figure provided by Adams & White (1848) agrees well with the lectotype and the present specimens of *Cry. laevimana*, and is tentatively referred to this species instead. Rathbun's (1910) record of a young female specimen of *Cry. laevimana* from Thailand poses no problems, her figure agreeing very well with the present specimens.

Chiong & Ng (1994) recognised *Cry. spatulifrons* var. *laevimana* as a valid species, and distinguished it from *Cry. spatulifrons* s. str. by numerous features (Table 5). In addition, whereas *Cry. spatulifrons* and *Cry. fistulosa* are known only from Australia, *Cry. laevimana* has been reported only from the Sunda Shelf thus far (Chiong & Ng, 1994).

Cryptopodia contracta Stimpson, 1857

Cryptopodia contracta Stimpson, 1857: 220 (South China Sea); Stimpson, 1907: 30, pl. IV, Fig. 6, 6a (no new record); Flipse, 1930: 62 (key only).

Material Examined. - None.

Remarks. - Stimpson (1857) described *Cry. contracta* from somewhere in the South China

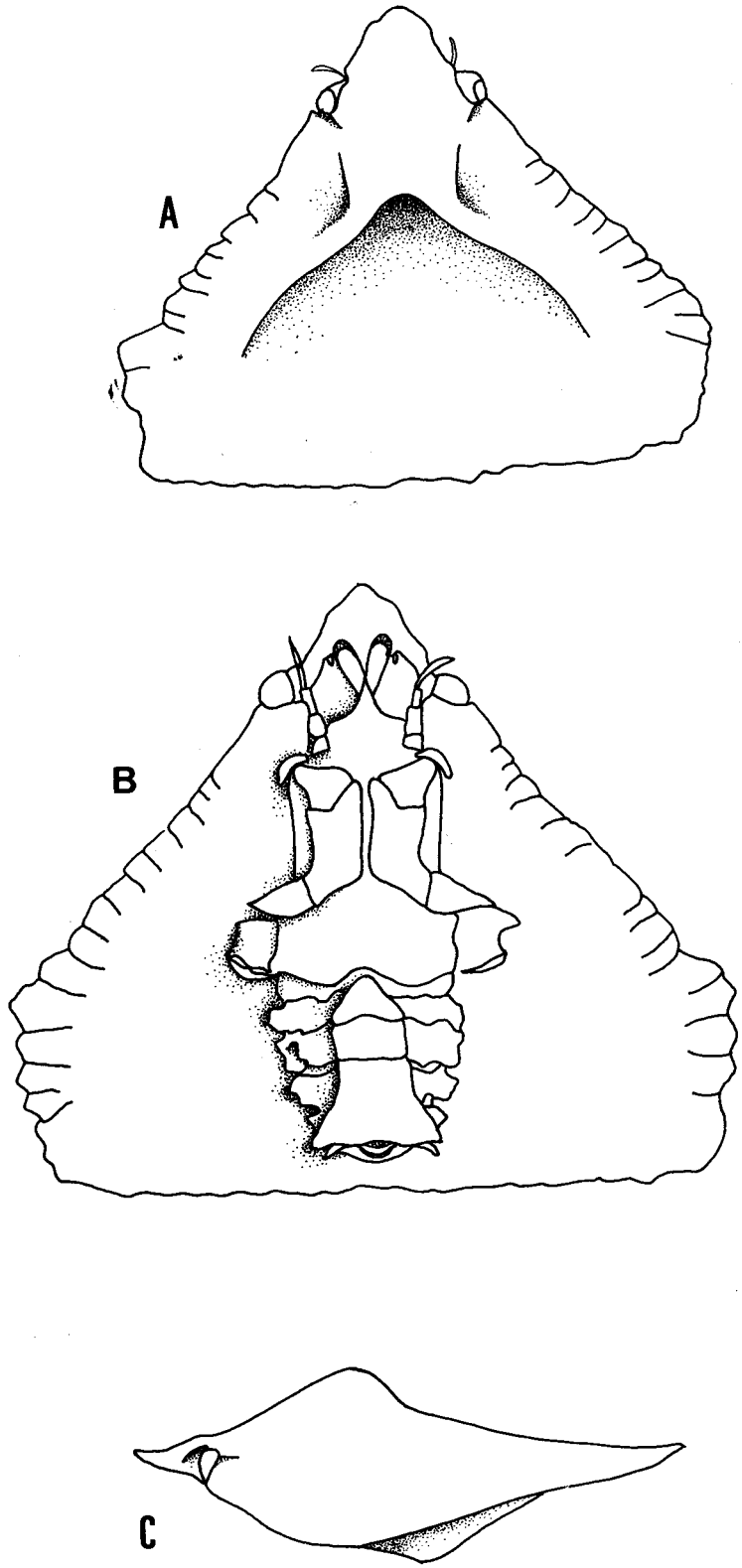

Fig. 31. Schematic figures of *Celatopesia*, new genus. A: dorsal view; B: ventral view; C: side view.

