



## RECENT BENTHIC OSTRACODA FROM PALK BAY, OFF RAMESWARAM, SOUTHEAST COAST OF INDIA

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### ABSTRACT

Fiftytwo bottom sediment samples were collected over a year from the inner-shelf off Rameswaram, Tamil Nadu and the detailed systematic study of Ostracoda was made. A total of 48 species belonging to 39 genera, 19 families, 3 superfamilies, 2 suborders of the Order Podocopida were identified and described with SEM photomicrography. Among these, 3 species belong to Platycopa and the rest to Podocopa. *Kotoracythere inconspicua*, *Neocythretta snellii* and *Paradoxostoma subtile* are recorded for the first time from the Indian waters and four species are recorded for the first time from the east coast. The assemblage of the fauna shows a close similarity to the Indo-Pacific region. A relatively faster rate of sedimentation is deduced based on the occurrence of carapace and valve ratio, in the study area.

**Key words:** Recent Ostracoda, Systematics, Palk Bay, Southeast coast of India.

### INTRODUCTION

During recent times, some notable work has been carried out pertaining to the systematics of Ostracoda of the Recent marine and marginal water bodies of Indian coast (Jain, 1978, 1981); Bhatia and Kumar (1979); Khosla *et al.* (1982); Varma *et al.* (1993); Vaidya and Mannikeri (1994); Shyam Sunder *et al.* (1995); Naidu *et al.* (1997); Kumar and Hussain (1997); Hussain (1998); Hussain *et al.* (1998); Hussain and Mohan (2000, 2001). Despite the above studies, a detailed taxonomic investigation is necessary on these fauna from the vast area available along the coast (length of the Indian coast line 7200 km). Hence, in order to know the lineages and phylogenetic relationships and zoogeographic distribution of taxa, the present study has been undertaken. In the process, a detailed account of 48 species recorded from Palk Bay, off Rameswaram, southeast coast of India is provided with the aid of SEM study.

### STUDY AREA AND METHODOLOGY

The area under investigation is off the coast of Rameswaram (79° 19' to 79° 35' E and 9° 15' to 9° 17' N) in the Palk Bay, Tamil Nadu. The climate is tropical with warm water temperatures. The region is influenced by the northeast monsoon and

southwest monsoon with a heavy downpour. The bay depressions, which generally occur during the months of October-November frequently cross the coast near Rameswaram. Coral reefs occur in the Palk Bay, especially off Rameswaram and they provide a favourable environment for the better thriving of Ostracoda in this region.

Bottom sediment samples were collected from the inner-shelf region of Palk Bay at 13 stations in a transect off Rameswaram within a depth range from less than a metre to 12 m. (fig. 1). Samples were collected during the four seasons over a period of one year (winter, summer, SW monsoon and NE monsoon) in the study area. The collections were made using a Petersen Grab sampler from a motor launch belonging to the Fisheries Department of Tamil Nadu. The sampling transect was from a notable landmark (Rameswaram temple) on the shore due east. As a sequel, a total of 52 samples were collected and subjected to standard micropaleontological techniques. Ostracod taxa were separated and counted from a unit weight of 25 ml wet sediment sample after completing all the laboratory work, under a stereobinocular microscope. Their detailed external and internal carapace morphology was studied and various species were identified. To procure lucid

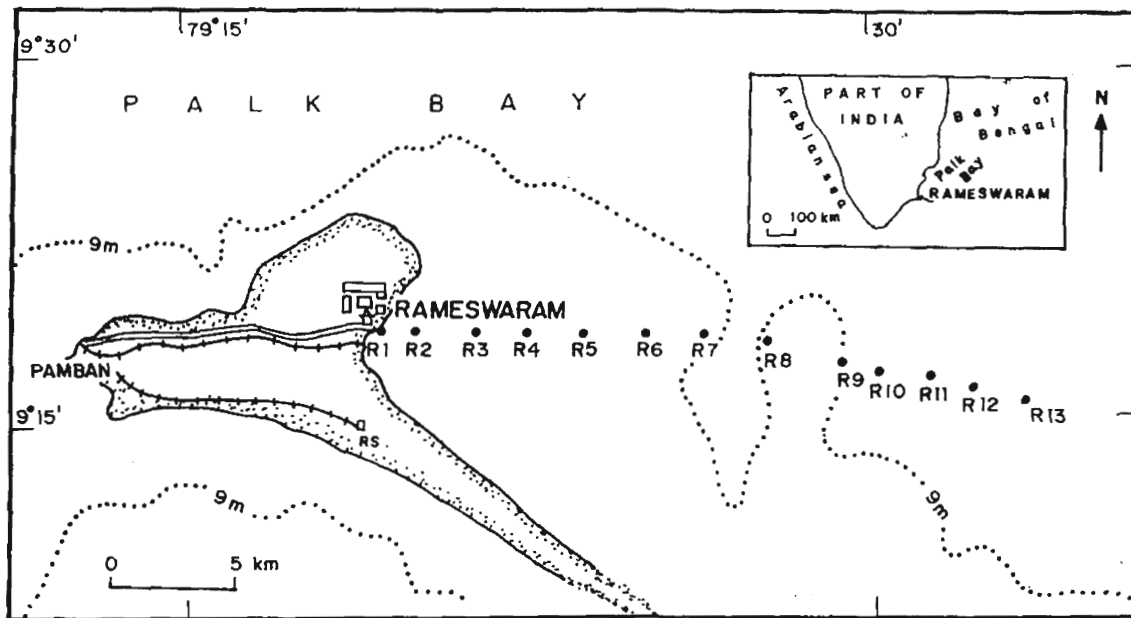


Fig. 1. Map showing location of sampling stations (R<sub>1</sub>-R<sub>13</sub>) in the Palk Bay, off Rameswaram, Tamil Nadu.

illustrations, SEM micrographs of all the species recorded were taken in different views, using JEOL JSM 5300. Numerical counts include carapaces and open valves of adult and juveniles for all the four seasons. Dimensions for all the hypotypes are given in mm. For the sake of brevity, only remarks of the species are given.

#### SYSTEMATIC PALAEOLOGY

In the present study, the classification of Hartmann and Puri (1974) is followed with the following modifications: Genera *Kotoracythere* Ishizaki and *Keijia* Teeter are included in the family Pectocytheridae Hanai, 1957. Genera *Lankacythere* Bhatia and Kumar and *Neocytheromorpha* Guan are included in the family Trachyleberididae Sylvester-Bradley, 1948. Genus *Neosinocythere* Huang is included in the family Sinocytheridae Huang, 1985 and Genus *Ornatoleberis* Keij is included in the family Xestoleberididae Sars, 1928.

Specimens (hypotypes) of all the species identified and illustrated are deposited in the Department of Applied Geology, School of Earth and Atmospheric Sciences, University of Madras, under the registration numbers Muagsri 1 – Muagsri 48.

**Subclass Ostracoda** Latreille, 1806

**Order Podocopida** G.W. Müller, 1894

**Suborder Platycopa** Sara, 1866

**Family Cytherellidae** Sars, 1866

**Genus Cytherella** Jones, 1849

*Cytherella dictyon* Malz & Jellinek, 1989

(Pl. I, fig. 1)

*Cytherella dictyon* Malz and Jellinek, 1989, pp. 206-207, pl. 10, fig. 87, p. 11, figs. 88-95. – Jellinek, 1993, p. 108, p. 1, figs. 29-30. – Hussain *et al.*, 1998, p. 20, p. 1, fig. A.

**Material** : 7 carapaces and 3 open valves.

**Dimensions** : Length 0.65 mm, Height 0.36 mm.

**Remarks** : *C. dictyon* was originally reported from Palm beach, Mombasa, Kenya (Malz and Jellinek, 1989). Subsequently, Jellinek (1993) recorded this species from various localities along the coast of Kenya. This species appears to be similar to *C. semitalis* Brady in overall shape, but differs from it in the absence of coarse pittings. This species also resembles *C. hemipunctata* Swanson in general outline but the latter possesses dense punctae. *C. dictyon* was reported for the first time from Indian waters by Hussain *et al.* (1998).

**Genus Cytherelloidea** Alexander, 1929

*Cytherelloidea leroyi* Keij, 1964

(Pl. I, fig. 2)

*Cytherelloidea leroyi* Keij, 1964, p. 421, pl. 2, figs. 1-4. - Zhao *et al.*, 1985, p. 199, pl. 19, fig. 1. - Whatley and Quanhong, 1987, pp. 334-335, pl. 1, figs. 15-18. - Mostafawi, 1992, p. 135, pl. 1, fig. 12. - Varma *et al.*, 1993, p. 554. - Vaidya and Mannikeri, 1994, p. 736. - Naidu *et al.*, 1997, p. 728, pl. II, fig. 7. - Hussain *et al.*, 1998, p. 20, pl. 1, fig. B. - Hussain, 1998, p. 2, pl. 1, fig. 1.

**Material:** 123 carapaces and 50 open valves.

**Dimensions:** Length 0.59 mm, Height 0.32 mm.

**Remarks:** *C. leroyi* was originally reported from northwest Borneo by Keij (1964). Subsequently, this species has also been reported from China Sea (Zhao *et al.*, 1985) and from Malacca Straits (Whatley and Quanhong, 1987). According to Zhao *et al.* (1985), *C. leroyi* can be regarded as an indicator of warm water conditions. In the present study area, the temperature ranges from 26.4°C to 32.6°C and most of the specimens of *C. leroyi* are found to occur in the silty sand substrate.

**Genus *Keijcyoidea* Malz, 1981**

*Keijcyoidea praecipua* (van den Bold, 1963)

(Pl. I, fig. 3)

*Cytherelloidea praecipua* van den Bold, 1963a, vol. 9, no. 1, p. 75, pl. 1, figs. 1-7. - Swain, 1969, p. 459, pl. 1, figs. 2a-b (not pl. 1, figs. 1a-b). - Swain and Gilby, 1974, pp. 277-278, pl. 1, figs. 5-6, text fig. 6c. - Hussain, 1998, pp. 2-3, pl. 1, figs. 2-3.

*Cytherelloidea* sp. cf. *C. praecipua* van den Bold, Khosla, 1978, p. 257, pl. 1, fig. 7. - Khosla *et al.*, 1982, pl. 1, fig. 2.

*Keijcyoidea praecipua* (Bold), Hussain *et al.*, 1998, pp. 20-21, pl. 1, figs. C and D.

**Material:** 42 carapaces and 10 open valves.

**Dimensions :** Length 0.53 mm, Height 0.31 mm.

**Remarks:** van den Bold (1963a) originally recorded this species from Recent coral sand, Tobago, West Indies as *C. praecipua* based on the presence of a strong tooth on the dorsal margin of the left valve fitting into a socket of the right valve which is an anomalous hinge structure seen in the genus *Cytherelloidea*. Later, Malz (1981) established a new genus *Keijcyoidea* based on the type species *C. praecipua* Bold (1963). Hussain *et al.* (1998) reported this species for the first time from the east coast of India, from off Tuticorin.

**Suborder Podocopa** Sars, 1866

**Superfamily Bairdiacea** Sara, 1866

**Family Bairdiidae** Sars, 1888

**Genus *Bairdoppilata* Coryell, Sample & Fields, 1935**

*Bairdoppilata (Bairdoppilata) alcyonicola*  
Maddocks, 1969

(Pl. I, fig.4)

*Bairdoppilata (Bairdoppilata) alcyonicola* Maddocks, 1969b, pp. 71-75, figs. 36-38. - Bhatia and Kumar, 1979, p. 174, pl. 3, fig. 5. - Vaidya and Mannikeri, 1994, p. 736. - Hussain *et al.*, 1998, p. 21, pl. 1, fig. G. - Hussain, 1998, p. 3., pl. 1, fig. 6. - Hussain and Mohan, 2000, p. 26, pl. 1, fig. 3.

