

Distribution of Ostracoda in Offshore Sediment Around Pulau Besar, Johor

Noraswana Nor Faiz & Ramlan Omar

School of Environmental Sciences and Natural Resources, Faculty of Science and Technology, National University of Malaysia, 43600 Bangi, Selangor, Malaysia

*e-mail address: rbo@ukm.my

ABSTRACT

The study on distribution of Ostracoda in offshore sediment based on 11 bottom samples has been made around Pulau Besar, Johor. 47 species both living and dead belonging to 37 genera and 18 families were collected and had been identified. A total of 1063 dead specimens and 932 living specimens of Ostracoda were found in the study area. The dominant species was *Pistocythereis cribriformis* and the dominant family was Trachyleberididae. Family that had the most variety of species was Trachyleberididae with 14 species. The Ostracoda that had been found were from benthic. The physico-chemical parameters such as, salinity, pH, temperature, depth, dissolved oxygen, percentage of organic matter and sediment texture were measured. The sediment texture in the study area can be classified as coarse sand, medium sand, fine sand, very fine sand and silty sand.

Keywords: distribution; ostracoda; offshore sediment; Pulau Besar

Introduction

Ostracoda are the oldest known microfauna which were recorded since Cambrian. Ostracoda are aquatic crustacean fully enclosed in a calcified bivalve carapace. The ostracod carapace is usually ovate, kidney-shaped or bean-shaped and from 0.3 to 30 mm long, although most adult carapaces measure only 0.5 to 3.0 mm long (Brasier 1980). Ostracods are one of the most diverse groups of living crustaceans, inhabiting marine, non-marine and even some semi-terrestrial habitats. They have an excellent fossil record, primarily due to their possession of a calcified bivalve carapace (Horne et al. 2002). From the study of ostracod of Malacca Straits, a total of 129 species identified. 22 species and 2 genera (*Bythocytheropteron* and *Alataconcha*) were described as new (Whatley & Zhao 1987; 1988). The composition and distribution of ostracod was high in Malacca Straits and the distribution was influenced by sediment texture and organic

matter. A total of 101 species of live and dead assemblages were recorded in the study of the recent podocopid ostracods of the Sedili River and Jason Bay (Zhao & Whatley 1989). The distribution of ostracod in the study area was influenced by depth factor. Gou (1990) recorded a total of 31 species belonging to 21 genera were identified from the Luhuitou reefs from Hainan Islands, South China Sea. Zhao (2005) was studied on ostracods as bioindicator to identify the environmental exchange at South China Sea through fauna composition, abundance, species diversity and evolution. He also reported that more than 2000 samples were taken from the Oligocene to Quaternary section, of which 725 contained ostracods and yielded at least 100 species. The detailed local scale study of the distribution of ostracod faunas from Java Sea, west Bawean Island, Indonesia had presented 130 species including 6 new species, 1 new subspecies and undetermined species (Dewi 1997). A total of 34 ostracod species were recovered belonging to 24 genera from recent reefal flat deposit in Bali, Indonesia (Mostafawi et al. 2005).

Study Area

Pulau Besar, Johor is the biggest islands offshore of Mersing and located in South China Sea. A total of 11 sediment samples were collected from 11 sampling stations in vicinity of Pulau Besar, Johor between 02°25'24'' to 02°27'29''N and 103°00'03'' to 104°00'01''E (Figure 1). The range of salinity in the study area was between of 31.20 ppt to 34.01 ppt. The maximum value of dissolve oxygen was 11.93 mg/L at station 9 while the minimum value was 6.90 mg/L at station 11. In the study area, the highest temperature was noted at station 4 with 30.80 °C and the lowest was 27.05 °C at station 7. The maximum value of pH value was 8.24 at station 8 and minimum at station 4 with 6.40. The range of depth in the study area was between of 6.60 to 20.50 m. For percentage of organic matter in the study area, station 11 showed the highest value with 7.58% and station 4 showed the lowest value with only 1.98%. The sediment textures in the study area are classified as coarse sand, medium sand, fine sand, very fine sand and silt sand (Table 1).

Materials and Methods

On July 2005, sediment samples were collected from twelve sampling stations in Pulau Besar, Johor, with grab sampler of Petite Ponar type. The samples were used for identification process and physico-chemical analysis. The preparation of ostracod samples was conducted by the method of wet filtration washings (Sohn et al. 1965). In the laboratory, each sample was washed over a 0.50, 0.180 and 0.063 mm sieve. The samples were preserved in formalin and later stained with Rose Bengal for estimating the percentage of ostracod species collected alive. Ostracod specimens were classified as living specimens if they possessed a full set of appendages and had both strongly and slightly Rose Bengal coloured valves. Many of the strongly coloured carapaces had their chitinous soft body parts preserved. Specimens were classified as dead if they had partly preserved or no appendages. All specimens were picked up from the dried sediment. A number of systematic of quantitative analysis were applied to the faunal analysis including the simple species diversity (number of species in each sample), abundance (specimen number in

each sample) and dominance (percentage of the most abundant species in each sample) have been ascertained in order to elucidate the nature of the various ostracod communities. The species were identified with Scanning Electron Microscope (SEM) in SEM Unit, Faculty Science and Technology, National University of Malaysia. Several *in-situ* physico-chemical parameters such as temperature, salinity, dissolve oxygen, pH and depth were measured. The percentage of organic matter and sediment texture had been determined in the laboratory.

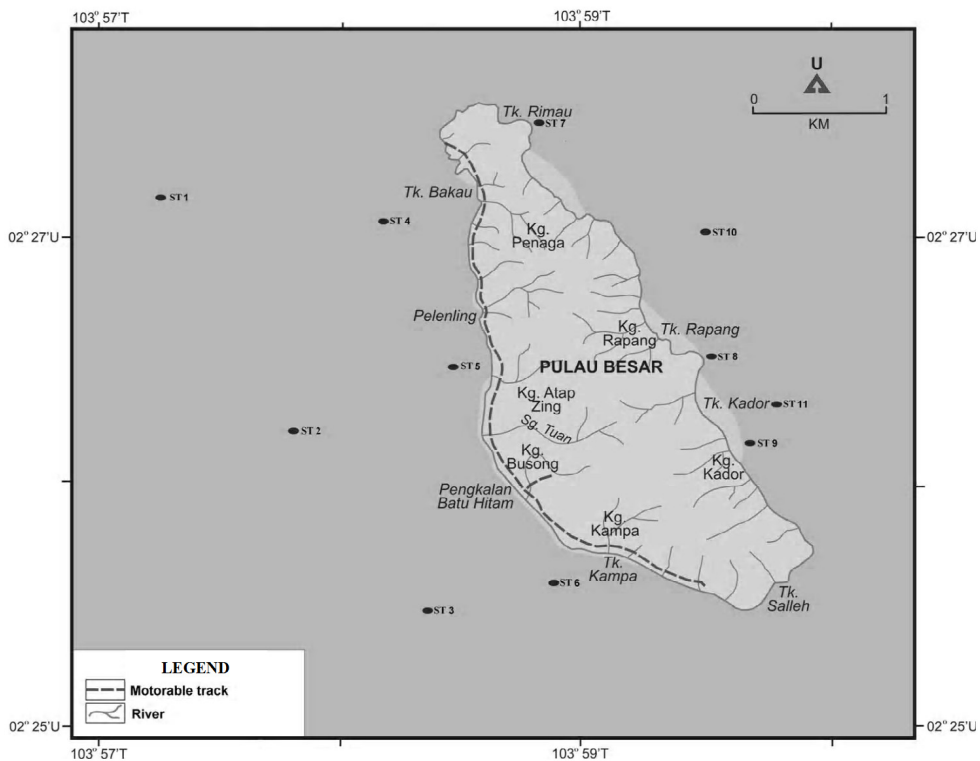


FIGURE 1: Location of Sampling Stations Around Pulau Besar, Johor

Result and Discussion

Ostracod Abundance

A total of 1928 individual from 18 families, 37 genera and 47 species were found and identified in offshore sediment around Pulau Besar, Johor from the entire set of 11 samples. The families are Trachyleberididae, Pontocyprididae, Bairdiidae, Paracytherididae, Cytherideidae, Loxoconchidae, Cytherellidae, Brachycytheridae, Schizocytheridae, Krithidae, Paracyprididae, Hemicythereridae, Xestoleberididae and Pectocytheridae, Leptocytheridea, Macrocyprididae, Cytheropteronidae and Bythocytheridea.

TABLE 1: The Coordinate, Temperature, Dissolve Oxygen, Salinity, pH, Depth, Organic Matter and Sediment Texture for Every Sampling Station

St.	Coordinate	Temperature, °C	Dissolve oxygen, mg/L	Salinity, ppt	pH	Depth, m	Organic matter, (%)	Sediment Texture
1	02°27'10"N, 103°57'17"E	28.40	7.69	31.30	7.30	18.50	2.83	Very fine sand
2	02°26'12"N, 103°57'44"E	27.07	7.68	31.60	7.20	17.30	3.62	Fine sand
3	02°25'24"N, 103°58'20"E	28.01	8.01	31.70	7.20	13.60	2.93	Silty sand
4	02°27'03"N, 103°58'10"E	30.80	8.11	31.90	6.40	8.20	1.98	Fine sand
5	02°26'24"N, 103°58'25"E	30.10	8.02	32.00	6.80	7.80	2.35	Medium sand
6	02°25'34"N, 103°58'52"E	27.50	8.15	33.60	8.10	6.60	6.42	Fine sand
7	02°27'29"N, 103°58'54"E	27.05	9.32	33.56	7.80	19.50	5.15	Fine sand
8	02°26'26"N, 103°59'34"E	28.72	7.34	31.20	8.24	12.40	2.18	Coarse sand
9	02°26'07"N, 103°59'40"E	28.54	11.93	34.01	7.96	20.50	2.42	Coarse sand
10	02°27'06"N, 104°00'01"E	28.23	8.05	32.46	7.90	19.60	6.24	Very fine sand
11	02°26'26"N, 103°00'03"E	29.34	6.90	32.28	8.03	18.50	7.58	Coarse sand

The faunal assemblage is dominated by Trachyleberididae family with 798 individual (average abundance % = 41.39%). The second family was Cytherellidae (10.32%), followed by Schizocytheridae (8.71%), Xestoleberidae (6.95%), Hemicytheridae (6.43%), Brachyocytheridae (5.65%), Loxoconchidae (4.60%), Pectocytheridae (3.63%), Paracyprididae (3.42%), Paradoxostomatidae (1.62%), Bairdiidae (1.87%), Pontocythereidae (1.66%), Leptocytheridea and Krithidae (1.45%), Cytherideidae (0.99%), Cytheropteronidae (0.62%). Macrocyprididae (0.57%), Paracytherididae (0.16%) and Bythocytheridae (0.10%). Family with had the most variety of species was Trachyleberididae with 14 species. The dominant species is *Pistocythereis cribriformis* with 178 specimens. The abundance of ostracoda were maximum at Station 2 (493 specimens) and minimum at Station 8 (42 specimens).