Sea, at about latitude 23°N. The holotype is almost certainly lost and there have been no other records of this species since Stimpson (1857, 1907). According to the figures in Stimpson (1907), this species does not have its cheliped merus expanded distally into a wing-like structure typical of *Cryptopodia*. Its carapace shape also does not resemble those of *Cryptopodia* species. Instead, it has a closer resemblence to the Indo-Pacific species of *Heterocrypta* Stimpson, 1871. Since Stimpson was also the author for *Heterocrypta*, he must have had reasons for not placing *Cry. contracta* in *Heterocrypta* but into *Cryptopodia*. Until more specimens become available, *Cry. contracta* should remain in *Cryptopodia*, albeit a rather unusual member of the genus.

Celatopesia, new genus

Cryptopodia - Stimpson, 1871: 137 (partim); Miers, 1881: 210 (partim); Rathbun, 1925: 553 (partim); Flipse, 1930: 82 (partim); Garth, 1958: 470 (partim); Gore & Scotto, 1979; 13 (partim); Williams, 1984: 346 (partim).

Type species. - *Cryptopodia concava* Stimpson, 1871, by present designation. Gender of genus feminine.

Description. - Carapace pentagonal; with large lateral expansions which completely conceal ambulatory legs and are prolonged posteriorly beyond base of abdomen. Carapace margins cut into small rectangular, truncated teeth with denticulated margins. Posterolateral margins straight, posterolateral angles truncated. Dorsal and ventral surfaces smooth; only gastric region elevated; posterior portion of carapace concave; ridge of granules running from mesobranchial to metabranchial regions, converging at base of gastric region. No obvious lateroventral carapace concavity for legs. Palm of chelipeds with slight expansion near middle; anterior and posterior margins of palm with lobulated crests; dorsal surfaces of movable finger with 2 rows of granules along its length; merus flat, upper surface dilated towards middle; upper and lower margins denticulated. Ambulatory legs with upper and lower margins of meri having 1-2 rows of longitudinal carinae; dactylus covered with setae. Male abdomen with semi-circular telson.

Etymology. - The genus name is derived from the setose ambulatory dactylus of the the type species. Gender is feminine.

Habitat. - Muddy-sandy bottom with broken shell, coral, 10-60m in depth.

Distribution. - Atlantic Ocean and Gulf of Mexico, as well as California and Pacific coasts of Central and northern South America.

Remarks. - The differences between *Cryptopodia* and *Celastopesia*, new genus, have been discussed in detail earlier (Table 1).

Celatopesia concava (Stimpson, 1871), new combination
(Figs. 32, 33)

Cryptopodia concava Stimpson: 1871: 137 (Conch Reef: Florida); Miers, 1881: 210 (list only); Rathbun, 1925: 553, text-Fig. 151, pl. 202, Figs. 3-4, pl. 282; Flipse, 1930: 82 (list only); Gore & Scotto, 1979: 13, Figs. 4, 5 h-p (Florida); Williams, 1984: 346-347, Figs. 281, 286 (no new records).

Material examined. - 1 female (10.1 by 7.4 mm) (RMNH 26891), (Arcibische Zee, O. V. Honduras), Pillsbury, 16°6'N 82°26.5'W-16°18'N 82°27'W, 10' Ottertrawl, 37m, Stn 574, Lome11967. — 1 male (10.4 by 7.1 mm) (RMNH 26892) (Voor Kust V. Fransguiand), Pillsbury, 06°07'N 52°19'W, 84-91m, 10' Try Net, Stn 650, 8 Jul.1968. — 1 male (7.4 by 5.9 mm), 1 female (7.1 by 6.2 mm) (RMNH N.31390), 06°07'N 52°19'W, coll. Presely, R.V. Hernan Cortez 38, 20' Ottertrawl, 54.9m, 8 Jul.1967. — 1 male (9.0 by 6.7 mm) (USNM 72647), South of Loggerhead Key, Tortugas, Florida, U. S. A., coll. W. L. Schmitt, No. 2 red buoy, 72m, Acc. 115488., 4 Aug.1931. — 1 female (11.9 by 8.3 mm) (USNM 49201), Tortugas, Florida, U. S. A., coll. J. B. Henderson, 16 fathoms, Acc. 52961. — 2 females (8.9 by 6.7 mm, 4.5 by 4.0 mm), 2 males (1 damaged) (USNM 232749), North Atlantic Ocean, off South Carolina, U. S. A., 32°49'3"N 78°39'48"W, coll. Presely, Suction Smpl., S. C. Mar. Res. MS06, Dojiri, M., 34m, 15 Mar.1981; 27 Aug.1985. — 1 female (10.1 by 7.5 mm) (USNM 26061), Key West Light, Florida, U. S. A., Bahama Expedition, coll. Univ. of Lowa, loan Dept. #12061 (Stn 47), Acc. 131487,29. Jul.1967. — 2 females (9.5 by 7.1 mm; 9.1 by 6.9 mm), 2 males (7.6 by 6.4 mm, 5.9 by 5.1 mm) (USNM 72646), Tortugas, Florida, U. S. A., coll. W. L. Schmitt, 36m, Stn 216, Acc. 88630, 11 Jun.1925. — 1 female (8.9 by 7.0 mm) (USNM 156480), 103km due west of Egmont Key, Florida, U. S. A., 27°37'N 83°58'W, coll. Presley, Dredge Hernan Cortez Scotto, L. E. 290, 11 Jul.1966. 1 male (5.2 by 4.7 mm) (USNM 25600), off Cape Romans Fila, coll. U. S. Fish Commission, 37.8m, Stn 7124. — 2 females (3.3 by 3.2 mm, 4.5 by 4.0 mm) (USNM 156481), 124.8km. due west of Egmont Key, Florida, U. S. A., 27°37'N 84°13'W, coll. Presley, Dredge Hernan Cortez Scotto, L. E. 290, 12 May.1967.

