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Eco-technological Approach for Improving Environment in a Hypertrophic Enclosed Bay, Japan

Shigeru Montani[(1)], Takeshi Kohama[(1)] and Machiko Yamada

[(1)] Department of Life Sciences, Kagawa University, Miki, Kagawa, 761-0795 Japan
Tel and Fax +81-87-8913143 e-mail:montani@ag.kagawa-u.ac.jp

Abstract

To improve the water quality in a hyper-eutrophic enclosed bay, we have established an interdisciplinary research project from 1995 to 1997. This study was conducted for development of new eco-technology to treat hyper-eutrophicated water. In this research project, we are aiming at promoting material circulation with activities of mussels in the bay ecosystem. The system, which consists of 50cm-long ropes to collect mussels, is settled from surface to 1.5m depth. Two ropes, which settled at upper layer (0-0.5m) and lower layer (1.0-1.5m), are collected for each month from February to September 1997. After retrieval of the rope, mussels were numbered, and their shell length and body weight were measured. Furthermore, we conducted some experiment in the laboratory to determine the clearance rate and the assimilation efficiency of mussel. Total settling mussels biomass are rapidly increased from April to September. The integrated values of settling Mytilus galloprovincialis biomass on each 50cm long rope increased from 0g in February to ca.7800g in August at upper layer, and 0g to ca.4700g at lower layer. In the experiment, the clearance rate of M.galloprovincialis increased with the magnitude of shell length, are expressed in (V) according to the following: V μmolC/h)=0.896 • SL+0.202 where SL is shell length. About the assimilation efficiency, it is expressed with 36% for nitrogen and 20% for phosphorus. Total nitrogen and phosphorus contents in M.galloprovincialis were 11.8 mgN/g (d.w.) and 1.1 mgP/g (d.w.), respectively. However, the role of mussels cultured on rope collector was estimated from biomass and individual activities, the clearance rate (gC/rope/d) of the whole rope collected in August was as same value as the 18m2 of primary productivity, when the red tide was occurred. Furthermore, assuming one rope collected in August was submerged into the water mass with the volume of 25m3 (5x5x1m), the relationship between the values of assimilation rates and loading rates indicate that 70.1% of DIN and 163% of DIP loaded to the 25m3 box were assimilated by them. Therefore, mussels can play good role as a N, P cleaner in hyper-eutrophic enclosed bay, such as Dokai Bay.