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Variation in biogeochemical parameters across intertidal seagrass meadows in the central Great Barrier Reef region

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Abstract

This survey provides baseline information on sediment characteristics, porewater, adsorbed and plant tissue nutrients from intertidal coastal seagrass meadows in the central region of the Great Barrier Reef World Heritage Area. Data collected from 11 locations, representative of intertidal coastal seagrass beds across the region, indicated that the chemical environment was typical of other tropical intertidal areas. Results using two different extraction methods highlight the need for caution when choosing an adsorbed phosphate extraction technique, as sediment type affects the analytical outcome. Comparison with published values indicates that the range of nutrient parameters measured is equivalent to those measured across tropical systems globally. However, the nutrient values in seagrass leaves and their molar ratios for *Halophila ovalis* and *Halodule uninervis* were much higher than the values from the literature from this and other regions, obtained using the same techniques, suggesting that these species act as nutrient sponges, in contrast with *Zostera capricorni*. The limited historical data from this region suggest that the nitrogen and phosphorus content of seagrass leaves has increased since the 1970s concomitant with changing land use practice.

Keywords: Seagrass; Nutrients; Water quality; Great Barrier Reef region

1. Introduction

Most persistent seagrass meadows in the Great Barrier Reef region are found in waters <10 m (Lee Long et al., 1993), the shallow near-shore band where particulate nutrients and sediment loading are consistently higher than further offshore (Furnas, 2003). The offshore dispersal of particulate nutrients and sediments is halted by onshore wave action and the predominant south-easterly winds (Belperio, 1983; Brodie, 1995; Devlin et al., 2001; Furnas, 2003). The sediment from these plumes settles out of the water column, particularly in the protected waters of estuaries and on the leeward margins of islands and north-facing bays, areas where seagrasses are most likely to be found (Lee Long et al., 1993). Sediments are a source of nutrients for seagrass growth (Short, 1987; Fourqurean et al., 1992; Udy and Dennison, 1996). Thus coastal seagrass habitats are vulnerable to changes in water quality as they are directly exposed to increased sediment loads. These additional sediments usually reduce habitat quality as a result of the combined effects of additional sediments and nutrients locally.

Overseas and temperate Australian studies have shown that declining water quality (particularly increased nutrient loadings) can have an adverse affect on seagrass growth, distribution and morphology by indirectly affecting light attenuation to the seagrass plants (Shepherd et al., 1989; Dennison et al., 1993;

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