TABLE 2: The Distribution of Ostracod Species in Pulau Besar, Johor According to the Sampling Stations

FAMILY	SPECIES	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	TOTAL
Bairdiidae	<i>Paranesidea sp.</i>	–	1	2	1								4
	<i>Triebelina sertata</i>		1	4	2			16		4			27
	<i>Bairdoppilata paraacraatericola</i>						3			2			5
Cytherellidae	<i>Cytherella semitalis</i>	1	18		4			4			5		32
	<i>Cytherelloidea cingulata</i>		8			1	1	18			1	9	38
	<i>Cytherelloidea leroyi</i>		20	1				37		13	18	16	105
	<i>Cytherelloidea malaccaensis</i>	4	9			6			3			2	24
Macrocypridae	<i>Macrocypris decora</i>	1	2			2			2			4	11
Paracypridae	<i>Phlyctenophora orientalis</i>		52				14						66
Pontocypridae	<i>Propontocypris sp.</i>			5	1				1	1			13
Schizocytheridae	<i>Argillocea sp.</i>						19						19
	<i>Neomonoceratina delicata</i>		13				4				7	1	25
	<i>Neomonoceratina iniqua</i>	2	37				5	59		11	7	22	143
Xestoleberididae	<i>Xestoleberis malaysiana</i>			4			46	24		6	2	3	85
	<i>Feveoleberis cypraedoides</i>	5	28	4			1		3			2	43
	<i>Ornatoleberis morkhoveni</i>				2	1				1	2		6
Loxoconchidae	<i>Loxoconcha liljeborgii</i>	7			4		1		2				14
	<i>Loxoconcha tumulosa</i>		10	6		13		34			12		75
Leptocytheridae	<i>Tanella sp.</i>			2		4	8	2		12			28
Pectocytheridae	<i>Keijia labyrinthica</i>	2	19	3		5	27			14			70
Krithidae	<i>Parakrithella pseudadonta</i>		9	6	5	8							28
Cytherideidae	<i>Miocyprideis spinulosa</i>				2			12			5		19
	<i>Paracytheridea tschoppi</i>					1				1	1		3
Cytheropteroidae	<i>Cytheropteron sp.</i>				3	2	2			4	1		12
Hemicytheridae	<i>Hemicytheridea reticulata</i>		16	1				5	4				26
	<i>Hemicytheridea cancellata</i>				10	2	5			1	8	1	27
	<i>Caudites sp.</i>	2	5		3	12	14			2		1	39
	<i>Neobuntonia cf. guttata</i>	1	7				5	11	3		1	1	29
	<i>Hermanites deltoideis</i>					2					1		3
Trachyleberididae	<i>Actinocythereis scutigera</i>		23	3			5	21		8	2		62
	<i>Henryhowella keutapangensis</i>				5				4	6	19	2	36
	<i>Bradleya pitatia</i>			3	1							1	5
	<i>Pistocythereis bradyi</i>	4	12	4			5	22		4	28	24	103
	<i>Pistocythereis cribriformis</i>		67	16	15	5	24			26	14	11	178
	<i>Pistocythereis euplectella</i>				1	4			6		5		16
	<i>Pistocythereis sp.</i>					2	21						23
	<i>Venericythere darwini</i>				5			7	10			2	24
	<i>Venericythere papuensis</i>		38	21			12						71
	<i>Keijella apta</i>		13	8			3	15	2			2	43
	<i>Keijella multisulcus</i>		13	6		2	20	37			2		80
	<i>Borneocythere paucipunctata</i>						2		1	14	3		20
	<i>Lankacythere coralloides</i>			2	7	6	24				4		43
	<i>Trachyleberis sp.</i>	5	45	4			26	14					94
Brachyocytheridae	<i>Neocytheretta snellii</i>	7	27	2	1		12		1	1	8		59
	<i>Hemikritha orientalis</i>	4		5	8			4			12	1	34
Bythocytheridae	<i>Atejehella semiplicata</i>				1					13			16
	<i>Bythoceratina sp.</i>				1	1							2
TOTAL		45	493	112	82	79	316	342	42	144	168	105	1928

Taxonomy

All the entire collection is stored at School of Environmental and Natural Resource Sciences, Faculty of Science and Technology, National University of Malaysia. The taxonomy is based on Morkhoven (1963), Moore (1961), Whatley & Zhao (1987; 1988), Zhao & Whatley (1989), Zhao et al. (1985), Dewi (1997) and Mostafawi et al. (2005).

Sub-phylum CRUSTACEA Pennant, 1777

Class Ostracoda Latreille, 1806

Order PODOCOPIDA Muller, 1894

Suborder PLATYCOPINA Sars, 1866

Family CYTHERELLIDAE Sars, 1866

Genus *Cytherella* Jones, 1849

Cytherella semitalis Brady, 1868

Pl. 1, figs. 7, 8

- 1868 *Cytherella semitalis* Brady; p. 72, pl. 18, figs. 23 & 24
- 1880 *Cytherella semitalis* Brady; Brady, p. 175, pl. 44, figs. 2a-e
- 1948 *Cytherella semitalis* Brady; Kingma, p. 63, pl. 6, figs. 6a, b
- 1987 *Cytherella semitalis* Brady; Whatley & Zhao, p. 334, pl. 1, figs. 7-10
- 1992 *Cytherella semitalis* Brady; Mostafawi, p. 133, pl. 1, fig. 4
- 1997 *Cytherella semitalis* Brady; Dewi, p. 55, figs. 11-13

Diagnosis: Carapace ovate to subquadrate in lateral view, both ends broadly rounded and have punctuate ornamentation.

Occurrence: 32 specimens were retrieved from stations 1, 2, 4, 7 and 10.

Genus *Cytherelloidea* Alexander, 1929

Cytherelloidea cingulata (Brady, 1869)

Pl. 1, figs. 9, 10

- 1869 *Cytherella cingulata* Brady; p. 159, pl. 16, figs. 24 & 25
- 1948 *Cytherelloidea cingulata* (Brady); Kingma, p. 65, pl. 6, figs. 10a, b
- 1964 *Cytherelloidea cingulata* (Brady); Keij, p. 419 & 450, pl. 1, figs. 4-8
- 1987 *Cytherelloidea cingulata* (Brady); Whatley & Zhao, p. 334, pl. 1, figs. 13 & 14
- 1992 *Cytherella cingulata* (Brady); Mostafawi, p. 135, pl. 1, fig. 13
- 1997 *Cytherelloidea cingulata* (Brady); Dewi, p. 55, figs. 16 & 17

Diagnosis: Carapace elongate to sub-rectangular. Anterior end evenly rounded, posterior end more angular. Have heavily ornamentation with strong ridges.

Occurrence: A total of 38 specimens were covered from stations 2, 5, 6, 7, 10 and 11.

Cytherelloidea leroyi Keij, 1964

Pl. 1, figs. 11, 12

- 1964 *Cytherelloidea leroyi* Keij; p. 420
 1985 *Cytherelloidea leroyi* Keij; Zhao et al., pl. 19, fig. 1
 1987 *Cytherelloidea leroyi* Keij; Whatley & Zhao, p. 58, pl. 1, figs. 15-18
 1992 *Cytherelloidea leroyi* Keij; Mostafawi, p. 334, pl. 1, fig. 12
 1997 *Cytherelloidea leroyi* Keij; Dewi, p. 55, fig. 15

Diagnosis: Species of *Cytherelloidea* is characterized by its distinct and prominent ridges with anteromarginal denticulations. Surface is coarsely pitted.

Occurrence: 105 specimens were covered from stations 2, 3, 7, 9, 10 and 11.

Cytherelloidea malaccaensis Whatley & Zhao, 1987

Pl. 1, fig. 13

- 1987 *Cytherelloidea malaccaensis* Whatley & Zhao; p. 335, pl. 1, figs. 19-21
 1997 *Cytherelloidea malaccaensis* Whatley & Zhao; Dewi, p. 56, figs. 20, 21

Diagnosis: Medium in size and carapace oblong in lateral view. A robust species characterized by coarse pits, sinuous median and marginal ridges.

Occurrence: A total of 24 species were found from stations 1, 2, 5, 8 and 11.

Suborder PODOCOPINA Sars, 1866

Superfamily BAIRDIACEA Sars, 1888

Family BAIRDIIDAE Sars, 1866

Subfamily BAIRDIINAE Sars, 1888

Genus *Paranesidea* Maddocks, 1969

Paranesidea sp.

Pl. 1, figs. 1, 2

Occurrence: Only 4 specimens were found in this study area.

Genus *Bairdoppilata* Coryell, Sample & Jennings, 1935

Bairdoppilata paraacratericola Titterton & Whatley, 1988

Pl. 1, figs. 3, 4

- 1988 *Bairdoppilata paraacratericola* Titterton & Whatley, 1988; p. 114, pl. 1, figs. 9-16
 1997 *Bairdoppilata paraacratericola* Titterton & Whatley, 1988; Dewi, p. 56, figs. 5, 6

Diagnosis: A large species of *Bairdoppilata* with punctate ornamentation on its surface and have distinct caudal process. Carapace rounded to sub-hexagonal in lateral view.

Occurrence: Only 5 specimens were found in stations 6 and 9.

Genus *Triebelina* Van den Bold, 1946

Triebelina sertata Triebel, 1948

Pl. 1, figs. 5, 6

- 1948 *Triebelina sertata* Triebel; p. 19, figs. 1 & 2
 1974 *Triebelina sertata* Triebel; Van den Bold, p. 34, pl. 1, fig. 7
 1988 *Triebelina sertata* Triebel; Malz & Lord, p. 66, pl. 1, figs. 1-7
 1990 *Triebelina sertata* Triebel; Gou, p. 33, pl. 2, fig. 16
 2002 *Triebelina sertata* Triebel; Hoibian et al., pl. 1, fig. 13
 2005 *Triebelina sertata* Triebel; Mostafawi et al., p. 126, pl. 1, fig. 7

Diagnosis: Surface with 3 longitudinal ribs and intercoastal punctation. Have anterior and posterior denticulations. Thick-shelled.

