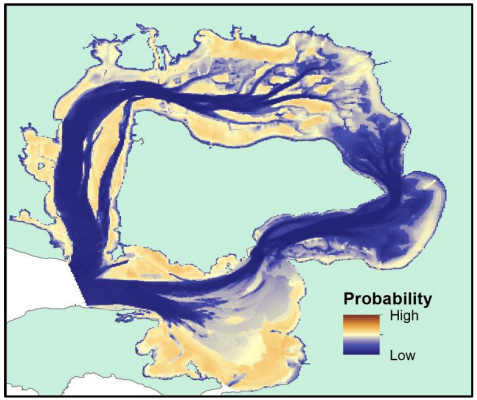
Seagrass in Western Port – nutrients, light and genetics



Craig Sherman, Rachel Manassa, Perran Cook, John Beardall, Ralph Mac Nally, Rhys Coleman, Kathy Cinque, Peter Yeates, Doug Russell, Wei Wen Wong, Jeff Ross, Tim Smith, Ryan Woodland, Mick Keough

DEAKIN UNIVERSITY

Melbourne Water

EPA VICTORIA

Parks VICTORIA

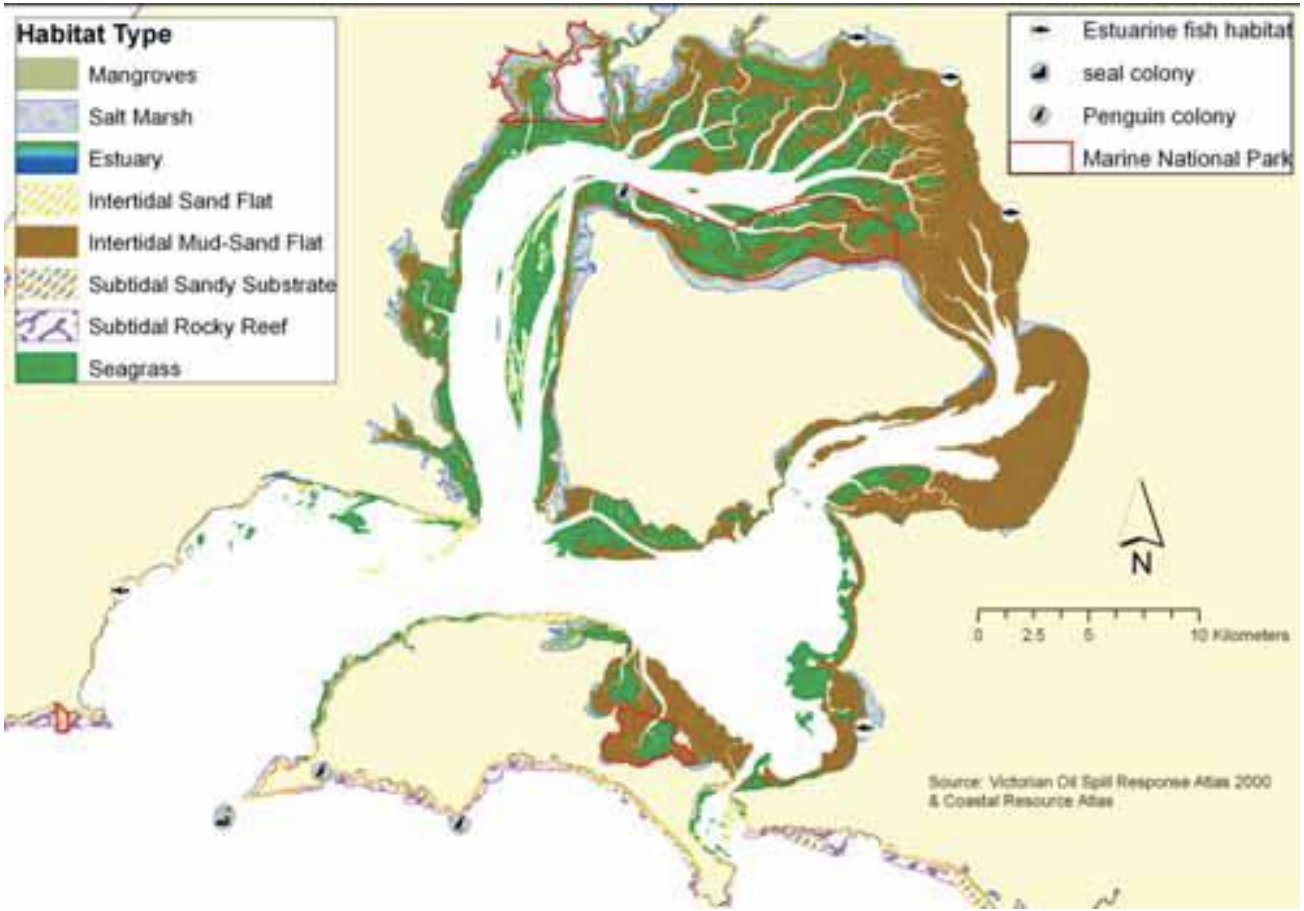
UTAS