**Material:** 84 carapaces and 14 open valves.

**Dimensions:** Length 0.96 mm, Height 0.53 mm.

**Remarks:** This species was originally described by Maddocks (1969b) from the Mozambique Channel. *B. (B.) paraalcyonicola* Titterton and Whatley is much similar to the present species, but the former is larger in size and has more produced caudal processes. In the study area, this species is found to occur more in summer season (April).

**Genus *Triebelina* van den Bold, 1946**

*Triebelina sertata* Triebel, 1948

(Pl. I, figs. 5-6)

*Triebelina sertata* Triebel, 1948, p.19, figs.1-2.

*Triebelina* cf. *cubensis* van den Bold, Kingma, 1948, p. 69, pl. 7, fig. 4.

*Triebelina sertata* Triebel, Key, 1953, p. 158, pl. 1, fig. 5. - Guha, 1968a, p. 59, pl. 5, fig. 1. - Bonaduce *et al.*, 1980, p. 144, pl. 1, fig. 13. - Jain, 1981, p. 108, pl. 1, fig. 3. - Hartmann, 1984, p. 125, pl. 4, figs. 6-7. - Malz and Lord, 1988, pp. 66-68, pl. 1, figs. 1-7. - Sridhar *et al.*, 1998, p. 193, fig. 3a.

**Material:** 7 carapaces and 2 open valves.

**Dimension:** Length 0.78 mm, Height 0.43 mm.

**Remarks:** *T. sertata* was originally reported from the Recent sediments of Red Sea by Triebel (1948). While dealing with the ecology of *Triebelina*, Maddocks (1969b, p.61) stated that the species of *Triebelina* are restricted to shallow waters and characteristic of reefs, either coralline or navigational and high wave energy level. *T. indopacifica*, *T. sertata*, *T. tuberculata* are Indopacific-Red Sea in distribution and are typically inhabitants of coral reef masses. The study area is also a region which is surrounded by abundant coral reefs and the samples collected are from shallow inner-shelf.

**Superfamily Cytheracea** Baird, 1850

**Family Cytheridae** Baird, 1850

**Subfamily Cytherinae** Baird, 1850

**Genus *Hemicytheridea*** Kingma, 1948

*Hemicytheridea reticulata* Kingma, 1948

(Pl. I, figs. 7-8)

*Hemicytheridea reticulata* Kingma, 1948, pp.71-72, pl.VII, fig.7. – Sreenivas *et al.*, 1991, pp. 492-499, pl.1, figs. 11-12. – Hussain, 1998, pp.7-8, pl.1, figs. 9-10. – Hussain and Mohan, 2000, p.26, pl.1, fig.4.

**Material:** 97 carapaces and 8 open valves.

**Dimension:** Length 0.52 mm, Height 0.27 mm.

**Remarks:** *H. reticulata* was first reported from Java and Sumatra region by Kingma (1948). Subsequently, Bentley (1988) recorded the occurrence of this species from near Sydney. Zhao and Whatley (1989a) reported the same from the Sedili river estuary and Jason Bay (Malay Peninsula), from water depth between 0 and 2 metres. In the study area, the samples were collected from depths between less than a metre and 12 metres. From the above synonymy, it is observed that this species is found to occur both in brackish and shallow marine environments.

*H. khoslai* Hussain *et al.* (1998) recorded from the Gulf of Mannar is somewhat similar to the present species. However, the former differs in the possession of a comparatively large-sized carapace, thicker ridges and more number of anterior marginal denticulations. The former has a rather truncated posterior end instead of a subrounded posterior margin as in *H. reticulata*.

*Hemicytheridea* sp. aff. *H. khoslai* Hussain *et al.*, 1998

(Pl. I, figs.9-10)

*Hemicytheridea khoslai* Hussain in Hussain, Mohan and Mannivannan, 1998, pp.23-24, pl.1, fig.M.

**Material:** 43 carapaces and 11 open valves.

**Dimension:** Length 0.72 mm, Height 0.34 mm.

**Remarks:** This species also resembles *H. paiki* Jain (1978) in its general outline, inner lamella and muscle scar pattern but differs in having comparatively coarser reticulations, and marginal denticulations.

**Genus *Neomonoceratina*** Kingma, 1948

*Neomonoceratina iniqua* (Brady, 1868)

(Pl. I, figs. 11-12)

*Cytherura iniqua* Brady, 1868, Ostracodea. Les Fonds de Mer., p.364, pl.8, figs.3-6.

*Cythere iniqua* (Brady), Brady, 1886, p.130, pl.39, figs.31-33.

*Neomonoceratina* sp.A Paik, 1977, p. 42, pl. 2, figs. 24-28, pl. 8, fig. 148. *Neomonoceratina iniqua* (Brady), Whatley and Quanhong, 1987, pp. 339-340, pl. 2, fig. 21. – Zhao and Whatley, 1988, pp. 566-567, pl. 1, figs. 7-12. – Mostafawi, 1992, p. 138, pl. 1, fig. 21. – Varma *et al.*, 1993, p. 554. – Vaidya and Mannikeri, 1994, pp. 735-738. – Sshyam Sunder *et al.*, 1995, p.473. – Kumar and Hussain, 1997, p. 133, pl. 1, fig. 4. – Hussain *et al.*, 1998, pp. 24-25, pl. 1, fig. N. – Hussain, 1998, p. 4, pl. 1, fig. 11. – Hussain and Mohan, 2000, p. 26, pl.1, fig.5.

**Material:** 1823 carapaces and 229 open valves.

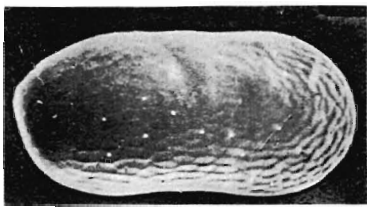
**Dimension:** Length 0.56 mm, Height 0.29 mm.

**Remarks:** *N. iniqua* (Brady) is diagnostic of possessing irregular reticulate surface ornamentation consisting of thin muri and polygonal fossae, a vertical median sulcus and in having a ventrolateral

## EXPLANATION OF PLATE I

(Bar scale equals 100 µm unless mentioned)

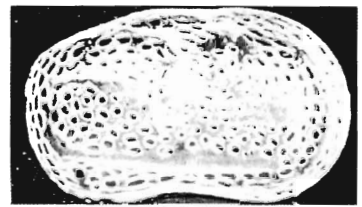
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| <p>1. <i>Cytherella dictyon</i> Malz &amp; Jellinek, 1989<br/>Right valve, external view.</p> <p>2. <i>Cytherelloidea leroyi</i> Keij, 1964<br/>Left valve, external view.</p> <p>3. <i>Keijcyoidea praecipua</i> (van den Bold, 1963)<br/>Right valve, external view.</p> <p>4. <i>Bairdoppilata (Bairdoppilata) aleyonicola</i> Maddocks, 1969<br/>Right valve, external view.</p> <p>5-6. <i>Triebelina sertata</i> Triebel, 1946<br/>Right valve, external view; 6. Right valve internal view.</p> <p>7-8. <i>Hemicytheridea reticulata</i> Kingma, 1948<br/>Left valve, external view; 8. Dorsal view.</p> | <p>9-10 <i>Hemicytheridea</i> sp. aff. <i>H. khoslai</i>, Hussain <i>et al.</i>, 1998<br/>Right valve, external view; 10. Dorsal view.</p> <p>11-12. <i>Neomonoceratina iniqua</i> (Brady, 1868)<br/>Left valve, external view; 12. Left valve, internal view.</p> <p>13. <i>Neomonoceratina porocostata</i> Howe &amp; McKenzie, 1989<br/>Right valve, external view.</p> <p>14-16. <i>Spinoceratina spinosa</i> (Annapurna &amp; Rama Sarma, 1987)<br/>14. Right valve, external view; 15. Left valve, external view;<br/>16. Hinge pattern.</p> <p>17-20. <i>Kotoracythere inconspicua</i> (Brady, 1880)<br/>17. Left valve, external view; 18. Right valve, external view.<br/>19. Left valve, external view; 20. Dorsal view.</p> |
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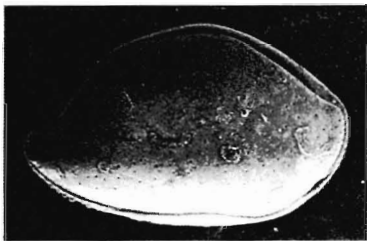
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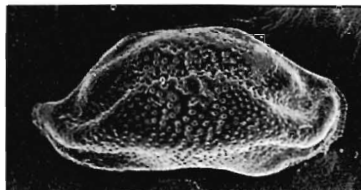
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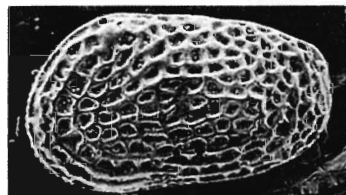
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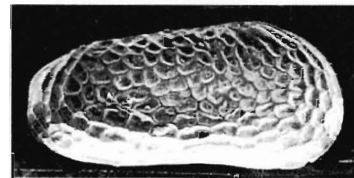
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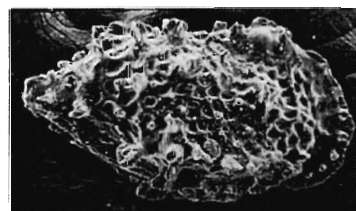
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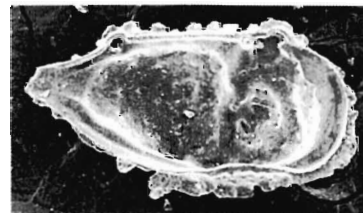
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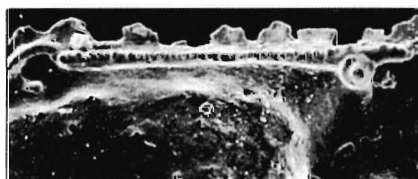
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16

50  $\mu$ m



17



18



rib terminating posteriorly to form a sharp but simple spine. This species was originally described by Brady (1968) as *Cytherura iniqua*. The same has been found to be widely occurring in many coastal areas of Asia and Persian Gulf, ranging from Pleistocene to Recent.

Originally, *Neomonoceratina* was erected by Kingma (1948) from Indonesian locality. Since then, over 30 species of this genus have been identified from various tropical and subtropical localities of the world (Zhao and Whatley, 1988). According to them, the western margins of the Pacific are the areas where *Neomonoceratina* is not only abundant, but also diverse since more than two-thirds of its species have been found to occur in that region.

*N. iniqua* is one of the widespread and abundantly occurring species during all the seasons, and its favourable substrates are silty sand and sand in the study area. This species occurs throughout the traverse with considerable population, thus, suggesting a wide range of tolerance to either active or passive parameters, such as surficial currents, salinity, temperature and high energy environment. It is also observed that this species can thrive in brackish as well as shallow marine habitat.

*Neomonoceratina porocostata* Howe & McKenzie, 1989

(Pl. I, fig.13)

*Neomonoceratina porocostata* Howe and McKenzie, 1989, pp.12-14, figs.60-61. – Hussain *et al.*, 1998, p.25, pl.1, figs.P. – Hussain, 1998, pp.4-5, pl. I, fig.13. – Hussain and Mohan, 2000, p.26, pl.1, fig.6.

