

RECENT BENTHIC OSTRACODA IN OFFSHORE SEDIMENT OF PULAU PERHENTIAN, TERENGGANU

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ABSTRACT

A study on the distribution of recent benthic ostracoda in offshore sediment was carried out around Pulau Perhentian, Terengganu. A total of 10 sediment samples were taken from the sampling stations between latitude 5°55.228' to 5°56.144'N and longitude 102°43.754' to 102°44.850'E using a grab sampler of Petite Ponar type. The sediment samples were washed over 0.50 mm, 0.15 mm and 0.063 mm size sieves. The specimens were picked, identified and counted from dried samples. The species diversity, specimen abundance and the Shannon-Wiener's diversity index, H' was calculated using PAST software. The specimens were identified using Scanning Electron Microscopy (SEM) and Light Microscopy (LM). From this study, 43 species of ostracoda belonging to 16 families and 29 genera were identified. The dominant species is *Hemicytheridea cancellata* with 168 individuals obtained. The species diversity is ranged from 1 to 40 species and the abundance is from 1 to 269 specimens. The species diversity index, H' is in the range of 0.69 to 3.21.

Key words: ostracoda, distribution, diversity, abundance, Pulau Perhentian

INTRODUCTION

Ostracoda are amazing small crustaceans (sometimes known as seed shrimp), from class of Crustacea which characterized by calcified bivalve that enclosed their body completely. The body length ranging between 0.2 to 1.0 mm. It has a very wide habitat, where found in freshwater, brackish water and marine with various diversity and abundance. The class encloses over 33,000 described species and subspecies, and many more species remain unknown to science. The class of ostracoda is subdivided into two subclasses with living representatives, the Myodocopa and Podocopa. The Myodocopa is exclusive to marine environments, but occupies the benthos as well as the plankton, while the Podocopa occur in marine, brackish and freshwater environments and occupies almost exclusively benthos (Amstrong & Brasier, 2005). The knowledge of ostracoda distribution in Malaysian waters had been contributed by Zhao and Whatley (1989) in southeastern Peninsular Malaysia which described more than 101 species. Local researches on ostracoda distribution had been done

in east coast Peninsular Malaysia (Faiz *et al.*, 2007; Faiz & Omar, 2009; Omar & Faiz, 2010) and Sulu Sea, Sabah (Noraswana *et al.*, 2014). The purpose of this study will determine the distribution of recent ostracoda in the study area.

MATERIALS AND METHODS

Ten sediment samples were collected from the sampling stations around Pulau Perhentian, Terengganu during October, 2012 (Figure 1). Pulau Perhentian lies approximately 19 km off the coast of north eastern Malaysia. The two main islands are Pulau Perhentian Besar and Pulau Perhentian Kecil. A grab sampler of Petite Ponar type was used to collect surface sediments. In the laboratory, the samples were washed over three different size sieves: 0.50 mm, 0.15 mm and 0.063 mm and dried at 60°C in an oven. The specimens were picked, identified and counted from 3 g of dried sediment samples. For the identification, the classification of Moore (1961) provides the basis for the generic classification of this study. Identification on the species level is primarily based on comparison on morphology features between collected specimen

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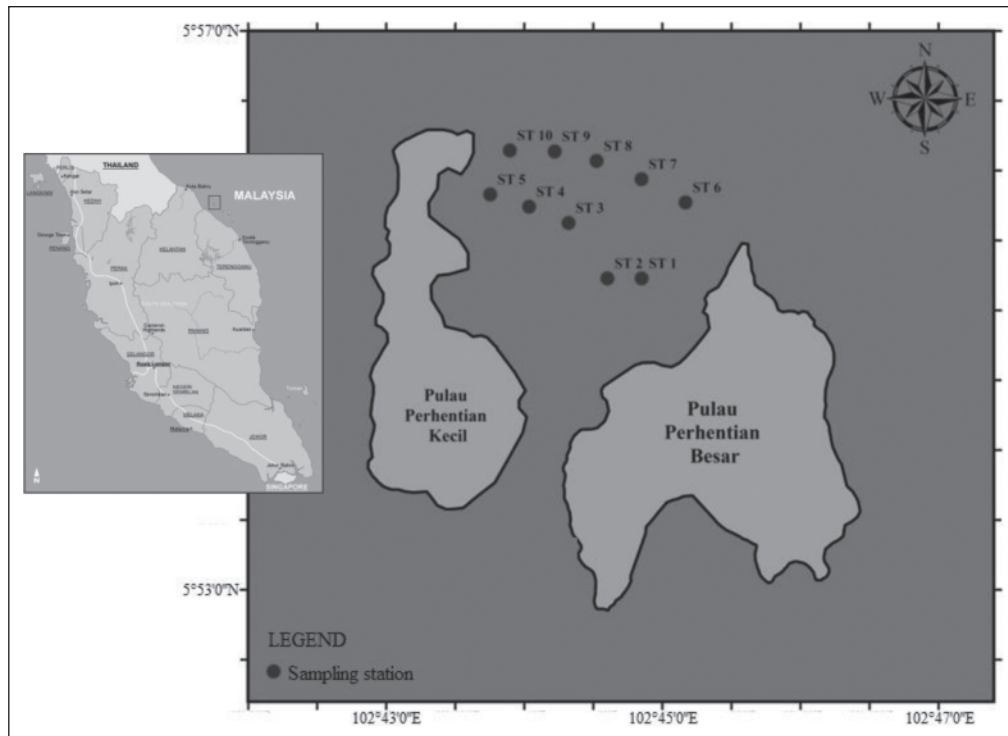


