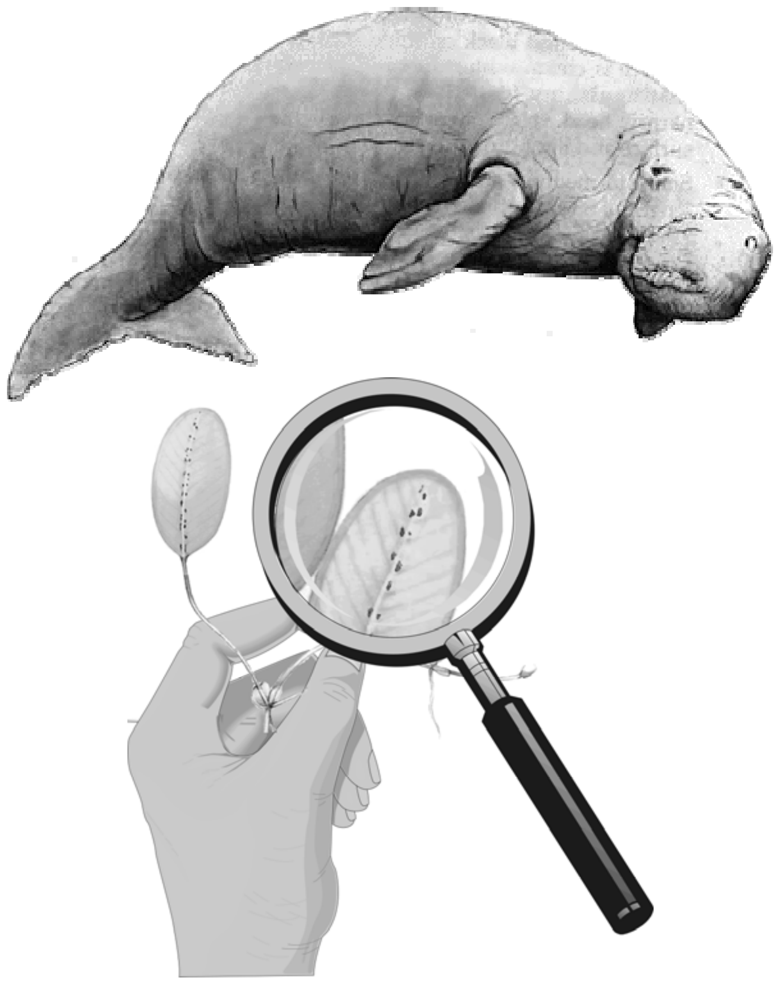
Seagrass-Watch

Guidelines for Wellesley Island Rangers



Mornington Island
30th – 31st October 2007

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Department of Primary Industries & Fisheries, Queensland

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Disclaimer

Information contained in this publication is provided as general advice only. For application to specific circumstances, professional advice should be sought.

The Department of Primary Industries & Fisheries has taken all reasonable steps to ensure the information contained in this publication is accurate at the time of the survey. Readers should ensure that they make appropriate enquires to determine whether new information is available on the particular subject matter.

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Acknowledgments:

We acknowledge the Traditional Owners and custodians on whose land and sea country this training has taken place. This was a joint project between the Carpentaria Land Council Aboriginal Corporation (CLCAC), the North Australia Indigenous Land and Sea Management Alliance (NAILSMA) and the Department of Primary Industries and Fisheries (DPI&F). We would like to thank Kelly Gardner and Bradley Wilson (CLCAC) for facilitating the establishment of this workshop.

Overview

Seagrass-Watch is a monitoring program that brings interested individuals from the community, government, non-government and management agencies together for the sustainability of seagrass habitats. It identifies areas important for seagrass species diversity and management. The information collected can be used to assist the management of coastal environments and to prevent significant areas and species being lost.

Monitoring seagrass resources is important for two reasons: it is a valuable tool for improving management practices; and it allows us to know whether resource status and condition is stable, improving or declining. Successful management of coastal environments (including seagrass resources) requires regular monitoring of the status and condition of natural resources.

Early detection of change allows coastal management agencies to adjust their management practices and/or take remedial action sooner for more successful results. Monitoring is important in improving our understanding of seagrass resources and to coastal management agencies for:

- *Exposing coastal environmental problems before they become intractable,*
- *Developing benchmarks against which performance and effectiveness can be measured,*
- *Identifying and prioritising future requirements and initiatives,*
- *Determining the effectiveness of management practices being applied,*
- *Maintaining consistent records so that comparisons can be made over time,*
- *Developing within the community a better understanding of coastal issues,*
- *Developing a better understanding of cause and effect in land/catchment management practices,*
- *Assisting education and training, and helping to develop links between local communities, schools and government agencies, and*
- *Assessing new management practices*

It is also important to realise that the reasons for monitoring will also influence the monitoring plan and the methods used. A rapid method for monitoring seagrass resources is used in the Seagrass-Watch program. The Seagrass-Watch program originated from

- *Community concerns about seagrass loss and habitat integrity*
- *Community interest in science, and*
- *Government objectives in long-term monitoring of critical fisheries habitats.*

The goals of the Seagrass-Watch program are:

