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TAXONOMY AND SYSTEMATICS OF CORAL ASSOCIATED BRACHYURAN CRABS IN GULF OF MANNAR MARINE BIOSPHERE RESERVE

A. GOKUL¹ AND K. VENKATARAMAN²

¹Sunderban Regional Centre

Zoological Survey of India, Canning-743 329

arunachalamgokul@gmail.com

²Marine Biological Station

Zoological Survey of India, Chennai-600 028

INTRODUCTION

Indian coral reefs are distributed along the entire east and west coasts. The coral reefs acts as a home for several faunal communities. Gulf of Mannar Marine Biosphere Reserve (GoMMBR) islands situated at south east coast of India are known for its rich coral diversity (Venkataraman *et al.*, 2003b, 2004). Crustaceans play a vital role in the symbiotic association with the coral colonies. Studies have been done on the crustacean cryptofaunal diversity and species richness in GoMMBR (Venkataraman *et al.* 2002, 2003a; Nammalwar and Edwin, 2002; Kathirvel and Gokul, 2006). However among the faunal diversity in coral reef areas, the crustaceans perform a better symbiotic association in coral reef ecosystem. According to Garth (1973) both obligatory and facultative symbiotic crustaceans were associated with the coral colonies. In spite of this it was reported that crustaceans were found to be associated more in the dense branched coral colonies covered with algae than in the colonies having surplus mucus (Coles, 1980). Symbiotic brachyuran crabs were abundant in *Pocillopora* coral colonies covered with algae. Jeyabaskaran (1997) reported the abundance of the brachyuran crabs were more in the branching corals comparatively.

Various studies have been conducted on the taxonomy of the crabs in India (Alcock, 1895, 1896, 1898, 1899a, 1899b, 1900; Sankarankutty, 1967;

Jeyabaskaran *et al.* 2000) as well as across the world (Guinot, 1971, 1976; Galil, 1988; Castro, 1999a, b, c).

The present study emphasized 26 species of brachyuran crabs belonging to 10 genera and 8 families. Out of these 4 species are new to GoMMBR and 2 species are new to India. The present study declares the brachyuran crabs along with the other faunal groups were found to be associated more in the branching corals particularly the *Pocillopora* colonies covered with algae. Based on the previous studies and for conservation aspects the crab collection was restricted to *Pocillopora* coral colonies covered with algae in the islands of GoMMBR. Considering its taxonomical and ecological importance the coral crabs symbiotically associated with *Pocillopora* colonies covered with algae were studied in detail.

SYSTEMATIC ACCOUNT

Phylum ARTHROPODA

Super class CRUSTACEA

Sub class MALACOSTRACA

Order DECAPODA

Family PORTUNIDAE

1. *Portunus brockii* (De Man)

Plate-I, Fig.-a

1887. *Neptunus brockii* De Man, *Archiv f. Naturgesch.*, p. 328.

1976. *Portunus (Monomia) brockii* Sakai, *Crabs of Japan and adjacent seas*, p. 343.

Materials : 2 Males. The maximum carapace length (CL) 2.5 cm and the minimum carapace length (CL) 1.0 cm. Reg. No. **ZSI/MBS/5219.**

Diagnosis : Front with 4 flat and indistinct lobes, laterals broader; 9 anterolateral teeth, increasing sharpness from first to the last, last one largest; carapace broader than long with conspicuous elevated patches of granulations on its surface; chelipeds moderately stout, granulated and tomentose; anterior border of arm with 2 spines; wrist with an inner sharp spine and an outer one as a lobule; hand with 3 upper inconspicuous carina and a distinct and granulated carina on outer surface; fingers short and stout; third maxilliped with an antero lateral projection of merus; penultimate segment of male abdomen with slightly convex border; first male pleopod curved, stout and bluntly ending.

Habitat : Sand, mud and mangrove flat; from shore to 22 m deep.

Distribution : Reports on previous records of the species from the GoMMBR : No earlier records in GoMMBR, from India: Andamans Alcock (1899) and from the Indo-Pacific region: Indonesia, Singapore, Australia and Japan (Sakai, 1976).

Remarks : It was recorded from the dead *Pocillopora* coral covered with algae from Poomarichan Island. It was recorded for the first time from the islands of GoMMBR.

2. *Thalamita integra* Dana

Plate-I, Fig.-b

1852. *Thalamita integra* Dana, *U. S. Exploration. Expedition*, p. 85., pl.1.

1976. *Thalamita integra* Sakai, *Crabs of Japan and adjacent seas*, p. 377.

Materials : 3 Males and 4 females; the maximum CL is 2.5 cm and the minimum CL is 1.0 cm.

Diagnosis : Front cut into 2 broad lobes exclusive of broad supraorbital tooth; edges of the frontal lobes and of the broad supra orbital tooth almost transverse and straight; no transverse ridge on cardiac and post-branchial region of carapace; chelipeds smooth; propodus with 4 teeth; upper inner border of propodus of walking legs more or less crested; the sixth segment of male abdomen much broader than long.

Habitat : Inter-tidal sandy areas, coral reefs and under dead coral blocks, up to 8 m deep.

Distribution : Reports on previous records of the species from the GoMMBR: Tuticorin (Henderson, 1893), Vedalai (Sankarankutty, 1967) and islands in GoMMBR (Jeyabaskaran *et al.*, 2000), from the Indian waters: Minicoy, Lakshadweep (Sankarankutty, 1961b) and Andamans (Alcock 1899; Sankarankutty 1961a) and from the Indo-Pacific region: Gulf of Mannar off Sri Lanka (Laurie, 1906) and Red Sea, east coast of Africa, Madagascar, Australia, Tahiti, Japan and Hawaii (Sakai, 1976).

Remarks : It was recorded from the dead *Pocillopora* coral covered with algae from Krusadai and Poomarichan Islands.

Family XANTHIDAE

3. *Halimede ochtodes* (Herbst)

Plate-I, Fig.-c

1783. *Cancer ochtodes* Herbst, *Veruch einer Naturgeschichte der krabben und krebse*, p. 158.

1976. *Halimede ochtodes* Sakai, *Crabs of Japan and adjacent seas*, p. 387.

Materials : 3 Males and 2 females; the maximum CL is 3.5 cm and the minimum CL is 2.5 cm.

Diagnosis : Carapace oval-pentagonal with smooth surface; anterolateral border divided into 4 rounded deep-cut lobes, decreasing in size from behind forwards; front projecting horizontally forward beyond the orbits with 2 uniform lobes; the chelipeds unequal, prominently in males; upper border of the arm cut into teeth or pearl-like tubercles; two tubercles on the inner border of wrist; upper and outer surfaces of the wrist covered with pustulous tubercles; upper border of the hand, and of the basal half of the finger with a row of pisiform tubercles; fingers sharp pointed; the legs smooth, but the upper border of the merus of all, or of the first three pairs serrate or spinulous; the dactylus and the neighboring part of the lower border of the propodite furred.

Habitat : Muddy or sandy bottom, 20 to 35 m deep.

Distribution : Reports on previous records of the species from the GoMMBR: Islands of GoMMBR (Jeyabaskaran *et al.*, 2000), from Indian waters: Chennai coast (Alcock, 1898) and Parangipettai coast (Sethuramalingam and Ajmalkhan, 1991) and from the

Indo-Pacific region: Red Sea, Myanmar, Gulf of Thailand, Malaysia, Singapore, Hong Kong and Japan (Sakai, 1976).