Size. - The largest specimen seen is a female measuring 11.9 by 8.3 mm (USNM 49201).

Description (Male, USNM 72646). - Carapace 1.2 times broader than long, pentagonal; with large lateral expansions completely concealing ambulatory legs and prolonged posteriorly beyond base of abdomen. Carapace margins cut into small rectangular, truncated teeth with denticulated margins. Posterolateral margins straight, posterolateral angles truncated; anterolateral margin straight; posterior margins nearly straight or slightly convex. Dorsal and ventral surfaces smooth; gastric region elevated only; posterior portion of carapace concave; ridge of granules running from hepatic to branchial regions, converging at base of gastric region. Rostrum 1.2 times broader than long, prominent, triangular, lateral margins gently convex, diverging proximally, crenulated. Post-rostral region not depressed. Orbits small, round, fissure on superior margin; eyes small. Lateroventral carapace concavity absent. pterygostomial region smooth. Epistome well-developed; antennular fossae narrow and oblique, margins of fossae granulated. Antennules when folded, occupying fossae completely. Surfaces of third maxillipeds smooth.

Chelipeds robust, smooth, length of palm longer than height, slight expansion near middle; anterior and posterior margins of palm with lobulated crests; fingers long, smooth, crossing when fingers crossed; dorsal surfaces of movable finger with 2 rows of granules along its length; carpus small, slightly granulated; merus flat, upper surface dilated towards middle; upper and lower margins denticulated; row of granules running whole length in center of merus.

Ambulatory legs slender, smooth, first pair longest; upper and lower margins of meri with 1-2 rows of longitudinal carinae; dactylus nearly straight, covered with setae.

Male abdomen rough, elongated, narrow; telson semi-circular. G1 with stout basal part 2.3 times length of slender distal part, tip less bulbous, tapering, 2 nearly symmetrical lobes, spines mainly on lobes and marginal row.

Remarks. - Stimpson (1871) described *Celatopesia concava* (as a *Cryptopodia* species) from Conch Reef, Florida. The holotype, as far as is known, is lost, as is most of Stimpson's