- *Partnerships between Government and non-government organisations,*
- *Community participation and ownership of marine resources,*
- *Long-term & broad-scale monitoring of habitat, seasonal patterns, condition and trend data,*
- *An early warning system of coastal environment changes,*
- *Community education on the importance of seagrass resources, and*
- *Community awareness of coastal management issues.*
- *To provide training to build the capacity of local communities to collect information useful for the ongoing management and protection of important marine resources.*
- *Integrate with existing education, government, non-government and scientific programs to raise community awareness and preserve these important marine ecosystems for the benefit of the community.*

This workshop is hosted by the Carpentaria Land Council Aboriginal Corporation (CLAC), the North Australia Indigenous Land and Sea Alliance (NAILSMA) and Seagrass-Watch, Department of Primary Industries & Fisheries (DPI&F). As part of this workshop we will

- *learn seagrass taxonomy*
- *discuss the present knowledge of seagrass ecology,*
- *discuss the threats to seagrasses*
- *learn techniques for monitoring seagrass resources*
- *provide examples of how Seagrass-Watch assists with the management of impacts to seagrass resources and provides an understanding of their status and condition.*

The following information is provided as a training guide and a reference for future community based Seagrass- Watch monitoring activities. For further information, please do not hesitate to contact us at

Seagrass-Watch HQ
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Queensland Department of Primary Industries & Fisheries
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or visit

www.seagrasswatch.org

Workshop leader

Dr. Jane Mellors

Jane is a Fisheries Biologist with the Queensland Department of Primary Industries & Fisheries. Jane has over 20 years experience in seagrass related research and monitoring. She is the project Leader for the Torres Strait, Education opportunities for indigenous involvement in marine ecosystem monitoring project. Jane is a specialist in tropical seagrass eco-physiology, seagrass taxonomy, geochemistry of marine sediments and marine invertebrate taxonomy pertaining to seagrass meadow communities. In 2003, Jane completed her Doctorate (Dept TESAG, James Cook University) on sediment and nutrient dynamics in coastal intertidal seagrass meadows of north eastern Australia of North Queensland

Current Projects

- Seagrass-Watch community seagrass monitoring
- NHT & Queensland ED: Education opportunities for indigenous involvement in marine ecosystem monitoring
- Co-author of a guide to tropical seagrasses of the Indo-west Pacific
- Investigations on the effects of nutrients on tropical seagrasses
- Water Quality and Ecosystem Monitoring Programs – Reef Water Quality Protection Plan

Workshop assistant

Anto Wilson

Anto Wilson graduated with a Bachelor of Science, majoring in Chemistry, from James Cook University. He has been employed on number of occasions to assist with seagrass sampling, His most recent venture being in association with Reef Water Quality Protection Plan project. The main task for this project is to monitor seagrass habitat using Seagrass-Watch methodology and to gather additional information on the nutrient status of the seagrass meadows being monitored Anto regularly volunteers for Seagrass-Watch monitoring activities in the Townsville region.

Projects

- Seagrass-Watch community seagrass monitoring
- Water Quality and Ecosystem Monitoring Programs – Reef Water Quality Protection Plan

Agenda

Tuesday 30th October 2007

Morning	0830 - 0900	Introduction & Welcome – *Kelly Gardner & Jane Mellors*
	0900 – 0930	Seagrass Biology & Identification - *Jane Mellors*
	0930 – 10:15	Laboratory exercise: Seagrass Identification & how to prepare a seagrass press specimen - *Jane Mellors & Anto Wilson*
		Morning Tea
	1030 - 1100	Seagrass Ecology and Threats – *Jane Mellors*
	1100– 1115	Seagrass monitoring – *Jane Mellors*
	1115 – 1230	Seagrass-Watch - *Jane Mellors*
	12:30 – 12:45	Safety briefing & risk assessment for field work – *Jane Mellors*
		Day 1 finished