**Material:** 132 carapaces and 20 open valves.

**Dimension:** Length 0.44 mm, height 0.25 mm.

**Remarks:** Howe and McKenzie (1989) recorded *N. porocostata* species for the first time from the Recent sediments of Darwin and northwestern Australia. Hussain (1998) recorded for the first time from Indian waters from off Tuticorin, east coast of India. This species occurs mostly in the substrates of either silty sand or sand in the study area.

**Genus** *Spinoceratina* Mostafawi, 1992

*Spinoceratina spinosa* (Annapurna & Rama Sarma, 1987)

(Pl. I, figs. 14-16)

*Cytherura halyi* (Scott) Misra and Shrivastava, 1979, pp. 297-298, pl. 2, fig. 3.

*Neomonoceratina spinosa* Annapurna and Rama Sarma, 1987, pp.179-180, pl.1, fig.E; pl.2, figs.4-5. – Hussain *et al.*, 1998, pp. 25-26, pl.1, fig.Q. – Hussain, 1998, p.5, pl.1, fig.14. – Hussain and Mohan, 2000, p.26, pl.1, fig.7.

*Neomonoceratina spinosa* Zhao and Whatley, Zhao and Whatley, 1988, p.572, pl.11, figs. 14-15.

*Spinoceratina spinosa* (Annapurna and Rama Sarma), Mostafawi, 1992, p.139, pl.2, figs.30-32.

**Material:** 114 carapaces and 18 open valves.

**Dimension:** Length 0.48 mm, Height 0.25 mm.

**Ramarks:** *N. spinosa* is characterised by its blunt spinose projections. This species was originally described by Annapurna and Rama Sarma (1987) from the east coast of India. Zhao and Whatley (1988) recorded the occurrence of an almost identical form as *N. spinosa* from the west Pacific margin, which seems conspecific to *N. spinosa* Annapurna and Rama Sarma, and is therefore considered to be a junior homonym.

Subsequently, Mostafawi (1992) established a new genus *Spinoceratina* based on the type species *N. spinosa* Zhao & Whatley.

**Family** *Pectocytheridae* Hanai, 1957

**Genus** *Kotoracythere* Ishizaki, 1966

*Kotoracythere inconspicua* (Brady, 1880)

(Pl. I, figs. 17-20)

*Cythere inconspicua* Brady, 1880, p.70, pl.13, figs. 1a-d. – Scott, 1905, p. 377.

*Leptocythere inconspicua* (Brady), Key, 1954, p. 354, pl.1, fig.4. – Guha, 1968a, pp.60-62, pl.4, fig.10.

*Callistocythere inconspicua* (Brady), Hanai, Ikeya, and Yajima, 1980, p.145.

*Pectocythere* sp. Tabuki and Nohara, 1988, pl.1, figs.3-4. *Morkhovenia inconspicua* (Brady), Teeter, 1975, p.435, figs.70-q, 8c. – Bonaduce *et al.*, 1980, p.144, pl.5, figs.10-14.

*Kotoracythere inconspicua* (Brady), Titterton and Whatley, 1988, p. 776. – Witte and van Harten, 1991, pp. 427-436, figs.3-5. – Witte, 1993, pp. 25-26, pl.3, figs. 19-22. – Sridhar *et al.*, 1998, p. 193, fig.3b.

**Material:** 101 carapaces and 22 open valves.

**Dimension:** Length 0.41 mm, Height 0.20 mm.

**Remarks:** *K. inconspicua* was reported for the first time from the Torres Strait, north of Australia by Brady (1880). Subsequently, this species has been widely recorded from various localities of the world, excepting the eastern Pacific coast. Witte and van

Harten (1991) reported this species from the beach samples of Joal, Senegal and Cape St. Mary, Gambia (West African coast). This is essentially a tropical, littoral species which is seldom found deeper than a few metres. It is a sandy-bottom dweller whose occurrence is often connected with reefs.

This species was reported for the first time from Indian waters, off Rameswaram by Sridhar *et al.* (1998). They also agree with the above observation from the Palk Bay.

**Genus *Keijia* Teeter, 1975**

*Keijia demissa* (Brady, 1868)

(Pl. II, fig.1)

*Cythere demissa* Brady, 1868, p. 180, p.1.12; 1880, p.66, p.1.12, fig.17.  
*Keijia demissa* (Brady), Teeter, 1975, pp.436-437, figs.7r-s, 8e. – Whatley and Quanhong, 1987, p.353, p.1.5, figs.27.28. – Zhao and Whatley, 1989a, p.171. – Mostafawi, 1992, p.140, p.1.2, fig.44. – Jellinek, 1993, p.121, p.1.8, figs.171-172. – Witte, 1993, pp.26-28, p.1.4, figs.10-12. – Shyam Sunder *et al.*, 1995, p.473. – Naidu, *et al.*, 1997, p.728, p.1.III, fig.3. – Hussain, 1998, p.6, p.1.I, fig.16.

**Material:** 129 carapaces and 17 open valves.

**Dimension:** Length 0.43 mm, Height 0.22 mm.

**Remarks:** *K. demissa* (Brady) was originally reported by Brady (1868) in his monograph of the Recent British ostracods. The diagnostic characters of this species are subquadrate shape of the carapace and the presence of a typical surface sculpture in the form of pores, reticulation and ridges and a vertical sulcus. This species is widely distributed in almost all the localities of the Indo-Pacific and in the tropics of the Atlantic and Carribean islands/Gulf of Mexico. It is found to occur mostly in silty sand substrate in the Palk Bay, off Rameswaram.

**Genus *Tanella* Kingma, 1948**

*Tanella gracilis* Kingma, 1948

(Pl. II, fig.2)

*Tanella gracilis* Kingma, 1948, pp. 87-89, p.1.X, fig.7. – Bate, 1971, p.246, pls. 1-3, fig.LL. – Jain, 1976, p. 128, p.1.2, figs.G-I; 1978, p. 97, figs. 2J1-4, 1981, p. 108, p.1.1, fig.9. – Paik, 1977, p. 40, p.1.8, fig.150. – Hartmann, 1978, p.80, p.1.4, figs.4-13, text figs. 108-113; 1980, p.126, p.1.7, figs. 11-18. – Sreenivas *et al.*, 1991, p. 496, p.1.1, figs.7-8. – Mostafawi, 1992, pp.139-140, p.1.2, fig.40. – Jellinek, 1993, p. 119, p.1.7, figs.145-150. – Varma *et al.*, 1993, p. 554. – Witte, 1993, pp. 31-32, p.1.4, figs. 13-15. – Vaidya and Mannikeri, 1994, p. 736. – Shyam Sunder *et al.*, 1995, p. 473. – Kumar and Hussain, 1997, pp. 133-134, p.1.1, fig.7. Naidu, *et al.*, 1997, p. 728, p.1.V, fig.5. – Hussain, 1998, pp. 6-7, p.1.I, fig.18. – Hussain and Mohan, 2000, p. 26, p.1.I,

fig.10.

*Tanella* sp. cf. *T. gracilis* Kingma, Whatley and Quanhong, 1988, p.6, pl. 6, figs.5-6.

**Material:** 783 carapaces and 96 open valves.

**Dimension:** Length 0.47 mm, Height 0.22 mm, Thickness 0.19 mm.

**Remarks:** *T. gracilis* is widely distributed in the Indo-Pacific and also reported from the Atlantic, including the Carribean.

Off Rameswaram, this is one of the abundantly occurring species during all the seasons, and is able to withstand the salinity and temperature variations. Its favourable substrates are silty sand and sand in the study area. The wide geographic distribution of *Kotoracythere inconspicua*, *Keijia demissa* and *Tanella gracilis* may be presumed primarily due to passive dispersal by ships, as also opined by Witte (1993).

**Family Cytheromatidae Elofson, 1939**

**Genus *Paracytheroma* Juday, 1907**

*Paracytheroma ventrosinuosa* Zhao & Whatley, 1989

(Pl. II, figs.3-4)

*Paracytheroma ventrosinuosa* Zhao and Whatley, 1989a, p.178, p.1.2, figs.12-14. – Mostafawi, 1992, p.142, p.1.2, fig.47. – Vaidya and Mannikeri, 1994, p.736. – Hussain, 1998, p.7, p.1.II, figs. 1-2.

**Material:** 89 carapaces and 37 open valves.

**Dimension:** Length 0.41 mm, Height 0.19 mm.

**Remarks:** Zhao and Whatley (1989a) first reported *P. ventrosinuosa* from the Recent sediments of southeastern Malay Peninsula from a depth range of 3-20 mts., in the fine sand, sandy gravel and mud substrates. A subreniform outline, rounded anterior margin, bluntly rounded posterior margin, deep oral concavity and a very wide inner lamella are the diagnostic characters.

**Family Cytherideidae Sars, 1925**

**Subfamily Cytherideinae Sars, 1925**

**Genus *Miocyprideis* Kollmann, 1960**

*Miocypridesis spinulosa* (Brady, 1868)

(Pl. II, fig.5)

*Cytheridea spinulosa* Brady, 1868, p.182, p.1.13, figs.1-6. – Brady,

1880, p. 112, pl. 33, figs. 6a-d.

*Clithrocytheridea atjehensis* Kingma, 1948, p. 70, figs. 6a-b.

*Clithrocytheridea spinulosa* (Brady), Key, 1954, p. 352, pl. 1, figs. 2a-b.

*Bishopina spinulosa* (Brady), Howe and McKenzie, 1989, p. 16, fig. 63.

*Miocyprideis spinulosa* (Brady), Zhao and Whatley, 1989b, p. 235, pl. 1, figs. 13-14. - Jellinek, 1993, p. 123, pl. 9, fig. 207. - Hussain, 1998, p. 7, pl. II, fig. 3.

**Material:** 45 carapaces and 9 open valves.

**Dimension:** Length 0.74 mm, Height 0.45 mm.

**Remarks:** A species of *Miocypridesis* is characteristic of its ovate shape, conspicuous anterior and posterior marginal denticles and a strong overlap of the left valve over the right one. Hussain (1998) reported *M. spinulosa* for the first time from India waters.

**Family** *Cushmanideidae* Puri, 1973

**Genus** *Cushmanidea* Blake, 1933

*Cushmanidea guhai* Jain, 1978

(Pl. II, figs. 6-7)

*Hulingsina* sp. A Paik, 1977, p. 40, pl. 2, figs. 40-43; pl. 8, fig. 152.

*Cushmanidea guhai* Jain, 1978, pp. 100-101, figs. 3A 1-A and 6D. - Vaidya and Mannikeri, 1994, p. 736.

**Material:** 55 carapaces and 9 open valves.

**Dimension:** Length 0.61 mm, Height 0.30 mm.

**Remarks:** *C. guhai* was originally reported by Jain (1978) from the beach sands of Mandvi, Kutch. To the authors' knowledge, this is the first report of the occurrence of *C. guhai* from the east coast of

India. From its zoogeographical distribution, it is understood that *C. guhai* is confined to Persian Gulf, Arabian Sea and eastern Bay of Bengal.

*Cushmanidea* sp.

(Pl. II, figs. 8-9)

**Material:** 7 carapaces and 2 open valves.

**Dimension:** Length 0.65 mm, Height 0.33 mm.

**Remarks:** The medium-sized carapace is elongate and subovate in general outline, with arched dorsum and a sinuate ventral margin. Anterior margin is broadly rounded with minute denticulations anteroventrally. Posterior margin is curved downwards with angle posteroventrally. Surface is ornamented with coarse and rounded pits. Left valve is larger than the right one and overlaps throughout the dorsal margin. Inner lamella wide anteriorly. Radial pore canals are numerous, simple and straight. Normal pores are numerous and sieve type. Musculature and hinge as for the genus.