Fig. 1. Location of sampling station in Pulau Perhentian, Terengganu, Malaysia.

with ostracoda species that had been recorded from earlier researchers and we referred to the taxonomy provided by several researchers (Whatley & Zhao 1987; Whatley & Zhao, 1988; Zhao & Whatley, 1989; Yassini & Jones, 1995; Dewi, 1997; Munef *et al.*, 2012).

For ostracod faunal analysis, the data obtained was used to compute the species diversity (number of species in each sample), abundance (specimen number in each sample) and dominance (percentage of the most abundance species in each sample). The Shannon-Wiener's diversity index (H') was calculated using PAST software. The species were identified using Scanning Electron Microscope (Tabletop Microscopy, Hitachi TM-1000) and Light Microscopy (Olympus SZ61). Based on Whatley and Zhao (1987), the terms of abundant, common and rare are used to describe the incidence of one species in its sample. Abundant indicates that one species has a percentage of more than 10% of the total specimens of the samples; common indicates 5 to 10% and rare indicates less than 5%.

RESULTS AND DISCUSSION

From this study, a total of 43 species, 29 genera and 14 families from 954 specimens obtained in the study area. The families are Hemicytheridea, Pontocyprididae, Schizocytheridae, Paracyprididae, Krithidae, Cytherellidae, Bairdiidae, Cytheruridae,

Xestoleberididae, Pectocytheridae, Loxoconchidae, Trachyleberididae, Leptocytheridae and Paradoxostomatidae. The representatives of these families are typical of infralittoral marine environments around the world. Among these represented families in the area, Trachyleberididae family recorded the highest diversity with 14 species. There are from the genus *Alocopocythere*, *Atjehella*, *Neocytheretta*, *Keijella*, *Lankacythere*, *Pistocythereis*, *Stigmatocythere*, *Trachyleberis* and *Venericythere*. Meanwhile, the most dominant family are Hemicytheridea with the highest percentage, comprising 34.9% of all specimens, followed by Trachyleberididae (207 specimens, 21.7%) and Loxoconchidae (117 specimens, 12.3%).

The diversity index of Shannon-Wiener, H' , abundance and dominance for each of the site studied is listed in Table 1. The species diversity is ranging from 1 to 40 species. The abundance of ostracoda is highest at station ST1 with 269 specimens and followed by station ST2 with 210 specimens. No ostracoda specimens are recorded at station ST9 and ST10. The diversity index, H' is relatively high ranging from 0.69 to 3.21 whereas the highest value is at the station ST2 and the lowest value is at the station ST5. The dominance is from 14.0 to 25.0%. These illustrate the diversity of ostracoda in the study area.

The list of species and their abundance are shown in Table 2. All the species found are benthic and tropical form. The dominant and abundant

Table 1. The coordinate, diversity, abundance, value of H' and dominance (%) for each sampling stations

Station	Coordinate	Diversity	Abundance	H'	Dominance, %
ST1	05°55.228'N, 102°44.850'E	40	269	3.18	15.6
ST2	05°55.464'N, 102°44.602'E	37	210	3.21	16.2
ST3	05°55.625'N, 102°44.321'E	34	146	3.12	20.5
ST4	05°55.741'N, 102°44.036'E	4	4	1.39	–
ST5	05°55.829'N, 102°43.754'E	2	2	0.69	–
ST6	05°55.771'N, 102°45.168'E	33	144	2.96	25.0
ST7	05°55.938'N, 102°44.849'E	35	178	3.12	14.0
ST8	05°56.069'N, 102°44.534'E	1	1	–	–
ST9	05°56.136'N, 102°44.221'E	–	–	–	–
ST10	05°56.144'N, 102°43.896'E	–	–	–	–