Occurrence: 27 specimens were retrieved from stations 2, 3, 4, 7 and 9.

Family PARACYPRIDIDAE Sars, 1923

Genus *Phlyctenophora* Brady, 1880

Phlyctenophora orientalis (Brady, 1868)

Pl. 1, figs. 14, 15

- 1868 *Macrocypris orientalis* Brady; p. 61, 62, pl. 7, figs. 1-3
 1880 *Phlyctenophora zealandica* Brady; p. 33, pl. 3, figs. 1a-m
 1916 *Paracypris zealandica* (Brady); Fyan, p. 1175, fig. 17
 1954 *Paracypris zealandica* (Brady); Keij, p. 352, pl. 1, fig. 6
 1987 *Phlyctenophora orientalis* (Brady); Whatley & Zhao, p. 356, pl. 2, figs. 3, 4
 1992 *Phlyctenophora orientalis* (Brady); Mostafawi, p. 163, pl. 8, fig. 175
 1997 *Phlyctenophora orientalis* (Brady); Dewi, p. 57, figs. 31, 32

Diagnosis: Carapace elongate in lateral view, smooth and polished. Anterior end rounded, posterior end narrowed and ventral sub-angular. Large size and compress laterally. Valves strongly calcified.

Occurrence: Only found in 2 stations i.e. stations 2 and 6 with 52 and 14 specimens respectively.

Family MACROCYPRIDIDAE Muller, 1912

Genus *Macrocypris* Brady, 1867

Macrocypris decora (Brady, 1866)

Pl. 1, figs. 16, 17

- 1866 *Cytherideis (Cytherideis) decora* Brady; p. 366, pl. 52, figs. 13a-c
 1880 *Macrocypris decora* (Brady); Brady, p. 44, pl. 1, figs. 3a-d, pl. 6, figs. 8a-b
 1978 *Macrocypris decora* (Brady); Khosla, p. 262, pl. 2, fig. 10
 1985 *Macrocypris decora* (Brady); Wang & Zhao, p. 75, pl. 6, fig. 6
 1987 *Macrocypris* cf. *M. decora* (Brady); Whatley & Zhao, p. 355, pl. 1, figs. 27, 28
 1992 *Macrocypris* cf. *M. decora* (Brady); Mostafawi, p. 1635, pl. 8, fig. 171
 1993 *Macrocypris decora* (Brady); Dewi, p. 57, fig. 28

Diagnosis: Large in size, carapace elongate in lateral view, smooth and polished. Dorsal margin arched and ventral margin concave. Anterior end broadly rounded and posteroventral end sharply acute or sub-acute.

Occurrence: Only 11 species were recorded from stations 1, 2, 5, 8 and 11.

Family PONTOCYPRIDIDAE Muller, 1894

Genus *Propontocypris* Sylvester-Bradley, 1947

Propontocypris sp.

Pl. 2, figs. 1, 2

Occurrence: 13 specimens were recorded in stations 3, 4, 6, 8 and 9.

Genus *Argilloecia* Sars, 1866

Argilloecia sp.

Pl. 2, fig. 3

Occurrence: Only recorded in stations 6 with 19 specimens.

Family SCHIZOCYTHERIDAE Howe, 1961

Subfamily SCHIZOCYTHERINAE Mandelstam, 1960

Genus *Neomonoceratina* Kingma, 1948

Neomonoceratina delicata Ishizaki & Kato, 1976

Pl. 2, fig. 4

- 1976 *Neomonoceratina delicata* Ishizaki & Kato; p. 136 & 138, pl. 3, figs. 7-10
- 1982 *Neomonoceratina microreticulata* Kingma; Yajima, p. 193, pl. 11, figs. 10-13
- 1985 *Neomonoceratina crispata* Hu; Zhao et al., p. 200, pl. 19, fig. 6
- 1987 *Neomonoceratina delicata* Ishizaki & Kato; Whatley & Zhao, p. 339
- 1990 *Neomonoceratina delicata* Ishizaki & Kato; Gou, p. 24, pl. 3, fig. 35
- 1997 *Neomonoceratina delicata* Ishizaki & Kato; Dewi, p. 59, fig. 47

Remarks: This species can easily be confused with *N. iniqua* due to their great similarity. According to Whatley & Zhao, 1987 the difference between this 2 species was in having a reticulum consisting of large and irregularly shaped fossae and somewhat stronger longitudinal muri.

Occurrence: Only 25 specimens were retrieved from stations 2, 6, 10 and 11.

Neomonoceratina iniqua (Brady, 1886)

Pl. 2, fig. 5

- 1886 *Cytherura iniqua* Brady; p. 64 & 65, pl. 8, figs. 3-6
- 1975 *Neomonoceratina depectera* Hu & Yang; p. 108, pl. 1, figs. 19 & 20
- 1976 *Neomonoceratina delicata* Ishizaki & Kato; p. 136 & 138, pl. 3, figs. 7-10
- 1983 *Neomonoceratina delicata* Ishizaki & Kato; Gou et al., p. 76, pl. 20, figs. 1-8
- 1987 *Neomonoceratina iniqua* (Brady); Whatley & Zhao, p. 356, pl. 2, fig. 21

- 1992 *Neomonoceratina iniqua* (Brady); Mostafawi, p. 76, pl. 20, figs. 1-8
 1997 *Neomonoceratina iniqua* (Brady); Dewi, p. 60, figs. 54, 55

Diagnosis: Carapace sub-rhomboidal in lateral view. Posterior end with clear caudal process. Dorsal margin straight. This species have small and simple spine at posteroventral and longitudinal ridges near the anterior end. Eye tubercle distinct.

Occurrence: This species was second dominant species with 143 specimens were retrieved; the species occurs in stations 1, 2, 6, 7, 9, 10 and 11.

Family XESTOLEBERIDAE (Sars, 1928)

Genus *Foveoleberis* Malz, 1980

Foveoleberis cypraeoides (Brady, 1868)

Pl. 2, figs. 6, 7

- 1868 *Cythere cypraeoides* Brady; p. 72, pl. 8, figs. 21, 22
 1880 *Xestoleberis foveolata* Brady; p. 130, pl. 30, figs. 1a-g
 1985 *Uroleberis foveolata* (Brady); Zhao et al., p. 200, pl. 20, figs. 24, 26-29
 1988 *Foveoleberis cypraeoides* (Brady); Whatley & Zhao, p. 26, pl. 10, figs. 18, 19
 1992 *Foveoleberis cypraeoides* (Brady); Mostafawi, p. 158, pl. 6, fig. 139
 1997 *Foveoleberis cypraeoides* (Brady); Dewi, p. 75, figs. 224, 226, 227, 229

Diagnosis: This species have small size and convex valves especially at the mid-ventral. Carapace sub-ovate in lateral view. Surface with punctate ornamentation. Anterior and posterior end well rounded.

Occurrence: 43 specimens were recorded from stations 1, 2, 3, 6, 8 and 11.

Genus *Xestoleberis* Sars, 1866

Xesoleberis malaysiana Zhao & Whatley, 1989

Pl. 2, fig. 8

- 1989 *Xestoleberis malaysiana* Zhao & Whatley; p. 177, pl. 2, figs. 15-19
 1992 *Xestoleberis malaysiana* Zhao & Whatley; Mostafawi, p. 155, pl. 6, fig. 134
 1997 *Xestoleberis malaysiana* Zhao & Whatley; Dewi, p. 75, fig. 222, 223

Diagnosis: A small species of *Xestoleberis* characterized by its arched dorsal margin, narrowly and obliquely rounded anterior margin. Posterior margin bluntly rounded. Smooth surface.

Occurrence: 85 specimens were found from stations 3, 6, 7, 9, 10 and 11.

Genus *Ornatoleberis* Keij, 1975

Ornatoleberis morkhoveni Keij, 1975

Pl. 2, figs. 9, 10

- 1886 *Cythere bimamillata* Brady; p. 309, pl. 40, figs. 10-12
 1975 *Uroleberis ? bimamillata* (Brady); Gramann, p. 26-29, pl. 4, fig. 7
 1975 *Ornatoleberis morkhoveni* Keij; p. 234, pl. 1, figs. 1-7

- 1988 *Ornatoleberis morkhoveni* Keij; Whatley & Zhao, p. 26, pl. 10, fig. 20
 2005 *Ornatoleberis morkhoveni* Keij; Mostafawi et al. p. 134, pl. 3, fig. 8, 9

Remarks: According Mostafawi et al. (2005), this species was originally described by Brady on 1886 as *Cythere bimamillata* from Gulf of Mannar. On 1975, Keij had replaced it by the new genus *Ornatoleberis* and reported from Java Sea, inhabiting intertidal or shallow water reef. This species also found in Myanmar (Burma), Indonesia (Bali) and west of New-Caledonia (Chesterfield Islands).

Occurrence: Only 6 specimens were recorded in this study area.

Family LOXOCONCHIDAE Sars, 1925

Genus *Loxoconcha* Sars, 1866

Loxoconcha lilljeborgii Brady, 1868

Pl. 2, figs. 11, 12

- 1868 *Loxoconcha lilljeborgii* Brady; p. 183, pl. 13, figs. 11-15
 1975 *Loxoconcha* cf. *lilljeborgii* Brady; Gramann, p. 33, pl. 5, figs. 6-8
 1978 *Loxoconcha georgei* Hartmann; p. 105, pl. 9, figs. 13-16
 1986 *Loxocorniculum georgei* (Hartmann); Cabioch et al., p. 28, pl. 9, fig. 13
 1992 *Loxoconcha lilljeborgii* Brady; Mostafawi, p. 151, pl. 5, figs. 102
 1995 *Loxoconcha georgei* (Hartmann); Tabuki & Nohara, pl. 1, fig. 8
 2005 *Loxoconcha lilljeborgii* Brady; Mostafawi et al., p. 134, pl. 3, figs. 3, 4

Diagnosis: Medium size, carapace rhomboidal and mostly with rather inflated valves. This species have four prominent horizontal ribs at posterior and distinct tubercle at posteroventral area. Anterior end rounded and posterior end upwardly rounded. Surface almost smooth and coarsely pitted.

Occurrence: Only 14 specimens were found from stations 1, 4, 6 and 8.

