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Department of Fisheries

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Fish for the future

FISHERIES FACT SHEET

SEAGRASSES

Photo: Michael Burgess

Marine meadows

Seagrasses support highly productive and diverse ecosystems. These specialised marine plants are vitally important in the coastal environment because they are a source of food and shelter; oxygenate water, trap sand and recycle nutrients; and provide breeding habitats and nursery areas for many marine organisms.

Not your average grass

Seagrasses are true flowering plants that live and reproduce submerged in seawater. Evolved from land plants, seagrasses generally look like terrestrial grasses but are more closely related to the lily family. They are a primary producer – within their leaves they use sunlight to convert carbon dioxide and water into oxygen and sugar (carbohydrates) through a process called photosynthesis.

Seagrasses can range in size from less than one centimetre to plants with leaves seven metres long. They can exist as a few plants or clumps, but generally form extensive seagrass 'beds' or 'meadows'.

The roots and rhizomes (horizontal stems) of seagrasses are often buried in sand or mud. They anchor the plant, absorb nutrients from soft sediment and store carbohydrates. Veins allow seagrasses to transport nutrients around the plant. This system of absorption and transport allows seagrasses to access the higher nutrient concentrations available in sediments rather than rely on lower concentrations in the surrounding water.

Worldwide distribution of seagrass

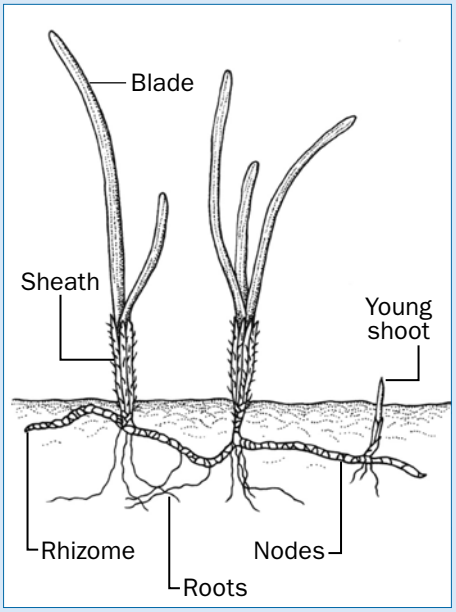
A gallery of grasses

1. Family *Posidonia* (Ribbonweed)

2. Family *Cymodoceacene* (Wireweed)

3. Family *Hydrocharitacea* (Paddleweed)

4. Family *Zosteraceae* (Eelgrass)



Seagrasses suited to WA

The southern half of Western Australia offers ideal conditions for seagrasses – clear waters, low nutrients, protection from heavy seas and swells, and sandy substrate. Many southern seagrass species are perennial (grow all year round), covering extensive areas of Shark Bay, Cockburn Sound, Geographe Bay, Flinders Bay and along the southern coast.

In the northern half of the State, seagrass diversity and abundance is lower. Meadows are restricted to sheltered and shallow waters due to large tidal movement, high turbidity, large seasonal freshwater run-off and cyclones. Seagrasses here are mainly ephemeral (seasonal) and are dominated by species that support direct grazing by turtles and dugong.

Of Shark Bay's 13,000 square kilometres, about 4,500 square kilometres are covered by seagrasses. Photo: Clay Bryce

Seagrass meadows off South West WA have the largest biomass (mass of living organisms) and the highest species diversity anywhere in the world, with 27 recognised species. Shark Bay harbours 12 species and there are nine species at Rottnest Island.

Australia has the most seagrass species in the world with over half of the reported 60 species. Western Australia can claim the largest and most diverse seagrass meadows in the world with an unrivalled 27 species covering an estimated 20,000 square kilometres.

Nursery areas

Seagrass meadows are important nursery areas for countless marine organisms, including blue swimmer crabs, prawns, western rock lobster, whiting, tailor, herring and squid – many of which are recreationally and commercially important.

Seagrass meadows are an important nursery for Western rock lobster. Photo: Sandy Clarke

Juveniles benefit from seagrass nutrients that stimulates the production of food, and the maze of seagrass leaves and stems that shelter and protect them from larger predators.

At the sheltered Cliff Head lagoon south of Dongara, a 50-square kilometre meadow of ribbonweed (*Posidonia* sp.) is regarded as an important habitat for the State's western rock lobster fishery, as the dense seagrasses are areas of significant settlement and nocturnal foraging for juvenile lobster.