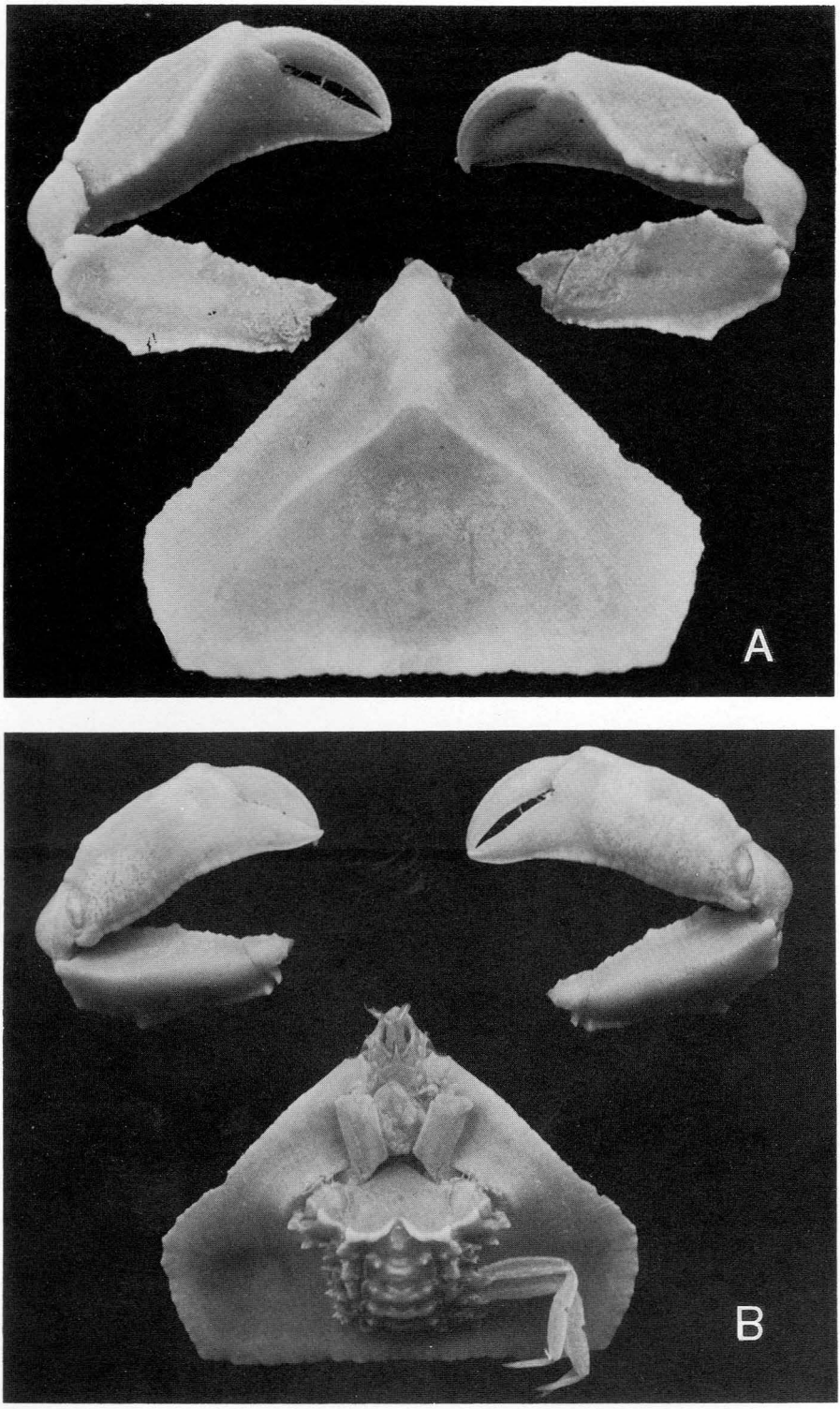

Fig. 32. *Celatoprasia concava* (Stimpson, 1871), new combination. Male, 7.6 by 6.4 mm (USNM 72646). A: dorsal view; B: ventral view.

material. We have, however, examined a series of specimens in RMNH and USNM which agree very well with the original description and figures of Stimpson (1871).

Miers (1881) mentioned that the carapace shapes of *Heterocrypta maltzani* and *Cel. concava* resemble each other. We have examined specimens of these two species, but their carapace shapes do not resemble each other as closely as Miers (1881) had indicated. The carapace of *H. maltzani* does not cover the ambulatory legs completely which is the case for *Cel. concava.*

Rathbun (1925) stated that the posterior margin of the carapace in the female is straight whereas it is slightly concave in male specimens. Gore & Scotto (1979) also reported variations in the posterior margin of the carapace in this species. Their specimens varied from straight to slightly concave in adult males and females, but was more noticeably concave in juvenile specimens. Our specimens tend to agree better with Gore & Scotto's (1979) definition than Rathbun's (1925). However, some of the juvenile specimens have straight posterior margins. Therefore, the concavity of the posterior margin of the carapace seems to be highly variable in this species. The specimens examined in this study also showed variation in the degree of elevation in the gastric regions. Both types of variation do not appear to be correlated with each other. Rathbun (1925) stated the carapace to be 1.2-1.33 times as broad than long. Gore & Scotto (1979) modified it to 1.0-1.4 times as wide as long. Our specimens agree better with Gore & Scotto's (1979) proportions.

