# Chapter 2: Brachyuran crab Diversity –A Taxonomical Approach

## Introduction

Amongst the living marine crustacean macrofauna, true crab belonging to infraorder brachyura is best known and intensively studied group. Brachyuran crabs belonging to order decapoda is the most diverse group of crustacean alive today. They are of the most adaptive living organisms which can be seen from their colonization in various habitats. The brachyuran crabs can be found from the depth of the 6000 meters in the oceanic environment to the hight of 2000 meters above sea levels. Brachyuran crabs forms one of the most dominant groups in estuarine and mangrove habitats where environment changes dramatically in terms of salinity and temperature. The brachyuran crabs have adopted different life styles in which some live exclusively terrestrial life and come to water for certain occasion while some inhabit freshwater habitat (Ng et al., 2008).

Maximum diversity of brachyuran crabs has been recorded from the marine environment as compared to the brachyuran crab diversity in fresh water and terrestrial habitat. In the marine environment, different habitat types support different kind of brachyuran crab diversity. In terms of region wise diversity, maximum diversity of brachyuran crabs has been reported from tropical regions. In tropics, the Indo-Pacific region supports maximum diversity followed byIndo-Malayan region. There are many checklists available on the brachyuran crab diversity of different parts of the world. Chace (1951) had compiled the first checklist of brachyuran crabs of the world and recorded 4,428 species distribiuted in 635 genera. Ng et al., (2008) have revised the checklist of the brachyuran crabs of the world and identified 6,793 valid species including 1,907 synonms of these species distributed in 1,271 genera, 93 families and 38 super families.

The studies on brachyuran crab fauna in Indian waters have historical account. Henderson (1893) had studied tha brachyuran fauna in Inian waters and deposited the material in Indian museum. Alcock (1895-1900) had extensively studied the brachyuran crab fauna of Indian subcontinent and identified several new species of crabs. The contribution made by Alcock is proved as a back bone to the current studies going on in brachyuran crab taxonomy. Alcock and Anderson (1894, 1899) have also studied the deep sea crab fauna collected during the voyage of RIMSS 'Investigator'. They carried out the collection in the Bay of Bengal, Arabian Sea and Indian Ocean up to Sri Lanka. The brachyuran crab fauna of east coast of India have been stuied extensively as compared to west coast of India. So far total 808 brachyuran crab species belonging to 62 families have been reported from Indian waters out of which 226 species are reported from west coast of India while 461 species are reported from east coast of India (Dev Roy, 2013).

The western coast of India is 3297 km long, out of which 1600 km of coast line is covered by the Gujarat state. Out of 1600 km of coast line maximum area of coastline is covered by Gulf of Kachchh followed by Saurashtra coast and Gulf of Khmbhat. The coastal areas of Gujarat support various marine habitat and they have been explored to study various marine fauna. As compared to other marine fauna the brachyuran crab fauna is least studied. Hornell (1906) had studied the marine fauna of coastal areas of Okaha Mandal and reported few brachyuran crab species. After the long gap of 50 years, Chhapagar (1957a, b) had studied the brachyuran crab fauna of Bombay state and identified 42 species of brachyuran crab from Gujarat (then part of Bombay State). In this study, some parts of Gujarat state like Okha of Gulf of Kachachh, Umarsadi and Umargaon of Gulf of Khambhat were studied extensively for the brachyuran crab species. Chhapagar (1955) has also described two new species of brachyuran crabs from the coastal areas of Okha. Chandi (1972) has also added few more species to the brcahuran crab fauna of Gujarat. Dev Roy (2013) has compiled the checklist of brachyuran crab fauna of western coast of India and listed the occurrence of 66 species from the copastal areas of Gujarat. Pandya (2010) and Shukla et al., (2013) have studied the brachyuran fauna of some parts of Gulf of Khmbhat. From the past studies carried out of brachyuran crab fauna of Gujarat state, it was observed that the areas of Saurashtra coast have not been explored extensively for the brachyuran crab diversity.

## Materials and method

In the present study, hand picking method was adopted for the brachyuran crab collection. Diluted formalin (5%) was poured in the crevices and rock holes for the collection of brachyuran crabs hiding or living inside. For the collection of burrowing crabs living on sandy shore, the burrows were excavated and the crabs present inside the burrows were collected. The fish landing centers were also visited for the brachyuran crab collection in which the trawler catch was examined for the presence of the brachyuran crab species. All the collected specimens were brought to the lab. Detailed morphometry and sex identification were carried out for each specimen. The crabs were identified up to species level using various identification keys, monograms and taxonomic literature (Alcock, 1898; Kemp, 1919; Chhapagar, 1957a, b; Jeyabaskaran et al., 2002; Dev Roy, 2013). The latest classification and scientific name of the species were adopted from Ng et al., (2008) and Boxshell et al., (2015).

All the identified specimens were phographed using CANON 1000D camera. The gonopods of the male specimen were observed under stereo microscops and the sketches of gonopods were made for different species. Different body parts or morphological caharacters important for the species were photographed and photographic identification plate for each species was prepared. The specimens of all the specimens were presereved using wet and dry preservation method. All the species were allotted a specific accessesion number and deposited in Zoology Museum, Department of Zoology, Faculty of Science, The M. S. University of Baroda, Vadodara, Gujarat, India.

## Results

Total 30 species of brachyuran crabs belonging to 22 genera and 11 families were recorded from the study area. The taxonomic details and description of families, genera and species recorded is given below.

## Family Portunidae Rafinesque, 1815

**Description-** Carapace usually broader than long, and broadest between last pair of antero-lateral teeth, transversely hexagonal to transversely ovate. Regions of the carapace not well defined; antero-lateral teeth varying from 5 to 9. Antennules and antennae short, orbits broad, eyes conspicuous, buccal frame quadrate, carpus of third maxillipeds articulated at inner dorsal margin of merus, dactylus of fifth pair of walking leg suboval or lanceolate, rarely styliform, and always dorso-ventrally flattened, fifth pair of walking leg generally modified for swimming, with at least propodus and dactylus paddle-like, male abdomen with with segments 3-5 fused to varying degrees.

In the present study, total two subfamily (Portuninae and Thalamitinae), four genus (*Portunus, Scylla, Charybdis* and *Thalamita*) and 8 species were reported. The detail taxonomical description is given below.

### SubfamilyPortuninae Rafinesque, 1815

**Description-** Carapace sub hexagonal, rarely sub circular, usually distinctly broader than long; antero-lateral margin divided into more than five teeth (5-9), basal antennal segment elongated, lying obliquely, with antero-lateral lobe not filling orbital hiatus, antennal peduncle and flagellum standing in orbit, antennal segment elongated, chelipeds longer than ambulatory legs, bearing a set of spines on merus, carpus and palm; last pair of legs with paddle-shaped propodi and dactyli, male first gonopod without sub terminal spines.

### Genus *Portunus* Weber, 1795

**Description-** Carapace transverse, broader than long; front relatively narrow (one fifth to one sixth carapace breadth excluding last antero-lateral tooth), 3-6 (usually 4) teeth; antero-lateral borders with 4-9 (usually 9) teeth, antennal flagellum not excluded from orbit; cheliped equal to subequal, longer than any of the legs; anterior border of merus with spines, carpus with inner and outer spines; Palm prismatic and costate. All segments of swimming legs conspicuously flattened, posterior border of propodus with bristles, no spines.

**1.** ***Portunus*** **(*Portunus*)** ***pelagicus*** **(Linnaeus, 1758) (Fig. 22a, b)**

**Synonyms**

*Cancer pelagicus* Linnaeus, 1758: 626; Linnaeus, 1767: 1042.

*Cancer pelagicus* Forskal, 1775: 89.

*Portunus denticulatus* Marion de Procé, 1822: 133.

*Neptunus pelagicus* Heller, 1865: 27.Miers, 1884: 229. De Man, 1886-1887: 69. Kemp, 1918: 250.

*Neptunus* (*Neptunus*) *pelagicus* Miers, 1886: 173 (part). Alcock, 1899: 31. Parisi, 1916: 171. Balss, 1922: 107. Yokoya, 1933: 177. Sakai, 1934: 303. Sakai, 1935: 128, Pl. 38. Sakai, 1939: 387-388, Pl. 49.

*Portunus* (*Portunus*) *pelagicus* Serene, 1968: 68.Utinomi, 1969: 87, Pl. 44. Sakai, 1976: 339, Pl. 118. Ng et al., 2008: 152.

*Portunus pelagicus*Fabricius, 1798: 367; Rathbun, 1902: 26. Stephenson and Rees, 1967b: 34-35, Figs. 12c, d, 17b. Stephenson, 1967: 17. Kim, 1973: 355. Takeda, 1982: 148. Miyake, 1983: 84, Pl. 28. Ng, 1998: 1124.

**Material examined-** Total 4 specimens were collected in which 3 specimens were males and 2 were females. (Veraval: 3 male and 1 female; Sutrapada: 1 male and 1 female).

1 male (CL: 49.75mm; CW: 105.24mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 15**

**Description-** Carapace 2.2 to 2.3 broader than long; surface roughly granulated; short and dense pubescence present between the granules; carapace regions well indicated; branchial regions prominently swollen; mesogastric, epibranchial, metagstric, cardiac and mesobranchial regions demarcated with ridges; front cut into 4 teeth; (Fig. 22a) outer pair of teeth more prominent than the inner once; anterolateral border cut into 9 teeth (Fig. 22c); last tooth large and projecting outward laterally; posterolateral junction rounded.

In large males chelipeds narrow and 4.6 times longer than broad; anterior margin of merus with 3 spines; carpus with inner and outer spines; lower surface of palm smooth (Fig. 22e, f); ambulatory legs long and slender in shape; natatorial paddle elongate oval in shape (Fig. 22d); 1.7 times longer than wide; sixth male abdominal somite relatively elongate and tapering (Fig. 22b); male first gonopod long and slender in shape (Fig. 24a, b); scattered bristles present on inner and outer surface of apical lobe; in males, spots and broad reticulated bands present.Male dark blue green carapace with purple blue chelipeds, tips rusty red; females, a uniformly brownish green carapace with red tipped chelipeds. Merus, carpus and manus of chelipeds speckled with pale white spots. Pale white broad bands and large blotches on carapace on background of blue green in males. Some females may also possess spots and bands on the posterior and branchial regions of carapace.

**Distribution-** The species has wide spread distribution ranging from Red sea to Australia. The species is reported from Red sea, Zanzibar, South Africa, Persian Gulf, Korea, China, Thailand, Taiwan, Indonesia, Japan and Australia (Ng et al., 2008; Boxshall et al, 2015).

In India, the species is widely distributed on both east and west coasts. The species is reported from Maharashtra (Chhapgar, 1957a, b); Tamilnadu (Sethuramlingam and Khan, 1991); Gulf of Mannar (Jeyabaskaran et al, 2000) and Andaman and Nicobar islands (Alcock, 1898).

**2. *Portunus sanguinolentus* (Herbst, 1783) (Fig. 23a, b)**

**Synonyms**

*Cancer sanguinolentus* Herbst, 1783: 161, pl. 8, figs 56-57.

*Lupa sanguinolenta* Milne Edwards H., 1834: 451. Barnard, 1950: 152, 154.

*Neptunus sanguinolentus* de Man, 1888d: 328. Alcock, 1899a: 32. Klunzinger, 1913: 333. Sakai, 1936b: 128, pl. 39, fig. 1.

*Neptunus (Neptunus) sanguinolentus* Miers, 1886: 174. Ortmann, 1893a: 75. de Man, 1902a: 642. Balss, 1922c: 106, 107. Chhapgar, 1957a: 417, pl. A, fig. 3.

*Portunus sanguinolentus* Rathbun, 1910b: 313. Hale, 1927a: 150, fig. 151. Stephenson and Campbell, 1959: 98, figs 2B; Shen and Dai, 1964:48.

*Portunus (Portunus) sanguinolentus* Rathbun, 1923a: 130. Kim and Chang, 1985: 52. Yamaguchiand Baba, 1993: 388.

*Portunus (Neptunus) sanguinolentus* Yamaguchi, 1993: 576.

**Material examined-** Total 3 specimens were collected in which 1 specimen was a male and 2 were females. (Sutrapada: 1 male; Dhamlej: 2 female).
1 male (CL: 58.42mm; CW: 136.86mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 16**

**Description-** Carapace very broad; little convex; carapace surface finely granular anteriorly; smooth posteriorly; mesogastric, epibranchial and metagastric ridges present (Fig. 23a); front cut into 4 four sharp and prominent teeth (Fig. 23d); outer pair of teeth prominent and broad than the inner once; supra orbital border cut into 2 fissures and 3 lobes; the angles of middle lobe not conspicuous; the anterolateral border long and cut into 9 teeth including outer orbital angle (Fig. 23c); last tooth four time longer than the other and projecting straight outward laterally; posterolateral junction rounded; Antero-external angle of merus of external maxillipeds not produced.

Chelipeds in adult male 2 to 2.5 times longer than carapace; merus armed with 3 to 4 teeth on anterior border (Fig. 23f); posterior border smooth; carpus with inner and outer spine; lower surface of palm smooth; posterior border of swimming leg without spine or spinules; a spinule present near the distal end of posterior border of card of the first two pair of ambulatory leg; male first left gonopod long and slender with strong and broad basal part; the tip of apical lobe blunt; sparse and scattered bristles present on the inner and outer surface of apical lobe (Fig. 24c, d). The carapace is olive green in colour with three red spots present in the posterior half of the carapace (Fig. 23e).

**Distribution-**The species has wide spread distribution ranging from Red sea to Australia. The species is reported from Red sea, South Africa, Persian Gulf, Pakistan, Maldives, Sri Lanka, Burma, China, Taiwan, Indonesia, Japan and Australia (Ng et al., 2008; Boxshall et al, 2015).

In India, the species is widely distributed on both east and west coasts. The species is reported from Maharashtra, Gujarat, Tamilnadu, Gulf of Mannar and Andaman and Nicobar islands (Alcock, 1898; Chhapgar, 1957 a, b; Jeyabaskaran et al., 2002).

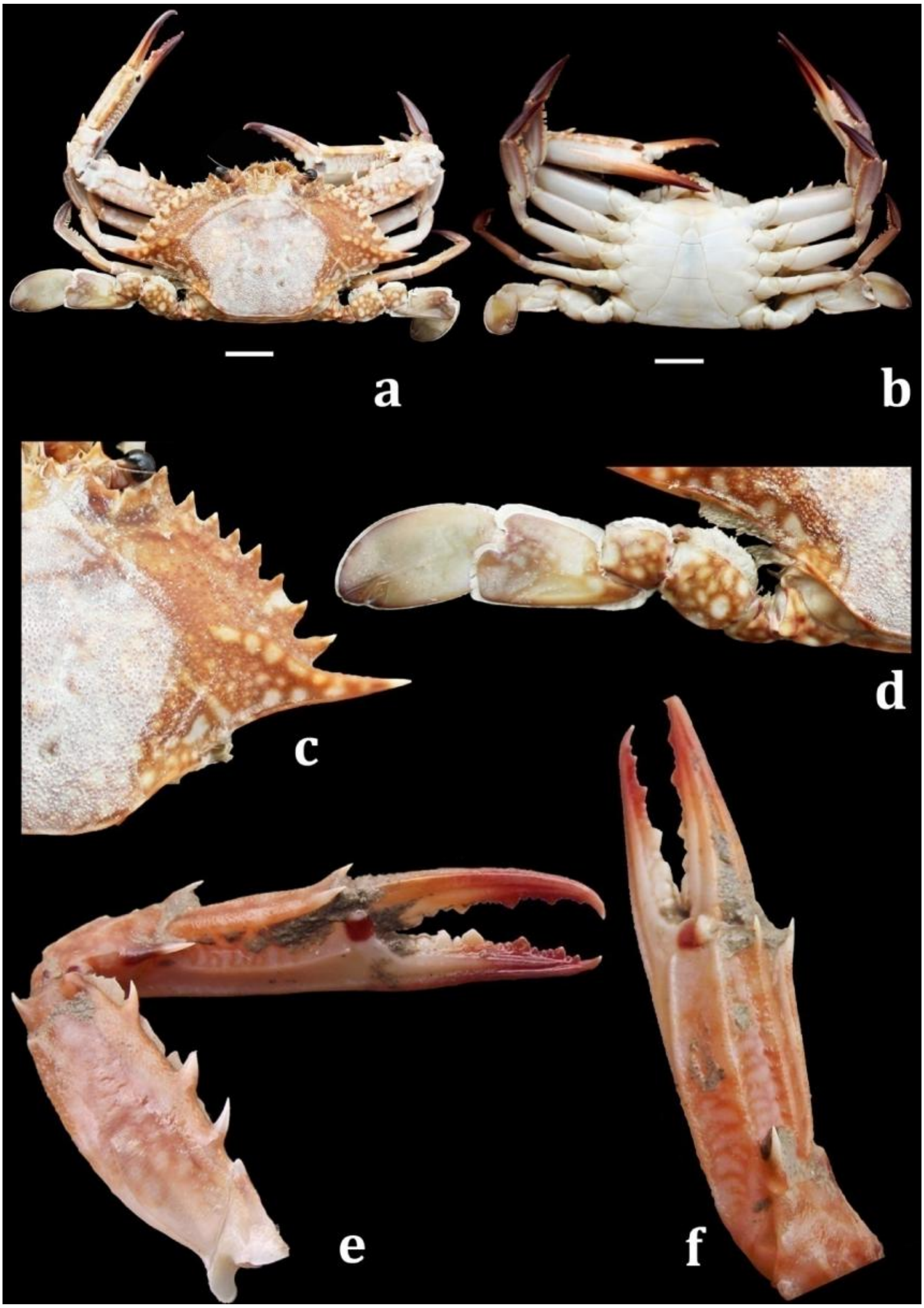


Figure: 22*Portunus* (*Portunus*) *pelagicus* (Linnaeus, 1758). (a) Dorsal view, (b) Ventral view, (c) Anterolateral border of carapace, (d) 5th periopod, (e) Cheliped structure, (f) Inner surface of cheliped palm.(Bar represents 1cm).

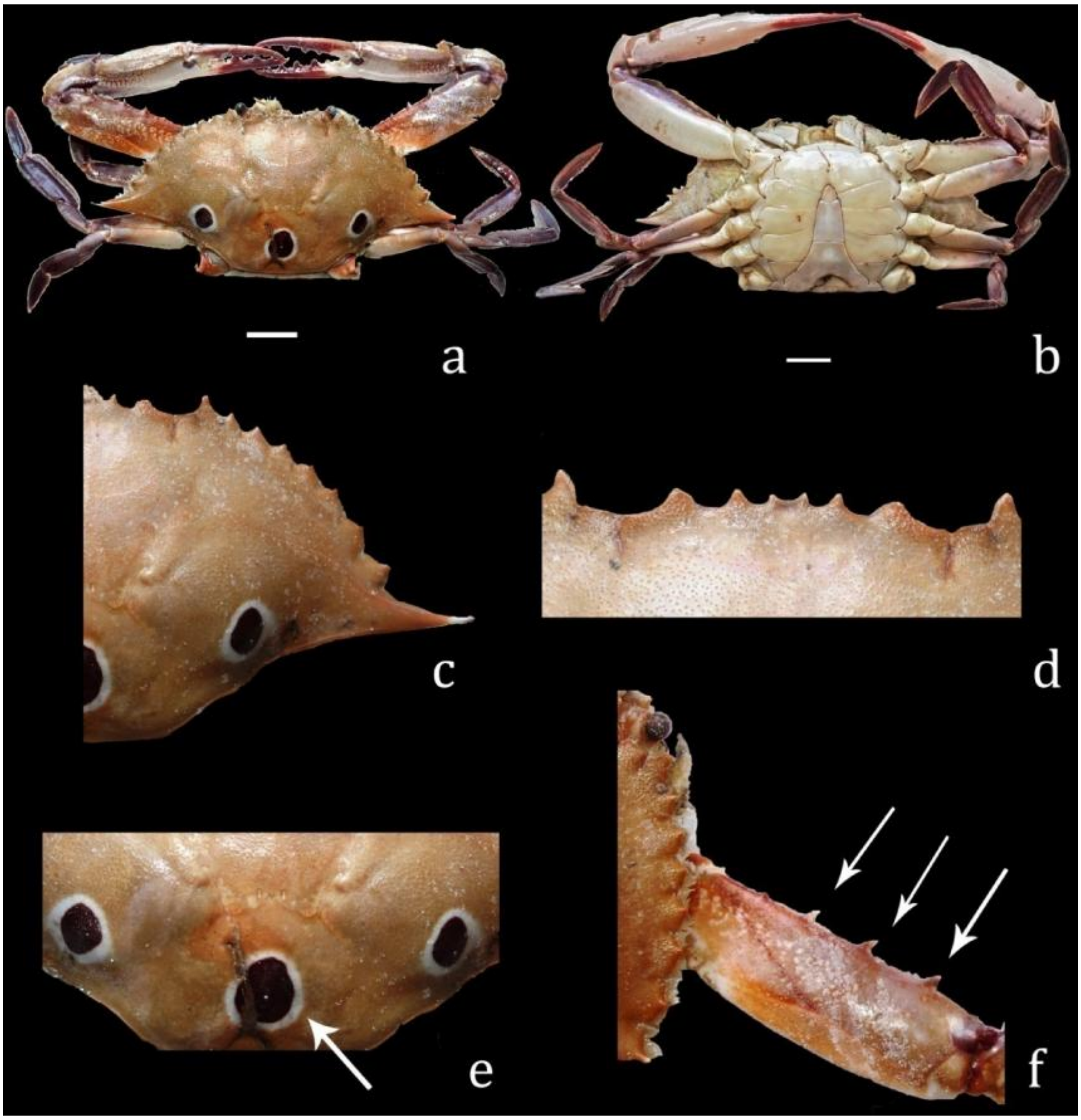


Figure: 23*Portunus sanguinolentus* (Herbst, 1783). (a) Dorsal view, (b) Ventral view, (c) Anterolateral border of carapace, (d) Frontal margin of carapace, (e) Pattern present on carapace, (f) Cheliped merus.(Bar represents 1cm).

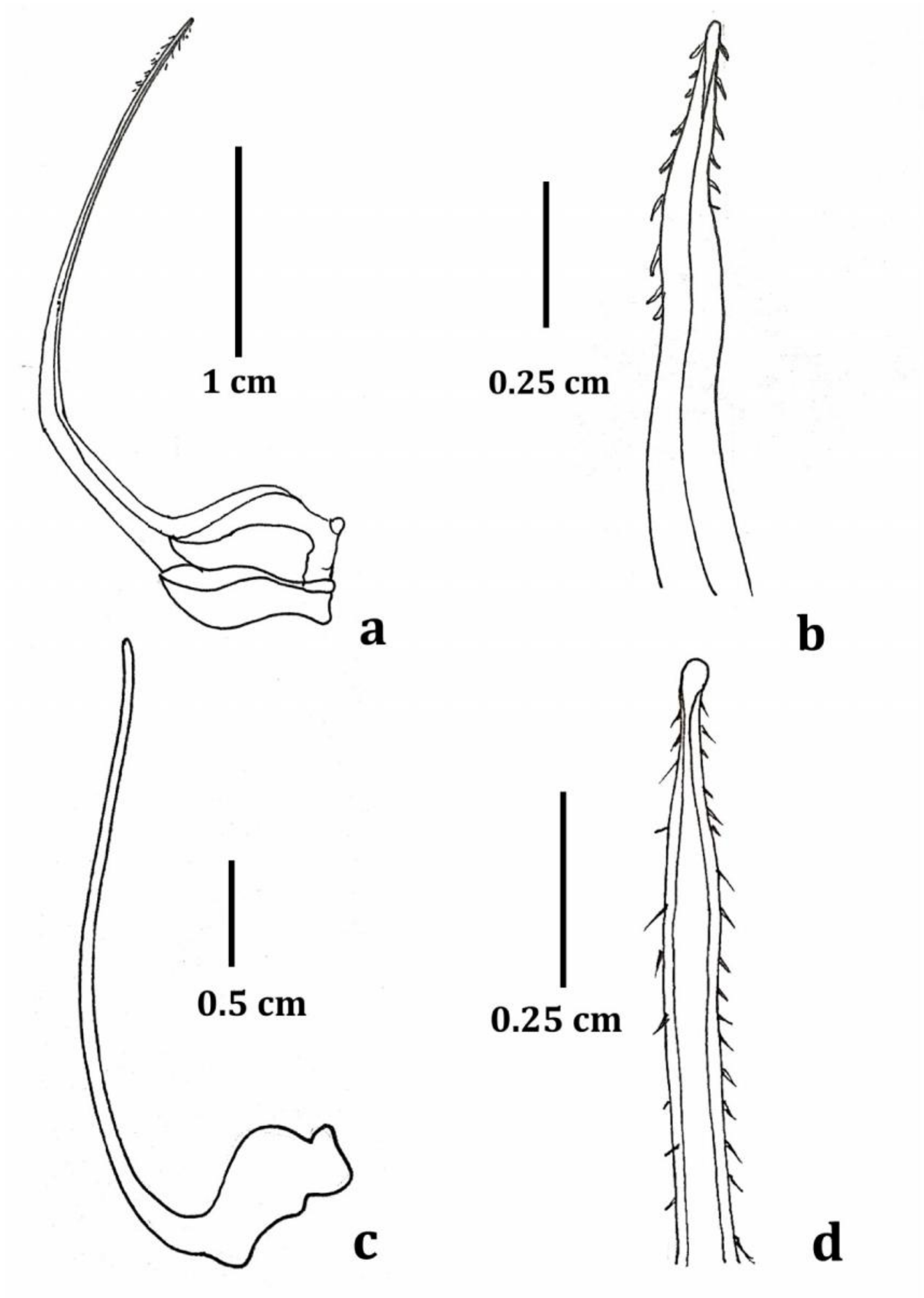


Figure: 24 Male 1st left gonopod: *Portunus* (*Portunus*) *pelagicus* (Linnaeus, 1758), (a) Entire gonopod, (b) Apical lobe; *Portunus sanguinolentus* (Herbst, 1783), (c) Entire gonopod, (d) Apical lobe.

## Genus *Scylla* de Haan, 1833

**Description**

Carapace glabrous, clearly broader than long; front with 4 teeth; antero-lateral borders with 9 subequal teeth. Antennal flagellum not excluded from orbit. Antero-external corner of third maxilliped rounded. Chelipeds heterochelous, smooth and glabrous, so are the strong and acute teeth; propodus and dactylus of fifth pair of leg flattened; male abdomen with segments 3 to 5 fused.

**3. *Scylla serrata* Forskal, 1775 (Fig. 25a, b)**

**Synonyms**

*Cancer serratus* Forskal, 1775: 90.

*Portunus serratus* Rüppell, 1830: 10, pl. 2.

*Portunus(Scylla)serrata* de Haan, 1833-1849 (1835): 44.

*Achelous crassimanus* MacLeay, 1838: 61, Stebbing, 1910: 308.

*Scylla tranquebarica var*. *oceanica* Dana, 1852c: 270, Dana, 1855: pl. 16, fig. 6a-b

*Scylla serrata* Milne Edwards A., 1861: 349, Haswell, 1882c: 79.

*Scylla oceanica* (not Dana, 1852) Estampador, 1949: 101.

*Scylla tranquebarica* (not Fabricius, 1798) Joel and Raj, 1980: 39.

**Material examined-**Total 8 specimens were collected in which 5 speciemens were males and 3 were females. (Veraval: 2 males and 1 female; Sutrapada: 1 male and 1 female; Dhamlej: 1 male; Kodinar: 1 male).

1 male (CL: 55.07mm; CW: 79.89mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 1**

**Description-** Carapace oval and convex in shape; carapace surface smooth and glabrous; granular lines present on the gastric region and epibranchial region; line originates from last teeth of anterolateral region and ends at branchial region; H shape groove moderately carved in the centre of the carapace (Fig. 25a); front with 4 subequal and equally spaced teeth (Fig. 25d); tips of the front teeth high in height and rounded in shape; the interspaces between front teeth rounded; anterolateral borders with 9 subequal teeth (Fig 25b); last teeth is smallest; anterolateral tooth narrow with curved or straight outer margin; basal antennal joint short and broad with lobules on antero external angle.

Chelipeds massive and unequal in size; merus with 3 spines and 2 spines on the anterior and posterior region respectively (Fig. 25f); carpus with strong spine on inner part and small spine on the outer part; two distinct spines present on the distal upper part near the insertion of finger(Fig. 25d); cheliped colour ranging from dark green to blue green; polygonal markings present on the chelipeds and female abdomen; fingers straight with slightly rounded claw shape tip; walking legs strong and slightly compressed, polygonal markings present on the walking legs. The serration in the outer border of apical lobe or tip of first gonopod is more (Fig. 27a, b). The angle between the branches of apical lobe of second gonopod is less (Fig. 28a, b). The specimens obtained in the study were showing some variation in the body and chelae colour. Normal body and chelae colour of *Scylla serrata* isdark green or blue green but body and chelae colour of the collected specimen was observed as greenish orange. Polygonal markings on the legs and chelipeds were observed less prominent in the collected specimens.

**Distribution-** The species has wide spread distribution ranging from Madagascar to Japan. The species is reported from Yemen, Mozambique, South Africa, Mauritius, Burma, Korea, Taiwan, China, Vietnam, Singaore, Phillippenes and Japan (Ng et al., 2008; Boxshall et al., 2015).

In India the species is reported from West Bengal, Orissa, Tamilnadu, Andaman and Nicobar Islands, Kerala, Goa, Maharashtra and Gujarat (Chhapagar, 1957 a, b, Alcock 1898, Dev Roy, 2013).

### 4. *Scylla tranquebarica* Forskal, 1775 (Fig. 26a, b)

**Synonyms**

*Portunus tranquebaricus* Fabricius, 1798: 366.

*Lupa tranquebarica* Milne Edwards H., 1834: 448.

*Scylla tranquebarica* Dana, 1852c: 270, Estampador, 1949: 103; Serene, 1952: 134, fig. 1B, pl. 1, fig. 2, pl. 2, figs 2, B, Keenan et al., 1998: 230, figs 7B, 8B, 9B, 11, Apel and Spiridonov, 1998: 313

**Material Examined-** 1 male specimen was collected from Sutrapada. Themale (CL: 31.04 mm; CW: 45.79mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 2**

**Description-** Carapace oval and convex in shape; carapace surface smooth and glabrous; granular lines present on the gastric region and epibranchial region, line originates from last teeth of anterolateral region and ends at branchial region; H-shaped groove moderately carved in the centre of the carapace (Fig. 26a). Front ornamented with 4 subequal and equally spaced teeth (Fig. 26d); front teeth moderately high in height and rounded in shape; the interspaces between front teeth rounded; anterolateral borders ornamented with 9 subequal teeth (Fig. 26c); last teeth is smallest; anterolateral tooth broad with convex outer margin; Basal antennal joint short and broad with lobules on antero external angle.

Chelipeds massive and unequal in size; merus ornamented with 3 spines and 2 spines on the anterior and posterior region respectively (Fig. 26$e_1$, $e_2$); carpus with strong spine on inner part and small spine on the outer part (smaller than *Scylla serrata*; two distinct spines present on the distal upper part near the insertion of finger(Size of the spine smaller than *Scylla serrata* ); cheliped colour ranging from purple to dark orange; polygonal markings weak on chelae and first two pair of walking legs; Strong patterning observed on female abdomen and last two pairs of walking legs; fingers straight with slightly rounded claw shape tip; The serration in the outer border of apical lobe of first gonopod is less as compared to *S. serrata* (Fig. 27c, d); The angle between the branches of apical lobe of second gonopod is more as compared to *S. serrata* (Fig. 28c, d).The specimens obtained in the study were showing some variation in the body and chelae colour. Normal body and chelae colour of *Scylla tranquebarica* is olive green or purple green but body and chelae colour of the collected specimen was observed as bright orange.

**Distribution-** The distribution of the species is ranging from Pakistan to Vietnam. The species is reported from Karachi, Taiwan, Philippines, Singapore, Malaysia and Vietnam (Ng et al., 2008; Boxshall et al., 2015).

In India the species has wide spread distribution on the eastern coast and some part of western coast. The species is reported from Tamilnadu, Orissa, Karanataka and West Bengal (Jeyabaskaran et al., 2002).

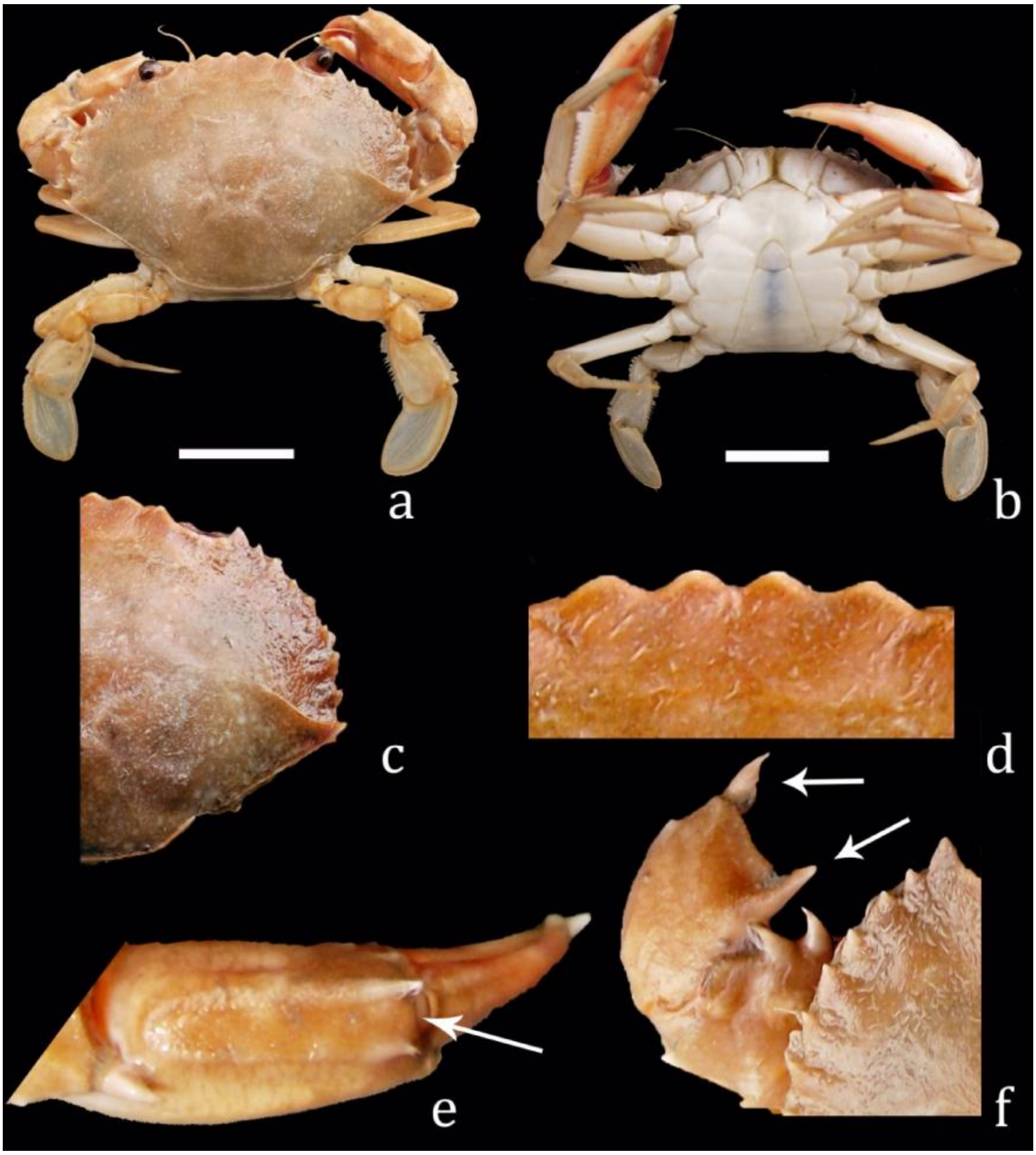


Figure 25: *Scylla serrata* Forskal, 1775. (a) Dorsal view (b) Ventral view (c) Anterolateral border of carapace (d) Frontal margin of carapace (e) Cheliped palm, (f) Cheliped merus.(Bar represents 1cm).

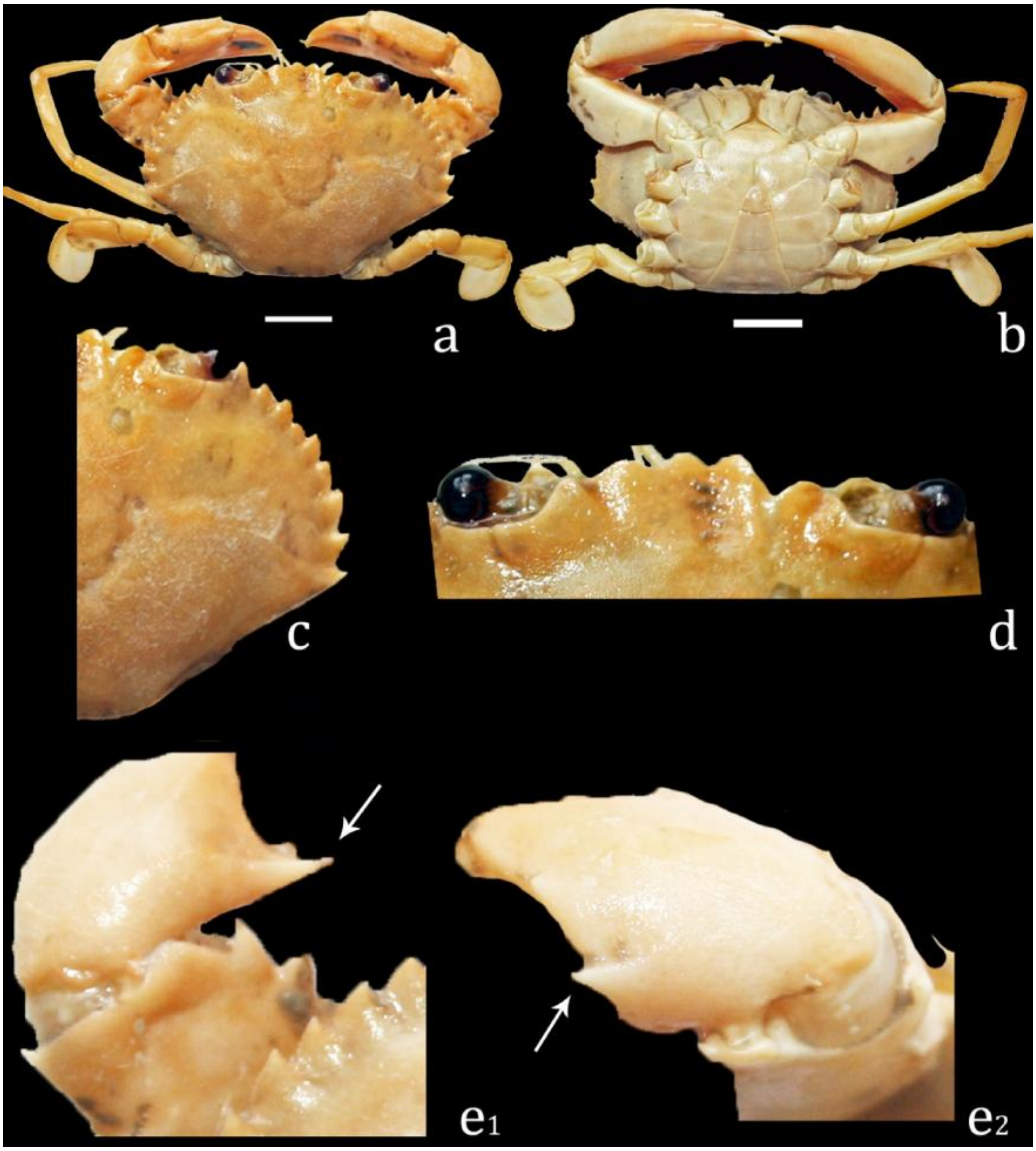


Figure 26: *Scylla tranquebarica* Forskal, 1775. (a) Dorsal view (b) Ventral view (c) Anterolateral border of carapace (d) Frontal margin of carapace (e1, e2) Cheliped merus.(Bar represents 1cm).

