Moreton Bay Seagrasses

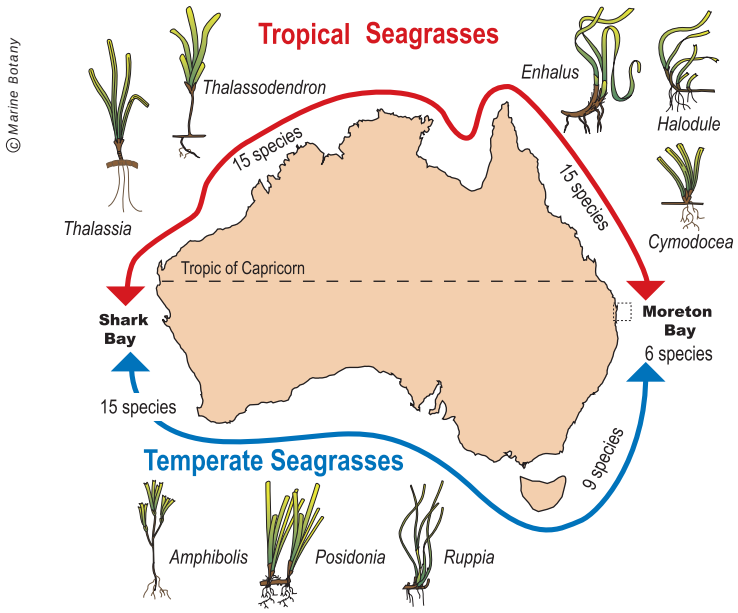
Wanga Wallen Banks.

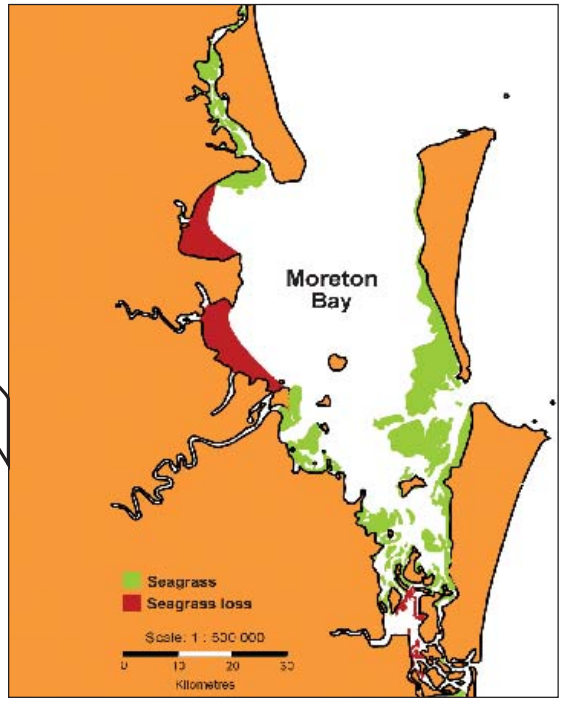
Dugong trails at low tide at Amity Banks .

Lots of invertebrates live in the seagrass beds.

Seagrasses are highly specialised marine flowering plants adapted to soft sediments of nearshore environments. Although there are relatively few species of seagrasses globally (<70 species), these plants have evolved from several lineages of land plants and are adapted to a totally submersed life. Seagrasses are a productive, widespread and ecologically significant feature of nearshore environments. Seagrasses indirectly support various coastal fisheries, largely through provision of a nursery habitat for juvenile animals.

Unlike algae, seagrasses have roots and vascular tissue allowing them to absorb and translocate nutrients from soft sediment. In low nutrient environments this provides seagrass with a competitive advantage over algae as they can access the higher nutrient concentrations available in the sediment compared to the overlying water. Seagrass habitats directly and indirectly support many coastal fisheries through the provision of important habitat for both juvenile and adult animals.





Distribution of seagrass in Moreton Bay
Results from Dennison et al. 1998.

Seagrasses are a prominent feature of both tropical and temperate coastlines of Australia. Australia's 32,000 km coastline contains the largest, most diverse seagrass assemblages in the world. The seagrass in Australia can be divided into those with temperate and those with tropical distributions. Shark Bay in Western Australia and Moreton Bay in southeast Queensland are located at the centre of the overlap zones.

