Distribution Of Planktonic Copepods (Zooplankton) In The Straits Of Malacca

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Introduction

Copepods are aquatic crustaceans, the diminutive relatives of the crab and shrimps. In terms of size, diversity and abundance, they can be regarded the insects of the sea (Huys and Boxshall, 1991). Humes (1994) stated that there are approximately 11,500 known species of copepods. Their habitat ranges from fresh water to hypersaline condition, from the highest mountains to the hot active thermal hydrothermal vents. Copepods are major members of the marine plankton community, forming the first vital link in the chain that leads from the minute algal cells of the phytoplankton up to the larger fish and mammals. Copepods were also used as food for livestock because of their high nutritional values (Zhong, 1989). They also serve as important food for fish especially in marine aquaculture. (Raymont, 1976). Gee (1989) reported that copepod may have an essential role to play in future development of fish farming. Wickstead (1965) suggested that copepods could be used as an alternative source of protein for human consumption. Copepods are good predators of other planktonic animals. Thus, it can be use to control planktonic vectors. They also important vectors of some human parasites while other copepods can be used as biological control because they act as intermidiate hosts to some disease (huys and Boxshall, 1991). There hasn't been any study of copepods ever conducted covering the Straits of Malacca or any of its scale. The need to study copepods in the Straits of Malacca is essential because firstly, the need to establish the copepods faunal status in the Straits of Malacca. Secondly, for sustainable management of the Straits of Malacca and its resources, vital information of biological portion particularly copepods are essential. The ecological importance copepods have in the ecosystem and also one major aquatic resource in irrefutable.

The objectives of this research is to study the biodiversity and the ecological distribution of copepods in the Straits of Malacca, to compare the community structure of the copepods between the two monsoon seasons.

Materials and Methods

The sampling programme was conducted during the Malacca Straits Scientific Expedition organized by JICA-MASDEC UPM from 1998 to 1999. The area of investigation in the Straits of Malacca is within the latitude line from 06° 00.07' N to 01° 10.33' N and longitude line from 99° 00' E to 103° 29.68' E. a total of 24 station were selected for study and their corresponding GPS positions. Two cruises were undertaken onboard K.K. Mersuji, K.K Jenahak and Research vessel Dorado during 23rd November to 2nd December 1998 and 24th March to 6th April 1999. The two cruises represent monsoon season affecting the Malacca Starits, which are the northeast monsoon (Nov-March), and the presouthwest monsoon (March-May).

The environmental parameters (tempreture, depth, salinity, dissolve oxygen, conductivity, pH and turbidity) were recorded using the probe (Hydrolab DS4 Multiprobe. A modified WP-2 net was employed for sampling of copepods. The volume of water filtered by the net was estimated by the cylinder formula (Newell and Newell, 1977; Kuipers, 1993). Copepods samples were retrieved using vertical tows from near bottom depending to the depth of the stations. In the lab, samples were divided into subsamples using the Folsom Splitter (modified). Sorting and counting of specimens was conducted under the Kyowa Tokyo Optical dissecting microscope (Model Se-L, no. 934881) with magnifying power of 20X and 40X. Copepods counting are using formula by Anon (1974)

Reference taxanomical books used to aid in identification were by Matsuo and Masaaki (1997), Huys *et. al.* (1996), Heron and Bradford-Grieve (1995), Bradford-Grieve (1994), Zhong (1989), Bradford *et. al.* (1983), Yamaji (1986), Boxshall (1979), Wells (1976), Lang (1965), Mori (1964), Lang (1948) and Dakin and Colefax (1940).

The choice of statistical method were based on Ludwig and Reynolds (1988), and literatures by Nomiki *et. al.* (1998), Ricardo and Jaime (1996), William and David (1984) and Greenwood (1982).

Results and Discussion

The temperature of surface seawater ranged from 27.80° C to 28.94° C in a constant pattern during the NE. During PSW, it ranges from 28.07° C to 29.05° C. the differences of the temperatures measures between both monsoon periods were nit significant ($p>0.05$). Relatively, the temperature measures were more stable during NE compare to PSW.

Salinity measures in surface seawater ranged from 29.11 ppt to 33.05 ppt during NE and 30.40 ppt to 34.33 during PSW. Salinity measures were significantly higher during PSW compare to NE ($p<0.05$). During NE, salinity decreased from the northen zone to the southern zone. The variations in surface salinity in the open sea may be correlated with the relatives intensities of precipitation and evaporation (Raymont, 1976).

Dissolve oxygen content in surface seawater during NE and PSW ranged from 4.90 to 6.40 mg/l and 5.05 to 7.45 mg/l respectively, and was more constant in the coastal waters compared to neritic water.
The distributions of ammonium are high detected in the coastal waters between Penang Island and Langkawi, Klang and Johor. The nitrite, nitrate level distributions were normally low. The distribution of ortho-phosphate and DOP (dissolved organic phosphorus) increased from NE to PSW.
The chlorophyll a concentrations in this study during PSW were significantly higher compared to that NE. Relatively lower concentrations during NE season were probably due to low nutrient concentrations such as nitrate and dissolve reactive phosphorus at this time of year.
In this study, 88 species of copepods were reported from both cruises and comprises four orders, which are Calanoida, Cyclopoida, Poecilostomatoida and Harpacticoida. These numbers of species were higher compares to 67 species previously reported in the Straits of Malacca (Idris *et. al.*, 1995). Amongst, 12 species are new records to Malaysian waters. The abundance of copepods fauna during NE and PSW ranged from 315 to 4931 ind/m^3 and 188 to 12670 ind/m^3 respectively. Relatively, the abundance of copepods fauna was higher during PSW, although the differences were not significant ($p<0.05$)

Conclusions

This study recorded 88 copepod species and 12 new record in Malaysian waters, many of which has been previously reported in adjacent waters such as Indian Ocean and Andaman Sea. It suggested that the Straits of Malacca and its adjacent waters share similar fauna through water exchanges. Comparatively, the northern zone is more homogenous and stable. The diversity and richness index in the northern zone is the highest compared to the other zones during both seasons.
The relative contributions of environmental factors in influencing the copepods community in the Straits of Malacca were assessed. Data on salinity, temperature and dissolved oxygen show that variability in at least these factors is greater towards the coastal waters, least toward the open neritic waters. Amongst, salinity was found to contribute the major proportion of the influences on the copepod community structure.

Benefits from the study

The knowledge and experience gained from this study can help government agency such as department of Fisheries to monitor the diversity of the organism, which associates with copepods and also for sustainable management of the Straits of Malacca and its resources. It also can establish baseline information on the copepods faunal status in the Straits of Malacca.

Patent(s), if applicable :
Nil

Stage of Commercialization, if applicable :

Nil

Project Publications in Refereed Journals:

Nil

Project Publications in Conference Proceedings

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Graduate Research

Name of Graduate	Research Topic	Field of Expertise	Degree Awarded	Graduation Year

Johan Bin Ismail	Distribution of Planktonic Copepods (Zooplankton) In the Straits of Malacca	Taxanomy	M.Sc.	2001

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