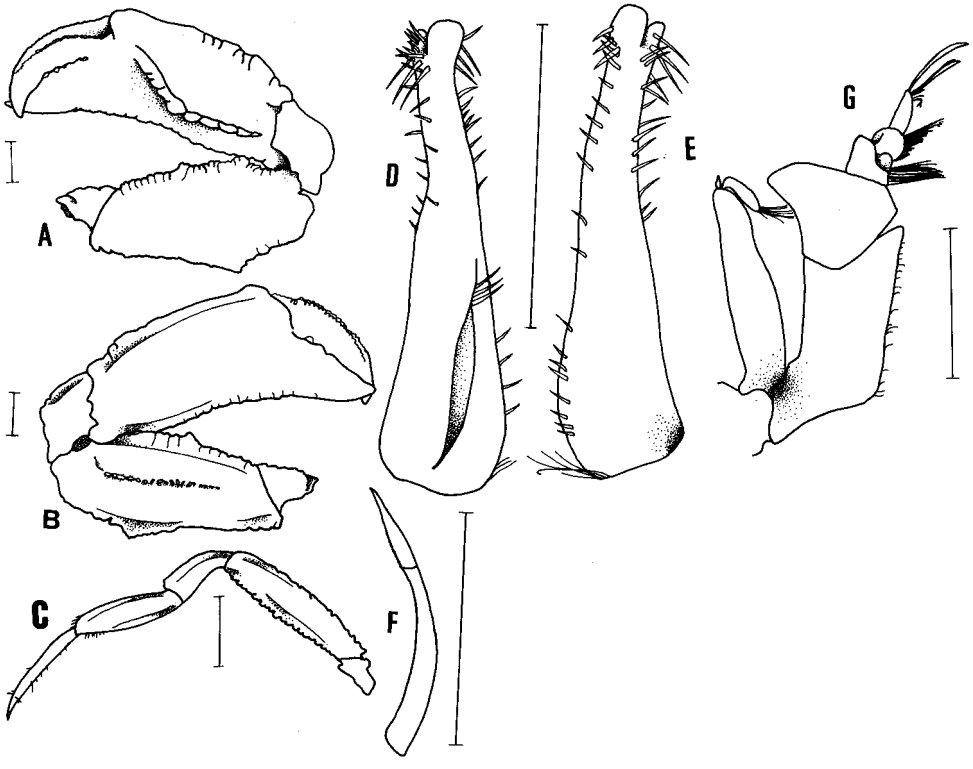

Fig. 33. *Celatopesia concava* (Stimpson, 1871), new combination. A, B, female, 11.9 by 8.3 mm (USNM 49201); C-F, male, 9.0 by 6.7 mm (USNM 72647); G, 11.9 by 8.3 mm (USNM 49201). A: dorsal view of right cheliped; B: ventral view of right cheliped, female, 11.9 by 8.3 mm (USNM 49201); C: ventral view of ambulatory leg; D: dorsal view of right G1; E: ventral view of right G1; F: right G2; G: external third maxillipeds. Scales = 1.0mm.

Gore & Scotto (1979) examined 48 specimens of *Cel. concava* and suggested that the species is uncommon in nearshore areas, and appears more abundant in the Gulf of Mexico and Caribbean Sea than the Atlantic waters off the eastern United States. They noted a slight variation in carapace morphology between specimens from the Gulf of Mexico and the western Altantic. However, there are no significant differences between the gonopods of specimens of these two regions. The present series of specimens confirm these observations.

Celatopesia hassleri (Rathbun, 1925), new combination
(Figs. 34, 35)

Cryptopodia hassleri Rathbun, 1925: 554, pl. 202, Figs. 1-2 (Magdalene Bay: Lower California: Mexico); Flipse, 1930: 82 (list only); Garth, 1958: 471, pl. Z4, Figs. 15, 15a; pl. 54, Fig. 2 (California; Mexico; Columbia).

Material examined. - 1 male (6.0 by 4.3 mm) (USNM), off Santa Cruz Bay, Mexico, coll. S.A. Glassell, 30-50 fathoms, 3 Jun.1938. — 1 male (8.5 by 5.5 mm) (USNM), Angelus Bay, Gulf of California, U.S.A., coll. S. A. Gassell, dredged in 20 fathoms, sand bottom, 1 Apr.1932. — 1 male (8.4 by 5.7 mm) (USNM), off Guatuks, O Oct. Mexico, coll. S. A. Glassell, 50 fathoms, 3 Jul.1938.

Size. - The largest specimen seen is male measuring 8.5 by 5.5 mm (USNM, no catalogue number).

Description (male, 8.5 by 5.5 mm, no catalogue number). - Carapace 1.4 times broader than long, pentagonal; with large lateral expansions completely concealing ambulatory legs and prolonged posteriorly beyond base of abdomen. Carapace margins cut into small rectangular, truncated teeth with denticulated margins, extending well into carapace, forming a border which appears translucent. Posterolateral margins straight, posterolateral angles truncated; anterolateral margin straight; posterior margins nearly straight or slightly convex. Dorsal and ventral surfaces smooth; gastric region elevated only; posterior portion of carapace concave; ridge of granules running from hepatic to branchial regions, converging at base of gastric region. Rostrum 1.4 times broader than long, prominent, triangular, lateral margins gently convex, diverging proximally, crenulated. Post-rostral region not depressed. Orbits small, round, fissure on superior margin; eyes small. Lateroventral carapace concavity absent. pterygostomial region smooth. Epistome well-developed; antennular fossae narrow, oblique, margins of fossae granulated. Antennules when folded, occupying fossae completely. Surfaces of third maxillipeds smooth.

