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Flood related loss and recovery of intertidal seagrass meadows in southern Queensland, Australia

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Abstract

The loss and recovery of intertidal seagrass meadows were assessed following the flood related catastrophic loss of seagrass meadows in February 1999 in the Sandy Strait, Queensland. Region wide recovery rates of intertidal meadows following the catastrophic disturbance were assessed by mapping seagrass abundance in the northern Great Sandy Strait region prior to and on 3 occasions after widespread loss of seagrass. Meadow-scale assessments of seagrass loss and recovery focussed on two existing *Zostera capricorni* monitoring meadows in the region. Mapping surveys showed that approximately 90% of intertidal seagrasses in the northern Great Sandy Strait disappeared after the February 1999 flooding of the Mary River. Full recovery of all seagrass meadows took 3 years. At the two study sites (Urangan and Wanggoolba Creek) the onset of *Z. capricorni* germination following the loss of seagrass occurred 14 months post-flood at Wanggoolba Creek, and at Urangan it took 20 months for germination to occur. By February 2001 (24 months post-flood) seagrass abundance at Wanggoolba Creek sites was comparable to pre-flood abundance levels and full recovery at Urangan sites was complete in August 2001 (31 months post-flood). Reduced water quality characterised by 2–3 fold increases in turbidity and nutrient concentrations during the 6 months following the flood was followed by a 95% loss of seagrass meadows in the region. Reductions in available light due to increased flood associated turbidity in February 1999 were the likely cause of seagrass loss in the Great Sandy Strait region, southern Queensland. Although seasonal cues influence the germination of *Z. capricorni*, the temporal variation in the onset of seed germination between sites suggests that germination following seagrass loss may be dependent on other factors (eg. physical and chemical characteristics of sediments and water). Elevated dissolved nitrogen concentrations during 1999 at Wanggoolba Creek suggest that this site received higher loads of sediments and nutrients from flood waters than Urangan. The germination of seeds at Wanggoolba Creek one year prior to Urangan coincides with relatively low suspended sediment concentrations in Wanggoolba Creek waters. The absence of organic rich sediments at Urangan for many months following their removal during the 1999 flood may also have inhibited seed germination. Data from population cohort analyses and population growth rates showed that rhizome weight and rhizome elongation rates increased over time, consistent with rapid growth during increases in temperature and light availability from May to October.

Keywords: seagrass; loss; recovery; flood; water quality; mapping

1. Introduction

Large-scale disturbance and loss of seagrasses associated with natural and human impacts have occurred both in Australia (Poiner et al., 1989; Preen et al., 1995; Seddon et al., 2000) and worldwide (Short and Wyllie-Echeverria, 1996). Disturbance can occur on small localised scales (sewage outfalls, dredging, dugong grazing) or at large scales from flooding (Quammen and Onuf, 1993; Moore et al., 1997) and climatic related impacts (Seddon et al., 2000; Cabello-Pasini et al., 2002). Changes to land use patterns in the coastal zone have exacerbated the effects of sediment loading and eutrophication of large-scale flooding events on seagrass ecosystems (Preen et al., 1995; Terrados et al., 1998). Reductions in light (Bach et al., 1998; Halun et al., 2002) and increased concentrations of silt, organic matter and

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