THE UNIVERSITY OF MELBOURNE

Why is seagrass important

- Ecosystem engineer
- Provides range of ecosystem services
  - Habitat, food, nutrient cycling, sediment stabilisation, carbon storage
- Important for maintaining water quality

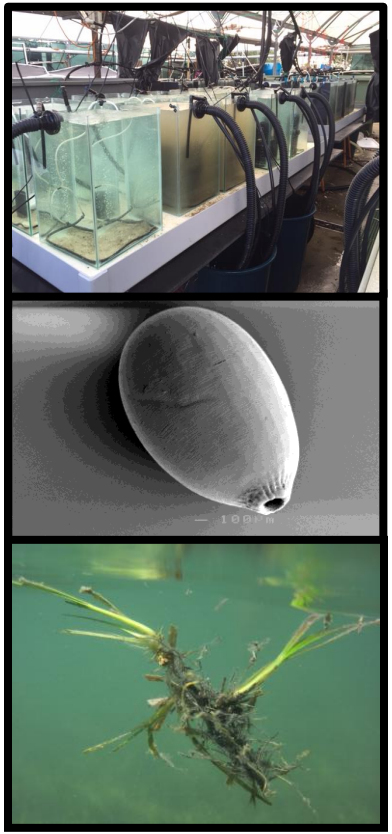
Seagrass in Western Port



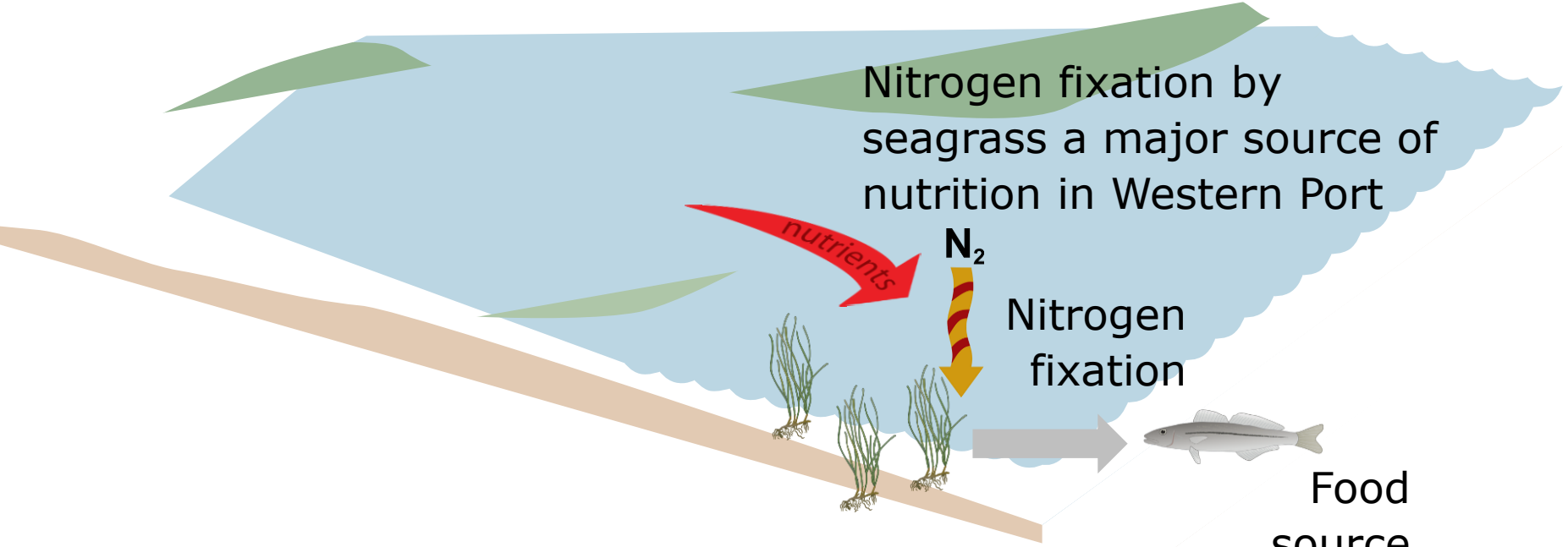
Source: Understanding the Western Port Environment Report – Melbourne Water