**Genus** *Pontocythere* Dubowsky, 1939

*Pontocythere* sp.

(Pl. II, fig. 10)

**Material:** 3 carapaces and one open valve.

**Dimension:** Length 0.68 mm, Height 0.31 mm.

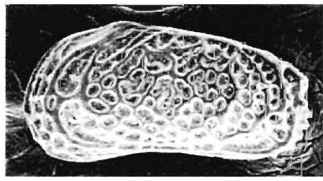
**Remarks:** This indeterminate taxa is characterised by its moderately large size and elongate ovate shape. Dorsal margin convex and

## EXPLANATION OF PLATE II

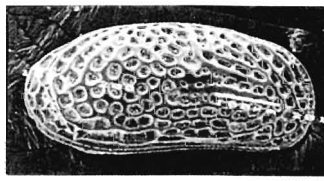
(Bar scale equals 100  $\mu$ m)

- |   |   |
|---|---|
| 1. <i>Keijia demissa</i> (Brady, 1868)<br>Left valve, external view.  | 11. <i>Alocopocythere reticulata indoaustratica</i> Hartmann, 1978<br>Right valve, external view                    |
| 2. <i>Tanella gracilis</i> Kingma, 1948<br>Left valve, external view.   | 12. <i>Chrysoocythere keiji</i> Jain, 1978<br>Left valve, external view   |
| 3-4. <i>Paracytheroma ventrosinuosa</i> Zhao & Whatley, 1989<br>3. Right valve, external view; 4. Right valve, internal view. | 13-14. <i>Stigmatocythere indica</i> (Jain, 1978)<br>13. Right valve, external view; 14. Left valve, internal view. |
| 5. <i>Miocyprideis spinulosa</i> (Brady, 1868)<br>Right valve, external view.   | 15-16. <i>Stigmatocythere kingmai</i> Whatley & Quanhong, 1988<br>15. Left valve, external view; 16. Dorsal view.   |
| 6-7. <i>Cushmanidea guhai</i> Jain, 1978<br>6. Right valve, external view; 7. Dorsal view.                                    | 17. <i>Keijella kiarwarensis</i> (Bhatia & Kumar, 1979)<br>Right valve, external view.                              |
| 8-9. <i>Cushmanidea</i> sp.<br>8. Right valve, external view; 9. Left valve, external view.                                   | 18. <i>Keijella reticulata</i> Whatley & Quanhong, 1988<br>Left valve, external view.                               |
| 10. <i>Pontocythere</i> sp.<br>Right valve, external view.  | 19. <i>Lankacythere coralloides</i> (Brady, 1886)<br>Right valve, external view.                                    |

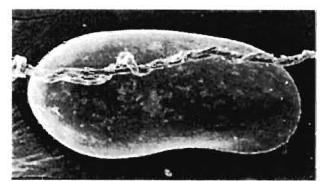




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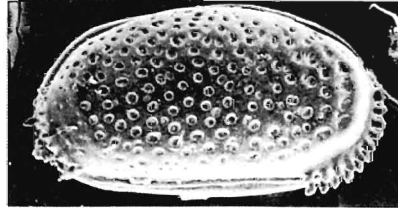
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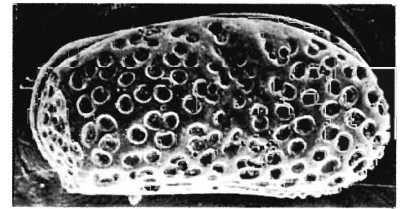
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4



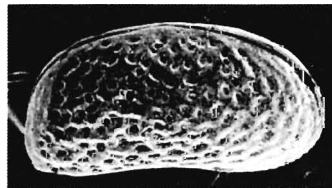
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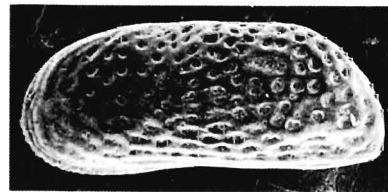
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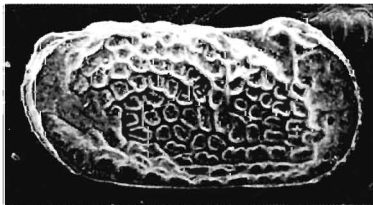
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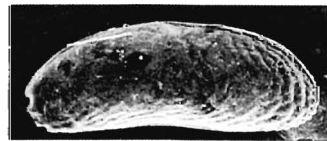
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16



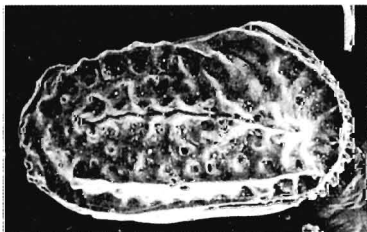
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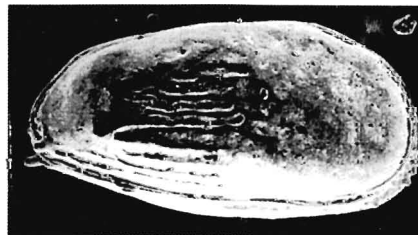
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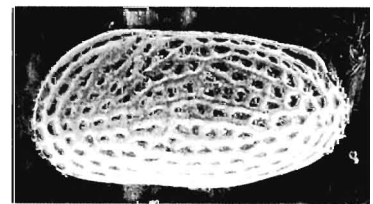
15



13



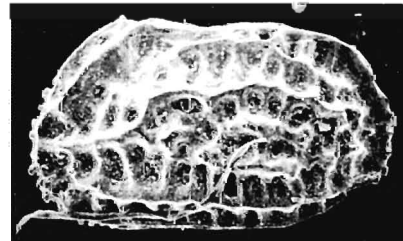
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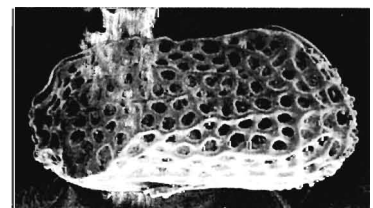
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14



12



19



ventral margin is concave medially. Maximum length ventral along and length is about 2½ times the height. Anterior end is rounded, and posterior end less so. Surface is ornamented with faint pittings, fine ribs anteriorly and posterior end is denticulated. Inner lamella is wide anteriorly and less so posteriorly and ventrally. Radial pore canals numerous anteriorly and appears branched, whereas posteriorly they are straight and simple. Normal pores are numerous. Four adductor scars are arranged subvertically with a v-shaped frontal scar. Hinge is merodont. For want of more material, this species is left under open nomenclature.

*Family* **Trachyleberididae** Sylvester-Bradley, 1948

*Subfamily* **Trachyleberidinae** Sylvester-Bradley, 1948

*Genus* **Alocopocythere** Siddiqui, 1971

*Alocopocythere reticulata indoaustralica*  
Hartmann, 1978

(Pl. II, fig. 11)

*Alocopocythere reticulata* (Hartmann), Bate, 1971, p. 246, pls. 1-3, fig. pp (non) *Alocopocythere reticulata* s.s. (Hartmann). – Gramann, 1975, p. 19, pl. 3, fig. 8 (non) *Alocopocythere reticulata* s.s. (Hartmann). – Paik, 1977, p. 40, pl. 5, figs. 79-81 (non) *Alocopocythere reticulata* s.s. (Hartmann) (non) *Alocopocythere reticulata* = Hartmann, 1978, pl. 1, fig. 6. – Jain, 1978, pl. 107, figs. 3G 1-3; 1981, p. 112, pl. 2, fig. 3. – Bhatia and Kumar, 1979, p. 173, pl. 1, fig. 6. – Vaidya and Mannikeri, 1994, p. 736.

*Material* : 123 carapaces and no open valves.

*Dimension* : Length 0.78 mm., Height 0.43 mm.

*Remarks*: *A. reticulata indoaustralica* Hartmann was originally recorded from Australia by Hartmann (1978). This species is widely reported along the west coast of India by Jain (1978, 1981), Bhatia and Kumar (1979) and Vaidya and Mannikeri (1994). To the authors' knowledge, this is the first report of *A. reticulata indoaustralica* from the east coast of India. This species is found to occur mostly in the substrates of sand and silty sand in the study area.

*Genus* **Chrysocythere** Ruggieri, 1961

*Chrysocythere keiji* Jain, 1978

(Pl. II, fig. 12)

*Chrysocythere* sp. Paik, 1977, p. 40, pl. 9, fig. 160.

*Chrysocythere keiji*, Jain, 1978, pp. 113-116, figs. 3 L 1-2, and 6 K; 1981, p. 108, pl. 2, fig. 2. – Bhatia and Kumar, 1979, pl. 3, figs. 6-8. – Verma *et al.*, 1993, p. 554. – Vaidya and Mannikeri, 1994, p. 736. – Hussain, 1998, p. 9, pl. 11, fig. 8. – Hussain and Mohan, 2000, p. 26, pl. 1, fig. 13.

*Material*: 102 carapaces and 15 open valves.

*Dimension*: Length 0.63 mm, Height 0.31 mm.

*Remarks*: *C. keiji* was first recorded from the beach sands of Mandvi (Jain, 1978). Paik (1977) recorded the same from the Persian Gulf. Later, *C. keiji* was recorded from off Karwar (Bhatia and Kumar, 1979; Vaidya and Mannikeri, 1994) and from the southwest Kerala coast (Jain, 1981). From its zoogeographical distribution, this species appears to be confined to Persian Gulf, Arabian Sea and Bay of Bengal.

*Genus* **Stigmatocythere** Siddiqui, 1971

*Stigmatocythere indica* (Jain, 1978)

(Pl. II, figs. 13-14)

*Carinocythereis* (*Tandonella*) *indica* Jain, 1978, p. 110, figs. 3J 1-3, 6I; 1981, p. 108, pl. 2, fig. 1. – Bhatia and Kumar, 1979, p. 173, pl. 3, fig. 6. *Stigmatocythere indica* (Jain) – Whatley and Quanhong, 1988, p. 9, pl. 6, figs. 20-21. – Varma *et al.*, 1993, p. 554. – Vaidya and Mannikeri, 1994, p. 736. – Naidu *et al.*, 1997, p. 728, pl. V, fig. 4. – Hussain and Mohan, 2000, p. 26, pl. II, fig. 1.

*Material*: 58 carapaces and 21 open valves.

*Dimension*: Length 0.57 mm, Height 0.26 mm.

*Remarks*: *S. indica* was originally reported by Jain (1978) from the beach sands of Mandvi, Kutch. However, while recording the same from Malacca Straits, this species has been transferred to *Stigmatocythere* by Whatley and Quanhong (1988). This species has also been recorded from southwest Kerala coast (Jain, 1981), off Karwar (Bhatia and Kumar, 1979; Vaidya and Mannikeri, 1994). From east coast of India, Varma *et al.* (1993) recorded this species for the first time.

*Stigmatocythere kingmai* Whatley & Quanhong,  
1988

(Pl. II, figs. 15-16)

*Cythereis hamata* Müller, Kingma, 1948, p. 80, pl. 9, figs. 5a-b. *Carinocythereis hamata* (Müller), Bate, 1971, p. 246, pl. 1, fig. v. *Carinocythereis* (*Carinocythereis*) cf. *C. hamata* (Müller), Jain, 1978, p. 108, fig. 3H; 1981, pl. 3, fig. 7.