Loxoconcha tumulosa (Hu, 1979)

Pl. 2, fig. 13

- 1979 *Loxocorniculum tumulosa* Hu; p. 71, pl. 2, figs. 17, 21, 22, 26, 27, 30, 31
 1981 *Loxoconcha heronislandensis* Hartmann; p. 117, pl. 9, figs. 1-6
 1984 *Loxoconcha tumulosa* (Hu); Hu, pl. 4, figs. 17, 18, 20
 1984 *Loxoconcha heronislandensis* (Hartmann); Hartmann, p. 128, pl. 7, figs. 1-7
 1987 *Loxoconcha heronislandensis* (Hartmann); Whatley & Zhao, p. 350, pl. 5, fig. 12
 1990 *Loxoconcha tumulosa* (Hu); Gou, p. 35, pl. 3, figs. 45-47

Diagnosis: A species of *Loxoconcha* that characterized by its reticulate ornament especially at posterodorsal area and has reticulate ridge denticulation.

Occurrence: 75 specimens were retrieved from stations 2, 3, 5, 7 and 10.

Family KRITHIDAE Mandelstam, 1960

Genus *Parakrithella* Hanai, 1961

Parakrithella psuedadonta Hanai, 1961

Pl. 2, fig. 14

- 1961 *Parakrithella psuedadonta* Hanai; p. 360, pl. 17, figs. 2a, b, fig.-text. 4a
 1978 *Parakrithella psuedadonta* Hanai; Guan et al., p. 243, pl. 65, figs. 16, 17
 1983 *Parakrithella psuedadonta* Hanai; Gou et al., p. 34, 35, pl. 6, figs. 14-21
 1987 *Parakrithella psuedadonta* Hanai; Whatley & Zhao, p. 360, pl. 4, figs. 11, 12
 1992 *Parakrithella psuedadonta* Hanai; Mostafawi, p. 142, pl. 4, figs. 11, 12
 1997 *Parakrithella psuedadonta* Hanai; Dewi, p. 63, figs. 94-95
 2001 *Parakrithella psuedadonta* Hanai; Kamiya et al., p. 101, fig. 17 (14)

Diagnosis: Medium in size. Carapace ovate in lateral view, anterior end broadly rounded and posterior end obliquely truncated. Surface of the valves completely smooth.

Occurrence: 28 specimens were found from stations 2, 3, 4 and 5.

Family PECTOCYTHERIDAE Hanai, 1957

Genus *Keijia* Teeter, 1975

Keijia labyrinthica Whatley & Zhao 1988

Pl. 2, fig. 15

- 1988 *Keijia labyrinthica* Whatley & Zhao; p. 29, pl. 6, figs. 1-3
 1992 *Keijia labyrinthica* Whatley & Zhao; Mostafawi, p. 142, pl. 2, fig. 46
 1997 *Keijia labyrinthica* Whatley & Zhao; Dewi, p. 67, figs. 140, 141

Diagnosis: A small species of *Keijia* with irregular, coarse and labyrinthine reticulation. Carapace sub-rectangular in lateral view and laterally compressed. Dorsal and ventral margins nearly parallel.

Occurrence: A total of 70 species were recorded from stations 1, 2, 3, 5, 6 and 9.

Family LEPTOCYTHERIDAE Hanai, 1957

Genus *Tanella* Kingma, 1948

Tanella sp.

Pl. 2, figs. 16, 17

Occurrence: 28 specimens were found from stations 5, 6, 7 and 9.

Family CYTHERIDEIDAE Sars, 1925

Genus *Miocyprideis* Kollmann, 1960

Miocyprideis spinulosa (Brady, 1868)

Pl. 2, figs. 18, 19

- 1868 *Cytheridea spinulosa* Brady; p. 182, pl. 13, figs. 1-6
 1975 *Miocyprideis atjehensis* Gramann; p. 25, pl. 2, figs. 9 & 10
 1985 *Miocyprideis spinulosa* (Brady); Malz & Ikeya, p. 178, pl. 2, figs. 1-9, pl. 3, figs. 10

- 1989 *Bishopina spinulosa* (Brady); Howe & McKenzie, p. 16, fig. 63
 1995b *Miocyprideis spinulosa* (Brady); Maddocks, p. 358-361, pl. 2, figs. 11 & 12
 1997 *Miocyprideis spinulosa* (Brady); Mostafawi et al., p. 128, pl. 2, fig. 3

Remarks: Mostafawi et al. (2005) noted the relationship between genus *Miocyprideis* and *Bishopina*. *Bishopina* species are smaller, have a sub-rectangular shape and broad, sub-truncate posterior and more distinct posterior transverse ridge. Its also differ in the median bar of the hinge.

Occurrence: This species were found from stations 4, 7 and 10 with 19 specimens.

Family PARACYTHERIDEIDAE Puri, 1957

Genus *Paracytheridea* Muller, 1894

Paracytheridea tschoppi Van den Bold, 1946

Pl. 2, fig. 20

- 1946 *Paracytheridea tschoppi* Van den Bold; p. 85, pl. 16, figs. 6, 7
 1974 *Paracytheridea tschoppi* Van den Bold; Maddocks, p. 211, pl. 4, figs. 1-6, 9, 12, 13, 18 & 19
 1982 *Paracytheridea* cf. *P. tschoppi* Van den Bold; Krutak, p. 274, pl. 5, figs. 10-14
 1989 *Paracytheridea reunionensis* Whatley & Keeler; p. 67, pl. 1, figs. 15, 17-19
 1992 *Paracytheridea* cf. *reunionensis* Whatley & Keeler; Mostafawi, p. 152, pl. 5, fig. 111
 1993 *Paracytheridea tschoppi* Van den Bold; Witte, p. 66, pl. 8, figs. 18, 19

Diagnosis: In dorsal view, the carapace is arrowhead-shaped. Posterior end drawn out into a distinct caudal process. Surface heavily ornamented with ridges and tubercles. Reticulate ornament at intercostal area.

Occurrence: Only 3 specimens were recorded in this study area.

Family CYTHEROPTERONIDAE Muller, 1894

Genus *Cytheropteron* Sars, 1866

Cytheropteron sp.

Pl. 2, fig. 21

Occurrence: This species were found from stations 4, 5, 6, 9 and 10 with only 12 specimens.

Family HEMICYTHERIDAE Puri, 1953

Genus *Caudites* Coryell & Fields, 1937

Caudites sp.

Pl. 3, figs. 1, 2

Occurrence: This species were identified in stations 1, 2, 4, 5, 6, 9 and 11 with 39 specimens.

Genus *Hemicytheridea* Kingma, 1948
Hemicytheridea cancellata (Brady, 1868)
 Pl. 3, fig. 3

- 1868 *Cythere cancellata* Brady; p. 62, pl. 7, figs. 9-11
 1954 *Cytheromorpha cancellata* (Brady); Keij, p. 354, pl. 1, figs. 7-9
 1963 *Hemicytheridea?* aff. *cancellata* (Brady); Van Morkhoven, p. 400, figs. 665-667
 1980 *Hemicytheridea* sp. Hanai et al.; p. 193
 1987 *Hemicytheridea cancellata* (Brady); Whatley & Zhao, p. 363, pl. 5, fig. 20

Diagnosis: Medium in size and has strong reticulate ornamentation. Dorsal margin straight and ventral margin sinuous. Posterior end turned upwards and anterior end rounded.

Occurrence: 27 specimens were found from stations 4, 5, 6, 9, 10 and 11.

Hemicytheridea reticulata Kingma, 1948
 Pl. 3, figs. 4, 5

- 1948 *Hemicytheridea reticulata* Kingma; p. 71, pl. 7, figs. 7a-e
 1997 *Hemicytheridea reticulata* Kingma; Dewi, p. 14, fig. 15

Diagnosis: A species of *Hemicytheridea* that have heavily reticulate ornament and distinct eye tubercle. Carapace elongate to sub-reniform in lateral view, medium size and thick-shelled.

Occurrence: 26 specimens were found from stations 2, 3, 7 and 8.

Genus *Neobuntonia* Hartmann, 1981
Neobuntonia cf. *guttata* (Brady, 1890)
 Pl. 3, figs. 6, 7

- 1890 *Cytheropteron guttata* Brady; p. 551, pl. 4, figs. 29 & 30
 1986 ? *Pseudoaurila guttata* (Brady); McKenzie. pl. 1, fig. 11
 2005 *Neobuntonia* cf. *guttata* (Brady); Mostafawi et al., p. 128, pl. 2, fig. 13

Diagnosis: Carapace pear-shaped, sub-triangular in lateral view. Anterior margin broadly rounded, dorsal margin nearly straight and ventral margin slightly convex centrally. Surface with coarse and smooth pitted.

Occurrence: 29 specimens were retrieved from stations 1, 2, 6, 7, 8, 10 and 11.

Genus *Hermanites* Puri, 1955
Hermanites deltoides (Brady, 1890)
 Pl. 3, figs. 8, 9

- 1890 *Cythere deltoides* Brady; p. 501, pl. 2, figs. 17, 18
 1978 *Quadracythere fabianae* Bonaduce et al.; p. 382, pl. 5, figs. 3-6
 1986 *Tenedocythere deltoides* (Brady); McKenzie, pl. 1, fig. 22
 1988 *Hermanites parviloba* Cronin; pl. 1, fig. 9

- 1989 *Quadracythere (Tenedocythere) deltoides* (Brady); Whatley & Keeler, p. 78, pl. 5, figs. 8-10
 1990 *Hermanites deltoides* (Brady); Gou, p. 33, pl. 2, figs. 17, 18

Diagnosis: A species of *Hermanites* that have irregular ornament where reticulate at posterior and pit at anterior. Carapace sub-quadrate, arrow-shaped in lateral view. Anterior end broadly rounded. Posterior end sub-acute and truncated.

Occurrence: Only 3 specimens were identified in stations 5 and 10.

Family TRACHYLEBERIDIDAE Sylvester-Bradley, 1948
Subfamily TRACHYLEBERIDINAE Sylvester-Bradley, 1948

Genus *Actinocythereis* Puri, 1953
Actinocythereis scutigera (Brady, 1868)
 Pl. 3, figs. 10, 11

- 1868 *Cythere scutigera* Brady; p. 70, pl. 8, figs. 15, 16
 1880 *Cythere scutigera* (Brady); Brady, p. 109, pl. 22, figs. 5a-b
 1948 *Cythereis scutigera* (Brady); Kingma, p. 83, pl. 9, figs. 6a-b
 1954 *Trachyleberis scutigera* (Brady); Keij, p. 356, pl. 3, fig. 2
 1987 *Actinocythereis scutigera* (Brady); Whatley & Zhao, p. 7, pl. 6, fig. 14
 1992 *Actinocythereis scutigera* (Brady); Mostafawi, p. 143, pl. 3, fig. 61
 1997 *Actinocythereis scutigera* (Brady); Dewi, p. 68, figs. 145, 146

Diagnosis: Carapace sub-rectangular in lateral view and large size. Surface of the valve covered with numerous, strong and prominent spines and tubercles. Dorsal and ventral margins almost straight. Have anterior marginal denticulation.