Juvenile King George whiting spend around four years in coastal embayment and estuary seagrass areas before venturing to offshore reefs to complete the life cycle. Many wrasse species, like Western blue groper, also reside in seagrass meadows as juveniles and immature adults before migrating to deeper waters or reef.

Seagrass reproduction

Seagrasses are well adapted to completing their entire life cycle underwater. Most seagrasses have separate male and female plants, and transfer pollen from the male flower to the female flower, where fertilisation occurs. This pollination is aided by water, with the pollen transported by currents and tides. Once the fertilised seeds are ripe, they are released to the water and dispersed by currents and tides to germinate into new plants in suitable locations. In some species, the seeds can remain dormant for several months, surviving until conditions are right for germination.

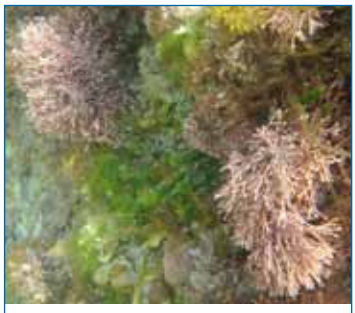
Reproduction can also occur through propagules (small plantlets) that grow on the stems of mature plants. These propagules eventually break free from the plant and, as they can survive for long periods, may be transported long distances to new locations.

Most commonly, seagrasses reproduce by vegetative expansion. The underground rhizomes put out lateral branches that extend to the surface. These shoots produce new plants along the edges of the meadow, increasing the area and allowing seagrasses to recover after being grazed or disturbed.

Ruppia is seagrass-like in appearance and is found across Western Australia's estuaries and saline lakes. Although classed as a salt-tolerant freshwater plant, Ruppia shares a similar ecological importance and vulnerability as seagrasses.

Seaweed

Seagrasses are often confused with large seaweeds (termed macro-algae). Algae are very simple plant-like organisms that do not have a true root system – they attach to hard substrates by root-like 'holdfasts'. Unlike seagrasses, they do not have veins to transport molecules around the organism, but take up minerals and nutrients directly from the water through diffusion. Algae also reproduce by releasing spores rather than producing flowers or seeds.



Seaweed or 'macroalgae' – not to be confused with seagrass.

In deep

Western Australia's clear coastal waters allow seagrasses to inhabit depths of more than 40 metres, such as areas off Cape Naturaliste and Esperance. In contrast, in many estuaries, light penetration is poor, so seagrasses are limited to two metres in depth.

To protect and produce

In much the same way that plants on land protect soil from erosion, the dense underground root system (rhizomes) of seagrasses form a secure mat that traps, stabilises and protects soft sand or mud.

Seagrass meadows also reduce water movement, providing a protective buffer for fish that are poor swimmers, such as cowfish, boxfish, leatherjackets, globefish, seahorses, pipefish and seadragons.

A substantial wrack of dead seagrass dislodged by winter storms in Geographe Bay. Photo: Michael Burgess

When seagrasses shed leaves or they are broken off during winter storms and heavy swells, this material accumulates in large piles on beaches in what are referred to as 'wracks'. These wracks of dead seagrass protect the beach and dune systems by acting as a buffer against wave action. And even though much of this material is dead, it forms an important part of coastal ecosystems.

Decomposing seagrass and other dead and decaying material provides a feeding place for swarms of amphipods (small crustaceans), worms and burrowing bivalves, such as pipis and cockles. These creatures break down the organic matter and recycle the nutrients. Wracks are also an important habitat and food source for other small invertebrates, such as crabs, sea cucumbers and sea urchins, which in turn are food for fish and birds.

Complex webs

Seagrasses harbour and support a large variety of marine life. Their leaves and rhizomes are a highly suitable surface for the attachment of marine organisms, such as bacteria, protozoans, algae, sponges, bryozoans, polychaete worms and ascidians. The collective array of attached organisms is referred to as 'epibiota'.

Growth of epibiota provides food for grazing and foraging marine life, which in turn attracts larger predators – creating a complex food web.

Year-round residents are normally small and highly adapted to seagrass habitat. Others are seasonal visitors or may spend a portion of their lifecycle in seagrass meadows, particularly during their juvenile stage.

