

MEIOBENTHIC COMMUNITY OF SUNGAI PULAI SEAGRASS BED, MALAYSIA

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ABSTRACT

Meiobenthos inhabiting the seagrass bed of Sungai Pulai estuary, Johor, was studied for the differences in community structure. Sampling was carried out using a hand corer during the lowest tide in December 2006. Three stations were chosen that were located at the upper estuary, lower estuary and at the sea area. Cluster analysis dendrogram of Bray-Curtis similarity showed the similarity level at about 70-75% and from the MDS plot, it is found that communities at upper estuary were separated from those at lower estuary and at sea. The differences in environmental setting were thought as the significant contributor to the distribution of meiobenthos among the stations.

Keywords: Meiobenthic community, Seagrass bed, Sungai Pulai Malaysia

INTRODUCTION

Seagrass beds are known for their important role in supporting many marine lives by providing shelters, food, feeding and nursery ground. They also play an important role in minimizing impact of the sea current in coastal and intertidal area (Heck *et al.*, 1995; Hemminga and Duarte, 2000). Seagrass bed of Sungai Pulai, Malaysia is unique because of its extensive coverage and multi-species (Sasekumar *et al.*, 1989). This area is also listed as one of the spot for biodiversity study under the NAGISA project for the Asia Pacific region. Thus, an ecological study was carried out to evaluate the species biodiversity in the area. The main taxonomic work will concentrate on benthic harpacticoid copepods and polychaetes. This paper will report on the meiobenthic community structure found on different location of the seagrass in the area.

MATERIALS AND METHODS

Study area

The sampling of meiobenthos was conducted at seagrass beds of Sungai Pulai estuary, Johor

from 3rd until 5th December 2006 during the lowest tide. Three stations with the seagrass beds were selected at the study area. The three stations are Sungai Duku, 07°24.137'N, 103°22.476E (S1), Tanjung Adang, 01°19.762'N, 103°33.894'E (S2) and Merambong, 01°20.094' N, 103°35.982E (S3) as shown in Figure 1.

Field sampling

At each station, three transects were established starting from the bank to the upper site of the area. The length of the transect was 12.0 m. A total of three quadrates frame, 0.5 m x 0.5 m were placed along the transect. The distance of each quadrate was 5 m. In each quadrate, a total of three replicates for the sediment samples were collected by inserting a hand corer with 2 cm inner diameter onto the top 10 cm layer of the sediment. The sediment core samples to study meiobenthos were fixed immediately using 10% formalin (Monthum and Aryuthaka, 2006). Environmental parameters of the water at the seagrass beds such as temperature, salinity, dissolved oxygen, pH, and conductivity were measured *in situ* at each station by using YSI multi probe.