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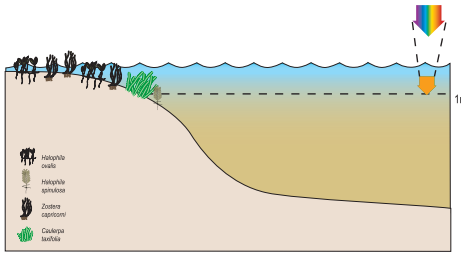
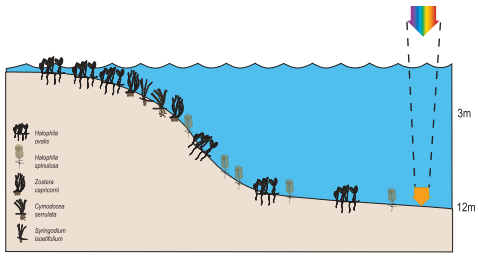
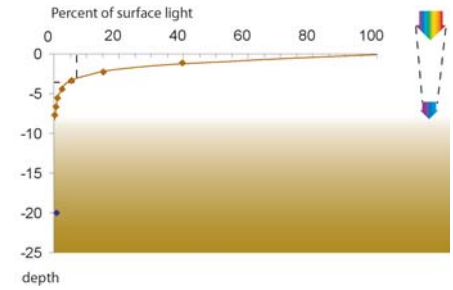
Light and seagrasses



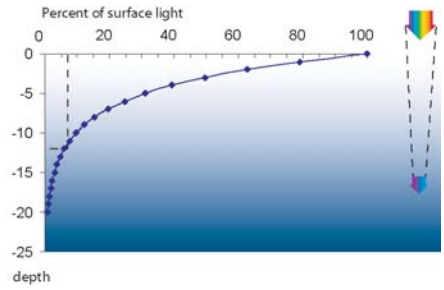
In the Eastern Bay *Zostera capricorni* is the dominant species and has only a shallow depth distribution with algae and *Halophila spinulosa* at the deep edge.



More species occupy the Eastern Bay and *Zostera capricorni* grows much deeper (up to 3m), with *Halophila spinulosa* and *Halophila ovalis* extending to 12m.



Depth of light penetration is low in the western Bay, based on mean annual Secchi depth of 1.5 m at Fishermans Island (EHMP data).



Depth of light penetration is higher in the eastern Bay based on mean annual Secchi depth of 7.3 m at Shark Spit, Moreton Island (EHMP data).

Fishermans Island

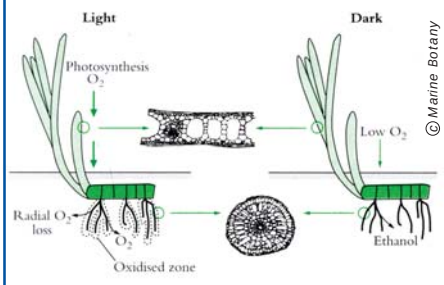
Moreton banks

Seagrass depth range

Seagrasses generally have high light requirements, with an average of 10% of surface light. However, species of the genus *Halophila* often grow in deeper water compared to other seagrass species and have been shown to survive at approximately 5% of surface light.

