Environ Monit Assess (2017) 189:117
DOI 10.1007/s10661-017-5838-1

Synechococcus production and grazing loss rates in nearshore tropical waters

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Received: 15 June 2016 / Accepted: 9 February 2017

Abstract Temporal variation of *Synechococcus*, its production (μ) and grazing loss (g) rates were studied for 2 years at nearshore stations, i.e. Port Dickson and Port Klang along the Straits of Malacca. *Synechococcus* abundance at Port Dickson ($0.3–2.3 \times 10^5$ cell ml^{-1}) was always higher than at Port Klang ($0.3–7.1 \times 10^4$ cell ml^{-1}) ($p < 0.001$). μ ranged up to 0.98 day^{-1} (0.51 ± 0.29 day^{-1}), while g ranged from 0.02 to 0.31 day^{-1} (0.15 ± 0.07 day^{-1}) at Port Klang. At Port Dickson, μ and g averaged 0.47 ± 0.13 day^{-1} (0.29–0.82 day^{-1}) and 0.31 ± 0.14 day^{-1} (0.13–0.63 day^{-1}), respectively. *Synechococcus* abundance did not correlate with temperature ($p > 0.25$), but nutrient and light availability were important factors for their distribution. The relationship was modelled as log *Synechococcus* = 0.37Secchi − 0.01DIN + 4.52 where light availability (as Secchi disc depth) was a more important determinant. From a two-factorial experiment, nutrients were not significant for *Synechococcus* growth as in situ nutrient concentrations exceeded the threshold for saturated growth. However, light availability was important and elevated *Synechococcus* growth rates especially at Port Dickson ($F = 5.94$, $p < 0.05$). As for grazing loss rates, they were independent of either nutrients or light intensity ($p > 0.30$). In nearshore tropical waters, an estimated 69 % of *Synechococcus* production could be grazed.

Keywords *Synechococcus* · Growth rate · Grazing loss rates · Nearshore waters · Straits of Malacca

Electronic supplementary material The online version of this article (doi:10.1007/s10661-017-5838-1) contains supplementary material, which is available to authorized users.

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Introduction

Synechococcus is widespread in the marine environment and plays an important role in marine food web (Agawin et al. 2000a; Chiang et al. 2002). It contributes more than 50 % of the biomass and production in oligotrophic tropical and subtropical open oceans (Agawin et al. 2000a; Chang et al. 2003; Winder 2009), and its distribution is mainly driven by temperature, nutrient levels and light (Agawin et al. 2000a; Chang et al. 2003; Liu et al. 2007; Mackey et al. 2009; Chen et al. 2011). However, it is difficult to ascertain the relative importance of these environmental factors due to strong covariation among these factors.

Published online: 20 February 2017