Assessment of Spatial and Temporal Variationsof Water Quality for Future MaricultureOperation in Ambong Bay, Sabah, Malaysia

Abstract

Study was conducted with the aim to understand the temporal and spatial variations of water quality parameters (temperature, salinity, pH, DO, TSS, $NO{-}3NO3{-}$, $NO{-}2NO2{-}$, NH_3-N and PO_4-P, and phytoplankton cell density) in Ambong Bay, Sabah, Malaysia in order to provide reference for future mariculture development in the bay. Samplings were carried out once a month in two stations (coastal and open sea) within the bay for 12 months period from September 2015 to August 2016. Results showed that there were significant differences in pH and $NO{-}2NO2{-}$ when compared spatially, whereas salinity, DO, TSS, phytoplankton cell density, $NO{-}3NO3{-}$, NH_3-N, and PO_4-P were temporally significant. The fermentation processes by anaerobic bacteria, organic acids from decaying vegetation and acidic clays in the mangrove soils might explain the significant spatial differences in pH and $NO{-}2NO2{-}$. The bay was dominated by dinoflagellate, Prorocentrum spp. (mean abundance of 16.23% and 24.44%, respectively) a potentially toxic algae species. Correlation matrix showed that NH_3-N was positively correlated with PO_4-P ($r = 0.475$, $p < 0.05$) but negatively correlated with salinity ($r = -0.517$, $p < 0.01$). Besides, salinity was positively correlated with DO ($r = 0.505$, $p < 0.05$) and TSS ($r = 0.408$, $p < 0.05$). In addition, DO and TSS were also positively correlated ($r = 0.451$, $p < 0.05$). Phytoplankton cell density was positively correlated with TSS ($r = 0.644$, $p < 0.01$). In general, the water quality in Ambong Bay is within the standard values permitted by the Malaysia Marine Water Quality standard for marine life, fisheries, coral reefs, recreational and mariculture (Class 2), except for $NO{-}3NO3{-}$. In conclusion, any mariculture operation to take place in Ambong Bay in the near future should take the temporal variation of the water quality into account. Moreover, effects of toxic phytoplankton to culture fishes should also be taken care and monitored frequently.