Remarks : It was recorded from the dead *Pocillopora* coral covered with algae from Krusadai Island.

4. *Demania baccalipes* (Alcock)

Plate-I, Fig.-d

1898. *Xantho* (*Lophoxanthus*) *scaberrimus* var. *baccalipes* Alcock, *J. Asiat. Soc. Bengal*, p.117.

1976. *Demania baccalipes* Sakai, *Crabs of Japan and adjacent seas*, p.421.

Materials : 10 Males and 6 females; the maximum CL is 2.0 cm and the minimum CL is 0.5 cm.

Diagnosis : Carapace longer than broad and moderately convex; regions and sub-regions of carapace defined by broad, deep and smooth channels and covered with well-defined tubercles; characteristic tubercles with a worn-out appearance especially in the middle of carapace and in the chelipeds; front 2-lobed and fronto-orbital border less than half of width of carapace; anterolateral border 4 lobed; chelipeds equal and covered with large depressed tubercles; 2 tubercles at the inner angle of wrist; anterior border of walking legs marked with wart-like tubercles.

Habitat : Found at the bottom of rocks or broken shells, 15 to 35 m deep.

Distribution : Reports on previous records of the species from the GoMMBR : Jeyabaskaran *et al.*, (2000), from the Indian waters : Okha, Mumbai (Chhapgar, 1957) and Parangipettai coasts (Sethuramalingam and Ajmalkhan, 1991) and from the Indo-Pacific region: Sri Lanka (Alcock, 1898), Malacca Strait and Japan (Sakai, 1976).

Remarks : It was recorded from the dead *Pocillopora* coral covered with algae from Shingle and Krusadai Islands.

5. *Leptodius euglyptus* Alcock

Plate-I, Fig.-e

1898. *Xantho* (*Leptodius*) *euglyptus* Alcock, *J. Asiat. Soc. Bengal*, 67, p.121.

1927. *Xantho* (*Leptodius*) *euglyptus* Gravely, *Bull. Madras Govt. Mus (M.S)*, 1, p. 146, pls. 19-26.

Materials : 60 Males and 83 females; the maximum CL is 2.0 cm and the minimum CL is 0.5 cm.

Diagnosis : Carapace broader than long and convex in its two-thirds; front projecting beyond orbit; anterolateral border cut into 5 conical teeth; chelipeds unequal; upper surface of hand nodular; fingers short and hollowed at tip; carpus and propodus of walking legs longitudinally ridged and grooved above; dactylus furred; side wall of carapace, edge of upper surface of arm of chelipeds and edge of legs hairy.

Habitat : Coral reefs, mostly seen in branching corals and sandy beaches.

Distribution : Reports on previous records of the species from the GoMMBR : Krusadai Island (Gravely (1927) and islands in Gulf of Mannar (Jeyabaskaran *et al.*, 2000), from the Indian waters : Okha (Chhapgar, 1957) and from the Indo-Pacific region : Sri Lanka and Mergui Archipelago (Alcock, 1898).

Remarks : It was recorded from the dead *Pocillopora* coral covered with algae from Shingle, Krusadai, Poomarichan, Pullivasal, Mulli, Vaalai and Thalayari, Appa and Anaipar Islands.

6. *Leptodius exaratus* (H. Milne Edwards)

Plate-I, Fig.-f

1834. *Chlorodius exaratus* H. Milne Edwards, *Librairie Encyclopedique de Roret*, p. 402.

1976. *Leptodius exaratus* Sakai, *Crabs of Japan and adjacent seas*, p. 423.

Materials : 63 Males and 74 females; the maximum CL is 3.5 cm and the minimum CL is 0.5 cm.

Diagnosis : Carapace transversely oval, 1.5-1.6 times broader than long, moderately convex in anterior, almost flat in posterior part; surface smooth and glabrous with well defined regions, areolated in anterior, less in posterior third; front projecting beyond inner orbital angle, bilobed with square cut lobes having anterior margin somewhat concave; anterolateral margins with four teeth behind outer orbital angle; chelipeds unequal in both sexes; unarmed except for small acute tubercle at upper inner angle of wrist; hand of larger cheliped swollen, completely smooth, tips of fingers broadened and hollowed-out; walking legs stout, unarmed and smooth.

Habitat : Intertidal and shallow subtidal of rocky coast and also in mangroves or soft sediment shores; not below 2-3 m deep.

Distribution : Reports on previous records of the species from the GoMMBR : Tuticorin (Henderson, 1893), Krusadai Island (Gravely, 1927), Shingle, Pullivasal and Krusadai Islands (Sankarankutty, 1967), islands in Gulf of Mannar (Jeyabaskaran *et al.*, 2000) from the Indian waters: Okha, Mumbai (Alcock 1898; Chhappgar 1957), Rameswaram (Henderson, 1893), Lakshadweep (Sankarankutty, 1962a) and Andamans (Alcock, 1898) and from the Indo-Pacific region: Red Sea, Persian Gulf, south and east coasts of Africa, Seychelles, Maldives, Sri Lanka, Thailand, Indonesia, Malaysia, Polynesia, Australia, China, Japan and Hawaii (Sakai, 1976).

Remarks : It was recorded from the dead *Pocillopora* coral covered with algae from Shingle, Krusadai, Poomarichan, Manauli Putti, Hare, Mulli, Vaalai and Thalayari and Nallathanni Islands.

7. *Leptodius sanguineus* (H. Milne Edwards)

Plate-I, Fig.-g

1834 *Chlorodius sanguineus* H. Milne Edwards, *Lib. Encyclo. de Roret*, 1, p. 207.

1976. *Leptodius sanguineus* Sakai, *Crabs of Japan and adjacent seas*, p. 422.

Materials : 4 Males and 4 females; the maximum CL is 1.5 cm and the minimum CL is 0.5 cm. Reg. No. **ZSI/MBS/5220**.

Diagnosis : Carapace more convex anteriorly and the branchial lobules more convex; 5 teeth on anterolateral margin, not including the external orbital angle; front distinctly narrow; chelipeds unequal in both sexes; upper surface of wrist more or less wrinkled; a strong tubercle on the inner angle of wrist; hands smooth; tips of fingers broadened and hollowed-out; walking legs stout, unarmed and smooth.

Habitat : Rocky or stony beaches, under stones or in crevices of rock.

Distribution : Reports on previous records of the species from the GoMMBR : No earlier records were carried out from GoMMBR, from Indian waters: Lakshadweep (Alcock 1898; Sankarankutty 1961b) and Andaman and Nicobar Islands (Heller, 1868; Alcock, 1898; Sankarankutty, 1962a) and from Indo-Pacific region: Red Sea, Persian Gulf, east coast of Africa, Maldives, Japan and Hawaii (Borradaile 1902; Sakai 1976).

Remarks : It was recorded from the dead *Pocillopora* corals covered with algae from Krusadai, Poomarichan and Nallathani Islands. It was reported for the first time from GoMMBR.

8. *Leptodius crassimanus* (A. Milne Edwards)

Plate-I, Fig.-h

1867. *Xantho crassimanus* A. Milne Edwards, *Ann. Soc. Entomol. France*, 7(4), p. 267.

1967. *Leptodius crassimanus* Sankarankutty, *Proc. Symp. Crustacea.*, 1, p. 351.

