A Regional Approach to Monitoring Change in Seagrass Meadows

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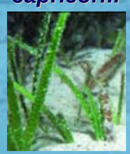
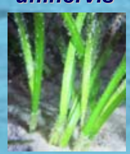
Objectives

- Monitor the condition of seagrass meadows across Queensland
- Examine relationships between trends in seagrass abundance and climate change
- Examine effects of localised impacts on seagrass meadows
- Promote awareness of seagrass ecology and protection

Zostera capricorni



Halodule uninervis

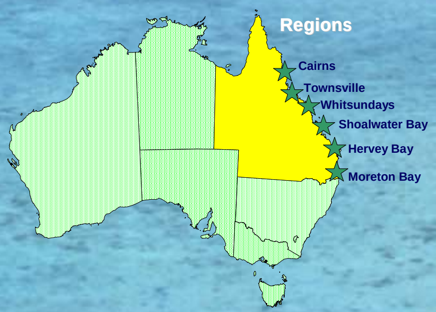


Halophila ovalis

Source: University of Queensland

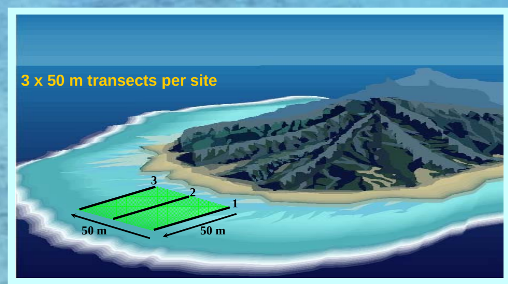
Regional coverage

Seagrass-Watch has established 64 monitoring sites in 6 regions in Queensland, Australia.
Monitoring occurs 4 times per year.



Site layout

Sites (50 x 50 m) within regions represent a range of seagrass habitats including sheltered mudflats, exposed sandflats, reef habitats and subtidal meadows.



Results and Discussion

Cairns/Townsville: Seasonal change

- Seasonal pattern evident in 2000-2 (Fig. 1).
  - Low seagrass cover in May-Aug (winter)
  - High seagrass cover in Nov-Feb (spring-summer)

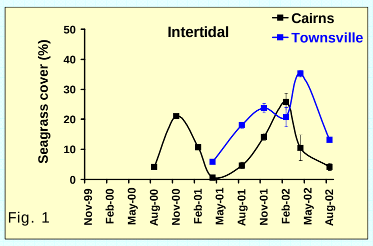


Fig. 1

Whitsundays: Climate related change

- Seasonal pattern evident in 2000 (Fig. 2).
  - Low seagrass cover in May-Aug (winter)
  - High seagrass cover in Nov-Feb (spring-summer)

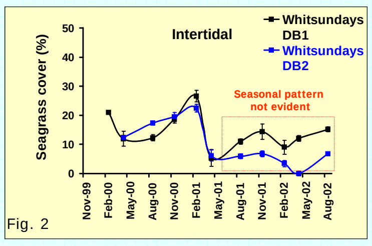


Fig. 2

- Seasonal pattern **not** evident in 2001-2 (Fig. 2).
  - Intertidal meadows (Fig. 2)
  - Subtidal meadows (Fig. 3)

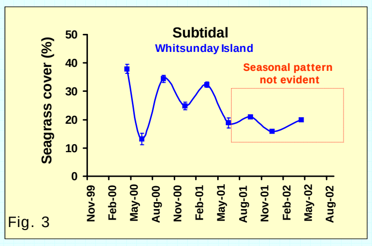


Fig. 3

- Low seagrass cover in 2001-2 coincided with low rainfall, high seawater temperatures (>29°C) (Figs. 4, 5) and a low Southern Oscillation Index (Fig. 6).

