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SHORT-TIMESCALE VARIATION OF PHYTOPLANKTON ABUNDANCE AND DIVERSITY AT REDANG ISLAND

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ABSTRACT A short-timescale sampling of phytoplankton abundance and diversity was carried out at Redang Island waters, South China Sea. Physico-chemical variables measured at four intervals over a day were relatively stable (temperature = 29 ± 0.6°C ; salinity = 27 ± 2 ppt, pH = 7.8 ± 0.1; total alkalinity = 2025 ± 33 μeq l^{-1}) whereas inorganic nutrient concentrations (NH_4 = 1.36 ± 0.51 μM; NO_2 = 0.06 ± 0.03 μM; PO_4 = 0.08 ± 0.03 μM; and SiO_4 = 9.98 ± 0.54 μM) were low and reflected oligotrophic conditions. The oligotrophic nature of Redang Island waters supported relatively lower biomass i.e. bacterial abundance = 6.6 ± 0.5 × 10^5 cell ml^{-1}; picoplankton abundance = 9.3 ± 0.8 × 10^4 cell ml^{-1}; phytoplankton abundance = 4.8 ± 2.2 × 10^3 cell ml^{-1} and zooplankton abundance = 1.18 ± 0.57 × 10^3 cell l^{-1}. Phytoplankton community was made up of ten genera (*Asteramphalus* sp., *Bacteriastrum* sp., *Chaetoceros* sp., *Cosinodiscus* sp., *Diploneis* sp., *Hemialus* sp., *Leptocylindricus* sp., *Navicula* sp., *Nitzschia* sp., and *Rhizosolenia* sp.), and significantly different from near-shore waters. Redang Island waters exhibited a simpler phytoplankton community which is probably more susceptible to climate change.

ABSTRAK *Penyampelan cara skala masa pendek mengkaji kelimpahan dan kepelbagaian fitoplankton telah dijalankan di perairan Pulau Redang, Laut China Selatan. Pembolehubah fiziko-kimia yang diukur empat kali dalam sehari adalah agak stabil (suhu = 29 ± 0.6 ° C; kemasinan = 27 ± 2 ppt, pH = 7.8 ± 0.1; jumlah kealkalian = 2025 ± 33 μeq l^{-1}) manakala kepekatan nutrien tak organik (NH_4 = 1.36 ± 0.51 μM; NO_2 = 0.06 ± 0.03 μM; PO_4 = 0.08 ± 0.03 pM; dan SiO_4 = 9.98 ± 0.54 μM) adalah rendah dan mencerminkan keadaan oligotrofik. Sifat oligotrofik perairan Pulau Redang pula menyokong biojisim yang rendah iaitu kelimpahan bakteria = 6.6 ± 0.5 × 10^5 sel ml^{-1}; kelimpahan pikoplankton = 9.3 ± 0.8 × 10^4 sel ml^{-1}; kelimpahan fitoplankton = 4.8 ± 2.2 × 10^3 sel ml^{-1} dan kelimpahan zooplankton = 1.18 ± 0.57 × 10^3 sel l^{-1}. Komuniti fitoplankton terdiri daripada sepuluh genus (Asteramphalus sp., Bacteriastrum sp., Chaetoceros sp., Cosinodiscus sp., Diploneis sp., Hemialus sp., Leptocylindricus sp., Navicula sp., Nitzschia sp., dan Rhizosolenia sp.) , dan secara bererti berbeza dari perairan dekat pantai. Perairan Pulau Redang mempamerkan komuniti fitoplankton yang lebih ringkas, dan yang lebih mudah dipengaruhi oleh perubahan iklim.*

(**Keywords**: coral reef, Redang Island, phytoplankton abundance, phytoplankton diversity, Sunda Shelf)

INTRODUCTION

Phytoplankton plays an important role functioning at the base of the food web through photosynthesis, incorporating dissolved carbon dioxide (CO2) as biomass [5,23]. In recent years, anthropogenic activities have greatly affected the global carbon (C) cycle where an increasing amount of CO2 being released into the atmosphere is identified as the main cause of global warming [9,11]. This has accelerated research on ocean primary producers (e.g. phytoplankton) as primary production is responsible for removing 30 – 60% of the CO2 emissions [5,17]. Phytoplankton is usually classified as > 2 μm fraction, and consists mainly of diatoms and dinoflagellates [18]. Variability in phytoplankton biomass is attributed to light intensity, seawater temperature and inorganic nutrient concentrations [3,26,30] whereas phytoplankton diversity reflects the resilience of the phytoplankton community to environmental stresses [12,28].

The Sunda Shelf region is important in terms of marine biodiversity and yet studies on phytoplankton in this region have mainly focused on near-shore coastal waters e.g. Klang and Port Dickson [13]. This present study was an attempt to complement our understanding of phytoplankton distribution by studying waters with less anthropogenic influence. We chose Redang Island waters located on the east side of Peninsular Malaysia. Redang Island is a popular tourist spot with teeming coral reefs. As phytoplankton exhibits relatively short reaction time to environmental change, we adopted a short-timescale sampling strategy to observe for any temporal variation. Although we only captured 'snapshots' of the environment in this study, short-term changes can