*Carinocythereis* (*carinocythereis*) *hamata* (Müller), Bhatia and Kumar, 1979, p. 173, pl. 2, fig. 5.

*Stigmatocythere kingmai* Whatley and Quanhong, 1988, pp. 10-11, pl. 6, figs. 24-28. – Vaidya and Mannikeri, 1994, p. 736.

*Material:* 257 carapaces and 41 open valves.

*Dimension:* Length 0.52 mm, Height 0.31 mm.

*Remarks:* *Cythereis hamata* Kingma (1948) was first described from the Pliocene of Sumatra. This has been referred to as *Carinocythereis* (*Carinocythereis*) *hamata*, by Jain (1978) as well as Bhatia and Kumar (1979), while reporting from the Recent sediments of west coast of India. After careful observations, Whatley and Quanhong (1988) considered this species as synonymous with their new species described as *Stigmatocythere kingmai*, on the basis of the occurrence of an almost straight eye rib and 3 longitudinal ribs. Maximum number of specimens of *S. kingmai* have been recorded during summer season (April) in the Palk Bay, off Rameswaram.

*Subfamily* **Campylocytherinae** Puri, 1960

*Genus* ***Keijella*** Ruggieri, 1967

*Keijella karwarensis* (Bhatia & Kumar, 1979)

(Pl. II, fig. 17)

*Bosquetina* sp. Bate, 1971, pls. 1-2, fig. ee.

*Ruggieria* (*Keijella*) sp. A. Paik, 1977, p.1.6, figs. 96-98; p.1.9, fig. 165.

*Jainella karwarensis* Bhatia and Kumar, 1979, p. 175, p.1.2, figs. 6-8.

*Keijella karwarensis* (Bhatia and Kumar), Whatley and Quanhong, 1988, pp. 12-13, p.1.7, figs. 17-18. – Vaidya and Mannikeri, 1994, p.736. – Naidu *et al.*, 1997, p. 728, p.1. III, fig. 7-9. – Hussain, 1998, p. 9, p.1. II, fig.9.

*Material:* 55 carapaces and 20 open valves.

*Dimension:* Length 0.61 mm, Height 0.30 mm.

*Remarks:* *K. karwarensis* of Rameswaram are identical to the figures and description of *Jainella karwarensis* reported by Bhatia and Kumar (1979) from off Karwar. On *J. karwarensis*, they (1979) remarked, "This new genus, which has been variously assigned to *Bosquetina* by Bate and *Keijella* by Paik, is apparently closely related to the *Ruggieria-Keijella* group, from which it differs in having a smooth surface, broad anterior and posterior vestibulum and the indented nature of the line of concrescence where the marginal pore canals originate. This differs from *Bosquetina* in the hinge line, presence of anterior and posterior vestibulum and in lacking the ventrolateral keel". However, this species has been subsequently transferred to the genus *Keijella* by Whatley and Quanhong (1988)

while recording the same from Malacca Straits. Hussain (1998) reported *K. karwarensis* for the first time from the east coast of India.

*Keijella reticulata* Whatley & Quanhong, 1988

(Pl. II, fig. 18)

*Keijella reticulata* Whatley and Quanhong, 1988, p. 15, p.1. 7, figs. 19-23. – Hussain, 1998, pp. 9-10, p.1. II, fig. 10. – Vaidya and Mannikeri, 1994, p. 736. – Sridhar *et al.*, 1998, p. 193, fig. 3f. – Hussain and Mohan, 2000, p. 26, p.1. II, fig.3.

*Material:* 93 carapaces and 19 open valves.

*Dimension:* Length 1.02 mm, Height 0.53 mm.

*Remarks:* *K. reticulata* is characterized by large size and reticulate ornamentation, with the reticulation dominated by longitudinal muri on the median and ventral areas and rather radial muri dorsally. Though the present species resembles *K. papuensis* (Brady) in the occurrence of reticulate ornamentation, it differs in the elongate shape and in lacking the posteroventral spine. This species also differs from *K. apta* (Guan) in its rod-like denticles as against the reticulation dominated by longitudinal muri and fine posterior marginal denticulations of the latter. The present species may also be differentiated from *K. whatleyi* Jain in having reticulation and in the absence of longitudinal ribs.

*Genus* ***Lankacythere*** Bhatia & Kumar, 1979

*Lankacythere coralloides* (Brady, 1886)

(Pl. II, fig.19)

*Cythere coralloides* Brady, 1886, p. 307, p.1. 39, figs. 19-22

*Cythereis reticulineaata*, Kingma, 1948, p. 82, p.1. 9, figs. 2a-b.

*Cythere coralloides* Brady, Misra and Shrivastava, 1979, p. 294, p.1.1, fig. 5.

*Lankacythere coralloides* (Brady), Bhatia and Kumar, 1979, p.1.1, figs.1-5. – Jain, 1981, p.108, p.1.1, fig.12. – Whatley and Quanhong, 1988, p.17, p.1. 8, figs.19-22. – Zhao and Whatley, 1989b, pp. 241-242, p.1.2, figs.12-15. – Mostafawi, 1992, p. 148, p.1.4, figs.89-90. – Jellinek, 1993, p. 127, p.1.17, figs. 322-323. – Vaidya and Mannikeri, 1994, p.736. Naidu *et al.*, 1997, p. 728, p.1.III, fig.10. – Hussain, 1998, p. 10, p.1. II, figs. 11-12. – Sridhar *et al.*, 1998, p.193, figs.3g-h.

*Material:* 87 carapaces and 33 open valves.

*Dimension:* Length 0.71 mm, Height 0.32 mm.

*Remarks:* Brady (1886) originally recorded this species from off Ceylon (now Sri Lanka). Bhatia examined the taxa described by Bate (1971) and Jain (1978) and opined that both are assignable to the genus *Lankacythere* (Bhatia and Kumar, 1979,

p.176). However, in those two indeterminate taxa, the posteroventral ridge is less prominent. This may be due to the reason that the taxa illustrated by those two authors (*op.cit.*) are females. In the present material, the males are found to exhibit a prominent posteroventral ear-shaped ridge, while in females it is not prominent.

**Family Hemicytheridae** Puri, 1953

**Subfamily Hemicytherinae** Puri, 1953

**Genus Mutilus** Neviani, 1928

*Mutilus pentoekensis* (Kingma, 1948)

(Pl. III, fig. 1)

*Hemicythere pentoekensis* Kingma, 1948, p. 77, pl. 8, figs. 4a-b.

*Quadracythere pentoekensis* (Kingma) – Gramann, 1975, p.12.

*Mutilus* sp. Jain, 1978, pp.119 and 112, figs.4E 1-2.

*Radimella* sp. indet. Jain, 1981, p. 108, pl. 3, fig.1.

*Mutilus pentoekensis* (Kingma), Zhao and Whatley, 1989a, p.245, pl.4, figs. 15-18. – Vaidya and Mannikeri, 1994, p. 736. – Hussain and Mohan, 2000, p. 26, pl. II, figs. 7-8.

**Material:** 797 carapaces and 189 open valves.

**Dimension:** Length 0.54 mm, Height: 0-31 mm.

**Remarks:** This species was originally reported from Indonesia by Kingma (1948) as *Hemicythere pentoekensis*. While revising the new species described by Kingma (1948), Zhao and Whatley (1989a), included this species under the genus *Mutilus*. *Mutilus* sp. and *Radimella* sp. reported by Jain (1978 and 1981 respectively) appear to be conspecific with *M. pentoekensis*.

To the authors' knowledge, this is the first report of the occurrence of this species from the east

coast of India. It is found to be widespread and abundant in the study area and its favourable substrates are silty sand and sand.

**Subfamily Orionininae** Puri, 1973

**Genus Caudites** Coryell & Fields, 1937

*Caudites javana* Kingma, 1948

(Pl. III, fig. 2)

*Caudites medialis* Coryell and Fields var. *javana* Kingma, 1948, p.85, pl. X, fig. 5.

*Caudites javana* Kingma, Key, 1953, p. 159, pl.1. figs. 8a-c and 9; 1954, p.358, pl. 2, figs. 12-13. – Guha, 1968a, p. 64, pl.V, figs. 13 and 19. – Jain, 1978, vol. 11, no. 2, p. 122, figs.4F1-3. Khosla *et al.*, 1982, pp. 361-371, pl.1, fig.18. – Howe and McKenzie, 1989, p. 39, fig. 162. – Vaidya and Mannikeri, 1994, p. 736. – Hussain, 1998, pp. 11-12, pl. II, fig.15. Hussain and Mohan, 2000, p. 26, pl.II, fig. 9.

**Material:** 149 carapaces and 22 open valves.

**Dimension:** Length 0.54, Height 0.29 mm.

**Remarks:** A review of the available literature shows that this species is confined in its occurrence to different localities of Indo-Pacific region. Most of the specimens are found either in silty sand or sand in the study area.

*Caudites sublevis* Bonaduce *et al.*, 1980

(Pl. III, fig. 3)

*Caudites rosaliensis* Swain, Misra and Shrivastava, 1979, pp. 295-296, pl.1, fig. 9.

*Caudites sublevis* Bonaduce *et al.*, 1980, p. 156, pl. 6, figs. 1-5. – Vaidya and Mannikeri, 1994, p. 736. – Hussain, 1998, pp. 12, pl. II, fig. 16.

*Caudites* sp. indet. Jain, 1981, p. 108, pl. 2, fig. 9.

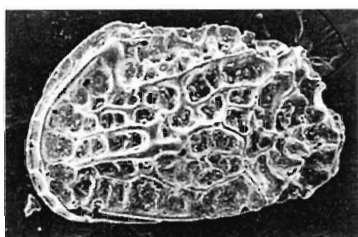
**Material:** 140 carapaces and 48 open valves.

**Dimension:** Length 0.57 mm, Height 0.32 mm.

#### EXPLANATION OF PLATE III

(Bar scale equals 100 µm unless mentioned) →

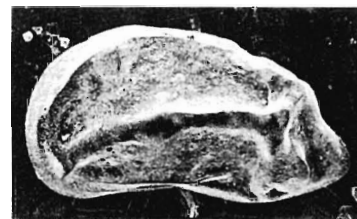
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|---|---|
| 1. <i>Mutilus pentoekensis</i> (Kingma, 1948)<br>Left valve, external view.   | 8-9. <i>Loxoconcha mandviensis</i> Jain, 1978<br>8. Right valve, external view; 9. Sieve Type normal pores.   |
| 2. <i>Caudites javana</i> Kingma, 1948<br>Right valve, external view.   | 10-11. <i>Loxoconchella anomala</i> (Brady, 1880)<br>Right valve, external view; 11. Left valve, internal view.   |
| 3. <i>Caudites sublevis</i> Bonaduce <i>et al.</i> , 1980<br>Left valve, external view.   | 12-13. <i>Loxocorniculum liljeborgii</i> Brady, 1868<br>12. Left valve, external view; 13. Right valve, internal view.  |
| 4-6. <i>Neocytheretta murilineata</i> Zhao & Whatley, 1989<br>4. Right valve, external view; 5. Right valve, internal view.<br>6. Dorsal view | 14-15. <i>Neosinocythere dekrooni</i> (Kingma, 1948)<br>14. Right valve, external view; 15. Dorsal view.  |
| 7. <i>Neocytheretta snellii</i> (Kingma, 1948) Right valve, external view.  | <b><i>Hemicytherura</i> sp.</b><br>16. Right valve, external view.<br><b><i>Semicytherura</i> cf. <i>contraria</i></b> Zhao & Whatley, 1989<br>Left valve, external view. |