Research undertaken

- Measuring nutrient transformation in major habitats
- Assessing the degree of light limitation
- Determining response of seagrasses to light limitation
- Determine genetic structure of seagrass
    - Sexual and asexual reproduction
    - Genetic diversity
    - Patterns of connectivity
- Future research



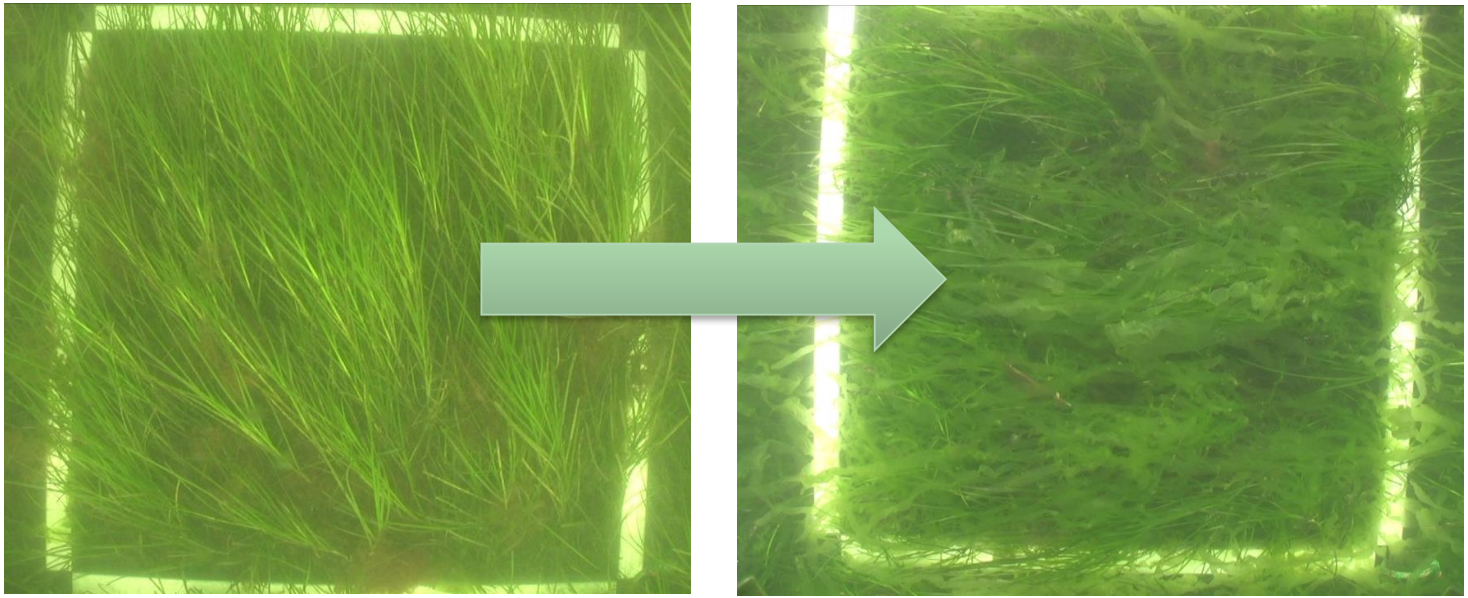
