

Spatial Patterns of Nutrient, Chlorophyll *a* and Phytoplankton Density in the Lagoon and Open Ocean Off Pulau Layang Layang, Malaysia.

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Abstract

The concentration of four major nutrients, chlorophyll *a*, the taxonomic composition and density of phytoplankton were investigated at Pulau Layang Layang, Malaysia, from 17-25 July 2002. Chlorophyll *a* was very low in content, homogeneous in distribution and ranged from 0.034±0.008 - 0.0743±0.016 µg/l. No significant difference was observed between station number and layer of the chlorophyll *a* samples in the shallow oligotrophic lagoon and deep open sea.

The mean value of the studied parameters from 16 stations and 40 overall samples were: PO₄-P=0.363 µM; NO₃-N=8.252 µM; NO₂-N=0.0428 µM and SiO₃-Si=44.55 µM. A significant difference (P<0.01) was observed between sampling stations but not between water depths for phosphate values. However no significant difference (P>0.05) between stations and water depths were observed for nitrate, nitrite and silicate.

Among the nutrients investigated, nitrite showed the lowest reading among the parameters, ranging from a non-detectable level to 0.09 µM in the lagoon and from 0 - 0.1 µM in the open ocean zone. Silicate showed the highest value among the nutrients. It was 122 times higher than phosphate and only five times that of nitrate.

Due to the shallowness of the lagoon (9.3-17.3m), all the physical parameters such as temperature, salinity, pH, DO, conductivity were well mixed (homogenous) between the layers and quite consistent in their values. The mean water temperature decreased from 30.08° C at the surface to 29.79° C at the bottom with a difference of 0.29° C. Variations for all the parameters measured between the stations and the vertical distribution within the lagoon were insignificant (P>0.05).

Sixty one (61) taxa of phytoplankton were observed. The most dominant diatom species in the lagoon were *Rhizosolenia styliformis*, *R. calcar avis*, *Chaetoceros distant*, *C. lasionous*, *C. radicans*, *Thalassiothrix.fraeunfeldii*, *Climacospheonia* sp. and in the open sea *Fragilaria* sp., *R. calcar avis* and *R. styliformis*. All cyanophyceae (blue green algae) *Richelia intracellularis*, *Trichodesmium erytheraem*, *T. hildebrandtii* and *T. thibautii* were dense in the lagoon and outside the lagoon. The density of diatoms and blue green algae ranged from 3.44 x 10⁴ - 1.72 x 10⁵ cells/m³ and 1.80 x 10⁴ - 4.43 x 10⁶ cells/m³ respectively. The Shannon Diversity Index (H) and the Species Evenness Index (J) of phytoplankton ranged from 1.48-4.10 and 0.31-0.61 respectively. All plankton densities showed a weak positive correlation with silicate (Si) with respect to all stations sampled. A positive correlation was also observed between the diatom densities and nitrite concentration.

Keywords: Lagoon and open sea Pulau Layang Layang, phytoplankton, densities, chlorophyll *a*, physical parameters and nutrients

Introduction

This paper is a report on the investigation of phytoplankton abundance, species composition and their relationship with major nutrient contents in the lagoon and the open sea area outside the lagoon. The physical parameters such as temperature, salinity, conductivity, dissolved oxygen and pH specific to the lagoon area of Pulau Layang Layang were also observed. The survey was conducted during the Pulau Layang Layang Expedition in July 2002 using the training vessel K.L. PAUS.