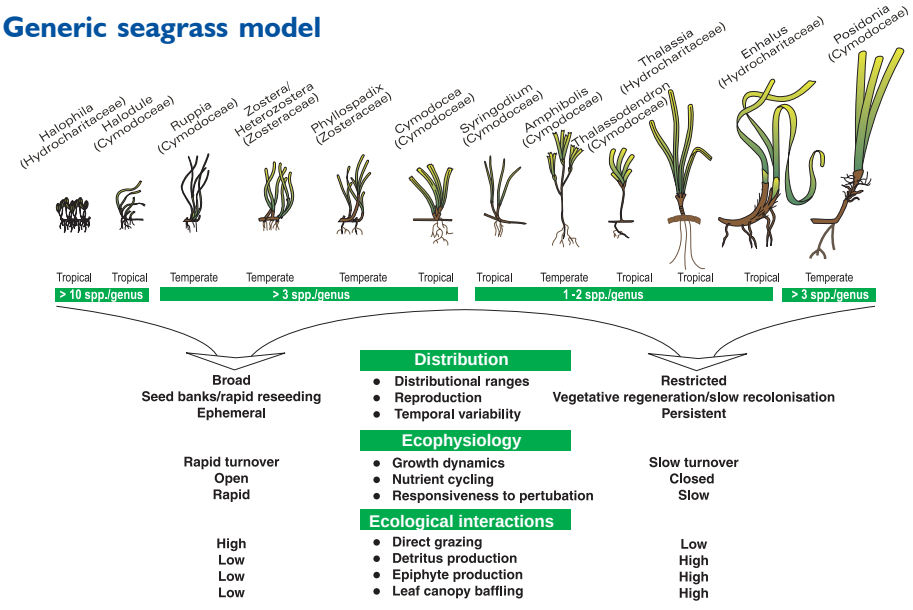
The distribution of seagrass in Moreton Bay is primarily limited by the amount of light that reaches the sediment. In the western Bay there has been seagrass loss or reduction in cover due to increases in water turbidity, caused mainly by the resuspension of fine sediment. Seagrass depth range is an indicator of ecosystem health that uses the vertical distribution of the most common species of seagrass in Moreton Bay (*Zostera capricorni*) to determine the amount of light reaching benthic habitats. The maximum depth to which seagrass grows, represents an integration of the amount of photosynthetically useful light (quality and quantity) reaching benthic habitats. The depth range of *Zostera capricorni* in western Moreton Bay is approximately 1m. In contrast, *Zostera capricorni* in the eastern bay has a depth range of approximately 3m and *Halophila spinulosa* and *Halophila ovalis* grow to at least 12m, demonstrating that this region of the bay has exceedingly clear water.

Seagrasses pump oxygen



O_2 is transported to rhizomes and roots of seagrasses during periods of light when photosynthesis releases O_2 into aerenchyma. Note the formation of an oxidised zone around roots and radial O_2 loss into surrounding anoxic sediments. Both leaves and roots contain airspaces, configured very differently, through which O_2 can diffuse. By night, almost all O_2 transport ceases because seawater surrounding the leaves becomes the only source of O_2 and alcoholic fermentation commences in roots.

Generic seagrass model



One useful method of categorising seagrass is on the basis of their growth forms, which range from small plants with thin leaves (e.g., *Halophila, Halodule*) to large plants with thick leaves (e.g., *Thalassia, Enhalus, Posidonia*). This gradient in seagrass morphology and turn over rates is also reflected in aspects of distribution, ecophysiology and ecological interactions. These large variations in morphology and ecological function of different seagrass species influences how they interact with higher trophic levels and the type of habitat they provide.

Dugong Grazing

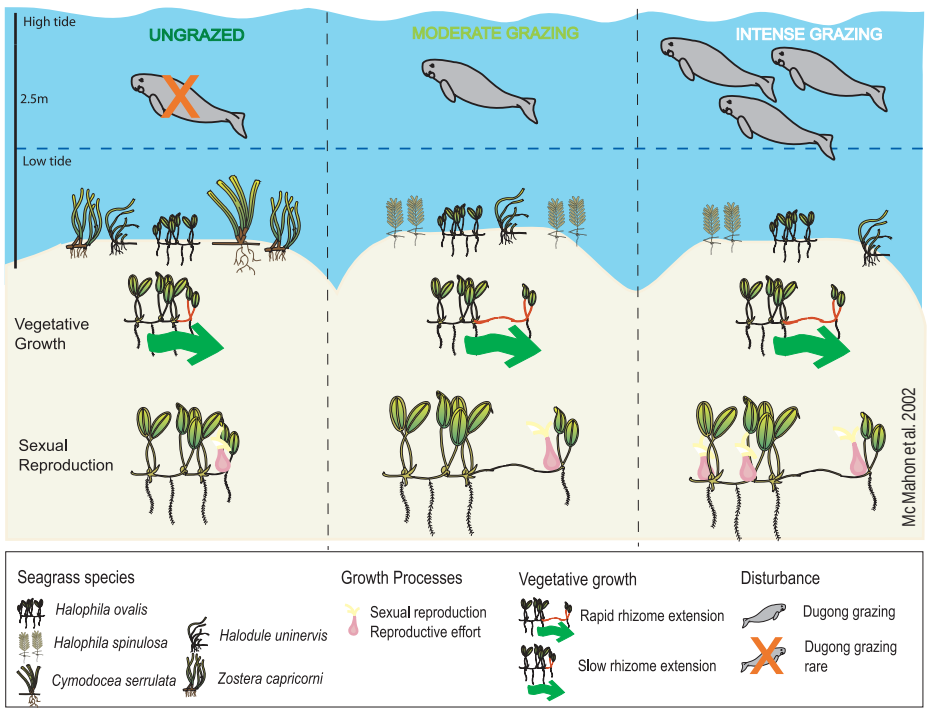
Tropical seagrasses form extensive undersea pastures for grazing dugong ('sea cows'; *Dugong dugon*) and green sea turtles (*Chelonia mydas*). Dugong feed almost exclusively on seagrasses, preferring species with low fibre content and high carbohydrate and nutrient content. Dugongs eat entire seagrass plants, including below-ground roots and rhizomes, and leave distinct grazing trails. Green sea turtles are less selective feeders, but the combined grazing effect of dugong and turtles selects for seagrass species that can recolonise rapidly. The ability of dugong to maintain their preferred food source with repeated grazing results in their being referred to as 'seagrass farmers'.