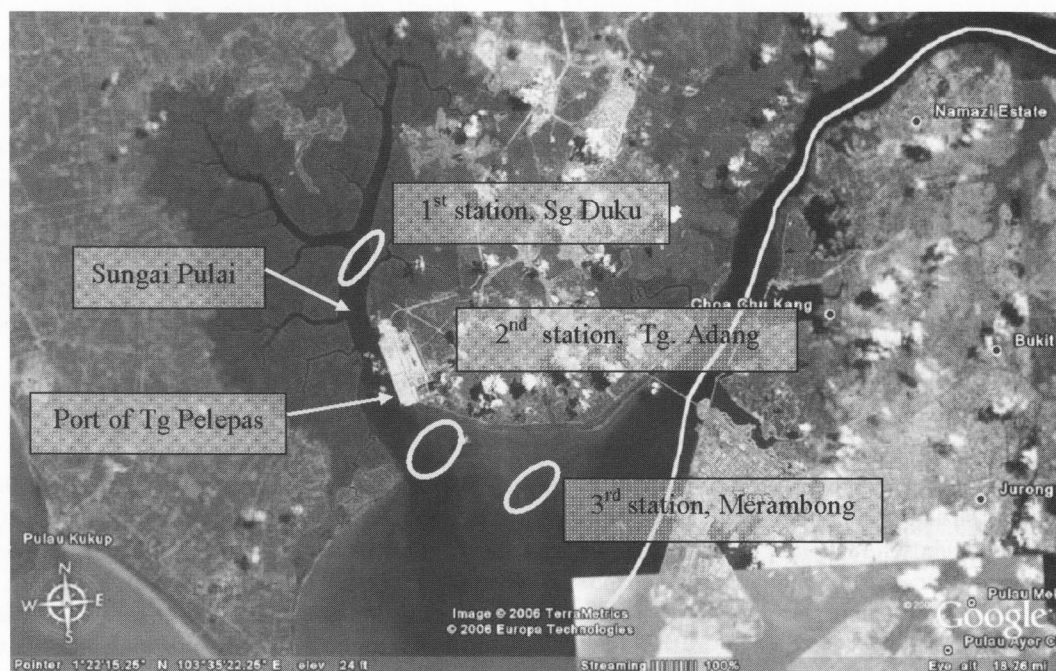


Figure 1. Location of the three stations of sampling site at Sungai Pulai, Johor, Malaysia. (Available from: www.googleearth.com.my)

RESULTS

Environmental parameters

The variation in water temperature, salinity and pH was small among sampling stations. Located at the upper stream, S1 has the lowest mean salinity, 28.87 ppt, followed by S2, 30.95 ppt which is located down stream. The mean salinity at S3 is the highest as it is located at more nearly to the sea with the value 31.21 ppt. The highest mean DO was also recorded at S3, which was 7.64 mg/L, and the lowest mean was 2.64 mg/L at S2 while in Sungai Duku (S1), the DO was 4.19 mg/L. Granulometric analysis using Malvern Particle Size Analyzer showed that sediment at S1 was mud but S2 and S3 shared the same fine sand type (mean size 2.87 phi).

Meiobenthos community

A total of 13 meiobenthic taxa were found at the seagrass beds of Sungai Pulai estuary, Johor within three sampling sites. The taxa found were Nematoda, Harpacticoida Copepod, Calanoida Copepoda, Cyclopoida Copepoda, Ostrococha, Polychaeta, Oligochaeta, Isopoda, Amphipoda, Gastropoda, Bivalvia, Cumacea and Tanaidacea. Nematodes were the most dominant group in all stations. Harpacticoid copepods have been found

the second dominant group only at S1 and S3. On the other hand, Calanoid copepods and copepod nauplii were found to be the second dominant group at S2.

The highest mean density was found at S2 (40–223 individuals 10 cm⁻²) and the lowest was at S1 (40–129 individuals 10 cm⁻²) (Fig. 2a–2c). There was a fluctuation of density between transects at S2 with quadrates at upper and lower level of the shore did not show consistent trend of density. On the other hand, quadrates at upper level at S1 supported higher number of meiobenthos those quadrates at lower part of the riverbank which is more exposed to the freshwater inflow. Density at S3 showed the same pattern with higher number of meiobenthos was found at quadrates nearest to the upper level of the shore.

The Bray-Curtis cluster analysis of the meiobenthos at seagrass beds in Sungai Pulai estuary produced two major clusters (Fig. 3). Community in S1 with a 71% similarity level dominates the first group while the other two communities, which are in S2 and S3, dominate the second group with a 75% similarity level. The MDS ordination based on the mean total density of meiobenthos (Fig. 4) clearly showed that the location of sampling sites clustered the meiobenthos.

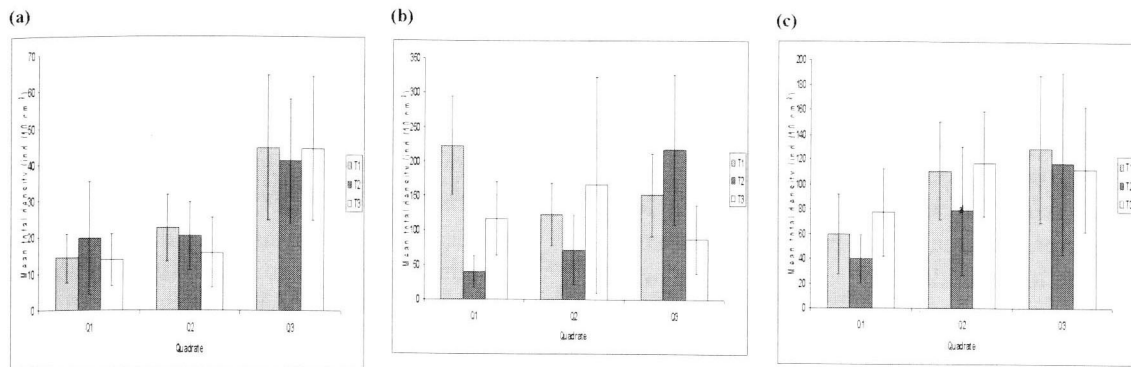


Figure 2. Mean density (ind./10 cm²) of meiobenthos (a) in Sungai Duku (S1), (b) in Tanjung Adang (S2), and (c) in Merambong (S3)