Chelipeds robust, smooth, length of palm longer than height, slight expansion near middle; anterior and posterior margins of palm with lobulated crests; fingers long smooth, crossing when fingers crossed; dorsal surfaces of movable finger with 2 rows of granules along its length; carpus small, heavily granulated; merus flat, upper surface dilated towards middle; upper and lower margins denticulated; row of granules running whole length in center of merus.

Ambulatory legs slender, smooth, first pair longest; upper and lower margins of meri with 1-2 rows of longitudinal carinae; dactylus nearly straight, covered with setae.

Abdomen rough, elongated, narrow; telson semi-circular shape. G1 with stout basal part 1.8 times length of slender distal part, tip less bulbous, tapering, 2 nearly symmetrical lobes, spines mainly on lobes and marginal row.

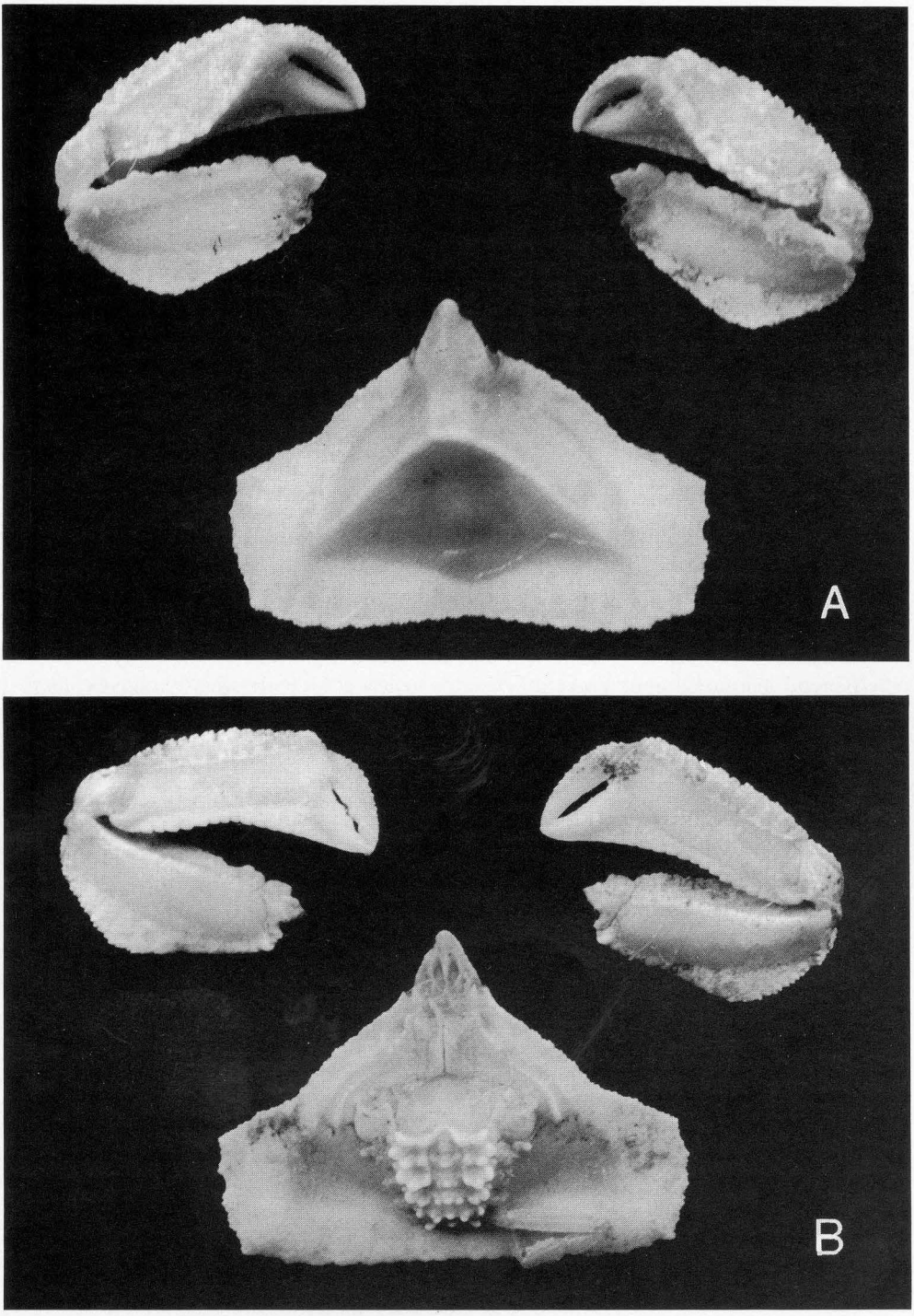

Fig. 34. *Celatoprocia hasslari* (Rathbun, 1925), new combination. Male, 8.5 by 5.5 mm (USNM). A: dorsal view; B: ventral view.

