

Investigating the spatial distribution of phototrophic picoplankton in a tropical estuary

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Abstract We sampled extensively (29 stations) at the Klang estuarine system over a 3-day scientific expedition. We measured physical and chemical variables (temperature, salinity, dissolved oxygen, total suspended solids, dissolved inorganic nutrients) and related them to the spatial distribution of phototrophic picoplankton (Ppico). Multivariate analysis of variance of the physico-chemical variables showed the heterogeneity of the Klang estuarine system where the stations at each transect were significantly different (Rao's $F_{18, 36}=8.401$, $p<0.001$). Correlation analyses also showed that variables related to Ppico abundance and growth were mutually exclusive. Distribution of Ppico was best explained by the physical mixing between freshwater and seawater whereas Ppico growth was correlated with temperature.

Keywords Phototrophic picoplankton · Frequency of dividing cell · Klang estuary

Introduction

Phototrophic picoplankton (Ppico) is ubiquitous and is the most abundant photosynthetic organism in the world

(Scanlan et al. 2009). Ppico can contribute up to 70 % of primary production (Stokner and Antia 1986), and its abundance is regulated by several environmental variables, e.g., light (Schubert et al. 2001), temperature (Agawin et al. 1998), nutrient concentrations (Berg et al. 2003), and grazing (Ayukai 1996). The relative importance of these environmental variables varies seasonally and geographically and is distinct for each location.

Our current knowledge on the ecology of picoplankton is mainly from studies carried out in temperate waters. There are limited studies in tropical waters, and only one report is available from Malaysia, i.e., on the diel variation of Ppico in mangrove waters (Lee et al. 2006). In temperate regions, temperature varies seasonally and affects the ecology of Ppico (Agawin et al. 1998; Uysal and Köksalan 2006). In contrast, tropical waters exhibit a stable temperature regime, and most organisms are already functioning at their temperature optimum (Pomeroy and Wiebe 2001). Therefore, in tropical waters, other factors, e.g., nutrients and light, and not temperature, may play important roles towards Ppico abundance and growth.

In this study, we investigated the Klang estuarine system. Estuaries are dynamic environments that provide a suitable platform to relate Ppico abundance and growth to ecological variables as Ppico must cope with rapid changes in resources, e.g., nutrients and light (Schubert et al. 2001). The Klang estuary is located strategically midway on the west coast of Peninsular Malaysia, overlooking the Straits of Malacca, and receives terrigenous input from the whole Klang valley catchment area including the capital city of Malaysia, i.e., Kuala Lumpur.

We sampled during a 3-day scientific expedition at the Klang estuarine system, organized by the Mangrove

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