Seagrass and nutrients



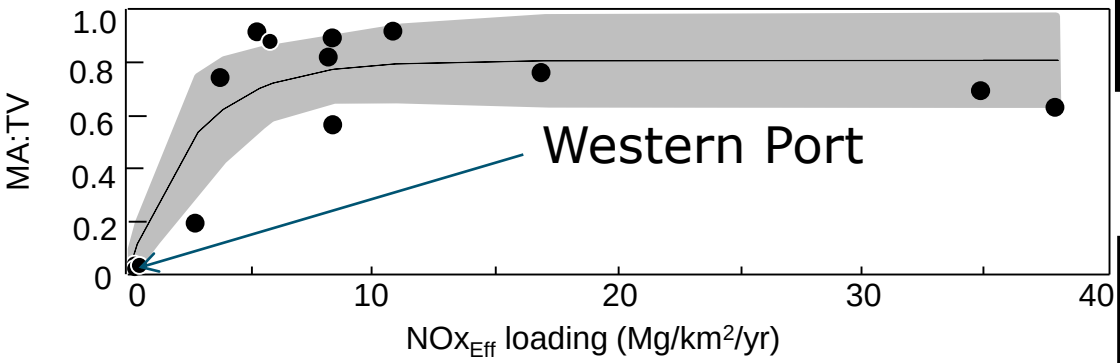
Seagrasses and tidal flats trap nutrient runoff, fix new nitrogen, feeding the foodweb in Western Port

Threats to seagrass – Excess nutrients

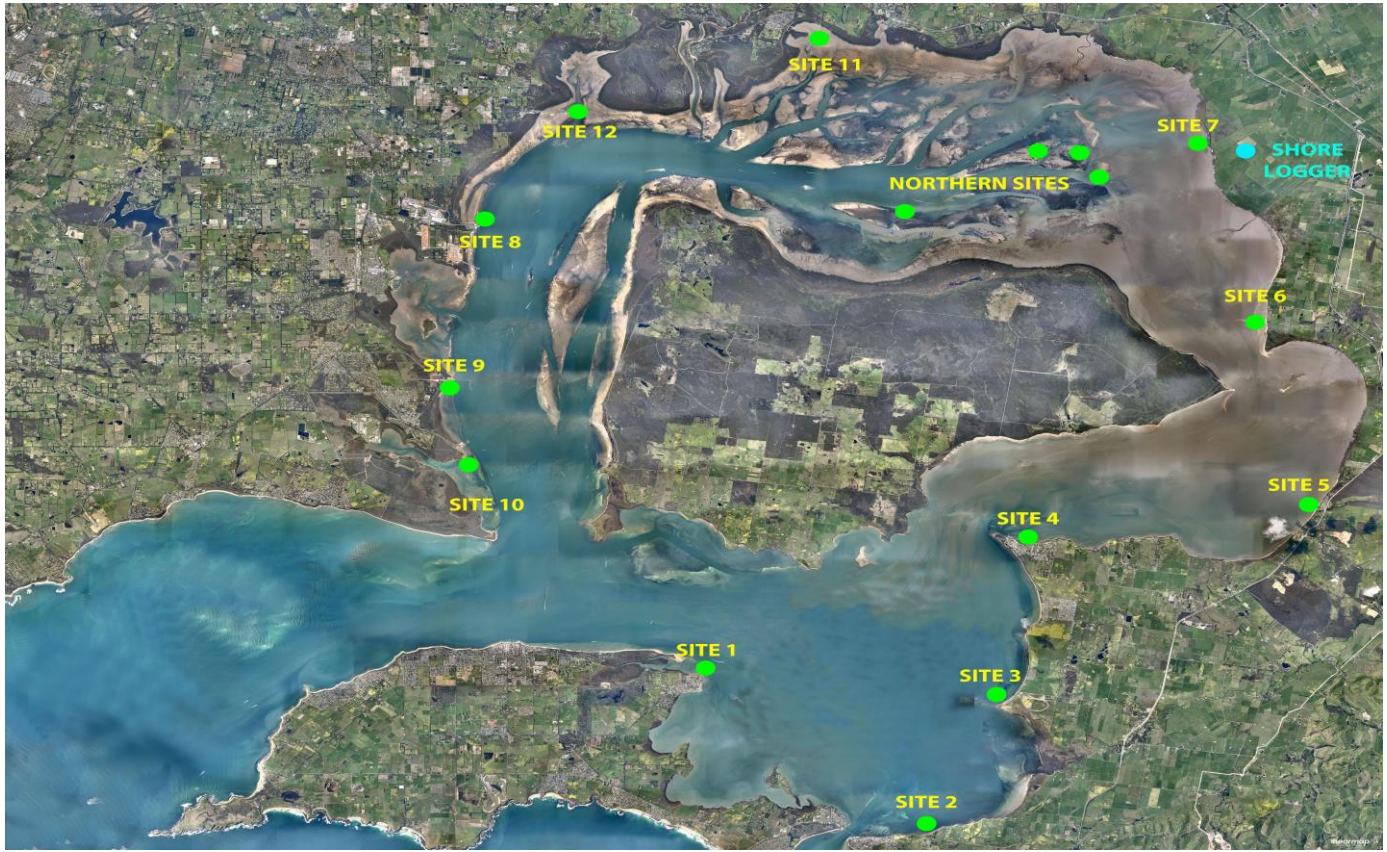
- Nutrient inputs can lead to overgrowth of seagrass by macroalgae and epiphytes



