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An approach based on nematode descriptors for the classification of ecological quality (EcoQ) of the Malaysian coasts

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Abstract Free-living marine nematodes were employed in ecological studies and were proven to be suitable bioindicators of pollution-induced effects on the benthic domain. This study represents the first attempt to use nematode descriptors in order to assign ecological quality (EcoQ) status to areas along the Sarawak coasts, thus integrating the methods actually applied by the Department of Environment (DOE). Three nematode parameters, i.e. colonizer–persister percentage, maturity index (MI), and Shannon diversity index (H), were used, as they are recognized as the best descriptors of EcoQ status in coastal habitats. The thresholds applied to the nematode parameters for the Sarawak study sites showed predominantly moderate and bad EcoQ status, with the exception of the Similajau site, which being close to a national park was found to have good EcoQ. The sites with the worst EcoQ were characterized by low salinity values, suggesting riverine inflows as a primary source of pollution, likely from the discharge of untreated wastes. This was confirmed by both the H and MI indices, which showed a close positive relation with salinity. Results obtained for the Niah site may suggest that "traces" of pollution were left in the nematode assemblages that could not be detected from other parameters of the water column. This investigation shows that analysis of nematode descriptors could be effectively applied to ecological assessment criteria within environmental policies of rapid growth countries such as Malaysia. Furthermore, it certainly suggests the need for management and conservation actions in the Sarawak coasts aimed at more sustainable use of the marine resources to prevent the loss of biodiversity.

Keywords Zoobenthos · Meiofauna · Ecological quality assessment · Anthropogenic impact · Malaysia

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Introduction

Coastal seas suffer from several local stresses including pollution, eutrophication and fishing effects, but also from phenomena such as global warming and ocean acidification (Doney 2010). Sale et al. (2014) documented a progressive reduction in ecosystem functionality and resilience, leading to loss of essential goods and services for human populations, especially in tropical regions subject to rapid industrial development.

Malaysia, in the southern extremity of the Asian continent, hosts a rich biodiversity of fauna and flora, having been recognized as one of the 12 most ecologically diverse countries in the world (van Steenis 1979; Shuttleworth 1981; Whitmore 1984; Myers 1990). However, it has experienced enormous growth in the industrial, agricultural and tourism sectors in recent decades, resulting in numerous environmental problems including deforestation, pollution, overfishing and destruction of coral reefs. These disturbances have led to an unpredictable rate of change in terrestrial and water systems, with a general rapid loss of both faunal and flora biodiversity and habitat (e.g. brackish system coastal marine and mangrove areas, seagrass beds, salt- and freshwater marshes,