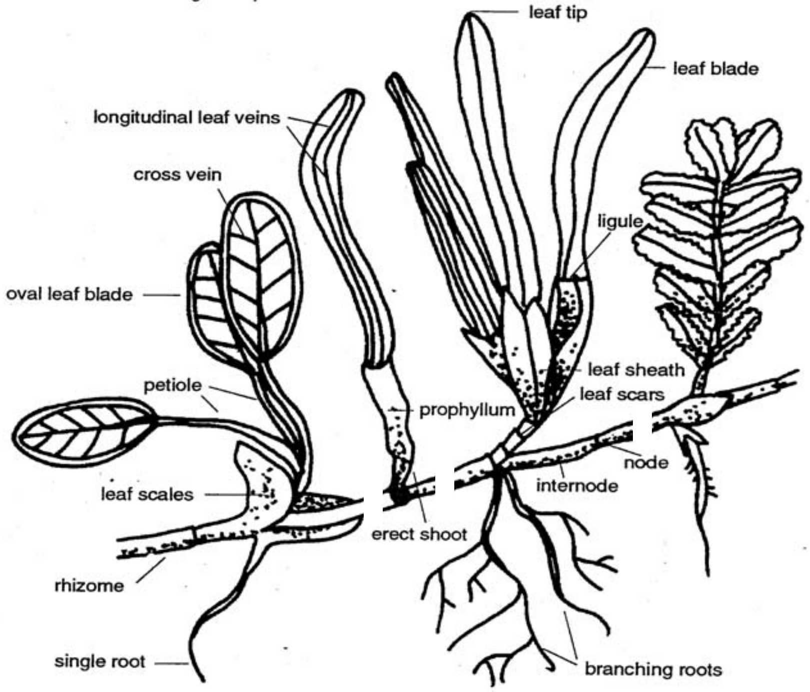
Wednesday 31st October 2007

Morning	9:00	Meet for transportation to Monitoring site
	Arrive at site	Channel between Mornington Island and Sydney Island
		Prepare field equipment
	Start Monitoring	Field exercise: Seagrass-Watch –*Jane & Anto* *Where*: Channel between Mornington and Sydney Island *What to bring:* • *hat, sunscreen (Slip! Slop! Slap!)* • *dive booties or old shoes that can get wet* • *drink/refreshments* • *Polaroid sunglasses (not essential)* • *enthusiasm* *You will be walking across a seagrass meadow exposed with the tide, through shallow water. It may be wet and muddy!* *Please remember, seagrass meadows are an important resource and are protected by law. We ask that you use discretion when working/walking on them.*
	Monitoring completed	Check data sheets, clean equipment
		Day 2 finished

- *Low tide: 0.7m at 11:45*

Background

Seagrasses are specialized marine flowering plants that have adapted to the nearshore environment of most of the world's continents. Most are entirely marine although some species cannot reproduce unless emergent at low tide. Some seagrasses can survive in a range of conditions encompassing fresh water, estuarine, marine, or hypersaline. There are relatively few species globally (about 60) and these are grouped into just 13 Genera and 5 Families.



Composite illustration demonstrating morphological features used to distinguish main seagrass taxonomic groups.

from Lanyon (1986)

Various common names are applied to seagrass species, such as turtle grass, eelgrass and shoal grass. These names are not consistently applied among countries and in any case are not commonly used in northern Australia. We are not aware of any name for seagrass species used consistently through sea country. However coastal communities would almost certainly recognise the term "dugong grass" as referring to the shallow subtidal and intertidal seagrasses.

There is now a broad understanding of the range of species and seagrass habitats. Areas less well known include the southeast Pacific reefs and islands, South America, the southern Atlantic, the Indian Ocean islands, the west African coast, and Antarctica. Shallow sub-tidal and intertidal species distributions are better recorded than seagrasses in water greater than 10 m below MSL. Surveying deeper water seagrass is time consuming and expensive and it is likely that areas of deepwater seagrass are still to be located.

A number of general parameters are critical to whether seagrass will occur along any stretch of coastline. These include physical parameters that regulate the physiological activity of seagrasses (temperature, salinity, waves, currents, depth, substrate and day length), natural phenomena that limit the photosynthetic activity of the plants (light, nutrients, epiphytes and diseases), and anthropogenic inputs that inhibit the access to available plant resources (nutrient and sediment loading). Various combinations of these parameters will permit, encourage or eliminate seagrass from a specific location.

Tropical seagrasses occupy a variety of coastal habitats. Tropical seagrass meadows typically occur in most shallow, sheltered soft-bottomed marine coastlines and estuaries. These meadows may be monospecific or may consist of multispecies communities, sometimes with up to 12 species present within one location. The stresses and limitations to seagrasses in the tropics are generally different than in temperate or subarctic regions. Temperature related impacts most often result from high water temperatures or overexposure to warm air; osmotic impacts result from hypersalinity due to evaporation; radiation impacts result from high irradiance and UV exposure.

The depth range of seagrass is most likely to be controlled at its deepest edge by the availability of light for photosynthesis. Exposure at low tide, wave action and associated turbidity and low salinity from fresh water inflow determines seagrass species survival at the shallow edge. Seagrasses survive in the intertidal zone especially in sites sheltered from wave action or where there is entrapment of water at low tide, (e.g., reef platforms and tide pools), protecting the seagrasses from exposure (to heat, drying or freezing) at low tide.

Tropical seagrasses are important in their interactions with mangroves and coral reefs. All these systems exert a stabilizing effect on the environment, resulting in important physical and biological support for the other communities (Amesbury and Francis 1988).

Barrier reefs protect coastlines, and the lagoon formed between the reef and the mainland is protected from waves, allowing mangrove and seagrass communities to develop. Seagrasses trap sediment and slow water movement, causing suspended sediment to fall out. This trapping of sediment benefits coral by reducing sediment loads in the water.

Mangroves trap sediment from the land, reducing the chance of seagrasses and corals being smothered. Sediment banks accumulated by seagrasses may eventually form substrate that can be colonized by mangroves. All three communities trap and hold nutrients from being dispersed and lost into the surrounding oceanic waters.

The habitat complexity within seagrass meadows enhances the diversity and abundance of animals. Seagrasses on reef flats and near estuaries are also nutrient sinks, buffering or filtering nutrient and chemical inputs to the marine environment. The high primary production rates of seagrasses are closely linked to the high production rates of associated fisheries. These plants support numerous herbivore- and detritivore-based food chains, and are considered as very productive pastures of the sea. The associated economic values of seagrass meadows are very large, although not always easy to quantify.

Tropical seagrass meadows vary seasonally and between years, and the potential for widespread seagrass loss has been well documented (Short and Wyllie-Echeverria 1996). The causes of loss can be natural such as cyclones and floods, or due to human influences such as dredging, agricultural runoff, industrial runoff or oil spills.

Loss of seagrasses has been reported from most parts of the world, sometimes from natural causes, e.g., high energy storms, or "wasting disease". More commonly, loss has resulted from human activities, e.g., as a consequence of eutrophication or land reclamation and changes in land use. Anthropogenic impacts on seagrass meadows are continuing to destroy or degrade these coastal ecosystems and decrease their yield of natural resources.