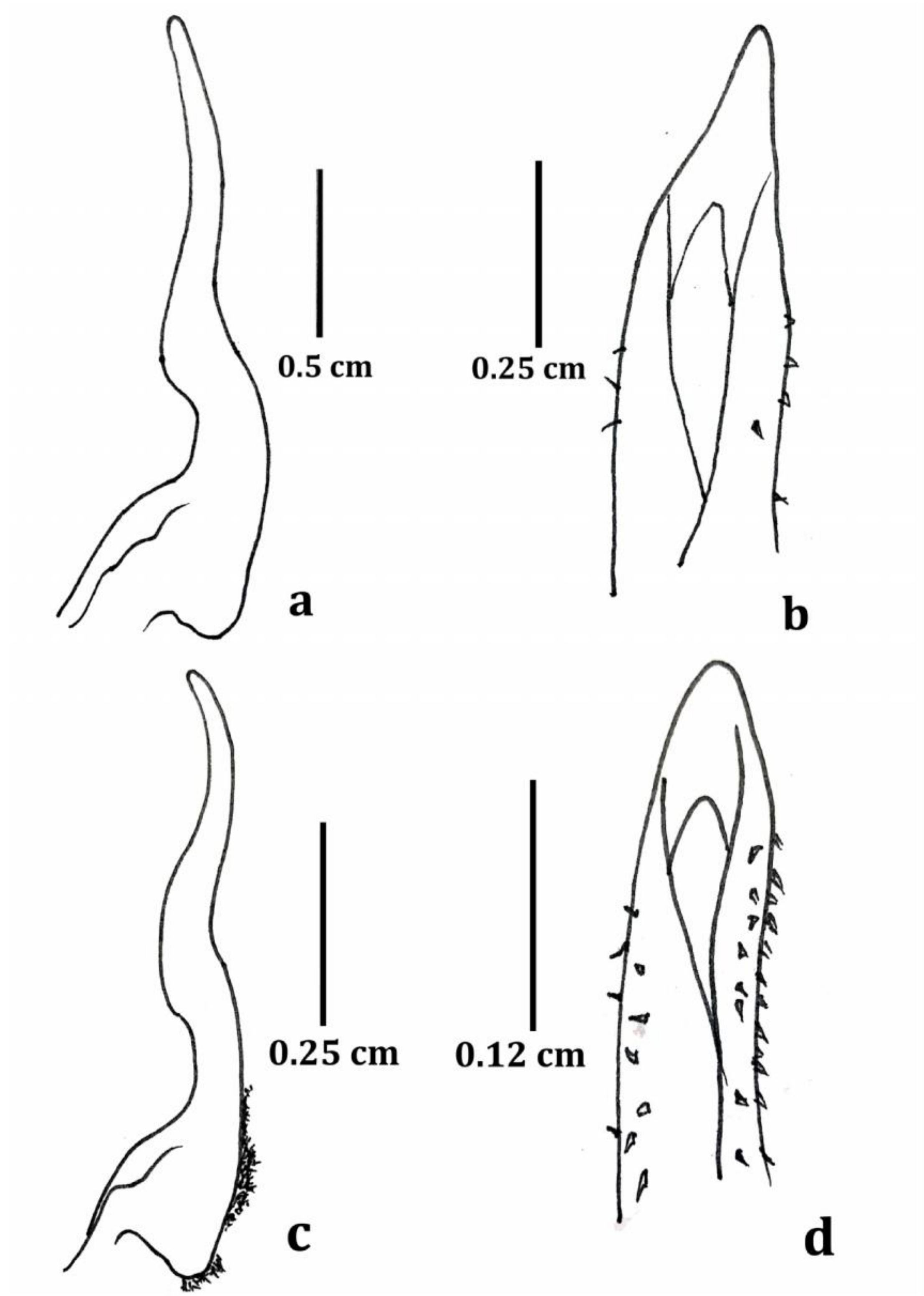


Figure 27: Male 1stleft gonopod: *Scylla serrata* Forskal, 1775(a) Entire gonopod (b) Apical lobe;*Scylla tranquebarica* Forskal, 1775(c) Entire gonopod (d) Apical lobe.

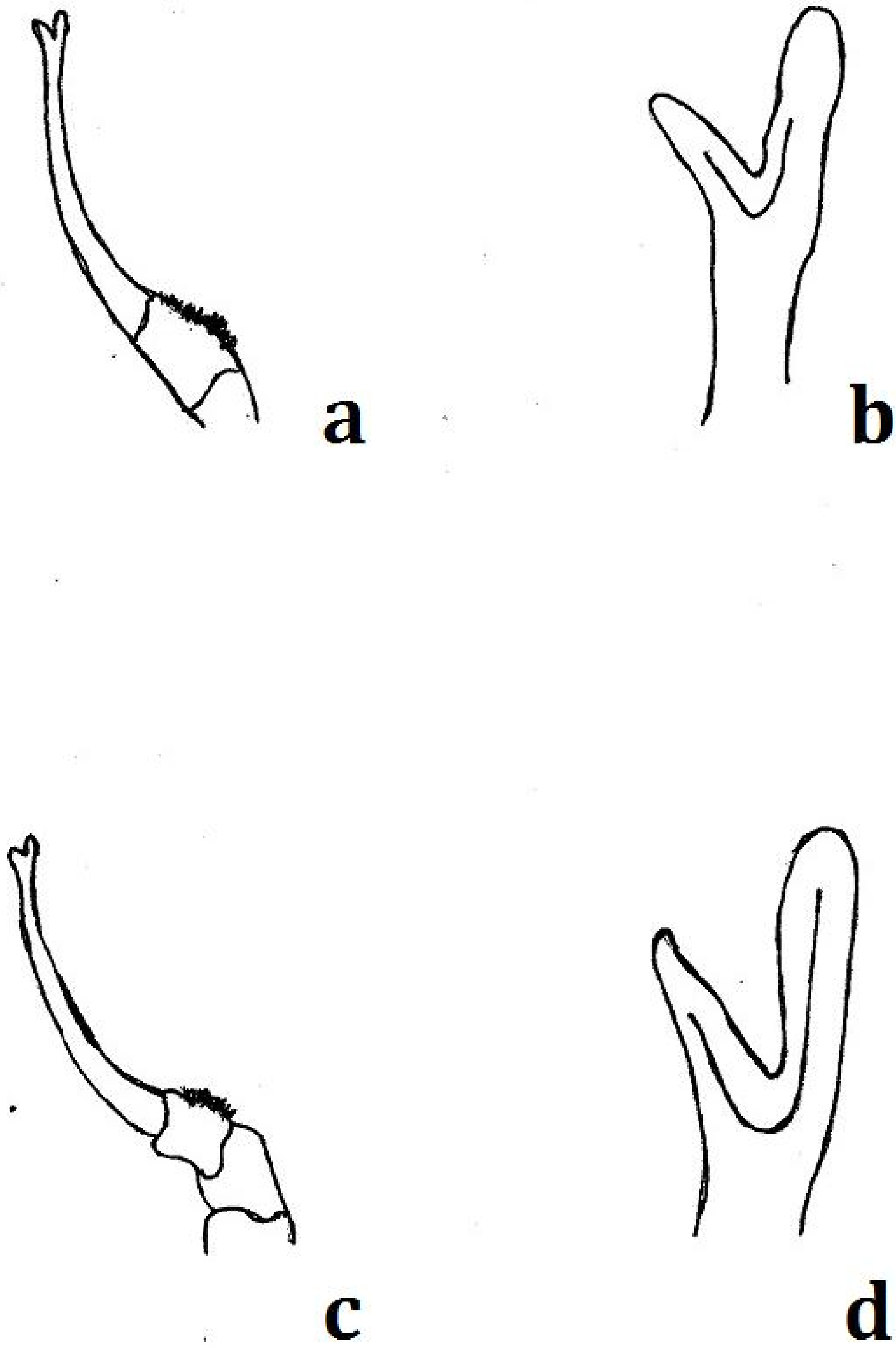


Figure 28: Male 2nd left gonopod: *Scylla serrata* Forskal, 1775 (a) Entire gonopod (b) Apical lobe; *Scylla tranquebarica* Forskal, 1775 (c) Entire gonopod (d) Apical lobe.

## Subfamily Thalamitinae Paulson, 1875

**Description-** Carapace sub hexagonal or sub trapezoidal, usually markedly broader than long; antero-lateral border divided into 4-7 teeth; basal antennal segment transversely broadened, usually filling orbital hiatus, with ridges, granules or spines; antennal peduncle and flagellum usually excluded from orbit; chelipeds longer than ambulatory legs, bearing a set of spines on merus, carpus and palm. Last pair of legs with paddle shaped propodus and dactylus; male first gonopod with sub terminal spines

## Genus *Charybdis* de Haan, 1833

**Description-** Carapace hexagonal, moderately broad, with transverse, granular ridges at least in its anterior half; front with 6 lobes or teeth of very different shape; antero-lateral borders with 6-8 (usually 6) teeth including Outer orbital angles; chelipeds longer than any of the ambulatory legs, usually a little heterochelous merus with spines on its anterior border, carpus with a strong inner spine, palm with spines on its upper face; fingers strongly toothed; second to fourth pairs of pereiopods compressed, fifth pereiopod natatorisl, propodus and dactylus paddle shaped.

### 5. *Charybdis feriatus* (Linnaeus, 1758) (Fig. 29a, b)

### Synonyms

*Cancer Marinus Laevis* Rumphius, 1705-1766 (1705): 10, pl. 6.

*Cancer feriatus* Linnaeus, 1758: 627.

*Cancer sexdentatus* (part = *feriatus*) Herbst, 1783: 153(part), pl. 8, fig. 53

*Portunus crucifer* Fabricius, 1798: 364. Von Siebold, 1824: 14.

*Goniosoma cruciferum* Milne Edwards A., 1861: 371; Nauck, 1880: 61, pl. 1, fig. 27. Miers, 1886: 191. Henderson, 1893: 374. Lanchester, 1902: 545.

*Charybdis (Goniosoma) crucifera* Alcock, 1899a: 51; Nobili, 1903c: 31.

*Charybdis cruciata* Rathbun, 1910a: 362. Rathbun, 1910b: 313. Sakai, 1939: 403, pl. 82, fig. 3. Barnard, 1950: 166, fig. 32a; Kazmi and Kazmi, 1987: 56.

*Charybdis (Goniosoma) cruciata* Shen, 1932a: 38, fig. 6, pl. 8. Chopra and Das, 1937: 392. Chhapgar, 1957b: 20.

*Charybdis (Charybdis) feriatus* Stephenson and Rees, 1967a: 10. Utinomi, 1969: 88, pl. 44. Stephenson, 1972a: 132 Dai and Yang, 1991: 232.
*Charybdis feriatus* Stephenson, 1967: 10. Campbell and Stephenson, 1970: 273. Holthuis and Sakai, 1970: 125, 318, pl. 21.

**Material examined-** Total 3 specimens were collected in which 2 specimens were males and 1 was female. (Sutrapada: 1 male; Dhamlej: 1 male and 1 female)
1 male (CL: 70.08mm; CW: 108.57mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 4**

**Description-**Carapace glabrous; two-third as long as broad; slightly convex; regions ill defined; transverse granular lines present on protogastric and mesogastric regions (Fig. 29a); front cut into 6 sub equal triangular distally rounded teeth (Fig. 29d);anterolateral border cut into six teeth including the outer orbital angle(Fig. 29c); first tooth truncated with concavity on lateral border; last tooth spine type but not prominent as others; posterolateral border rounded; antennal flagellum excluded in adults.

chelipeds massive; 2.5 time longer than carapace length; merus with three spine on the anterior border (Fig. 29e); posterior border unarmed and smooth; carpus with strong internal spine; 3 spinules on the outer border; some ridges on the outer border; palm with 2-3 spines on upper border; fingers as long as palm; strongly toothed; merus of last pair of legs 2-4 times as long as broad with spine at the distal end of posterior border; propodus without spine on posterior border in adults (Fig. 29f); male first gonopod "L" shaped; apical lobe short, stout with slight bend; inner border covered with dense setae; outer border covered with sparse setae (Fig. 32a, b).The species is bright orange in colour with white bands running across different carapace regions. White bands make cross sign near the frontal region of carapace.

**Distribution-** The distribution of the species is ranging from South Africa to Japan and Australia. The species is so far reported from South Africa, Somalia, Persian Gulf, Pakistan, Srilanka, China, Burma, Thailand, Taiwan, Japan and Australia (Ng et al., 2008; Boxshall et al., 2015).

In India, the species is widely distributed on both Eastern and Western coasts. The species is reported from Bay of Bengal, Tamilnadu, Maharashtra, Gujarat and Karnataka (Alcock, 1898; Chhapgar, 1957 a, b; Dev Roy, 2013).

**6. *Charybdis annulata* (Fabricius, 1798) (Fig. 30a, b)**

**Synonyms**

*Portunus annulatus* Fabricius, 1798: 364.

*Thalamita annulata* Milne Edwards H., 1834: 463.

*Goniosoma annulatum* Milne Edwards A., 1861: 374, 385. Hoffmann, 1874: 11.

*Goniosoma orientale* (not Dana, 1852) Heller, 1865: 29, pl. 3, fig. 3.

*Goniosoma annulatum* var. de Man, 1883: 151.

*Charybdis (Goniosoma) annulata* Alcock, 1899a: 54. Nobili, 1903c: 31.

Chopra and Das, 1937: 393, fig. 4. Chhapgar, 1957b: 22, pl. 6 h-k. Hashmi, 1963a: 239. Chandy, 1970: 402. Khan and Ahmad, 1975: 78.

*Charybdis annulata* Rathbun, 1910a: 364. Balss, 1922c: 106. --Gordon, 1931: 537, fig. 13d. Sakai, 1939: 402. Barnard, 1947: 363.

*Charybdis (Charybdis) annulata* Leene, 1938: 60, figs 26-28.

**Material examined-** Total 10 specimens were collected in which 6 specimens were males and 4 were females. (Veraval: 1 males; Sutrapada: 3male and 2 female; Dhamlej: 1 male and 1 female; Kodinar: 1 male and 1 female).

1 male (CL: 31.16mm; CW: mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 5**

**Description-** Carapace convex and transverse granular lines on gastric regions; prominent on protogastric and mesogastric regions; the epibranchial line interrupted at two places first at cervical groove and second at mid line region (Fig. 30a); the front in the adult comprises six deeply cut (Fig. 30d), triangular sharp teeth; anterolateral border cut into six teeth (fig. 30c); first two small and acute; last tooth small, thin, sharply pointed then the immediate three tooth; posterolateral junctions are rounded in shape; antennal flagellum excluded from orbit.

Chelipeds almost equal in size; larger than the carapace length; three spines present on the outer surface of merus (Fig. 30e); inner surface is smooth; carpus contains strong internal spines and three small spines on the outer border; palm or hand with five spine on the upper surface; the first two and last one small; central two are large and sharp; the fingers of the large cheliped as long as palm; fingers of the small cheliped longer then palm; the outer and inner borders of the legs covered with the fringes of hair; the merus of the swimming leg contains subdistal posterior spine; the posterior border of the propodite of swimming leg serrated with 4 to7 denticals (Fig. 30f); banded pattern on walking legs. Male left pleopode stout; apical one fourth of total length; apical lobe curved laterally at right angle; apical lobe contain sharp tip at the end point; inner border of the apical lobe covered with the continuous ridge of hair; sparse hair observed at the angular part of outer border of apical lobe (Fig. 32c, d). The species shows polymorphism in terms of colouration and two different colour morphs (Orange morph and Brown morph) are reported

**Distribution-** The species has wide distribution that ranges from Madagascar, South Africa, Malaysia, Thailand and Japan. In Indian sub continent the species is recorded from Pakistan, Burma and Sri Lanka (Ng et al., 2008; Boxshall et al., 2015).

In India, the species is recorded from East and West coast including Bimlipatam and Bombay, Gulf of Mannar and Andaman and Nicobar islands (Alcock, 1898; Chhapgar, 1957a, b; Sankarankutty, 1962; Jeyabaskaran et al., 2002).

**7. *Charybdis lucifera* (Fabricius, 1798) (Fig. 31a, b)**

**Synonyms**

*Portunus lucifer* Fabricius, 1798: 364.

*Goniosoma quadrimaculatum* Milne Edwards A., 1861: 375, pl. 34, fig. 3

*Goniosoma luciferum* Henderson, 1893: 374.

*Charybdis (Goniosoma) quadrimaculata* Alcock, 1899a: 54. Doflein, 1904: 96.
*Charybdis lucifera* Rathbun, 1910a: 364, pl. 2, fig. 10. Guinot, 1962c: 10. Kazmi and Kazmi, 1987: 56.
*Charybdis (Goniosoma) lucifera* Chopra and Das, 1937: 392, fig. 3.
*Charybdis (Charybdis) lucifera* Leene, 1938: 57, figs 23-25. Shen and Dai, 1964: 56. Stephenson, 1972b: 11(key), 33. Khan and Ahmad, 1975: 77. Mustaquim and Rabbani, 1976: 162. Huang and Yu, 1997: 120

**Material examined-** Total 3 specimens were collected in which 3 specimens were males and 3 were females. (Sutrapada: 1male and 1 female; Dhamlej: 2 male and 2 female).
1 male (CL: 45.95mm; CW: 73.24mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 6**

**Description-** Carapace bare and smooth; carapace ridges present and faintly granular (Fig. 31a); front cut into 6 teeth (Fig. 31d); median blunt, projecting outward beyond more triangular outwardly directed submedians teeth; lateral teeth narrowest; separated from submedians by V shaped notch; antennal flagellum excluded from orbital hiatus; anterolateral border cut into six teeth; tooth size increases from first to five; last tooth smallest and spiniform; posterior border of cepahlothorax curved, forming curved posterolateral junction; four pale white spots on mesobranchial region (Fig. 31c).

Cheliped strong and unequal; anterior border of merus with three spines; carpus contains strong internal spines and three small spines on the outer border; palm or hand with five spine on the upper surface (Fig. 31e); fingers of major cheliped shorter than palm; propodus of walking leg with serrated posterior border; merus with spine on posterior border (Fig. 31f); male first gonopod L shaped; apical lone narrow; inner surface of apical lobe covered with sparsely spaced short setae; outer surface of apical lobe bearing long setae starting from tip and increasing in length proximally (Fig. 32e, f). The species shows yellowish brown colouration with two large white spots on either of the epibranchial region. Chelipeds are scarlet pink; fingers are light brown in colour with white tips.

**Distribution-** The species has wide spread distribution ranging from Red Sea to Australia. The species is so far reported from Saudi Arabia, Pakistan, Sri Lanka, West Sumatra, Taiwan, Thailand, Malaysia, Indonesia and Australia (Ng et al., 2008; Boxshall et al., 2015).

In India, the species is widely distributed on both east and west coasts. The species is reported from Maharashtra, Gujarat, Tamilnadu and Andaman and Nicobar islands (Alcock, 1898; Chhapgar, 1957a, b; Sankarankutty, 1962; Jeyabaskaran et al., 2002).

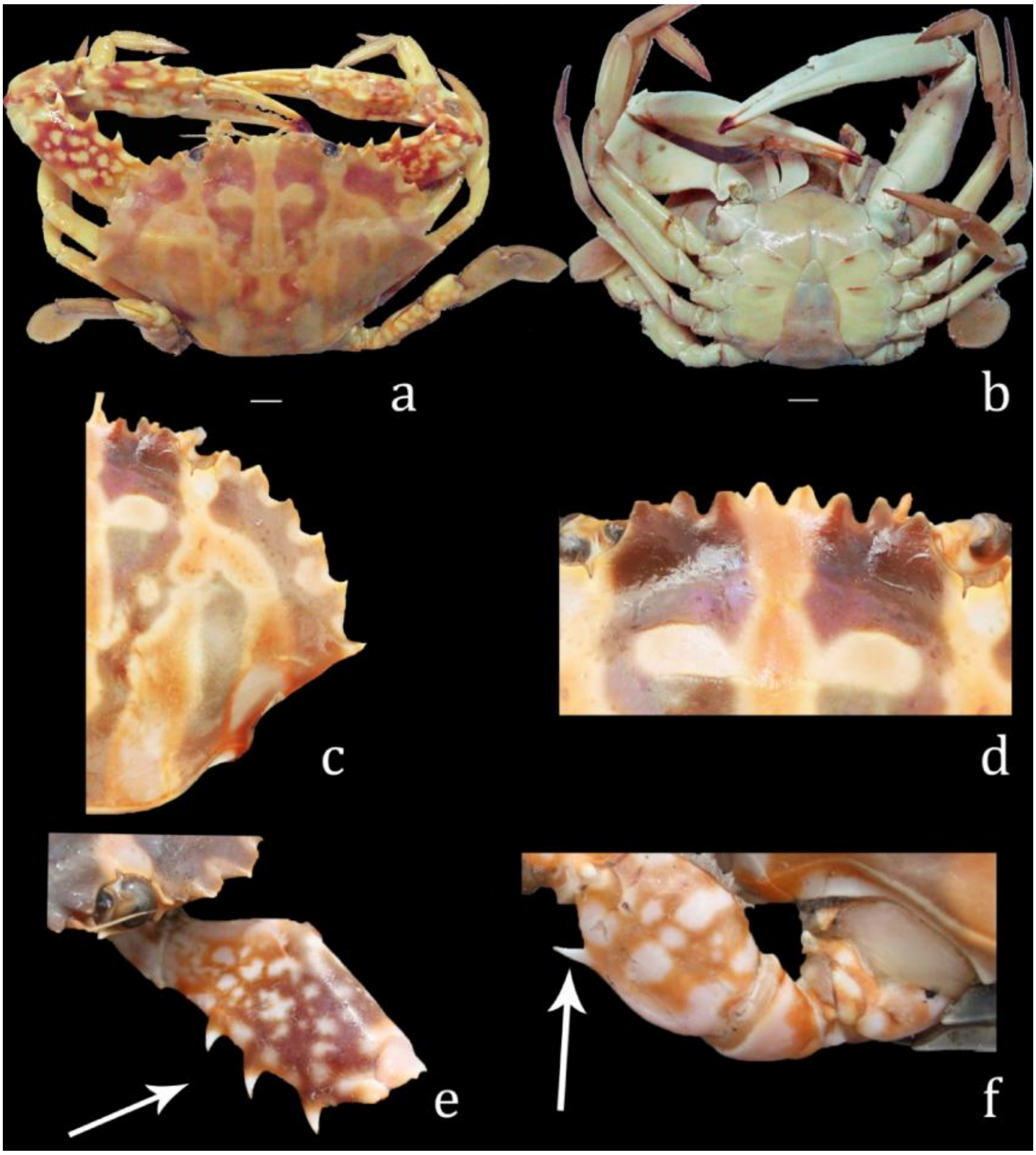


Figure 29: *Charybdis feriatus* (Linnaeus, 1758). (a) Dorsal view (b) Ventral view (c) Anterolateral border of carapace (d) Frontal margin of carapace (e) Cheliped merus (e) 5th Periopod merus.(Bar represents 1cm).

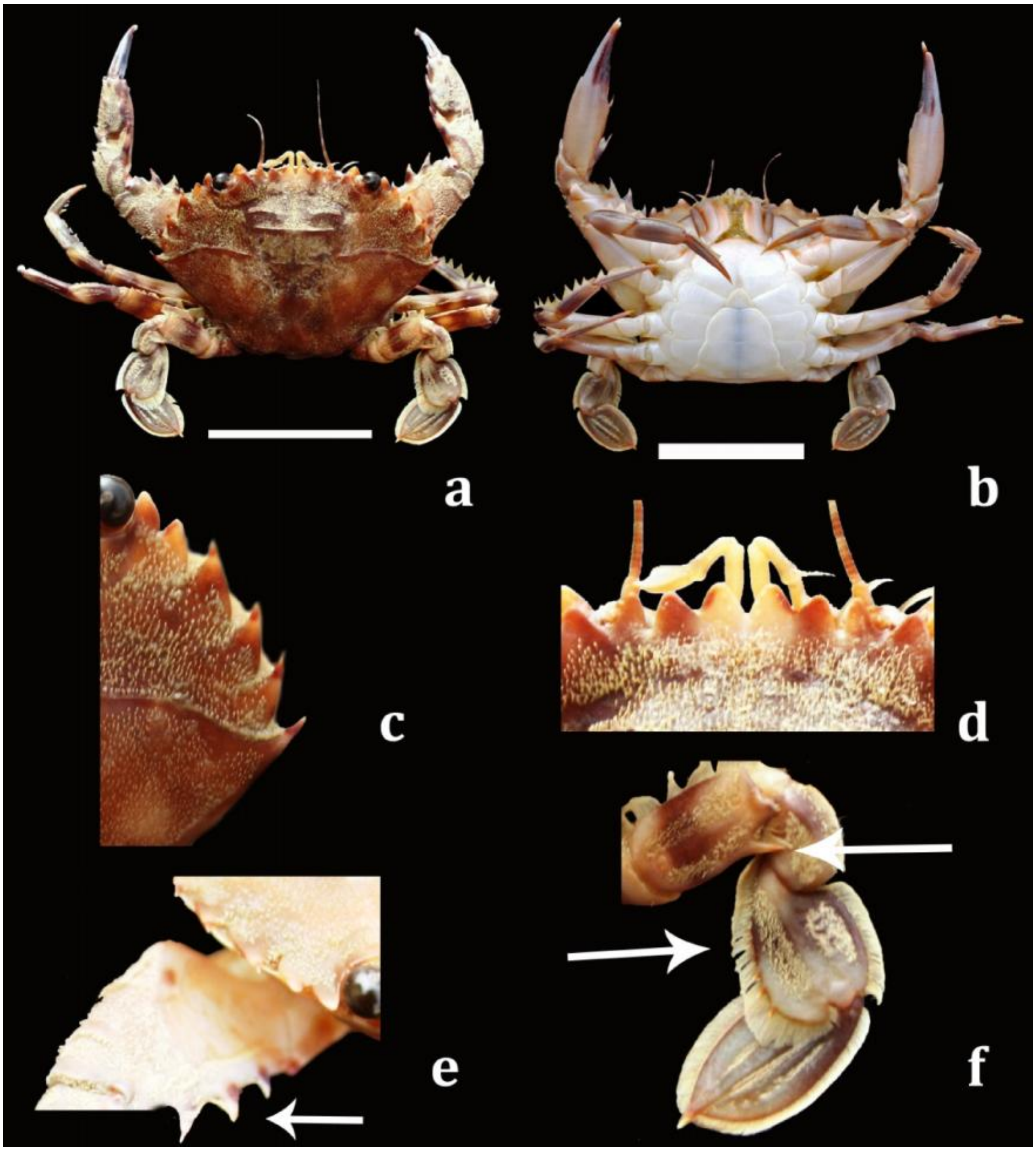


Figure 30: *Charybdis annulata* Fabricius, (1798).(a) Dorsal view (b) Ventral view (c) Anterolateral border of carapace (d) Frontal margin of carapace (e) Cheliped merus (f) 5th Periopod.(Bar represents 1cm).

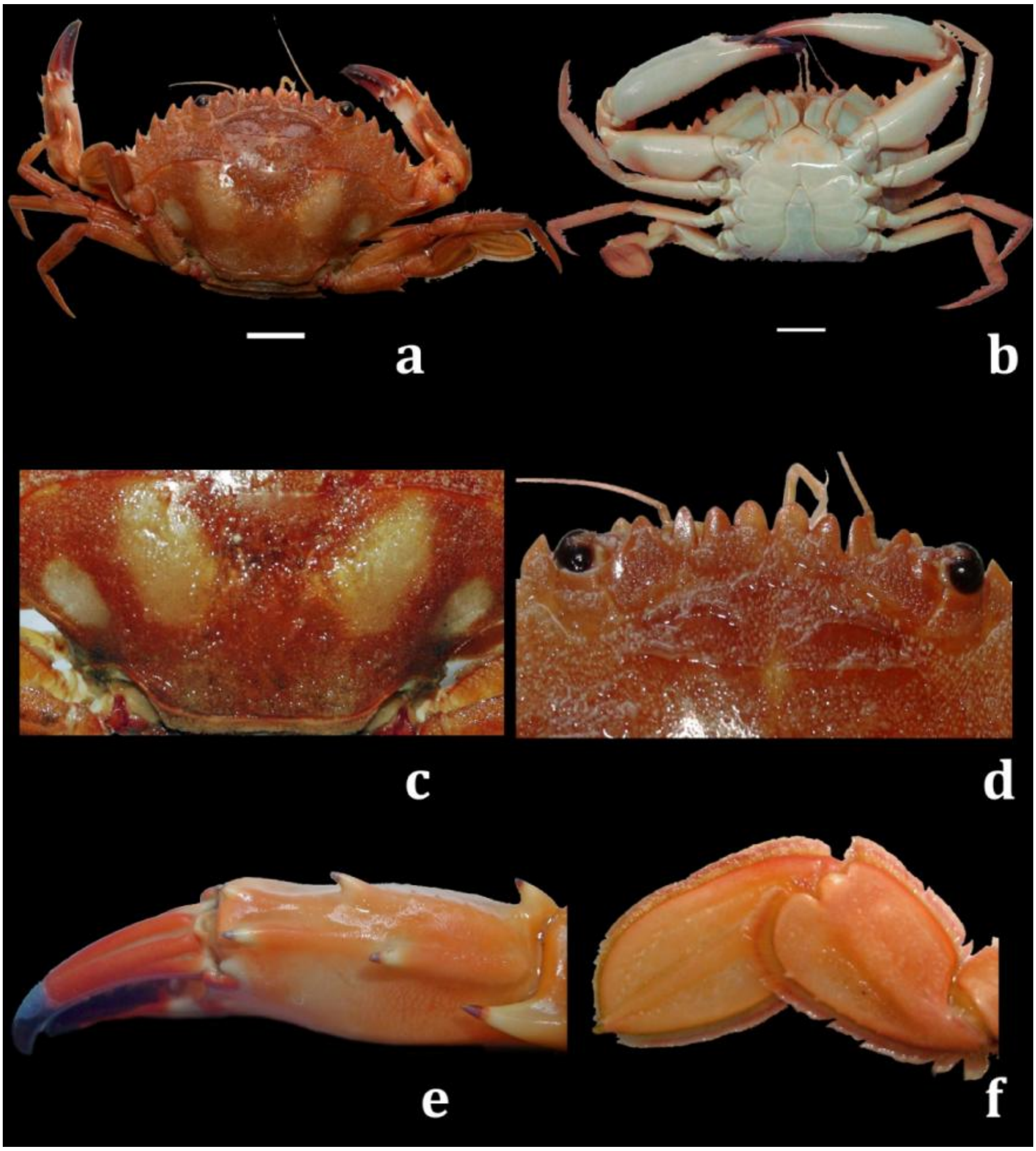


Figure 31: *Charybdis lucifera* (Fabricius, 1798). (a) Dorsal view (b) Ventral view (c) Pattern on carapace (d) Frontal margin of carapace (e) Cheliped palm (inner surface) (e) Periopod structure.(Bar represents 1cm).

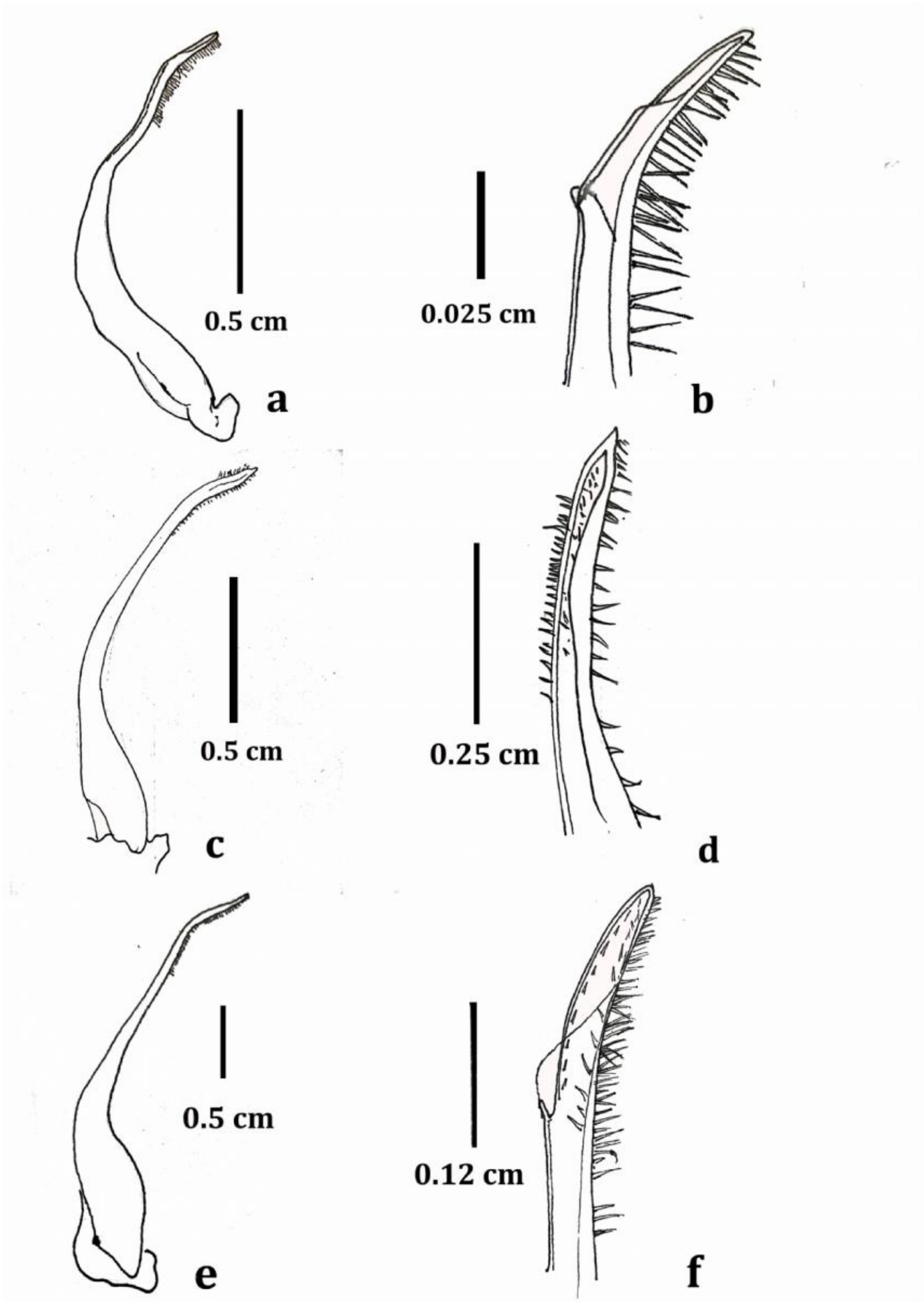


Figure 32: Male 1st left gonopod: *Charybdis feriatus* (Linnaeus, 1758) (a) Entire gonopod (b) Apical lobe; *Charybdis annulata* Fabricius, (1798)(c) Entire gonopod (d) Apical lobe; *Charybdis lucifera* (Fabricius, 1798)(e) Entire gonopod (f) Apical lobe.

## Genus *Thalamita* Latreille, 1829

**Description-** Carapace roughly hexagonal, much broader than long, epibranchial ridges present, also a number of gastric ridges in front of these; antero-lateral borders with usually 5 teeth, in some cases an additional tiny subsidiary tooth at base of first, fourth usually very small, basal antennal joint broadly contacting inner orbital tooth and excluding flagellum from orbit,; All segments of swimming leg flattened, merus with strong spine on posterior border.

### 8. *Thalamita crenata* (Latreille, 1829) (Fig. 33a, b)

**Synonyms**

*Talamita crenata* Rüppell, 1830: 6, pl. 1, fig. 2.

*Portunus crenatus* Milne Edwards H., 1834: 461

*Thalamita crenata* Milne Edwards H., 1834: 461; Krauss, 1843: 25. Alcock, 1899a: 73(key), 76. Lanchester, 1902: 543; de Man, 1902a: 644; Nobili, 1903c: 32. Rathbun, 1910a: 365; Chhapgar, 1957b: 25, pl. 7; Sankarankutty, 1961a: 102(list), 106; Takeda and Shimazaki, 1974: 53; Apel and Spiridonov, 1998: 233, figs 44, 49-50, pl. 8.; Shokita et al., 2000: 657.

*Thalamita prymna* var. *crenata* Kossmann, 1877: 49. Laurie, 1906: 418

*Thalamita ceranata* Hashmi, 1963b: 117.

**Material examined-** Total 12 specimens were collected in which 6 specimens were males and6 were females. (Sutrapada: 4 male and 3 female; Dhamlej: 2 male and 3 female).

1 male (CL: 44.26mm; CW: 64.88mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 13**

**Description-** Carapace smooth, slightly convex; carapace length two third of the width; three pair of ridges present on the gastric region; epibrachial ridge interrupted by cervical grove (Fig. 33a); front cut in to 6 rounded teeth of equal size; the tip of teeth rounded in shape (Fig. 33d); inner supra orbital teeth arched and looked like frontal teeth; anterolateral border cut into 5 claw shaped nearly equal size teeth (Fig. 33c); the size of teeth slightly decreasing from front to rear; posterior surface of carapace forms curvature with posterolateral border; basal antennal joint with low ridge bearing rounded granules.

Chelipeds little unequal; larger cheliped 2.5 time longer than greatest carapace length; surface smooth; anterior border of merus with three enlarged spines with some tubercles; few squamiform granules present on posterior border; upper surface of palm with one spine (Fig. 33e); fingers of larger hand not as long as palm; fingers of smaller hand as long as palm; surface of walking legs smooth; legs unarmed except one spine present on the distal end of posterior border of merus of last pair; posterior border of propodus of swimming leg with 5 spines and 4-6 small tubercles (Fig. 33f); male first gonopod long and thin in shape; slightly tapering towards the apical lobe or tip; double row of sub terminal bristles present on the inner surface of apical lobe; outer surface smooth with no bristles (Fig. 34a, b).

**Distribution-** The species is commonly found in rocky shore as well as mangrove habitat. The species has wide spread distribution ranging from South Africa to Hawaii Island. The species is reported from South Africa, Kenya, Somalia, Persian Gulf, Korea, Pakistan, China, Malaysia, Thailand, Taiwan, Indonesia, Japan and Australia (Ng et al., 2008; Boxshall et al., 2015).

In India, the species is widely distributed on both east and west coasts. The species is reported from Maharashtra, Gujarat, Tamilnadu and Andaman and Nicobar islands (Alcock, 1898; Chhapgar, 1957a, b; Sankarankutty, 1962; Jeyabaskaran et al., 2002).

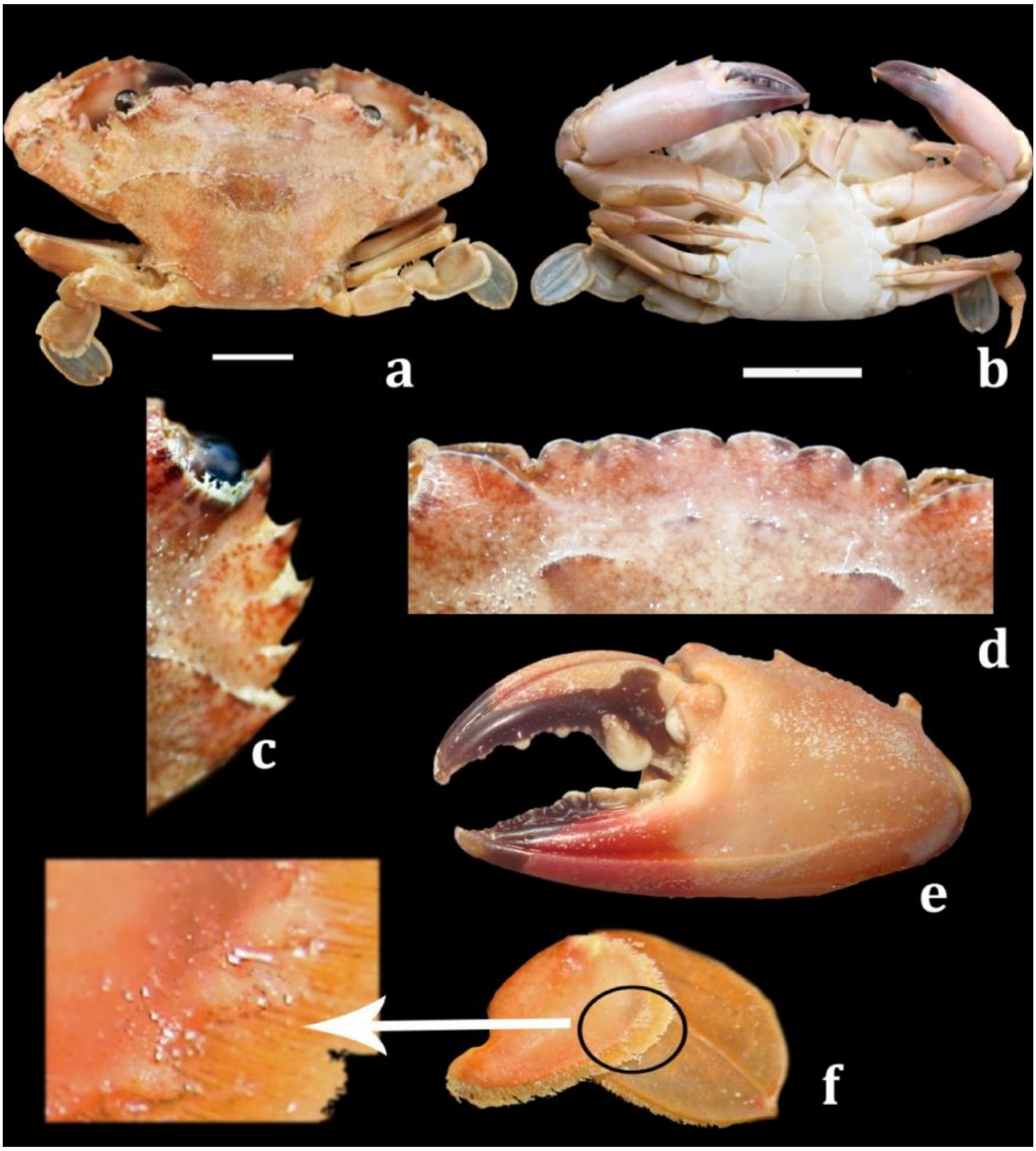


Figure 33: *Thalamita crenata* (Latreille, 1829). (a) Dorsal view (b) Ventral view(c) Anterolateral border of carapace (d) Frontal margin of carapace (e) Cheliped (outer surface) (f) Propodous of 5th periopod.(Bar represents 1cm).