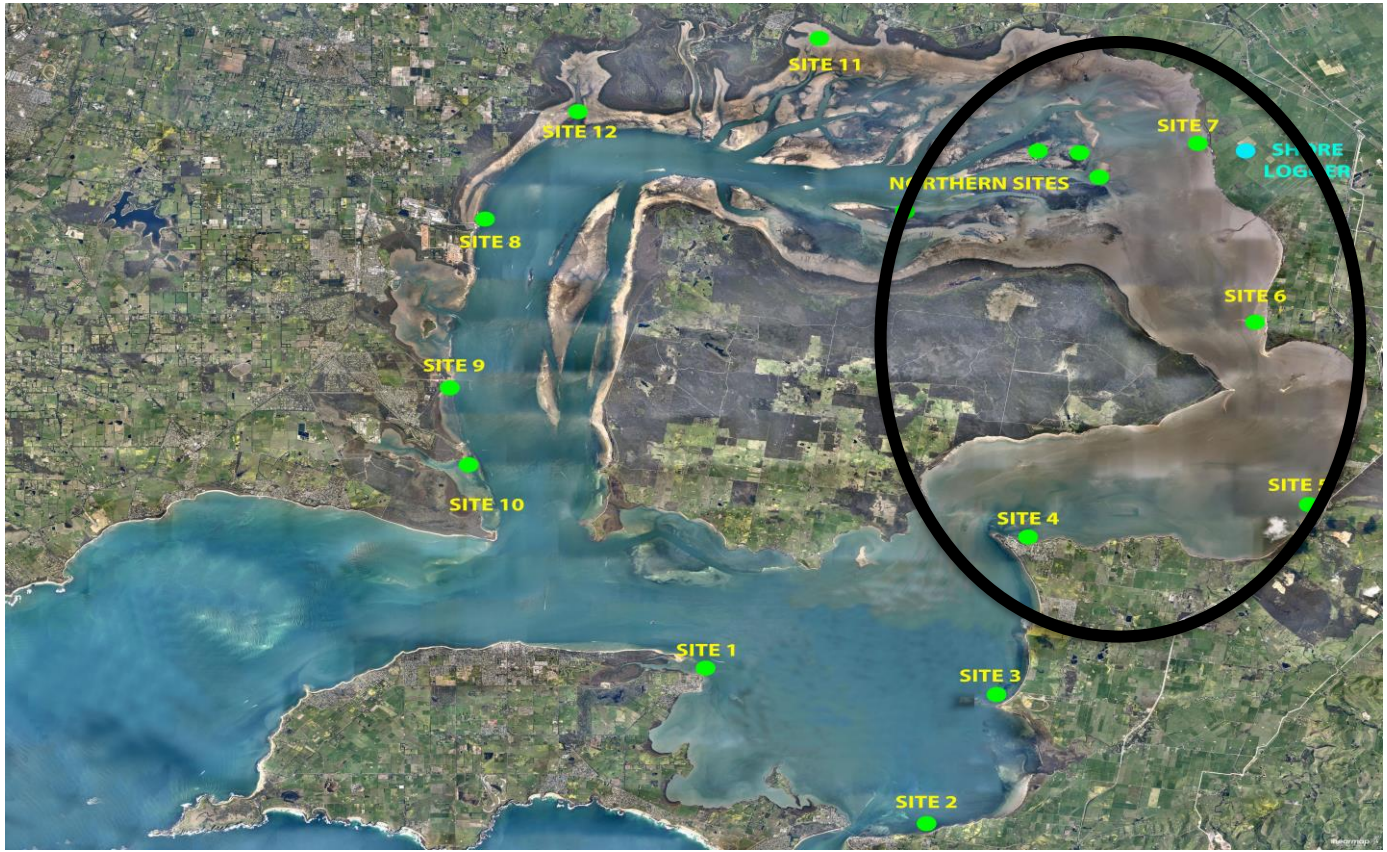
Statewide patterns of seagrass loss



Light measurement sites



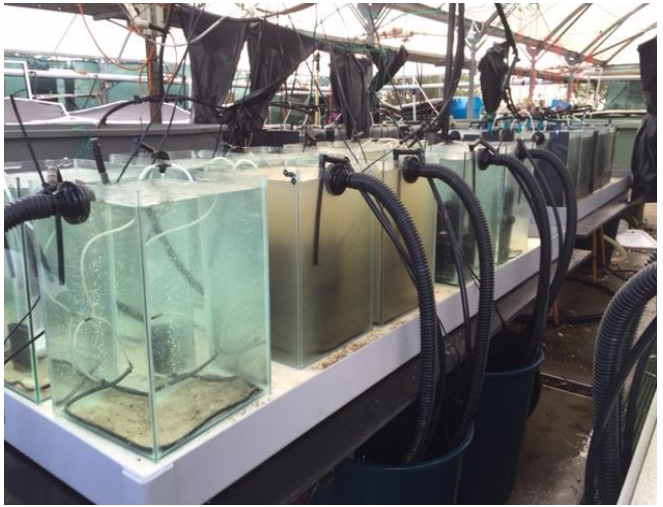
Threats to seagrass – Light Limitation



Eastern section highly turbid

Threats to seagrass – Light Limitation

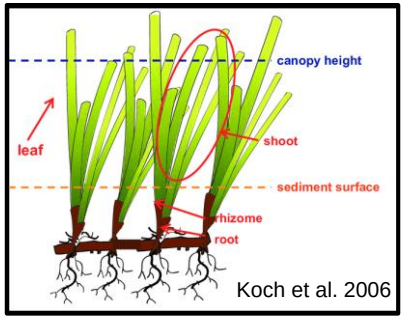