Remarks. - Rathbun (1925) described *Celatopesia hassleri* (as a *Cryptopodia* species) from a single male specimen collected from Magdalene Bay, Lower California, Mexico. She noted that it was closely allied to *Cel. concava* but can be distinguished by its greater carapace width (1.6 times its length), narrower rostrum, rounder posterolateral angles and stronger marginal teeth. The average carapace width of the specimens in this study is about 1.4 times broader than long. None, however, have a carapace width of 1.6 times broader than long as reported by Rathbun (1925). In any case, all specimens of *Cel. hassleri* are broader than the majority of the *Cry. concava* specimens (average 1.2 times broader than long).

Garth (1958) reported 71 specimens from northern Hughes Point to the western coast of Lower California, Mexico and southern La Libertad, Ecuador, and commented that specimens from the Gulf of California were proportionately broader than long compared to those from the Bay of Panamá (closer to *Cel. concava* in this aspect). Garth suggested that it could be due to the isolation of populations between Isabel Island, Mexico and Costa Rica. We are not able to confirm the difference in the degree of concavity of the posterior margin of carapaces between sexes, nor the differences between Californian and Panamanian populations as reported by Garth (1958: 471) as there are only three male specimens available for this study. In all other aspects, however, they are identical and there is no reason to suppose they are different taxa for the moment.

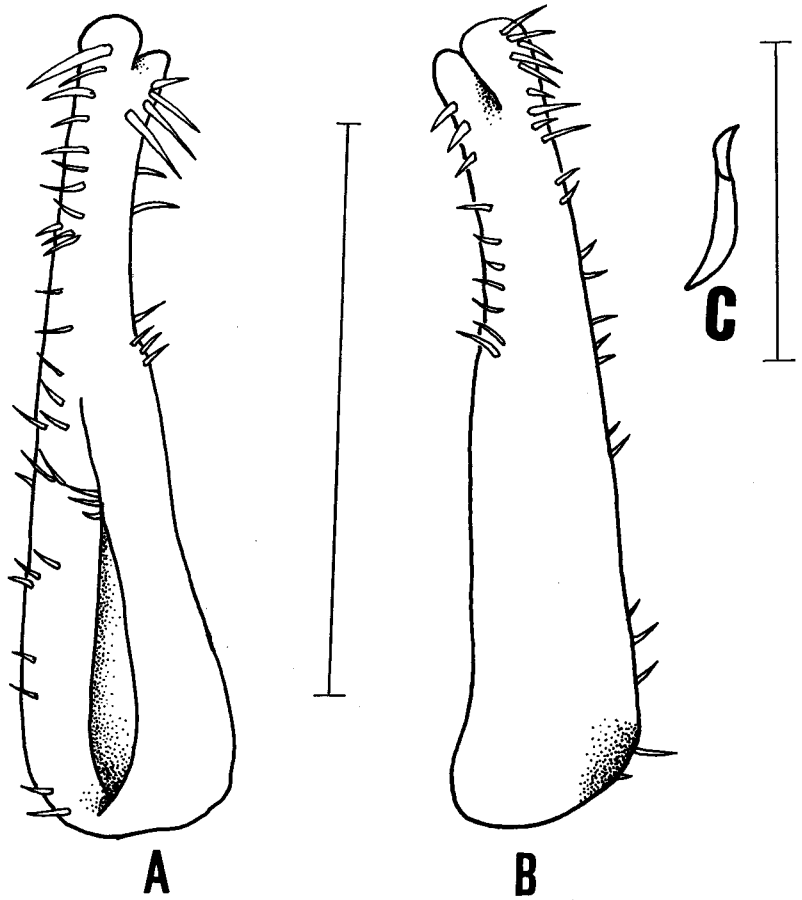

Fig. 35: *Celatopesia hassleri* (Rathbun, 1925), new combination. Male, 8.5 by 5.5 mm (USNM). A: dorsal view of left G1; B: ventral view of left G1; C: left G2. Scales = 1.0mm.

The present specimens also show that the granulation on the carpus of *Cel. hassleri* is more distinct than that of *Cel. concava*; there being more rows of bigger granules on the carpus of *Cel. hassleri* compared to *Cel. concava*. This heavy granulation on the carpus seem to be consistent among all *Cel. hassleri* specimens examined. More differences between the two *Celatopesia* species are listed in Table 6.