Materials : 1 female. The maximum CL is 4.0 cm and the minimum CL is 3.5 cm.

Diagnosis : Front narrow with edges of its lobes deeply concave with the appearance of quadridentate; carapace anteriorly convex and broader than long; anterolateral border cut into 5 teeth; fingers of cheliped black in colour with white tips and not so broad at tip and also not sharply hollowed; first male pleopod curved and its tip flat and arrow-headed covered with long spines.

Habitat : Found among rocks.

Distribution : Reports on previous records of the species from the GoMMBR : Shingle Island (Sankarankutty, 1967), from the Indian waters : Mumbai (Chhappgar, 1957), Parangipettai (Sethuramalingam and Ajmalkhan, 1991) and Andamans (Alcock, 1898) and from the Indo-Pacific region: Karachi, Sri Lanka and Australia (Alcock, 1898).

Remarks : It was recorded from the dead *Pocillopora* corals covered with algae from Krusadai, Poomarichan and Nallathani Islands.

9. *Etisus laevimanus* (Randall)

Plate-II, Fig.-i

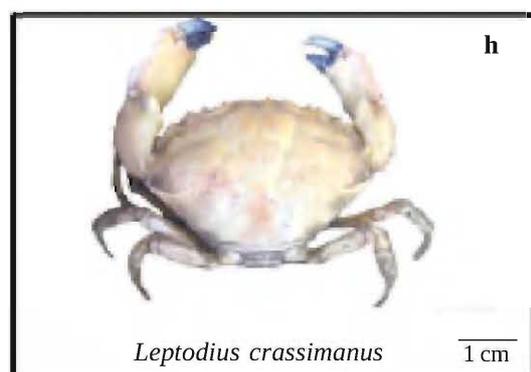
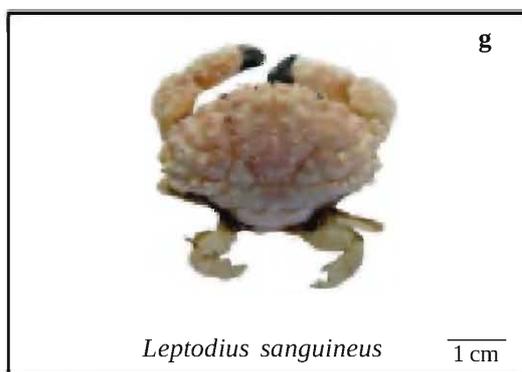
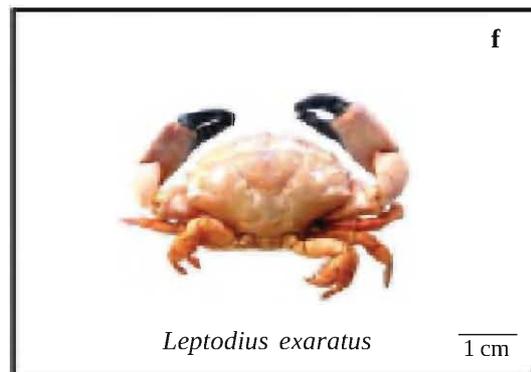
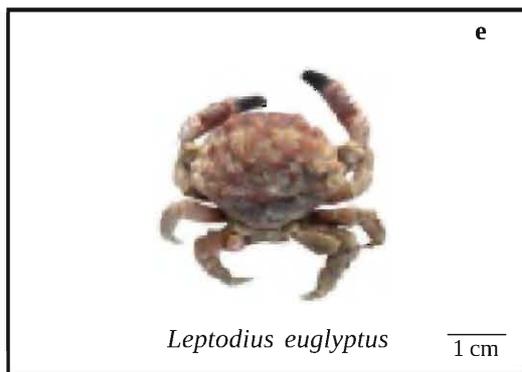
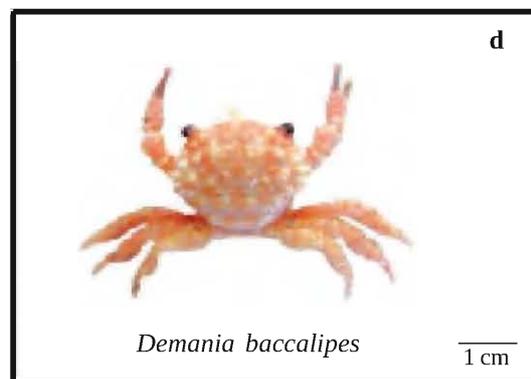
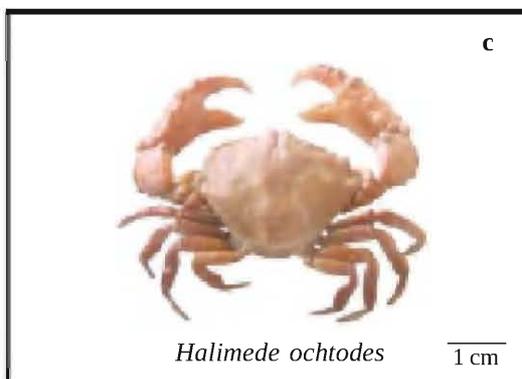
1839. *Etisus laevimanus* Randall, *J. Acad. nat. sci. Phil.*, 8(1), p. 115.

1976. *Etisus laevimanus* Sakai, *Crabs of Japan and adjacent seas*, p. 455.

Materials : 15 Males and 18 females; the maximum CL is 2.0 cm and the minimum CL is 1.5 cm.

Diagnosis : Four teeth (excluding the external angle of orbit) on the anterolateral border; free edge of front bow-shaped; legs not spiny; chelipeds in the adult male two and half of carapace length; the wrist with a blunt spine at the inner angle; walking legs with both edges

PLATE-I



of all long joints hairy, more in the lower edge of the dactylus and the upper edge of the other joints; upper edge of propodus and dactylus strongly granular.

Habitat : Found in live and dead corals.

Distribution : Reports on previous records of the species from the GoMMBR: Tuticorin (Henderson, 1893), Krusadai Island (Gravelly, 1927), Kilakkarai (Sankarankutty, 1967) and islands of Gulf of Mannar (Jeyabaskaran *et al.*, 2000), from the Indian waters: Okha and Mumbai (Chhappgar, 1957), Lakshadweep, Andaman and Nicobar Islands (Alcock, 1898) and from the Indo-Pacific region: Red Sea, Persian Gulf, east coast of Africa, Mauritius, Karachi, Sri Lanka, Celebes, Singapore, Reunion Islands, Japan and Hawaii (Alcock 1898; Sankarankutty 1962a; Sakai 1976).

Remarks : It was recorded from the dead *Pocillopora* corals covered with algae from Manauli Putti, Mulli and Anaipar Islands.

10. *Pilodius areolatus* (H. Milne Edwards)

Plate-II, Fig.-j

1834. *Chlorodius areolatus* H. Milne Edwards, *Librairie Encyclopedique de Roret*, 1, p. 400.

1976. *Pilodius areolatus* Sakai, *Crabs of Japan and adjacent seas*, p. 460.

Materials : 6 Males and 10 females; the maximum CL is 1.0 cm and the minimum CL is 0.5 cm.

Diagnosis : Carapace flat and completely lobulated and covered with a coat of very short pubescence; lobules of carapace deeply demarcated and convex; covered with pearly granules of equal size; front deeply and broadly cut into two granular lobe; chelipeds unequal; outer surface of arm, wrist and hand covered with pearly granules; fingers strongly arches; exposed surface of legs covered with a dense spongy fur, from which, the tops of numerous conical shaped granules peep out.

