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ORIGINAL ARTICLE

Assessment of the characteristic of nutrients, total metals, and fecal coliform in Sibu Laut River, Sarawak, Malaysia

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Abstract The concentrations of nutrients (nitrogen and phosphorus), total metals, and fecal coliform (FC) coupling with chlorophyll-*a* (chl-*a*), 5-day biochemical oxygen demand (BOD_5) and other general environmental parameters were evaluated at the sub-surface and near-bottom water columns of 13 stations in the Sibu Laut River during low and high slack waters. The results indicated that inorganic nitrogen (mainly nitrate) was the primary form of nitrogen whereas organic phosphorus was the major form of phosphorus. The abundance of total heavy metals in Sibu Laut River and its tributaries was in the order of Pb < Cu < Zn < Cd. Fecal coliform concentration was relatively low along Sibu Laut River. The shrimp farm effluents contributed a substantial amount of chl-*a*, BOD_5, nutrients, and FC to the receiving creek except for total metals. Nevertheless, the influence was merely noticeable in the intake creek and amended rapidly along Selang Sibu River and brought minimal effects on the Sibu Laut River. Besides, the domestic sewage effluents from villages nearby also contributed a substantial amount of pollutants.

Keywords Waterquality·Eutrophication·Heavymetals·Fecalcoliform·SibuLautRiver

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Introduction

Deterioration in water quality is one of the greatest concerns associated with population growth and accompanying land-use changes (Ribeiro and Kjerfve 2002; Davis and Koop 2006; Ham et al. 2009; Whitall et al. 2010; Hadibarata et al. 2012). Eutrophication, metals contamination, and bacterial pollution are among the major problems and stresses of the marine environment and have been receiving global attention and interest (Malik and Ahmad 2002; Parnell 2003; Jonas and Millward 2010; Reopanichkul et al. 2010; Shin et al. 2012).

Eutrophication can be defined as the process of increasing nutrients of an ecosystem that causes changes to its nutritional status (Nixon 1995). Most frequently, this has usually been characterized by increased supplies of nutrients in particular nitrogen and phosphorus to that system, although the supply of excessive decomposable organic carbon leads to eutrophication as well (Young et al. 1999; Pinckney et al. 2001; Howarth and Marino 2006). The discharge of excessive nutrients from urban and industrial wastewaters, or rural and agricultural runoff contributes to the enrichment of inorganic and organic material in marine waters. Eutrophication can lead to the detrimental changes of the structure and function of both living organisms and non-living components in an ecosystem (Paez-Osuna et al. 1998; Bricker et al. 1999; Smith et al. 1999; Meyer-Reil and Koster 2000; Parnell 2003; Del-Pilar-Ruso et al. 2009; Reopanichkul et al. 2010). Often, the "bloom" or greatly increase of aquatic vegetation or phytoplankton and algal in a water body is the first