Experiments to determine light/turbidity thresholds



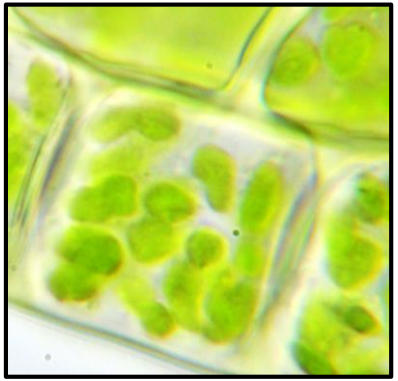
Response of *Z. muelleri* to increasing turbidities

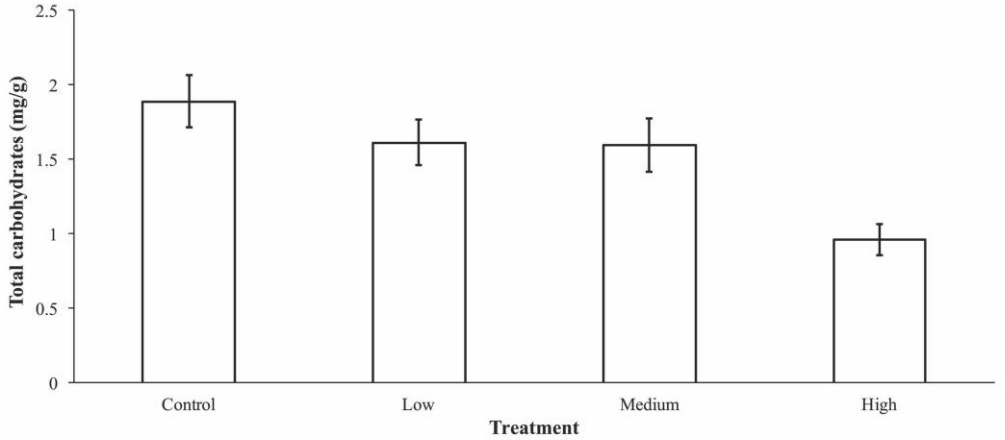
- 4 turbidity levels (control, low, medium, high)
- Morphological and physiological changes over exposure and recovery period
- Intertidal system