Table 2. The abundance of ostracoda according to family and species

Family	Species	Total	% Abundance
Hemicytheridea	<i>Neobuntonia guttata</i>	26	2.7
	<i>Neobuntonia</i> sp.	3	0.3
	<i>Hemicytheridea cancellata</i>	168	17.6
	<i>Hemicytheridea reticulata</i>	52	5.5
	<i>Caudites exmouthensis</i>	46	4.8
	<i>Corallicythere</i> sp.	13	1.4
	<i>Bosasella elongata</i>	25	2.6
Pontocypridae	<i>Argilloecia</i> sp.	10	1.0
	<i>Propontocypris</i> sp.	5	0.5
Schizocytheridae	<i>Neomonoceratina delicata</i>	21	2.2
	<i>Neomonoceratina bataviana</i>	23	2.4
	<i>Neomonoceratina</i> sp.	5	0.5
Paracypridae	<i>Phlyctenophora orientalis</i>	35	3.7
Krithidae	<i>Parakrithella pseudadonta</i>	2	0.2
Cytherellidae	<i>Cytherella semitalis</i>	12	1.3
	<i>Cytherelloidea leroyi</i>	16	1.7
	<i>Cytherelloidea cingulata</i>	11	1.2
Bairdiidae	<i>Triebelina sertata</i>	12	1.3
Cytheruridae	<i>Semicytherura</i> sp.	11	1.2
Xestoleberididae	<i>Xestoleberis hanaii</i>	44	4.6
Pectocytheridae	<i>Keijia demissa</i>	36	3.8
	<i>Keijia labyrinthica</i>	6	0.6
Loxoconchidae	<i>Loxocorniculum</i> sp.	2	0.2
	<i>Loxoconcha tumulosa</i>	3	0.3
	<i>Loxoconcha australis</i>	32	3.4
	<i>Loxoconcha liljeborgii</i>	26	2.8
	<i>Loxoconcha paiki</i>	48	5.0
Trachyleberididae	<i>Alocopocythere goujoni</i>	7	0.7
	<i>Atjehella semiplicata</i>	16	1.7
	<i>Neocytheretta adunca</i>	11	1.2
	<i>Neocytheretta</i> sp.	23	2.4
	<i>Keijella multisulcus</i>	6	0.6
	<i>Keijella reticulata</i>	12	1.3
	<i>Keijella</i> sp.	34	3.6
	<i>Lankacythere coralloides</i>	13	1.4
	<i>Pistocythereis bradyi</i>	13	1.4
	<i>Pistocythereis cribriformis</i>	29	3.0
	<i>Pistocythereis</i> sp.	7	0.7
	<i>Stigmatocythere roesmani</i>	5	0.5
	<i>Trachyleberis</i> sp.	11	1.2
	<i>Venericythere papuensis</i>	20	2.1
Leptocytheridae	<i>Tanella gracilis</i>	51	5.3
Paradoxostomatidae	<i>Paracytherois</i> sp.	3	0.3

species in the study area (>10% of total specimens) is *Hemicytheridea cancellata* (168 specimens, 17.6%). *Hemicytheridea cancellata* shows great dominance in station ST1 to ST7. Its abundance ranged from 0 to 42 individuals/g. Maximum abundance was found in station ST1. This species is widespread at a water depth of less than 25 m, being abundant in the station with clayey sand sediment. Most of the species found in the study area are rare (less than 5%). There are only three common species with total abundance between 5 to 10% found in the study area (*Hemicytheridea reticulata*, *Loxoconcha paiki* and *Tanella gracilis*). Selected micrographs of this species are shown in Figure 2.

The distribution of ostracoda in the study area was recorded high in diversity but low in abundance. In shallow marine environment, the diversity become higher and the density are lower than deeper water due to the general stability of the environment (Armstrong & Brasier, 2005). The ostracod diversity of shallow marine environment is generally much higher than that observed in other deep sea marine environments. All the species identified in the study area are belonged to order Podocopida which occupies benthic and marine environment. It is the most diverse of the four orders of ostracods, and also has a rich fossil record. Meanwhile, the Cytheridae are the most abundant and diverse group of marine ostracods found as fossils from the Upper Cretaceous

to the Recent (Tsukagoshi & Parker, 2000). Most of the species recorded in the study area are common in Southeast Asia.

Pulau Perhentian is clearly dominated by *Hemicytheridea cancellata*. The common species are *Hemicytheridea reticulata*, *Loxoconcha paiki* and *Tanella gracilis*. The taxonomy of dominant species *Hemicytheridea cancellata* is shown below:

Order PODOCOPIDA (Muller, 1894)
 Family HEMICYTHERIDAE (Puri, 1953)
 Genus *Hemicytheridea* (Kingma, 1948)
Hemicytheridea cancellata (Brady, 1868)

- 1868 *Cythere cancellata* Brady: p. 62, pl. 7, fig. 9-11
 1954 *Cytheromorpha cancellata* (Brady); Keij, p. 354, pl. 1, fig. 7-9
 1963 *Hemicytheridea?* aff. *cancellata* (Brady); van Morkhoven, p. 400, fig. 665-667
 1987 *Hemicytheridea cancellata* (Brady); Whatley and Zhao, p. 363, pl. 5, fig. 20
 2007 *Hemicytheridea cancellata* (Brady); Faiz et al., p. 147, fig. 2(2), 2(3)

Diagnosis: Medium in size and has strong reticulate ornamentation. The dorsal margin is straight and ventral margin is sinuous. The posterior end is turned upwards and the anterior end is rounded.