Occurrence: 62 specimens were recorded from stations 2, 3, 6, 7, 9 and 10.

Genus *Bradleya* Hornibrook, 1952
Bradleya pitalia (Hu, 1981)
 Pl. 3, fig. 12

- 1972 *Bradleya (Quasibradleya)* sp. Benson; p. 114, pl. 2, fig. 10
 1981 *Trachyleberis pitalia* Hu; p. 86 & 87, pl. 1, figs. 12, 14, 20-22
 1990 *Jugoscythereis* cf. *elongata* (Hu); Tabuki & Nohara, p. 374, pl. 1, fig. 14
 1990 *Bradleya pitalia* (Hu); Gou, p. 28, pl. 2, fig. 24
 1993 *Quadracythere* sp. Tu et al.; pl. 13, fig. 9
 1995 *Bradleya pitalia* (Hu); Zhou, p. 75, pl. 3, fig. 15

Diagnosis: Carapace sub-quadrate to elongate. Surface of the carapace have 3 horizontal ridges and reticulate ornamentation. Anterior end broadly rounded. Posterior end compressed and sub-triangular with 6 to 7 spines.

Occurrence: Only 5 specimens were identified from stations 3, 4 and 11.

Genus *Henryhowella* Puri, 1957
Henryhowella keutapangensis (Kingma, 1948)
 Pl. 3, fig. 13

- 1948 *Cythereis keutapangensis* Kingma; p. 81, pl. 10, figs. 1a-b
 1988 *Henryhowella keutapangensis* (Kingma); Whatley & Zhao, p. 29, pl. 6, figs. 15-18
 1997 *Henryhowella keutapangensis* (Kingma); Dewi, p. 68, figs. 148, 149

Diagnosis: Carapace sub-rectangular, sub-angular posteriorly. Anterior end highest and well-rounded. Dorsal margin straight and ventral margin sinuous. Valves covered with numerous small spines, superimposed on reticulation. Heavily calcified.

Occurrence: 36 specimens were recorded from stations 4, 8, 9, 10 and 11.

Subfamily PTERYGOCYTHERINAE Puri, 1957
Pistocythereis bradyi (Ishizaki, 1968)
 Pl. 3, figs. 14, 15

- 1880 *Cythere darwinii* Brady; p. 97 & 98, pl. 25, figs. 2a-g
 1968 *Echinocythereis bradyi* Ishizaki; p. 40, pl. 9, fig. 17
 1978 *Echinocythereis bradyi* Ishizaki; Guan et al., p. 296, pl. 96, figs. 1 & 2
 1988 *Pistocythereis bradyi* (Ishizaki); Whatley & Zhao, p. 19, pl. 9, figs. 3-5
 1992 *Pistocythereis bradyi* (Ishizaki); Mostafawi, p. 146, pl. 4, fig. 75
 1997 *Pistocythereis bradyi* (Ishizaki); Dewi, p. 71, fig. 186

Diagnosis: Carapace sub-ovate in lateral view and large in size. Surface ornament heavily reticulates. Has prominent eye tubercle. Valves strongly calcified. Dorsal margin almost straight and ventral margin denticulate. Anterior end broadly rounded and posterior end obliquely rounded.

Occurrence: A total of 103 specimens were recorded and occur in all stations except stations 4, 5 and 8.

Genus *Pistocythereis* Gou, 1983
Pistocythereis cribriformis (Brady, 1865)
 Pl. 3, figs. 16, 17

- 1865 *Cythere cribriformis* Brady; p. 379, pl. 61, figs. 6a-d
 1880 *Cythere cribriformis* Brady; Brady, p. 96, pl. 19, figs. 3a-d
 1948 *Cythere cribriformis* Brady; Kingma, p. 78 & 79, pl. 9, figs. a & b
 1988 *Pistocythereis cribriformis* (Brady); Whatley & Zhao, p. 19 & 20, pl. 9, figs. 6, 7
 1992 *Pistocythereis cribriformis* (Brady); Mostafawi, p. 146, pl. 4, fig. 73
 1997 *Pistocythereis cribriformis* (Brady); Dewi, p. 72, fig. 189

Diagnosis: Carapace sub-ovate in lateral view. Large in size. Valves rather inflated. The surface has covered with numerous small spines at muri and heavily reticulate.

Dorsal margin almost straight and ventral margin denticulate. Anterior end broadly rounded and posterior end obliquely rounded.

Occurrence: This is the most dominant species in the study area. A total of 178 specimens were recorded and occur in all stations except stations 1, 7 and 8.

Pistocythereis euplectella (Brady, 1869)

Pl. 3, figs. 18, 19

- 1869 *Cythere euplectella* Brady; p. 157 & 158, pl. 16, figs. 5-7
- 1981 *Bicornucythere euplectella* (Brady); Hanai et al., p. 173
- 1985 *Bicornucythere euplectella* (Brady); Zhao et al., p. 199, pl. 19, fig. 18
- 1988 *?Lankacythere euplectella* (Brady); Whatley & Zhao, p. 34, pl. 9, figs. 1 & 2
- 1992 *Lankacythere euplectella* (Brady); Mostafawi, p. 146, pl. 4, fig. 74
- 1997 *Pistocythereis euplectella* (Brady); Dewi, p. 72, figs. 190-193

Diagnosis: This species was characterized based on its hingement and deep concentric fossae.

Occurrence: Only 16 specimens were found from stations 4, 5, 8 and 10.

Pistocythereis sp.

Pl. 4, figs. 1, 2

Occurrence: Only 23 specimens were found from stations 5 and 6.

Occurrence: 20 specimens were retrieved from stations 6, 8, 9 and 10.

Genus *Venericythere* Mostafawi, 1992

Venericythere darwini (Brady, 1868)

Pl. 4, figs. 3, 4

- 1868 *Cythere darwini* Brady; p. 71, pl. 8, figs. 17, 18
- 1977 *Ruggieria darwini* (Brady); Paik, pl. 5, figs. 85-88, pl. 9, fig. 164
- 1980 *Bicornucythere darwini* (Brady); Hanai et al., p. 173
- 1988 *Ruggieria darwini* (Brady); Whatley & Zhao, p. 33, pl. 8, figs. 10-13
- 1992 *Venericythere darwini* (Brady); Mostafawi, p. 146, pl. 4, figs. 69, 70
- 1997 *Venericythere darwini* (Brady); Dewi, p. 71, figs. 174, 175

Diagnosis: This species is characterized by coarse reticulation dominated by longitudinal muri and alae consisting of a longitudinal ventral rib and an oblique row of 5 rod-like spines.

Occurrence: Only 24 specimens were retrieved from stations 4, 7, 8 and 11.

Venericythere papuensis (Brady, 1880)

Pl. 4, figs. 5

- 1880 *Cythere papuensis* Brady; p. 95, figs. 15a-d
- 1948 *Cythereis papuensis* (Brady); Kingma, p. 81-82, pl. 10, figs. 2a-b

- 1976 *Cythere papuensis* (Brady); Puri & Huling, p. 283, pl. 16, figs. 7, 11-18
 1988 *Keijella papuensis* (Brady); Whatley & Zhao, p. 13, pl. 18, figs. 1, 2
 1992 *Venericythere papuensis* (Brady); Mostafawi, p. 146, pl. 4, figs. 71 & 72
 1997 *Venericythere papuensis* (Brady); Dewi, p. 70, figs. 170 & 171

Diagnosis: Carapace large in size and sub-rectangular in lateral view. Anterior end rounded and has rod denticle. Dorsal and ventral margins almost parallel. Ornament reticulate, have spines at posteroventral and prominent eye tubercle.

Occurrence: Only found in stations 2, 3 and 6 with 71 specimens.

Genus *Keijella* Ruggeri, 1967

Keijella apta (Guan, 1978)

Pl. 4, figs. 6, 7

- 1978 *Lathetocytheretta apta* Guan; p. 260, pl. 68, figs. 14-17
 1981 *Leguminocythereis apta* (Guan); Gou et al., p. 163, pl. 79, figs. 21-25, pl. 91, fig. 12
 1983 *Leguminocythereis apta* (Guan); Gou et al., p. 60, 61, pl. 15, figs. 17-24
 1988 *Keijella apta* (Guan); Whatley & Zhao, p. 30, pl. 7, figs. 10-12

Diagnosis: This species has a longitudinal reticulation and V-shaped frontal scar.

Occurrence: 43 specimens were recorded from stations 2, 3, 6, 7, 8 and 11.

Keijella multisulcus Whatley & Zhao, 1988

Pl. 4, figs. 8, 9

- 1988 *Keijella multisulcus* Whatley & Zhao; p. 30, pl. 7, figs. 24-28
 1989 *Keijella multisulcus* Whatley & Zhao; Zhao & Whatley, p. 186
 1992 *Keijella multisulcus* Whatley & Zhao; Mostafawi, p. 144, pl. 3, fig. 63
 1997 *Keijella multisulcus* Whatley & Zhao; Dewi, p. 70, figs. 162-165

Diagnosis: Medium, sub-ovate to rectangular in lateral view. Surface almost smooth anteriorly and marked by about 8 to 10 longitudinal furrows, posteroventral strong, anterior and posterior margins denticulate.

Occurrence: This species were recorded in stations 2, 3, 5, 6, 7, and 10 with a80 specimens.

Genus *Borneocythere* Mostafawi, 1992

Borneocythere paucipunctata (Whatley & Zhao, 1988)

Pl. 4, figs. 10, 11

- 1988 *Keijella paucipunctata* Whatley & Zhao; p. 33, pl. 8, figs. 5-9
 1992 *Borneocythere paucipunctata* (Whatley & Zhao); Mostafawi, p. 146, pl. 3, figs. 64-68
 1997 *Borneocythere paucipunctata* (Whatley & Zhao); Dewi, p. 71, figs. 172, 173

Diagnosis: Carapace large and sub-ovate in lateral view. Valve inflated with shallow, somewhat elongate punctae mid-laterally, smooth elsewhere except for few longitudinal ridges on central surface and short, sharp posteroventral spine.