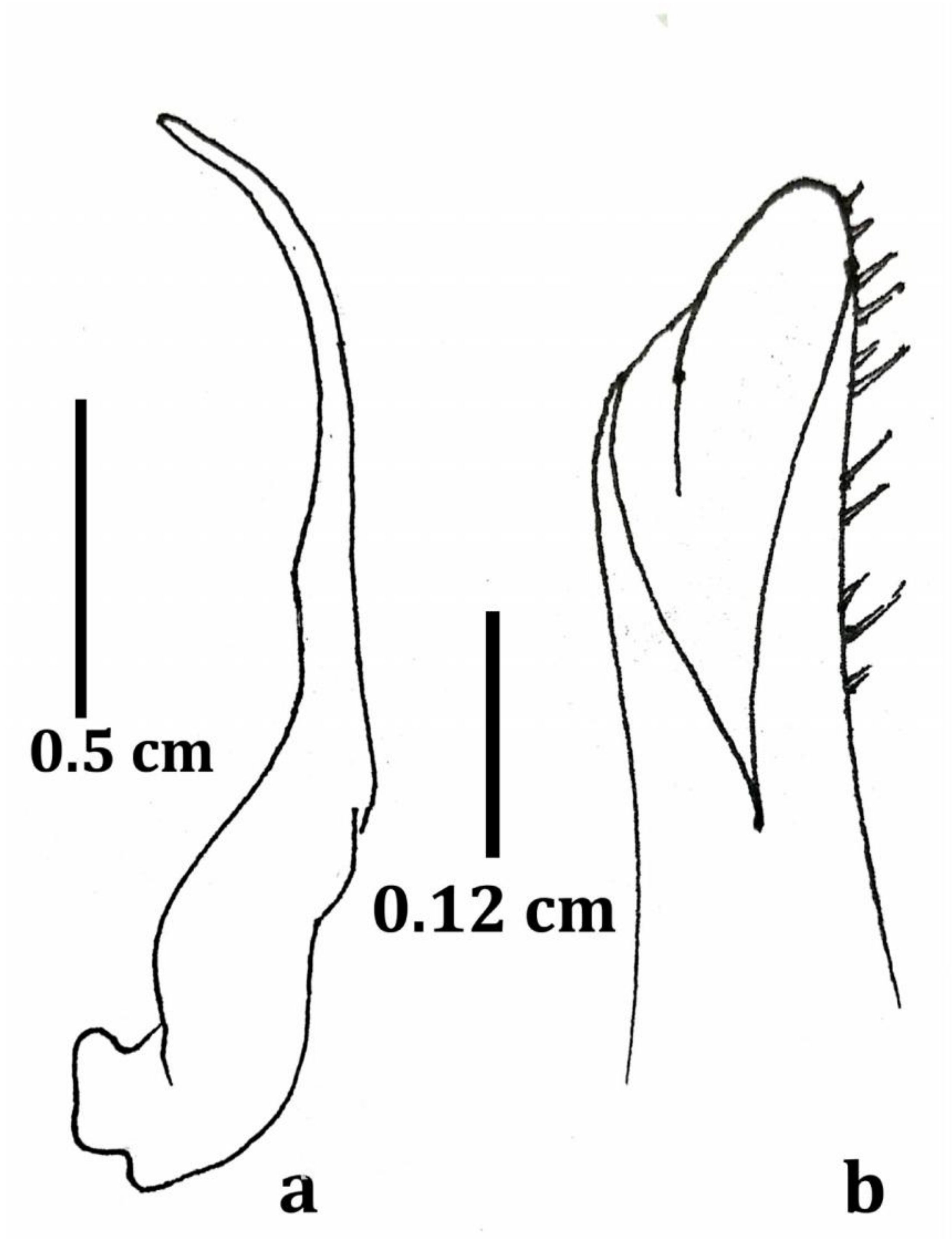


Figure 34: Male 1st left gonopod: *Thalamita crenata* (Latreille, 1829)(a) Entire gonopod (b) Apical lobe.

## Family Xanthidae MacLeay, 1838

**Description-** Carapace hexagonal, transversely oval to transversely hexagonal, sometimes circular, areolation generally well defined antero-lateral margins generally with two to six teeth, spines, or lobes; thoracic sternum narrow or not very widened; male abdomen divided into five segments; male first left gonopod slender, curved, with apical part usually very ornamented.

### Subfamily Xanthinae MacLeay, 1838

**Description-** Dorsal regions of the carapace distinct, sometimes strongly delineated, sometimes obliterated with smooth or granular surfaces. Antero-lateral margins convex, continued as far as the exorbital angles, without crest joining the buccal frame, and noticeably separated from the postero-lateral ones that are concave; behind the exorbital angles, presence of four antero-lateral teeth, slightly projecting, but sometimes more numerous, and sometimes subdivided into as many as ten teeth; front nearly straight or bilobed, generally with a median fissure and a lateral fissure separating the supraorbital angles, and without a marginal crest; antennules folded transversely; basal article of the antennae broad and short; antennal flagellum included in the orbit; chelipeds always very strong, subequal and similar, or unequal and dissimilar, with a surface either smooth or granular or even coarsely tuberculate; ambulatory legs generally rounded in section, with smooth or granular surfaces, and sometimes carinated on the margins of some articles

### Genus *Leptodius* A. Milne Edwards, 1863

**Description-** Carapace transversely oval, antero-lateral margins armed with four or five teeth behind the exorbital angles; front not extending beyond the supra orbital angles, antennules fossae narrow and elongated, basal article of the antennae elongated, third maxillipeds squat, with the merus broad and projecting at the antero-external angle, fingers of the larger cheliped with strongly hollowed extremities, that are enlarged and hoof-shaped, and not crossing when they are closed.

**9. *Leptodius affinis* (De Haan, 1835) (Fig. 35a, b)**

**Synonyms**

*Cancer* (*Xantho*) *affinis* De Haan, 1835: 48, pl. 13 fig. 8; Krauss, 1843: 30

*Cancer* (*Xantho*) *lividus* De Haan, 1835: 48, pl. 13 fig. 6

*Chlorodius exaratus* Dana, 1852: 208

*Leptodius exaratus* A. Milne Edwards, 1873: 222. De Man, 1887a: 33.Chopra and Das, 1937: 398. Sankarankutty, 1962: 129.

*Xantho exaratus* var. *typica* Ortman, 1893: 445.

*Chlorodius exaratus* var *pictus* Stimpson, 1907: 54, Fig. 6.

*Chlorodius exaratus* var *typicus* Stimpson, 1907: 55.

*Leptodius nigromaculatus* Serene, 1952: 255, figs. 1A-H.

*Leptodius affinis* Lee *et al.,* 2013: 192, fig. 3, 4E-I.

**Material Examined-** Total 8 specimens were collected in which 6 specimens were males and 2 were females. (Dhamlej: 4 male and 2 female; Kodinar: 2 male).

1 male (CL: 18.09mm; CW: 29.07mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 18**

**Description-** Carapace transversely subovate in shape carapace regions well defined, dorsal surface of carapace depressed, finely granular (Fig. 35a), carapace - 1. 4 - 1.6 times as broad as long, Front short, cut in to two lobes (Fig. 35d), ratio of FW/CL and FW/CW is 0.27 ± 0.06 and 0.43 ± 0.12 respectively, anterior margins of frontal lobes moderately concave, Orbits small, oval in shape; two small fissures present on superior margins while two blunt teeth present on both sides of inferior margins. Small concavity present between first antero lateral tooth and exo orbital angle, four lobes present on anterolateral border (Fig. 35c), First and last lobes smaller in size while second and third more pronounced; small sinus observed between each lobes, posterolateral margin slightly concave in shape, Antennules situated transversely and antennary flagellum occupied by orbit hiatus, buccal cavity completely covered by third maxillipeds, merus subquadrate in shape, surface granular; longitudinal line observed on the central portion of fourth sternite, fifth to eight sternites observed distinct.

Chelipeds asymmetrical in shape with outer granular surface (Fig. 35f), long setae observed on both anterior and posterior margins of merus, outer surface of carpus covered with fine granules, fingers black in colour and toothed. Ambulatory legs smooth, setae observed on anterior and posterior margins of merus of first to third pair of ambulatory legs, dactylus covered with dense setae. Male abdomen narrow in shape, third to fifth somites fused together (Fig. 35e). First left gonopod of male long and slender in shape, the proximal and distal parts of ventral margins of apical lobes ornamented with 5 to 6 and 6 to 8 small outgrowths respectively, apical lobe curved in shape, forms angle with the rest of the structure of first pleopod, length of apical lobe is 0.11 to 0.17 times to the total length (Fig. 37a, b). Total 5 different colourmorphs of the specieswere identified in the present study (Fig. 38a-e).

**Distribution-** The distribution range of *L. affinis* comprises an area from eastern Indian Ocean to the western and central Pacific Ocean. The species is reported from Burma, Sri Lanka, Taiwan, Thailand, Indonesia, Philippines, Fiji (Ng et al., 2008; Boxshall et al., 2015).

In India, the species is reported from Tamilnadu (Lee et al., 2013).

### 10. *Leptodius exaratus* (H. Milne Edwards, 1834) (Fig. 36a, b)

**Synonyms**

*Cancer inaequalis* Audouin, 1826: 86. Savigny, 1809: pl. 5 fi g. 7

*Chlorodius exaratus* H. Milne Edwards, 1834: 402; 1849: pl. 11fi g. 3

*Leptodius exaratus* A. Milne-Edwards, 1868: 71 . Richters, 1880: 148. Nobili, 1906a: 121. Chopra and Das, 1937: 398 (in part). Forest and Guinot, 1961: 63;Khan, 1977: 181, pl. 1D; Tirmizi and Ghani, 1996: 48, fi g. 18.

*Chlorodius* (*Leptodius*) *exaratus* Kossmann, 1877: 32, pl. 2, fi gs. 1–6.

*Xantho exaratus* var. *typica* Ortmann, 1893: 445 (in part).

*Xantho* (*Leptodius*) *exaratus* Alcock, 1898: 118 [353] (in part).

*Xantho hydrophilus* Laurie, 1915: 444, pl. 43, fi g. 1.

*Xantho exaratus* Monod, 1938: 125, fi g. 17B. Vatova, 1943: 19.

*Xantho* (*Leptodius*) *hydrophilus*, Barnard, 1950: 223.

**Material examined-**Total 8 specimens were collected in which 6 specimens were males and 2 were females. (Dhamlej: 4 male and 2 female; Kodinar: 2 male).

1 male (CL: 22.565mm; CW: 36.35mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 19**

**Description-** Carapace transversely sub ovate; about 1.5–1.6 times as broad as long; dorsal surface somewhat convex, finely granular; rugose particularly at anterior and lateral regions; regions well defined; separated by distinct grooves (Fig. 36a); Front about 0.2–0.3 times as broad as carapace breadth; not much protruded; margin deeply sinuous medially (Fig. 36c); separated from inner orbital tooth by notch; Orbit small, oval; superior margin with 2 fissures; exorbital angle separated from first anterolateral tooth on anterolateral margin by shallow concavity; anterolateral margin with 4 broad, triangular teeth behind exorbital angle (Fig. 36e); first small, acute; second broad, large; third similar to second, slightly more produced; last small, most acute; posterolateral margin somewhat concave; posterior margin granular, central region straight; Male abdomen narrow; somites 3–5 fused, sutures vaguely discernible; somite 6 long, median length about 1.6 times that of telson, distal half slightly broader than proximal half, lateral margins slightly concave. Telson sub triangular, tip broadly rounded

Chelipeds unequal; merus with long setae on anterior and posterior borders; carpus finely granular; rugose on external surface, with blunt tooth on inner angle (Fig. 36d); palm inflated, rugose dorsally, smooth ventrally; fingers stout, darkly pigmented throughout length, except at tips with white colour, cutting margins irregularly dentate; ambulatory legs short, stout; anterior margins finely granular; anterior and posterior margins of meri with long setae (Fig. 36f); carpi, propodi subequal in length, sparsely setose; dactyli tomentose, spinose, ending distally in long, chitinous claw. Male left first gonopod long, slender, with 6–8 stout, curved sub distal spines; with elongate apical lobe set at slight angle with rest of gonopod, with 8-10 mushroom-shaped marginal outgrowths; apical lobe about 0.05–0.07 times total length (Fig. 37c, d); second left gonopod about quarter length of first left gonopod. Total 3 different colour morphs of the species were identified in the present study (Fig. 38f-h).

**Distribution-** The distribution of *Leptodius exaratus* is found in the Western Indian Ocean, ranging from the eastern and southern coasts of Africa to the coast of India; and also in the Red Sea and the Persian Gulf. The species is reported from Madagascar, Pakistan, Somalia, South Africa, Persian Gulf, Red Sea (Ng et al., 2008; Boxshall et al., 2015).

In India, the species is reported from western coast from Gujarat and Maharastra. On the eastern coast the species is reported from Gulf of Mannar and Andaman and Nicobar Islands (Chappgar, 1957a, b; Sankarankutty, 1962; Jeyabaskaran et al., 2002).

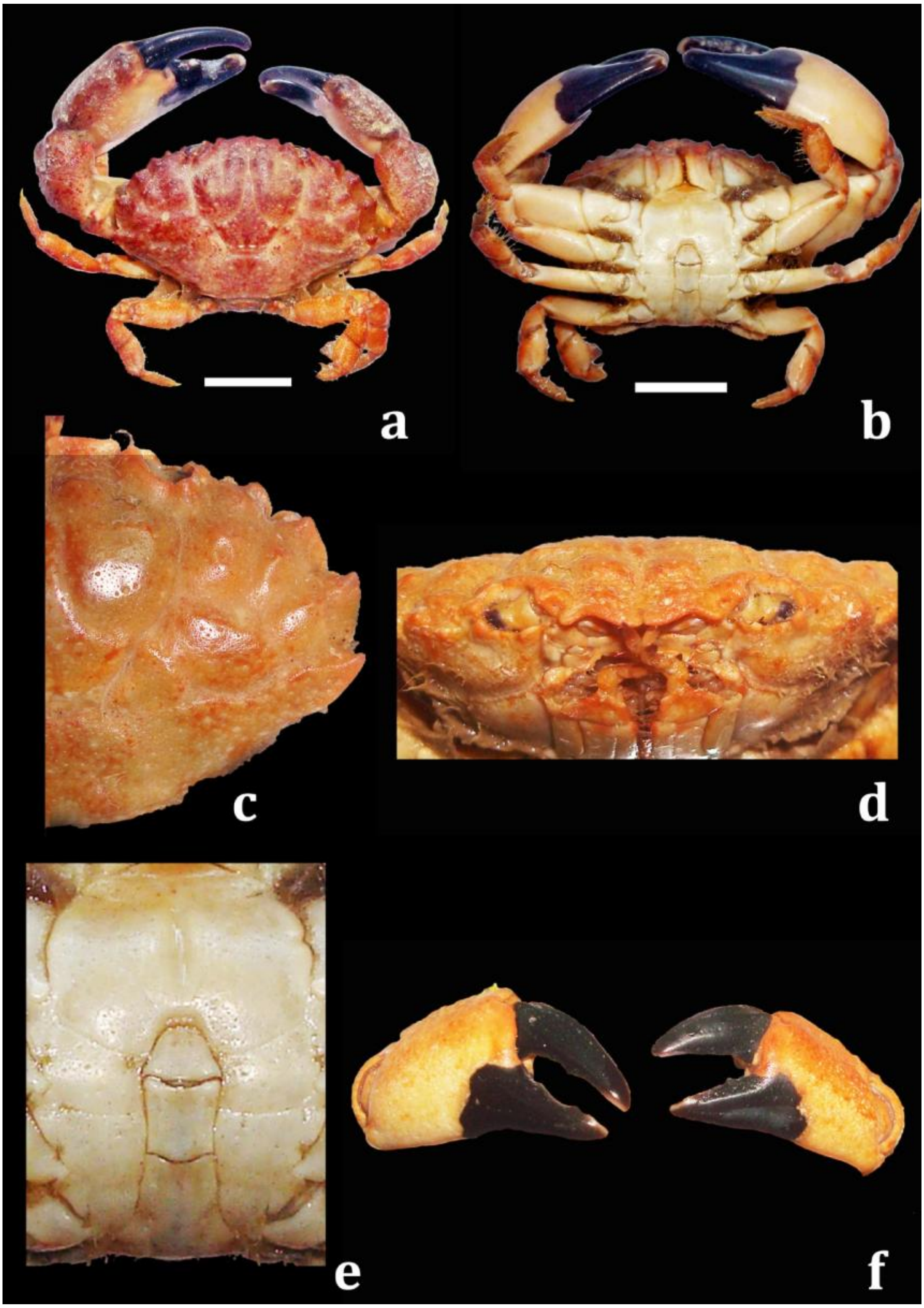


Figure 35:*Leptodius affinis* (De Haan, 1835).(a) Dorsal view (b) Ventral view (c) Anterolateral border of carapace (d) Frontal view (e) Male abdomen (f) Chelipeds.(Bar represents 1cm).

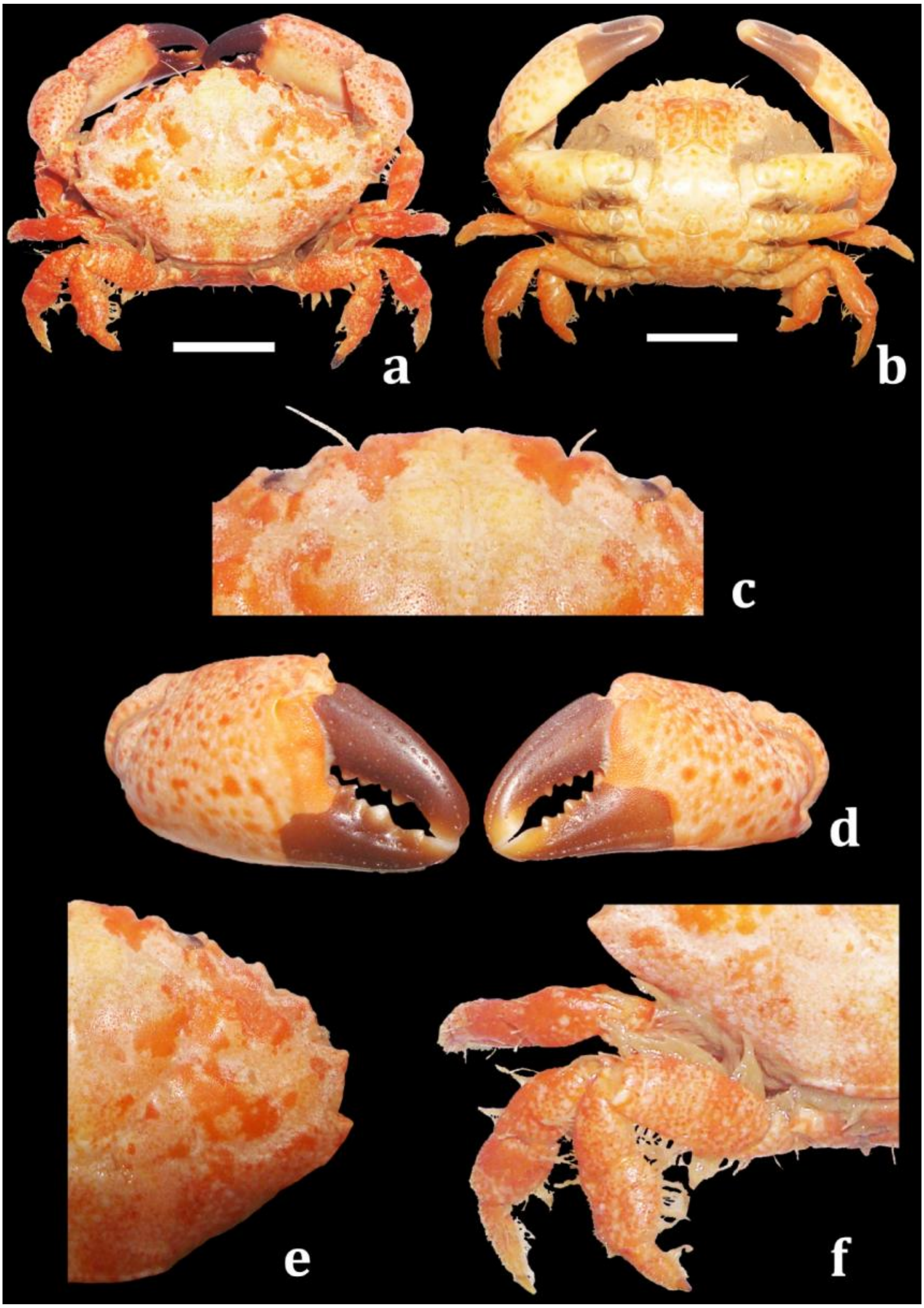


Figure 36: *Leptodius exaratus* (H. Milne Edwards, 1834). (a) Dorsal view (b) Ventral view (c) Frontal margin of carapace (d) Chelipeds (e) Anterolateral border of carapace (f) Periopods.(Bar represents 1cm).

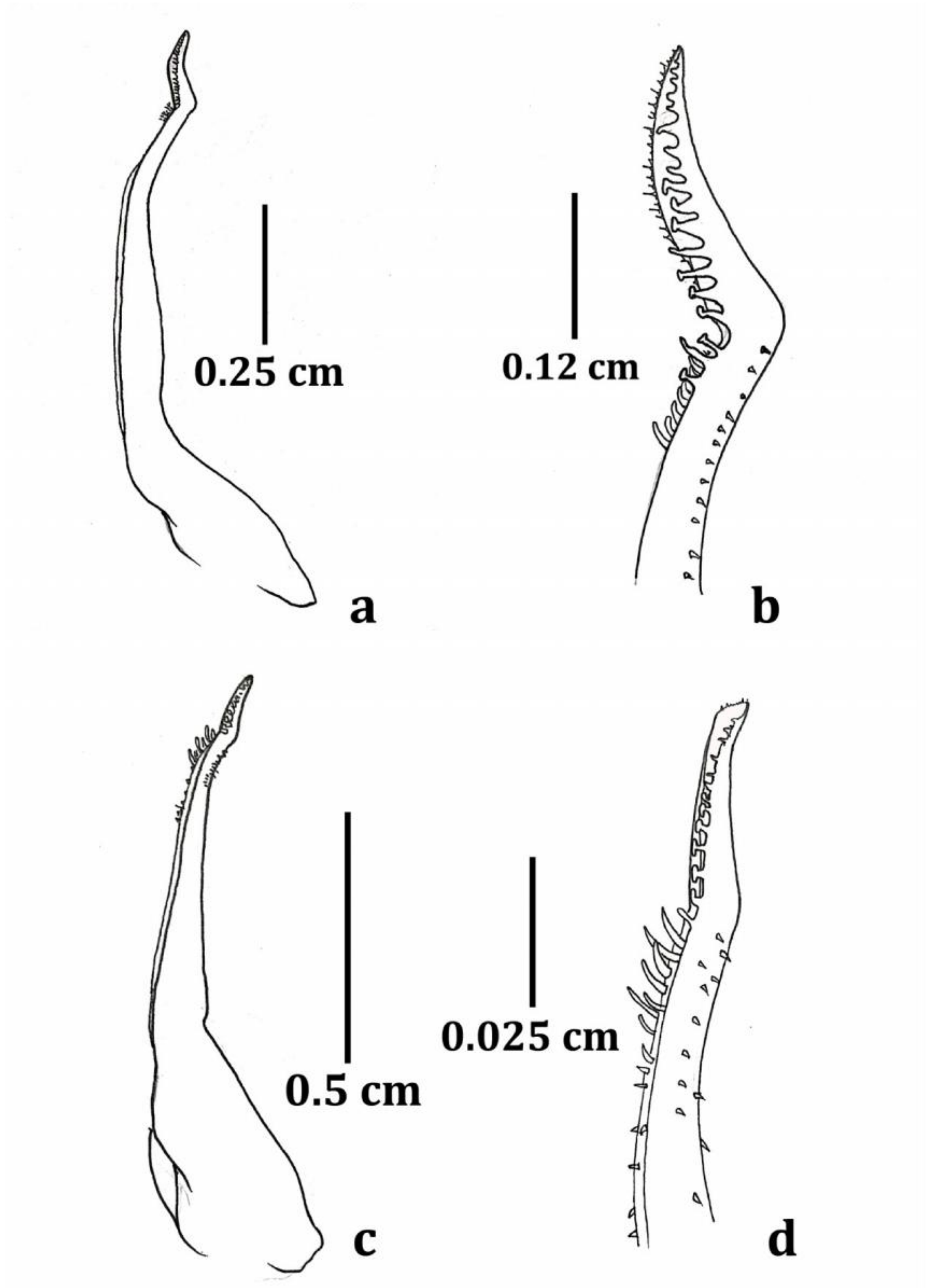


Figure 37: Male 1st left gonopod: *Leptodius affinis* (De Haan, 1835)(a) Entire gonopod (b) Apical lobe; *Leptodius exaratus* (H. Milne Edwards, 1834) (c) Entire gonopod (d) Apical lobe.

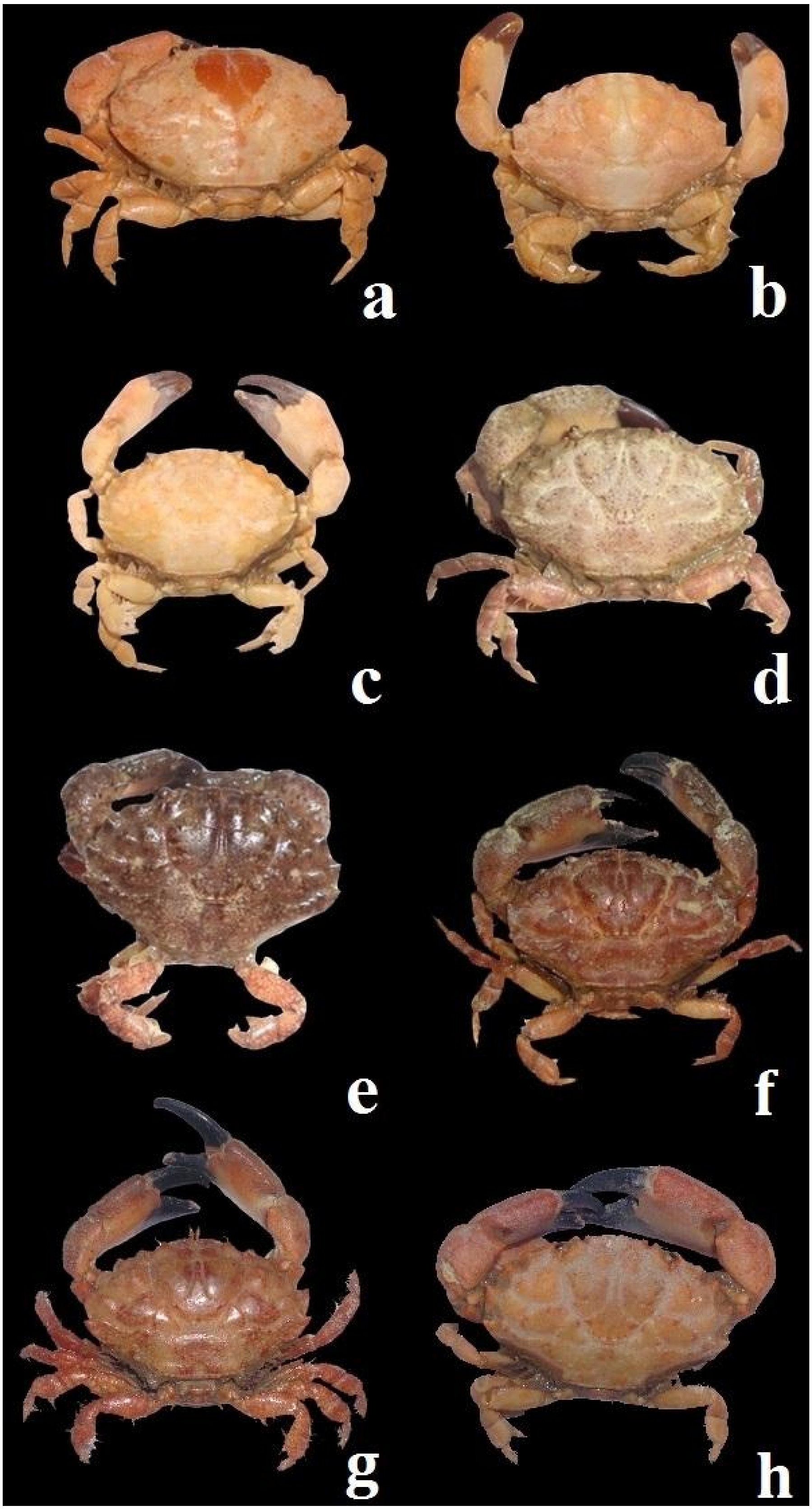


Figure 38: Different color forms of *Leptodius affinis* (De Haan, 1835) (a-e) and *Leptodius exaratus* (H. Milne Edwards, 1834) (f-h).

## Genus *Macromedaeus* Ward, 1942

**Distribution-** Antero-lateral margins having more than four teeth or lobes, front not extending beyond the supra orbital angles; antennular fossae broad, basal article of the antennae short and squat; third maxillipeds elongated, with the merus obviously as long as broad; fingers of the larger cheliped with excavated extremities, rounded but not enlarged, not crossing when they are closed.

### 11. *Macromedaeus crassimanus* (A. Milne Edwards, 1867) (Fig. 39a, b)

**Synonyms**

*Xantho crassimanus* Milne Edwards A., 1867: 267; Rathbun, 1906: 847.

*Leptodius crassimanus* Haswell, 1882c: 61; Müller, 1887: 474; de Man, 1887d: 287; Balss, 1924a: 10; Boone, 1934: 114, pl. 59; Chhapgar, 1957b: 30, pl. 9 a-c; Sankarankutty, 1966a: 351.

*Xantho (Leptodius) crassimanus* Alcock, 1898, 120; Odhner, 1925: 80.

*Macromedaeus crassimanus*Guinot, 1968a: 708, figs 18; Takeda, 1976a: 85.

**Material Examined-** Total 4 specimens were collected in which 3 specimens were males and 1 was female. (Sutrapada: 2 male and 1 female; Kodinar: 1 male).

1 male (CL: 20.1mm; CW: 30.07mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 20**

**Description-** Carapace moderately convex; regions and sub regions well defined by different grooves in anterior two third half of the carapace; grooves between different regions prominent but flatter and even (Fig. 39a); two lobes of the front with deeply concave edges gives an appearance of four teeth (Fig. 39e); anterolateral border cut into five teeth; first on depressed, third largest and last one smallest (Fig. 39c).

Dorsal surface of palm and carpus covered with un even tubercles; inner and outer surfaces of palm smooth; finger tips not broad, slightly hollow and not gapping (Fig. 39d); ambulatory legs smooth except the pubescence dorsal margin of merus; male abdomen narrow and long; sixth segment longer than broad; telson triangular in shape; male first left gonopod with apical lobe slightly curved laterally; apical lobe nib shaped, armed with hook shaped spines on its border opening (Fig. 40a, b). The species is yellow or gray in colour. Fingers black with whitish tips.

**Distribution-**The distribution of the species is wide spread ranging from western Indian Ocean to Australia. The species so far reported from Pakistan, Sri Lanka, China, Indonesia and Australia (Ng et al., 2008; Boxshall et al., 2015).

In India, The species is reported from Bombay on the western coast of India while on the eastern side, the species is reported from Andaman Nicobar Islands. In the present study, the first time reported from the coastal area of Gujarat state (Alcock, 1898; Chhapgar, 1957a, b).

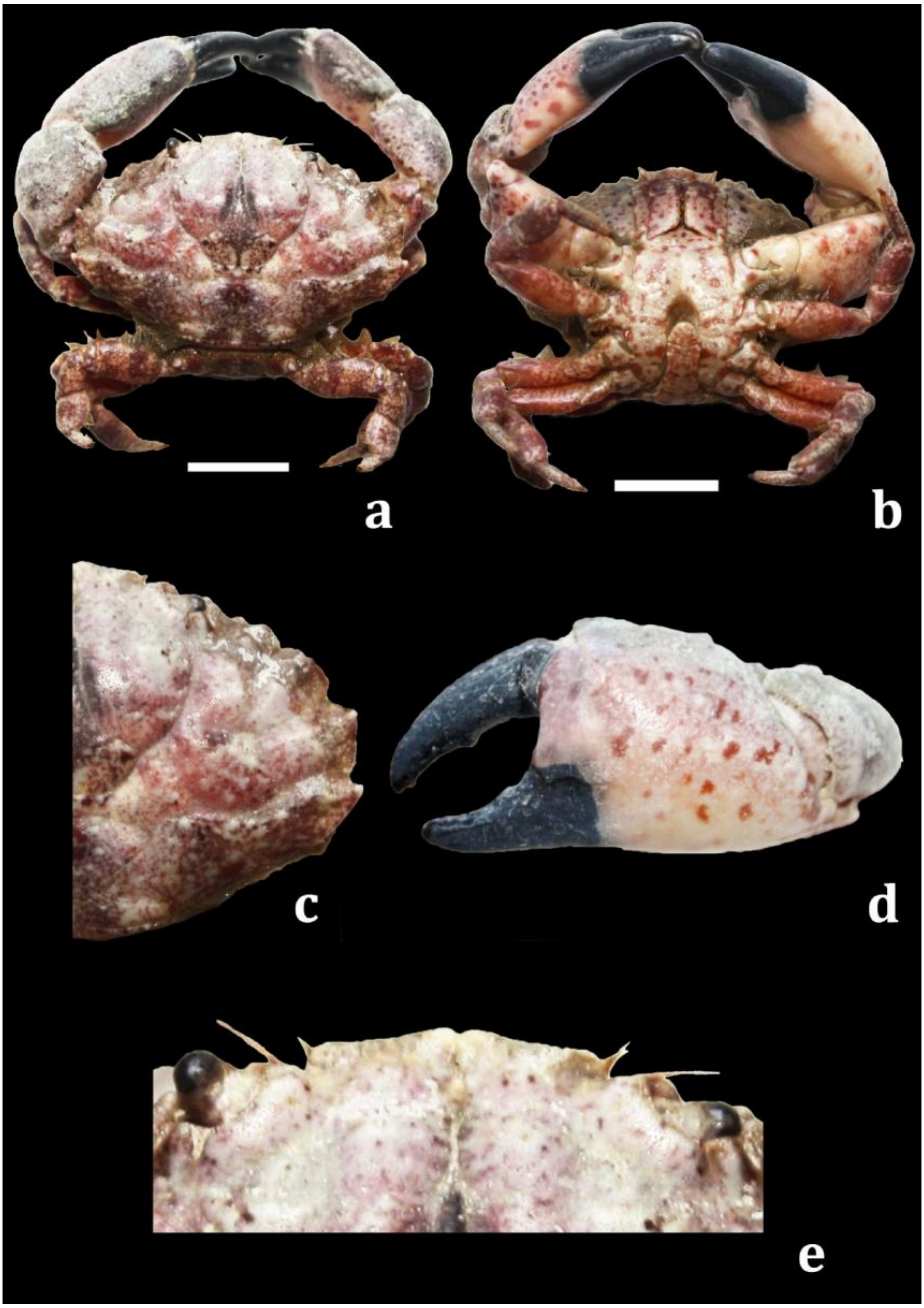


Figure 39: *Macromedaeus crassimanus*(A. Milne Edwards, 1867) (a) Dorsal view (b) Ventral view (c) Anterolateral border of carapace (d) Cheliped (e) Frontal margin of carapace.(Bar represents 1cm).

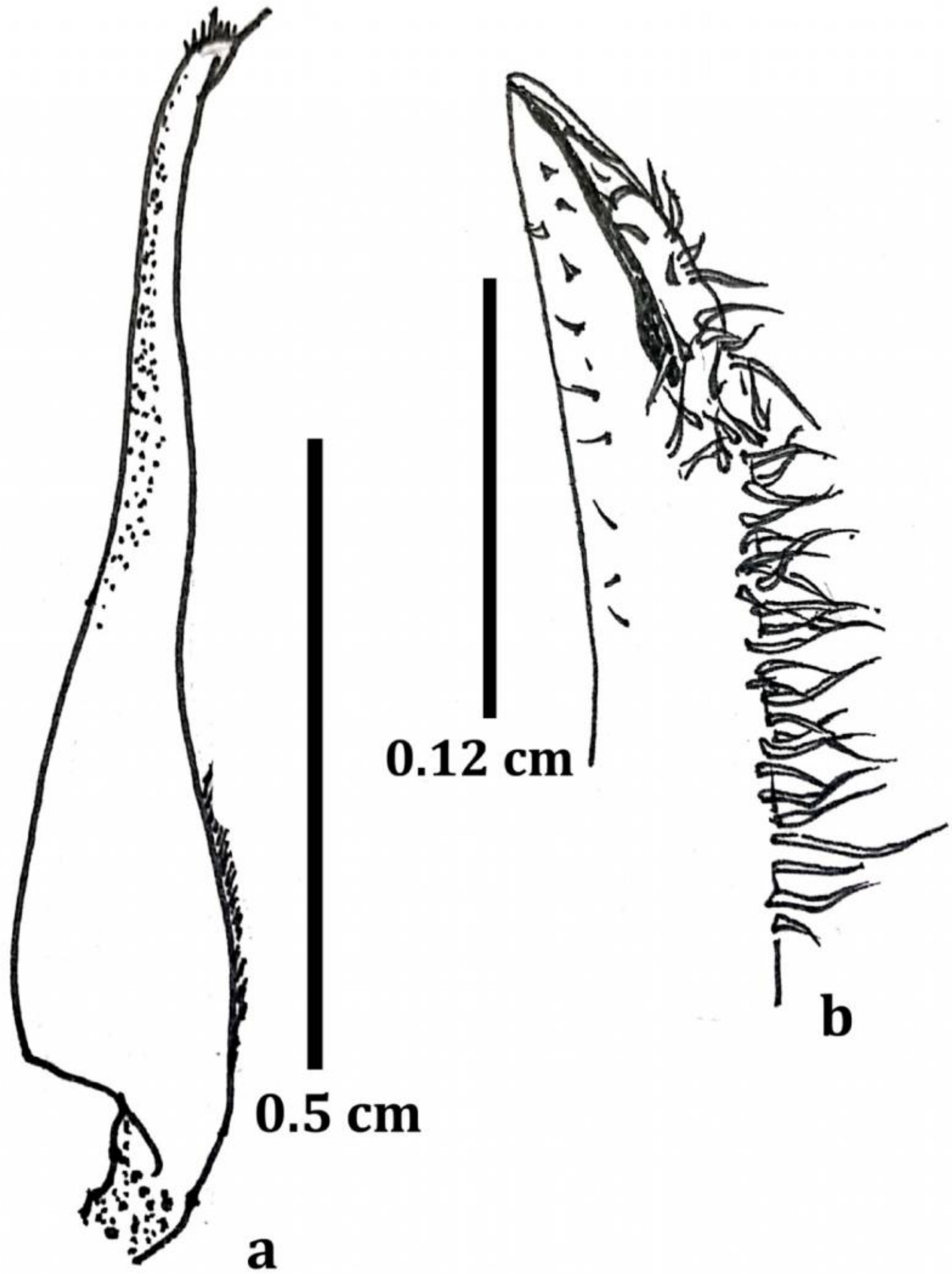


Figure 40: Male 1st left gonopod: *Macromedaeus crassimanus* (A. Milne Edwards, 1867)(a) Entire gonopod (b) Apical lobe.

## Genus *Demania* Laurie, 1906

**Description-** Carapace transversely oval, sometimes pentagonal or rounded, regions always well demarcated, covered with lobules or tubercles, sometimes squamiform, or with granules; antero-lateral margins sometimes rounded, or cut into four lobes, either rounded or toothed; front broad, not extending beyond the supra orbital angles, sometimes more produced; male chelipeds sub equal or feebly un equal; chelipeds tuberculated or granulated; fingers not spoon-shaped; ambulatory legs almost smooth, or granulated or tuberculated, sometimes with depressed or squamose tubercles; sometimes anterior border markedly crested.

### 12. *Demania baccalipes* (Alcock, 1898) (Fig. 41a, b)

**Synonyms**

*Xantho (Lophoxanthus) scaberrinus* var. *baccalipes* Alcock, 1898: 117.

*Xantho reynaudii* var. *baccalipes* Balss, 1938b: 51.

*Xantho (Lophoxanthus) scaberrinus baccalipes* Chhapgar, 1957b: 29, pl. 8.

*Demania scaberrima baccalipes*Guinot, 1971a: 1074.

*Demania baccalipes* Sakai, 1976a: 421, pl. 151, fig. 1;Guinot, 1979: 59, pl. 4, fig. 9;Serene,1984: 187- 188.

**Material Examined:**Total 10 specimens were collected in which 6 specimens were males and 4 were female. (Sutrapada: 3 male and 2 female; Dhamlej: 3 male and 2 female; Kodinar: 2 male and 2 female).

1 male (CL: 37.7mm; CW: 61.07mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 26**

**Description-** Carapace width 1.30 greater than length, carapace moderately convex in the anterior part with well defined tubercles, carapace regions and sub regions clearly defined by broad, deep smooth groves; protogastric region and mesogastric regions not separated from each other as well as from cardio-intestinal region (Fig. 41a); the sub median lobes of frontal margin separated by an open fissure (Fig. 41d); tubercles warn in appearance,especially in the middle of the carapace, on the chelipeds and on the ischium of the external maxillipeds; anterolateral margins with three to four teeth behind the exorbital angle; two posterior teeth generally more projecting and angular (Fig. 41c).

Chelipeds almost equal in shape; carpus with blunt triangular tubercle on the internal angle (Fig. 41e); the ambulatory legs hardly flattened (sub cylindrical) with the superior margin without a smooth crest, but with some conspicuous teethon the merus (Fig. 41f) and some rugoseelevations on the carpus and propodus; male first left gonopod slender and long in shape; long setae present at the basal part; apical lobe with long and branched setae on the outer margin; tip of the apical lobe with blunt lips structure; internal margin of apical lobe covered with small tubercles with pointed and triangular tip (Fig. 42a, b). Fresh specimens are brick red in colour while preserved specimens are orange in colour.

**Distribution-** The species is distributed from Indian Ocean to Japan with type locality in Sri Lanka. The species is so far reported from Sri Lanka, Malaysia, China, Singapore and Japan (Ng et al., 2008; Boxshall et al., 2015).

In India, the species is reported from both western and eastern coasts. On the western coast, the species is reported from Gujarat and Maharashtra while on the eastern coast the species is reported from Tamilnadu, Gulf of Mannar and Andaman Nicobar islands (Alcock, 1898; Chhapgar, 1957a, b; Sankarankutty, 1962; Jeyabaskaran et al., 2002).