Table 6. Differences between *Cel. concava* (Stimpson, 1871), new combination, and *Cel. hassleri* (Rathbun, 1925), new combination

Characters	*Cel. hassleri*	*Cel. concava*
Carapace shape	1.4 times broader than long (Fig. 32A)	1.2 times broader than long (Fig. 34A)
Rostrum	1.4 times broader than long	1.2 times broader than long
Posterolateral region	Rounder	Straight
Closed fissures between marginal teeth	Greatly extended	Less extended
Degree of granulation on carpus	More granulated, granules bigger and distinct	Less granulated, granules smaller and less distinct
G1	G1 with stout basal part 1.8 times length of slender distal part, tip less bulbous and tapered, 2 nearly symmetrical lobes, spines mainly on lobes and marginal row (Fig. 33D, E)	G1 with stout basal part 2.3 times length of slender distal part, tip less bulbous and taper, 2 nearly symmetrical lobes, spines mainly on lobes and marginal row (Fig. 35A, B)

KEY TO *CRYPTOPODIA* AND ALLIED GENERA

1. Pterygostomial region with granular ridges ..... *Heterocrypta* Stimpson, 1871
- Pterygostomial region without granular ridges 2

2. Carapace with branchial, cardiac and gastric regions elevated; dorsal triangular depression deep; lateroventral concavity present, into which legs fit; fingers short, tips not crossing when fingers crossed; ambulatory dactyli glabrous ..... *Cryptopodia* H. Milne Edwards, 1834
- Carapace with only gastric region elevated; dorsal triangular depression absent; lateroventral concavity for legs absent; fingers long, tips crossing when fingers crossed; ambulatory dactyli setose ..... *Celatopesia*, new genus

KEY TO SPECIES OF *CRYPTOPODIA*

1. Pterygostomial region and external surfaces of third maxillipeds rough 2
- Pterygostomial region and external surfaces of third maxillipeds smooth 5

2. Third maxillipeds appear swollen ..... *Cryptopodia pan* Laurie, 1906
- Third maxillipeds normal 3

3. External surfaces of third maxillipeds heavily granulated, anterolateral margins straight ..... *Cryptopodia collifer* Flipse, 1930
- External surfaces of third maxillipeds heavily pitted, eroded, anterolateral margins convex 4

4. Rostrum broad, margin subparallel proximally, crenulated ..... *Cryptopodia fistulosa* Chiong & Ng, 1994
- Rostrum triangular, margin convex, diverging proximally, crenulated ..... *Cryptopodia spatulifrons* Miers, 1879

5. Dorsal carapace with 2 lyre-shaped longitudinal grooves ..... *Cryptopodia dorsalis* White, 1847
- Dorsal carapace entire, without lyre-shaped grooves 6

6. Carapace triangular; chelipeds short, length of palm subequal to height ..... *Cryptopodia laevimana* Miers, 1879
- Carapace pentagonal; chelipeds robust, length of palm longer than height 7

7. Carapace margins deeply denticulated; carpus of chelipeds semi-globular; dactylus of ambulatory legs blade-like; G1 S-shaped 8
- Carapace margins not deeply denticulated; carpus small, dactylus of legs nearly straight; G1 not S-shaped 9

8. Carapace and carpus of chelipeds slightly granulated; spines on lateral margins simple to slightly bifurcated ..... *Cryptopodia angulata* H. Milne Edwards & Lucas, 1841
- Carapace and carpus of chelipeds heavily granulated; spines on lateral margin distinctively bifurcated ..... *Cryptopodia echinosa*, new species

9. Lower surfaces of merus of chelipeds tuberculated, with stout, flattened tubercles ..... *Cryptopodia contracta* Stimpson, 1857
- Lower surfaces of merus of chelipeds smooth, with a row of granules separating anterior and posterior facets 10

10. Rostrum broader than long, margin gently convex, diverging proximally; posterior margins of carapace concave; anterior margin of merus of chelipeds with 1 prominent tooth and 2 reduced teeth ..... *Cryptopodia queenslandi* Rathbun, 1918
- Rostrum broader than long, margin gently convex, diverging proximally; posterior margins of carapace concave; anterior margin of merus of chelipeds with 3 prominent equal sized teeth 11

11. Carapace appears evenly dome-shaped when viewed frontally; branchial, cardiac and gastric regions strongly elevated; rostrum broader than long, lateral margins convex ..... *Cryptopodia fornicata* (Fabricius, 1781)
- Carapace appears dome-shaped medially with lateral parts flattened out when viewed frontally; posterior margin of carapace nearly straight; branchial, cardiac and gastric regions less elevated; rostrum longer than broad, lateral margins straight ..... *Cryptopodia patula*, new species

KEY TO SPECIES OF *CELATOPESIA*, NEW GENUS

1. Carapace about 1.2 times broader than long; posterolateral margin straight; marginal teeth extended lesser into carapace; granulation on carpus not extensive ..... *Celatopesia concava* (Stimpson, 1871)
- Carapace about 1.4 times broader than long; posterolateral margin rounded; marginal teeth extended greater into carapace; granulation on carpus extensive ..... *Celatopesia hassleri* (Rathbun, 1925)

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