Genus *Lankacythere* Bhatia & Kumar, 1979

Lankacythere coralloides (Brady, 1886)

Pl. 5, figs. 1, 2

- 1886 *Cythere coralloides* Brady; p. 307, pl. 39, figs. 19-22
- 1977 *Cythere?* cf. *cribriiformis* Paik; pl. 1, figs. 9-11, pl. 8, fig. 147
- 1979 *Lankacythere coralloides* (Brady); Bhatia & Kumar, p. 176, pl. 1, figs. 1-5
- 1987 *Lankacythere coralloides* (Brady); Whatley & Zhao, p. 33, pl. 8, figs. 19-22
- 1989 *Lankacythere coralloides* (Brady); Zhao & Whatley, p. 186

Diagnosis: Medium, sub-rectangular in lateral view. Compress laterally. Surface coarsely reticulate, deep fossae and muri with short spine. Dorsal and ventral margins sub-parallel. Prominent eye tubercle.

Occurrence: 43 specimens were recorded from stations 3, 4, 5, 6 and 10.

Genus *Trachyleberis* Brady, 1898

Trachyleberis sp.

Pl. 5, figs. 3, 4

Occurrence: 94 specimens were found from stations 1, 2, 3, 6 and 7.

Superfamily CYTHERACEA Baird, 1850

Family BRACHYCYTHERIDAE Puri, 1954

Subfamily ARCULACYTHERINAE Hartmann, 1981

Genus *Hemikrithe* Van den Bold, 1950

Hemikrithe orientalis Van den Bold, 1950

Pl. 5, figs. 5, 6

- 1950 *Hemikrithe orientalis* Van den Bold; p. 901, 903, 904; text-figs. 1a-d
- 1981 *Hemikrithe orientalis* Van den Bold; Gou et al., ms, 155, pl. 88, figs. 1, 2
- 1985 *Hemikrithe orientalis* Van den Bold; Zhao et al., p. 200, pl. 19, fig. 17
- 1988 *Hemikrithe orientalis* Van den Bold; Whatley & Zhao, p. 37, pl. 10, fig. 6
- 1992 *Hemikrithe orientalis* Van den Bold; Mostafawi., p. 150, pl. 5, fig. 100
- 1997 *Hemikrithe orientalis* Van den Bold; Dewi, p. 74, figs. 218, 219

Diagnosis: Valves elongate, more or less bean-shaped. Anterior end evenly rounded. Dorsal margin nearly straight and ventral margin sinuate. Surface covered with reticulations. Valves rather thinly calcified.

Occurrence: 34 specimens were retrieved from stations 1, 3, 4, 7, 10 and 11.

Genus *Atjehella* Kingma, 1948
Atjehella semiplicata Kingma, 1948
Pl. 5, fig. 8

- 1948 *Atjehella semiplicata* Kingma; p. 76, pl. 8, figs. 1a-e
1976 *Atjehella semiplicata* Kingma; Keij, p. 452, pl. 1, figs. 1-6
1977 *Atjehella* aff. *semiplicata* Kingma; Paik, pl. 6, rjh 105-109, pl. 10, fig. 169
1988 *Atjehella semiplicata* Kingma; Whatley & Zhao, p. 37, pl. 10, fig. 5
1997 *Atjehella semiplicata* Kingma; Dewi, p. 74, figs. 215-217

Diagnosis: Carapace sub-rectangular in lateral view and very compressed laterally. Anterior end broadly rounded and posterior end quadrate. Dorsal and ventral margins nearly straight. A sub-peripheral ridge runs parallel to and along the entire anterior, ventral and posterior margins.

Occurrence: Only 16 specimens were identified from stations 4, 6 and 10.

Subfamily CYTHERETTINAE Triebel, 1952
Genus *Neocytheretta* Van Morkhoven 1963
Neocytheretta snellii (Kingma, 1948)
Pl. 5, fig. 7

- 1948 *Paracytheretta snellii* Kingma, p. 77, pl. 7, figs. 14a-c
1963 *Neocytheretta snellii* (Kingma); Van Morkoven, p. 236-239, figs. 356-359
1979 *Neocytheretta snellii* (Kingma); Keij, p. 60, pl. 1, figs. 5, 6
1988 *Neocytheretta snellii* (Kingma); Whatley & Zhao, p. 22, pl. 9, figs. 18, 19
1992 *Neocytheretta snellii* (Kingma); Mostafawi, p. 150, pl. 5, fig. 96
1997 *Neocytheretta snellii* (Kingma); Dewi, p. 73, fig. 204

Diagnosis: Carapace elongate in lateral view. Anterior end broadly rounded and posterior end posterodorsally obtuse. Dorsal margin straight. The valves have irregular tubercles arranged approximately into 3 horizontal lines and clearly reticulate.

Occurrence: A total of 59 specimens were recorded from stations 1, 2, 3, 4, 6, 8, 9 and 10.

Family BYTHOCYTHERIDAE Sars, 1926
Genus *Bythoceratina* Hornibrook, 1953
Bythoceratina sp.
Pl. 5, fig. 9

Occurrence: Only 2 specimens were found in the study area.

Comparison

An analysis of these species and a comparison with adjacent areas shows that a high degree of faunal mixing occurs in this study area, which reveals the close relationship of the fauna with that of the Malacca Straits, Sedili River and Jason Bay, South China Sea, Java Sea and Indonesia (Table 2). From this study, we know that the fauna of the area studied is closet in composition, among fauna which have been studied, to that of the Malacca Straits (Whatley & Zhao 1987, 1988) with a total of 29 species common to the two areas. Some of these are widespread in both areas. Among these are *Pistocythereis cribriformis*, *Pistocythereis bradyi*, *Neomonoceratina iniqua* and *Cytherelloidea leroi*. A total of 25 species are previously recorded in Sedili River and Jason Bay (Zhao & Whatley 1989). The common species in both areas are *Phlyctenophora orientalis*, *Neocytheretta snellii* and *Xestoleberis malaysiana*. Study on the distribution of ostracoda faunas from Java Sea, west Bawean Island, Indonesia had presented 130 species (Dewi 1997). A total of 26 species are previously recorded among Pulau Besar and Java Sea. Some of these are *Hemikrithe orientalis*, *Keijella multisulcus*, *Foveoleberis cypradoidea*, *Hemicytheridea reticulata* and *Venericythere papuensis*. A total of 21 species were found in both Pulau Besar and South China Sea. Some of these are *Triebelina sertata*, *Macrocypris decora*, *Loxoconcha liljeborgii*, *Parakriothella pseudadonta* and *Hermanites deltoidea*. Mostafawi et al. (2005) had studied the taxonomy of ostracoda from recent reefal flat deposit in Bali, Indonesia and found that a total of 34 ostracoda species were recovered in the study areas. 7 species are common in both area and some of these are *Ornatoleberis morkhoveni*, *Miocyprideis spinulosa*, *Paracytheridea tschoppi* and *Neobuntonia cf. guttata*. While 19 species are previously recorded in Singapore platform that also studied by Mostafawi (1992). Some of these are *Cytherella semitalis*, *Neomonoceratina delicate*, *Keijia labyrinthica* and *Pistocythereis euplectella*. Only 1 species are previously recorded at Filipina and the species are *Atjehella smiplicata*.

SPECIES	Malacca Straits	Jason Bay & Sedili River	Singapore	South China Sea	Filipina	Java Sea	Indonesia
<i>Paranesidea</i> sp.							
<i>Triebelina sertata</i>				x			x
<i>Bairdoppilata paraacratricola</i>	x					x	
<i>Cytherella semitalis</i>	x	x	x			x	
<i>Cytherelloidea cingulata</i>	x	x	x	x		x	
<i>Cytherelloidea leroi</i>	x		x	x		x	
<i>Cytherelloidea malaccaensis</i>	x	x				x	
<i>Macrocypris decora</i>	x		x	x		x	
<i>Phlyctenophora orientalis</i>	x	x	x	x		x	
<i>Propontocypris</i> sp.							
<i>Argillocea</i> sp.							
<i>Neomonoceratina delicate</i>	x	x	x	x		x	
<i>Neomonoceratina iniqua</i>	x	x				x	

<i>Xestoleberis malaysiana</i>		X	X		X	
<i>Feveoleberis cypraeoides</i>	X	X	X	X	X	
<i>Ornatoleberis morkhoveni</i>	X	X				X
<i>Loxoconcha lilljeborgii</i>			X	X		X
<i>Loxoconcha tumulosa</i>				X		
<i>Tanella</i> sp.						
<i>Keijia labyrinthica</i>	X	X	X		X	
<i>Parakritella pseudadonta</i>	X	X	X	X	X	
<i>Miocyprideis spinulosa</i>						X
<i>Paracytheridea tschoppi</i>		X		X		X
<i>Cytheropteron</i> sp.						
<i>Hemicytheridea reticulata</i>	X	X			X	
<i>Hemicytheridea cancellata</i>	X					
<i>Caudites</i> sp. 2						
<i>Neobuntonia</i> cf. <i>guttata</i>						X
<i>Hermanites deltoides</i>				X		X
<i>Actinocythereis scutigera</i>	X	X	X	X	X	
<i>Henryhowella keutapangensis</i>	X				X	
<i>Bradleya pitalia</i>		X		X		
<i>Pistocythereis bradyi</i>	X	X	X	X	X	
<i>Pistocythereis cribriformis</i>	X	X	X	X	X	
<i>Pistocythereis euplectella</i>	X	X	X		X	
<i>Pistocythereis</i> sp.						
<i>Venericythere darwini</i>	X	X		X	X	
<i>Venericythere papuensis</i>	X	X	X	X	X	
<i>Keijella apta</i>	X					
<i>Keijella multisulcus</i>	X	X	X		X	
<i>Borneocythere paucipunctata</i>	X		X		X	
<i>Lankacythere coralloides</i>	X	X				
<i>Trachyleberis</i> sp. 1						
<i>Neocytheretta snellii</i>	X	X		X	X	
<i>Hemikrithe orientalis</i>	X	X	X	X	X	
<i>Atjehella semiplicata</i>	X	X		X	X	X
<i>Bythoceratina</i> sp. 2						

Acknowledgement

This research was funded by the IRPA (Code project: 09-02-02-0096-EA240) and E-Science Fund (Code project: 04-01-02-SF0172). We wish to thank SEM Unit, FST, UKM for SEM micrographs.