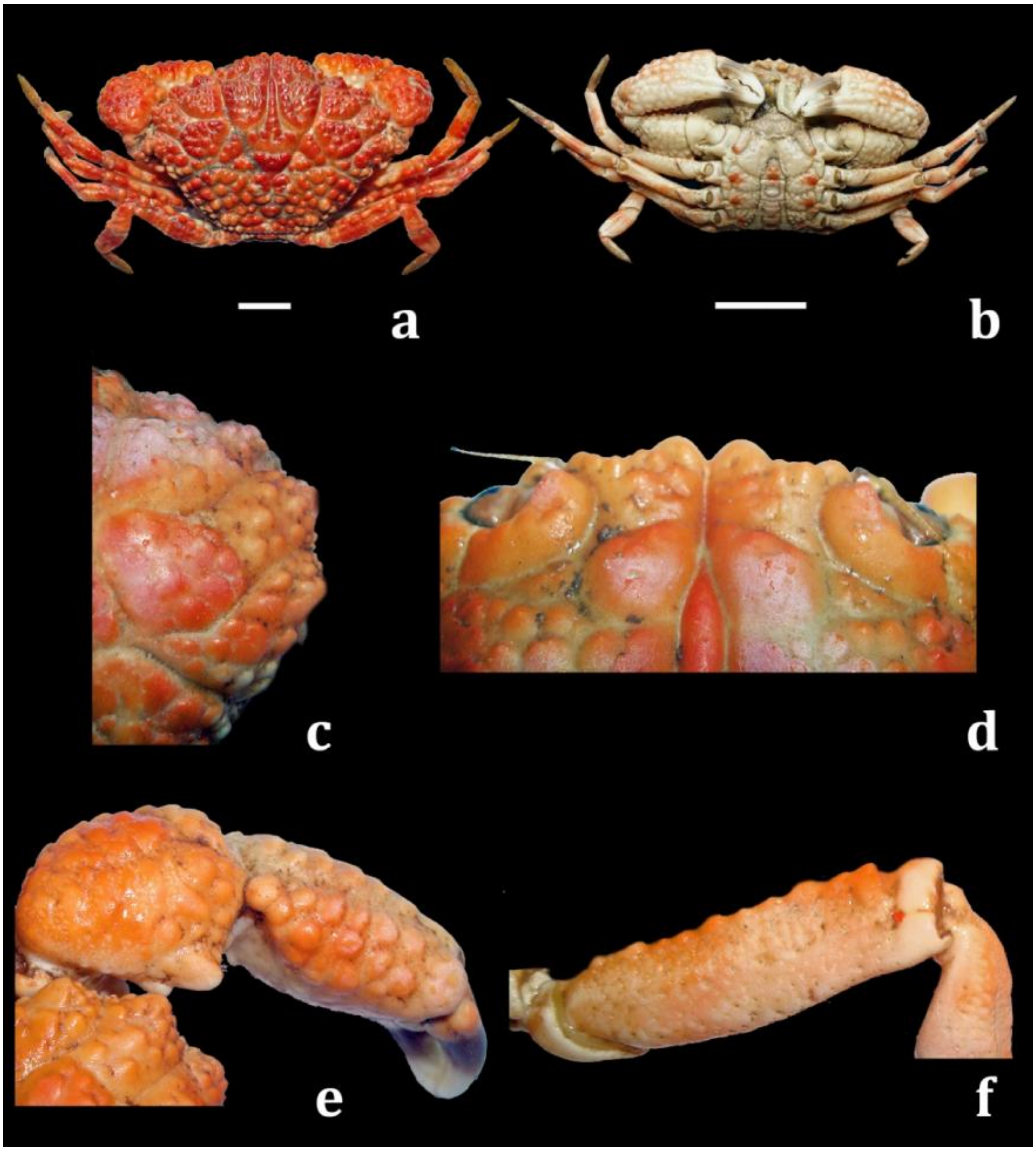


Figure 41:*Demania baccalipes* (Alcock, 1898) (a) Dorsal view (b) Ventral view (c) Anterolateral border of carapace (d) Frontal margin of carapace (e) Cheliped (f) Merus of periopod.(Bar represents 1cm).

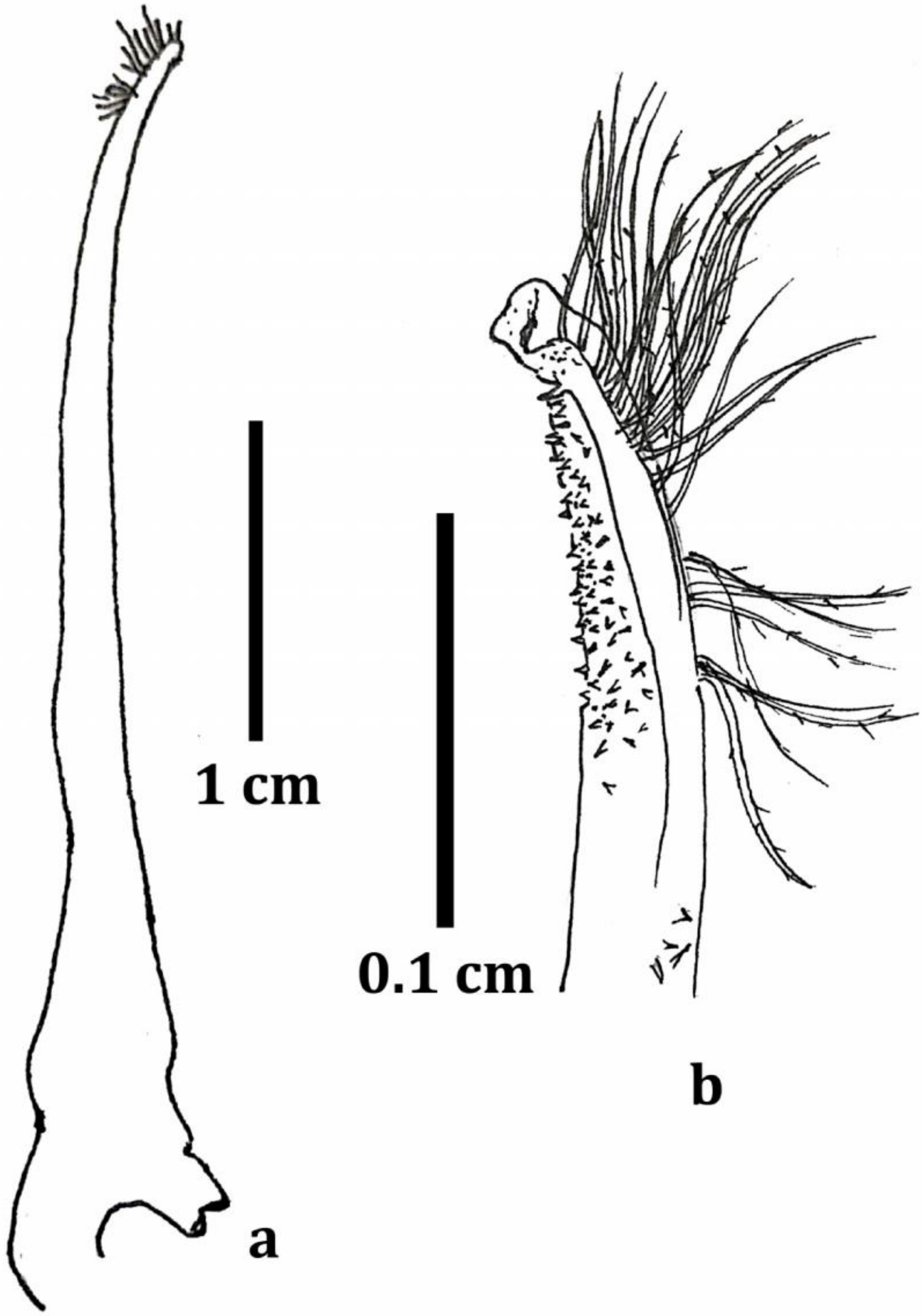


Figure 42: Male 1st left gonopod: *Demania baccalipes* (Alcock, 1898)(a) Entire gonopod (b) Apical lobe.

### Subfamily Zosiminae Alcock, 1898

**Description-** Carapace xanthoid-shaped, dorsal surface strongly areolated and convex; antero-lateral margins convex, continued as far as the exorbital angles, without crest joining the buccal frame, and noticeably separated from the postero-lateral ones that are concave; front with or without marginal crest and feebly bilobed; antennules folded transversely; basal article of the antennae short and completely embracing the ventral prolongation of the fronto-lateral margin; chelipeds sub equal, similar, and with a more or less developed carina on the superior margin of the palm; ambulatory legs with a crest on the anterior margin, particularly on carpus and propodus.

### Genus *Atergatis* de Haan, 1835

**Description-** Carapace transversely oval in outline, sorsal surface convex, smooth, with the regions not or faintly indicated; antero-lateral margins very long, strongly convex, arched, crested, entire or only separated in shallow lobes by indistinct closed fissures; ambulatory legs short and flattened, and with a crest on the anterior and superior margins of the carpus and propodus at least.

**13. *Atergatis integerrimus* (Lamarck, 1801) (Fig. 43a, b)**

**Synonyms**

*Cancer laevis latipes* Seba, 1761: pl. 19, figs 6-7.

*Cancer integerrimus* Lamarck, 1801: 272. Lamarck, 1818: 272.

*Atergatis subdivisus* Adams and White, 1848: 38, pl. 8, fig. 3.

*Atergatis integerrimus* Dana, 1852c: 158;Stimpson, 1858a: 32;de Man, 1887d: 244; Ortmann, 1893b: 462; Henderson, 1893: 352; Alcock, 1898: 95;Chopra and Das, 1937: 397; Sakai, 1939: 448, pl. 56, fig. 2; Stephensen, 1945: 154, fig. 39B. Chhapgar, 1957b: 27, pl. A, fig. 2, pl. 8 a-c;Sankarankutty, 1966a: 356;Guinot, 1967a: 261;Takeda, 1978a: 39; Miyake, 1983: 101, pl. 34, fig. 2.;Dai and Yang, 1991: 283.

**Material Examined-** Total 10 specimens were collected in which 6 specimens were males and 4 were female. (Sutrapada: 3 male and 2 female; Dhamlej: 2 male and 2 female; Kodinar: 1 male).

1 male (CL: 53.87mm; CW: 84.07mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 21**

**Description-** Carapace is 1.6 times broader than long; surface of the carapace irregularly and distinctly pitted; carapace more pitted near front and anterolateral border (Fig. 43a); front emerges slightly near the middle part and joins with the anterolateral border with distinct angle (Fig. 43d);orbits very small, width of orbits less than one third of the front; anterolateral border without spines (Fig. 43c);The crests of the antero-lateral margins of the carapace are continued to the epibranchial angle by a short crest that gradually disappears along the postero-lateral margins; epibranchial angle; a tooth or crest kind of structure emphasized on the inside by a furrow; The third maxilliped has a transverse tuft of setae near the anterior margin of the merus (Fig. 43f).

Chelipeds equal in shape; the upper border of the merus sharply crested; palm and fingers bluntly crested (Fig. 43e); the tips are spoon shaped; the outer surface of the ambulatory leg prominently pitted; small tuft of hair present near the distal end of lower edge of propodite; other joints are free of hair; claw hairy in all the ambulatory legs; the male first left gonopod long and slender in shape with tongue shaped apical lobe, the apical lobe flattened dorso-ventrally with blunt tip, large setae like spicules present on the outer border while inner border with small spicules (Fig. 46a,b). The carapace of the species is brown to brick red in colour with yellow or white coloured pits. The fingers are black in colour with white tips.

**Distribution-** The distribution of the species is wide spread ranging from western Persian Gulf to Japan. The species so far reported from Persian Gulf, Gulf of Oman, China, Singapore, Malaysia, Indonesia, Philippines and Japan (Ng et al., 2008; Boxshall et al, 2015).

In India, the species is commonly observed on the both western and eastern coast of India. The species is so far reported from Gujarat, Maharstra, Karnataka etc. On the east coast of India, the species reported from Bay of Bengal, Gulf of Mannar and Andaman and Nicobar Islands (Alcock, 1898;

Sankarankutty, 1962; Chopra and Das, 1937; Chhapagar, 1957; Jeyabaskaran et al., 2002, Trivedi et al. 2011; Dev Roy, 2013).

**14. *Atergatis roseus* (Ruppell, 1830) (Fig. 44a, b)**

**Synonyms**

*Carpilius roseus* and *marginatus* Ruppell, 1830.p. 13,fig. 3.

*Atergatis roseus* and *marginatus*, De Haan, 1835, p.17.

*Atergatis roseus*, Heller 1861, p. 309; A Milne Edwards, 1865, p. 239.

*Atergatis marginatus*, Milne Edwards, 1865, p. 240.

*Atergatis laevigatus*, A. Milne Edwards, 1865, p. 241, figs. 4-4a.

*Atergatis scrobiculatus*, Heller, 1861, p. 5.

**Material Examined-** Total 5 specimens were collected in which 3 specimens were males and 2 were female. (Veraval: 2 male and 1 female; Sutrapada: 1 male and 1 female).

1 male (CL: 53.08mm; CW: 86.75mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 23**

**Description-** Carapace transversely suboval, slightly convex, smooth, minute pits distributed all over its surface; regions undefined (Fig.44a); the antero-lateral margin arched, bluntly carinate; No traces of teeth or ridge marking the junction of the anterolateral and postero-lateral margins at the epibranchial angle; punctuations occur also on chelipeds, walking legs, abdomen, sternum; minute setae distributed on abdomen, sternum and coxae. Front narrow, imperceptibly convex, divided into two lobes by a small notch (Fig. 44c); front orbital width 0.37 times as wide as carapace; orbit width 1/5 of front border; Posterior margin of carapace smaller than front orbital width.

Superior face of chela bluntly creste (Fig. 44d), fingers spoon-tipped with three flutes, coxae and ischium of chelipeds with small tuft of hairs, at the anterior margin of the inner face; carpus with blunt teeth and two tufts of hairs at the inner angle. Walking legs are dilated and crested; merus crested at the anterior border (Fig. 44$f_1$, $f_2$), doubly posteriorly, in order to accommodate the propodus in closed position; carpus crested at the anterior border; propodus crested at the anterior and posterior borders; In the lower sideof ischium and merus of ambulatory legs, tufts of yellow hairs present, two and one respectively; dactyls of walking legs covered by hairs on upper and lower surface; Abdomen segments 3 to 5 are fused (Fig. 44b), immovable; In the third maxilliped, yellow hairs cover the upper margin of merus and the carpus of palp, which terminates with a tuft of longer hairs; The internal margin of ischium of third maxilliped ornate by small hairs (Fig. 44e). The tip of the first pleopod is slightly curved at the end, the left with one hair near the tip, the right with two hairs (Fig 46c, d). The colour of the species varies with the locality. Different colour forms are reported like brick-red, reddish-brown, bright-brown to rose, dark pink or chocolate in adults, reddish orange rimmed with white in young.

**Distribution-** The natural range of *Atergatis roseus*is from Hong Kong, India, Sri Lanka to Pakistan, the Red Sea and also South Africa. It is one of the alien crustacean decapods introduced into the Mediterranean via the Suez Canal that gradually dispersed northward and spread westwards. In the eastern Mediterranean, the species was recorded first from Israel, successively from Lebanon, southern coasts of Turkey and Syria (Ng et al., 2008; Boxshall et al., 2015).

In India, the species is co existing with *Atergatis integerrimus*. The species is so far reported from Maharshtra, Gujarat, Kerala and Karnataka on the western coast while on the eastern coast the species is reported from Bay of Bengal, Gulf of Mannar, Tamilnadu and Andaman and Nicobar Islands (Alcock, 1898; Chopra and Das, 1937; Chhapagar, 1957; Sankarankutty, 1962; Jeyabaskaran et al., 2002, Dev Roy, 2013).

### 15. *Atergatis ocyroe* (Herbst, 1801) (Fig. 45a, b)

**Synonyms**

*Cancer ocyroe* Herbst, 1801: 20, Pl. 54 fig. 2.

*Atergatis compressipes* MacLeay, 1838: 59.

*Atergatis floridus* Sakai, 1999: 32, Pl. 17C. Jeyabaskarn et al., 2002, Pl 52.

**Material examined-** Total 20 specimens were collected in which 15 specimens were males and 5 were females. (Veraval: 2 male and 1 female; Sutrapada: 4 male and 2 female; Dhamlej: 2 males; Kodinar: 7 male and 2 female).
1 male (CL: 36.25 mm; CW: 50.52 mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 24**

**Description-** Carapace relatively narrow about 1.4 times broader than long, dorsal surface of the carapace strongly convex with regions well indicated, epibranchial region comparatively lower (Fig. 45a), orbits very small, width of orbits less than one third of the front (Fig. 45d); anterolateral border without spines; the crests of the antero-lateral margins of the carapace continued to the epibranchial angle by a short crest that gradually disappears along the postero-lateral margins; epibranchial angle; a tooth or crest kind of structure emphasized on the inside by a furrow; The third maxilliped has a transverse tuft of setae near the anterior margin of the merus, the ischium of third maxillipeds distinctly more longitudinally rectangular (Fig. 45c).

Chelipeds equal in shape; the upper border of the merus sharply crested; palm and fingers bluntly crested; the tips are spoon shaped (Fig. 45e); the outer surface of the ambulatory leg prominently pitted; small tuft of hair present near the distal end of lower edge of propodite; other joints are free of hair; claw hairy in all the ambulatory legs; the male first left gonopod slender and long in shape, the apical lobe slender and pointed, long setae present on the outer border of apical lobe while inner border with small spicules (Fig. 46e, f).

**Distribution-** Herbst, 1801 has described the species based on the specimens collected from the eastern coast of India. As per Ng and Davie (2007), the distribution of the species ranges from west coast of Thailand to South African coast. The species is so far reported from South Africa, and Thailand (Ng and Davie, 2007).

In India, the species is reported from Tamilnadu (Jeyabsakaran et al., 2000).

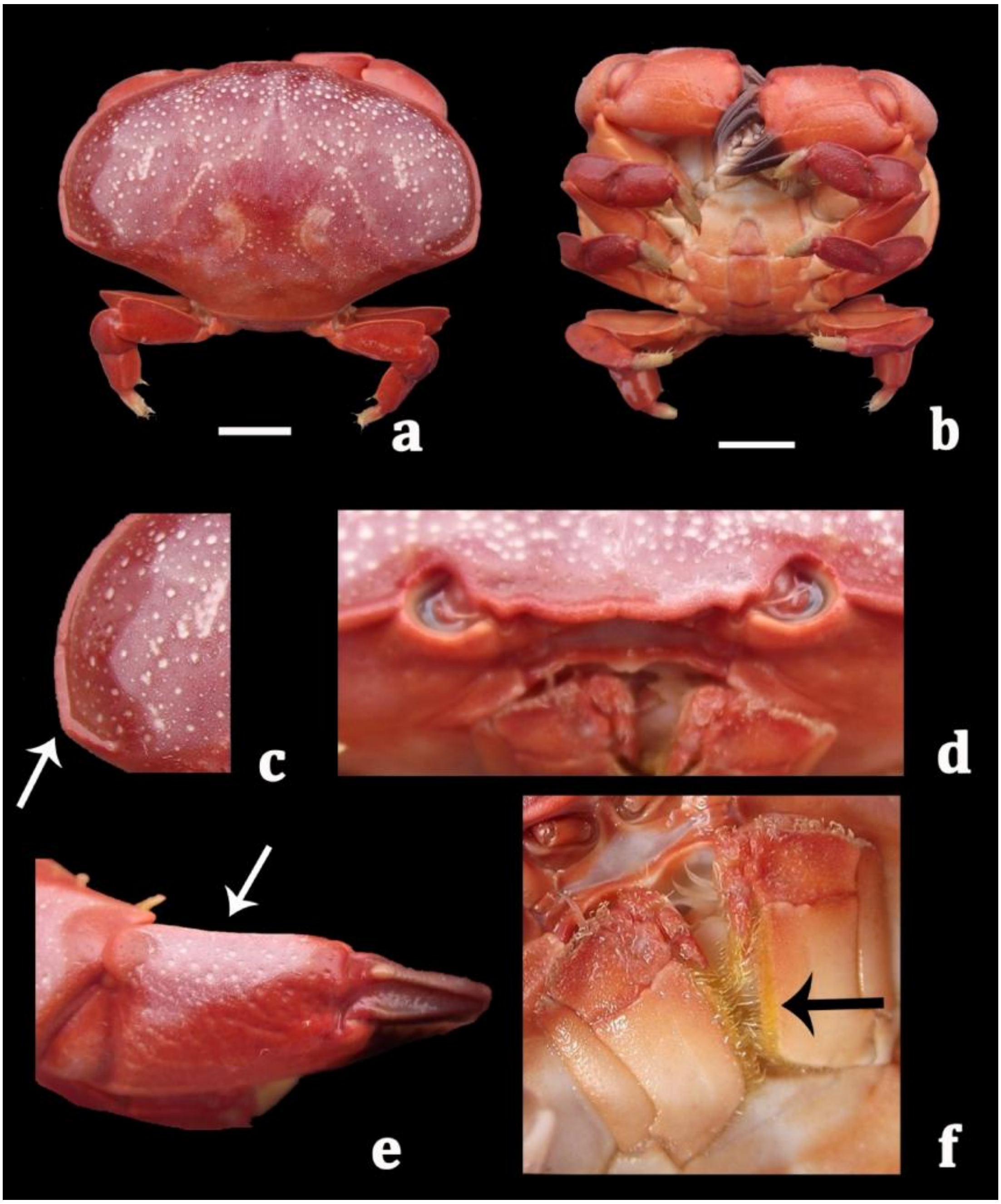


Figure 43:*Atergatis integerrimus* (Lamarck, 1801) (a) Dorsal view (b) Ventral view (c) Anterolateral border of carapace (d) Frontal view (e) Cheliped palm anterior border (f) 3rd maxiiliped.(Bar represents 1cm).

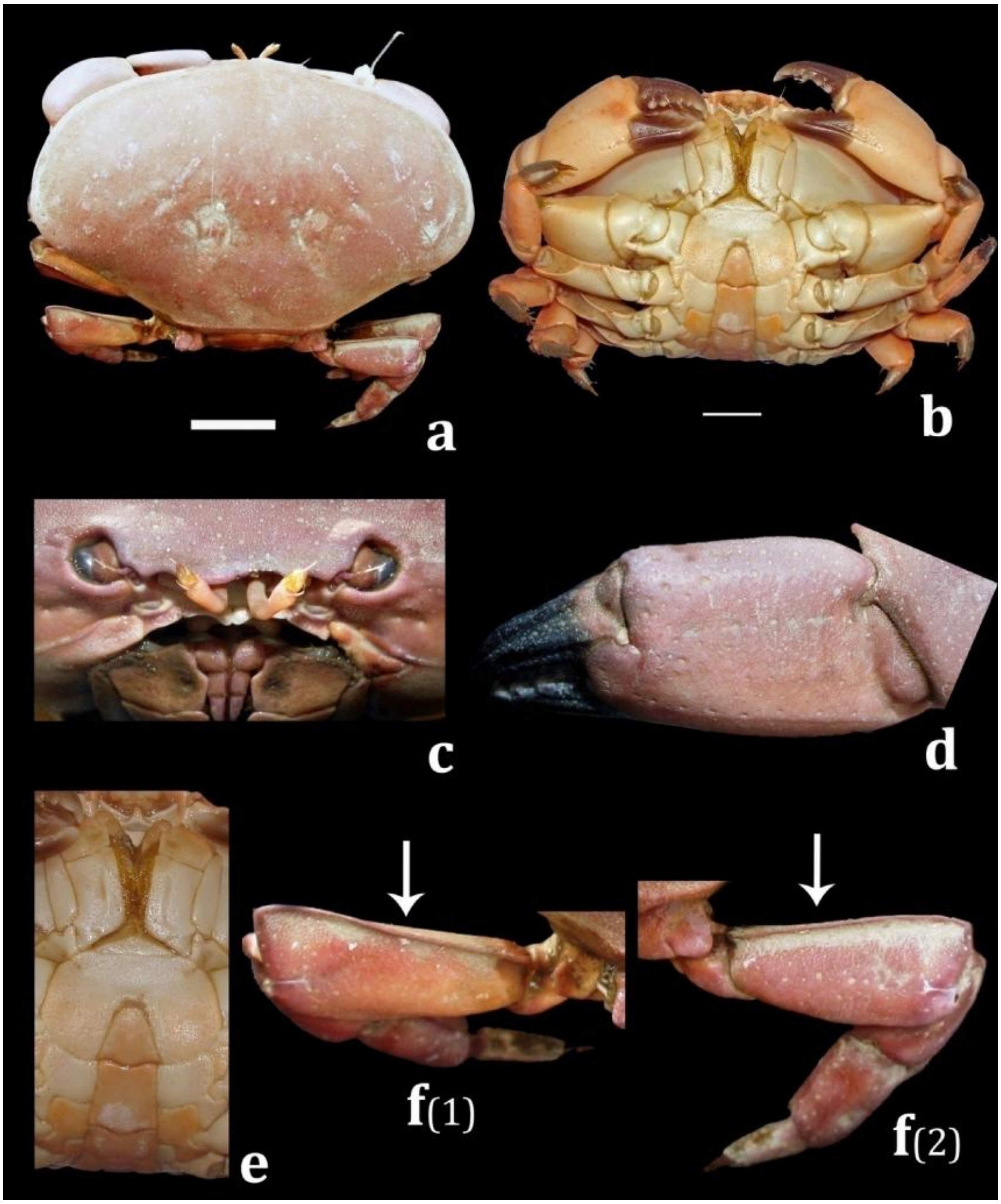


Figure 44:*Atergatis roseus* (Riippell, 1830) (a) Dorsal view (b) Ventral view (c) Anterolateral border of carapace (d) Frontal view (e) Male abdomen and 3rd maxiiliped (f1-f2) Merus of periopod.(Bar represents 1cm).

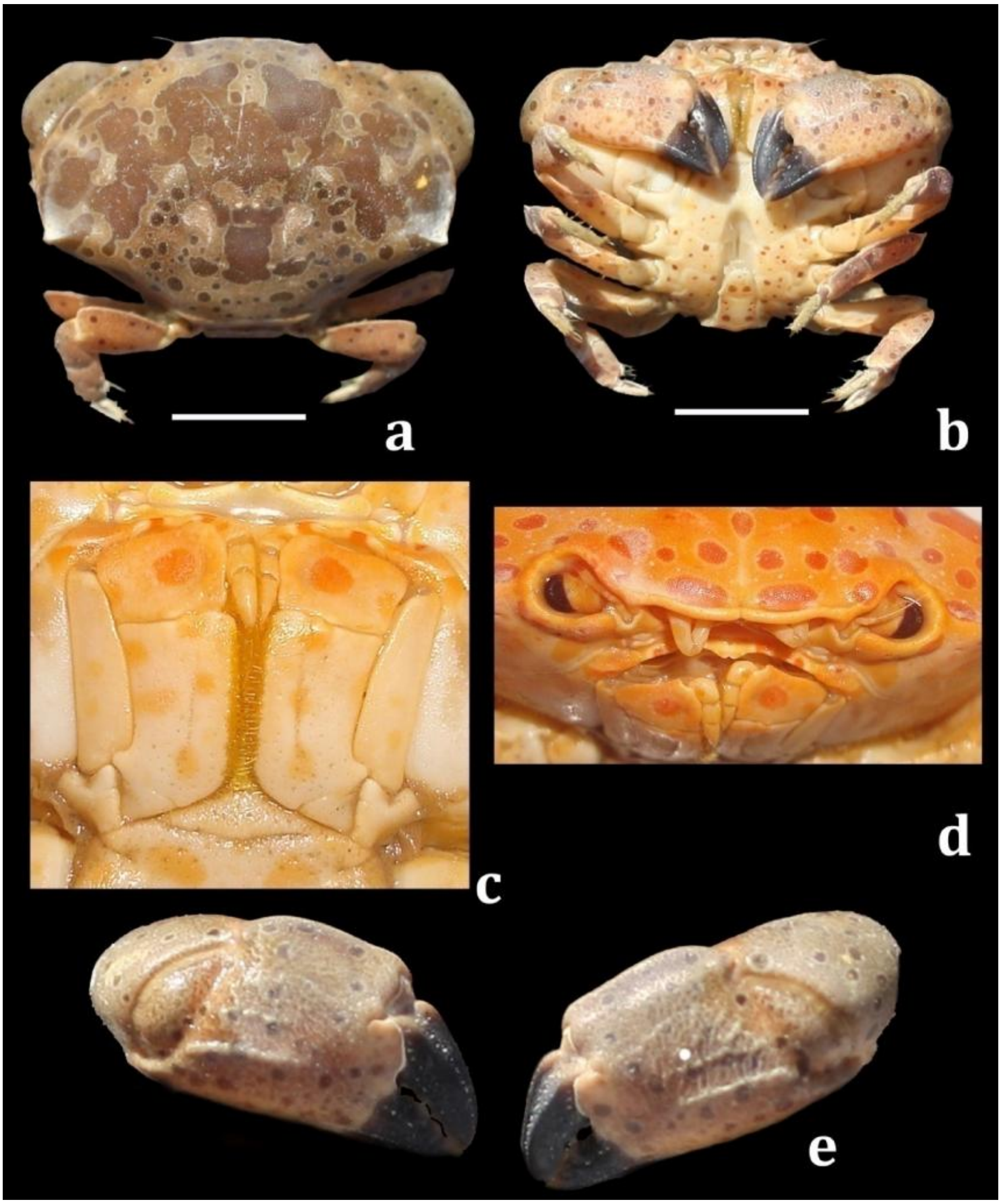


Figure 45:*Atergatis ocyroe* (Herbst, 1801)(a) Dorsal view (b) Ventral view (c) 3rd maxiiliped (d) Frontal view (e) Chelipeds.(Bar represents 1cm).

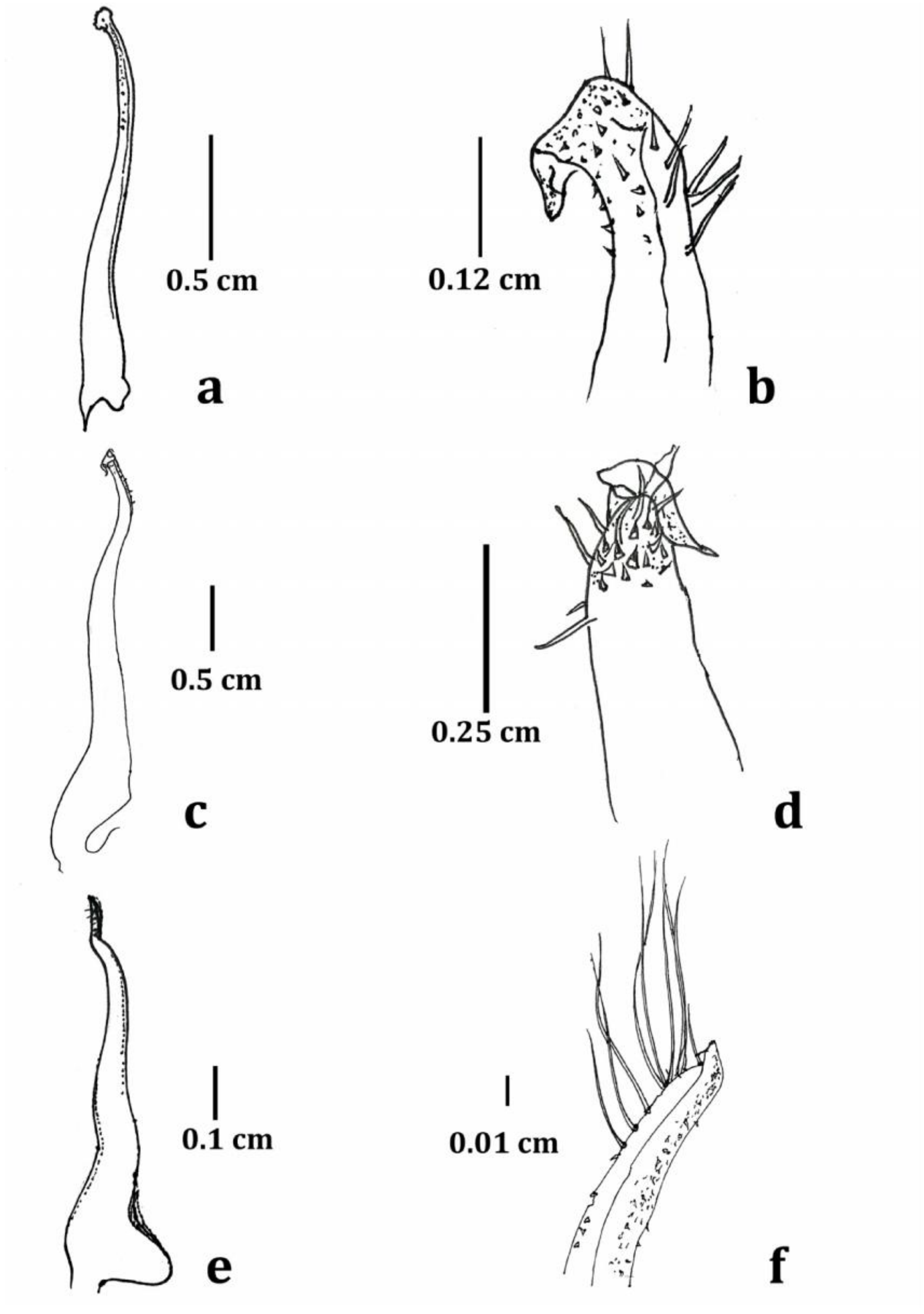


Figure 46: Male 1st left gonopod:*Atergatis integerrimus* (Lamarck, 1801)(a) Entire gonopod (b) Apical lobe;*Atergatis roseus* (Riippell, 1830)(c) Entire gonopod (d) Apical lobe;*Atergatis ocyroe* (Herbst, 1801) (e) Entire gonopod (f) Apical lobe.

**Subfamily Etisinae Ortmann, 1893**

**Description-** Dorsal regions of the carapace more or less delineated and projecting, but always indicated, with the surface finely granular or smooth, behind the exorbital angles, presence of four to eight antero-lateral teeth, with acute or sub acute tips. Front: its breadth less than one third the maximum width of the carapace, sometimes nearly straight and usually projecting, bilobed or four lobed, with a noticeable median fissure; antennules folded transversely; basal article of the antennae with an external antero-lateral, sometimes feeble, lobule occupying the orbital hiatus; antennal flagellum excluded from the orbit; chelipeds with the extremities of fingers rounded and spoon-shaped; ambulatory legs with a dactylo-propodal articulation formed by a rounded prolongation of the propodal lateral margin sliding against and beneath a projecting button situated proximally on the lateral margin of the dactylus: this structure sometimes hardly indicated or differentiated but then the extremity of the dactylus being always bifid. Male abdomen with third to fifth segments fused.

**Genus *Etisus* H. Milne Edwards, 1834**

**Description-**Carapace broad, dorsal surface feebly convex both longitudinally and transversely; regions delimited but smooth; antero-lateral margins armed either with five acute spines, or with numerous claw-shaped teeth of which five are larger, or with seven pro curved spines; frontal margin nearly half the greatest breadth of carapace, laminar, more or less developed in front of the supra orbital angles; Antennules folded transversely antennal flagellum excluded from the orbit. Buccal cavern hardly elongated; chelipeds a little unequal, rather long, very massive, smooth; fingers very stout, spoon-shaped, like horse's hoof.

**16. *Etisus laevimanus* Randall, 1840 (Fig. 47a, b)**

**Synonyms**

*Etisus macrodactylus* Bianconi, 1851: 107, pl. 10, fig. 1.

*Etisus levimanus* Dana, 1852c: 185. Dana, 1855: pl. 10, fig. 1a-h.

*Etisus convexus* Stimpson, 1858a: 31. Stimpson, 1907: 36, pl. 5, fig. 2.

*Etisus maculatus* Heller, 1861b: 332. de Man, 1880c: 173.

*Chlorodopsis espinosus* Borradaile, 1902b: 262, fig. 57.

*Etisus (Etisus) laevimanus* Holthuis, 1953: 21.

*Pilodius espinosus* McNeill, 1968.

*Etisus laevimanus* Randall, 1840: 115;Hilgendorf, 1879: 791;Richters, 1880: 146; Alcock, 1898: 131; Rathbun, 1906: 851; Nobili, 1907: 390;Klunzinger, 1913: 236; Balss, 1922c: 131;Gordon, 1934: 30, fig. 14Aa;Boone, 1934: 121, pls 64-65; Sakai, 1939: 497, pl. 59, fig. 3, pl. 95, fig. 3; Ward, 1942b: 98; Stephensen, 1945: 157.

**Material examined-**Total 15 specimens were collected in which 9 specimens were males and 6 were female. (Veraval: 1 male; Sutrapada: 3 male and 2 female; Dhamlej: 3 male and 2 female; Kodinar: 2 male and 2 female).

1 male (CL: 37.7mm; CW: 61.07mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 26**

**Description-** Carapace distinctly broad than long. Amongst all regions, gastric region fairly demarcated; the branchio-hepatic region contains three lobes (Fig. 47a); anterolateral margin of the carapace with four teeth (Fig. 47c), not separated by small intercalated tooth; the outer margins of the teeth smooth but sometimes endowed with the spinules or denticles; front divided into two lobes by single groove in the middle (Fig. 47d); anterior border of the front makes bow like structure; blunt tooth present on the inner angle of the orbit.

Chelipeds very long and slightly unequal; in males the chelipeds almost reach the maximum length of the carapace but in females slightly smaller; carpus with blunt spine at the inner angle; both the surfaces of the chelipeds smooth but sometimes the outer surface of the cheliped ornamented with the dots or irregular markings of brown colour; fingers black or brown in colour; black or brown colour of pollex covers some distal part of palm; few cutting teeth also present on the inner side of pollex; the tips of the finger make hoof like structure (Fig. 47f). Ambulatory legs covered with hair on both sides; the density and length of hair slightly high on merus as compared to other segments; small hook like spine on the distal end of dactylus (Fig. 47e). Outer border of female abdomen covered with small hair while in male abdomen hair are not present (Fig. 47b); male first leftgonopode slender in shape while the apical lobe contains small hair tuft on outer margin (Fig. 48a, b). The colour of the body ranges from yellow to green.

**Distribution-**The species has wide spread distribution ranging from Red Sea to Fiji. The species is so far reported from Red Sea, Zanzibar, Persian Gulf, Karachi, Japan, Taiwan, China, Singapore, Indonesia, Australia, Fiji (Ng et al., 2008; Boxshall et al, 2015).

In India the species is recorded from rocky shores of western and eastern coast Maharastra and Gujarat, Laccadive Islands, Gulf of Mannar, Andaman Islands. Species prefers rocky shore habitat and is abundantly found in coral reefs(Alcock, 1898; Chhapagar, 1957; Jeyabaskaran et al., 2002, Dev Roy, 2013).

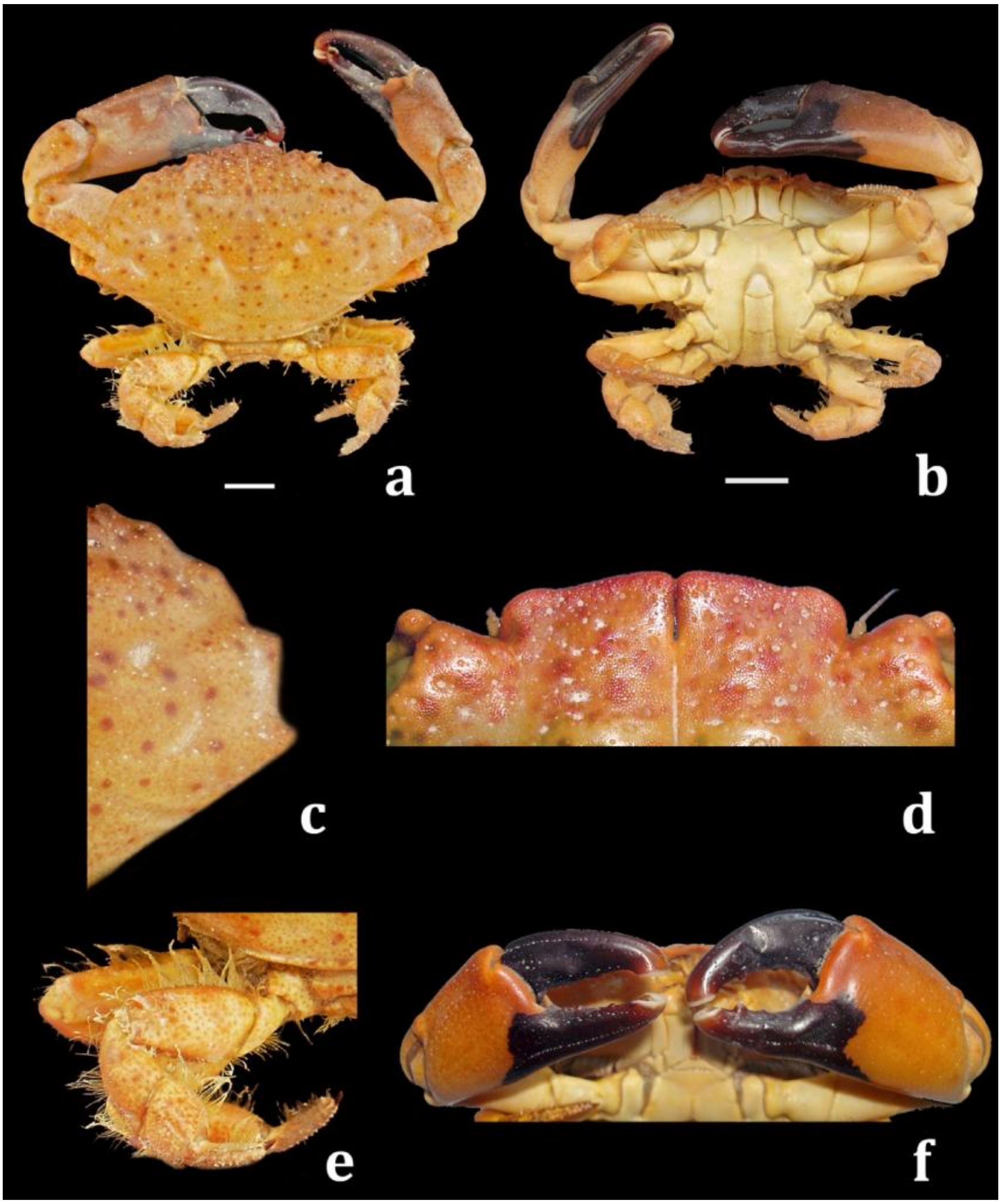


Figure 47:*Etisus laevimanus* Randall, 1840(a) Dorsal view (b) Ventral view (c) Antero-lateral border of carapace (d) Frontal margin of carapace (e) Periopods (f) Chelipeds.(Bar represents 1cm).

