

SEAGRASSES OF NORTH EAST ARNHEM LAND, NORTHERN TERRITORY: REVIEW OF CURRENT KNOWLEDGE

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INTRODUCTION	1
GOULBURN ISLANDS CASTLEREAGH BAY.....	2
MELVILLE BAY	3
WESTERN GULF OF CARPENTARIA (GOVE TO ROPER RIVER).....	3
REFERENCES	4

INTRODUCTION

Arnhem Land consists of the eastern half of the large peninsula that forms the northernmost portion of the Northern Territory. The region, with a total area of about 95,900 km², consists of a ruggedly dissected plateau and associated lowlands. The coast of Arnhem Land extends from Van Diemen Gulf and the Cobourg Peninsula eastward to Gove Peninsula, the Gulf of Carpentaria south east to the Roper River, and Groote Eylandt. The climate is characterised by a tropical monsoon with a distinct wet season starting in November/December and lasting for approximately four months followed by a dry season. Cyclonic activity is low to moderate (Ferns 1999).

Although no area on earth is unaffected by human influence, Arnhem Land is located in one of the least impacted regions globally (Halpern *et al.* 2008). Northern Australia is part of the global centre for marine biodiversity. The drivers of anthropogenic change are mostly much less in northern Australia than in the remainder of the Indo-Pacific. Australia as the only developed country in the region has a global responsibility for the conservation of marine biodiversity.

Local indigenous people hold much of the biological knowledge of Arnhem Land. Very little marine research has been conducted and consequently there is very little known about the distribution and abundance of marine flora and fauna, including seagrasses along the Arnhem Land coastline (Butler & Jernakoff 1999; Coles *et al.* 2004)). Much of the information has been based on anecdotal evidence from the 1970s (Williams *et al.* 2000; Green & Short 2003), surveys from fixed wing aircraft in the 1980s (Poiner *et al.* 1987), and a recent survey of intertidal seagrass meadows by helicopter in November 2004 (Roelofs *et al.* 2005).

Seagrass has been reported in the past from Nhulunbuy (*Halophila decipiens*) and along the north coast of the Tiwi Islands. Ten seagrass species have been reported from the waters surrounding Arnhem Land (Poiner *et al.* 1987; Roelofs *et al.* 2005): *Cymodocea serrulata*, *Cymodocea rotundata*, *Enhalus acoroides*, *Halodule uninervis*, *Halophila*

decipiens, *Halophila ovalis*, *Halophila spinulosa*, *Syringodium isoetifolium*, *Thalassia hemprichii* and *Thalassodendron ciliatum*. *H. uninervis* and *H. ovalis* are by far the most common on the open sand and mud flats. *T. hemprichii* and *T. ciliatum* are often found on reef platforms and around rocky islands. *E. acoroides* often occurs in sheltered bays.

GOULBURN ISLANDS CASTLEREAGH BAY

This region encompasses the western coastline of northern Arnhem Land and lies within the western part of the Arnhem-Wessel marine bioregion (ANZECC 1998). The Goulburn-Castlereagh Bay region has a diverse coastline. Between Goulburn Islands and Maningrida the dominant landforms are undulating sand and lateritic plains with sandy beaches and low rocky headlands with mangrove lined saline mudflats in the more protected bays and estuaries. East of Maningrida, coastal landforms are dominated by floodplains and mangroves with extensive tidal mud and sand flats. Off the coast there are a number of islands: North and South Goulburn islands; Entrance Island in the mouth of the Liverpool estuary; Mooronga Island and the Crocodile Islands, which lie north-east of Millingimbi.

In this region the coastal waters are shallow and have a tidal range of 2 – 5 m (Heap *et al.* 2004). Currents (0.5 – 1.0 knots) are generally westerly during the Dry but during the Wet they are weak and have no constant direction (Heap *et al.* 2004). Wave energy is generally low except during short periods during storm and cyclonic activity in the Wet and transition periods between the Wet and Dry (Davies 1986). Water clarity varies within the region: estuaries, protected bays in the west and near coastal waters in the east are naturally turbid, whereas the rocky platform and sandy areas in the west and offshore waters across the region including around the offshore islands (eg Goulburn's, Crocodile and Mooronga islands) have low turbidity.

Roelofs *et al.* (2005) mapped 6,694ha of intertidal seagrass meadows in this region. Approximately half of the meadows mapped were classified as aggregated patches. Intertidal seagrass communities in this region were concentrated around the Goulburn Islands, Maningrida and Milingimbi (Roelofs *et al.* 2005).

Six seagrass species have been identified from this region: *Enhalus acoroides*, *Halodule uninervis*, *Halophila decipiens*, *Halophila ovalis*, *Thalassia hemprichii* and *Thalassodendron ciliatum*.

The Goulburn Islands seagrasses were typical of tropical reefal seagrass communities and were comprised of *Thalassia*, *Thalassodendron* and *Enhalus* species (Roelofs *et al.* 2005). The sheltered regions near the Maningrida and Milingimbi communities supported extensive *Halophila* dominated meadows. Isolated and aggregated seagrass patches were the dominant cover type for this region (Roelofs *et al.* 2005). The large open bays in the region (Boucaut, Castlereagh, Buckingham and Arnhem Bays) were almost devoid of intertidal seagrass meadows, with only small isolated meadows found in Castlereagh and Boucaut Bays (Roelofs *et al.* 2005).