Habitat : Corals reefs in shallow waters.

Distribution : Reports on previous records of the species from the GoMMBR : Islands of Gulf of Mannar (Jeyabaskaran *et al.*, 2000), from the Indian waters: Andaman and Nicobar Islands (Alcock, 1898) and from the Indo-Pacific region : Red Sea, east coast of Africa, Mauritius, Sri Lanka, south seas, Japan and Hawaii (Alcock 1898; Sakai 1976).

Remarks : It was recorded from the dead *Pocillopora* corals covered with algae from Poomarichan and Hare Islands.

11. *Chlorodiella nigra* (Forskål)

Plate-II, Fig.-k

1775. *Cancer niger* Forskål, *Haunia*, I-XXXIV, p. 89.

1976. *Chlorodiella nigra* Sakai, *Crabs of Japan and adjacent seas*, p. 465.

Materials : 388 Males and 540 females; the maximum CL is 2.0 cm and the minimum CL is 0.3 cm.

Diagnosis : Carapace transversely hexagonal, 1.5-1.6 times as broad as long, slightly convex; surface smooth and glabrous with ill-defined regions; front broad, about 0.4 times the carapace breadth, almost straight with a shallow median notch; anterolateral border with four teeth behind the outer orbital angle, rounded in adult and sharp in juvenile specimens; first tooth often smaller or even indistinct and confluent with outer orbital angle; chelipeds asymmetrical, twice the length of carapace, smooth and unarmed except for a small spine or tubercle on the anterior border of the merus and on the inner margin of the carpus; tips of fingers spoon-shaped. Ambulatory legs stout, smooth with numerous long plumose setae.

Habitat recorded by earlier workers : Found in live and dead corals.

Distribution : Reports on previous records of the species from the GoMMBR: Krusadai Island (Gravelly, 1927), Manauli Island (Sankarankutty, 1967) and islands of Gulf of Mannar (Jeyabaskaran *et al.*, 2000), from the Indian waters: Lakshadweep (Borradaile, 1902; 1903), Andaman and Nicobar Islands (Heller 1868; Alcock 1898) and from the Indo-Pacific region: Red Sea, south and east coasts of Africa, Madagascar, Seychelles, Karachi, Mergui Archipelago, Australia, French Polynesia, Japan and Hawaii (Sankarankutty 1962a; Sakai 1976).

Remarks : It was recorded from the dead *Pocillopora* corals covered with algae from Shingle, Krusadai, Poomarichan, Pullivasal, Manauli Putti, Hare, Mulli, Vaalai and Thalayari, Appa, Anaipar, Nallathanni and Upputhanni Islands.

12. *Cymo andreossi* (Audouin)

Plate-II, Fig.-I

1826. *Pilumnus andreossi* Audouin, *Des. de l'Egypte, Hist. Nat, Paris*. 1(4), p. 86.

1976 *Cymo andreossi* Sakai, *Crabs of Japan and adjacent seas*, p.467.

Materials : 11 Males and 6 females; the maximum CL is 1.5 cm and the minimum CL is 0.5 cm.

Diagnosis : Carapace almost circular, slightly broader than long, surface flat, covered with a short pubescence; front somewhat deflexed, bilobed with wide V-shaped incision; anterolateral margin evenly convex, composed of three lobes covered with granules; chelipeds markedly unequal, covered with tomentum and granules; fingers of larger cheliped stout, truncated, blunt-pointed and deeply hollowed at tip, those of smaller cheliped, though also hollowed, thin, slender and pointed; ambulatory legs stout, thickly covered with long pubescence, dorsal margins of merus finely granular, those of following segments with more acuminate granules.

Habitat : Coral reefs in shallow waters.

Distribution : Reports on previous records of the species from the GoMMBR: Tuticorin (Henderson, 1893), Krusadai Island (Gravelly, 1927), Manauli Island (Sankarankutty, 1967) and islands of Gulf of Mannar (Jeyabaskaran *et al.*, 2000), from the Indian waters: Lakshadweep (Borradaile, 1902; 1903) and Andaman and Nicobar Islands (Alcock, 1898) and from the Indo-Pacific region: Red Sea, Persian Gulf, east coast of Africa, Madagascar, Seychelles, Karachi, Mergui Archipelago, Australia, French Polynesia, Japan and Hawaii (Sankarankutty, 1962a).

Remarks : It was recorded from the dead *Pocillopora* corals covered with algae from Vaalai and Thalayari, Anaipar and Nallathanni Islands.

13. *Actaea cavipes* (Dana)

Plate-II, Fig.-m

1852. *Actaeodes cavipes* Dana, *U. S. exploration Expedition*, 13, pl. 1, p. 78.

1976. *Actaea cavipes* Sakai, *Crabs of Japan and adjacent seas*, p. 447.

Materials : 32 Males and 73 females; the maximum CL is 2.5 cm and the minimum CL is 0.4 cm. Reg. No. **ZSI/MBS/5221**.

Diagnosis : Carapace broader than long, completely lobulated; the lobules covered with military granules and separated by broad grooves; front obliquely depressed with cupid's bow-shaped edge; anterolateral border with 4 or 5 lobes; lobes granular and uneven but not pitted; outer surface of wrist with numerous pits and craters; carpus and propodus of legs with a double longitudinal crest; fingers long, pointed and slightly hollow at tip.

Habitat : Coral reefs in shallow waters.

Distribution : Reports on previous records of the species from the GoMMBR: No previous reports were carried out from GoMMBR, from the Indian waters: Lakshadweep (Borradaile 1903; Sankarankutty 1961b) and Andaman and Nicobar Islands (Alcock 1898; Sankarankutty 1961a) and from the Indo-Pacific region: Red Sea, east coast of Africa, Mauritius, Samoa, Fiji, Tahiti, New Caledonia, New Guinea and Japan (Alcock 1898; Sankarankutty 1961b; Sakai 1976).

Remarks : It was recorded from the dead *Pocillopora* corals covered with algae from Shingle, Krusadai, Poomarichan, Pullivasal, Manauli Putti, Hare and Appa Islands. It was reported for the first time from GoMMBR.

14. *Actaea calculosa* (A. Milne Edwards)

Plate-II, Fig.-n

1834. *Cancer calculosa* H. Milne Edwards, *Librairie Encyclopedique deRoret*, 1, p. 371.

1976. *Actaea tuberculosus* Guinot, *Mem. Mus. Nat. D' hist*, p. 221.

Materials : 1 Male and 3 females; the maximum CL is 2.0 cm and the minimum CL is 1.0 cm. Reg. No. **ZSI/MBS/5222**.

Diagnosis : Carapace shorter and broader its length is being only about two thirds of its breadth; the regions and lobules much more distinctly delimited; front sharply bilobed; tubercles on the carapace and chelipeds much smoother and hardly faceted; 4-lobulation of the anterolateral borders more distinct; fingers in chelipeds short, blunt pointed, hardly hollow at tip; the tubercles on the legs never spiny (Plate-II N).

Habitat : Coral reefs in shallow waters.