References

- Brasier, M.D. 1980. *Microfossil*. George Allen & Unwin LTD.
- Dewi, K.T. 1997. *Ostracoda from the Java Sea, west of Bawean Island, Indonesia*. Department of Geology, The University of Wollongong Australia.
- Gou, Y.X. 1990. Recent Ostracoda from Hainan Island, South China Sea. In Ziegler, W., *European Ostracodologists Meeting*. Vol. 2. Courier Forschungsinstitut Senckenberg.

- Horne, D. J., Cohen, A. & Martens, K. (2002). Taxonomy, Morphology and Biology of Quaternary and Living Ostracoda. *The Ostracoda: Applications in Quaternary Research Geophysical Monograph*, 131: 5-36.
- Morkhoven, V. 1963. Volume II. *Post-paleozoic ostracoda: Their morphology, taxonomy, and economic use*. Amsterdam: Elsevier Publishing Company.
- Moore, R.C. 1961. *Treatise on invertebrate Paleontology*, Part Q, Arthropoda 3: Crustacea, 56-70. Geological Society of America and University of Kansas Press, Colorado.
- Mostafawi, N. 1992. Rezente ostracoden aus dem mittleren Sunda-schelf, zwischen der Malaiischen Halbinsel und Borneo (abstract in English). *Senckenbergiana letheica* 72: 129-168.
- Mostafawi, N., Colin, J.P., & Babinot, J.F. 2005. An account on the taxonomy of ostracodes from recent reefal flat deposits in Bali, Indonesia. *Revue de micropaleontologie* 48: 123-140.
- Pokory, V. 1980. Ostracodes. In Boersma, A. & Haq, B. U. *Introduction to Marine Micropaleontology*. New York: Elsevier North Holland, Inc.
- Sohn, I.G., Berdan, J.M. & Peck, R.E. 1965. Ostracods. In Kummel, B. & Raup, D. (Eds.). *Handbook of paleontological techniques*. (W.H. Freeman and Company, San Francisco). pp. 75-89.
- Whatley, R., C., & Zhao, Q., 1987. Recent Ostracoda of the Malacca Straits, part I. *Revista Espanola de Micropaleontologie*, 19(3): 327-366.
- Whatley, R., C., & Zhao, Q., 1988. Recent Ostracoda of the Malacca Straits, part II. *Revista Espanola de Micropaleontologie*, 20(1): 5-37.
- Zhao, Q., Wang, P. & Zhang, Q. 1985. Ostracoda in bottom sediments of the South China Sea off Guangdong Province, China: their taxonomy and distribution. In Wang, P. (eds.). *Marine Micropaleontology of China*, p. 196-217. Beijing: China Ocean Press.
- Zhao, Q. & Whatley, R.C. 1989. Recent podocopid ostracoda of the Sedili River and Jason Bay, southeastern Malay Peninsula. *Micropaleontology* 35: 168-187.
- Zhao, Q. 2005. Late Cainozoic ostracod faunas and paleoenvironmental changes at ODP site 1148 South China Sea. *Marine Micropaleontology* 54: 27-47.

Plate 1

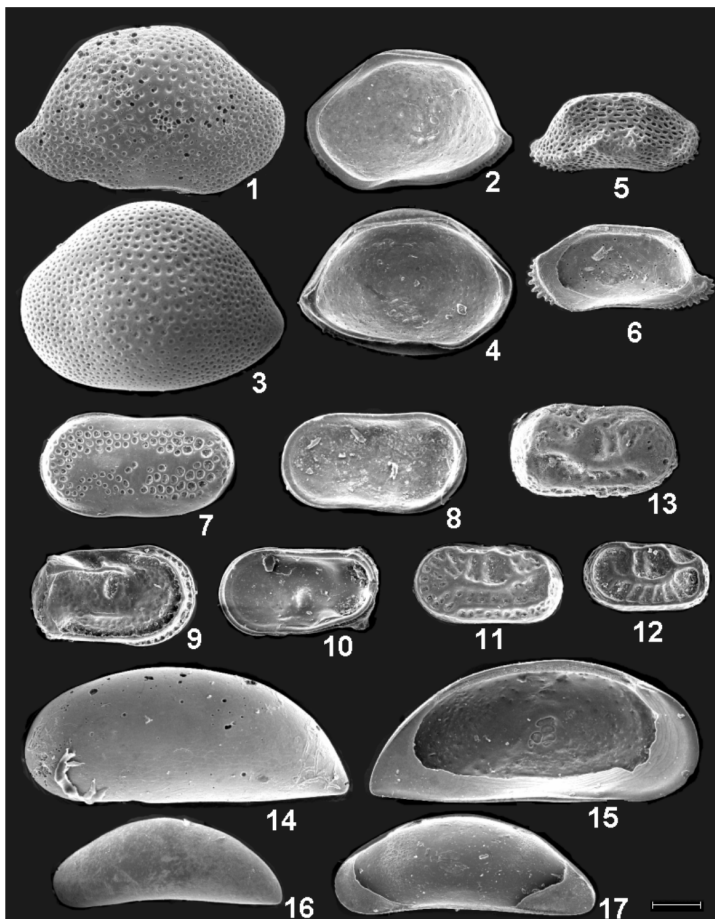


Plate 1

- Figures 1, 2 *Paranesidea* sp., 1. ext. view, RV, 100x, ST 5; 2. int. view, RV, 125x, ST 3.
 Figures 3, 4 *Bairdoppilata paracratericola* Titterton & Whatley, 1988, 3. ext. view, LV, 94x, ST 6, 4. int. view, LV, 120x, ST 17.
 Figures 5, 6 *Triebelina sertata* Triebel, 1948, 5. ext. view, RV, 169x, ST 5, int. view, RV, 151x, ST 7.
 Figures 7, 8 *Cytherella semitalis* Brady, 1868, 7. ext. view, LV, 146x, ST 39; 8. int. view, LV, 144x, ST 2.
 Figures 9, 10 *Cytherelloidea cingulata* (Brady, 1869), 9. ext. view, LV, 159x, ST 28, 10. int. view, LV, 160x, ST 7.
 Figures 11, 12 *Cytherelloidea leroyi* Keij, 1954, 11. ext. view, RV, 186x, ST 28, 12. int. view, LV, 210x, ST 7.
 Figure 13. *Cytherelloidea malaccaensis* Whatley & Zhao, 1987, ext. view, RV, ST 2.
 Figures 14, 15 *Phlyctenophora orientalis* (Brady, 1868), 14. ext. view, LV, 82x, ST 23, 15. int. view, LV, 82x, ST 2.
 Figures 16, 17 *Macrocypris decora* (Brady, 1866), 16. ext. view, LV, 120x, ST 23, 17. int. view, RV, 100x, ST 11

Plate 2

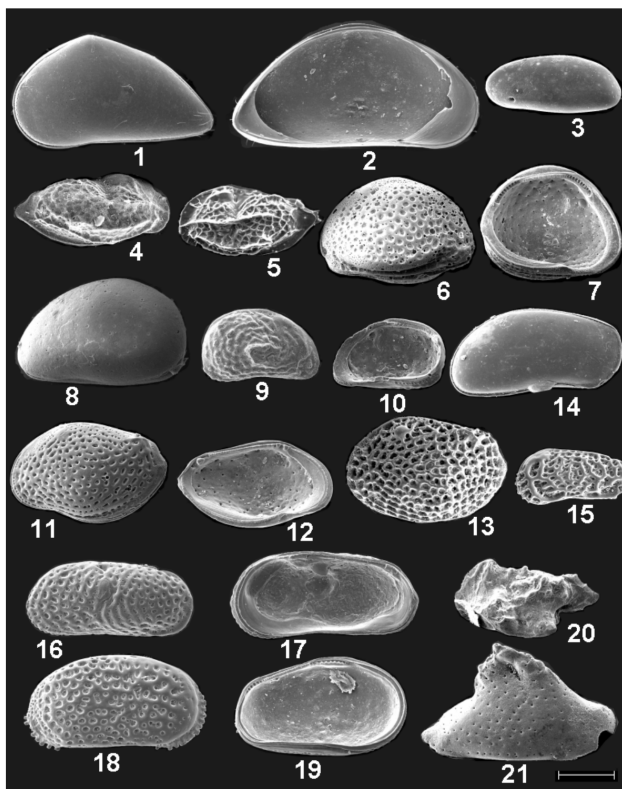


Plate 2

- Figures 1, 2 *Propontocypris* sp., 1. ext. view, LV, 117x, ST 6, 2. int. view, LV, 95x, ST 3.
 Figure 3 *Argilloecia* sp., ext. view, RV, 169x, ST 7.
 Figure 4 *Neomonoceratina delicata* Ishizaki & Kato, 1976, ext. view, RV, 165x, ST 2.
 Figure 5 *Neomonoceratina iniqua* Brady, 1868, ext. view, LV, 150x, ST 7.
 Figures 6, 7 *Foveoleberis cypraeoides* (Brady, 1868), 6. ext. view, LV, 145x, ST 2, 7. int. view, LV, 130x, ST 3.
 Figure 8 *Xestoleberis malaysiana* Zhao & Whatley, 1989, ext. view, RV, 138x, ST 7.
 Figures 9, 10 *Ornatoleberis morkhoveni* Keij, 1975, 9. ext. view, LV, 90x, ST 6, 10. int. view, LV, 215x, ST 6.
 Figures 11, 12 *Loxoconcha lilljeborgii* Brady, 1868, 11. ext. view, LV, 150x, ST 4, 12. int. view, LV, 150x, ST 10.
 Figure 13 *Loxoconcha tumulosa* (Hu, 1979), ext. view, LV, 162x, ST 7
 Figure 14 *Parakrithella pseudadonta* Hanai, 1961, ext. view, RV, 130x, ST 3
 Figure 15 *Keijia labyrinthica* Whatley & Zhao 1988, ext. view, LV, 220x, ST 2
 Figures 16, 17 *Tanella* sp. 16. ext. view, RV, 134x, ST 6, 17. int. view, LV, 120x, ST 6
 Figures 18, 19 *Miocyprideis spinulosa* (Brady, 1868), 18. ext. view, RV, 125x, ST 7, 19. int. view, LV, 150x, ST 7.
 Figure 20 *Paracytheridea tschoppi* Van den Bold, 1946, ext. view, LV, 186x, ST 5.
 Figure 21 *Cytheropteron* sp., dorsal view, RV, 127x, ST 4.

