SEAGRASS BIOLOGY: PROCEEDINGS OF AN INTERNATIONAL WORKSHOP

Rottnest Island, Western Australia, 25 - 29 January 1996 pp 345-350
Editors: John Kuo, Ronald C. Phillips, Diana I. Walker and Hugh Kirkman

Monitoring Seagrasses in Tropical Ports and Harbours

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Key words: Seagrass, tropical, monitoring, coastal management, mapping.

Abstract

Ecologically and economically important seagrass habitats are often insheltered coastal sites threatened by port and harbour development. These seagrass habitats provide population and community parameters which can be readily measured and as a result are useful for monitoring downstream impacts from catchment and port development activities. Environment monitoring programs which are appropriately designed to detect realistic levels of change, enable port and coastal management agencies to make decisions with greater confidence. The design of sampling programs to obtain baseline data on seagrass distribution and abundance must include sufficient numbers of samples to enable a calculation of the minimum monitoring effort required to detect changes which are statistically and biologically meaningful. With little information on natural inter-annual variability in tropical seagrasses, we consider an inter-annual change of-at least 50% in areal extent or 70% in above-ground biomass sufficient to prompt management action. Other reasons that should prompt a management response include significant changes in species composition, seagrass growth characteristics, or depth distribution, or a trend in one direction for anyone of these parameters over three successive sampling periods. Measures of change in these coastal resources need to be presented along with advice on legislative measures for protection of seagrasses. Marine environment planning and management processes with community consultation, legislative power, and support from education and enforcement will help to maintain community and government concern for the protection of our limited seagrass resources.

INTRODUCTION

Coastal zone managers increasingly recognise the importance of seagrasses in coastal marine communities for supporting diverse flora and fauna, in supporting coastal fisheries productivity (Fortes 1990; Coles et aI.. 1993; Watson, Coles and Lee Long, 1993), in stabilising sediments and maintaining coastal water quality and clarity (Ward, Kemp and Boynton, 1984; Fonseca and Fisher, 1986), In the tropics, turtles and sirenians (Dugong dugon) are direct grazers of seagrasses (Lanyon, Limpus and Marsh, 1989), The importance of these endangered species and the demonstrated value to fisheries has ensured ongoing management for seagrass conservation in north eastern Australia,

Seagrasses are often at the downstream end of catchments, receiving runoff from a range of agricultural, urban and industrial land-uses. Their ecological values and location in areas likely to be developed for harbours and ports have made seagrasses a potential target for assessing environmental health and impacts on coastal systems. The ideal "bio-indicator" must, however, show measurable and timely responses to environmental impacts. Seagrass habitats in ports provide sessile plants - individuals, populations and communities - which can all be easily measured. Seagrass plants generally remain in place so that the prevailing anthropogenic impacts can be monitored.

Altered seagrass depth distribution in Chesapeake Bay (Dennison *et al.* 1993) was the "indicator" when runoff-impacts on water quality caused changes in light penetration and consequently affected seagrass abundance and distribution patterns. Improved knowledge of the relationships between various seagrass growth characteristics and environmental parameters such as light and nutrients (eg. Short, 1987; Dennison *et al.* 1993) provide very useful tools for monitoring environmental impacts on coastal seagrass systems.

Our work focuses at the level of seagrass populations and communities. We discuss how seagrass abundance, species composition and distribution patterns can be monitored to assess environmental change and detect impacts in coastal localities. We present this approach as an