Distribution : Reports on previous records of the species from the GoMMBR : No earlier records were

carried out from both the GoMMBR and the Indian waters, from the Indo-Pacific region: Persian Gulf, Karachi and Mergui Archipelago (Alcock, 1898), Sri Lankan side of Gulf of Mannar (Laurie, 1906), Gulf of Thailand, China Sea, Tahiti, Australia, Kei Islands and Japan (Sakai, 1976).

Remarks : It was recorded from the dead *Pocillopora* corals covered with algae from Krusadai and Manauli Putti Islands. Since there is no earlier record of this species, this record is the first from the Indian waters.

Family PILUMNIDAE

15. *Pilumnus vespertilio* (Fabricius)

Plate-II, Fig.-o

1793. *Cancer vespertilio* Fabricius, *Emendata et aucta*, 2, p. 463, pls.1-8.

1976. *Pilumnus vespertilio* Sakai, *Crabs of Japan and adjacent seas*, p. 484.

Materials : 10 Males and 13 females; the maximum CL is 1.5 cm and the minimum CL is 0.5 cm.

Diagnosis : Carapace, legs and chelipeds (with the exception of the fingers and the lower corner and lower border of the hand, which are bare) entirely concealed by a thick, dark, shaggy coat of coarse, tufted and somewhat matted hairs; two kinds of two hairs, longer and shorter; the longer being most numerous on the legs and on the borders of the carapace; when denuded, carapace transversely oval, nearly 3/4 as long as broad, the regions fairly distinctly delimited and areolated and the surface studded with small well-separated clusters of granules, from which the hairs spring; front obliquely deflexed; the orbital margins, like the edge of the front smooth or obscurely crenulate; the antero-lateral border a little shorter than the posterolateral cut into three spiniform teeth; the chelipeds unequal; inner angle of the wrist sharp, but never spiniform; the upper and outer surfaces of the wrists, of the smaller hand, and of all but the lower border and lower outer corner of the larger hand (which is quite bare and usually quite smooth) covered with clusters of granules; the carpus and propodus of all the legs, and the merus also of the last pair of legs with granular on the anterior and dorsal aspects.

Habitat : Coral reefs and rocky beach in shallow waters.

Distribution : Reports on previous records of the species from the GoMMBR: Tuticorin (Henderson, 1893), Krusadai Island (Gravely, 1927), Manauli Island (Sankarankutty, 1967) and islands of Gulf of Mannar (Jeyabaskaran *et al.*, 2000), from the Indian waters : Okha and Mumbai (Chhapgar, 1957), Lakshadweep (Borrdale 1903; Sankarankutty 1961b), Palk Bay and Andamans (Alcock, 1898), and from the Indo-Pacific region: Red Sea, east coast of Africa, Mauritius, Sri Lanka, Japan and Hawaii (Sakai, 1976).

Remarks : It was recorded from the dead *Pocillopora* coral covered with algae from Shingle, Hare and Vaalai and Thalayari Islands.

16. *Pilumnus tomentosus* Latreille

Plate-II, Fig.-p

1825. *Pilumnus tomentosus* Latreille, exposées succinctement et dans un ordre analytique, avec l'indication de leurs genres, *Bailliere*, 2, p. 125.

1976. *Pilumnus tomentosus* Sakai, *Crabs of Japan and adjacent seas*, p. 485.

Materials : 4 Males and 6 females; the maximum CL is 2.0 cm and the minimum CL is 0.5 cm.

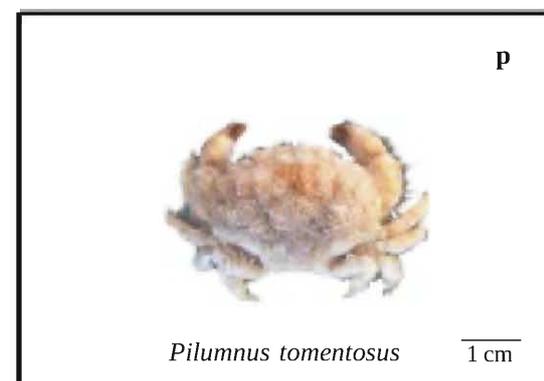
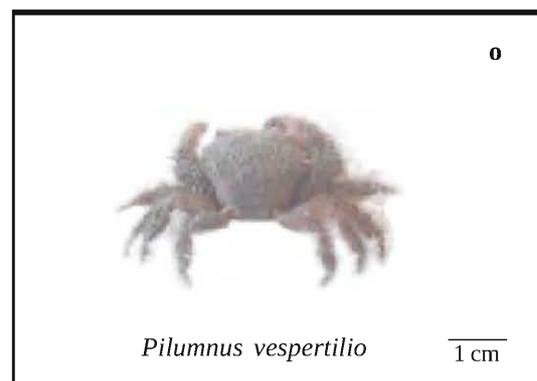
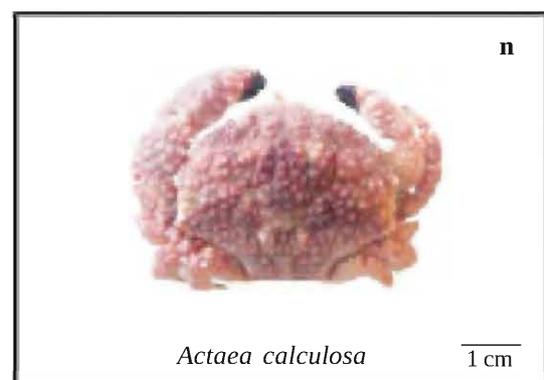
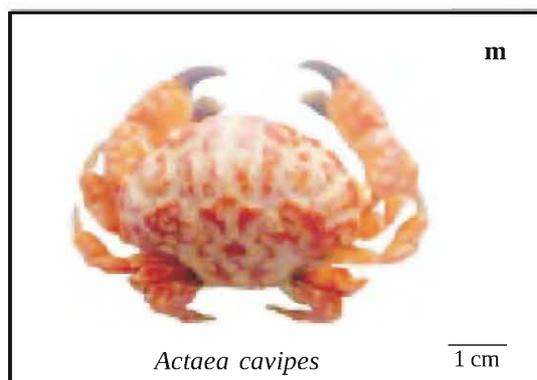
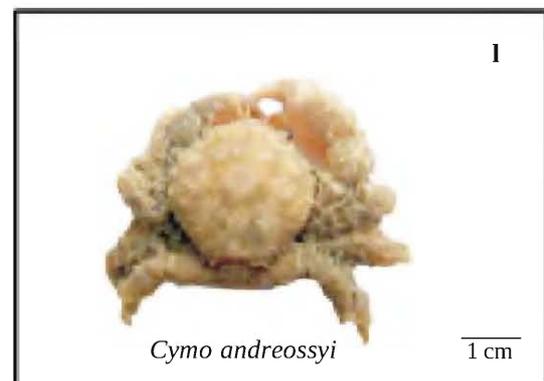
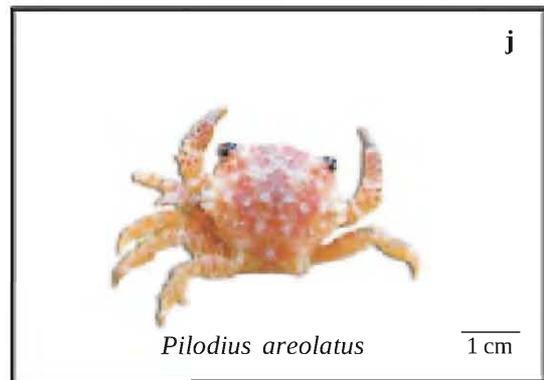
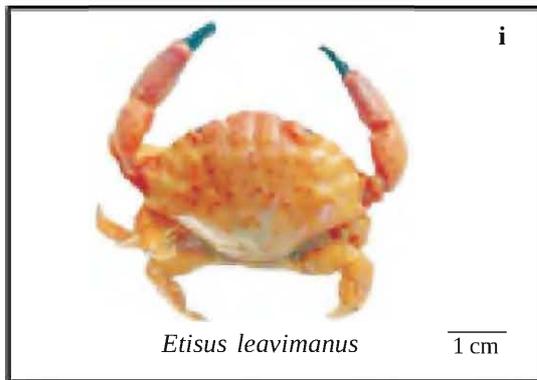
Diagnosis : Carapace and appendages with long hairs; regions of carapace moderately defined; carapace moderately convex; anterolateral borders armed with sharp teeth; posterolateral border not concave; front bilobed; preorbital tooth distinct; external orbital tooth with no accessory tooth; entire animal covered with yellowish hair but outline of carapace and appendages perceptible in natural condition; hairs uniformly distributed on carapace and chelipeds.