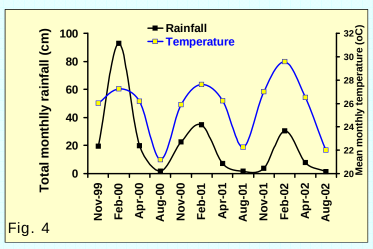


Fig. 4

- Possible causes of poor seagrass growth?
  - High water temperatures reduce photosynthesis and increase respiration
  - Desiccation due to high temperatures and low humidity
  - Low nutrient availability

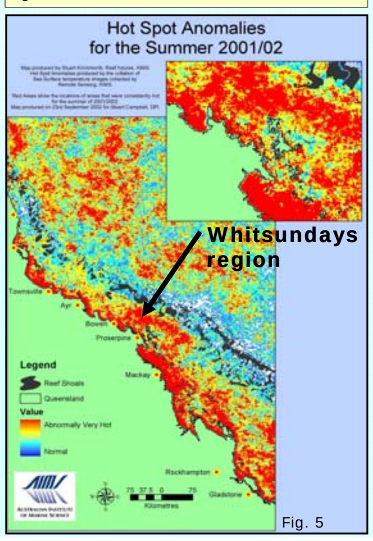


Fig. 5

The Southern Oscillation Index

Indicates the stage of La Niña or El Niño events in the Pacific Ocean (Fig 6.).

A strongly positive SOI (>10) in 2000-1 depicts La Niña, - above average rainfall in Australia.

A strongly negative SOI (<-10) in 2001-2 depicts El Niño, - below average rainfall in Australia.

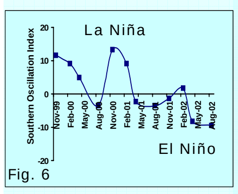


Fig. 6

Shoalwater Bay: Seagrass-turtle interactions

- The seasonality and inter-annual variability of seagrass abundance and its relationship with green turtle (*Chelonia mydas*) populations is being investigated.
- Evidence suggests a strong link between mass nesting of turtles and Southern Oscillation related weather conditions (Limpus and Nicholls 2000).
- Mass nesting has been found 2 years following El Niño and low nesting 2 years following La Niña events.
- The study will aim to determine the possible mechanism of the SOI linkage to green turtle population fluctuations and potential links to seagrass meadow abundance.

Reference

Limpus, C.J. and Nicholls, N. (2000). ENSO regulation of the Indo-Pacific green turtle populations. *In*: Applications of seasonal climate forecasting in agricultural and natural ecosystems - "The Australian experience." G. Hammer, N. Nicholls, and C. Mitchell (Eds.). Kluwer Academic Publishers: Dordrecht.

Hervey Bay: Climatic events

- Flooding of the Mary River in February 1999 caused total loss of intertidal *Zostera capricorni*, at 2 localities, Urangan (mainland) and Fraser Island (Fig. 7).
- Meadows at Fraser Island recovered after 2 years, meadows at Urangan recovered in 3 years (Fig. 7).
- Proximity to urban/catchment inputs may have delayed seagrass recovery at Urangan (Fig. 8).
- Recovery of *Z. capricorni* from seeds - suggests seeds dormant for at least 3 years.

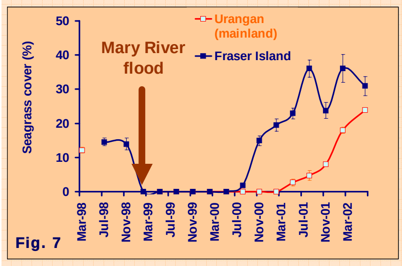


Fig. 7

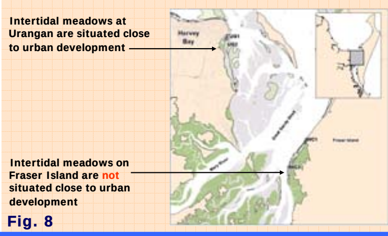


Fig. 8

Summary:

- El Niño events (ie. high air and seawater temperatures) may inhibit seagrass growth in some regions.
- Recovery of intertidal seagrass meadows after flooding disturbance is likely to take 2-3 years in the absence of additional impacts.
- Ongoing monitoring will allow investigation of seasonal responses and inter-annual variability of seagrass abundance in relation to climate change – on a regional basis.

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