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TESTING THE SEDIMENT-TRAPPING PARADIGM OF SEAGRASS: DO SEAGRASSES INFLUENCE NUTRIENT STATUS AND SEDIMENT STRUCTURE IN TROPICAL INTERTIDAL ENVIRONMENTS?

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ABSTRACT

Seagrass meadows are considered important for sediment trapping and sediment stabilisation. Deposition of fine sediments and associated adsorbed nutrients is considered an important part of the chemical and biological processes attributed to seagrass communities. This paradigm was based on work in temperate regions on *Zostera marina* and in tropical regions on *Thalassia testudinum,* two species that maintain relatively high biomass, stable meadows. The current study investigates this concept for three species of intertidal tropical seagrass meadows in northeastern Australia. Sediment structure and nutrient status did not differ between vegetated and unvegated habitats in intertidal areas within the central region of the Great Barrier Reef World Heritage Area. The 'trapping' functions that have been attributed to seagrasses need to be re-assessed for a variety of locations and species before they can be accepted as dogma. In tropical Australia, intertidal meadows are predominantly ephemeral and comprised of structurally small species of low biomass. Consequently, sediment trapping within these meadows is largely insignificant.

Seagrass meadows have traditionally been considered important for sediment trapping, sediment stabilisation and as nutrient sinks (Hemminga and Duarte, 2000). The concept of seagrass meadows acting as a sink for particles (sediments and adsorbed nutrients) is due to a reduction of flow velocities by the plant canopy (Gacia et al., 1999). As the flow velocity drops, the capacity of the water to hold particles decreases, resulting in the deposition of fine sediments and their adsorbed nutrients. This paradigm is based on historical accounts of differences in sedimentation patterns, sediment structure and nutrient content between seagrass areas and bare sand (Wilson, 1949; Odum, 1959; McRoy and McMillan, 1977; Christiansen et al., 1981). The sediment-trapping paradigm has made an important contribution in understanding how seagrass meadows function, as many chemical and biological processes are related to the sedimentary environment in which seagrasses grow.

Nitrogen cycling, (Iizumi and Hattori, 1982; Howarth, 1988; Blackburn, 1990; Caffrey and Kemp, 1990), nutrient parameters (McRoy, 1970; Orth, 1977; Kenworthy et al. 1982; Thayer et al., 1984; Pulich 1985; Boon, 1986; Moriarity and Boon, 1989) and sediment structure (Scoffin, 1970, Almasi et al., 1987; McGlathery et al., 1994) are all related to fine scale sediment movement and have been measured as being different between seagrass and associated unvegetated substrates. Seagrass species and meadows come in a variety of functional forms ranging from small leafed species that form ephemeral, low biomass beds to large leafed species forming stable, high biomass beds (Walker et al., 1999). Historically much of the research on the 'trapping' paradigm was undertaken at locations characterized by *Zostera marina* (Scoffin, 1970; McRoy, 1970; Orth, 1977). Thus, the dogma relating to sediment trapping and nutrient status of seagrass meadows is based on the results of a single Northern Hemisphere temperate species, usually studied at one