Habitat : Rocky beaches, up to 25 m deep.

Distribution : Reports on previous records of the species from the GoMMBR : Islands of Gulf of Mannar (Jeyabaskaran *et al.*, 2000), from the Indian waters : No previous records and from the Indo-Pacific region : South and West Australia and Japan (Sakai, 1976).

Remarks : It was recorded from the dead *Pocillopora* corals covered with algae from Krusadai, Pullivasal and Manauli Putti Islands.

PLATE-II



Family TRAPEZIIDAE

17. *Tetralia rubridactyla* Garth

Plate-III, Fig.-q

1902. *Tetralia glaberrima* Borradaile, *The fauna and geography of the Maldive and Laccadive Archipelagoes*, 1(3), p. 265, Figs. 41–60.

1999b. *Tetralia rubridactyla* Castro, *Zoosystema*, 21(1), 102.

Materials : 1 Male and 1 female; the maximum CL is 1.0 cm and the minimum CL is 0.5 cm. Reg. No. **ZSI/MBS/5223**.

Diagnosis : Anterior border of carapace with relatively small lobes or no lobes. Carapace trapezoidal or oval, its posterior border shorter than anterior border; chelipeds unequal in size; surface of chelipeds smooth or with microscopic granules; setae on dorsal surface of the propodus of larger cheliped; thoracic sternum with median suture; walking legs not distinctly banded; anterior distal border of merus of cheliped with prominent dentate crest; distal portion of dactylus of chelipeds orange red endopod of first maxilliped with straight or slightly concave edge.

Habitat : From *Acropora* corals.

Distribution : There was no earlier record of occurrence of the species from GoMMBR and Indian region. It was recorded previously from the Indo-Pacific region from Indonesia, western Indian oceans far north as Somalia to the Pacific Ocean (Japan to French Polynesia) except Hawaiian Islands (Castro, 1999b).

Remarks : It was recorded from the dead *Pocillopora* corals covered with algae from Manuli Putti and Vaalai and Thalayari Islands. Since there is no previous record from Indian waters, this is the first record of the species.

18. *Trapezia areolata* Dana

Plate-III, Fig.-r

1852. *Trapezia areolata* Dana, *U. S. exploration. expedition*, p. 13, pt.1.

1907. *Trapezia cymodoce areolata* Rathbun, *Mem. Mus. Comp. Zool. Harvard*, 35, p. 59, Pl. 1–9.

Materials : 3 Males and 2 females; the maximum CL is 1.5 cm and the minimum CL is 0.5 cm.

Diagnosis : A distinct spine at the junction of anterolateral and posterolateral borders of carapace;

lower border of hand cristate and entire; frontal border rather undulate; frontal teeth being not deeply separated; outer surface of hand smooth and bold; no transverse series of red spots on carapace; carapace and chelipeds covered with an elegant meshwork of deep reddish lines.

Habitat : From *Pocillopora* corals (Castro *et al.*, 2004).

Distribution : Reports on previous records of the species from the GoMMBR : Islands in Gulf of Mannar (Jeyabaskaran *et al.*, 2000) from the Indian waters: Andaman and Nicobar Islands (Alcock, 1898) and from the Indo-Pacific region : Sri Lanka, Mergui Archileago, New Guinea, Australia, Tahiti, Fiji, Samoa and New Caledonia (Alcock 1898; Jeyabaskaran *et al.*, 2000).

Remarks : It was recorded from dead *Pocillopora* corals covered with algae from Upputhanni Island.

Family MAJIDAE

19. *Tylocarcinus styx* (Herbst)

Plate-III, Fig.-s

1803 *Cancer styx* Herbst, *Veruch einer Naturgeschichte der krabben und krebse*, 3, p.53.

1976 *Tylocarcinus styx* Sakai, *Crabs of Japan and adjacent seas*, p. 221.

Materials : 69 Males and 97 females; the maximum CL is 2.5 cm and the minimum CL is 1.1 cm.

Diagnosis : Carapace elongate pyriform, dorsal surface covered with rounded tubercles; rostrum 1/3rd to 1/4th of postrostral carapace length; rostral spines fused at base and ; diverged at distal part; preocular spine sharp, upcurved; lateral margins tuberculate, but lacking spines; chelipeds shorter and more slender than first ambulatory legs; ambulatory legs very stout, decreasing in size from the very long first one to the last; merus with 5-6 spines on anterior border; carpus with sharp distal spine; dactylus claw-shaped.

Habitat : Rocky beaches and coral reefs.

Distribution : Reports on previous records of the species from the GoMMBR : Tuticorin (Henderson, 1893), Krusadai island (Gravelly, 1927), Manuli Island (Sankarankutty, 1967) and islands of Gulf of Mannar (Jeyabaskaran *et al.*, 2000), from the Indian waters : Lakshadweep (Sankarankutty, 1961b) and Andamans

(Alcock, 1898) and from the Indo-Pacific region : Red Sea, east coast of Africa, Maldives, Sri Lanka, Mergui Archipelago, Samoa and Japan (Sakai, 1976).

Remarks : It was recorded from the dead *Pocillopora* corals covered with algae from Krusadai, Manauli Putti, Hare, Mulli and Nallathanni Islands.

20. *Schizophrys aspera* (H. Milne Edwards)

Plate-III, Fig.-t

1834. *Mithrax asper* H. Milne Edwards, *Librairae Encyclopedique de Rore.*, 1, p. 320.

1976. *Schizophrys aspera* Sakai, *Crabs of Japan and adjacent seas*, p. 246.

Materials : 16 Males and 30 females; the maximum CL is 2.5 cm and the minimum CL is 2.0 cm.

Diagnosis : Carapace broadly pyriform, depressed or moderately convex, surface unevenly granular and setose; gastric region with a transverse row of 4 tubercles or spines; rostrum prominent, consisting of two stout divergent spines of about 1/6th to 1/9th of postrostral carapace length; each bearing one lateral accessory spine of variable length; lateral margins of carapace with 6 well developed acute spines behind postorbital tooth; chelipeds not much stouter than first pair of legs in females, much longer and more stout in males; walking legs with cylindrical setose.

Habitat : Rocky areas.