It is important to document seagrass species diversity and distribution and identify areas requiring conservation measures before significant areas and species are lost. Determining the extent of seagrass areas and the ecosystem values of seagrasses is now possible on a local scale for use by coastal zone managers to aid planning and development decisions. Knowledge of regional and global seagrass distributions are still too limited and general for broad scale protection and management. Such information is needed to minimize future impacts on seagrass habitat worldwide. With global electronic communication it is now possible to begin the process of assembling both formally published and unpublished notes on the distribution of the world's seagrasses with the eventual aim of providing a global "report card" on the distribution and status of seagrass.

With well-recorded events of seagrass loss from many coastal environments it is important to map and record the distribution of not only the location of existing seagrass but also areas of potential seagrass habitat. Such areas are generally shallow, sheltered coastal waters with suitable bottom type and other environmental conditions for seagrass growth. Potential habitat may include areas where seagrass was known to grow at some time in the past but from which it has recently been eliminated.

Spatial and temporal changes in seagrass abundance and species composition must be measured and interpreted with respect to prevailing environmental conditions. These may need to be measured seasonally, monthly, or weekly, depending on the nature of their variability, and the aims of the study. Physical parameters important to seagrass growth and survival include light (turbidity, depth), sediment type and chemistry, and nutrient levels. Detailed studies of changes in community structure of seagrass communities are essential to understand the role of these communities and the effects of disturbance on their composition, structure and rate of recovery.

Seagrasses of the Wellesley Island Group

In 2006, the Aboriginal Traditional Owners of the Wellesley Islands region of the southern Gulf of Carpentaria prepared a *Sea Country Plan* that outlined their cultural relationships and obligations to their Sea Country (Carpentaria Land Council Aboriginal Corporation 2006). The plan also summarized ideas and commitments for the sustainable use and management of their sea country. One of the many issues highlighted within this plan was the reporting of hunters over a number of years of underweight and sick dugong and marine turtles in their Sea Country. The link between these culturally iconic species and seagrass habitat is well understood by the Traditional Owners. Through their plan they requested support and assistance for mapping and monitoring the seagrass habitats that surround the Wellesly Islands. In the first step to achieving this, a helicopter and boat based survey was undertaken to map and describe the seagrass communities of the Wellesley Islands (Taylor et al 2007). From this baseline survey a suitable site for Seagrass-Watch monitoring was identified.

The Wellesley Islands are a group of 25 islands off the coast of north Queensland, in the Gulf of Carpentaria. The region is the traditional Sea Country of four different indigenous peoples who all share a similar relationship with their Sea Country. Mornington Island is the largest of the Wellesley Islands and is inhabited by approximately 1200 people (JCU, 2007). The majority of the islanders are from the Lardil people and are the Traditional Owners of the land and surrounding seas. Yangkal tribal lands consist of the islands south of Mornington Island to the Mainland. The Kaiadilt tribal group are the Traditional Owners of Bentinck and Sweers Islands. The coastal mainland region from Massacre Inlet to the Leichhardt River is Gangalidda people Sea Country (Carpentaria Land Council Aboriginal Corporation, 2006).

Seagrass communities represent the dominant benthic habitat of the intertidal and shallow subtidal areas of the Wellesley Islands. In August 2007, DPI&F, in collaboration with the Mornington Island Rangers mapped and surveyed 21,674 ha of seagrass. Eight seagrass species associated with 43 separate meadows were identified around Mornington Island, Denham Island, Forsyth Island, Sydney Island, Lingnoonganee Island and Bentinck Island (Taylor et al 2007). The diversity of seagrass species found was high (8) compared with surveys of other Gulf of Carpentaria locations at Karumba (2 species; Dew et al. 2007) and Weipa (6 species; Roelofs et al. 2006).

Seagrass species found in the Wellesley Island Group, August 2007 (Taylor et al 2007)

Family	***Species***			
CYMODOCEACEAE Taylor	Syringodium isoetifolium (Ashcers.) Dandy		Cymodocea rotundata *Ehrenb. et Hempr. ex Aschers*	
	Halodule uninervis (wide and narrow leaf morphology) (Forsk.) Aschers. in Boissier			
HYDROCHARITACEAE Jussieu	*Enhalus acoroides* (L.F.) Royle		*Thalassia hemprichii* (Ehrenb.) Aschers. in Petermann	
	Halophila decipiens Ostenfield		*Halophila ovalis* (R. Br.) Hook. F.	
	Halophila spinulosa (R. Br.) Aschers. in Neumayer			

The majority of the meadows found were intertidal (49%) followed by meadows that began on the intertidal flat and extended into the subtidal area (30%). Only 8 out of the 43 meadows found were completely subtidal. *Halodule uninervis* was the most common species recorded. Subtidal meadows were dominated by *Halophila spinulosa.*

Seagrass cover in the majority of the meadows surveyed was primarily aggregated patches. Meadows of continuous cover were found within the rivers on Mornington Island and the majority of the intertidal and subtidal habitats on Bentinck Island. Only a few meadows were comprised of isolated patches of seagrass (Taylor et al 2007).