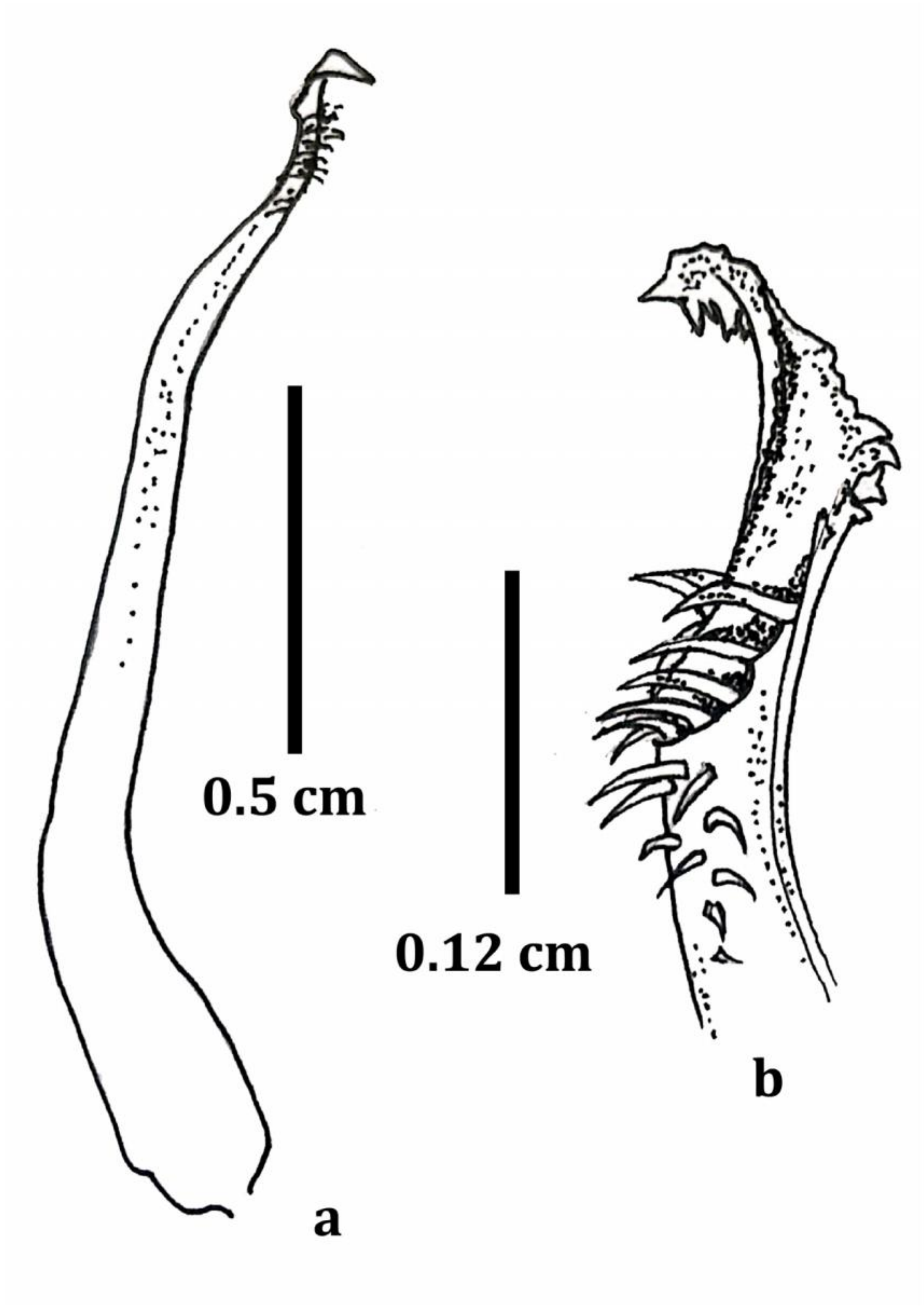


Figure 48: Male 1st left gonopod: *Etisus laevimanus* Randall, 1840(a) Entire gonopod (b) Apical lobe

## Family Eriphiidae MacLeay, 1838

**Description-** Carapace xanthoid-shaped or transversely oval, very broadened and dorsally flattened, with areolation sometimes feeble; antero-lateral margins with four lobes, teeth, spines or spinules, rarely entire; crests of endostom defining efferent channels well developed and generally complete; larger chela usually with prominent, crushing molari form tooth; thoracic sternum narrow or not very widened; all male abdominal segments distinct, movable; female openings sterna; male openings coxal; male first gonopod stout, relatively straight to feebly curved.

### Subfamily Eriphiinae Alcock, 1898

**Description-** Carapace xanthoid shaped, narrow, amtero lateral margin spinose; chelipeds unequal, feebly dissimilar; small cheliped without noticeably elongated fingers.

### Genus *Eriphia* Latreille, 1816

**Description-** Body thick, carapace almost quadrilateral, dorsal surface very little convex or flat, anteriorly tuberculated, sometimes tomentose; antero-lateral margins slightly curved, much shorter than postero-lateral, spinate; fronto-orbital border extremely broad, nearly two thirds the greatest width of carapace. front broad, bilobed, strongly deflexed, cut into two lobes, the outer part of each largely in contact with a broad prolongation of the infra orbital plate; antennules fold transversely; antennae with flagellum completely excluded from the orbital hiatus; orbits deep and suboval, endostomial crests strong; chelipeds unequal in both sexes, massive; fingers stout, pointed, not hollowed; male abdomen with all segments distinct.

### 17. *Eriphia smithii* MacLeay, 1838 (Fig. 49a, b)

**Synonyms**

*Eriphia Smithii* MacLeay, 1838: 60. Krauss, 1843: 30, pl. 2, fig. 3.

*Eriphia laevimana* var. *smithii* Hilgendorf, 1879: 797; Miers, 1880a: 237.

*Eriphia laevimana* var. *Smithii* de Man, 1888d: 327;Alcock, 1898: 216.

*Eriphia laevimana* var. *Smithi* Nobili, 1906b: 291.

*Eriphia smithii* Stimpson, 1907: 72; Barnard, 1950: 274, figs 37f, 51.

*Eriphia sebana smithi* Stimpson, 1907: 72; Stephensen, 1945: 140, fig. 34C-D.

*Eriphia laevimana smithii* Sakai, 1939: 523, fig. 49, pl. 64, fig. 4.

*Eriphia smithi* Sakai, 1976a: 478, pl. 172, fig. 3;Dai and Yang, 1991: 356, fig. 174(3), pl. 47(8); Wada, 1995: 401, pl. 111, fig. 4; Muraoka, 1998: 44.

**Material Examined:**Total 6 specimens were collected in which 4 specimens were males and 2 were female. (Sutrapada: 3 male and 1 female; Dhamlej: 2 male and 1 female; Kodinar: 1 male).

1 male (CL: 36.51mm; CW: 46.00mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 30**

**Description-**Carapace roundly fan shaped, slightly convex, regions well defined (Fig. 49a), hepatic and proto gastric regions well ornamented with spiniform and coniform granules; upper hepatic region marked with two shallow grooves extending poster laterally; shallow H shaped depressions present on the gastro-cardiac region (Fig. 49c).Fronto-orbital breadth nearly one-third the breadth of the carapace. Frontal margin denticulate, divided into 2 lobes by a deep median notch (Fig. 49d); dorsal surface bearing an inverse Y-shaped groove extending backwards.Orbit circular, with denticles and 2 fissures on the dorsal margin. Antero-lateral margin with 6-7 spines, including the outer orbital angle, gradually decreasing in size from front to rear; antennal basal segment completely shut out from the orbit and the orbital hiatus closed.

Chelipeds asymmetrical, Merus finely granulated and serrated along the dorsal margin; Carpus and palm of the major chela with sparse and flat granules on the outer surfaces; fingers obtusely denticulate along cutting edges; carpus and palm of minor chela with prominent beaded granules (Fig. 49e), fingers thinner and longer, teeth of the inner margin obscure. Ambulatory legs with the merus finely granulated along the anterior margin and bearing a few setae along the posterior margin; anterior margin of the carpus, and anterior and posterior margins of the propodus and dactylus thickly covered with setae (Fig. 49f); dactylus tipped. First left gonopod of the male stubby, slightly curved laterally; apical lobe tapering and armed with spines on the inner side (Fig. 50a, b). Male abdomen seven segmented (Fig. 49b), telson triangular, female abdomen oblong in shape. The fresh specimen is dark brown in colour with red eyes.

**Distribution-** The species has wide spread distribution ranging from Red Sea to Indonesia. The species is so far reported from Red Sea, Kenya, South Africa, Persian Gulf, Gulf of Oman, Pakistan, Malaysia, Japan, China, Hong Kong, Singapore, Indonesia (Ng et al., 2008; Boxshall et al, 2015).

In In India, the species is reported from both western and eastern coasts. On the western coast, the species is reported from Gujarat, Maharashtra while on the eastern coast the species is reported from Gulf of Mannar and Andaman islands (Alcock, 1898; Chhapgar, 1957a, b; Jeyabaskaran et al., 2002).

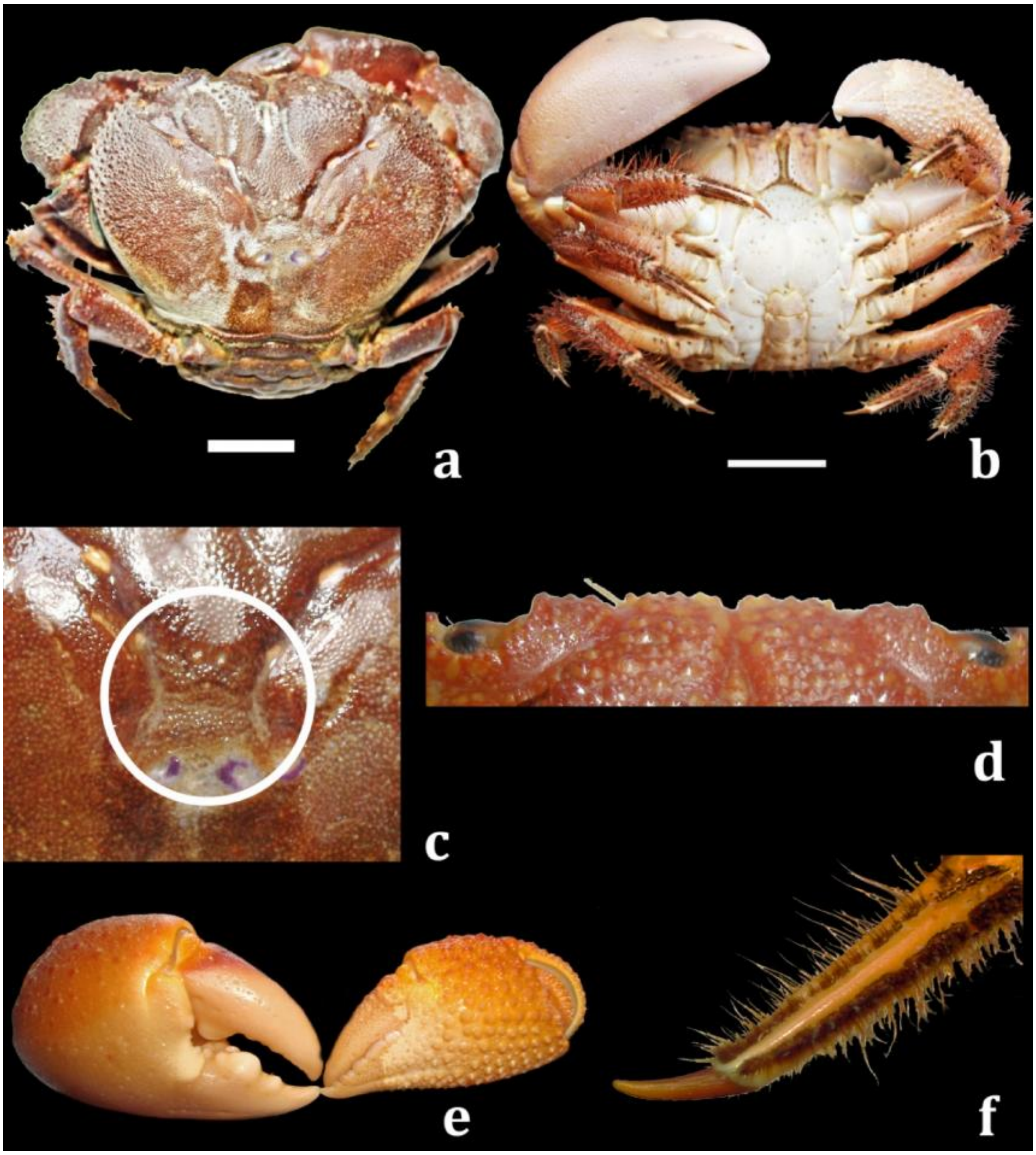


Figure 49: *Eriphia smithii* MacLeay, 1838 (a) Dorsal view (b) Ventral view (c) Pattern on gastric region (d) Frontal margin of carapace (e) Chelipeds (f) Propodus and dactylus of periopods.(Bar represents 1cm).

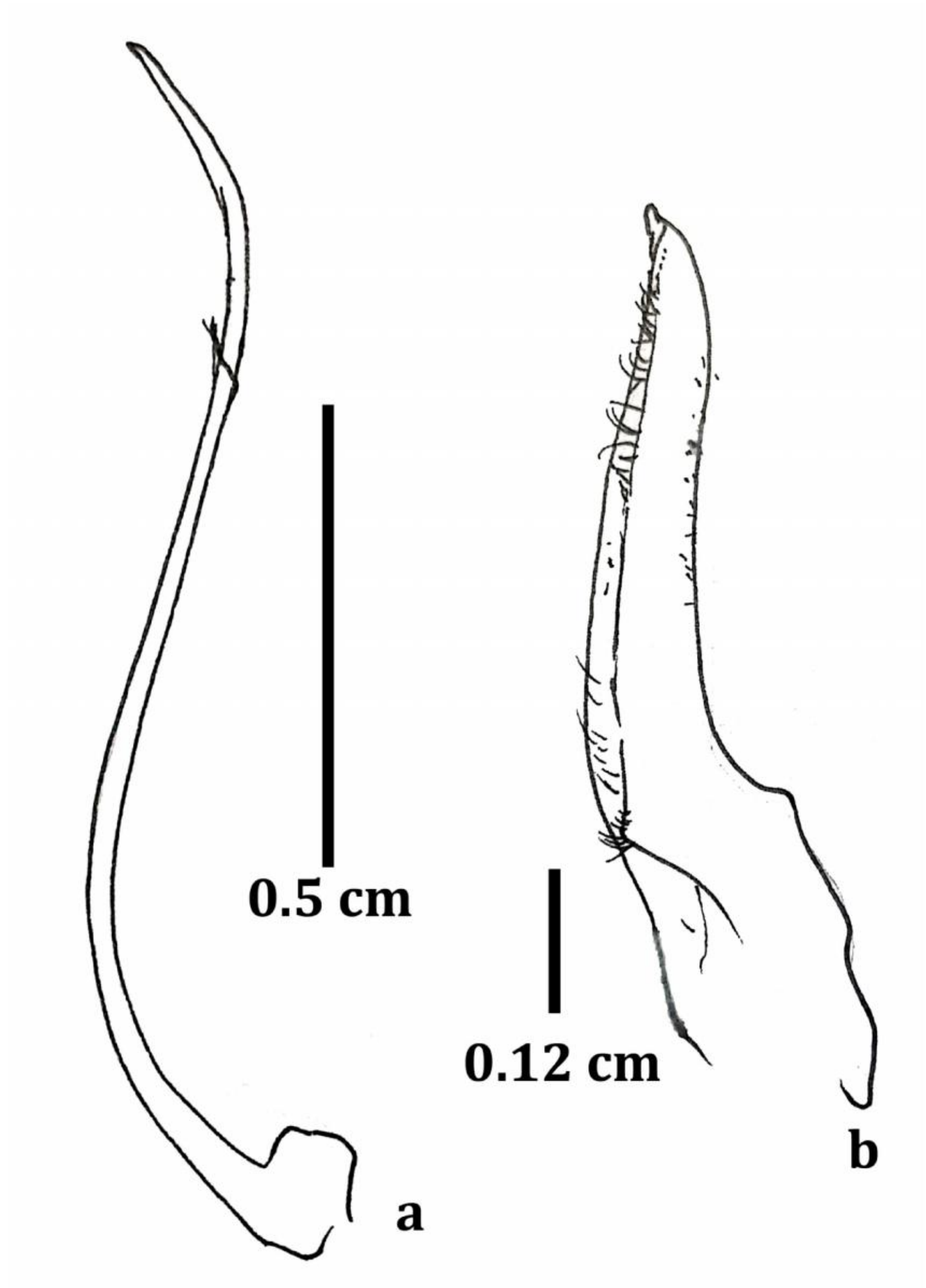


Figure 50: Male 1st left gonopod: *Eriphia smithii* MacLeay, 1838 (a) Entire gonopod (b) Apical lobe.

## Subfamily Oziinae Alcock 1898

**Description-** Carapace xanthoid-shape, very broad and dorsally flattened, less so medially; antero-lateral margins lobate or dentate; chelipeds unequal, very dissimilar; small cheliped with noticeably elongated fingers.

## Genus *Epixanthus* Heller, 1861

**Description-** Carapace very broad, transversely oval, dorsal surface with regions obscurely marked; antero-lateral margins long, strongly arched, sharp and crested, usually regularly fissured or dentate; front broad, slightly deflexed, cut into four teeth or lobes; antennules fold transversely, antennae with basal article broad and short, in contact with front, flagellum in the orbital hiatus; chelipeds unequal in both sexes, massive; fingers long, pointed; fingers of the smaller cheliped remarkably long and slender, as long as the palm.

### 18. *Epixanthus frontalis* (H. Milne Edwards, 1834) (Fig. 51a, b)

### Synonyms

*Ozius frontalis* Milne Edwards H., 1834: 406; Stimpson, 1907: 60, pl. 7, fig. 4.
*Epixanthus Kotschii* Heller, 1861b: 325, pl. 1, fig. 14.
*Epixanthus frontalis* Heller, 1865: 20; Milne Edwards A., 1873a: 241;Alcock, 1898: 185; Lanchester, 1902: 541; Klunzinger, 1913: 295; Balss, 1922c;Chopra and Das, 1937: 405.; Sakai, 1939: 519, fig. 47, pl. 98, fig. 4;Chhapgar, 1957b: 35, pl. 10 g-I;Guinot, 1958: 276, figs 29;Dai and Yang, 1991: 353, fig. 173(1), pl. 47

**Material Examined:**Total 2 female specimens were collected from Sutrapada. 1 female (CL: 15.12mm; CW: 24.16mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 29**

**Description-** Carapace transversely ovate, slightly convex near front and posterior part, almost flat on both the sides; carapace slightly broader than long; regions ill defined (Fig. 51a); surface near front and anterolateral border finely granular otherwise the entire surface smooth; the front, less than third a third greatest width of the carapace, sub truncate dorsally but cut into four teeth, all teeth projecting rather downward; anterolateral border thin and sharp, divided into four lobes (Fig. 51c), last lobe somewhat teeth shaped; two ridges projecting inward from third and fourth lobes; ridges end in epibranchial region.

Chelipeds massive, unequal in adult male, each segment of the chelipeds smooth; carpus with blunt tooth on the distal inner surface; fingers in the larger hand slender, long, arched and meet only at tips (Fig. 51c, d); in minor cheliped fingers are much longer than palm; ambulatory legs with smooth surface; blunt spine projecting outward on the distal upper border of merus; borders of dactylus and propodus covered with short setae; propodus with hook shape spine at the distal part (Fig. 51f). Male first left gonopod short and stout; apical lobe stout with blunt tip; small triangular spicules on the outer border with small tubercles near proximal part of the outer border of the apical lobe; proximal part of the inner border covered with small tubercles while distal part with three to four triangular spicules (Fig. 52a, b); second left male gonopod slender and long; the apical lobe takes circular turn and makes knot like structure; joint of apical lobe and main shaft makes spine like structure on the inner border. Fresh specimen is brick red to cream in colour with chocolate brown fingers. Lower borders of chelipeds and ambulatory legs pale white in colour.

**Distribution-** The species has wide spread distribution ranging from Red Sea to Australia. The species is so far reported from Red Sea, South Africa, Persian Gulf, Pakistan, Sri Lanka, Burma, Japan, Taiwan, China, Gulf of Thailand, Malay Peninsula, Philippines, Indonesia, Australia (Ng et al., 2008; Boxshall et al., 2015).

In India, the species is reported from both western and eastern coasts. On the western coast, the species is reported from Gujarat and Maharashtra while on the eastern coast the species is reported from Tranquebar, Orissa coast, Gulf of Mannar and Andaman islands (Alcock, 1898;Chhapgar, 1957a, b;Jeyabaskaran et al., 2002).

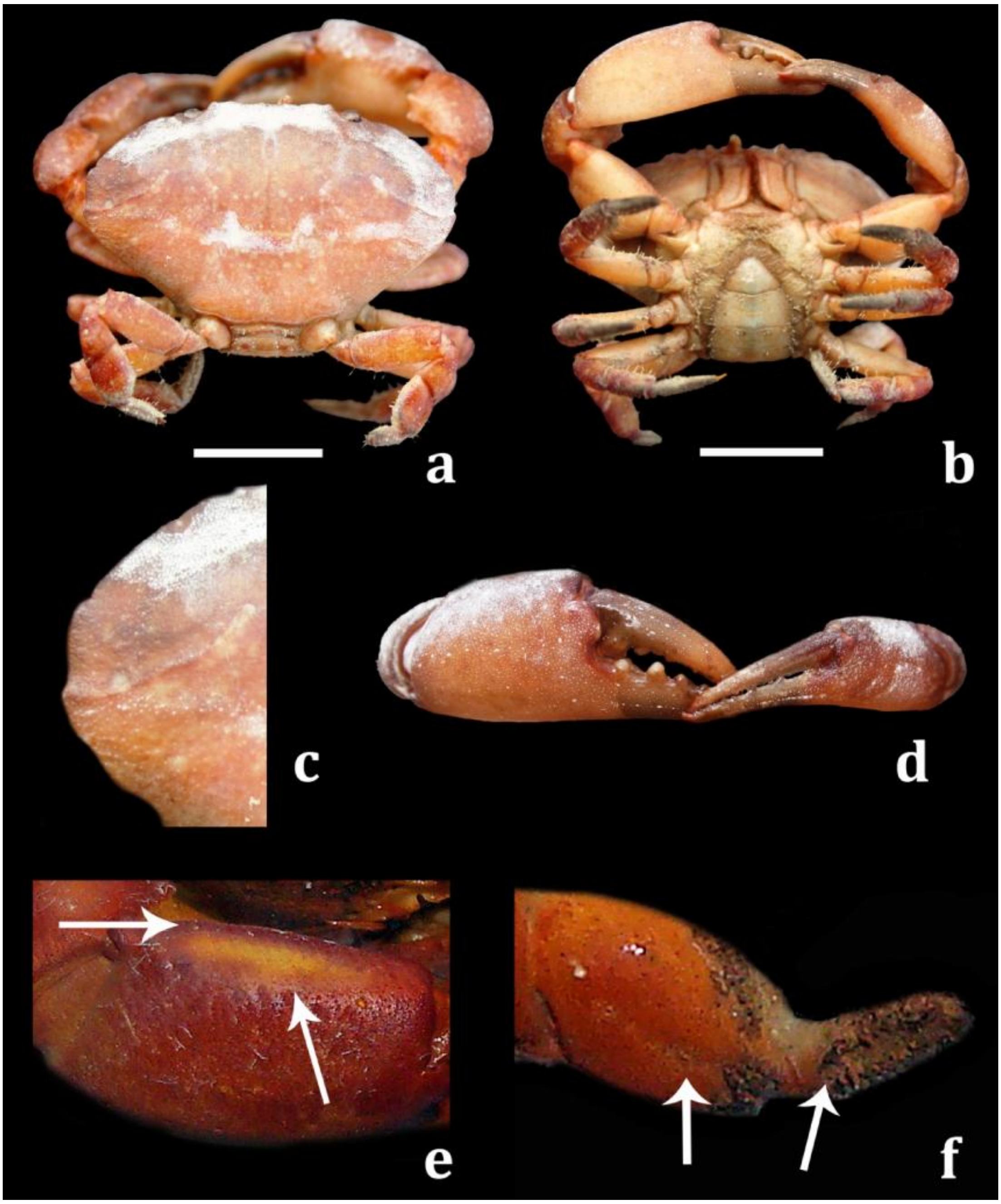


Figure 51: *Epixanthus frontalis* (H. Milne Edwards, 1834) (a) Dorsal view (b) Ventral view (c) Anterolateral border of carapace (d) Chelipeds (e) Crest on palm of cheliped (f) Propodus and dactylus of periopods.(Bar represents 1cm).

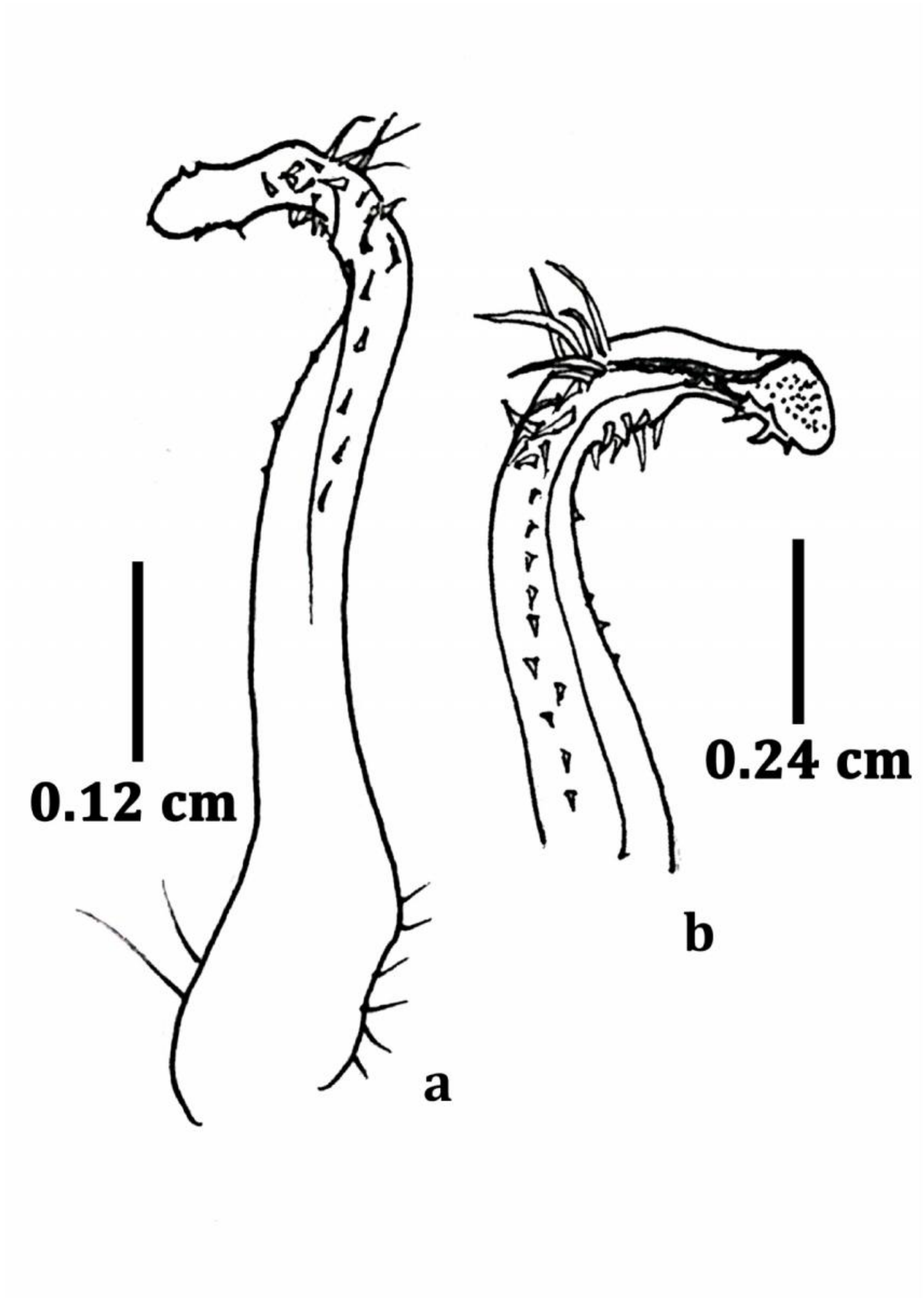


Figure 52: Male 1st left gonopod: *Epixanthus frontalis* (H. Milne Edwards, 1834) (a) Entire gonopod (b) Apical lobe.

## Genus *Menippe* de Haan, 1833

**Description-** Carapace broad, transversely oval, moderately convex fore and aft, very slightly so from side to side; the regions, except the gastric, little defined; antero-lateral borders long strongly arched, cut into four teeth; postero-lateral borders slightly shorter than antero-lateral, convergent; posterior border short; front narrow, less than a fifth the greatest breadth of the carapace, rather prominent, almost horizontal, cut into two prominent lobes, the outer angle of each of which forms a distinct tooth; orbit with the three grooves near the outer angle well marked: inner orbital angles - both upper and lower - well pronounced; eyes on short thick stalks; the side edges of the front not turned down and the short basal antennal joint s not nearly reach the front, so that the cavities of the orbits and antennules not properly separated, long antennary flagellum stands in the orbital hiatus; the antennules fold nearly transversely; the anterior edge of third maxilliped merus is oblique and a little sinuous but not excised; the ridges of the endostome, defining the expiratory channels, are complete, but low and faint; chelipeds massive, un euqal in both sexes; fingers stout, pointed, not hollowed; abdomen of male singularly broad, all seven segments distinct.

### 19. *Menippe rumphii* (Fabricius, 1798) (Fig. 53a, b)

**Synonyms**

*Cancer Rumphii* Fabricius, 1798: 336;Herbst, 1799: 63, pl. 49, fig. 2.

*Pseudocarcinus Bellangeri* Milne Edwards H., 1834: 409, pl. 14 bis, fig. 15.

*Menippe bellangeri* Heller, 1865: 15; Muller, 1887: 474.

*Menippe rumphii* Alcock, 1898: 178; Shen, 1936c: 67; Chopra and Das, 1937: 404; Barnard, 1950: 818;Sakai K., 1999: 31, pl. 16D.

*Menippe Rumphii* Klunzinger, 1913: 283.

**Material Examined-** Total 8 specimens were collected in which 5 specimens were males and 3 were female. (Sutrapada: 2male and 1 female; Dhamlej: 2 male and 2 female; Kodinar: 1 male).

1 male (CL: 29.42 mm; CW: 42.26 mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 31**

**Description-**Carapace sub ovate in shape, broader than long, regions well defined, the surface of the carapace finely pitted anterior-laterally (Fig. 53a), but elsewhere smooth; gastric region distinct and prominently subdivided into three lobes; The front, not quite a fifth the greatest breadth of the carapace, consists of two prominent round-pointed lobes (Fig. 53d), outside of each of which a prominent rounded tooth separated from the supra orbital margin by a grove; front with four pimple like tubercles standing in a square; Two low indistinct somewhat granular elevations, nearly parallel with the curve of the antero-lateral border, traverse either branchial region; the first, which is the more distinct, can generally be traced across the gastric region also; the anterolateral border is fairly sharp and is divided into four broad lobes (Fig. 53c), of which the last two are distinctly, the first two indistinctly acuminate.

Cheliped 1 massive, a little unequal, smooth with some fine and distant pitting: inner angle of carpus bluntly prominent; fingers stout, rather short (Fig. 53e); cheliped 2 stout, smooth, except the upper border which is sometimes microscopically granular; upper border of carpus sparsely (Fig. 53f), walking legs with both borders of propodus and dactylus more thickly setose. Male first left gonopod long and slender; long and thick setae present on the distal outer border while short and sparse setae present on the inner border; apical lobe short and stout; tip of the apical lobe lip like; small spicules present on the dorsal surface of apical lobe (Fig. 54a, b).Fresh specimen brown to bright orange in color with fine granular lines on the chelipeds; finger black.Colours in spirit reddish or brownish yellow with sometimes a fine network of darker markings; fingers black.

The species is very much identical to other species called *Myomenippe hardwicki* (Gray, 1831) but they vary in case of below mentioned characters. Anterolateral border teeth are blunt in *M. rumphii* while they are sharp in *M. hardwickii.* The inner angle of carpus of cheliped in *M. rumphii* is blunt but it is sharper and appears like spine in *M. hardwickii.*

**Distribution-** The species has wide spread distribution ranging from Red Sea to Malaysia. The species is so far reported from Red Sea, Persian Gulf, Pakistan, Burma, Sri Lanka, Malaysia (Ng et al., 2008; Boxshall et al, 2015).

In In India, the species is mostly mis identified as *M. hardwickii*. The species is so far reported from Gujarat, Laccadive Islands, Tamilnadu while on the eastern coast the species is reported from Gulf of Mannar and Andaman islands (Alcock, 1898; Chhapgar, 1957 a, b; Jeyabaskaran et al., 2002).

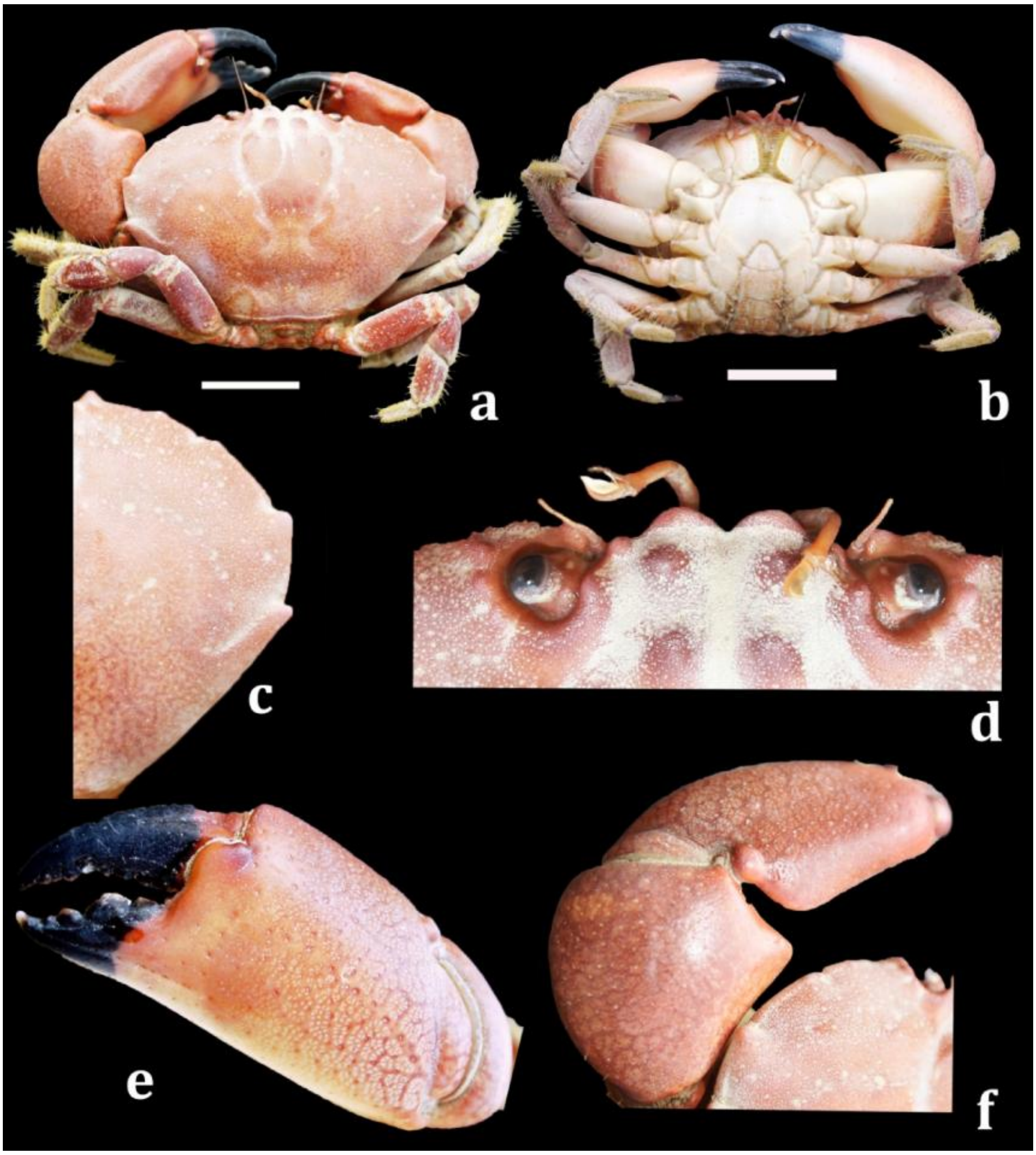


Figure 53: *Menippe rumphii* (Fabricius, 1798) (a) Dorsal view (b) Ventral view (c) Anterolateral border of carapace (d) Frontal margin of carapace (e) Outer surface of cheliped (f) Dorsal view of cheliped merus and carpus.(Bar represents 1cm).

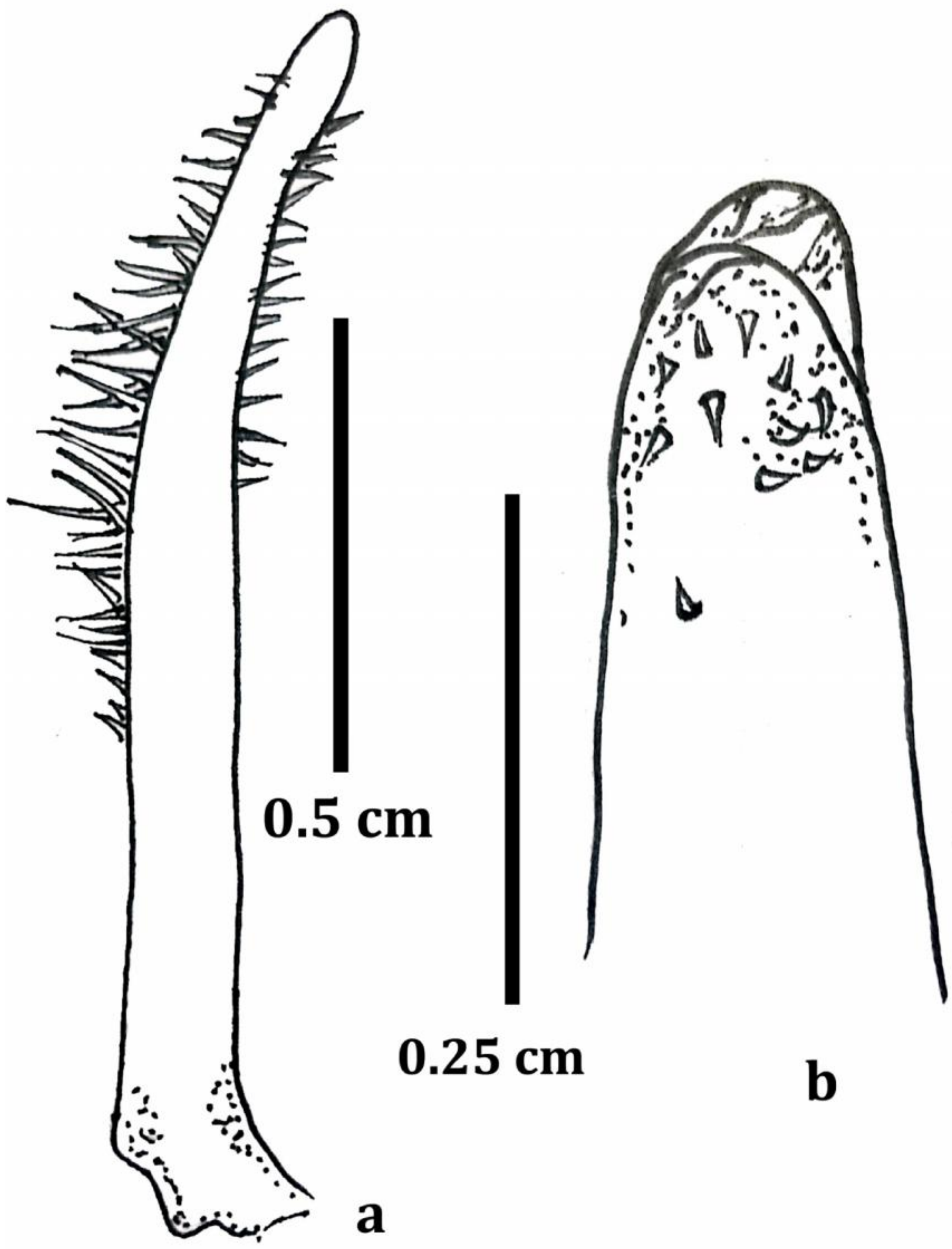


Figure 54: Male 1st left gonopod: *Menippe rumphii* (Fabricius, 1798)(a) Entire gonopod (b) Apical lobe.

