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Effects of eutrophication on diatom abundance, biovolume and diversity in tropical coastal waters

Joon Hai Lim · Choon Weng Lee

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Abstract Diatom abundance, biovolume and diversity were measured over a 2-year period along the Straits of Malacca at two stations with upper (Klang) and lower (Port Dickson) states of eutrophication. Diatom abundance, which ranged from 0.2×10^4 to 21.7×10^4 cells L^{-1} at Klang and 0.9×10^3–41.3×10^3 cells L^{-1} at Port Dickson, was influenced partly by nutrient concentrations. At Klang, the diatoms were generally smaller and less diverse ($H' = 0.77 \pm 0.48$) and predominated by *Skeletonema* spp. ($60 \pm 32\%$ of total diatom biomass). In contrast, diatoms were larger and more diverse ($H' = 1.40 \pm 0.67$) at Port Dickson. *Chaetoceros* spp. were the most abundant diatoms at Port Dickson but attributed only $48 \pm 30\%$ of total diatom biomass. Comparison of both Klang and Port Dickson showed that their diatom community structure differed and that eutrophication reduced diatom diversity at Klang. We also observed how $Si(OH)_4$ affected the abundance of *Skeletonema* spp. which in turn influenced the temporal variation of diatom community at Klang. Our results highlighted how eutrophication affects diatom diversity and community structure.

Keywords Diatom abundance · Diatom community · Diatom biovolume · Tropical waters

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J. H. Lim · C. W. Lee
Laboratory of Microbial Ecology, Institute of Biological Sciences, Faculty of Science, University of Malaya, 50603 Kuala Lumpur, Malaysia

J. H. Lim · C. W. Lee (✉)
Institute of Ocean and Earth Sciences, University of Malaya, 50603 Kuala Lumpur, Malaysia
e-mail: lee@um.edu.my

J. H. Lim
Institute of Postgraduate Studies, University of Malaya, 50603 Kuala Lumpur, Malaysia

Introduction

Diatoms are unicellular phytoplankton in the class Bacillariophyceae and are characterized by a silica outer shell or frustule (Round et al. 1990). They play an important role in the ocean food web by supplying carbon and energy to the pelagic ecosystem, and they account for about 20% of the global primary production (Field et al. 1998). Due to their tight coupling with carbon cycle and their rapid response to environmental changes, abundance, biovolume and diversity of diatoms are vital indicators for understanding how marine ecosystems respond to eutrophication. These indicators have been used to monitor environmental conditions and water quality (Lee 2003; Rott et al. 2003; Gameiro et al. 2007; Potapova and Charles 2007).

Diatoms are widely distributed (Malviya et al. 2016) and are particularly common in nutrient-rich regions and coastal waters (Smetacek 2012). However, reports of diatom distribution are lacking in the Strait of Malacca (OBIS 2016), even though the Strait of Malacca is an important source of renewable and non-renewable

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