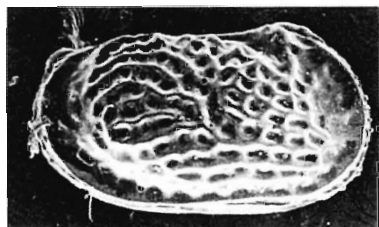
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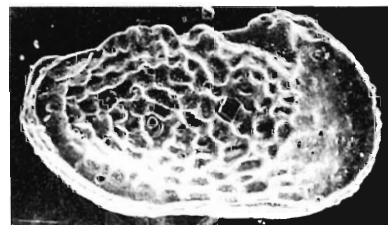
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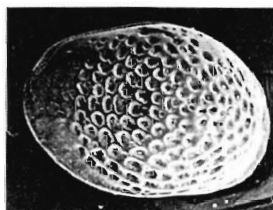


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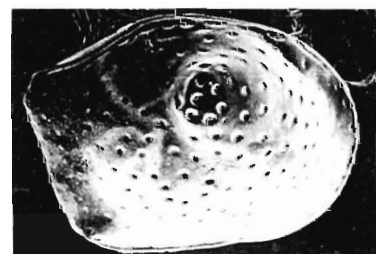


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5  $\mu$ m

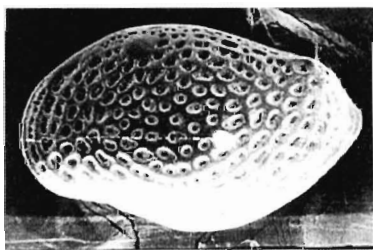


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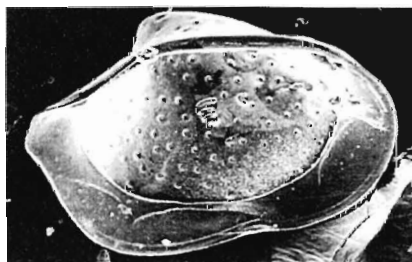


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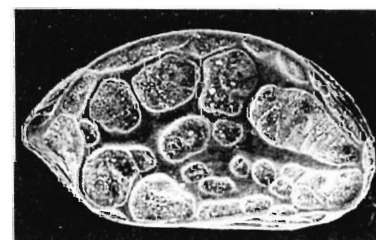
50  $\mu$ m



12



11



16



13



14



15



17

*Remarks:* *C. sublevis* is characterised by a median ridge extending from posterodorsal to anteroventral ends, and by a comparatively smooth surface. Maximum number of specimens have been found in the substrate of silty sand in the Palk Bay, off Rameswaram.

**Family Cytherettidae** Triebel, 1972

**Genus *Neocytheretta*** van Morkhoven, 1963

*Neocytheretta murilineata* Zhao & Whatley, 1989

(Pl. III, figs. 4-6)

*Neocytheretta murilineata* Zhao and Whatley, 1989 (Pl. III, figs.4-6)  
*Neocytheretta murilineata* - Zhao and Whatley, 1989a, pp.181-182, p1.3, figs. 11-15. - Mostafawi, 1992, p.150,p1.5, fig.98. - Hussain, 1998, p.11, p1.II, fig.18.

*Material:* 327 carapaces and 105 open valves.

*Dimension:* Length 0.65, Height 0.31 mm.

*Remarks:* *N. murilineata* is characterised by longitudinal muri of reticulate ornamentation, rather smooth posterior end and a blunt spine posteroventrally. This spine is noticed in both the valves. This species resembles *N. ventrocostata* Howe & McKenzie in general outline and inner lamella but the latter's reticulations are closely spaced and the dorsal ridge is overhanging near posterodorsal margin.

*N. murilineata* was originally reported by Zhao and Whatley (1989a) from southeastern Malay Peninsula. Hussain (1998) reported this species for the first time from Indian waters. This species is found to be widespread and abundant in the study area. The maximum number occurs in the substrates of silty sand in all seasons and also in clayey sand during winter.

*Neocytheretta snellii* (Kingma, 1948)

(Pl. III, fig. 7)

*Paracytheretta snellii* Kingma, 1948, p.77, p1.7, figs. 14a-c.

*Neocytheretta snellii* (Kingma) van Morkhoven, 1963, pp.236-239, figs.356-359. - Keij, 1979, p.60, p1.1, figs.5-6. - Malz, 1980, p.50, p1.1, figs. 1-5. - Gou *et al.*, 1981, p.152, p1.76, figs.21-23. - Zhao *et al.*, 1985, p.200, p.19, fig.15. - Whatley and Quanhong, 1988, p.22, p1.9, figs. 18-19. - Mostafawi, 1992, p.150, p1.5, fig.96. *Material:* 13 carapaces and 4 open valves.

*Dimension:* Length 0.62, Height 0.28 mm.

*Remarks:* This species was originally described

by Kingma (1948) from the Recent sediments of Java Sea. Subsequently, while establishing a new genus *Neocytheretta*, van Morkhoven (1963) revised and redescribed this species under the genus *Neocytheretta*. This species has been reported from Indonesian waters, South China Sea. From its distribution, it is understood that the same is found to occur in warmer and shallow water regions. To the authors' knowledge this is the first report of occurrence of *N. snellii* from Indian waters.

**Family Loxoconchidae** Sars, 1925

**Genus *Loxoconcha*** Sars, 1866

*Loxoconcha mandviensis* Jain, 1978

(Pl. III, figs. 8-9)

*Loxoconcha mandviensis* Jain, 1978, p.125, figs.4k1-2, 60. - Vaidya and Mannikeri, 1994, p.736.

*Material:* 105 carapaces and 39 open valves.

*Dimension:* Length 0.49 mm, Height 0.29 mm.

*Remarks:* *L. mandviensis* was originally reported from the beach sands of Mandvi, Kutch (Jain, 1978). Its characteristic features are the concentrically arranged reticules, conspicuous smooth posterior margin, wide inner lamella both anteriorly and posteriorly, and sieve-type normal pores, and straight and simple radial pore canals. Most of the specimens are found either in the substrate of silty sand or sand in the study area. To the authors' knowledge, this is the first report of occurrence of the *L. mandviensis* from the east coast of India.

**Genus *Loxoconchella*** Triebel, 1954

*Loxoconchella anomala* (Brady, 1880)

(Pl. III, figs. 10-11)

*Loxoconcha anomala* Brady, 1880, p. 123, p1. 28, figs. 5a-d.  
*Loxoconchella anomala* (Brady), Holden, 1967, p. 34, figs. 25a-f. - Jain, 1978, p. 127, fig. 5D. - Vaidya and Mannikeri, 1994, p. 736.

*Material:* 29 carapaces and 12 open valves.

*Dimension:* Length 0.53 mm, Height 0.35 mm.

*Remarks:* Brady (1880) reported *Loxoconcha anomala* from Honolulu in the Pacific. Subsequently, Holden (1967) redescribed this species and shifted the same to the genus *Loxoconchella*, based on its general outline, adont hinge and complex radial pore

canals. From the west coast of India, Jain (1978) recorded this species from Mandvi beach. In the east coast of India, this is known to occur in the Gulf of Mannar (Scott, 1905).

**Genus *Loxocorniculum*** Benson & Coleman, 1863

*Loxocorniculum lilljeborgii* Brady, 1868

(Pl. III, figs. 12-13)

*Loxoconcha lilljeborgii* Brady, Key. 1954, p. 358, pl. 3, fig. 4. – Guha, 1968a, p. 61, pl. 4, fig. 2. – Zhao *et al.*, 1985, p. 206, pl. 20, fig. 12. – Whatley and Quanhong, 1987, p. 351, pl. 5, fig. 13.

*Loxoconcha lilljeborgii* Brady, Mostafawi, 1992, p. 151, pl. 5, fig. 102. – Vaidya and Mannikeri, 1994, p. 736. – Naidu *et al.*, 1997, p. 728, pl. IV, figs. 2-3.

*Loxocorniculum lilljeborgii* (Brady), Hussain, 1998, p. 7, pl. III, figs. 1-2.

**Material:** 1256 carapaces and 175 open valves.

**Dimension:** Length 0.52 mm, Height 0.27 mm.

**Remarks:** *L. lilljeborgii* is characteristic of its subrhomboidal shape, reticulate ornamentation and in the possession of a distinct posterodorsal ear-like node. Zhao *et al.* (1985) recorded the same as *Loxoconcha lilljeborgii* from South China Sea, and by Whatley and Quanhong (1987) from Malacca Straits. *Loxoconcha* sp. cf. *lilljeborgii*, recorded by Jain (1981) from the west coast of India, is almost similar to the present species. In the study area, this species is found to be abundant and widespread during all the seasons. Its favourable substrates are silty sand and sand.

**Family *Sinocytheridae*** Huang, 1985

**Genus *Neosinocythere*** Huang, 1985

*Neosinocythere dekrooni* (Kingma, 1948)

(Pl. III, figs. 14-15)

*Cythereis dekrooni* Kingma, 1948, pp. 79-80, pl. 9, figs. 15a-b. *Neosinocythere dekrooni* (Kingma), Zhao and Whatley, 1989b, pp. 243-244, pl. 4, figs. 9-12. – Varma *et al.*, 1993, p. 557, pl. 2, figs. 1-3. – Naidu *et al.*, 1997, p. 728, pl. IV, figs. 7-8. – Kumar and Hussain, 1997, p. 134, pl. I, fig. 9.

**Material:** 21 carapaces and 13 open valves.

**Dimension:** Length 0.43 mm, Height 0.21 mm.

**Remarks:** *Cythereis dekrooni* was originally reported by Kingma (1948) from the upper Pliocene beds of Sangiran, east Java. Subsequently, Zhao and Whatley (1989b), while making the taxonomic revision of the new species described by Kingma

(1948), shifted the same to *Neosinocythere* Huang. This species has been reported for the first time from the Indian waters by Varma *et al.* (1993) from Tekkali Creek, east coast of India. *N. dekrooni* is characterised by subrhomboidal shape, posteroventral caudal process, with subcentral, posterodorsal, posteroventral, anteroventral and posterior tubercles and the fine and dense punctae on entire surface.

**Family *Cytheruridae*** G.W. Müller, 1894

**Subfamily *Cytherurinae*** G.W. Müller, 1894

**Genus *Hemicytherura*** Elofson, 1941

*Hemicytherura* sp.

(Pl. III, fig. 16)

**Material:** 30 carapaces and 18 open valves.

**Dimension:** Length 0.32 mm, Height 0.22 mm.

**Remarks:** The carapace is small and subtriangular in general outline. The dorsal margin is strongly arched, whereas the ventral margin is nearly straight. Anterior end is obliquely rounded and the posterior end possesses a well developed caudal process in the middle. Surface is ornamented with about 22-24 fossae of various sizes and shapes. Each fossa has numerous, minute pits. Left valve overlaps the right anterodorsally, ventrally and at the caudal process. Inner lamella is wide anteriorly. Normal pores are numerous. Radial pore canals are simple and straight.

This species resembles *H. santosensis* Swain and Gilby in general outline; however, it differs from the latter in the arrangement of fossae and in the absence of median longitudinal ridge. The present species is also similar to *H. subulata* Ahmed *et al.* in lateral outline but differs in having a less arched dorsum, arrangement of the fossae and in the absence of conspicuous anterior marginal notches.

**Genus *Semicytherura*** Wager, 1957

*Semicytherura* sp. cf. *S. contraria* Zhao & Whatley, 1989

(Pl. III, fig. 17)

*Semicytherura contraria* Zhao and Whatley, 1989a, pp. 173-174, pl. 1, figs. 10-14. – Hussain, 1998, p. 12, pl. III, fig. 4.

