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Intra-annual Changes in Seagrass Standing Crop, Green Island, Northern Queensland

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Abstract

A visual estimation technique was used to estimate the standing crop of a mixed-species seagrass meadow at Green Island, northern Queensland. This technique measured monthly changes in the standing crop of seagrass within 10 fixed quadrats along three fixed transects from May 1987 to April 1988. The mean standing crop fluctuated by a factor of two from 60 g dry weight (DW) m^{-2} (August 1987) to 133 g DW m^{-2} (December 1987). The climatic factors that correlated with mean monthly standing crop were investigated. Owing to the high degree of association between these factors, principal-components analysis was used to create new orthogonal variables to be included in an 'all-subsets regression'. The best regression model explained only 12% of the variation in seagrass standing crop. This model and the magnitude and direction of the loadings of the vectors associated with the first principal component suggested that seagrass standing crop was positively correlated with any day length and temperature and negatively correlated with number of strong-wind days. These variables were indirect measures of light availability and temperature, suggesting that fluctuations in seagrass standing stock at Green Island were influenced by changes in temperature and light availability.

Introduction

Seasonal changes in seagrass standing crop have been linked to changes in day length, light, temperature, salinity (Zieman 1975; Sand-Jensen 1975, 1989; Aioi 1980; Bulthuis 1987; Walker and McComb 1988; Kerr and Strother 1990) and, more recently, nutrients (Powell *et al.* 1989). The difficulty in separating these parameters in the field is usually acknowledged because they tend to vary in concert (e.g. light and temperature) and have combined effects in modifying photosynthetic rates and growth. In the eastern Australian tropics, seasonal rainfall has been suggested as a factor strongly influencing seagrass growth (Bridges *et al.* 1982; Coles *et al.* 1987; Lanyon *et al.* 1989). However, the factors influencing the timing of seasonal growth appear to be poorly understood, and there have been no experimental studies. Lanyon *et al.* (1989) sampled intertidal seagrass meadows in the Townsville region (northern Queensland) at three-monthly intervals and observed that there was an increase in seagrass biomass coincident with the summer rains, presumably as a result of nutrient runoff.

Our study was sited at Green Island reef on the inner edge of the Great Barrier Reef. Because Green Island is 27 km off the coast, we expected any seasonal changes in seagrass standing crop to be less influenced by terrestrial runoff than were changes in the inshore meadows studied by Coles *et al.* (1987) and Lanyon *et al.* (1989). However, around 120 000 tourists visit Green Island each year (Anon. 1990), and there has been concern over their effect on the nutrient loads within the seagrass meadow (Baxter 1990).

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