Seagrass density was generally light. (between 1 and 15 g DW m^{-2}). This density of seagrass does not detract from these meadows being invaluable resources for sustaining populations of dugong, turtle, fish, and prawns that support local economies and sustenance fishing. The survey recorded a very high number of dugong feeding trails on nearly every intertidal seagrass meadow. The highest density of feeding trails was recorded from the intertidal seagrass meadows dominated by *Halodule uninervis* and / or *Halophila ovalis* (Taylor et al 2007).. These two species of seagrass are known to be the preferred food of dugongs as they are more palatable and easily digested (Lanyon 1991; Preen 1995).

Research by DPI&F in 1981 established the vital role that seagrass meadows of the Wellesley Island's play as nursery areas for tiger prawns, a component of the commercially important Northern Prawn Fishery (Coles and Lee Long 1985). Other qualities that are attributed in general to all seagrass meadows is their capacity to maintain coastal water quality and clarity and as sites of high biodiversity. The loss of seagrass habitat due to manmade or natural factors would lead to a loss of a food source and nursery areas of species reliant on seagrass meadows.

Other seagrass meadows in the Eastern Gulf of Carpentaria that have been studied by DPI&F show marked seasonal and inter-annual changes (Weipa (Roelofs *et al.* 2003; Taylor *et al*. 2007), and Karumba (Dew *et al.* 2007)) Seagrass meadow area and biomass within the Wellesley Island region are also likely to vary seasonally and between years. The relatively low cost monitoring methodology known as Seagrass-Watch is a way of tracking these changes utilising locally trained people.

The August 2007 survey identified the intertidal *Halodule uninervis* and *Halophila ovalis* meadow between Mornington and Sydney Islands as a potential Seagrass-Watch site. This meadow was recorded as being light in density but with continuous cover. The presence of *Halodule uninervis* within this meadow means that the local community will also be able to monitor the seed bank which is a measure of the meadow's its ability to recover after disturbance (resilience).

Potential Seagrass-Watch site in the channel between Mornington and Sydney Islands. (Taylor et al 2007).

A guide to the identification of western Pacific Seagrasses

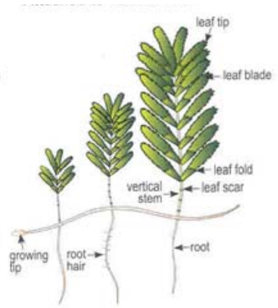
Adapted from *Waycott, M, McMahon, K, Mellors, J., Calladine, A., and Kleine, D (2004) A guide to tropical seagrasses in the Indo-West Pacific. (James Cook University Townsville) 72pp.*

Leaves cylindrical

Syringodium isoetifolium
- Leaf tip pointed
- Leaves contain air cavities
- Inflorescence a “cyme”

Leaves oval to oblong

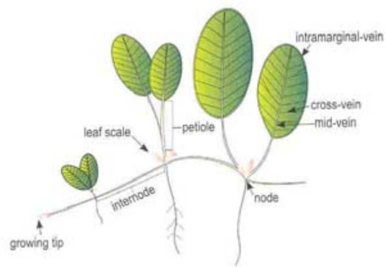
obvious vertical stem with more than 2 leaves



Halophila spinulosa
- leaves arranged opposite in pairs
- leaf margin serrated

Halophila tricostata
- leaves arranged in clusters of 3, at a node on vertical stem
- leaf margin serrated
- leaf clusters do not lie flat

leaves with petioles, in pairs



Halophila ovalis
- cross veins more than 10 pairs
- leaf margins smooth
- no leaf hairs
- separate male & female plants

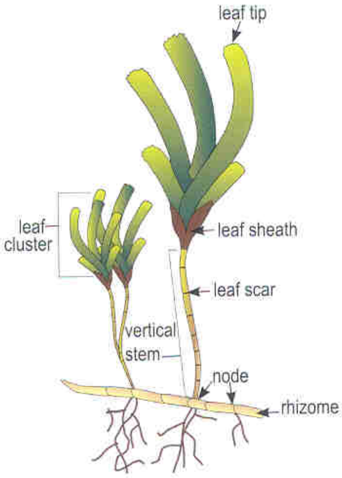
Halophila decipiens
- leaf margins serrated
- fine hairs on both sides of leaf blade
- male & female flowers on same plant

Halophila minor
- Leaf less than 5mm wide
- cross veins up to 10 pairs
- leaf margins smooth
- no leaf hairs
- separate male & female plants

Halophila capricorni
- leaf margins serrated
- fine hairs on one side of leaf blade
- separate male & female plants

Leaves strap-like

Leaves can arise from vertical stem



Thalassia hemprichii

- Leaf with obvious red flecks, 1-2mm long
- Leaf tip rounded may be slightly serrated
- Leaf often distinctly curved
- Distant scars on rhizome

Cymodocea serrulata

- Leaf tip rounded with serrated edge
- Leaf sheath broadly flat and triangular, not fibrous
- Leaf sheath scars not continuous around upright stem

Cymodocea rotundata

- Leaf tip rounded with smooth edge
- Leaf sheath not obviously flattened
- Leaf sheath scars continuous around upright stem

Halodule uninervis

- Leaf tip tri-dentate or pointed, not rounded
- Leaf with 3 distinct parallel- veins, sheaths fibrous
- Rhizome usually white with small black fibres at the nodes

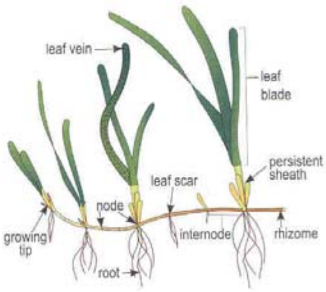
Halodule pinifolia

- Leaf tip rounded
- Leaf with 3 distinct parallel- veins, sheaths fibrous
- Rhizome usually white with small black fibres at the nodes