**Material:** 112 carapaces and 11 open valves.

*Dimension:* Length 0.42 mm, Height 0.21 mm.

*Remarks:* *S. contraria* was first reported from the Recent sediments of southeastern Malay Peninsula by Zhao and Whatley (1989a). The present species resembles *S. minurensis* Hanai in the nature of ornamentation. However, the former differs in the occurrence of a straight dorsal margin and a small but conspicuous subalar process. Though the present species resembles *S. peypouqueti* Bonaduce *et al.*, the latter has stronger alae and comparatively denser punctae. The only other report of the occurrence of *S. contraria* in Indian waters is by Hussain (1998).

*Semicytherura* sp.

(Pl. IV, fig. 1)

*Material:* 38 carapaces and 21 open valves.

*Dimension:* Length 0.41 mm, Height 0.20 mm.

*Remarks:* The small carapace is elongate-ovate in lateral outline. Dorsal margin is arched and the ventral margin is sinuous anteriorly and convex posteriorly. Anterior margin is obliquely rounded, whereas the posterior margin develops to form a prominent mid-posterior caudal process. The surface ornamentation consists of about 12-14 longitudinal ribs, with a faint reticulate pattern posteriorly. The remaining surface is finely pitted or almost smooth. Inner lamella is wide anteriorly and less so posteriorly. Radial pore canals are many. Muscle pattern and hinge are as for the genus.

This indeterminate species resembles *S. contraria* Zhao and Whatley in general outline and internal features; however, it differs in the ventral marginal curvature, in the absence of intercostal punctae, and a small alar process.

*Genus Paijenborchellina* Kuznetsova, 1957

*Paijenborchellina prona* (Lubimova and Guha, 1960)

(Pl. IV, figs. 2-4)

*Paijenborchella prona* Lubimova and Guha, Lubimova, Guha and Mohan, 1960, pp. 43-44, pl. 4, figs. 1 a-b. – Guha, 1968b, p. 213, pl. 2, fig. 4.

*Paijenborchella (Eopaijenborchella) prona* Lubimova and Guha – Khosla, 1978, p. 274, pl. 5., fig. 8.

*Paijenborchellina prona* (Lubimova and Guha), Khosla and Nagori, 1989, p. 49, pl. 12, fig. 1. – Hussain, 1998, p. 5, pl. 1, fig. 15.

*Material:* 44 carapaces and 18 open valves.

*Dimension:* Length 0.62 mm, Height 0.32 mm.

*Remarks:* This species of *Paijenborchellina* is characterised by the presence of fine ribs and numerous pits on the surface. The pear-shape, obliquely rounded anterior end, prominent posteroventral caudal process, two prominent tubercles in the middle of the valve, minute pits on the ventral and anterior regions arranged almost parallel to the respective margins are some of its characteristic features. This species appears to be confined to the Tertiary and Recent sediments of the Indian region.

*Subfamily Cytheropterinae* Hanai, 1957

*Genus Cytheropteron* Sars, 1866

*Cytheropteron* sp.

(Pl. IV, fig.5)

*Material:* 28 carapaces and 9 open valves.

*Dimension:* Length 0.62 mm, Height 0.32 mm.

*Remarks:* The medium-sized carapace is ovate in lateral outline. The dorsal margin is convex, whereas the ventral margin is almost straight with ventrolaterally developed wing-like structures (alar processes). Anterior margin is rounded and the posterior margin has developed a prominent caudal process. The surface is smooth but for these lateral wing-like extensions and an anterodorsal tubercle. Inner lamella is moderately wide anteriorly. Normal pores are few, open and scattered. Radial pore canals are few in number and widely spaced. Hinge is of merodont type.

*Genus Kangarina* Coryell and Fields, 1937

*Kangarina abyssicola* (G.W. Müller, 1894)

(Pl. IV, fig.6)

*Cytheropteron abyssicolum* Müller, 1894, p. 302, pl. 20, figs. 5-11; pl. 21, figs. 6-9.

*Hemicytherura (Kangarina) abyssicola* (G.W. Müller) Ruggieri, 1953, no.2A, vol.23, p. 53, figs. 15-15a.

*Kangarina abyssicola* (G.W. Müller), van den Bold, 1963b, pl. 10, fig. 1. – Guha, 1968a, p. 62, pl. IV, fig. 12. – Bonaduce *et al.*, 1976, p. 84, pl. 17, fig. 16 *et syn.* – Jain, 1978, pp. 128-129, figs. 5G1-2. Malz and Jellinek, 1984, p. 150. – Witte, 1993, pp. 72-73, pl. 9, figs. 25-26. – Hussain, 1998, pp. 12-13, pl. III, figs. 6-7.

*Material:* 59 carapaces and 9 open valves.



*Dimension:* Length 0.39 mm, Height 0.22 mm.

*Remarks:* *K. abyssicola* is characteristic of its small size of the carapace, arrangement of ridges and the occurrence of subrounded pittings on the surface. G.W. Müller (1894) reported *Cytheropteron abyssicolum* from the Gulf of Naples. Subsequently, the same was described under the genus *Kangarina* by many authors like van den Bold (1963b) from Trinidad; Guha (1968a) from Andaman Islands; Jain (1978) from the beach sands of Mandvi; and (Hussain, 1998) off Tuticorin.

*Family Xestoleberididae* Sars, 1928

*Genus Ornatoleberis* Keij, 1975

*Ornatoleberis morkhoveni* Keij, 1975

(Pl. IV, figs. 7-8)

*Cythere bimamillata* Brady, 1886, p. 309, pl. 40, figs. 10-12.  
*Ornatoleberis morkhoveni* nom. nov. – Keij, 1975, pp. 234-236, pl. 1, figs. 1-7.

*Ornatoleberis morkhoveni* Keij, Misra and Shrivastava, 1979, pp. 300-301, pl. 2, fig. 13. – Whatley and Quanhong, 1988, p. 26, pl. 10, fig. 20. – Hussain, 1998, p. 13, pl. III, fig. 11.

*Material:* 10 carapaces and 3 open valves.

*Dimension:* Length 0.39 mm, Height 0.28 mm.

*Remarks:* *O. morkhoveni* is characterised a thick valve, ornamented with short ridges and a prominent ear-shaped carina occupying the central and posteroventral regions.

*Genus Xeslotoberis* Sars, 1866

*Xestoleberis variegata* Brady, 1880

(Pl. IV, figs. 9-10)

*Xestoleberis variegata*, Brady, 1880, p. 129, pl. 31, figs. 8a-g. – Guha, 1968a, p. 64, pl. 4, fig. 19. – Kaesler and Waters, 1972, p. 17, figs. 6-9. – Khosla, 1978, p. 276, pl. 5, fig. 20. – Wang and Quanhong, 1985, p. 77, pl. 8, fig. 15. – Zhao *et al.*, 1985, p. 201, pl. 20, fig. 16. – Mostafawi, 1992, p. 156, pl. 6, fig. 136. – Hussain, 1998, pp. 13, pl. III, figs. 8-10.

*Xestoleberis* cf. *X. variegata* Brady, Kingma, 1948, p. 99, pl. VIII, fig. 9. – Jain, 1978, p. 129, figs. 5H 1-3.

*Material:* 504 carapaces and 150 open valves.

*Dimension:* Length 0.49 mm, Height 0.34 mm.

*Remarks:* This species was reported from off St. Vincent by Brady (1880). Subsequently, this species has been reported from the following localities: from off Ceylon (Scott, 1905); from off Andaman islands,

Bay of Bengal (Guha, 1968a); from the beach sands of Mandvi (Jain, 1978); from the South China Sea (Zhao *et al.*, 1985) and from the East China Sea (Wang and Quanhong, 1985). Though the present species is much similar to *X. malaysiana* Zhao and Whatley in general outline, the latter has a much more rounded and symmetrical posterior margin. *X. cf. variegata* of Kingma (1948, Malayan region) differs from *X. variegata* Brady in the occurrence of a straight ventral margin and a weak punctation on the surface. Zhao *et al.* (1985, p. 201), while reporting *X. variegata* from the South China Sea, stated that this species is indicative of warm waters. In the Palk Bay, this is one of the widespread and abundantly occurring species indicative of warm waters and its favourable substrate is found to be silty sand.

*Family Paradoxostomatidae* Brady & Norman, 1889

*Genus Paradoxostoma* Fischer, 1855

*Paradoxostoma* sp. cf. *P. subtile* Bonaduce *et al.*, 1980

(Pl. IV, fig. 11)

*Paradoxostoma subtile* Bonaduce, Masoli, Minichelli and Pugliese, 1980, p. 176, p. 10, figs. 5-6; pl. 7, fig. 7.

*Material:* 3 carapaces and no open valves.

*Dimension:* Length 0.68 mm, Height 0.28 mm.

*Remarks:* This species is characterised by its typical elongate ovate shape, which is laterally strongly compressed. A pronounced caudal process is present medially. Surface is conspicuously smooth and fragile. This species closely resembles *P. rubrum* Müller described from the Recent sediments of Gulf of Naples, but slightly differs in general outline. To the authors' knowledge, this is the first report of occurrence of *P. subtile* from the Indian waters.

*Superfamily Cypridacea* Baird, 1845

*Family Macrocyprididae* G.W. Müller, 1912

*Genus Macrocyprina* Triebel, 1960

*Macrocyprina decora* (Brady, 1866)

(Pl. IV, fig. 12)

*Cytherideis decora* Brady, 1866, vol. 5., p. 1.5., p. 366, pl. 57, figs. 13a-

c.

*Macrocypris decora* (Brady), Brady, 1880, vol. 1, p.1.3, p.44. p1.1, fig.3. – van den Bold, 1958, p.397, p1.1, fig.2. – Khosla, 1978, vol.24, no.3, p.262, p1.2, fig.10. – Whatley and Quanhong, 1987, p.336, p1.1, figs.27-28.

*Macrocypris decora* (Brady), Hussain, 1998, pp.3-4, p1.III, figs. 15-16.

**Material:** 20 carapaces and 15 open valves.

**Dimension:** Length 1.12 mm, Height 0.41 mm.

**Remarks:** *M. decora* is distinguished by its large, elongate and subtriangular in lateral outline. The length is almost thrice the height. The right valve is conspicuously larger than the left one and the surface is smooth. This species has been recorded by many authors from various localities: from the lower Miocene beds of Gujarat, India (Khosla, 1978); Malacca Straits (Whatley and Quanhong, 1987); from off Tuticorin (Hussain, 1998).

**Family** Pontocyprididae Müller, 1894

**Genus** *Propontocypris* Sylvester-Bradley, 1947

*Propontocypris (Propontocypris) crocata*  
Maddocks, 1969

(Pl. IV, fig. 13)

*Propontocypris* sp. Maddocks, 1968, no. 15, fig.2.

*Propontocypris (Propontocypris) crocata* Maddocks, 1969a, pp. 11-15, figs. 9-10 and 11B, D-F, I-M. – Hussain, 1998, pp. 13-14, p1. III, fig.17.

**Material:** 39 carapaces and 6 open valves.

**Dimension:** Length 0.85 mm, Height 0.48 mm, Thickness 0.22 mm.

**Remarks:** The triangular lateral outline of the carapaces, the acuminate and pointed posterior end and the smooth surface having numerous pores are the characteristic features of *P. (P.) crocata*. Maddocks (1969a) originally described this species from Nosy Be' Madagascar. While describing the same, she (1969a) remarked, "Common on many varieties of calcareous and noncalcareous algae, beach stranded sponges and dead coral and shelf fragment accumulations, at all littoral and sublittoral shore collecting localities". *P. (P.) hartmanni* (Scott) resembles the present species, however, the former differs in being larger in size, in the more angulate nature and in the occurrence of a posteroventral spine. This species has been reported for the first time from the Indian waters by Hussain (1998).