## Family Grapsidae MacLeay, 1838

**Description-** Carapace subcircular to squarish, usually quadrilateral. Dorsal surface swollen, usually smooth; antero-lateral margins either straight or slightly arched; fronto-orbital border very much less than the greatest breadth of the carapace; front of great breadth, much broader than orbits; orbit at or very near the exorbital angles, divided into two fossae; inter antennular septum very broad; buccal cavern square; generally a gap between the third maxilliped, often large and rhomboidal; exopodite of third maxilliped either very slender or very broad, with a flagellum, palp of third maxilliped articulating either at the antero-external angle or at the middle of the anterior border of merus; all segments of male abdomen usually distinct.

### Subfamily Grapsinae MacLeay, 1838

**Description-** Front usually strongly deflexed; orbit at or very near the exorbital angles, divided into two fossae; antennal flagellum very short; generally a wide rhomboidal gap between the third maxilliped, exopodite of third maxilliped either very slender or very broad, with a flagellum, merus of third maxilliped not traversed by an oblique hairy ridge; palp articulating at or near the antero-external angle of merus; male abdomen generally filling the whole space between the last pairs of legs.

### Genus *Grapsus* Lamarck, 1801

**Description-** Carapace subcircular, slightly broader than long, its regions fairly well defined, cervical groove distinct, branchial region with regular obliquely transverse ridges; antero-lateral borders armed with one tooth behind the acute exorbital angle; front breadth less than half breadth of carapace, 4 post frontal lobes; inter antennular septum very broad; suborbital border deeply notched near external orbital angle; ischium of third maxillipeds longer than broad, merus shorter than ischium, exopodite with flagellum; chelipeds sub equal, much shorter than the ambulatory legs; carpus with a strong tooth at inner angle; palm and fingers short and stout; finger tips spoon-shaped.

**20. *Grapsus albolineatus* Latreille, in Milbert, 1812 (Fig. 55a, b`)**

**Synonyms**

*Cancer strigosus* (not Linnaeus, 1761) Herbst, 1799: 55, pl. 47, fig. 7.

*Grapsus albo-lineatus* Lamarck, 1818: 249.

*Grapsus (Goniopsis) strigosus* (not Linnaeus, 1761) de Haan, 1833-1849(1835): 33, pl. D.

*Grapsus (Goniopsis) flavipes* MacLeay, 1838: 66.

*Grapsus peroni* Milne Edwards H., 1853: 169.

*Grapsus granulosus* Milne Edwards H., 1853: 169;Holthuis, 1958: 48.

*Grapsus longipes* Stimpson, 1858b: 102. Stimpson, 1907: 119.

*Grapsus strigosus* (not Linnaeus, 1761) Dana, 1852c: 338;Alcock, 1900b: 393; Lanchester, 1902: 549;Kemp, 1918: 229; Chopra and Das, 1937: 425; Balss, 1938a: 77; Sakai, 1939: 650, pl. 106, fig. 3;Chhapgar, 1957b: 53, pl. B, fig. 5, pl. 15 k-m;Sakai, 1965b: 193, pl. 92

*Grapsus albolineatus* Holthuis, 1958: 48. Banerjee, 1960: 147.

**Material examined-** Total 6 specimens were collected in which 3 specimens were males and 3 were females. (Veraval: 1 male; Sutrapada: 1 male and 3 female; Kodinar: 1 male).

1 male (CL: 53.92 mm; CW: 57.16mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 42**

**Description-** Carapace rounded in shape, depressed, surface rough, branchio cardiac region not prominent, hepatic region without strong vertical tubercle (Fig. 55a); lateral margin arched or sub parallel, front wide with four lobe including inner orbital angles (Fig. 55d); anterolateral margin with one teeth after extra orbital spine (Fig. 55c); rest of the antero lateral border sharp and without dentition; inter antennules septum rugose, epistom rugose, not sunken transversely, espistomal ridge entire, not tuberculate, antero-lateral portion of epistom with one entire highly arched ridge, which touches the "m" shaped upper border of the buccal covern. Antero internal angle of external maxillipeds not produced transversely.

Chelipeds almost equal in shape, light pinkish in colour, merus with two large spine on the inner surface; carpus with strong internal spine; dorsal surface of palm and carpus with large tubercles; external surface of palm rough with three distinct ridges (Fig. 55e), finger tips pinkish to white in colour, ambulatory legs flattened in shape, merus long, upper surface of merus ridge shaped (Fig. 55f), ridge of the merus ends with large spine distally, lateral surface of the merus covered with lateral ridges, propodus covered with long setae and ends with hook shaped spine; Male abdomen with sixth segment equal to or shorter than fifth. Male first left gonopod curved, not stout; apical lobe covered with long setae (Fig. 56). Fresh specimen is greenish in colour brown blotches on carapace and legs; preserved specimens are reddish brown in colour. The species is commonly observed in mangrove habitat but on the rocky shore habitat, the species is commonly observed in rock crevices with rich algal or weed growth.

**Distribution-** The species has wide spread distribution ranging from Red Sea to New Caledonia The species is so far reported from Red Sea, east coast of Africa, Pakistan, Sri Lanka, Burma, Sumatra, Malaysia, Taiwan, China, Philippines, Indonesia, Japan, New Guinea, New Caledonia(Ng et al., 2008; Boxshall et al, 2015).

In India, the species is commonly found on both west and east coasts. The species is so far reported from Malabar coast, Coromandel coast, Maharashtra, Gujarat, Kerala, Karnataka, Tamilnadu, Gulf of Mannar, Andaman Islands and Nicobar Islands (Alcock, 1898; Chhapgar, 1957a, b;Sethuramlingam and Khan, 1991; Jeyabaskaran et al., 2002; Dev Roy, 2013).

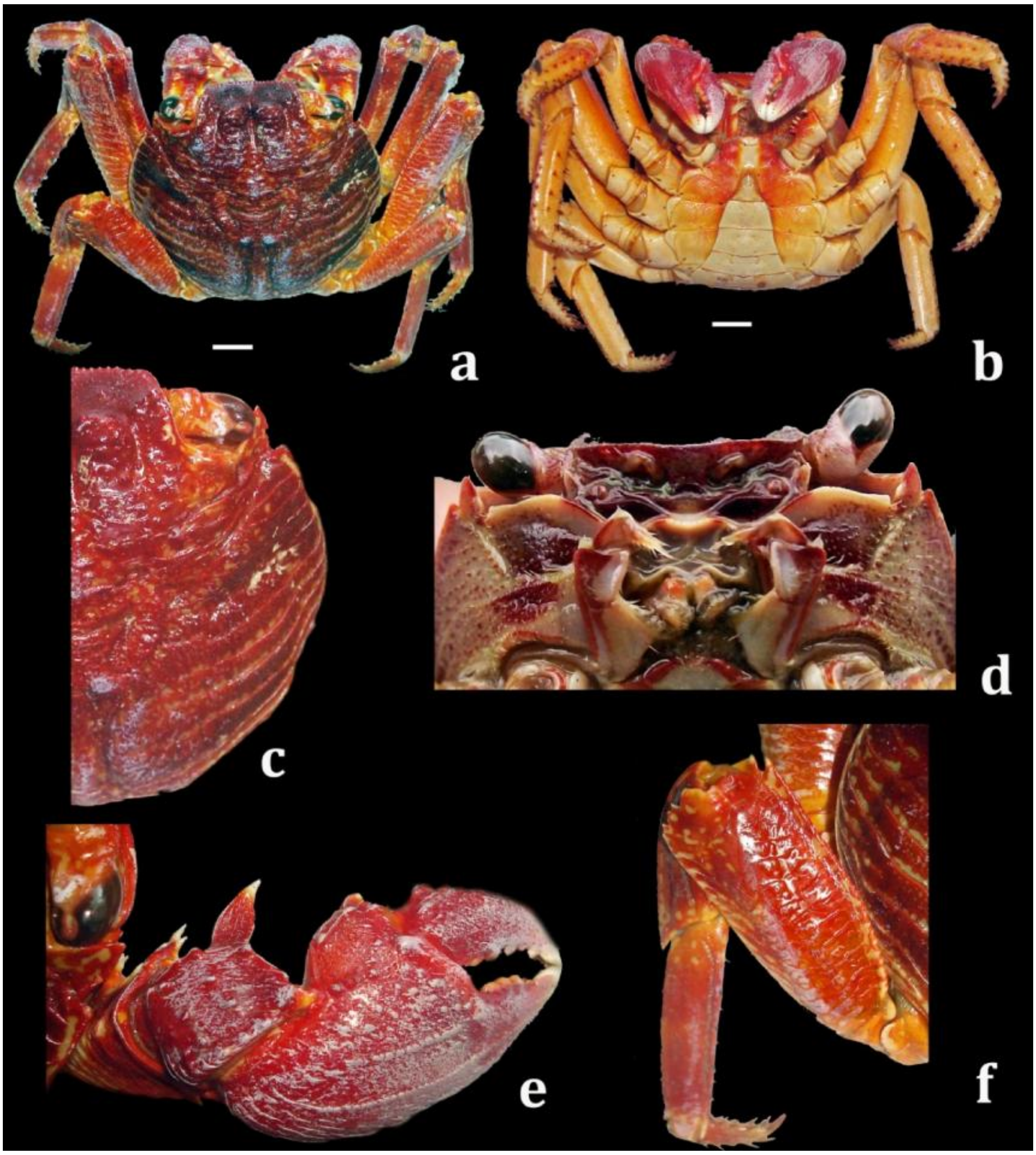


Figure 55: *Grapsus albolineatus* Latreille, in Milbert, 1812 (a) Dorsal view (b) Ventral view (c) Anterolateral border of carapace (d) Frontal view (e) Cheliped outer surface (f) Periopod merus.(Bar represents 1cm).

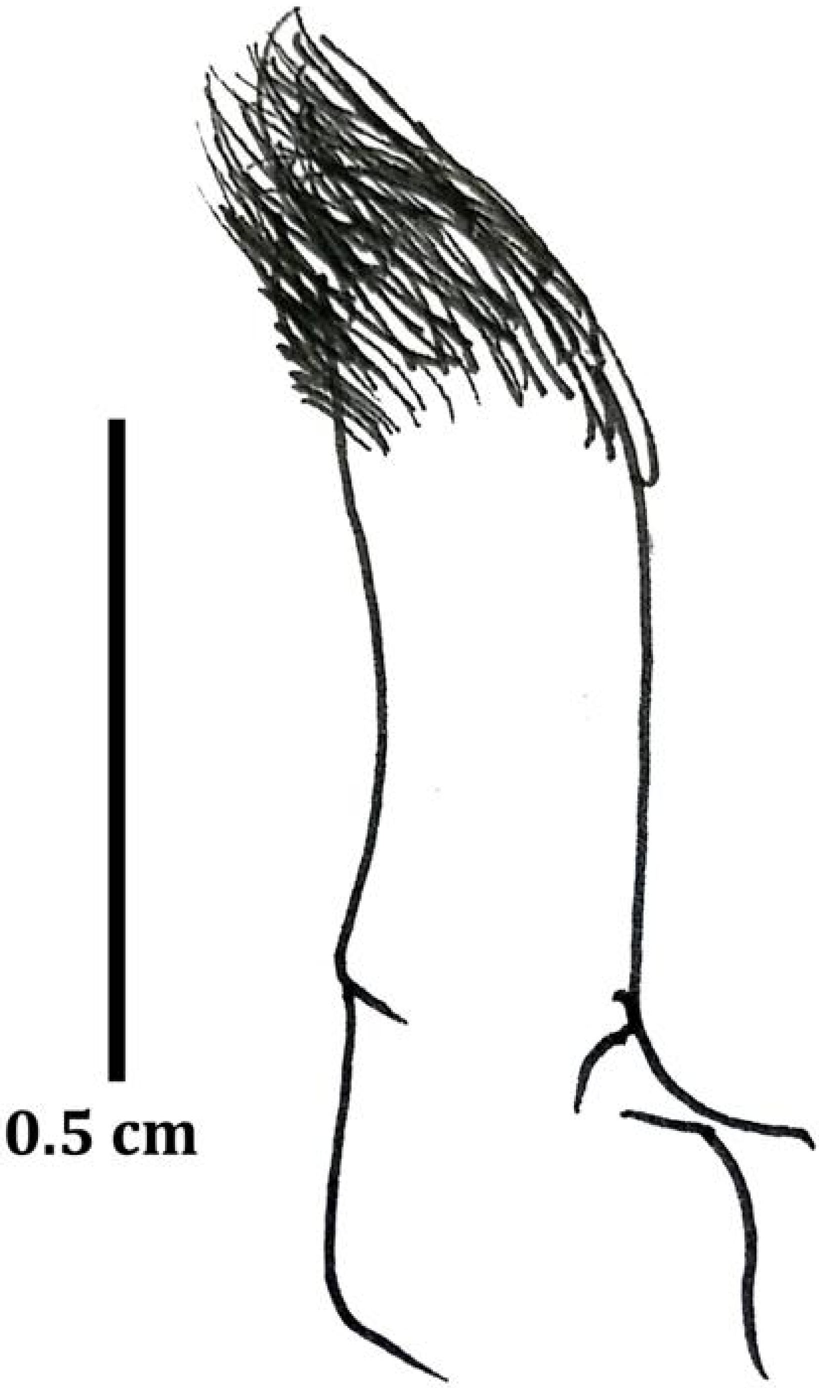


Figure 56: Male 1st left gonopod: *Grapsus albolineatus* Latreille, in Milbert, 1812.

### Subfamily PlagusiinaeDana, 1851

**Description-** Carapace sub circular, sometimes disk-like, front cut into lobes or teeth by the antennular fossae, visible in dorsal view as deep clefts, Lower border of the orbit curving down into line with the prominent anterior border of the buccal cavern; antennal flagellum short; third maxillipeds not completely closing the buccal cavern, but not leaving a rhomboidal gap, and without a hairy crest; exopodite slender and exposed, without flagellum; merus without an oblique hairy ridge; palp articulating near the antero-external angle of the merus; male abdomen covering the whole space between the last pair of legs.

### Genus *Plagusia* Latreille, 1804

**Description-** Carapace sub circular, depressed, antero-lateral margins toothed; no true front, so that the antennular fossae are visible in a dorsal view as deep clefts in the anterior border of the carapace, inter antennular septum broad; buccal cavern squarish, its anterior border crenate and projecting strongly in a horizontal direction; third maxillipeds not completely closing the buccal cavern, but not leaving a rhomboidal gap; chelipeds sub equal, dorsally rugose; fingers stout, with rounded, hollowed-out tips; ambulatory legs very stout, dorsally rugose, with broad massive meri and short serrated dactyli.

**21. *Plagusia squamosa* (Herbst, 1790) (Fig. 57a, b)**

**Synonyms**

*Cancer squamosa* Herbst 1790

*Plagusia depressa var. squamosa* Alcock, 1900, 69(2), p. 437.

*Plagusia depressa tuebrculata* Chhapagar 1957, 61. Sakai 1976. Jayabaskaran and Ajmal Khan 2000.P. 86.Laurie, 1906: 430. Rathbun, 1918a: 334, pl.102. Parisi, 1918: 112. Tesch, 1918a: 129. Sakai, 1976a: 676.

*Plagusia depressa* var. *tuberculata* Barnard, 1950: 134, fig. 26g-h.

*Plagusia squamosa* Ng et al., 2001, p. 47.

**Material Examined-** Total 1 female specimens was collected from Sutrapada.

1 male (CL: 32.12 mm; CW: 34.49 mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 49**

**Description-** Carapace circular in shape, all the regions of the carapace distinct,the surface is covered with flat pearly or squamiform tubercles which are fringed anteriorly with little close-set bristles of uniform length (Fig. 57a), absence of true front, so that the antennular fossae are visible in a dorsal view as deep clefts, pile of oblong tubercles present behind the cardiac region, large congregation of big sized tubercles present on the central part of the gastric region, anterolateral border cut into four teeth including postorbital angle (Fig. 57c), second tooth large as compared to third and fourth tooth, third maxillipeds not leaving rhomboidal gape, inner border of third maxillipeds covered with brown coloured seate, ischium of third maxillipeds 2.5 times longer than merus, merus of third maxillipeds rounded in shape.

Chelipeds almost equal in shape, massive in size, upper surface of palm and carpus ridged and granulated, setae present on the inner border of merus, carpus and palm of the chelipeds, one spine on the inner border of merus and carpus; finger arranged in longitudinal; merus of ambulatory legs with one spine (Fig. 57f), with two fringes of hair on upper surface; coxa of ambulatory legs with lobe entire (Fig. 57d); abdomen seven segmented (Fig. 57e). The fresh specimen of the species is greenish in colour with brown coloured spots.

**Distribution-** The species has wide spread distribution ranging from South Africa to Australia. The species is so far reported from South Africa, Mauritius, Japan, Taiwan, China, Indonesia, Australia (Ng et al., 2008; Boxshall et al., 2015).

In India, the species is reported from Bay of Bengal and Arabian Sea, Gujarat and Tamilnadu (Alcock, 1898; Chhapgar, 1957a, b; Sethuramlingam and Khan, 1991).

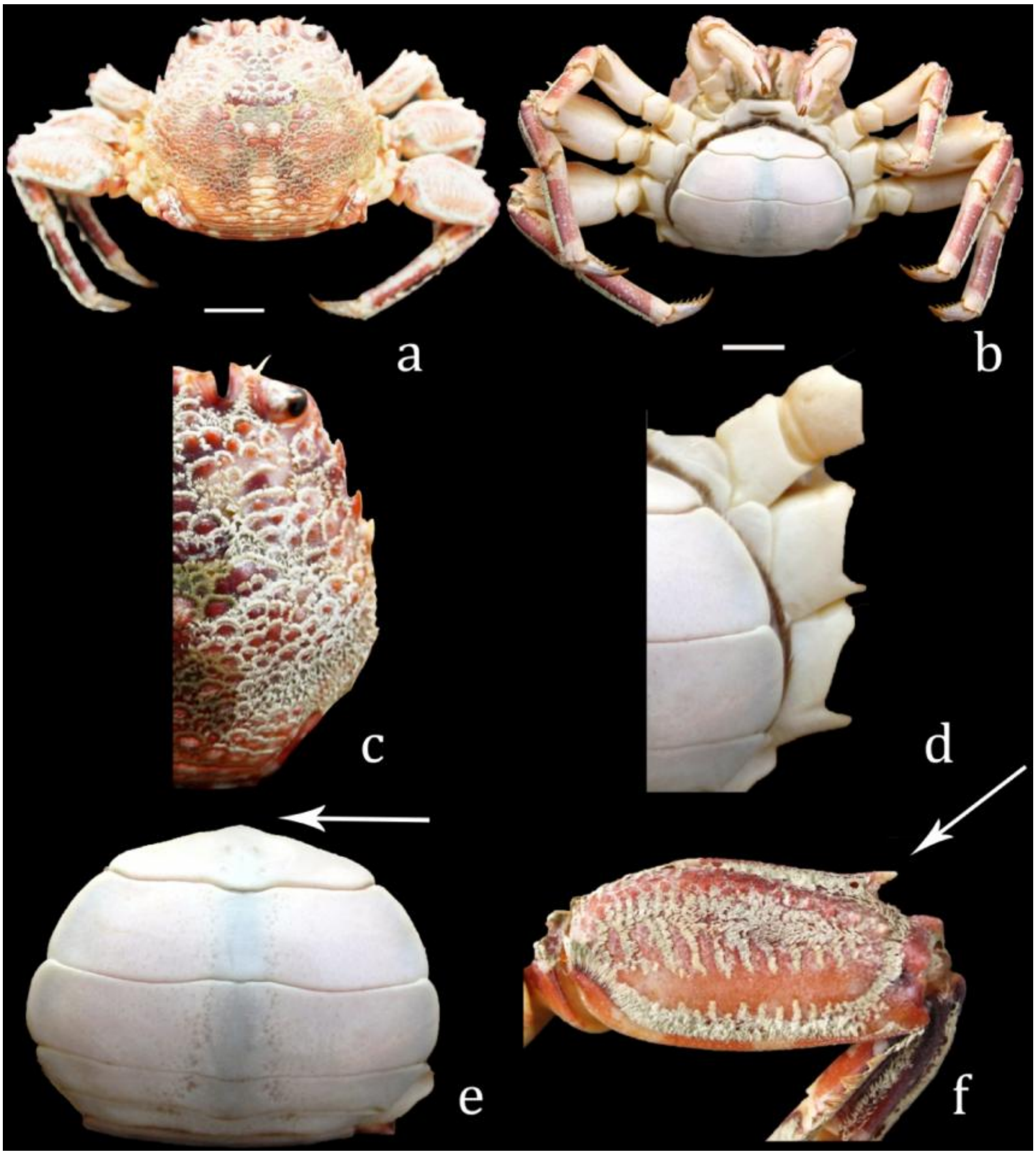


Figure 57: *Plagusia squamosa* (Herbst, 1790) **Female Specimen** (a) Dorsal view (b) Ventral View (c) Anterolateral border of carapace (d) Coxa of periopods (e) Abdomen (f) Spine on merus of periopod.(Bar represents 1cm).

## Family Pilumnidae Samouelle, 1819

**Description-** The abdomen of the male is divided into 6 or 7 segments; in males, the length of the second pleopod never exceeds that of the first; usually the second pleopod is very short but can sometimes extend beyond half of the length of the first; the abdomen is elongated and narrow, covering most of sternite 4 and with a locking mechanism; the genital openings are coxal or coxo- sternal.

### Subfamily Pilumninae Samouelle, 1819

**Description-** Carapace hexagonal, transversely ovate to transversely rectangular; dorsal surface more or less convex, smooth to granulated or spinose; antero-lateral margins with several spines or teeth; frontal margin entire to bilobed and quadrilobate; crests of endostome defining efferent canals incomplete; thoracic sternum narrow or not very widened; all male abdominal segments distinct, movable; male first gonopod generally slender, usually curved and S-shaped, with its distal part simple.

### Genus *Pilumnus* Leach, 1815

**Description-** Usually entire body set with hairs, dorsal surface of the carapace moderately convex, with the regions more or less defined; antero-lateral margins with sharp spines behind exorbital angles; postero-lateral margins distinctly concave; front bilobed, exceptionally entire; pre-orbital tooth distinct; chelipeds unequal, hairy; outer surface of palm often with several rows of spines; fingers pointed; thoracic sternum rather narrow; male abdomen narrow and slender.

### 22. *Pilumnus vespertilio* (Fabrius, 1793) (Fig. 58a, b)

**Synonyms**

*Cancer vespertilio* Fabricius, 1793: 463.

*Pilumnus vespertilio* Milne Edwards H., 1834: 418; Richters, 1880: 148; Miers, 1880a: 234; Haswell, 1882c: 65; de Man, 1887b: 58; Alcock, 1898: 192; Lanchester, 1902: 541; Nobili, 1906b: 274; Rathbun, 1906: 862; Stimpson, 1907: 65; Balss, 1924a: 11; Sakai, 1934a: 307; Barnard, 1950: 263, fig. 49a-b;Chhapgar, 1957b: 36, pl. 10 j-l; Guinot, 1958: 278; Miyake, 1983: 134, pl. 45, fig. 4; Dai and Yang, 1991: 364, fig. 176(3), pl. 49(1).

*Pilumnus ursulus* Adams and White, 1848: 45, pl. 9, fig. 6.

*Pilumnus mus* Dana, 1852c: 240.

*Actaea dentata* Edmondson, 1935: 29, fig. 9, pl. 1B.

**Material examined-** Total 15 specimens were collected in which 10 specimens were males and 5 were females. (Veraval: 2 male and 1 female; Sutrapada: 3 male and 2 female; Dhamlej:1 male and 2 female; Kodinar: 4 male).

1 male (CL: 19.04 mm; CW: 27.04 mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 50**

**Description-** Carapace about 1.4 times as broad as long, convex in the anterior half and depressed in the posterior half; surface thickly covered with dark brown setae of various lengths (Fig. 58a), those near the margins being longer; regions well demarcated on denudation, each region covered with a patch of granules, interspersed with short setae between the regions, front deflected, front length less than one-third the breadth of the carapace, cut into two lobs by a median notch, each lobe with distinct and prominent extero-lateral angle; orbits small, two notches of its dorsal margin; antero lateral margins slightly shorterthan the postero-lateral margins; postero lateral margin straight and more or less forming a facet; antero lateral margin armed with three teeth excluding the outer orbital tooth (Fig. 58c); the first one triangular, the second one sharper and the third one sharper.

Chelipeds asymmetrical and covered with long setae (Fig. 58d); merus covered with granules and short pubescence on the outer surface; carpus sharp at the inner-distal angle; palm without hair but bearing beaded granules in the lower half of the outer surface; fingers black with irregular obtuse teeth along the cutting age; ambulatory legs depressed and covered with long setae, dactylus with a cuticular claw; male abdomen 7 segmented, telson bluntly triangular (Fig. 58b); male first left gonopod of the male slender and long, arched ventrally in the middle; apical lobe hooked shaped, inner margin and lateral margin of apical lobe covered with long setae; tuft of long setae also present on the dorsal surface of apical lobe (Fig. 60a, b).

**Distribution-** The species has wide spread distribution ranging from Red Sea to Fiji. The species is so far reported from Red Sea, Tanzania, Mauritius, Mergui Archipelago, Malay Peninsula, Japan, Taiwan, China, Gulf of Thailand, Singapore, Philippines, Indonesia, New Guinea, Australia, New Caledonia, Fiji (Ng et al., 2008; Boxshall et al., 2015).

In India, the species is commonly observed on both east and west coasts. The species is reported from Gujarat, Maharashtra, Rameswaram and Tuticorin, Gulf of Mannar, Palk Strait, Maldives, Andaman Islands (Alcock, 1898; Chhapgar, 1957a, b; Sankarankutty, 1962).

### 23. *Pilumnus longicornis* Hilgendorf, 1879 (Fig. 59a, b)

**Synonyms**

*Pilumnus longicornis* Hilgendorf, 1879: 794, pl. 1, figs 8-9; Chopra and Das, 1937: 406, pl. 6, fig. 3;Sakai, 1939: 533, pl. 100, fig. 3; Chhapgar, 1957b: 37, pl. 10;Takeda, 1989: 167.

*Pilumnus andersoni* de Man, 1887b: 59, pl. 3, figs 5-6.

**Material Examined-**Total 5 specimens were collected in which 2 specimens were males and 3 specimens were females. (Sutrapada: 1 male and 1 female; Kodinar: 1 maleand 2 female).

1 male (CL: 15.56 mm; CW: 21.44 mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 51**

**Description-** Dorsal part of animal body covered with long flexible hair; the outline of carapace and appendages not covered by hair, carapace regions weakly defined; surface of epibranchial region covered by very fine granules (Fig. 59a); front narrow and bilobed; frontal lobes well convex and median frontal sinus deep and v shaped; orbital border finely denticulate; the antero lateral border armed with four acuminate spine including external orbital spine (Fig. 59c); the first one smaller with some additional spines below it.

Chelipeds unequal in shape; palm of the major cheliped tuberculated only on superior surface and on the proximal part of the outer surface (Fig. 59d); rest of the surface smooth and glabrous; palm of minor cheliped covered with erected tubercles arranged in longitudinal series; ambulatory legs long and slender in shape; spinule present on the distal end of anterior border of merus; male first left gonopod long, slender and curved; gets narrow towards tip; apical lobe curved and forms hook shaped tip; long setae present on the inner border of the apical lobe; outer surface with few short setae; tip of the apical lobe with hook shaped lip (Fig. 60c, d). The species is small in appearance with golden coloured setae. The density and amount of setae on the carapace is less as compared to other sympatric species *P. vespertilio.*

**Distribution-**The species has wide spread distribution ranging from Mozambique to Australia. The species is reported from Mozambique, South Africa, Madagascar, Persian Gulf, Pakistan, Sri Lanka, Sumatra, Japan, Korea, Taiwan, Gulf of Thailand, Singapore, Philippines, Indonesia and Australia (Ng et al., 2008; Boxshall et al., 2015).

In India, the species is reported from both west and east coasts. The species is so far reported from Maharashtra, Gujarat, Kerala, Karnataka, Tamilnadu, Gulf of Mannar and Nicobar Islands (Alcock, 1898; Chhapgar, 1957a, b; Sethuramlingam and Khan, 1991; Jeyabaskaran et al., 2002; DevRoy, 2013).

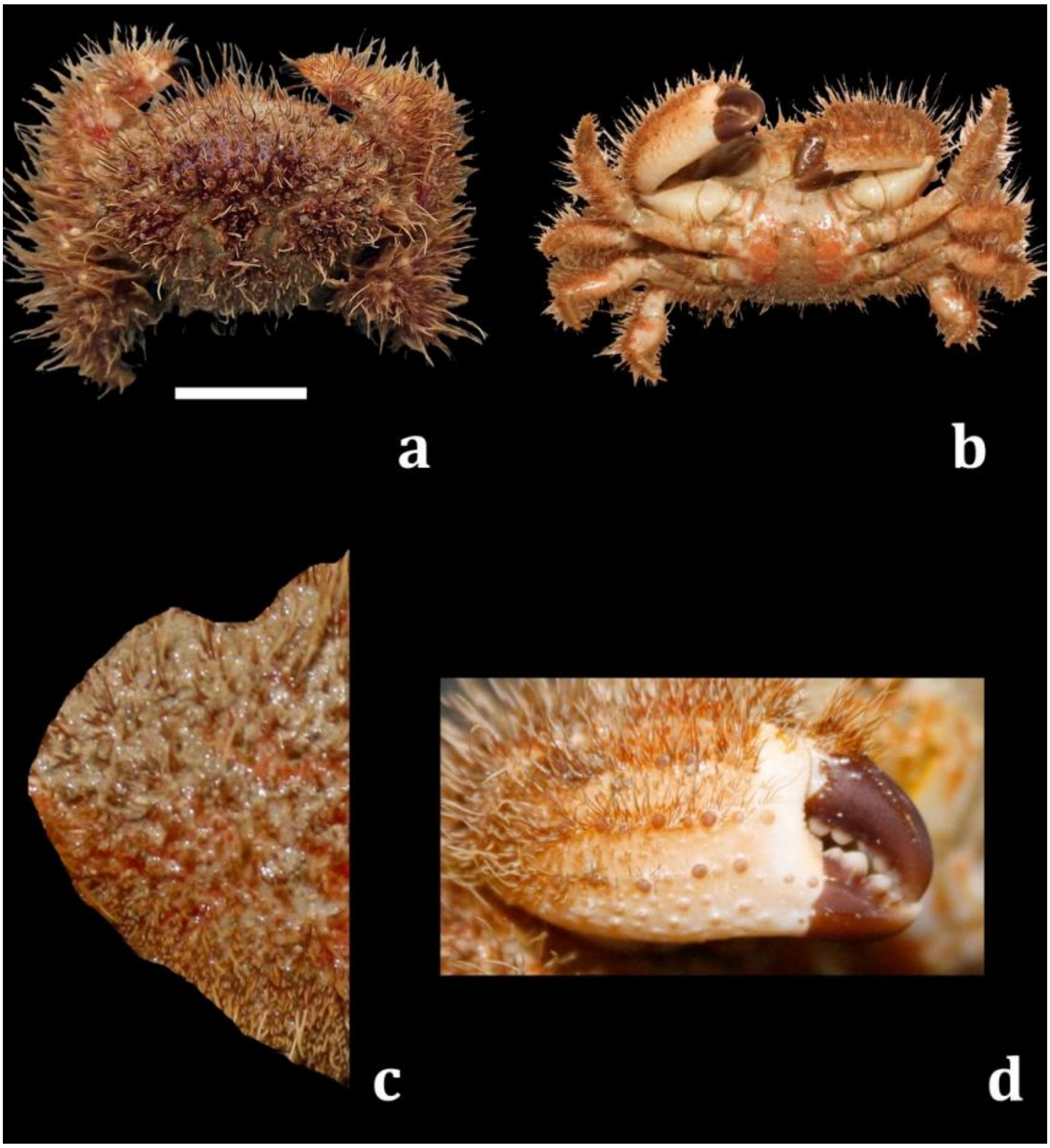


Figure 58: *Pilumnus vespertilio* (Fabrius, 1793)(a) Dorsal view (b) Ventral view (c) Anterolateral border of carapace (d) Chelipeds.(Bar represents 1cm).

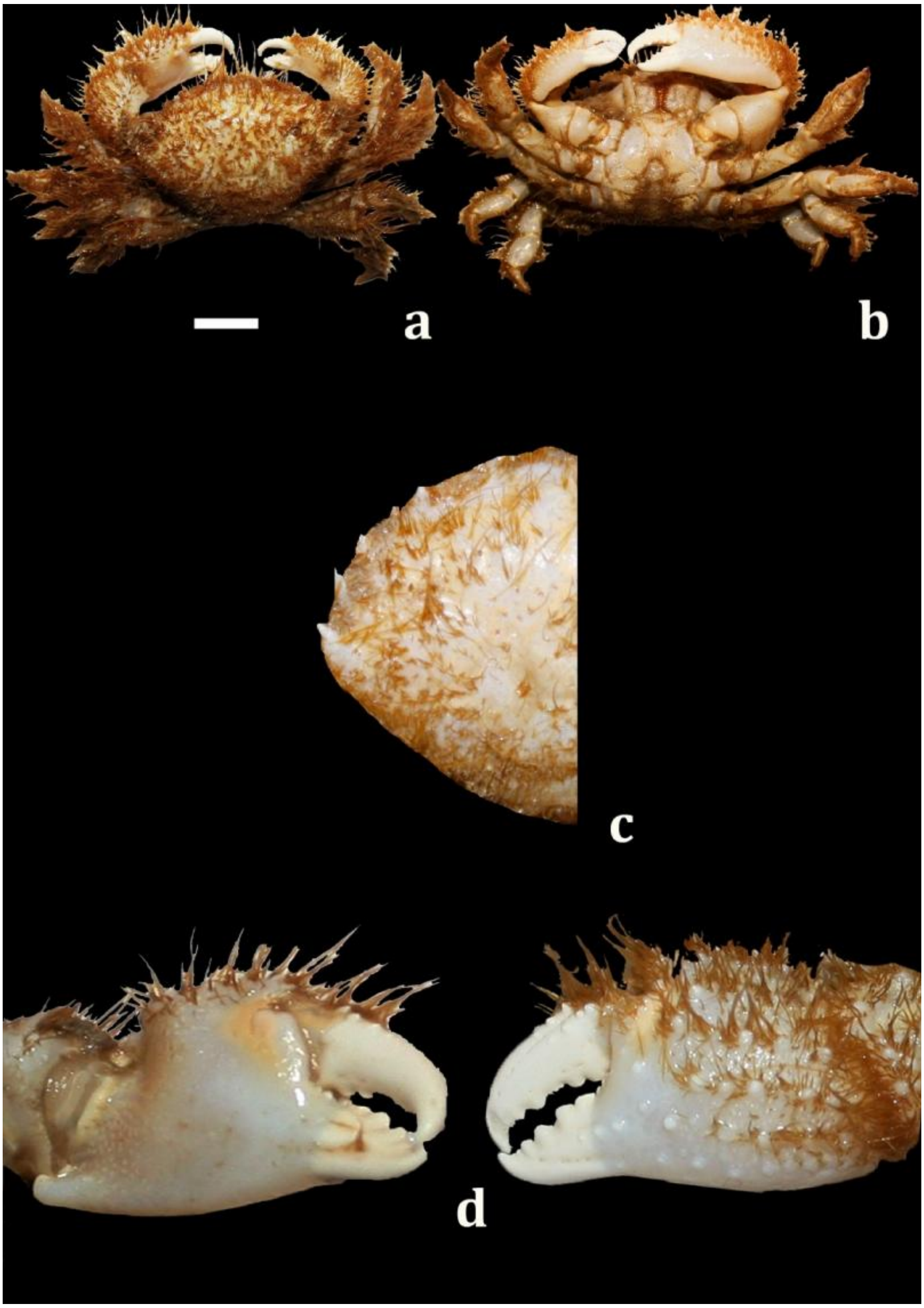


Figure 59: *Pilumnus longicornis* Hilgendorf, 1879(a) Dorsal view (b) Ventral view (c) Anterolateral border of carapace (d) Chelipeds.(Bar represents 1cm).

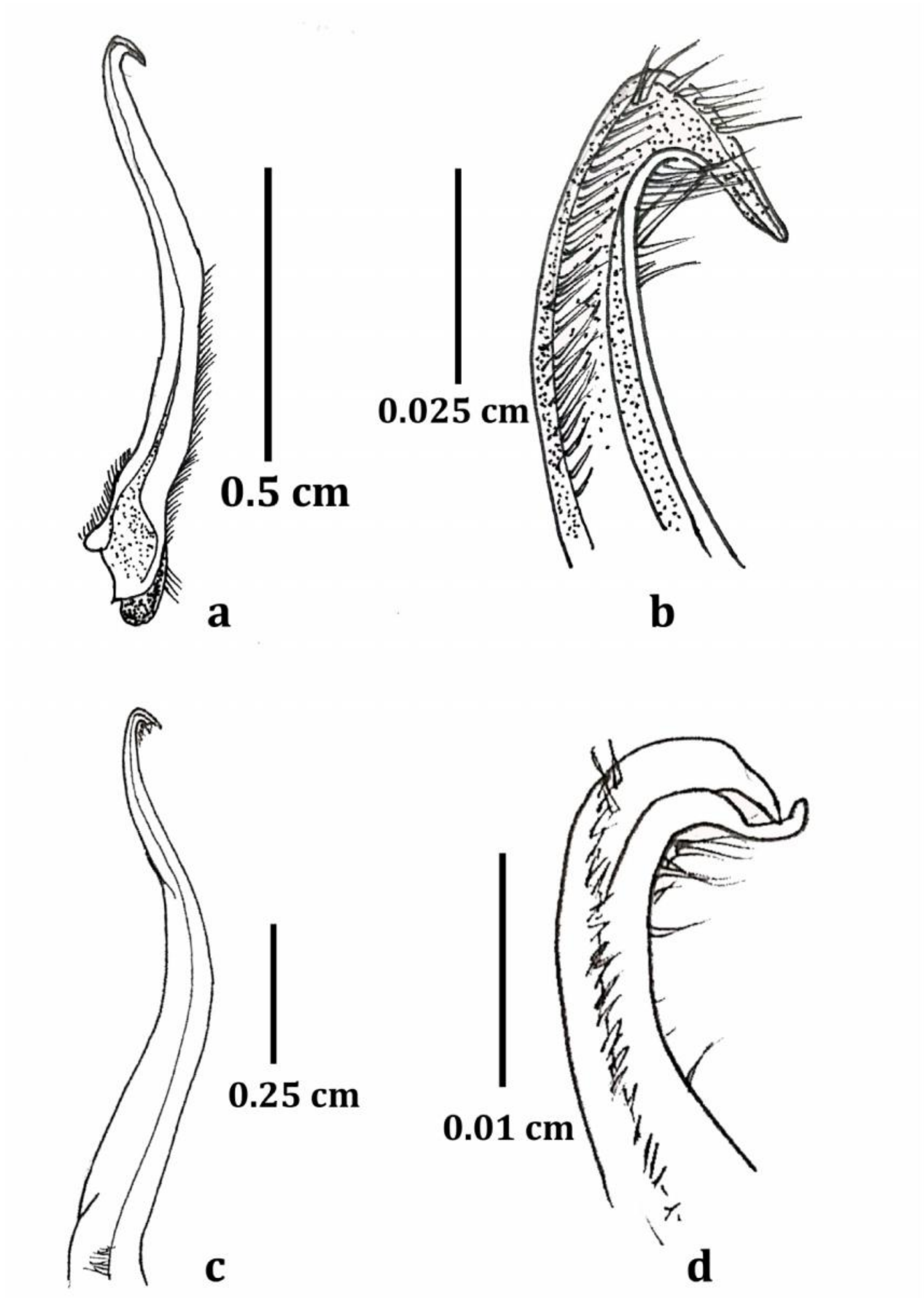


Figure 60: Male 1st left gonopod: *Pilumnus vespertilio* (Fabrius, 1793). (a) Entire gonopod, (b) Apical lobe: *Pilumnus longicornis* Hilgendorf, 1879, (c) Entire gonopod, (d) Apical lobe.

## Family Ocypodidae Rafinesque, 1815

**Description-** Carapace quadrangular; lateral margins unarmed; front usually of no great breadth, being often a narrow lobe more or less deflexed; orbits broad, occupying the whole anterior margin of the carapace outside the front; their outer wall often defective; inter antennular septum generally broad, sometimes as a thin plate; eyestalks long; buccal cavern usually large and a little narrower anteriorly; third maxillipeds foliaceous and usually completely closing the buccal cavern, sometimes leaving a gap but never rhomboidal; exopodite generally slender and often more or less concealed; palp coarse, articulating at or near the antero-external angle of the merus.; male abdomen narrow, with all segments usually distinct; ventral surface of abdomen or bases of ambulatory legs often with tufts of fine setae.

### Subfamily Ocypodinae Rafinesque, 1815

**Description-** Carapace sub quadrilateral, deep; dorsal surface with the regions seldom well defined; antero-lateral margins either straight or slightly arched; front narrow, deflexed; commonly a mere lobe along the long eyestalk; inter antennular septum broad; antennular flagellum small or rudimentary, folding obliquely or almost vertically; third maxillipeds completely closing the buccal cavern; exopodite inconspicuous but not, or not entirely, concealed, and with or without flagellum; chelipeds remarkably unequal either in both sexes or in the male only.