Distribution : Reports on previous records of the species from the GoMMBR : Tuticorin (Henderson, 1893), Krusadai Island (Gravelly, 1927), Manauli Island (Sankarankutty, 1967) and islands in Gulf of Mannar (Jeyabaskaran *et al.*, 2000), from the Indian waters: Lakshadweep (Sankarankutty, 1961b), Okha, Mumbai (Chhapgar, 1957) and Nicobar (Sankarankutty, 1962b) and from the Indo-Pacific region : Red Sea, Persian Gulf, east coast of Africa, Maldives, Sri Lanka, Karachi, Mergui Archipelago, Samoa, New Caledonia, Hawaii and Japan (Sakai, 1976).

Remarks : It was recorded from the dead *Pocillopora* corals covered with algae from Hare Island.

Family LEUCOSIIDAE

21. *Arcania heptacantha* (De Haan)

Plate-III, Fig.-u

1850. *Iphis heptacantha* De Haan, *Lugduni Batavorum*, fasc, p. 27.

1976. *Iphis heptacantha* Sakai, *Crabs of Japan and adjacent seas*, p. 94.

Materials : 4 Males and 4 females; the maximum CL is 2.5 cm and the minimum CL is 1.5 cm.

Diagnosis : Carapace circular in outline; dactylus of chelipeds as long as palm fingers and slender; margins of carapace armed with 7 spines, of which lateral 2 most prominent; colouration uniformly pale vermilion.

Habitat : Sandy or muddy bottom.

Distribution : Reports on previous records of the species from the GoMMBR : Islands in GoMMBR (Jeyabaskaran *et al.*, 2000). No other records from the Indian waters. From the Indo-Pacific region : Gulf of Thailand, Singapore and Japan (Sakai, 1976).

Remarks : It was recorded from the dead *Pocillopora* corals covered with algae from Poomarichan and Manauli Putti Islands.

22. *Arcania erinaceus* (Fabricius)

Plate-III, Fig.-v

1798. *Leucosia erinaceus* Fabricius, *Hafniae*, p. 352.

1976. *Arcania erinaceus* Sakai, *Crabs of Japan and adjacent seas*, p. 92.

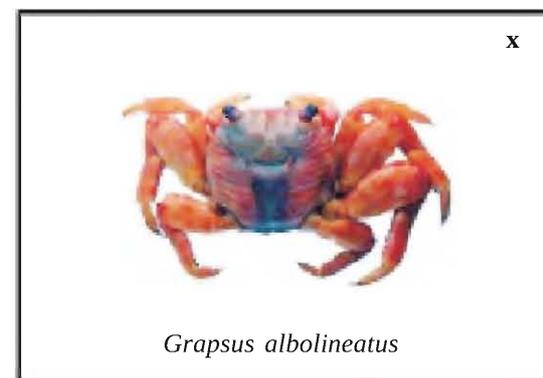
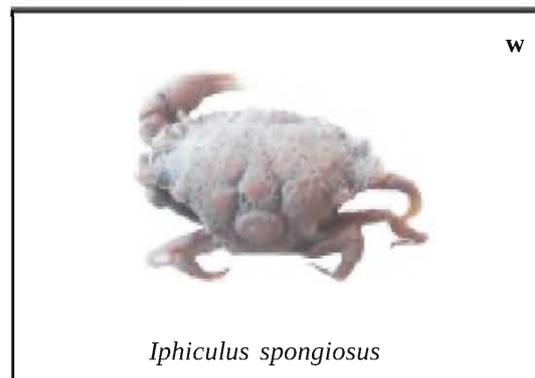
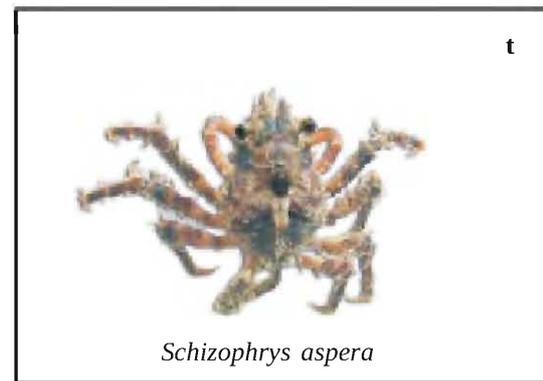
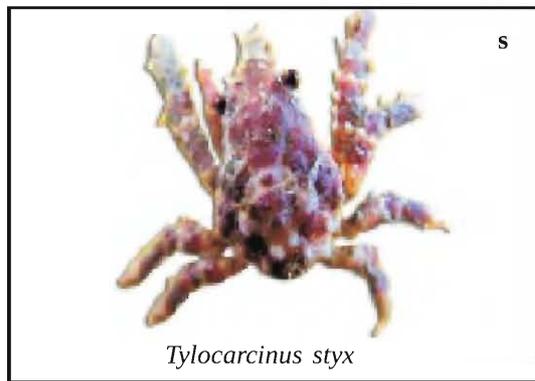
Materials : 3 Males and 2 females; the maximum CL is 2.0 cm and the minimum CL is 1.1 cm.

Diagnosis : Carapace globular, thickly covered with thorns and spine-like granules, among which the smooth shallow sulci that defining the branchial and hepatic regions visible; around the margin of the carapace, eleven large spines, covered with secondary spinelets; ventral surface of the external maxillipeds, thoracic sterna, and abdominal terga also covered with sharply granular; front ending in two prominent sharp spines; merus of chelipeds and legs covered with thorns, and the other joints, except the dactyli, the distal half of the hand, and the fingers sharply granular; the fingers a little shorter than the palm; the first pair of true legs exceeding the arms in length by their last 2 1/2 joints.

Habitat : Sandy or muddy substrate.

Distribution : Reports on previous records of the species from the GoMMBR : Trawl catches from GoMMBR (Jeyabaskaran *et al.*, 2000), from the Indian

PLATE-III



waters : Pondicherry and mouth of Hooghly river (Alcock, 1895) and from the Indo-Pacific region : Sri Lanka, Singapore and Japan (Sakai, 1976).

Remarks : It was recorded from the dead *Pocillopora* corals covered with algae from Manauli Putti Island.

23. *Iphiculus spongiosus* Adams and White

Plate-III, Fig.-w

1849. *Iphiculus spongiosus* Adams and White, *Zoology of the voyage, H.M.S. Samarang*, 1843–46, p 57, pls. I–XIII.

1976. *Iphiculus spongiosus* Sakai, *Crabs of Japan and adjacent seas*, p.105.

Materials : 5 Males and 2 females; the maximum CL is 2.0 cm and the minimum CL is 1.0 cm. Reg. No. **ZSI/MBS/5224**.

Diagnosis : Carapace convex, transversely ovoidal, much broader than long; the surface when denuded of its wooly covering, granulose with numerous larger pustulus tubercles, and showing the cardiac and intestinal regions tumid and very well demarcated by grooves; on the anterolateral margins, four large coarse spines, increasing in size from backwards; on the postero- lateral margins, two coarser dentiform tubercles present, separated by a wide interval; front coarsely bilobed; a strong tooth at the outer angle of the orbit; another at the outer angle of the buccal cavern; the chelipeds densely tomentose up to the base of the fingers; the fingers are more slender.

Habitat : Muddy substrate.

