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Water quality in the Great Barrier Reef region: responses of mangrove, seagrass and macroalgal communities

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Abstract

Marine plants colonise several interconnected ecosystems in the Great Barrier Reef region including tidal wetlands, seagrass meadows and coral reefs. Water quality in some coastal areas is declining from human activities. Losses of mangrove and other tidal wetland communities are mostly the result of reclamation for coastal development of estuaries, e.g. for residential use, port infrastructure or marina development, and result in river bank destabilisation, deterioration of water clarity and loss of key coastal marine habitat. Coastal seagrass meadows are characterized by small ephemeral species. They are disturbed by increased turbidity after extreme flood events, but generally recover. There is no evidence of an overall seagrass decline or expansion. High nutrient and substrate availability and low grazing pressure on nearshore reefs have lead to changed benthic communities with high macroalgal abundance. Conservation and management of GBR macrophytes and their ecosystems is hampered by scarce ecological knowledge across macrophyte community types.

Keywords: Pollution; Mangroves; Seagrass; Macroalgae; Nutrients; Herbicides

1. Introduction

The Great Barrier Reef World Heritage Area (GBRWHA) contains a large number of interconnected ecosystems colonised by marine plants including coral reef systems, extensive seagrass meadows and estuarine systems with mangrove forests. These systems are also closely linked with adjacent coastal river catchments in a catchment-to-reef continuum. Globally, the rate of degradation of coral reefs, seagrass beds, mangrove forests and other tropical marine ecosystems is increasing as a consequence of direct human pressures, including input of pollutants such as sediments, nutrient and toxic compounds. Additionally, indirect pressures on coral reefs are global climate change (coral bleaching), crown-of-thorns starfish outbreaks and coral diseases (Wilkinson, 2002). The Great Barrier Reef (GBR) is considered to be in a 'near-pristine state over large areas', however, water quality in some coastal areas appears to be declining from effects of human activities (Australian State of the Environment Committee, 2001; Brodie, 1997).

A large body of evidence now shows that water quality and ecological integrity of some of the coastal area of GBRWHA are affected by material originating from a range of human activities on the catchment, such as primary industries (agriculture, aquaculture), urban and industrial development (reviewed in Haynes, 2001; Williams, 2002; Baker et al., 2003; Furnas, 2003). In summary, delivery of sediments and nutrients to rivers discharging into GBR waters has increased by at least four times compared to estimates from before 1850;

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