Plate 3

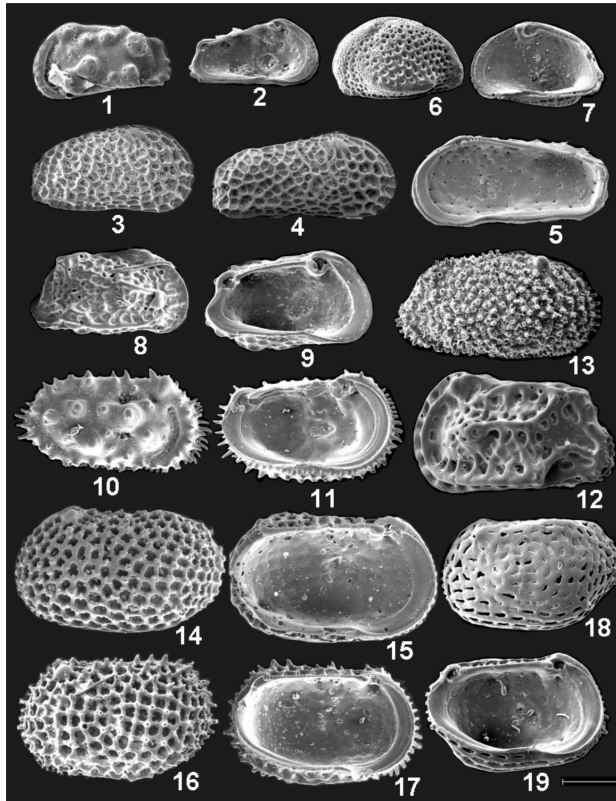


Plate 3

- Figures 1, 2 *Caudites* sp. 1. ext. view, LV, 180x, ST 7, 2. int. view, LV, 189x, ST 7
- Figure 3 *Hemicytheridea cancellata* (Brady, 1868), ext. view, RV, 153x, ST 3
- Figures 4, 5 *Hemicytheridea reticulata* Kingma, 1948, 4.), ext. view, RV, 130x, ST 2 5. int. view, RV, 115x, ST 2.
- Figures 6, 7 *Neobuntonia* cf. *guttata* (Brady, 1890), 6. ext. view, LV, 161x, ST 7, 7. int. view, RV, 157x, ST 7.
- Figures 8, 9 *Hermanites deltoides* (Brady, 1890), 8. ext. view, RV, 145x, ST 2, 9. int. view, LV, 143x, ST 2.
- Figures 10, 11 *Actinocythereis scutigera* (Brady, 1868), 10. ext. view, RV, 80x, ST 2, 11. int. view, LV, 83x, ST 2.
- Figure 12 *Bradleya pitalia* (Hu, 1981), ext. view, LV, 112x, ST 3.
- Figure 13 *Henryhowella keutapangensis* (Kingma, 1948), ext. view, RV, 116x, ST 4.
- Figures 14, 15 *Pistocythereis bradyi* (Ishizaki, 1968), 14. ext. view, LV, 115x, ST 10, 15. int. view, LV, 100x, ST 11.
- Figures 16, 17 *Pistocythereis cribriformis* (Brady, 1865), 16. ext. view, LV, 110x, ST 2, 17. int. view, LV, 110x, ST 2.
- Figures 18, 19 *Pistocythereis euplectella* (Brady, 1869), 18. ext. view, LV, 129x, ST 5, 19. int. view, LV, 135x, ST 5.

Plate 4

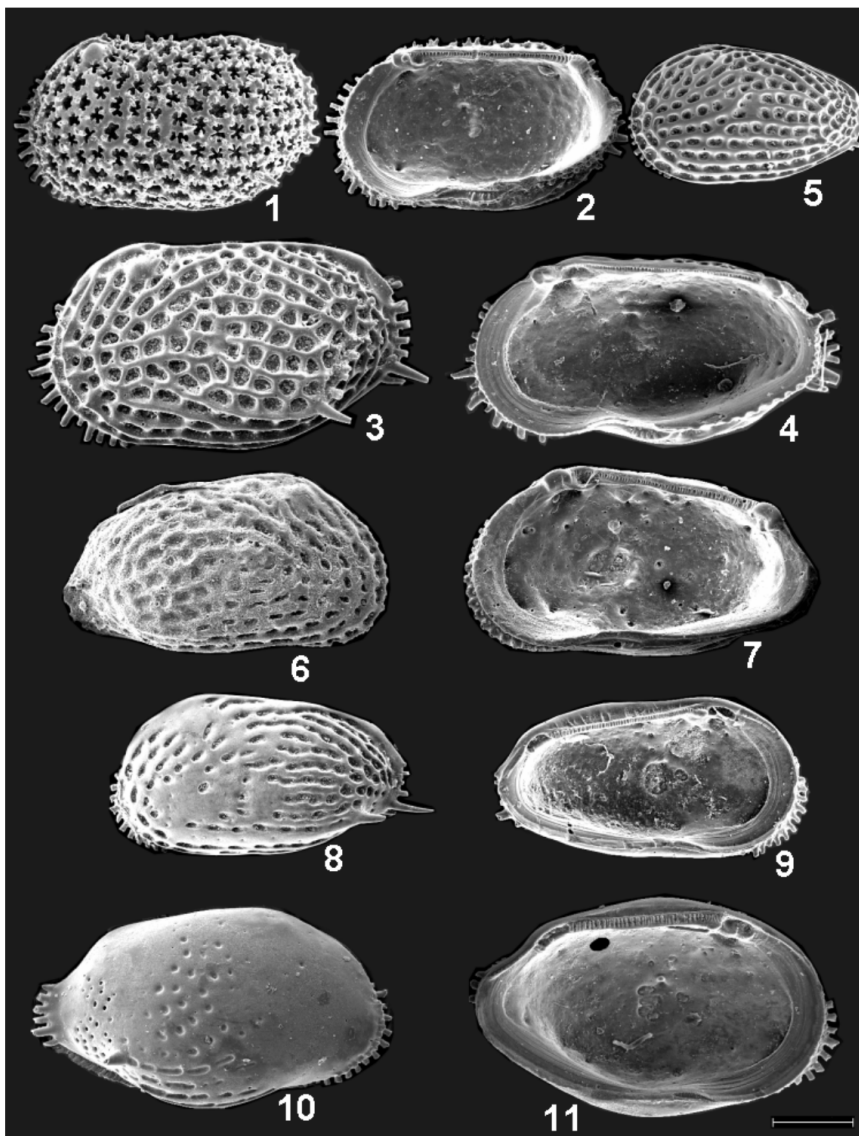


Plate 4

- Figures 1, 2 *Pistocythereis* sp., 1. ext. view, LV, 110x, ST 6, 2. int. view, RV, 112x, ST 6
 Figures 3, 4 *Venericythere darwini* (Brady, 1868), 3. ext. view, LV, 85x, ST 8, 4. int. view, RV, 87x, ST 8.
 Figure 5 *Venericythere papuensis* (Brady, 1880), ext. view, LV, 154x, ST 2.
 Figures 6, 7 *Keijella apta* (Guan, 1978), 6. ext. view, LV, 110x, ST 6, 7. int. view, RV, 100x, ST 7.
 Figures 8, 9 *Keijella multisulcus* Whatley & Zhao, 1988, 8. ext. view, LV, 105x, ST 6. 9. int. view, LV, 107x, ST 6.

Plate 5

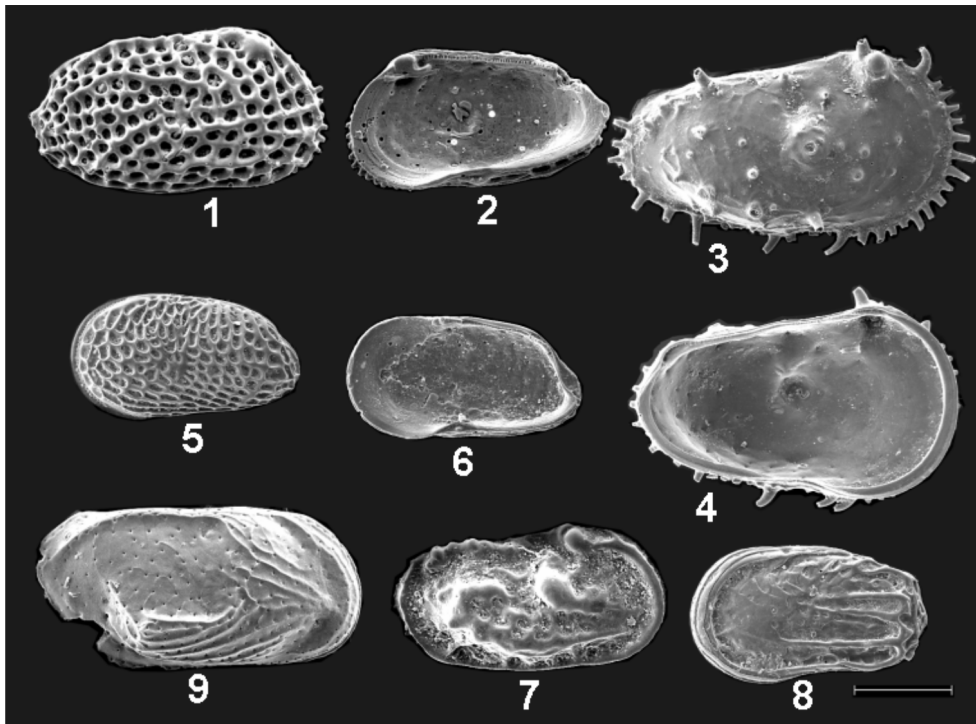


Plate 5

- Figures 1, 2 *Lankacythere coralloides* (Brady, 1886), 1. ext. view, RV, 136x, ST 6. 2. int. view, RV, 147x, ST 6.
- Figures 3, 4 *Trachyleberis* sp. 1, 3. ext. view, RV, ST 6, 4. int. view, RV, 121x, ST 6.
- Figures 5, 6 *Hemikrithe orientalis* Van den Bold, 1950 5. ext. view, LV, 174x, ST 3, 6. int. view, RV, 176x, ST 3.
- Figure 7 *Neocytheretta snellii* (Kingma, 1948), ext. view, RV, 155x, ST 10.
- Figure 8 *Atjehella semiplicata* Kingma, 1948, ext. view, RV, 178x, ST 9.
- Figure 9 *Bythoceratina* sp. 2, ext. view, RV, 163x, ST 4.