Queensland tropical seagrass meadows

Seagrass Ecology Group TropWATER

www.TropWATER.com
Today’s talk

- Quick tropical seagrass lesson
- Seagrass monitoring and report cards
- Implications from research projects
  1. Risk mapping
  2. Connectivity/Dispersal
  3. Infauna/fisheries
GBR seagrasses

- seagrass habitat covers 10% of the GBRWHA
  - 3,464 km² intertidal and shallow subtidal (*down to 15m depth*)
  - 32,335 km² deepwater (>15m)
- high diversity (*15 species?*)
- dynamic populations
- productivity high
- important ecological role (*protected*)

food for sea turtles

nursery/habitat for fisheries
Tropical Seagrasses?
Site Layer - GBR

- >65,000 sites
- Seagrass at 40% of sites
- 12 species

Carter et al 2016
Seagrass condition

GBR-wide long-term trend

Start MMP

fewer sites

TC Larry

TC Yasi

Recovery

McKenzie et al 2016
Queensland port seagrass monitoring

Legend:
- Red dot: Long-term monitoring site
- Blue dot: Baseline mapping only
- White area: Great Barrier Reef World Heritage Area

Carter et al. 2015
Seagrass monitoring

Cairns Harbour seagrass

Carter et al 2015
McKenna et al 2015
1. Risk mapping

![Map of Great Barrier Reef World Heritage Area](image)

- Coral reefs
- Great Barrier Reef catchment
- Coal province
- Shipping channels
- Oil and gas pipelines
- Rail transport network
  - Port
  - Major port
  - Coal mine
  - Proposed coal mine

![Aerial view of coastal area](image)

![Aerial view of industrial area](image)
Vulnerable seagrass sites - Great Barrier Reef

Grech et al. 2011. A broad-scale assessment of the risk to coastal seagrasses from cumulative threats. Marine Policy
2. Simulating abiotic dispersal of seagrass propagules

Hydrodynamic model: 2-dimensional advection-diffusion Second-generation Louvain-la-Neuve Ice-ocean Model (SLIM)

Unstructured grids, variable resolution

Wind speed/direction and tides > 1 August 2012 – 31 January 2013

Lagrangian particle tracker

Grech et al. 2016. Spatial patterns of seagrass dispersal and settlement. Diversity and
Dispersal distances

Connectivity

Grech et al unpublished

Abbot Point, Foundation species, August 1
Dispersal: Dugong

- Digestion
  146-166 hrs.

- Dispersal distance
  Max 234 km

- Population
  7,438 – 11,402

  • Zostera muelleri
  • Halodule uninervis
  • Halophila decipiens
  • Halophila spp.*

Tol et al. 2017. Long distance biotic dispersal of seagrass seeds by marine mega-herbivores. Scientific Reports
Infauna—Fish and Prawns

- Cairns is one of the most sampled seagrass faunal assemblages in tropical seagrasses

- Seagrasses support high abundances (~10,000 / ha) of juvenile fish

- 134 taxa of mostly juvenile fish (15 highly-valued recreational and 11 highly-valued commercial species)

- Juvenile tiger prawn nursery valued at $1.2 million
Seagrass distribution over time
Penaeid Prawns assemblages

Coles et al unpublished data
Cyclone Yasi??
Steps to describe seagrass meadow condition

1. Establish appropriate indicators
2. Define baselines
3. Classify meadow type for each indicator (highly variable – stable)
4. Set thresholds for grades (very poor – very good)
5. Define score range for grades (0 - 1)
6. Calculate grade and score for each indicator and meadow
7. Determine port grade & score
Fish abundance and Richness

York et al. unpublished data