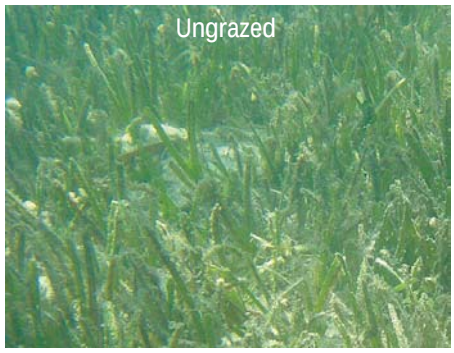
Halophila ovalis flower

In Moreton Bay, hundreds of dugong and thousands of turtles regularly graze seagrasses, particularly on the shallow Amity and Moreton Banks. Intensive grazing occurs on Moreton banks and moderate grazing occurs on Amity Banks. There is very little dugong grazing at Wanga Wallen Banks. To maintain their populations with regular dugong grazing, seagrasses need to grow quickly by rhizome extension or flower and produce seeds which can grow into new individuals. Recent research by Kathryn McMahon has shown the seagrass, *Halophila ovalis* grows faster in areas grazed by dugongs compared to areas that are not grazed. Flowering and seed production occurs throughout most of the year, with peaks in spring and autumn. Areas grazed intensively by dugongs produce more flowers over a year than those areas not grazed by dugongs.

Dugong grazing influences on *Halophila ovalis*

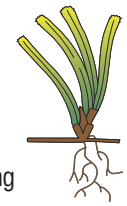
The conceptual diagram of growth dynamics of *Halophila ovalis* under three different dugong grazing disturbance regimes. An ungrazed meadow has high seagrass cover with long lived species, vegetative growth rates are low and sexual reproduction is significant in summer. In moderately grazed meadows, seagrass cover is low to moderate with colonising species, vegetative growth is high and sexual reproduction is high in summer. In intensively grazed meadows seagrass cover is also low to moderate with colonising species, vegetative growth is high and sexual reproduction is significant in summer, autumn and early winter.





Moreton Bay Seagrass Species

Cymodocea serrulata

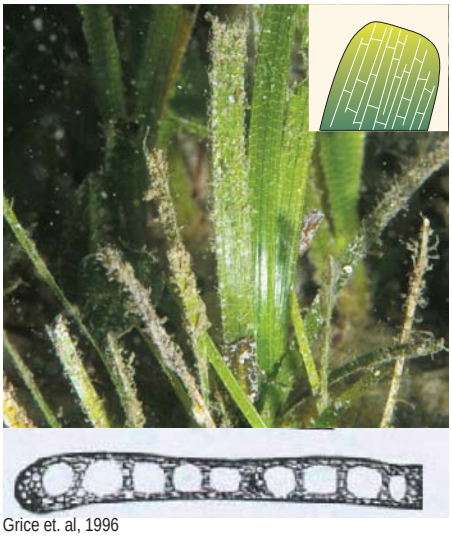


- subtidal to 15m (QLD)
- mostly monospecific meadows
- simple leaf
- leaves flat, leaf tip serrated
- leaves 4-9mm wide, <20cm long
- rhizomes robust

