

Oxygen Demand of the Sediment from the Semariang Batu River, Malaysia

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Abstract: The Semariang Batu River is located near the city of Kuching, with residential and shrimp farming activities which may impact the quality of the sediment. However, sediment of this river had not been investigated. Therefore, the objectives of this study were to determine the sediment oxygen demand (SOD) at different locations along the river and the relationship between SOD and the characteristics of the sediment. Surface sediments were collected at five stations for analysis. Results indicated that sediment total phosphorus values ranged from 288-1446 mg/kg. The station near the residential, seafood and boat landing jetty and the station near shrimp farm discharge recorded the highest sediment phosphorus and nitrogen. SOD₂₀ ranged from 0.76 gO₂/m²/day at the station with the least human activities to 21.4 gO₂/m²/day at the station with shrimp farm discharge. SOD₂₀ near the jetty was also high 16.2 gO₂/m²/day which ranked the second highest in value among the five stations. SOD₂₀ values were significantly correlated with phosphorus, nitrogen and clay content of the sediment.

Key words: Sediment oxygen demand · Shrimp effluent · Domestic discharge · Nitrogen · Phosphorus

INTRODUCTION

Water quality of many rivers in the world has been investigated to gain more understanding on the impact of agriculture, aquaculture, sewage, household and industrial effluents on the receiving water bodies [1-5]. However, not as much studies are done on the sediment. The study of sediment is important as sediment is a sink for organic materials and other contaminants such as heavy metals, antibiotics and pesticides and these contaminants could affect the quality of water which is in contact with the sediment for a long time. Nelson *et al.* [6] reported that the Klang River in Malaysia showed low dissolved oxygen due to the high oxygen demand of sediment that rests on the bottom during neap tides and was resuspended during spring tides. Chau [7] reported that even though the exogenous organic materials dissolved in the overlying water of a land-locked embayment in Hong Kong had been reduced substantially, the soft bottom sediment continued to act as sources of nutrients. Contaminants were reported to reduce the richness and evenness of marine communities [8].

The Semariang Batu River is a tidal influenced river located near Kuching city, Malaysia. The rapid development of the city is encroaching on the river where traditionally a village is located upstream and in the 1990's due to the bloom in shrimp industry; it became a site for shrimp aquaculture. Impacts of shrimp aquaculture on the water quality have been reported in different parts of the world [9-11]. The input of shrimp aquaculture into the river and coastal areas include nutrients and organic matter [12]. Preliminary investigation of the Semariang Batu River water quality indicated phosphate was highest at the station downstream of shrimp farm discharge and ammonia-nitrogen was highest at the station near the residential area [13]. Shrimp pond bottom soil was found to be high in nutrients such as nitrogen and phosphorus and organic matter and as a result high oxygen demand was reported [11, 14, 15]. For residential areas, discharge into the rivers includes untreated or partly treated sewage and greywater with high organic matter and high nutrients [12, 16-18]. These potentially results in eutrophication and oxygen depletion of the receiving water bodies [11, 12]. Sediment oxygen demand plays an important role in determining the dissolved oxygen level in water bodies.