Thalassodendron ciliatum

- distinct upright stem
- clusters of curved leaves (>5 mm wide), margins serrated
- stem and rhizome woody

Leaves always arise directly from rhizome



Enhalus acoroides

- large plant, leaves >30 cm long, >1 cm wide
- inrolled edges of leaves
- long, black bristles protruding from thick rhizome

Zostera capricorni

- leaf with 3-5 parallel-veins
- cross-veins form boxes
- leaf tip smooth and rounded, may be dark point at tip
- rhizome usually brown or yellow in younger parts

Monitoring a seagrass meadow

Environment monitoring programs provide coastal managers with information and assist them to make decisions with greater confidence. Seagrasses are often at the downstream end of catchments, receiving runoff from a range of agricultural, urban and industrial land-uses.

Seagrass communities are generally susceptible to changes in water quality and environmental quality that make them a useful indicator of environmental health. Several factors are important for the persistence of healthy seagrass meadows, these include: sediment quality and depth; water quality (temperature, salinity, clarity); current and hydrodynamic processes; and species interactions (e.g., epiphytes and grazers). Seagrass generally respond in a typical manner that allows them to be measured and monitored. In reporting on the health of seagrasses it is important to consider the type of factors that can effect growth and survival. Factors include:

- increased turbidity reduces light penetration through the water, interfering with photosynthesis and limiting the depth range of seagrass;
- increased nutrient loads encourages algal blooms and epiphytic algae to grow to a point where it smothers or shades seagrasses, also reducing photosynthetic capacity;
- increased sedimentation can smother seagrass or interfere with photosynthesis;
- herbicides can kill seagrass and some chemicals (e.g., pesticides) can kill associated macrofauna;
- boating activity (propellers, mooring, anchors) can physically damage seagrass meadows, from shredding leaves to complete removal;
- storms, floods and wave action can rip out patches of seagrasses.

Seagrass-Watch

A simple method for monitoring seagrass resources is used in the Seagrass-Watch program. This method uses 50m by 50m sites established within representative intertidal meadows to monitor seagrass condition. The number and position of sites can be used to investigate natural and anthropogenic impacts.

Seagrass-Watch is one of the largest community based seagrass monitoring program in the world. Since it's genesis in 1998 in Australia, Seagrass-Watch has expanded to the Indo and western Pacific, with volunteers in Micronesia, Palau, Japan, Philippines, Malaysia, Indonesia, Papua New Guinea, Solomon Islands and Fiji. Monitoring is now occurring at approximately 150 sites. To learn more about the program, visit www.seagrasswatch.org .

Seagrass-Watch aims to raise awareness on the condition and trend of nearshore seagrass ecosystems and provide an early warning of major coastal environment changes. Participants of Seagrass-Watch are generally volunteers from a wide variety of backgrounds who all share the common interest in marine conservation and sustainability. Most participants are associated with established local community groups, schools, universities & research institutions, government (local & state) or non-government organisations.

Seagrass-Watch integrates with existing education, government, non-government and scientific programs to raise public awareness of these important marine ecosystems for the benefit of the community. The program has a strong scientific underpinning with an emphasis on consistent data collection, recording and reporting. Seagrass-Watch identifies areas important for seagrass species diversity and sustainability and the information collected is used to assist the management of coastal environments and to prevent significant areas and species being lost. Seagrass-Watch is also a component of the Global Seagrass Monitoring Network.

Seagrass-Watch monitoring efforts are vital to assist with tracking global patterns in seagrass health, and assess the human impacts on seagrass meadows, which have the potential to destroy or degrade these coastal ecosystems and decrease their yield of natural resources. Responsive management based on adequate information will help to prevent any further significant areas and species being lost. To protect the valuable seagrass meadows along our coasts, the community, government and researchers have to work together.

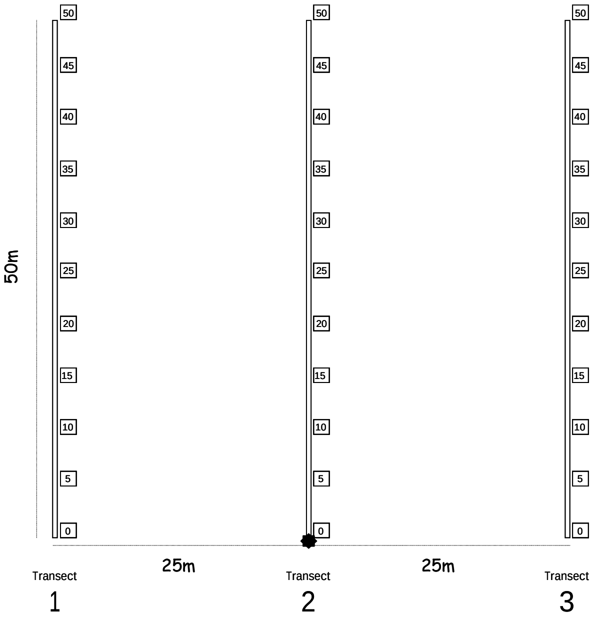
THE GOALS OF THE PROGRAM ARE:

- To educate the wider community on the importance of seagrass resources
- To raise community awareness of coastal management issues
- To develop community participation and ownership
- To build the capacity of local communities in the use of standardised scientific methodologies
- To conduct long-term & broad-scale monitoring of seagrass & coastal habitats, and
- To provide an early warning system of coastal environment changes for management.