Distribution : No earlier records were made from GoMMBR. Records from the Indian waters : Andamans (Alcock, 1896) and from the Indo-Pacific region : Red Sea, Bay of Bengal, Singapore, Gulf of Thailand, the Philippines, Hong Kong and Japan (Sakai, 1976).

Remarks : It was recorded from the dead *Pocillopora* corals covered with algae from Anaipar Island. It was reported for the first time from GoMMBR.

Family GRAPSIDAE

24. *Grapsus albolineatus* Lamarck

Plate-III, Fig.-x

1818. *Grapsus albo-lineatus* Lamarck, *Exposition des principes fondamentaux de la Zoologie*, 5, p. 249.

1976. *Grapsus albolineatus* Sakai, *Crabs of Japan and adjacent seas*, p. 630.

Materials : 2 Males and 4 females; the maximum CL is 3.0 cm and the minimum CL is 2.5 cm.

Diagnosis : Carapace subcircular, slightly broader than long; depressed, dorsal surface smooth in median, with transverse and oblique striae in lateral part; front broad, about 1/3rd of total carapace width, deflexed; lateral margins strongly arched with a single sharp tooth behind the orbital tooth; chelipeds subequal, anterior margin of arm (merus) with sharp spines; inner corner of carpus with long spine; hand with upper surface granular, fingers with corneous spooned tip; walking legs stout, depressed, meri with subdistal spine; dactyli with strong brownish spines).

Habitat : Rocky beach or coral reefs.

Distribution : Reports on previous records of the species from the GoMMBR: Tuticorin (Henderson, 1893), from the Indian waters : Malabar and Coromandel coasts (Alcock, 1900), Trivandrum (Pillai, 1951), Okha (Chhapgar, 1957) and Andaman and Nicobar Islands (Alcock 1900; Sankarankutty, 1961a) and from the Indo-Pacific region: Red Sea, east coast of Africa, Sind coast, Sri Lanka, Polynesia, Hawaii and Japan (Sakai, 1976).

Remarks : It was recorded from the dead *Pocillopora* corals covered with algae from Shingle and Poomarichan Islands.

25. *Metapograpsus messor* (Forskål)

Plate-IV, Fig.-y

1775. *Cancer messor* Forskål, *Hauniae.*, I–XXXIV, p. 88.

1976. *Metapograpssus messor* Sakai, *Crabs of Japan and adjacent seas*, p. 630.

Materials : 4 females; the maximum CL is 2.5 cm and the minimum CL is 2.1 cm.

Diagnosis : Carapace trapezoidal, 1.25-1.35 times broader than long, with strongly converging lateral margins; surface smooth and slightly convex; front very broad, about 3/5th of greatest carapace width; lateral margins entire, without tooth behind the outer orbital angle; chelipeds unequal, larger one about 1.5 times the length of the carapace, strong and stout; palm inflated, outer surface smooth; fingers with blunt tips; walking legs with broad, flattened merus and strongly spinose dactyli.

PLATE-IV



Fig. 1 : *Paramonacanthus japonicus*.

Habitat : Mangroves, sub-tidal region, rocks, oyster beds and muddy substratum.

Distribution : Reports on previous records of the species from the GoMMBR : Tuticorin (Henderson, 1893) and Krusadai Island (Gravely, 1927), from the Indian waters : Okha and Mumbai (Chhapgar, 1957), Trivandram (Pillai, 1951), Parangipettai (Sethuramalingam and Ajmalkhan, 1991), Orissa, Gangetic delta and Andamans (Alcock, 1900) and from the Indo-Pacific region: Red Sea, east coast of Africa, Seychelles, Persian Gulf, Pakistan, Australia, Hawaii and Japan (Sakai, 1976).

Remarks : It was recorded from the dead *Pocillopora* corals covered with algae from Upputhanni Island.

Family OCYPODIDAE

26. *Ocypode cordimana* Desmarest

Plate-IV, Fig.-z

1825. *Ocypode cordimana* Desmarest, *Sur les cotes ou dans les eaux douces de la France*. Paris., p. 121.

1976. *Ocypode cordimana* Sakai, *Crabs of Japan and adjacent seas*, p. 599.

Materials : 2 Males and 1 female; the maximum CL is 2.0 cm and the minimum CL is 1.5 cm.

Diagnosis : Carapace deep, quadrilateral, strongly convex fore and aft, its length about seven-eighth of its greatest breadth; antero-lateral angles coinciding with the outer orbital angles, and point acutely forwards; orbits deep; no terminal style to the eyes; chelipeds and legs rough and squamiform; no serration of their edges, except in the case of the lower borders of the arms, the inner edge of the wrists, and the lower border of the hands; palm of the larger hand, though deep, not particularly compressed, and no stridulating ridge.

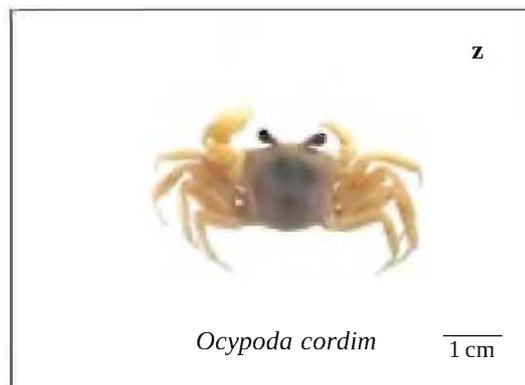


Fig. 2 : Colour changing behaviour of fish *Paramonacanthus japonicus* in the rearing tank.

Habitat recorded by earlier workers : Sandy beach.

Distribution : Reports on previous records of the species from the GoMMBR : Tuticorin (Henderson, 1893) and Krusadai island (Gravely, 1927), from the Indian waters : Lakshadweep (Borradaile 1903; Sankarankutty 1961b), Mumbai (Chhapgar, 1957), Trivandrum (Pillai, 1951), Chennai (Alcock, 1900) and Andaman and Nicobar Islands (Heller 1868; Alcock 1900) and from the Indo-Pacific region: Red Sea, east coast of Africa, Mauritius, Maldives, Tahiti and Japan (Sakai, 1976).

Remarks : It was recorded from the dead *Pocillopora* corals covered with algae from Shingle Island.

SUMMARY

A total of 26 species were collected from the *Pocillopora* coral colonies covered with algae from the present study. The present study emphasized 26 species of brachyuran crabs belonging to 10 genera and 8 families. Out of these 4 species are new to GoMMBR and 2 species are new to India. Alcock (1895-1900) examined 601 Species from the collections of Indian Museum. His collections were not specifically pertaining to GoMMBR but it represents all over the coasts also some outside waters. 208 species of crabs were reported by Laurie (1906) from the Gulf of Mannar waters. However his samplings were mainly based in both Indian and Sri Lankan waters. Sankarankutty (1967) reported 88 species of brachyuran crabs from the biosphere reserve. Recently Jeyabaskaran *et al.* (2000) updated the checklist of brachyuran crabs in GoMMBR

which records 106 species. The earlier studies on the brachyuran crabs in GoMMBR revealed a greater number of species. However the crabs examined from the earlier studies were collected from the coral reef areas. The previous studies were not restricted to the coral colonies. An attempt was made in the present

study in which the samplings of the cryptic brachyuran crabs are restricted only to the dense branched *Pocillopora* colonies. Periodical and long term studies should be encouraged on the taxonomy and ecology of brachyuran crabs which will definitely focus light on the coral associated crustaceans in GoMMBR.

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