### Genus *Ocypode* Weber, 1795

**Description-** Carapace not very much broadened anteriorly; antennalarly flagellum rudimentary; eyestalks robust, the cornea occupying not less than one fourth to one fifth of total eyestalk length; chelipeds heterochelous in both sexes, small cheliped more robust than any of the ambulatory legs and clearly larger than third maxillipeds, large chela usually oval, and with a stridulating ridge on inner face of palm, missing in only one species.

**24.** ***Ocypode ceratophthalma*** **(Pallas, 1772) (Fig. 61a, b)**

**Synonyms**

*Cancer ceratophthalmus* Pallas, 1772: 83, pl. 5, fig. 17.

*Ocypode (Ocypode) ceratophthalmus* de Haan, 1833-1839 (1835): pl. C.

*Ocypoda ceratophthalma* Milne Edwards H., 1837: 48; Haswell, 1882c: 94. Miers, 1886: 238;de Man, 1888d: 351; Ortmann, 1897b: 364;Alcock, 1900b: 345; Nobili, 1905c: 494; Chopra & Das, 1937: 418, fig. 17a-a'; Sakai, 1939: 614, fig. 91a, pl. 104, fig. 5;Chhapgar, 1957b: 44, pl. B, fig. 1, pl. 13 a-c.

*Ocypode ceratophthalma* Milne Edwards H., 1837: pl. 17, figs 1, 1a-n;Kossmann, 1877: 55;Ortmann, 1894b: 60; Lanchester, 1902: 548; Rathbun, 1902b: 123. Miyake, 1983: 158, pl. 53, fig. 5; Wada, 1995: 413, pl. 117, fig. 1. 1149, fig

*Ocypode urvillei* Guérin-Méneville, 1829-1844 (1829): pl. 1, fig. 1

*Ocypoda Urvillii* Dana, 1852c: 328.

*Ocypoda macleayana* Hess, 1865: 143, pl. 6, fig. 8.

*Ocypoda urvillei* Bouvier, 1915b: 299.

*Ocypode ceratophthalmus* Barnard, 1950: 86, fig. 17c-d; Michel, 1964: 11;Dai et al., 1986.

**Material examined-** Total 20 specimens were collected in which 15 specimens were males and 5 were females. (Veraval: 2 male and 1 female; Sutrapada: 4 male and 2 female; Dhamlej: 2 males; Kodinar: 7 male and 2 female).

1 male (CL: 17.08 mm; CW: 22.46 mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 35**

**Description:** Carapace squarish, broader than long (Fig. 61a), anterior corners flattened, front between the eyes narrow (Fig. 61d), bent down; eyestalks large, elongated, prolonged beyond the cornea in a slender style, antennules attached below the eyes, each antennule consists of a 3-segmented peduncle, the coxopodite and a 2-segmented basiopodite, distal segment of basiopodite bears whip-like flagella; anterolateral border with strong exo orbital angle (Fig. 61c); third maxilliped pediform, basis large and distinct with ischium by a line and then distinct into merus, carpus, propodus and then dactylus, all segments fringed with setae, exopodite long, slender and unsegmented; granules present on third maxilliped, which have taxonomic importance.

Chelipeds stout somewhat unequal, rough; fingers with truncate ends, stridulating ridge on inner surface of palm of major chela composed of about 13-16 distant striae in upper half and 20-30 close set ones in lower half (Fig. 61e), small chela with both fingers pointed; abdomen somewhat slender, broad with 6 somites; ambulatory pereiopods third and fourth (long finely roughened. Gonopod of female slender; Male first pleopod slender, its distal part clearly bent laterally, palp with long and slender tip, its distance to pleopod tip slightly more than palp length (Fig. 62a, b). The fresh specimen of the species is cream to off white in colour with two brown coloured "," shaped marks on both sides of cardiac region of the carapace.

**Distribution-** The species has wide spread distribution ranging from Red Sea to New Caledonia. The species is so far reported from Red Sea, Somalia, Tanzania, South Africa,Mauritius, Sumatra, Japan,Taiwan,China,Philippines, Indonesia, Australiaand New Caledonia (Ng et al., 2008; Boxshall et al., 2015).

In India, the species is commonly observed on both west and coasts. The species is so far reported from Maharastra and Gujarat, Bay of Bengal, Kerala, Karnataka, Tamilnadu, Gulf of Mannar, Andaman Islands and Nicobar Islands (Alcock, 1898; Chhapgar, 1957a, b; Sethuramlingam and Khan, 1991; Jeyabaskaran et al., 2002; DevRoy, 2013).

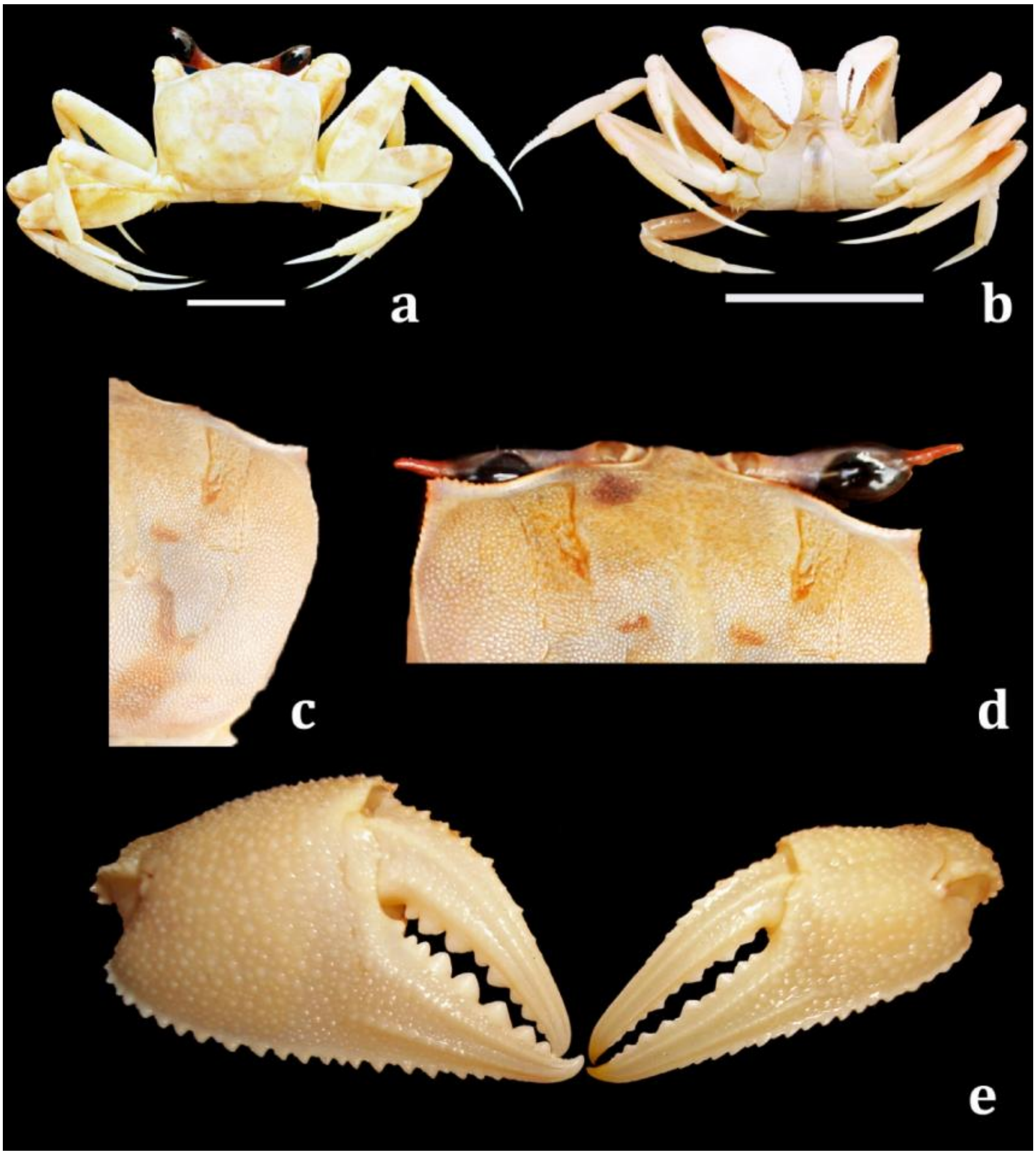


Figure 61: *Ocypode ceratophthalma* (Pallas, 1772). (a) Dorsal view (b) Ventral view (c) Anterolateral border of carapace (d) Frontal margin of carapace (e) Chelipeds.(Bar represents 1cm).

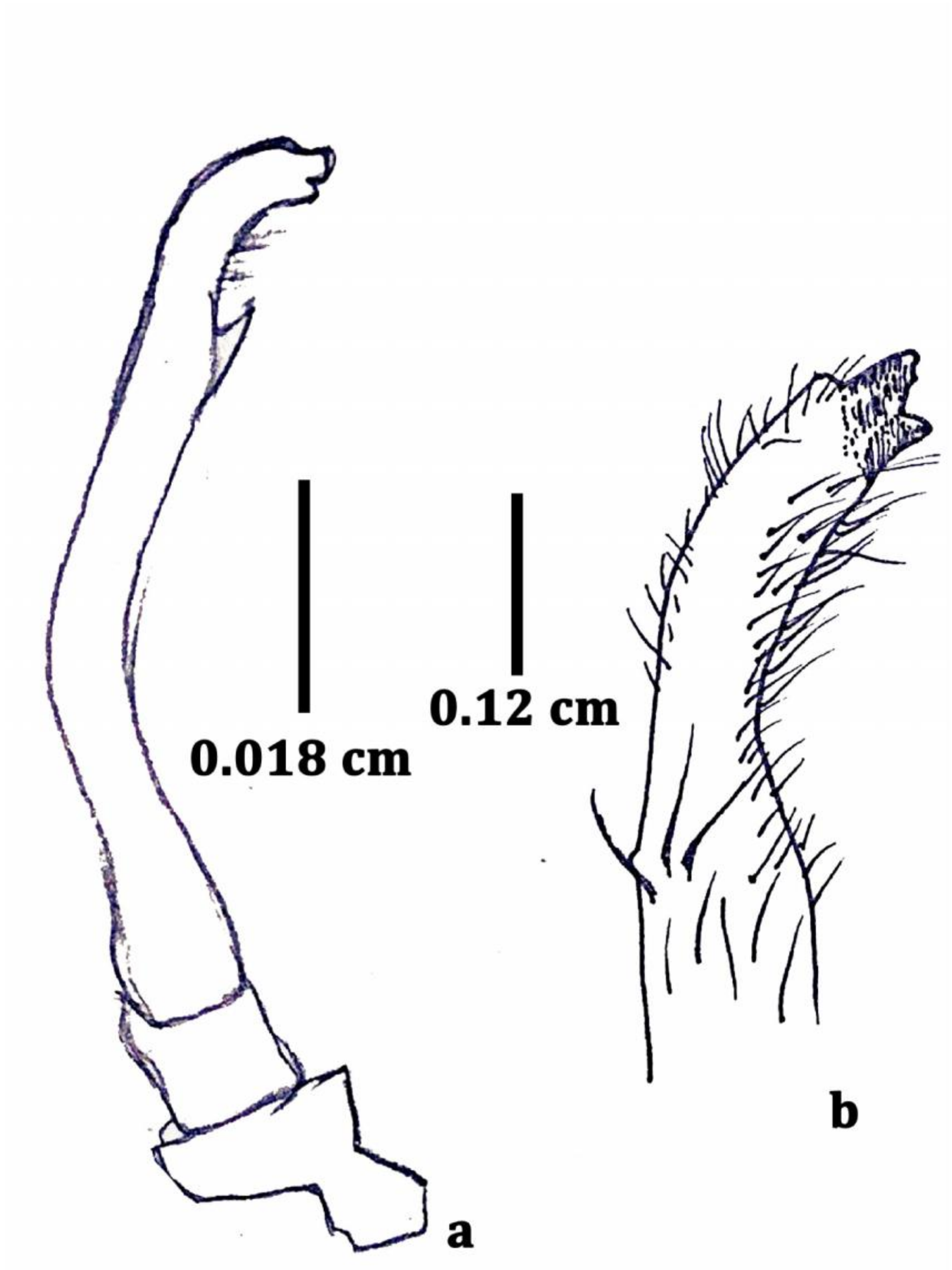


Figure 62: Male 1st left gonopod: *Ocypode ceratophthalma* (Pallas, 1772).(a) Entire gonopod (b) Apical lobe

## Family Matutidae de Haan, 1835

**Description-** Carapace circular; a strong spine at the junction of antero- and postero-lateral margins; front narrow, antennae rudimentary; third maxillipeds elongate and pointed at the tip, completely covering the buccal cavern and completely concealing the palp in repose; exopodite widest proximally, tapering to a point distally; flagellum absent; chelipeds sub equal; walking legs natatorial, third to fourth pair of walking leg with the dactyli more or less lanceolate; fifth pair with the last articles paddle-like; male abdomen with five segments. Male first left gonopod elongate and columnar, distal tip rounded.

### Genus Matuta Weber, 1795

**Description-** Carapace sub circular, bearing six obtuse tubercles centrally, regions undefined; front wider than orbit; lateral spine of carapace much longer than broad; antennular fossae continuous with orbits; chela with a strong mid-palmar ridge (non stridulating), parallel to lower margin; upper margin of palm cut into three teeth; dactylar ridge in male strongly milled Carpus of fourth pereiopod unicarinate; third abdominal segment carinate.

### 25. *Matuta planipes* Fabricius, 1798 (Fig. 63a, b)

**Synonyms**

*Matuta planipes* Fabricius, 1798: 369;Alcock, 1896: 161; Balss, 1922b: 125; Rathbun, 1923a: 138; Sakai, 1935a: 63; Chhapgar, 1957a: 406; Campbell and Stephenson, 1970: 246, fig. 7; Dai et al., 1986: 98, fig. 55(1), pl. 12(4); Dai and Yang, 1991: 109, fig. 55(1), pl. 12(4); Tirmizi and Kazmi, 1991: 64, figs 18E-H.

*Cancer lunaris* (not Rumphius, 1741) Herbst, 1799: 43, pl. 48, fig. 6.

*Matuta victor* (not Fabricius, 1781) Latreille, 1818a: 273, figs 3-4.

*Matuta appendiculata* Bosc, 1830: 222.

*Matuta rubrolineata* Miers, 1877b: 244, pl. 39, figs 5-6.

*Matuta lineifera* Miers, 1877b: 245, pl. 39, fig. 7; Haswell, 1882c: 134.

*Matuta laevidactyla* Miers, 1886: 296; de Man, 1896b: 364.

**Material Examined-** Total 1 male specimens was collected from Sutrapada.

1 male (CL: 36.55 mm; CW: 51.55 mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 48**

**Description-** Carapace circular in shape, surface minutely granular, small tubercles clustering around mid- dorsal tubercles, largest cluster of tubercles around mesogastric tubercle (Fig. 63a), Front with straight horizontal lobers laterally and a slightly emarginated rostrum medially, ischium of third maxilliped tuberculated, Anterolateral margins nearly uniformly crenulated (Fig. 63c), tubercles somewhat larger posteriorly. Lateral spine 0.2 carapace width. Posterolateral margin oblique, with granulate carina extending to base of lateral spine.

Chelipeds almost equal in shape, carpus of cheliped with two obtuse tubercles on outer surface, its upper margin carinate, granulate, internal anterior angle produced. Upper margin of palm cut into three teeth (Fig. 63e), proximal tooth tuberculated (Fig. 63d), uper external surface with two rows of granulate low tubercles, proximal most in lower row largest. mid palm, in male, a rounded ridge extending to tip of lower finger, proximally with granulate tubercle followed by a prominent, acuminate spine, mid palm, in female, five tubercles, second tubercles spine-like, At lower proximal angle of palm a small granulate tubercle, lower margin with row of tubercles terminating at base of dactylus. In female, an additional row of obtuse granules parallel to lower margin. Distinctly milled ridge on outer surface of dactylus in male, absent in female, plastron finely granular; ambulatory legs flattened, propodus of ambulatory legs leaf or paddle shape; male first left gonopod short and stout, apical lobe stout, the dorsal part of the apical lobe covered with long setae except the tip, small spines present on the tip of the apical lobe; ventral part of the apical lobe without setae (Fig. 64a, b). Fresh specimens of the species are yellow in colour with reticulating brown lines forming small rings anteriorly and larger, elongate loops posteriorly.

**Distribution-** The species has wide spread distribution ranging from Persian Gulf to Australia. The species is so far reported from Persian Gulf, Pakistan, Sri

Lanka, Burma, Sumatra, Japan, Korea, Taiwan, Gulf of Thailand, Singapore, South China Sea, Indonesia and Australia (Ng et al., 2008; Boxshall et al., 2015).

In India, the species is commonly observed on both west and coasts. The species is so far reported from Maharastra, Gujarat, Sunderbunds and Gangetic Delta, Mahanaddi Delta, Tamilnadu and Calcutta (Alcock, 1898; Chhapgar, 1957a, b)

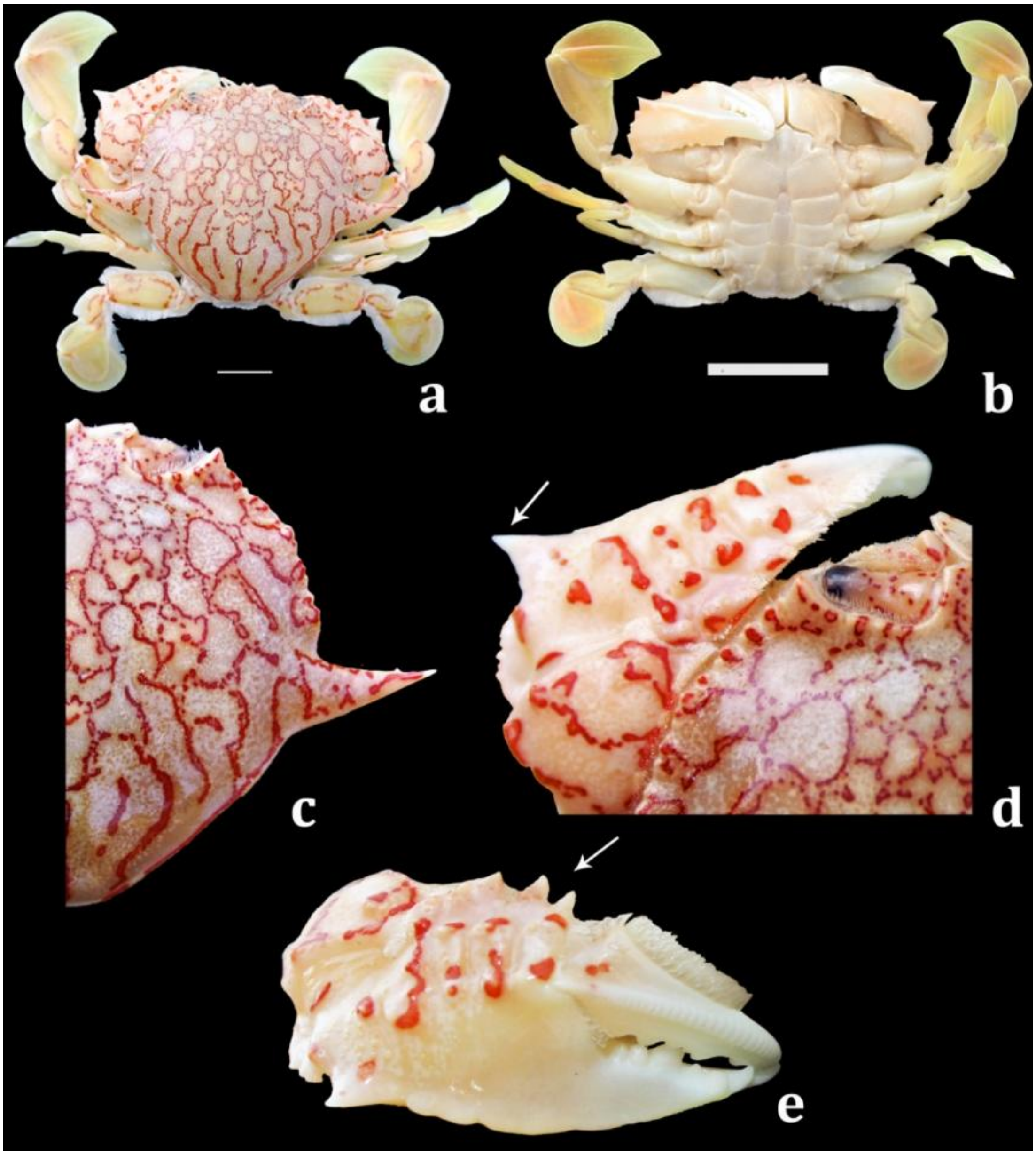


Figure 63: *Matuta planipes* Fabricius, 1798. (a) Dorsal view, (b) Ventral view, (c) Anterolateral border of carapace, (d) Spine on lateral surface of cheliped palm, (e) Spines on upper surface of cheliped palm.(Bar represents 1cm).

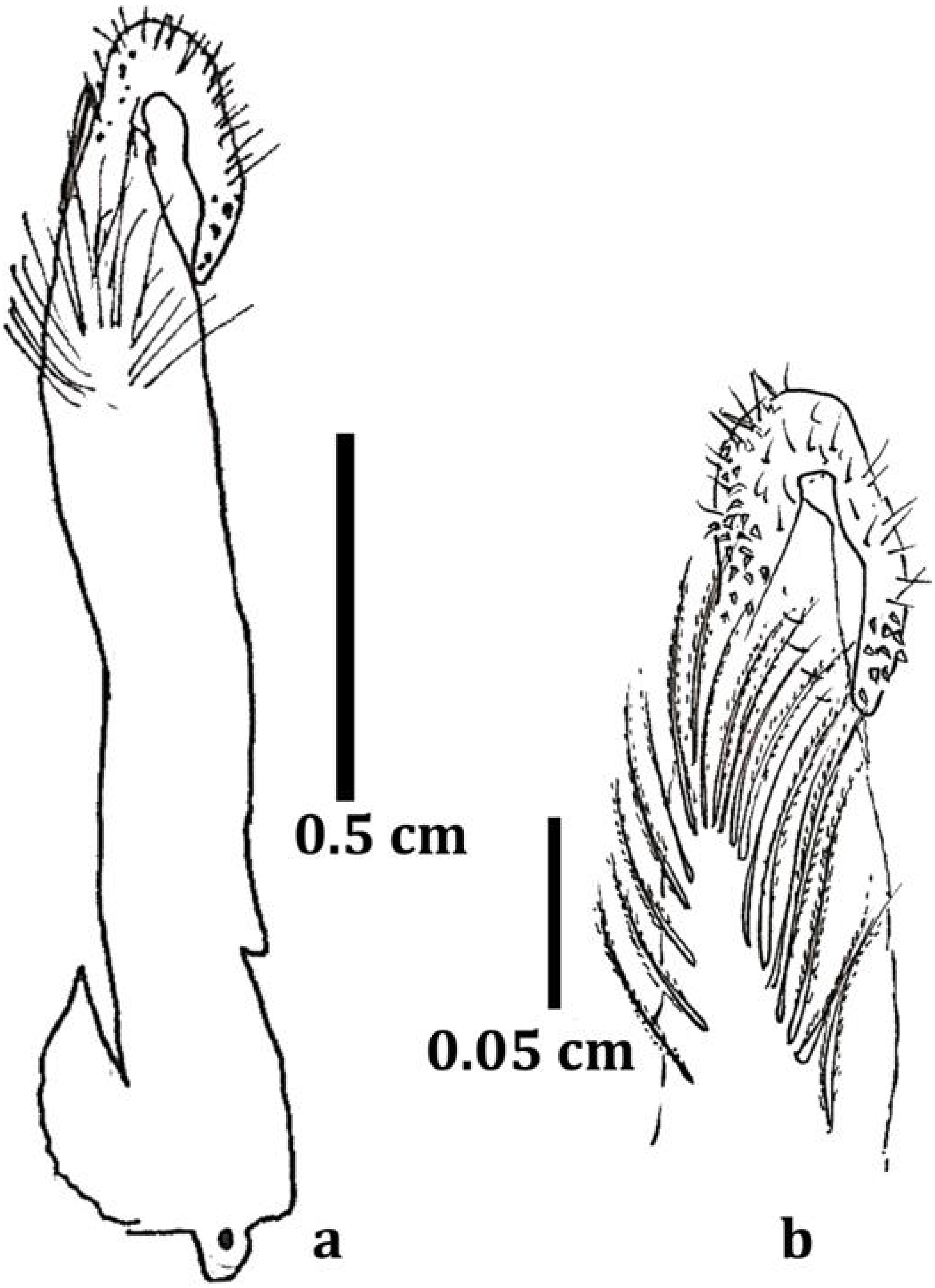


Figure 64: Male 1st gonopod: *Matuta planipes* Fabricius, 1798 (a) Entire gonopod (b) Apical lobe

## Family Majidae Samouelle, 1819

**Description-** Hooked hairs almost always present; orbits generally more or less incomplete; basal article of antennae well developed, generally fused with epistome and often with front; palp of third maxillipeds articulated either at the summit or at the antero-internal angle of merus; chelipeds specially mobile, rarely much greater than the other legs; fingers bent at an angle on the hand; male and female abdomens with all segments distinct or some segments fused; sometimes segment 6 fused to telson, to form a pleotelson.

### Subfamily Majinae Samouelle, 1819

**Description-** Eyes with nearly complete or complete orbits; orbit formed by a supraocular hood, an intercalated spine, and a sharp post ocular tooth; basal antennal article very broad but not specially expanded to form a floor to the orbit, and usually armed at both anterior angles with a strong spine; male abdomen with all segments distinct in both sexes and nearly uniform in width rather than triangular; male first left gonopod slender, weakly curved, aperture sub terminal and usually protected by lobes or flaps, apex usually slender and simple.

### Genus *Schizophrys* White, 1848

**Description-** Carapace nearly orbicular-triangular.Dorsal surface generally with granules and spinules. Lateral margins armed with strong spine; rostral spines with one or two lateral accessory spines; post ocular spine marked with an accessory spinule; eyestalks short and stout; cornea rounded and terminal; no pre ocular spine but posterior angle of supraocular eave produced into a stout spine; antennae flagellum shut out from within the orbit; chelipeds long and robust; merus and carpus spinose or tuberculate; chela long and heavy, smooth except some proximal tubercles; fingers gaping and with tips hollowed; male first left gonopod slender, curved outwards distally, with a simple sub terminal opening.

**26.** ***Schizophrys aspera*** **(H. Milne Edwards, 1834) (Fig. 65a, b)**

**Synonyms**

*Mithrax asper* Milne Edwards H., 1834: 320; Dana, 1852c: 97.

*Maja (Mithrax) dichotoma* de Haan, 1833-1849 (1837): pl. 22, fig. 4.

*Maja (Dione) affinis* de Haan, 1833-1849 (1839): 94, pl. G.

*Mithrax spinifrons* Milne Edwards A., 1867: 263.

*Schizophrys aspera* Milne Edwards A., 1872: 231, pl. 10, fig. 1, 1a-f;Haswell, 1882c: 22;Miers, 1886: 67; de Man, 1887b: 20;Alcock, 1895a: 243;Lanchester, 1902: 535;Rathbun, 1924c: 6; Sakai, 1935a: 66;Barnard, 1950: 60, fig. 13b;Chhapgar, 1957b: 15, pl. 4 d-f; Sankarankutty, 1962b: 159, figs 15-1;Dai and Yang, 1991: 152, fig 77(5), pl. 18(5);Tirmizi and Kazmi, 1991: 175, figs 54-56;Ng, 1998c: 1136(key), 1137, fig.

*Mithrax (Schizophrys) affinis* Kossmann, 1877: 11, 13.

*Mithrax (Schizophrys) triangularis* Kossmann, 1877: 11, 13.

*Dione affinis* Stimpson, 1907: 18.

**Material Examined-**Total 2 male specimens were collected from Sutrapada.
1 male (CL: 72.31 mm; CW: 48.32 mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 53**

**Description-**Carapace is pyriform in shape (Fig. 65a), the surface of the carapace not very convex and densely covered with granules with scattered distributed sharp tubercles; true rostrum moderetly prominent with pseudo rostral spines parallel or slightly incovered at tip, pseudo rostral spines also bears a large accessory spine near the base on the outer border, the intercalated spine triangular in shape, post ocular spine prominent with a large accessory spine on the superior border; behind the post ocular tooth (Fig. 65d), antero lateral border with six equidistant spine (Fig. 65c), one spine present in the hepatic region and others present in the branchial region; two posterior spines small and last one deviated on the dorsal surface; subhepatic and epimeral regions with scattred and sharp spinules; pterygostomial region with coarse granules; the basal segment of antenna is armed with two terminal spines, both spine visible in the dorsal view on the either side of the pseudodorsal spines, infraorbital tooth small but acuminate.

Chelipeds long and slender; palm longer than merus; the merus and carpus covered with sharp prominent spines; palm smooth and unarmed except one or two spines near the base of the upper border; the fingers of male chelipeds with wide gape; tips hollowed; movable finger with large tooth near base (Fig. 65f). Ambulatory legs long and densely covered with tomentum, merus with small terminal tooth on the upper border (Fig. 65e); abdomen of both male and female with seven distinct segments (Fig. 65b). Male left first gonopod long and slender with curved apical lobe; the inner border of the gonopod covered with short setae while long setae present near the base of the curvature of apical lobe; apical lobe curved and appears like twisted knot; the tip of the apical lobe blunt and covered with short setae, apical lobe swollen medially (Fig. 66a, b).The fresh specimens of the species are bright red to orange in colour while preserved specimens are light pink to off white in colour.

**Distribution-**The species has wide spread distribution ranging from Red sea to Australia. The species is reported fromRedSea, South Africa, Mauritius, Pakistan, Sri Lanka, Burma, Malaysia, Japan, Taiwan, China, Singapore, Philippines and Australia(Ng et al., 2008; Boxshall et al., 2015).

In India, the species is reported from both west and east coasts. The species is so far reported from Maharastra, Gujarat, Kerala, Karnataka, Tamilnadu, Gulf of Mannar and Nicobar Islands (Alcock, 1898; Chhapgar, 1957a, b; Sethuramlingam and Khan, 1991; Jeyabaskaran et al., 2002;DevRoy, 2013).

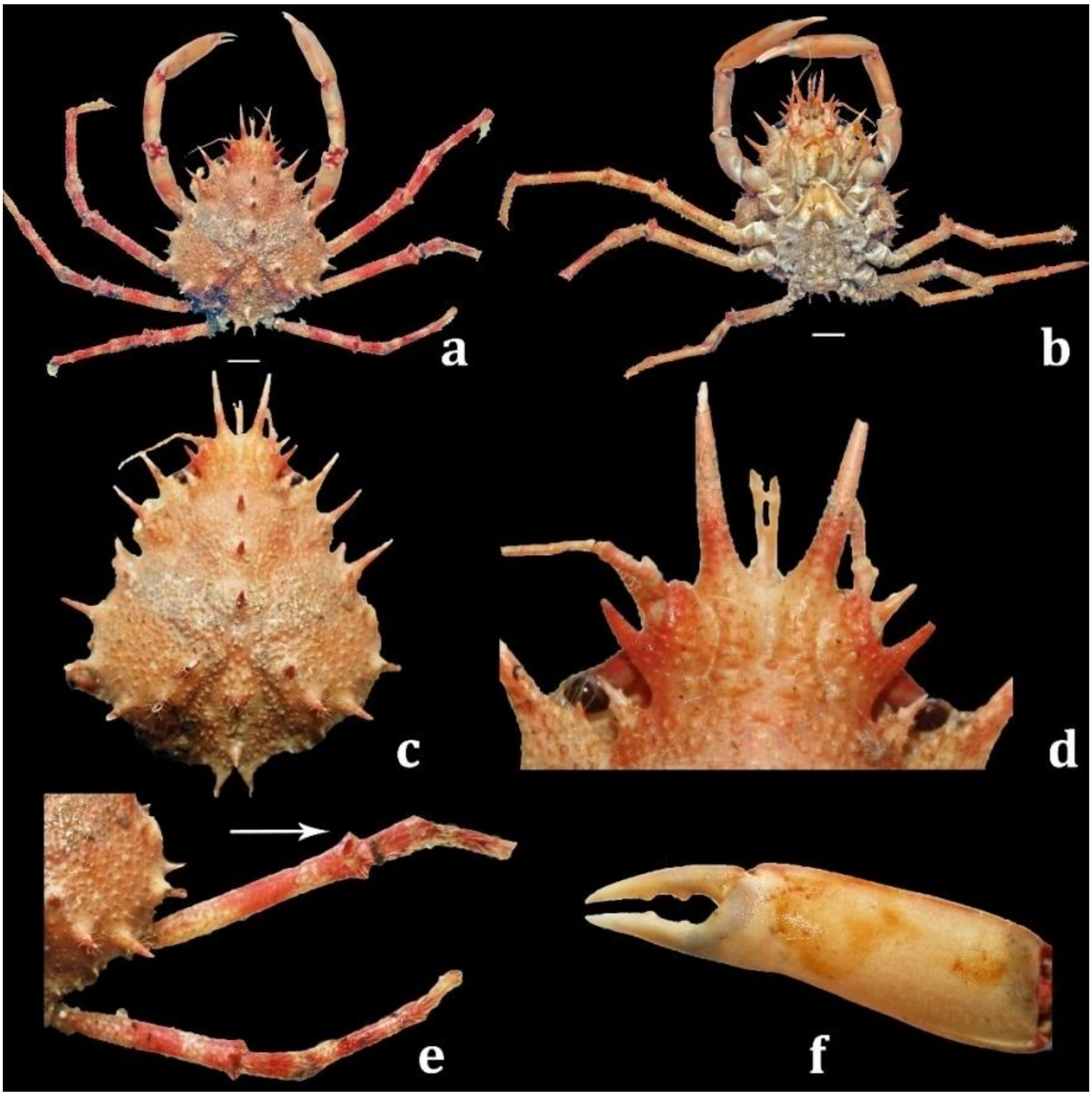


Figure 65: *Schizophrys aspera* (H. Milne Edwards, 1834) (a) Dorsal view (b) Ventral view (c) Spines on carapace (d) Frontal margin of carapace (e) Spine on distal end of periopod merus (f) Cheliped outer surface.(Bar represents 1cm).

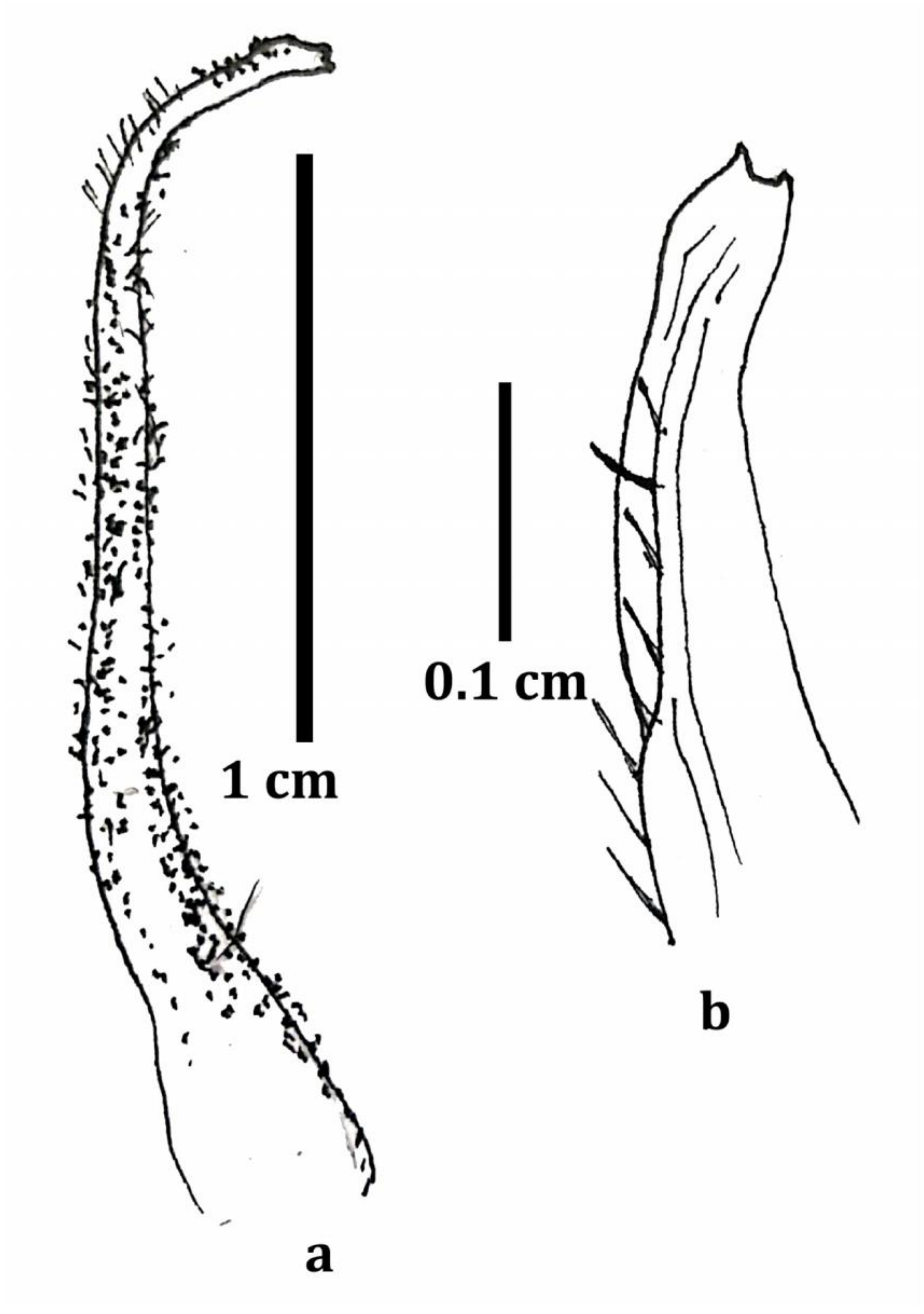


Figure 66: Male 1st gonopod: *Schizophrys aspera* (H. Milne Edwards, 1834) (a) Entire gonopod (b) Apical lobe.

## Subfamily Pisinae Dana, 1851

**Description-** Rostrum usually two-spined; eyes with commencing orbits; in addition to the supraocular spine, almost always as a prominent eave, a large and blunt post ocular process in which the eye retract; eyestalks short; basal antennal article broad; merus of third maxillipeds expanded at its antero-external angle, broader than ischium and carrying the palp at antero-internal angle; male abdomen not terminally broadened; telson triangular and not inserted deeply into sixth segment; ambulatory legs often very long.

## Genus *Hyastenus* White, 1847

**Description-** Carapace pyriform, variously tuberculate or spinose; rostrum varying in length; orbit comprising eave and postorbital lobe separated by a narrow hiatus; supra orbital eave at most moderately expanded, antero-lateral angle weakly produced or bearing a slender pre orbital spine; postorbital lobe not well developed, anterior margin sometimes with a proximal lobe, posterior margin convex but neither keeled nor lobed; basal antennal article generally narrow, antero-lateral angle blunt or produced as a small spine, lateral margin usually produced as a convex or triangular lobe, which never extends dorsally; article separated from postorbital lobe by a U-shaped hiatus of varying width.

### 27. *Hyastenus diacanthus* (de Haan, 1837) (Fig. 67a, b)

**Synonyms**

*Pisa (Naxia) diacantha* de Haan, 1833-1849 (1837): pl. 24, fig. 1.

*Naxia diacantha* Adams and White, 1848: 10.

*Hyastenus diacanthus* Miers, 1879b: 26; Haswell, 1882c: 20; Rathbun, 1893: 85. Ortmann, 1893a: 55; Alcock, 1895a: 210; Lanchester, 1902: 536; Nobili, 1903c: 27; Chopra, 1935: 466; Sakai, 1938a: 279, fig. 36, pl. 29, fig. 2; Buitendijk, 1950: 62; Dai and Yang, 1991: 142, fig. 72(1), pl. 16(6).

*Halimus diacanthus* Rathbun, 1902a: 29. Stimpson, 1907: 16.

**Material Examined-**Total 1 male specimen was collected from Sutrapada.
1 male (CL: 68.69 mm; CW: 49.81 mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 54**

**Description-** Carapace pyriform in shape (Fig. 67a), regions strongly convex and well defined, carapace surface covered with tomentum but smooth and glabrous beneath it, gastric region prominently convex with two obtuse tubercles in the median line and one large spine (Fig. 67d), the anterior tubercle is very indistinct, small low tubercle present in the proto gastric region but some time it becomes in distinct, cardiac and intestinal regions slightly convex, intestinal region mounted with low tubercles, branchial regions region less convex, strong forwardly pointed spine at the junction of antero lateral and postero lateral border junction (Fig. 67c), pseudorostral spine are shorter than half the length of the carapace, preocular tooth almost obscure, postocular cup with no accessory process on the superior margin, basal antennal segment slender, armed distally with an obscure tooth and also with an obtuse tooth on the outer border near the base, prominent tubercle on the pterygostomial region followed by a smaller one, The rostrum consists of two more or less divergent horns (Fig. 67f), the length of which in the adult male is from half to nearly two-thirds that of the carapace proper, but in the female is less.

Chelipeds in male stouter than ambulatory legs, equal in shape and longer than carapace length (Fig. 67e), In the female and young, male the chelipeds are rather more slender than any of the other legs, chelipeds unarmed and thickly covered with tomentum, but fingers naked in both the sexes, In full-grown male, the fingers gape near the base, the movable finger being proximally armed with a stout tooth; in the female (and also in young male) they leave no hiatus and are uniformly denticulated throughout their whole length; ambulatory legs thickly covered with tomentum, tip of dactylus sharp, curved and naked; male abdomen with seven distinct segments (Fig. 67b) while female abdomen with five segments only, the suture line between different segments faintly visible in the median convex part. Male first left gonopod long, slender and narrow near apical lobe, the apical lobe slender, narrow and lip shaped, single groove or line present in the centre part of the gonopod ends at apical lobe forming lip like structure (Fig. 68a, b).