MELVILLE BAY

Melville Bay is a large embayment adjacent to Nhulunbuy (pop. 3500), the second largest population in the Northern Territory (Gardner 1991). Melville Bay is approximately 170 km² in area, and fringed by mangroves, with several coarse sandy beaches and some rocky shores. There are small rocky islands and headlands in the northern part of the bay. The water in the Bay is shallow, rarely more than 15m in depth and mostly less than 10m. The tidal range is 4m and on most low spring tides some of the shallow arms of the Bay dry out. The substrate over most of the Bay is fine mud and silts, typically anoxic, and seagrasses are present but patchy in distribution (Foster *et al.* 1968; Hanley 1996). Seagrasses are largely *Halophila* spp. although several other species are reported (Hanley 1996). Approximately 10.8 km² of intertidal flats occur within the bay (http://dbforms.ga.gov.au/pls/www/npm.ozest.show_mm?pBlobno=9037) and it is likely that seagrass habitats cover some proportion of these.

Along the northern side of Melville Bay, is the Gove peninsula where the Nabalco alumina refinery is located. The Nabalco bauxite mine at Nhulunbuy lies inland and the ore is transported by conveyor to the Gove peninsula. There have been a number of reports examining Nabalco's operations and potential environmental impacts on the region (Noller 1991; Peerzada *et al.* 1990a, 1990b; Peerzada & Dickinson 1989; McConchie 1991; Hanley 1993a). Concerns have included the level of sulphur emissions from the Steam Power Station stacks, the discharge of heated seawater into the Bay, occasional spills of caustic soda into the Bay (Noller 1991), and heavy metal contamination of oysters in Melville Bay.

Apart from the possible impact of Nabalco operations on the Bay there are several other sources of concern. A barge landing facility and a fuel depot for prawn trawlers are located on the southern side of a low, narrow peninsula dividing Melville Bay from the sea. Further east along this peninsula lies the recreational yacht club in Inverell Bay. The sediments of the small embayments on the southern side of the peninsula are fine mud and silts and are highly anoxic. This is a depositional environment with poor circulation, particularly since the construction of a causeway during World War II has halted movement of seawater through the northern end of Drimmie Arm (Hanley 1996). Careful assessment and the development of a management plan for the area has been recommended (Hanley 1996).

WESTERN GULF OF CARPENTARIA (GOVE TO ROPER RIVER)

The Gulf of Carpentaria is a large, shallow, muddy marine bay shared between the Northern Territory and Queensland. The area has marked seasonality in temperature, rainfall, salinity and wind regimes. The dominant weather feature is a seasonal summer monsoon with associated northerly winds and rain and a very dry winter period with south-east trade winds. Seasonal temperatures range from 10 °C in winter (Poiner *et al.* 1989) to the high 30's in summer. Tidal ranges are around 0.5m at Groote Eylandt.

Two broad scale surveys have been conducted of the western Gulf of Carpentaria coast. This is a complex coastline with few river inputs, and is consequently less muddy than the southern Gulf. In November 1983 (Poiner *et al.* 1987) mapped 440km² of seagrass meadows between Limmen Bight River and Gove. Significant areas of seagrass occurred at



Groote Eylandt (Poiner *et al.* 1987). Roelofs *et al.* (2005) mapped approximately 59km² of intertidal meadows along the mainland coast. The differences between the surveys are possibly a result of different survey methods used and/or because of physical damage by tropical storms and cyclones for which the region is prone.

Eight seagrass species have been identified in this region: *Cymodocea serrulata*, *Cymodocea rotundata*, *Enhalus acoroides*, *Halodule uninervis*, *Halophila ovalis*, *Halophila spinulosa*, *Syringodium isoetifolium*, and *Thalassia hemprichii* (Poiner *et al.* 1987; Roelofs *et al.* 2005).

Open-coastline communities were the major intertidal meadow types mapped in this region and they were dominated by monospecific stands of *H. ovalis* and *H. uninervis* intertidally, and *C. serrulata* and *S. isoetifolium* subtidally (Poiner *et al.* 1987; Roelofs *et al.* 2005). Mixed-species meadows of *C. serrulata*, *T. hemprichii* and *S. isoetifolium* occurred on reef flats, some small sheltered embayments were dominated by *E. acoroides*, and *H. ovalis* and *H. spinulosa* sometimes occurred in river-mouth areas (Poiner *et al.* 1987).

In areas surveyed in 2004, seagrass communities were concentrated in the Caledon and Blue Mud Bay regions in the north and Numbulwar in the south (Roelofs *et al.* 2005). Most meadows with aggregated seagrass patches and they supported abundant dugong and turtle populations, particularly in Caledon Bay and from Limmen Bight to the Sir Edward Pellew Island Group (Roelofs *et al.* 2005).

For more information, visit www.seagrasswatch.org

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