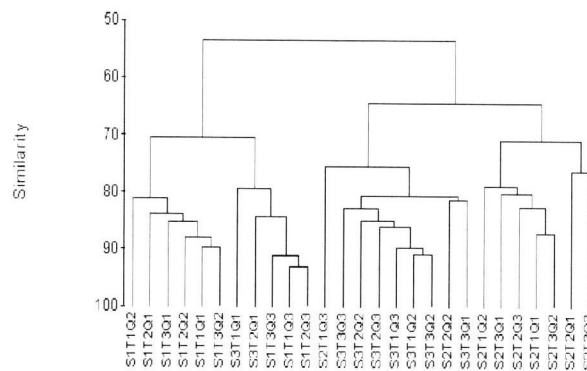


Figure 3. Cluster analysis dendrogram of Bray-Curtis similarity for meiobenthos at three sampling stations (Sungai Duku (S1), Tanjung Adang (S2) and Merambong (S3) in seagrass beds of Sungai Pulai estuary

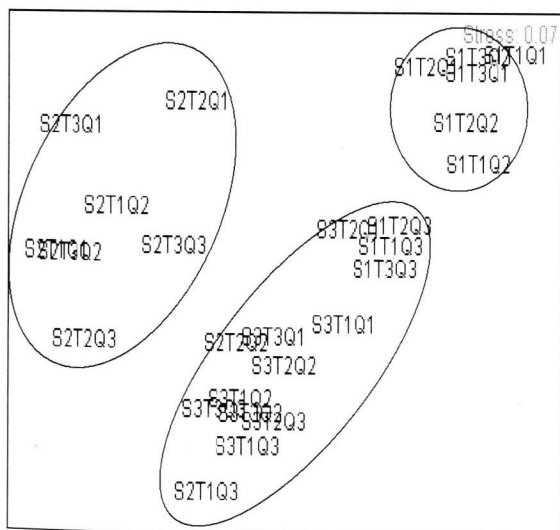


Figure 4. MDS ordination by using Bray-Curtis similarities between samples of three stations (Sungai Duku (S1), Tanjung Adang (S2) and Merambong (S3) in seagrass beds of Sungai Pulai estuary

DISCUSSION

The dominance of nematodes in most of meiobenthos community inhabiting marine bottom particularly with mud and fine sand sediment is well known and it is always followed by the harpacticoid copepods (McIntyre, 1969; Hicks and Coulls, 1983). Elliot and Kingston (1987) found that benthic communities in the inner estuarine areas are very low in densities with distance from the sea is usually attributed to low salinity. In addition, the muddy substrate of the sediment in this type of sediment offer less space for meiofauna. Meiofaunal organisms are patchily distributed horizontally, even when the sediment grain distribution is homogeneous and such patchiness caused by several reasons including waves and currents and food availability (Flach *et al.*, 2002). Besides, the lower density of meiobenthos that are closer to water movements by the tidal currents might be caused by the migration of the

meiobenthos. This is due to the strong tidal or wave action may also trigger a migration of benthos (Hall, 1994).

Meiobenthos did not show a high but a moderate in the density if compared to the previous report on meiobenthos density in the coastal water of Malaysia (Zaleha *et al.*, 2003). The long exposure of the area to the environmental stress during the lowest tide at the sampling time might cause some bias on the meiobenthos data. The salinity changes, which create stress, might also play a role in reducing the benthic communities in the intertidal estuary (Alongi, 1990).

CONCLUSION

Differences in community structure of meiobenthos in the seagrass bed of Sungai Pulai might be due to the different environmental setting. Meiobenthos in the inner estuary such as Sungai Dua experiencing lower salinity regime but more sheltered from strong wave and current if compared to the community at Merambong. Seagrass bed must have play an important role as the buffer zone that minimize the impact of human intervention in the area as shown by the stable diversity found in the study area near to the Tanjung Pelepas Port. It is suggested that the vegetative area must be conserved as to protect the natural resources in the area.

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