**Distribution-**The species has wide spread distribution ranging from Red sea to Australia. The species is reported fromRed Sea, Sri Lanka, Burma, Japan, Korea, East China Sea, Taiwan, China, Singapore, Philippines, Indonesia and Australia(Ng et al., 2008; Boxshall et al., 2015).

In India the species is reported from Tamilnadu, Gulf of Mannar, Orissa, and Andaman Nicobar Islands.(Alcock, 1898; Sethuramlingam and Khan, 1991;Jeyabaskaran et al., 2002).

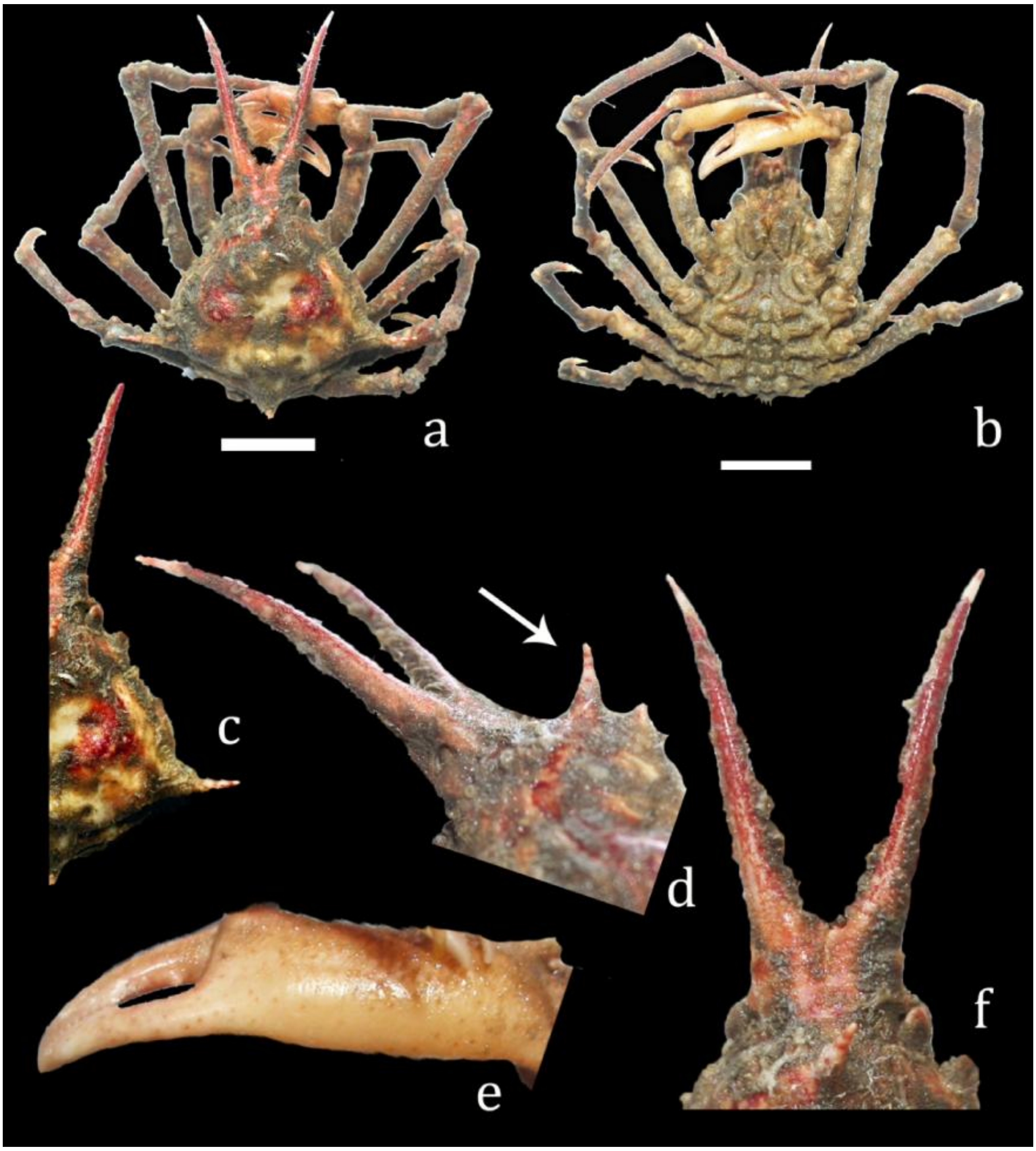


Figure 67: *Hyastenus diacanthus* (de Haan, 1837) (a) Dorsal view (b) Ventral view (c) Anterolateral border of carapace (d) Forward projecting spine on mesogastric region of carapace (e) Outer surface of cheliped (f) Spines on frontal margin of carapace.(Bar represents 1cm).

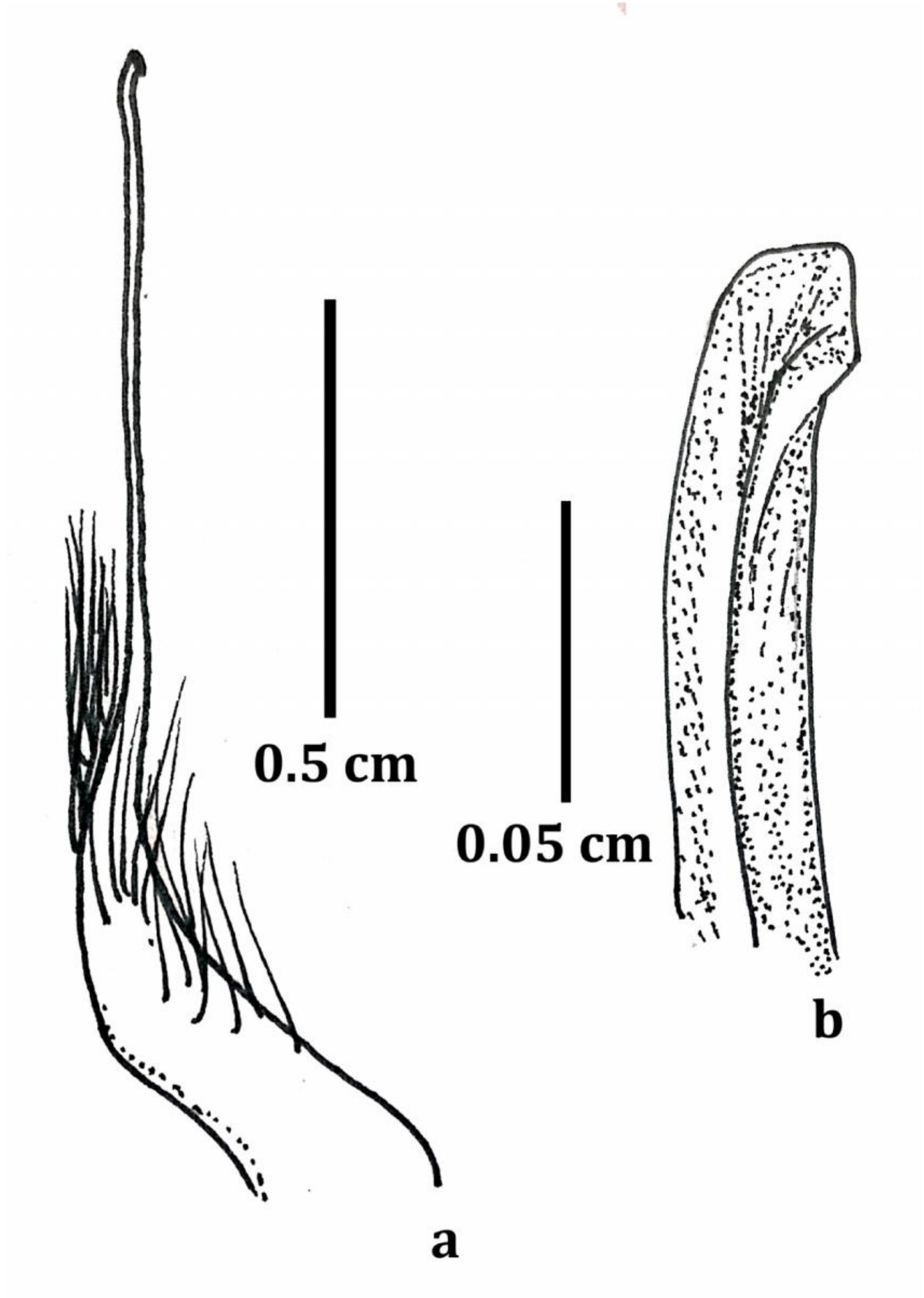


Figure 68: Male 1st gonopod: *Hyastenus diacanthus* (de Haan, 1837)(a) Entire gonopod (b) Apical lobe.

## Family Dromiidae de Haan, 1833

**Description-** Carapace commonly ovoid or sub circular, may be pentagonal, often sub globular, generally convex in both directions; uropods generally represented by dorsal plates, sometimes intercalated laterally, rarely ventrally, always present. Presence of a lateral linea linea, orbit, antennular and antennal fossae defined; third maxilliped opercula form; fourth and fifth pair of walking leg of the same size, reduced, dorsal, and with a terminal apparatus, involving distal propodal spines and dactyli; abdomen of both sexes consisting of six segments plus the telson, generally without pleurae; rarely, in males presence of vestigial pleopods on segments 3-5; telson short and rounded or truncate, exceptionally elongated.

### Genus *Dromia* Weber, 1795

**Description-** Carapace wider than long, surface smooth or sculptured; rostrum tridentate; female sternal grooves end apart or together between or behind the cheliped bases; cheliped with an epipod; legs not knobbed or ridged; length of propodi and dactyli of first two pairs of legs usually equal, inner margins of dactyli armed with 5-7 small spines on inner margin; fourth leg shorter than second leg.

### 28. *Dromia dormia* (Linnaeus, 1763) (Fig. 69a, b)

**Synonyms**

*Cancer lanosus* Rumphius, (1705): 19; Seba, 1759: 42, pl. 18, fig. 1.

*Cancer dormia* Linnaeus, 1763: 413; Fabricius, 1775: 405.

*Cancer dromia* Fabricius, 1781a: 501.

*Cancer dormitator* Herbst, 1790: 250, pl. 18, fig. 103.

*Dromia rumphii* Weber, 1795: 92; Fabricius, 1798: 359; Latreille, 1803a: 386. Lamarck 818: 264. Hilgendorf, 1879: 812; Lenz, 1901: 450.

*Dromia hirsutissima* Dana, 1852c: 403(part).

*Dromia dormia* Borradaile, 1903d: 298; Macnae and Kalk, 1958: 71, 117, 125; Michel, 1964: 34; McLay, 1993: 151, fig. 16c; Wada, 1995: 381, pl. 101, fig. 2.

*Dromidiopsis dormia* Rathbun, 1923b: 67;Sakai, 1936c: 11, pl. 5, fig. 2; Buitendijk, 1939: 23; Ward, 1942b: 70; Sakai, 1954: 73; Tinker, 1965: 66. Holthuis, 1968a: 220. Takeda, 1973d: 9; Alcala, 1974: 174, figs 1a-b; Sakai, 1976a: 9, pl. 3; Dai et al., 1981b: 131, figs 1-2, pl. 1: 1; Miyake, 1983: 5, pl. 2, fig. 2; Lewinsohn, 1984: 95, pl. 2; Dai and Yang, 1991: 18, fig. 4(2-3), pl. 1(2).

**Material Examined-**Total 2 male specimens were collected from Sutrapada.
1 male (CL: 57.48mm; CW: 72.80 mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 63**

**Description-** Carapace pyriform in shape (Fig. 69a), much wider than long, strongly convex, entire carapace covered with short, dense and light brown tomentum, cardiac, branchial and frontal groves shallow; rostrum tridentate, median tooth of the rostrum large (Fig. 69d), blunt and extending further than the lateral teeth; anterolateral margin of carapace armed with four unequal teeth (Fig. 69c), first anterolateral tooth largest, third tooth very small and close to the second tooth, posterolateral tooth large, broad based, blunt and directed anteriorly.

Chelipeds massive, outer face of palm inflated, inner superior margin with four tubercles (Fig. 69e), chelipeds covered with tomentum; fingers of chelipeds white in colour. Ambulatory legs slender in shape, second and third ambulatory legs shorter than chelipeds; distal border of carpus produced as rounded lobes, the inner margin of dactylus of the first two pairs of walking leg armed with 4 to 5 strong spines (Fig. 69f), all the abdominal segments freely movable; male first left gonopod long, slender and narrow upward, the apical lobe narrow with sharp tip (Fig. 70a, b). The carapace of the species is mostly occupied by sponges belonging to different species which gives different coloration. The fresh specimen recorded in the study was golden brown in colour. The preserved specimens are dark brown in colour.

**Distribution-**The species has wide spread distribution ranging from Red sea to Hawaii Island. The species is reported from Red Sea, Japan, China, Taiwan, Philippines, Indonesia, New Caledonia, Hawaiian Islands (Ng et al., 2008; Boxshall et al, 2015).

In India the species is reported from Maharstra, Tamilnadu, Gulf of Mannar, Andaman and Nicobar Islands (Alcock, 1898;Chhapgar, 1957a, b; Sethuramlingam and Khan, 1991;Jeyabaskaran et al., 2002).

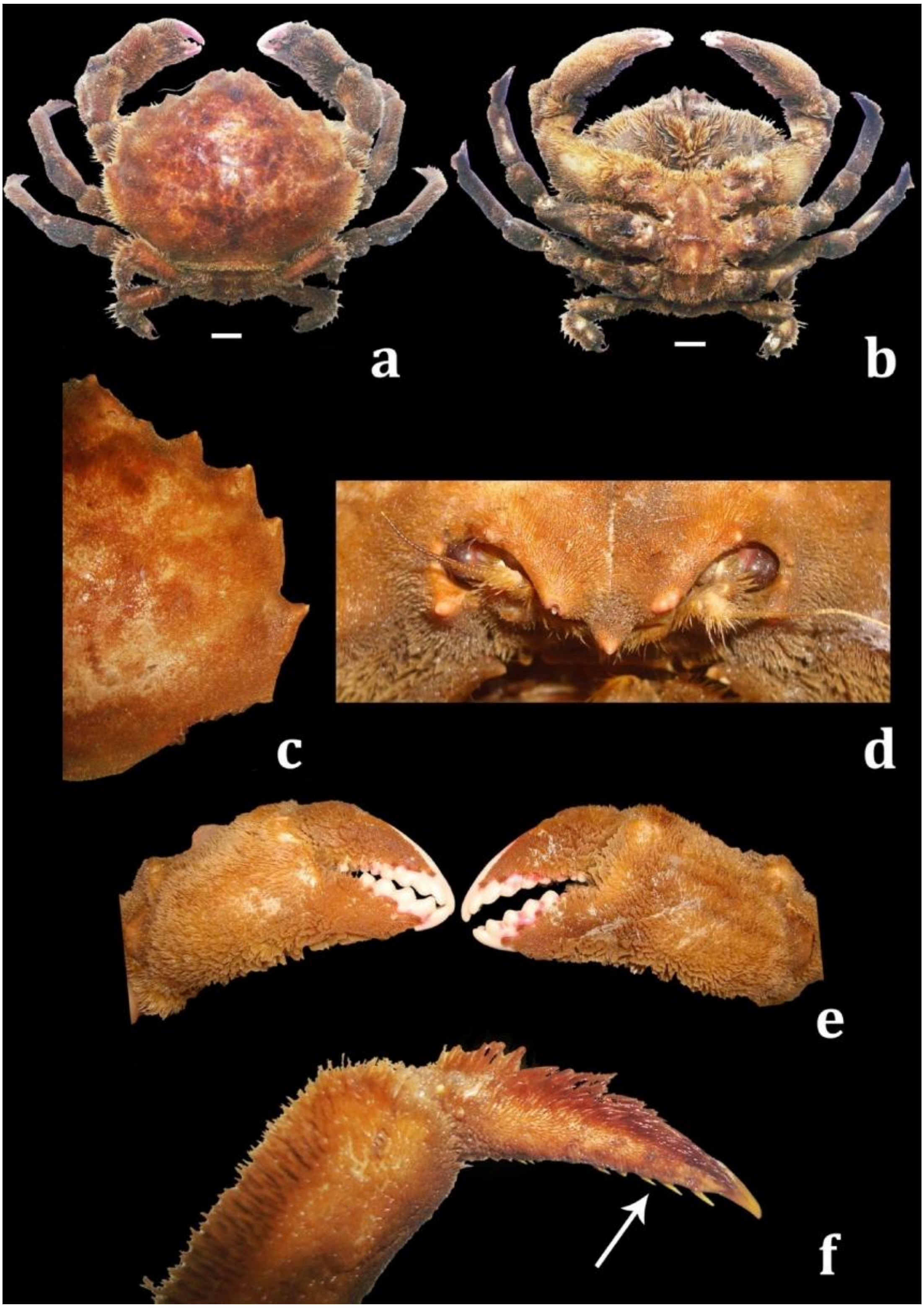


Figure 69: *Dromia dormia* (Linnaeus, 1763) (a) Dorsal view (b) Ventral view (c) Anterolateral border of carapace (d) Spines on Frontal lobe (e) Chelipeds (f) Spines on dactylus of poeripods. (Bar represents 1cm).

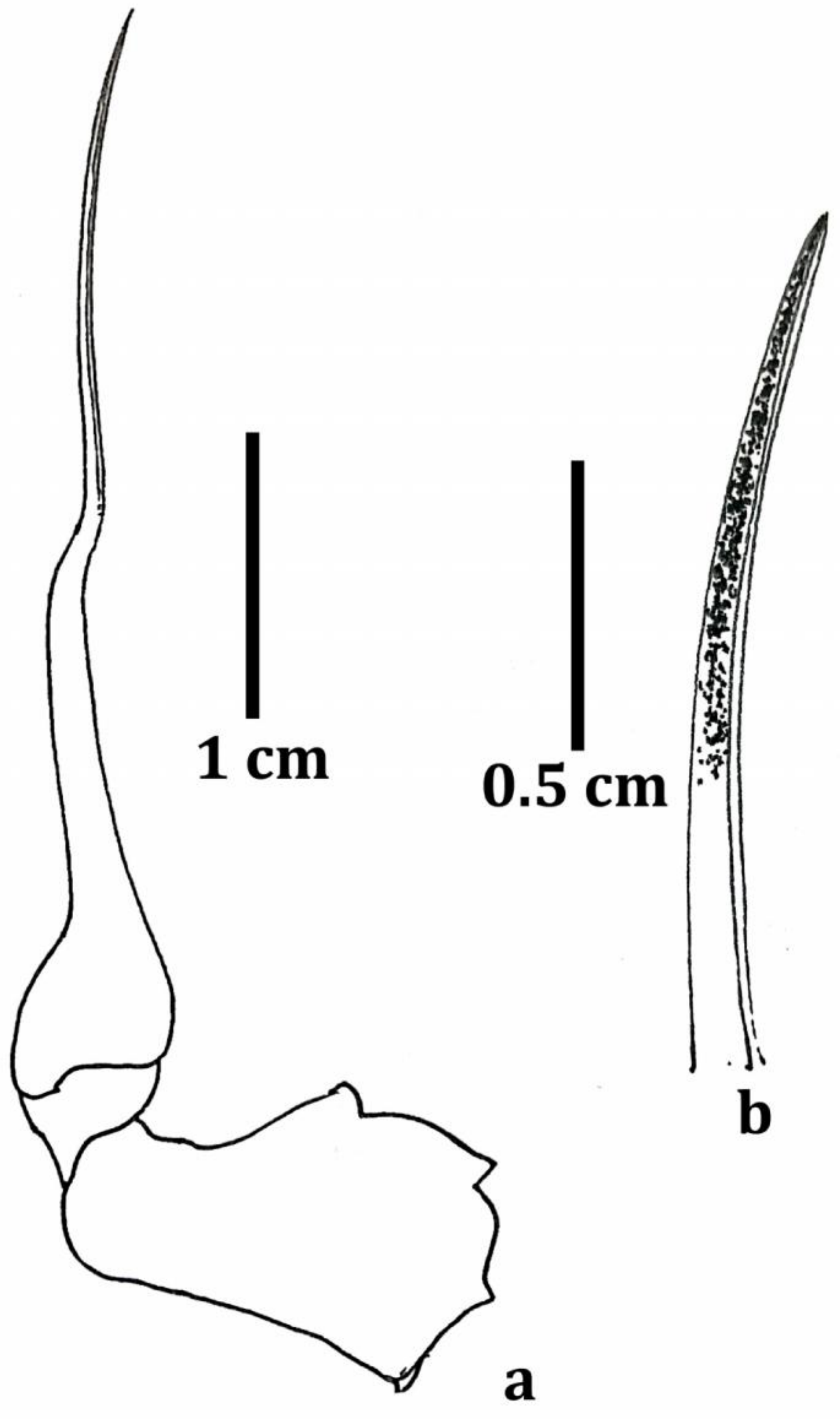


Figure 70: Male 1st left gonopod: *Dromia dormia* (Linnaeus, 1763) (a) Entire gonopod (b) Apical lobe.

## Genus *Conchoecetes* Stimpson, 1858

**Description-** Carapace as wide as long, or slightly wider than long, flattened, subpentagonal, surface granular with a tomentum of fine setae; rostrum tridentate, lateral teeth well developed; female sternal grooves end apart between or behind the first pair of walking legs; epipods present on chelipeds; first two pairs of legs shorter, dactyli armed with 20-30 tiny spines.;third leg shorter and stouter, dactyl large and talon-like, used for carrying a bivalve shell. Fourth leg shortest, segments flattened.

### 29. *Conchoecetes artificiosus* (Fabricius, 1798) (Fig. 71a, b)

**Synonyms**

*Dromia artificiosa* Fabricius, 1798: 360.

*Cancer artificiosa* Herbst, 1803: 54, pl. 58, fig. 7.

*Conchoecetes artificiosus* Stimpson, 1858d: 240. Alcock, 1900a: 151. Chopra, 1933a: 28. Sakai, 1935a: 61

**Material Examined-** Total 1 female specimens was collected from Sutrapada.
1 male (CL: 28.25 mm; CW: 25.77 mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 64**

**Description-** Carapace flat and pentagonal in shape (Fig. 71a), front narrow and cut into three teeth (Fig. 71e); the middle teeth smaller and on the lower plane, anterolateral border with two teeth, one tooth just behind on the cervical groove and the other behind the branchial groove. Two parallel grooves present on the central part of the carapace (Fig. 71c); U shape groove contacting two parallel groove also present on the central part, whole body surface covered with an evenly spread tomentum.

Chelipeds massive, upper surface of palm covered with rounded tubercle (Fig. 71f); ambulatory legs stout and slender in shape, the third pair of legs shorter than the two pairs, dactylus of legs talon like, last pair of legs end in tiny claw like dactylus (Fig. 71d).

**Distribution-** The species has wide spread distribution ranging from South Africa to Australia. The species is reported from South Africa, Persian Gulf, Pakistan, Sri Lanka, Japan, China, Singapore and Australia (Ng et al., 2008; Boxshall et al, 2015).

In India the species is reported from Maharashtra, Tamilnadu, Orissa, West Bengal and Andaman Island (Alcock, 1898; Chhapgar, 1957a, b).

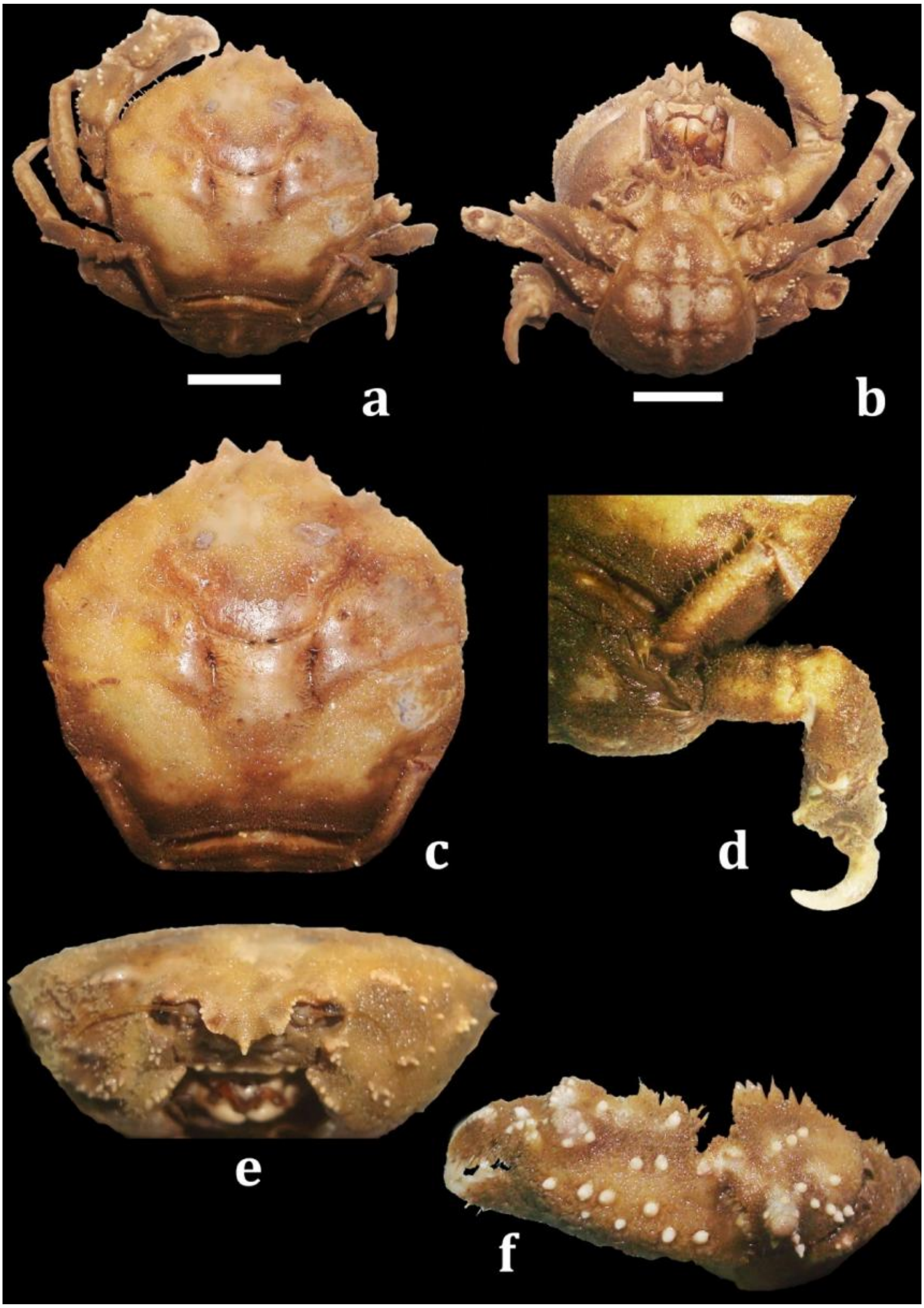


Figure 71: *Conchoecetes artificiosus* (Fabricius, 1798). **Female Specimen.** (a) Dorsal view (b) Ventral view (c) Carapace (d) Dactylus of periopod (e) Frontal view (f) Outer surface of cheliped.(Bar represents 1cm).

## Family Parthenopidae

**Description-** Carapace transversely elliptical, pentagonal or octogonal in outline, more or less expanded to form a vault below which pereiopods may be concealed; a characteristic coaptation between the carapace and the pereiopods, and between the legs together; lateral margins often cristate; buccal cavern varying from quadrate to elongate and triangular, sometimes tending to an oxystome disposition; third maxillipeds varying from wide to strongly narrowed anteriorly and with the merus very pointed at the extremity; endostpmial ridges generally well marked, dividing the endostome into two parts, either with both afferent and efferent channels clearly defined, or with only one channel apparent; chelipeds equal or subequal.

### Genus *Cryptopodia* H. Milne Edwards, 1834

**Description-** Carapace very broadly triangular, sometimes lyre-shaped, with very large lateral clypeiform vaulted expansions completely concealing the ambulatory legs, and prolonged posteriorly far beyond the base of abdomen. Dorsal surface with regions more or less inflated; lateral margins more or less distinctly serrated and crenate, and with closed fissures sometimes very apparent; rostrum nearly horizontal, very prominent; eyes very small, retractile; antennae with the basal article of antennae dilated. buccal cavity and third maxillipeds small, sometimes swollen; in chelipeds, merus with a wing like lobe on posterior margin; palm elongated, tri carinated and dentate; fingers short; ambulatory legs slender, with the fourth, fifth and sixth articles carinated; dadactyli nearly straight.

**30. *Cryptopodia angulata* H. Milne Edwards and Lucas, 1841 (Fig. 72a, b)**

**Synonyms**

*Cryptopodia angulata* H. Milne Edwards & Lucas, 1841: 481, pl. 28, Figs. 16-19; Alcock, 1895: 282; Flipse, 1930: 62 (key only); Yang, 1979: 11; Tirmizi, 1980: 107 (list); Banu & Nurul Huda, 1987: 646; Ahmad et al., 1993: 15 (list); Tirmizi, 1980: 107 (list only); Tirmizi& Kazmi, 1983: 369 (list only); Tirmizi & Kazmi, 1991: 211; Davie & Turner,1995: 450, Figs. IE, F; 2A.

*Cryptopodia angulata* Chopra, 1935: 473

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

**Material Examined-** Total 1 male specimens was collected from Sutrapada.
1 male (CL: 32.54 mm; CW: 53.41 mm) specimen was designated as museum specimen with accession number **ZL-AR-CR- 57**

**Description-** Carapace broader than long (Fig. 72a), pentagonal and convex in shape, the edges of the carapace dentate and harbors curved spine at all angles, the lateral margins of the carapace large and conceal the abdomen and ambulatory legs beneath it, the shape of the teeth range from simple to bifurcate; two spines at the centre of the posterior margin of the carapace, second spine present in front of both the anterolateral spines (Fig. 72c), the dorsal surface of carapace granulated while ventral surface is smooth, deep triangular depression at the centre of the carapace and branchial, cardiac and gastric regions elevated, the margins of the triangular depression granulated and ridges of the granules start from the apex of the triangular shape and end at the base of the rostrum on either side, rostrum or front triangular spine shape (Fig. 72d); orbits and eyes small and round, the surface of the third maxillipeds is smooth.

Chelipeds granular and robust, palm contains denticules in anterior and posterior margins, five prominent teeth present on the anterior margin of palm (Fig. 72f), the carpus of the chelipeds semi globular, merus flat and harbors wing like expansions at the distal end with denticulate pattern on upper and lower margins (Fig. 72e), fingers are short and smooth; ambulatory legs are slender and smooth, the first pair of legs is longest, the upper margin of the merus is denticulate while lower margin is crenate, and dactylus is strongly crenate on both margins; abdomen of male rough, elongated, narrow; sixth segment with vertical spine; telson triangular in shape; male first left gonopod S-shaped, stout basal part about 2.9 times length of apical lobe, apical lobe tapered, bilobed; spines mainly on lobes. The fresh specimen of the species is white in colour.

**Distribution-** The species has wide spread distribution ranging from Pakistan to Australia. The species is reported from Pakistan,Malaysia and Australia (Ng et al., 2008; Boxshall et al., 2015).

In India the species is reported from Gujarat, Orissa, West Bengal and Tamilnadu (Alcock, 1898; Chhapagar, 1957a, b; Ravichandran *et al.* 2010).

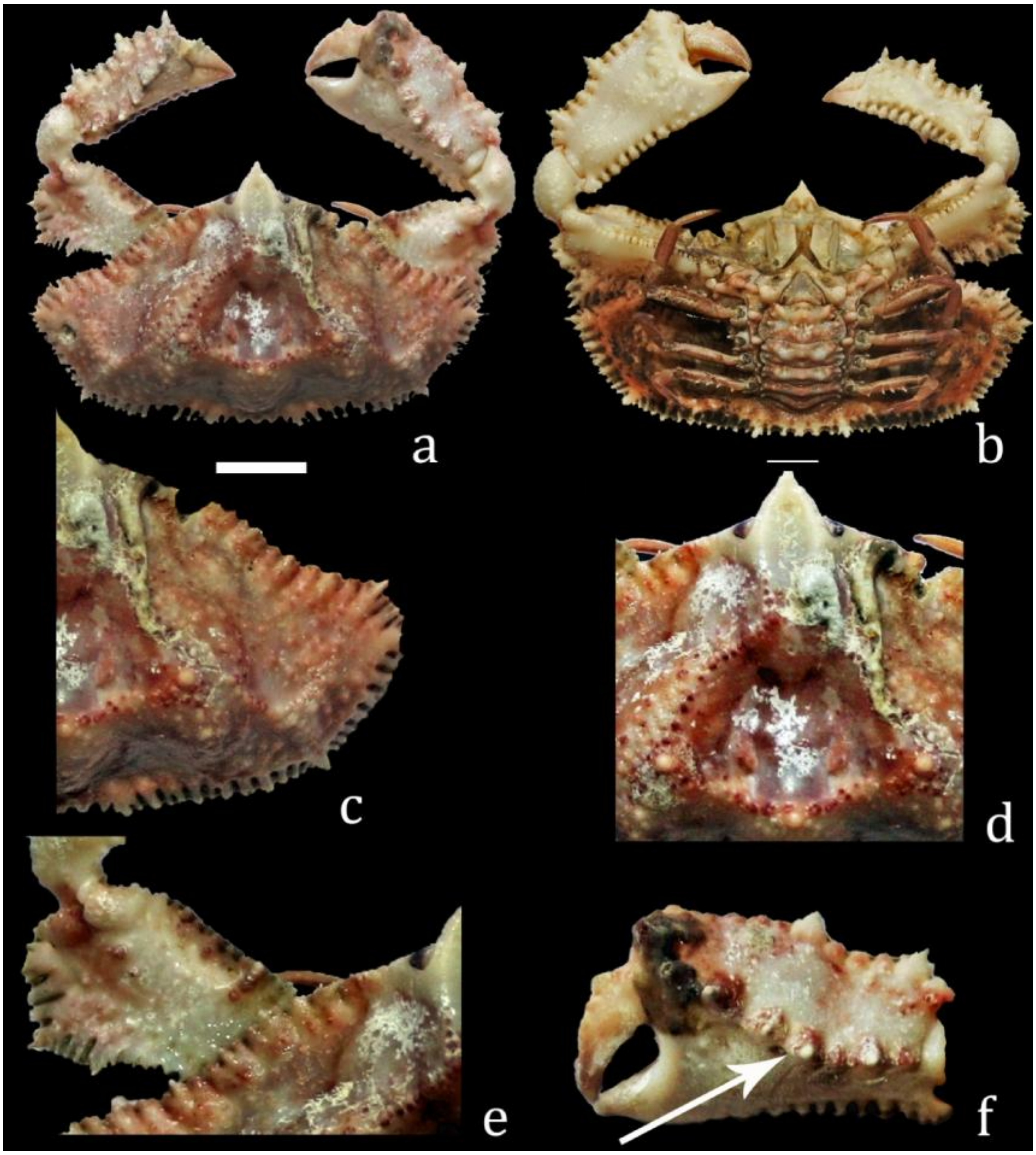


Figure 72: *Cryptopodia angulata* H. Milne Edwards and Lucas, 1841**Female Specimen** (a) Dorsal view (b) Ventral view (c) Anterolateral border of carapace (d) Frontal margin of carapace (e) Merus of cheliped (f) Spines on outer surface of cheliped palm. (Bar represents 1cm).

## Discussion

In the present study, total 30 species of brachyuran crabs belonging to 22 generaand 11 families were recorded from the study area. In this study two species belonging to genus *Scylla* were recorded of which, *Scylla tranquebarica* was first time reported from Gujarat. Amongst the two species reported, *S. serrata* has wide spread distribution in the coastal areas of the state while other species showed patchy distribution.Previously many researchers have attempted to identify distinguishing morphological characters for the proper identification of these three species, but due to the close similarities in the morphological characters, it has created huge confusion (Keenan et al., 1998).

Joel and Raj (1980) have stated that coloration difference between the *Scylla* species cannot be used as major identification character because the coloration in the species varies with the habitat, geographical location and water quality. *Scylla tranquebarica* reported from Pulicat lake shows dark grayish green color (Joel and Raj, 1980) while the specimens of the same species reported from Thailand shows olive green or purplish green color (Jirapunpipat et al., 2008) but in the present study the collected specimens show bright orange coloration. Keenan et al., (1998) have reported that morphological variation in first and second gonopod of males is an important character for the identification of the species. The first gonopod of both the species are almost same in the appearance except the shape of the apex and serration on the outer border. The serration on the outer border is high in *S. serrata* as compared to *S. tranquebarica*. In the second male gonopod, the apex is divided into two branches and the angle between the branches is the most important character for species identification. The angle between the two branches of the apex is high in *S. tranquebarica* then that in *S. serrata*. Joel and Raj (1980) have reported that *S. serrata* utilizes a wide range of habitat while, *Scylla tranquebarica* requires specific kinds of micro habitat for survival. In the present study, it was observed that *S. serrata* lives in the complex system of the burrows in mudflats while on rocky shores it lives in rock crevices. *S. tranquebarica* was mostly observed residing in shallow mud or algal assemblage.

*Leptodius affinis* belonging to family Xanthidae is reported for the first time from the western coast of India. The main difference between *L. exarartus* and *L. affinis* appears in the morphology of first pleopod of male. The apical lobe or tip is observed to be shorter in *L. exarartus* than in *L. affinis.* The angle formed between apical lobe and rest of the structure of pleopod is greater in *L. exarartus* while in *L. affinis* the angle is lesser therefore: the apical lobe appears to be more bent. On the ventral side of apical lobe the out growth are observed very few in *L. exarartus* as compared to *L. affinis.* The ratio between the length of apical lobe and total length of pleopod is observed to be lesser than 0.1 in *L. exarartus* while it is greater than 0.1 in *L. affinis* (Lee et al., 2013).

The color of the species varies with the locality and different color patterns have been reported. In the present study total five and three different color patterns were recorded for *L. affinis* and *L. exaratus* respectively. Amongst the two species recorded, *L. exaratus* is commonly found on the rocky shores of Gujarat (Chhapgar, 1957a, b). The species utilizes wide range of micro habitat like rock crevices, deep tide pool, algal assemblage and maximum abundance of the species was observed in the lower intertidal zone of current study area. Color patterns of *L. exaratus* like “g” and “h” were commonly observed in the area where zoanthids were dominant while color pattern “f” was commonly observed in algal assemblage (Fig. 38). *Leptodius affinis* was found in the upper intertidal area where rock and boulders were available. The species utilize different kind of micro habitats like algal assemblage, rock crevice, under surfaces rock and boulder and shallow tide pools. In the present study, maximum numbers of specimens of *L. affinis* were collected from under surfaces of rock. Specimens of colour pattern “a – d” (Fig. 38) were collected from under rock surfaces and tide pools while specimens of color pattern “e” were collected from algal assemblages. The distribution range of *L. affinis* comprises an area from eastern Indian Ocean to the central Pacific Ocean. In India, the species is recorded from several locations on the eastern coast which includes Bay of Bengal (Alcock and Anderson, 1984; Alcock, 1898), the Andaman Islands (Sankarankutty, 1962) and the Gulf of Mannar (Gravely, 1927). The present study reports the occurrence of the species for the first time from the western coast (Gujarat state) of India, located outside the known distribution range of *L.*

*affinis.* This creates an interesting scope to carry out an investigation to determine the presence of the species at other locations along the western coast of India and to redefine the distribution range of the species.

*Atergatis ocyroe* belonging to family Xanthidae is also reported for the first time from western coast of India. The species is very similar in appearance with *Atergatis floridus*. Recently Ng and Davie (2007) have revised the taxonomy of both the species and described the distinguishing characters. The surface of third maxillipeds and chelipeds is more or less spotted in *A. ocyroe* but it is not spotted in *A. floridus.* The epibranchial region is more swollen in *A. floridus* while it is less swollen in *A. ocyroe.* The ischium of third maxilliped is slender type in *A. floridus* while it is rectangular in *A. ocyroe*. The color pattern of both the species varies a lot. *A.floridus* has a characteristic green coloration with flower like yellowish to yellowish white markings on the carapace but in case of *A. ocyroe*, the species has cream colored background with reddish brown to brown and sometimes greenish brown blotches on the carapace. In India, the species is mostly reported as *A. floridus.* Jeyabsakaran et al., (2002) has collected some specimens from Gulf of Mannar and identified as *A. floridus* but the drawing of the specimen resembles the characteristic of *A. ocyroe.*

In deep sea brachyuran crabs species like *Hyastenus dicanthus, Dromia dormia* and *Conchoecetes artificious* were first time reported from Gujarat. All the three crab species were collcted from the trawler by-catch dumped by the fisher man community of Sutrapada. The distribution of the species ranges from depth of 20 meter to 30 meter. The species are mostly associated with the sponge or sea grass beds. In India the species are reported from Maharastra, Kerala, Karnataka, Tamilnadu, Gulf of Mannar and Nicobar Islands (Alcock, 1898; Chhapgar, 1957a, b; Sethuramlingam and Khan, 1991; Jeyabaskaran et al., 2002; DevRoy, 2013).The present study reports 30 species of brachyuran crab including few new records of the species from Gujarat state. Though the species numbers recorded in the present species are less than the species number recorded by Chhapagar (1957 a, b). The present study showed that the coastal area of Saurashtra coast have significant potential for the taxonomical studies on brachyuran crabs and detail studies are required to carve the clear picture of brachyuran crab fauna of Saurashtra coast.