Apart from green turtles, dugong and garfish, very few animals directly eat seagrass. Instead, seagrass inhabitants are reliant on epibiota or detritus, or feed on other inhabitants living in the meadows.

Seagrasses play host to a range of small organisms called 'epiphytes' (plants) and 'epifauna' (animals) that live and feed on them.

Seagrass loss and recovery

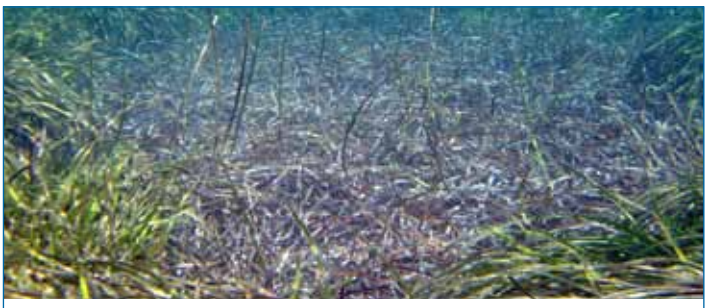
Seagrass beds are a fragile habitat and if damaged or removed, can take many years to recover, depending on the species. Worldwide, seagrasses are under threat from human impacts and in Western Australia we have already experienced large seagrass losses.

In Cockburn Sound, seagrass meadows originally covered an area of nearly 4,000 hectares before degradation by industrial discharges of nutrients in the late 1960s and early 1970s. In 2004, it was estimated that only 872 hectares were present, representing a 78 per cent loss in seagrass coverage.

Similarly, in Princess Royal Harbour and Oyster Harbour at Albany, seagrass loss is estimated at 66 per cent and 46 per cent respectively. Princess Royal Harbour was used as a dumping ground for industrial and sewage waste while Oyster Harbour was overloaded with agricultural nutrients flowing through the King and Kalgan rivers.

Seagrasses are sensitive to excess nutrients. In these conditions, bacteria thrive and may produce compounds that are toxic to seagrasses. High levels of nutrients trigger phytoplankton blooms or excessive growth on the leaves of seagrass, reducing the amount of light received for photosynthesis.

Close proximity to the coast makes seagrasses vulnerable to human impacts.



This dead patch of seagrass shows damage to the meadow caused by a boat mooring.

If not managed, vegetation clearing in catchment areas, and coastal activities such as developments and dredging, can cause sand and silt to enter nearshore areas or become suspended in the water column. This increased turbidity in the water reduces the amount of light penetration, affecting photosynthesis, while a build-up of sediments can bury seagrasses.

Physical damage to seagrass meadows can occur from boat propellers, anchors, chains and moorings. Storms or cyclones large enough to tear up and smother seagrass meadows can occasionally arise. Water pollution, stormwater runoff, oil spills, herbicides and pesticides, discharge and other wastes can put large areas of seagrasses at risk.

In Princess Royal Harbour, nutrient reduction strategies since the 1980s have enabled a gradual recovery of seagrass meadows. Researchers are improving methods of transplanting existing seagrass plants in affected areas to speed up the recovery process.

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Glossary

Detritus
Dead or decaying organic matter

Diffusion
A process where molecules are transported from a high concentration to a low concentration without using energy

Ecosystem
A complex set of relationships among the living resources, habitats and residents of an area

Epibiont
An organism that lives on the surface of another organism

Estuary
Coastal water body where ocean tides and river waters merge

Eutrophication
Increase in nutrients or organic matter in an ecosystem

Germination
The growth process of a mature seed, characterised by the sprouting of a stem and root

Invertebrate
Animal without a backbone

Juvenile
An individual organism that has not yet reached its adult form, sexual maturity or size

Nursery area
Area in which animals breed and where juvenile animals grow

Rhizome
Underground, horizontal stems of vascular plants

Photosynthesis
Process by which green plants convert carbon dioxide and water to carbohydrates and oxygen using sunlight for energy

Pollination
The transfer of pollen from the male flower to the female flower, where fertilisation occurs

Substrate
The layer or surface immediately underneath something or to which it is attached

Turbidity
The amount of solid particles that are suspended in water and that cause light rays shining through the water to scatter. Thus, turbidity makes the water cloudy or even opaque in extreme cases

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FURTHER INFORMATION

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