Larkum et. al, 1989

Zostera capricorni

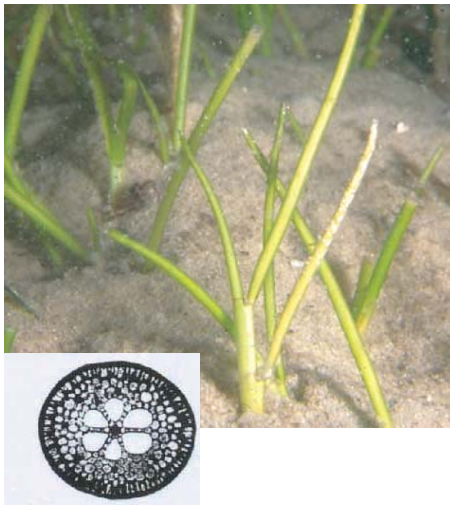
- intertidal / subtidal to 6m (QLD)
- monospecific / mixed meadows
- simple leaf
- leaves flat, leaf tip rounded
- leaves 2-5mm wide, 3-50cm long
- rhizomes light to dark brown
- cross veins in leaf clearly visible



Grice et. al, 1996

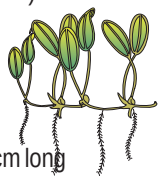
Syringodium isoetifolium

- subtidal to 10m (QLD)
- mostly monospecific meadows
- simple leaf
- leaves cylindrical, leaf tip tapers to point
- leaves 1-2mm diameter, 10-30cm long
- rhizomes fleshy white

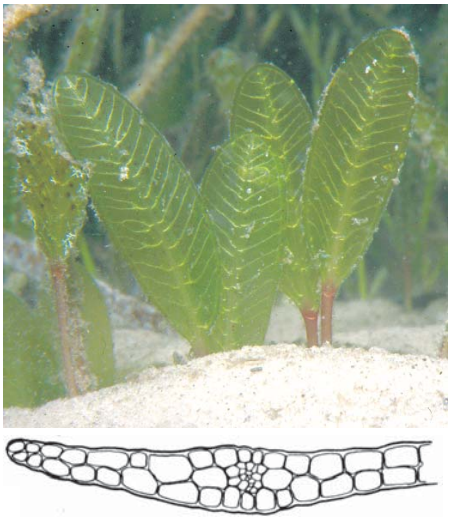


Grice et. al, 1996

Halophila ovalis

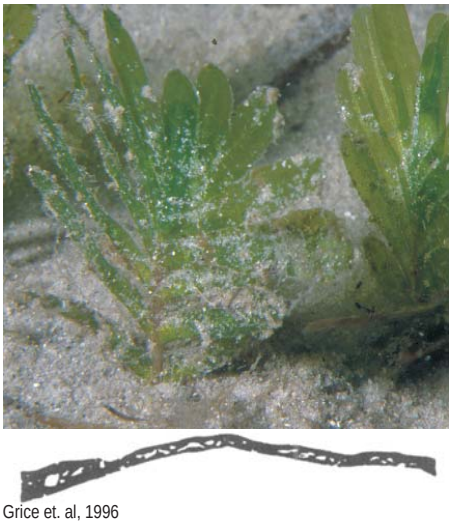


- intertidal / subtidal to 48m (QLD)
- monospecific / mixed meadows
- simple leaf
- leaves flat
- leaves 0.5-2.0cm wide, 1-4cm long
- rhizomes thin, white to yellow colour



Halophila spinulosa

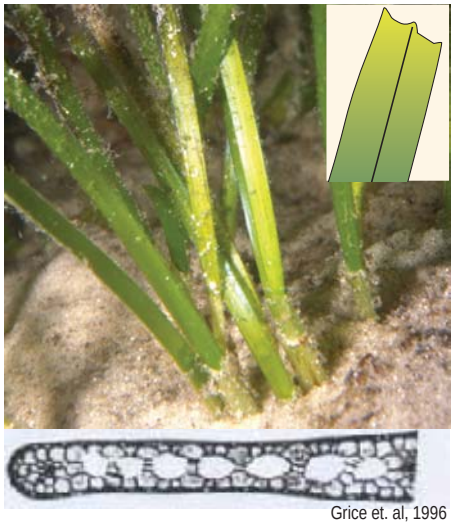
- subtidal to 44m (QLD)
- monospecific / mixed meadows
- compound leaf
- leaves flat, serrated
- 5-20 serrated leaf pairs
- rhizomes thin, light to pink colour



Grice et. al, 1996

Halodule uninervis

- intertidal / subtidal to 10m (QLD)
- monospecific / mixed meadows
- simple leaf
- leaves flat, leaf tip 3 points in 'crown'
- leaves 0.25-5mm wide, <25cm long
- rhizomes thin, light colour
- no cross veins in leaf



Grice et. al, 1996

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