*Propontocypris (Schedopontocypris) bengalensis*  
Maddocks, 1969

(Pl. IV, fig. 14)

*Propontocypris (Schedopontocypris) bengalensis* Maddocks, 1969a, pp. 37-38, figs. 31A-C and F. – Honnappa and Abrar, 1984, pp. 92-100, pl. C, figs. 2-3; pl. 6, figs. 1-3. – Sreenivas *et al.*, 1991, pp. 492-499, pl. 1, fig. 5. – Vaidya and Mannikeri, 1994, p. 736. – Hussain, 1998, p. 14, p1.III, fig.18.

*Schedopontocypris* sp. A Jain, 1981, p.108, p1.1, fig.13.

**Material:** 25 carapaces and 6 open valves.

**Dimension:** Length 0.59 mm, Height 0.29 mm.

**Remarks:** Rameswaram specimens of *P. (S.) bengalensis* are identical to those described by Maddocks (1969a) from the Recent sediments of Bay of Bengal. Subsequently, the same has been reported from many localities in India and appears to be

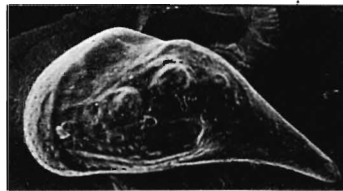
#### EXPLANATION OF PLATE IV

(Bar scale equals 100 µm unless mentioned)

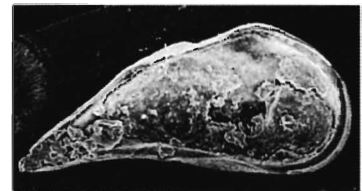
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| 1. <i>Semicytherura</i> sp.<br>Left valve, external view.  | 11. <i>Paradoxostoma</i> sp. cf. <i>P. subtile</i> Bonaduce <i>et al.</i> , 1980<br>Right valve, external view.      |
| 2-4. <i>Paijenborchellina prona</i> (Lubimova & Guha, 1960)<br>2. Left valve, external view; 3. Left valve, internal view; 4. Dorsal view. | 12. <i>Macrocypris decora</i> (Brady, 1866)<br>Right valve, external view.   |
| 5. <i>Cytheropteron</i> sp.<br>Dorsal view.  | 13. <i>Propontocypris (Propontocypris) crocata</i> Maddocks, 1969<br>Left valve, external view.                      |
| 6. <i>Kangarina abyssicola</i> (G.W.Müller, 1894)<br>Right valve, external view.   | 14. <i>Propontocypris (Schedopontocypris) bengalensis</i> Maddocks, 1969<br>Right valve, external view.              |
| 7-8. <i>Ornatoleberis morkhoveni</i> Keji, 1975<br>7. Right valve, external view; 8. Left valve, internal view.                            | 15. <i>Paracypris</i> sp.<br>Left valve, external view.  |
| 9-10. <i>Xestoleberis variegata</i> Brady, 1880<br>9. Left valve, external view; 10. Dorsal view.  | 16-17. <i>Phlyctenophora orientalis</i> (Brady, 1868)<br>Right valve, external view; 17. Right valve, internal view. |



1



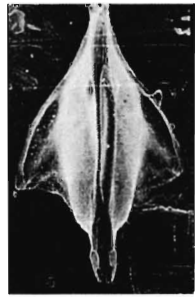
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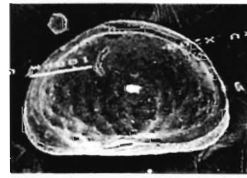
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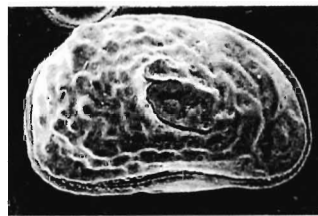


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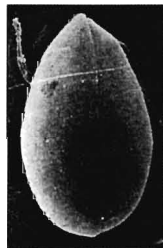


6

50  $\mu$ m



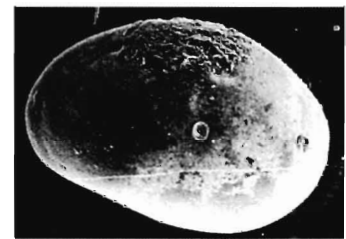
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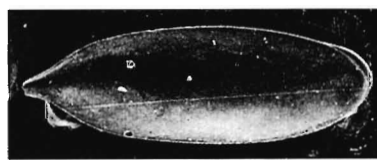
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15



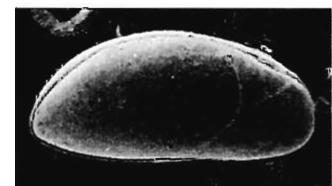
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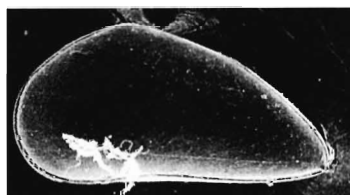
11



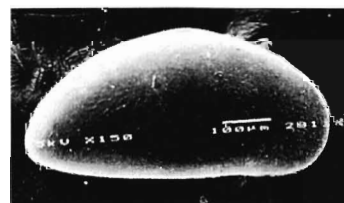
12



16



13



14



17

endemic to the Indian coast. *P. (P.) paradispar* Maddocks, though resembling this species, differs in having a more convex dorsal margin and a narrowly rounded posterior end. *P. (S.)* sp., described by Whatley and Quanhong (1987) from the Malacca Straits, is similar to this species in general outline. However, the former differs in possessing a somewhat sinuous ventral margin and a narrowly rounded posterior margin.

Family **Candonidae** Kaufmann, 1900.

Subfamily **Paracypridinae** Sars, 1923

Genus **Paracypris** Sars, 1866

*Paracypris* sp.

(Pl. IV, fig.15)

**Material:** 7 carapaces and 2 open valves.

**Dimension:** Length 0.72 mm, Height 0.27 mm.

**Remarks:** This indeterminate taxa can be identified by its shape, anterior and posterior marginal curvatures and somewhat larger size. Dorsal margin is moderately convex and sloping posteriorly. Ventral margin is concave at the middle, otherwise it is almost straight. Surface is smooth. Inner lamella is wide anteriorly and posteriorly but narrow ventrally. Marginal pore canals are many. Muscle scar pattern and hinge are as for the genus. This species closely resembles *P. nuda* Mostafawi, 1992 in general outline but slightly differs in dorsal margin and posterodorsal angle.

Genus **Phlyctenophora** Brady, 1880

*Phlyctenophora orientalis* (Brady, 1868)

(Pl. IV, figs.16-17)

*Macrocypris orientalis* Brady, 1868, pp. 61-62, pl.7, figs.1-3.  
*Phlyctenophora zealandica* Brady, 1880, p. 33, pl. 3, figs.1 a-m. – Guha, 1980, p. 43, pl. 1, figs. 17 and 24.- Hussain, 1998, p. 14, pl. III, fig. 19.

*Paracypris zealandica* (Brady), Fyan, 1916, p.1175, fig.17. – Kingma, 1948, p. 67, pl. 6, figs.18a-c. – Key, 1954, p. 352, pl.1 figs. 6. – Guha, 1968b, p. 211, pl. 1, fig. 8.

*Phlyctenophora bhatiai* Jain, 1976, pp.127-128, pls.1A-D.

*Phlyctenophora* sp. cf. *P. zealandica* Brady, Jain, 1978, p.1 33, figs. 5S1-2; 1981, p. 110, pl. 1, fig. 17.

*Phlyctenophora orientalis* (Brady), Whatley and Quanhong, 1987, pp. 336-337, pl. 2, figs. 3-4. – Vaidya and Mannikeri, 1994, p. 736. – Hussain and Mohan, 2000, p. 26, pl. II, fig. 12.

**Material:** 52 carapaces and 34 open valves.

**Dimension:** Length 0.91 mm, Height 0.43 mm.

**Remarks:** *P. orientalis* (Brady) reported by Whatley and Quanhong (1987) was variously referred to as: *P. zealandica* (by Brady, 1880 and Jain, 1978); *Paracypris zealandica* (by Kingma, 1948 and Guha, 1968b); and *Phlyctenophora bhatiai* (by Jain, 1976). Whatley and Quanhong (1987) after comparing the specimens of Malacca Straits with Brady's type material of *Macrocypris orientalis* transferred all the aforesaid species to the genus *Phlyctenophora*. This species has also been reported from New Zealand, Australia, China and Indonesia. *P. orientalis* (Brady) occurs commonly along the west and east coasts of India.

This species is much similar to *Phlyctenophora zealandica* Brady in having a convex dorsal margin, somewhat sinuous ventral margin and in the occurrence of a wide anterior and posterior inner lamella, however, *P. orientalis* is subtriangular in lateral view, with a narrow posterior end.

## SUMMARY

Fifty-two sediment samples were collected from the Palk Bay, off Rameswaram, southeast coast of India. A total of 48 species belonging to 39 genera were identified. Among these, 3 species belong to Cytherellidae, 2 to Bairdiacea, 38 to Cytheracea and the remaining 5 species belong to Cypridacea.

Among these taxa, *Loxocorniculum lilljeborgii*, *Mutilus pentoekensis*, *Neocytheretta murilineata*, *Neomonoceratina iniqua*, *Tanella gracilis* and *Xestoleberis variegata* were found to be abundant and widespread. They occur in almost all the samples collected. It indicates their tolerance to the environmental variations during the 4 seasons. It is also observed that the favourable substrate for the forms to thrive is silty sand followed by sand. Off Rameswaram, *Kotoracythere inconspicua*, *Neocytheretta snellii* and *Paradoxostoma subtile* are recorded for the first time from the Indian waters. Four species, namely, *Cushmanidea guhai*, *Alococythere reticulata indoaustraliana*, *Mutilus pentoekensis*, and *Loxoconcha mandviensis* have been recorded for the first time from the east coast of India.

From the zoogeographical distribution of the present fauna, it is observed that the fauna has a close affinity to other ostracod assemblages of the Indo-Pacific region, viz., other parts of east and west coasts of India, Persian Gulf, Red Sea, Malacca Straits, South China Sea, Indo-Malayan region, east African coast and Australia. However, the occurrence of *Cushmanidea guhai*, *Chrysocythere keiji*, *Loxoconcha mandviensis* and *Propontocypris (Schedopontocypris) bengalensis* appears confined to the Indian coast. *Kotorocythere inconspicua*, *Keijia demissa* and *Tanella gracilis* are observed to be cosmopolitan. It is also opined that the present faunal geographical distribution may be mainly due to passive dispersal by southequatorial currents. But, the occurrence of *Keijicyoidea praecipua* from the Miocene deposits and Recent sediments of India, and *Kangarina abyssicola* is rather difficult to explain. The distribution of *Loxoconchella anomala* is also quite interesting.

A total of 8264 specimens (carapaces, open valves, adults and juveniles) of Ostracoda were recovered. Out of these, 95.12% are represented by Cytheracea, 2.05% by Cytherellidae, 1.73% by Cypridacea and 1.10% by Bairdiacea. Carapaces are more common than open valves (80.45% and 19.55% respectively). It seems to indicate a relatively faster rate of sedimentation in the inner-shelf region off Rameswaram.

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