Seagrass-Watch Protocols

Source: McKenzie, L.J., Campbell, S.J., Vidler, K.E. & Mellors, J.E. (2007) Seagrass-Watch: Manual for Mapping & Monitoring Seagrass Resources. (Seagrass-Watch HQ, Cairns) 114pp (www.seagrasswatch.org/manuals.html)

Site layout



Quadrat code = site + transect+quadrat

e.g., PI1225 = Pigeon Is. site 1, transect 2, 25m quadrat

Pre-monitoring preparation

Make a Timetable

Create a timetable of times of departure and arrival back, and what the objective of the day is and what is to be achieved on the day. Give a copy of this to all volunteers involved in advance so they can make their arrangements to get to the site on time. List on this timetable what the volunteers need to bring.

Have a Contact Person

Arrange to have a reliable contact person to raise the alert if you and the team are not back at a specified or reasonable time.

Safety

- Assess the risks before monitoring - check weather, tides, time of day, etc.
- Use your instincts - if you do not feel safe then abandon sampling.
- Do not put yourself or others at risk.
- Wear appropriate clothing and footwear.
- Be sun-smart.
- Adult supervision is required if children are involved
- Be aware of dangerous marine animals.
- Have a first aid kit on site or nearby
- Take a mobile phone or marine radio

Necessary equipment and materials

- ❑ *3x 50metre fibreglass measuring tapes*
- ❑ *6x 50cm plastic tent pegs*
- ❑ *Compass*
- ❑ *1x standard (50cm x 50cm) quadrat*
- ❑ *Magnifying glass*
- ❑ *3x Monitoring datasheets*
- ❑ *Clipboard, pencils & 30 cm ruler*
- ❑ *Camera & film*
- ❑ *Quadrat photo labeller*
- ❑ *Percent cover standard sheet*
- ❑ *Seagrass identification sheets*

Quarterly sampling

Within the 50m by 50m site, lay out the three 50 transects parallel to each other, 25m apart and perpendicular to shore (see site layout). Within each of the quadrats placed for sampling, complete the following steps:

Step 1. Take a Photograph of the quadrat

- Photographs are usually taken at the 5m, 25m and 45m quadrats along each transect, or of quadrats of particular interest. First place the photo quadrat labeller beside the quadrat and tape measure with the correct code on it.
- Take the photograph from an angle as **vertical** as possible, which includes the entire quadrat frame, quadrat label and tape measure. Avoid having any shadows or patches of reflection off any water in the field of view. Check the photo taken box on datasheet for quadrat.

Step 2. Describe sediment composition

- Dig your fingers into the top centimetre of the substrate and feel the texture. Describe the sediment by noting the grain size in order of dominance (e.g., Sand, Fine sand, Fine sand/Mud).

Step 3. Describe other features and ID/count of macrofauna

- Note and count any other features which may be of interest (eg. number of shellfish, sea cucumbers, sea urchins, evidence of turtle feeding) within the comments column.

Step 4. Estimate seagrass percent cover

- Estimate the total % cover of seagrass within the quadrat – use the percent cover photo standards as a guide.

Step 5. Estimate seagrass species composition

- Identify the species of seagrass within the quadrat and determine the percent contribution of each species to the cover. Use seagrass species identification keys provided.

Step 6. Measure canopy height

- Measure canopy height of the dominant strap-like seagrass species ignoring the tallest 20% of leaves. Measure from the sediment to the leaf tip of at least 3 shoots.

Step 7. Estimate algae percent cover

- Estimate % cover of algae in the quadrat. Algae are seaweeds that may cover or overlie the seagrass blades. Use "Algal percentage cover photo guide". Write within the comments section whether the algae is overlying the seagrass or is rooted within the quadrat.

Step 8. Estimate epiphyte percent cover

- Epiphytes are algae attached to seagrass blades and often give the blade a furry appearance. First estimate how much of the blade surface is covered, and then how many of the blades in the quadrat are covered (e.g., if 20% of the blades are each 50% covered by epiphytes, then quadrat epiphyte cover is 10%).
- Epibionts are sessile animals attached to seagrass blades – please record % cover in the comments or an unused/blank column – do not add to epiphyte cover.

Step 9. Take a voucher seagrass specimen if required

- Seagrass samples should be placed inside a labelled plastic bag with seawater and a waterproof label. Select a representative specimen of the species and ensure that you have all the plant part including the rhizomes and roots. Collect plants with fruits and flowers structures if possible.

At completion of monitoring

Step 1. Check data sheets are filled in fully.

- Ensure that your name, the date and site/quadrat details are clearly recorded on the datasheet. Also record the names or number of other observers and the start and finish times.

Step 2. Remove equipment from site

- Remove all tent pegs and roll up the tape measures. If the tape measures are covered in sand or mud, roll them back up in water.

Step 3. Wash & pack gear

- Rinse all tapes, pegs and quadrats with freshwater and let them dry.
- Review supplies for next quarterly sampling and request new materials
- Store gear for next quarterly sampling

Step 4. Press any voucher seagrass specimens if collected

- The voucher specimen should be pressed as soon as possible after collection. Do not refrigerate longer than 2 days, press the sample as soon as possible.
- Allow to dry in a dry/warm/dark place for a minimum of two weeks. For best results, replace the newspaper after 2-3 days.

