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Investigating the decay rates of *Escherichia coli* relative to *Vibrio parahemolyticus* and *Salmonella Typhi* in tropical coastal waters

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ABSTRACT

Using the size fractionation method, we measured the decay rates of *Escherichia coli*, *Salmonella Typhi* and *Vibrio parahaemolyticus* in the coastal waters of Peninsular Malaysia. The size fractions were total or unfiltered, <250 μm, <20 μm, <2 μm, <0.7 μm, <0.2 μm and <0.02 μm. We also carried out abiotic (inorganic nutrients) and biotic (bacterial abundance, production and protistan bacterivory) measurements at Port Dickson, Klang and Kuantan. Klang had highest nutrient concentrations whereas both bacterial production and protistan bacterivory rates were highest at Kuantan. We observed signs of protist–bacteria coupling via the following correlations: Protistan bacterivory–Bacterial Production: $r = 0.773$, $df = 11$, $p < 0.01$; Protist–Bacteria: $r = 0.586$, $df = 12$, $p < 0.05$. However none of the bacterial decay rates were correlated with the biotic variables measured. *E. coli* and *Salmonella* decay rates were generally higher in the larger fraction (>0.7 μm) than in the smaller fraction (<0.7 μm) suggesting the more important role played by protists. *E. coli* and *Salmonella* also decreased in the <0.02 μm fraction and suggested that these non-halophilic bacteria did not survive well in seawater. In contrast, *Vibrio* grew well in seawater. There was usually an increase in *Vibrio* after one day incubation. Our results confirmed that decay or loss rates of *E. coli* did not match that of *Vibrio*, and also did not correlate with *Salmonella* decay rates. However *E. coli* showed persistence where its decay rates were generally lower than *Salmonella*.

1. Introduction

Coastal waters account for less than 10% of the ocean area. However they are highly productive and account for 25% of primary production in the ocean (Berger et al., 1989). Coastal waters are increasingly exploited by humans for food, recreation, transport and other needs, and at present most are in various stages of degradation (Alongi, 1998). There is also an increasing public health threat from pathogens (Hazen and Toranzos, 1990; Moe, 1997). Disposal of inadequately treated waste is considered faecal pollution and a main source of bacterial pathogens in the sea (Solo-Gabriele et al., 2000).

For faecal pollution studies, the concept of bacterial indicator is standard (Wolf, 1972). A fundamental assumption to this concept is the parity in the survival of indicator and enteric pathogens over a wide range of aquatic environments (Bonde, 1977). It is however acknowledged that these indicators are inadequate to predict the presence of pathogenic

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