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SEAGRASS HABITATS OF NORTHEAST AUSTRALIA: MODELS OF KEY PROCESSES AND CONTROLS

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ABSTRACT

An extensive and diverse assemblage of seagrass habitats exists along the tropical and subtropical coastline of north east Australia and the associated Great Barrier Reef. In their natural state, these habitats are characterised by very low nutrient concentrations and are primarily nitrogen limited. Summer rainfall and tropical storms/cyclones lead to large flows of sediment-laden fresh water. Macro grazers, dugongs (*Dugong dugon*) and green sea turtles (*Chelonia mydas*) are an important feature in structuring tropical Australian seagrass communities. In general, all seagrass habitats in north east Australia are influenced by high disturbance and are both spatially and temporally variable. This paper classifies the diversity into four habitat types and proposes the main limiting factor for each habitat. The major processes that categorise each habitat are described and significant threats or gaps in understanding are identified. Four broad categories of seagrass habitat are defined as 'River estuaries', 'Coastal', 'Deep water' and 'Reef', and the dominant controlling factors are terrigenous runoff, physical disturbance, low light and low nutrients, respectively. Generic concepts of seagrass ecology and habitat function have often been found inappropriate to the diverse range of seagrass habitats in north east Australian waters. The classification and models developed here explain differences in habitats by identifying ecological functions and potential response to impacts in each habitat. This understanding will help to better focus seagrass management and research in tropical habitats.

Increased awareness of human impacts on seagrass meadows has generated renewed interest in understanding the dynamic nature of seagrass communities (Short and Wyllie-Echeverria, 1996). This is particularly relevant in the tropics where some abundant species are considered very dynamic but are little studied (Duarte, 1999). Over 45,000 ha of seagrass have been lost from Australian coastal waters in recent years, this loss has been largely attributed to reductions in water quality and therefore in available light (Walker and McComb, 1992). Tropical seagrass habitats in Australia are extensive (18 405 km^2), diverse and important for primary and secondary production (Hillman et al., 1989; Lee Long et al., 2000). The Queensland coastline is ca 9800 km long and extends through tropical and subtropical regions including the 2600 km of the Great Barrier Reef (Hopley, 1986). Extensive coastal lagoons, estuaries, rivers and the barrier reef with its inshore lagoon provide a high diversity of potential seagrass habitats (Fig. 1). Classifications of north east Australian seagrass communities (Poiner et al., 1987; Lee Long et al., 1998) have demonstrated a need to develop a clear framework for understanding the diversity of seagrass habitats.

Australia has the highest species diversity of seagrasses in the world, with more than half the known species of seagrass occurring in Australian waters (Kuo and McComb, 1989). This high diversity is in part due to the overlap of tropical and temperate seagrass floras and the considerable endemism present in certain bioregions (Walker and Prince, 1987). In north east Australia, the highest species diversity of seagrass occurs near the tip of Cape York, with a gradual decline in diversity moving south down the east coast (Coles