Step 5. Submit all data

- Data can be entered into the MS-Excel file downloadable from www.seagrasswatch.org. Email completed files to hq@seagrasswatch.org
- Mail original datasheets, photos and herbarium sheets

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Managing seagrass resources

Threats to seagrass habitats

Destruction or loss of seagrasses has been reported from most parts of the world. Man-made impacts on seagrass meadows such as nutrient and sediment overload, land reclamation and changes in land use, continue to destroy or degrade coastal ecosystems and decrease seagrass functions and values, Other impacts include increases in dredging, construction on the shoreline, damage associated with commercial overexploitation of coastal resources, and recreational boating activities. Impacts that may affect the physical condition of seagrass meadows locally include; scarring from vessel landings, trawling, anchoring, moorings, pipelines and shipping accidents (TS NRM Reference Group, 2005). .Other identified impacts that are slightly more insidious and more difficult to counter are natural seagrass die-back, marine pests and global warming. It has been recognized that these factors could impact on local seagrass meadows leading to a loss of a food source and nursery areas of species reliant on seagrass meadows.

In other parts of the world efforts are being made towards redressing declines in seagrass habitat through : transplantation of seagrass, improvement of water quality, restrictions on boating activity, fishing and aquaculture, and protection of existing habitat through law and environmental policy.

Management

Seagrasses do not exist in nature as a separate ecological component from other marine plants or habitats and are often closely linked to other community types. In the tropics the associations are likely to be complex interactions with mangrove communities and coral reef systems. In temperate waters, algae beds, salt marshes, bivalve reefs, and epiphytic plant communities are closely associated with areas of seagrass. Many management actions to protect seagrasses have their origin in the protection of wider ecological systems or are designed to protect the overall biodiversity of the marine environment.

Coastal management decision making is complex, and much of the information on approaches and methods exists only in policy and legal documents that are not readily available. There may also be local or regional Government authorities having control over smaller jurisdictions with other regulations and policies that may apply. Many parts of South East Asia and the Pacific Island nations have complex issues of land ownership and coastal sea rights. These are sometimes overlaid partially by arrangements put in place by colonising powers during and after World War II, leaving the nature and strength of protective arrangements open for debate.

Both Australia and the United States have developed historically as Federations of States with the result that coastal issues can fall under State or Federal legislation depending on the issue or its extent. In contrast, in Europe and much of South East Asia, central Governments are more involved. Inter-country agreements in these areas such as the UNEP Strategic Action Plan for the South China Sea and the Mediterranean Countries Barcelona Convention (http://www.unep.org/) are required to manage marine issues that encompass more than one country.

Approaches to protecting seagrass tend to be location specific or at least nation specific (there is no international legislation directly for seagrasses as such that we know of) and depend to a large extent on the tools available in law and in the cultural approach of the community. There is, however, a global acceptance through international conventions (RAMSAR Convention; the Convention on Migratory Species of Wild Animals; and the Convention on Biodiversity) of the need for a set of standardised data/information on the location and values of seagrasses on which to base arguments for universal and more consistent seagrass protection.

Indigenous concepts of management of the sea differ significantly from the introduced European view of the sea as common domain, open to all and managed by governments (Hardin 1968). Unlike contemporary European systems of management, indigenous systems do not include jurisdictional boundaries between land and sea. Torres Strait Islanders have a form of customary ownership of maritime areas that has been operating in place for thousand of years to protect and manage places and species that are of importance to their societies. Many of these systems, have undergone considerable change since Torres Strait became part of Queensland in 1881 and there is a general feeling among modern day islanders that efforts should be made towards cultural revitalisation of those aspects of traditional *Ailan Kastom* that still exist (TSRA 2006).

Marine resource management in Torres Strait should therefore attempt to achieve the following interrelated objectives: *a*) monitor the wellbeing (e.g. distribution, health and sustainability) of culturally significant species and environments (e.g. dugong, marine turtles, fish, molluscs, seagrass *etc*.); and *b*) monitor the cultural values associated with these culturally significant species and environments (Smyth et al. 2006).

To realize objective a) we believe the following also needs to be accomplished if the successful management of coastal seagrasses is to be achieved.

1. Important fish habitat is known and mapped
2. Habitat monitoring is occurring
3. Adjacent catchment/watershed impacts and other threats are managed
4. Some level of public goodwill/support is present
5. Legal powers exist hat are robust to challenge
6. There is effective enforcement and punishment if damage occurs

The key element is a knowledge base of the seagrass resource that needs to be protected and how stable/variable that resource is. It is also important to know if possible any areas that are of special value to the ecosystems that support coastal fisheries and inshore productivity. It is also important that this information is readily available to decision makers in Governments and traditional owners in a form that can be easily understood.

Only then, can a combination of modern *"western"* science and indigenous knowledge be brought together within a co-management framework for the successful management of these resources. (Johannes 2002; Aswani & Weiant 2004; Turnbull 2004; Middlebrook and Williamson 2006; Gaskell 2003, George et al. 2004). This can only occur if the resource owners actively involve themselves in the management of their resources. Western science also needs to recognise that resource owners have practical and spiritual connections with the resources found within their environment. Once this is recognized then this approach will have the added benefit of empowering communities who own the knowledge to be the primary managers and leaders in decisions about their land and sea country.

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