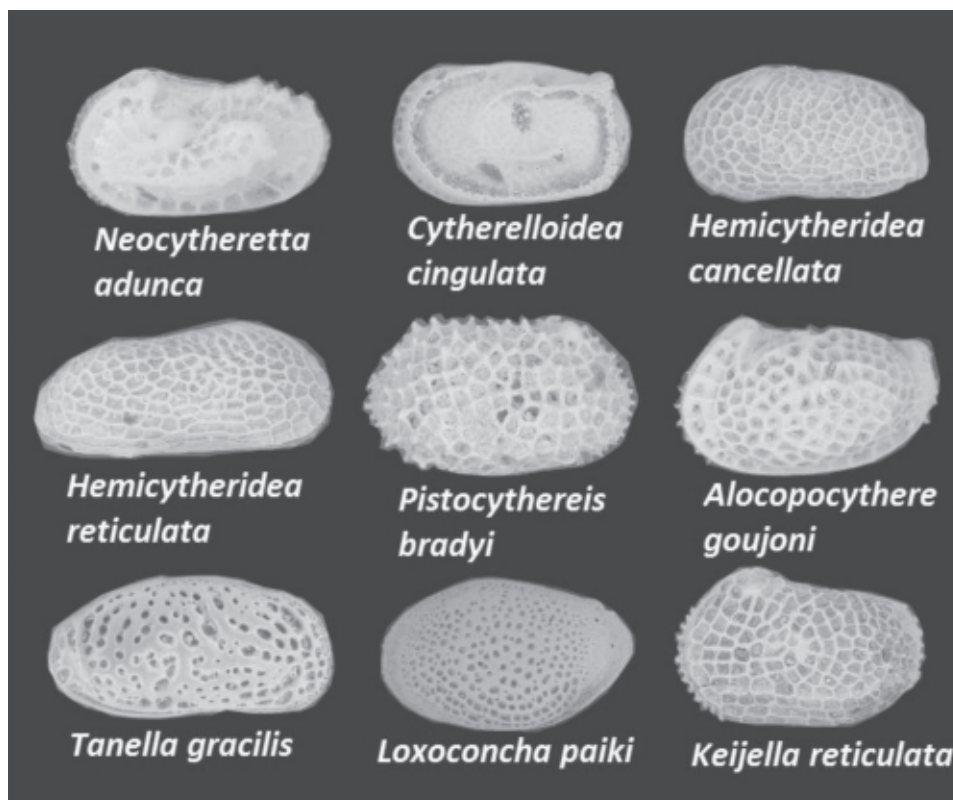


Fig. 2. SEM micrograph of selected ostracoda species.

Distribution: This species was previously found abundant in Malacca Straits (Whatley & Zhao, 1988) and common in east coast of Peninsular Malaysia (Faiz *et al.*, 2007).

This dominant and common species are typical tropical species commonly found and reported in shallow seas of Southeast Asia (Whatley & Zhao, 1987; Whatley & Zhao 1988; Zhao & Whatley, 1989; Dewi, 1997; Faiz *et al.*, 2007; Faiz & Omar, 2009; Tanaka *et al.*, 2009; Omar & Faiz, 2010; Noraswana *et al.*, 2014). The fauna of Jason Bay, south-eastern Peninsular Malaysia (water depth is between 0-20 m) is typified by such species as *Hemicytheridea wangi*, *H. reticulata*, *Neomonoceratina iniqua*, *N. delicata*, *Parakrithella pseudadonta*, *Phlyctenophora orientalis*, *Stigmatocythere roesmani* and *Tanella gracilis*, even in the shallow southern part of the Malacca Straits, where water depth is between 20 and 50 m. *Loxococoncha paiki* was firstly described and reported from the Malacca Straits (Whatley & Zhao, 1987). *Hemicytheridea reticulata* and *Tanella gracilis* are apparently originated in the Indo-Pacific region (Dewi, 1997).

CONCLUSION

This study showed that the distribution of ostracoda in the study area is high in diversity but low in abundance. A total of 43 species, 29 genera and 14 families are identified from 954 specimens. The species found are Podocopida which occur in all marine environments and the dominant species recorded is *Hemicytheridae cancellata*.

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