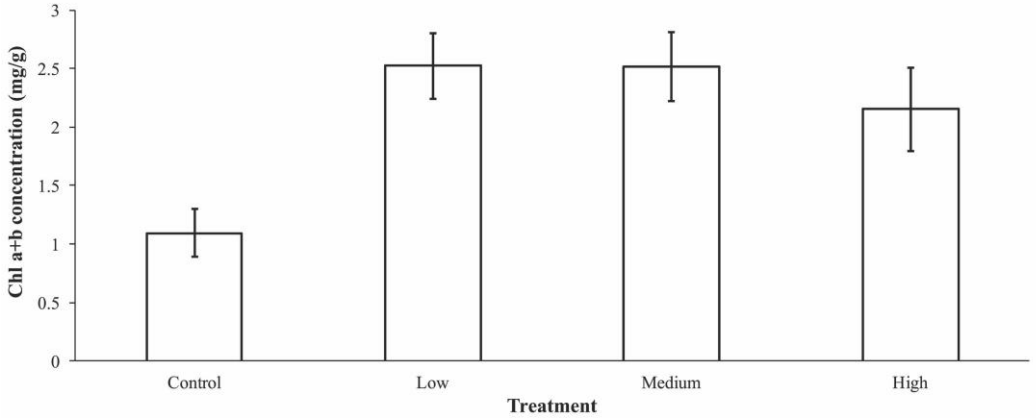
Indicators of light limitation



Koch et al. 2006

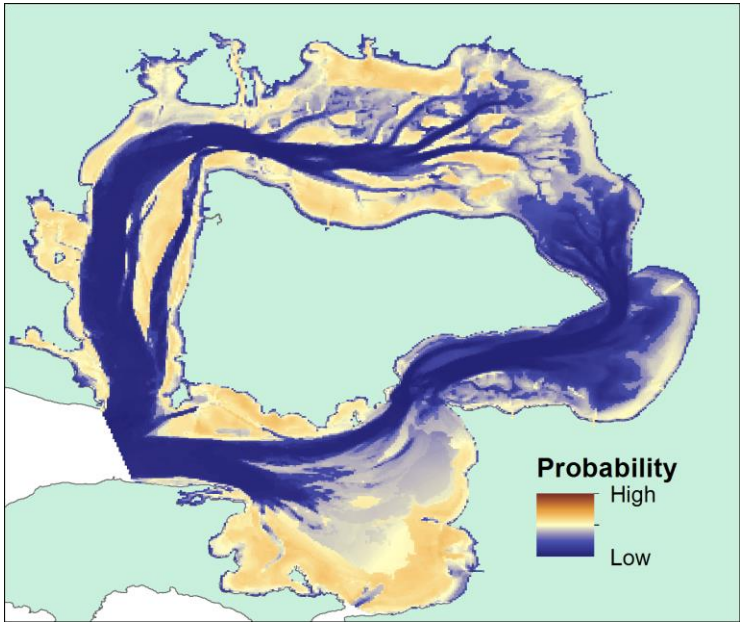






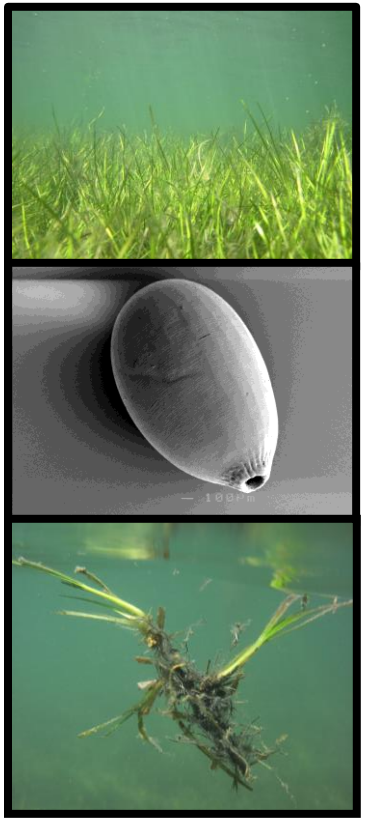
Towards restoration

- To identify sites suitable for restoration, we can combine our knowledge of:
  - Light requirements and indicators of light limitation from experiments
  - Light fields from models (Talk by Kathy Cinque)
  - Other environmental properties such as elevation and slope



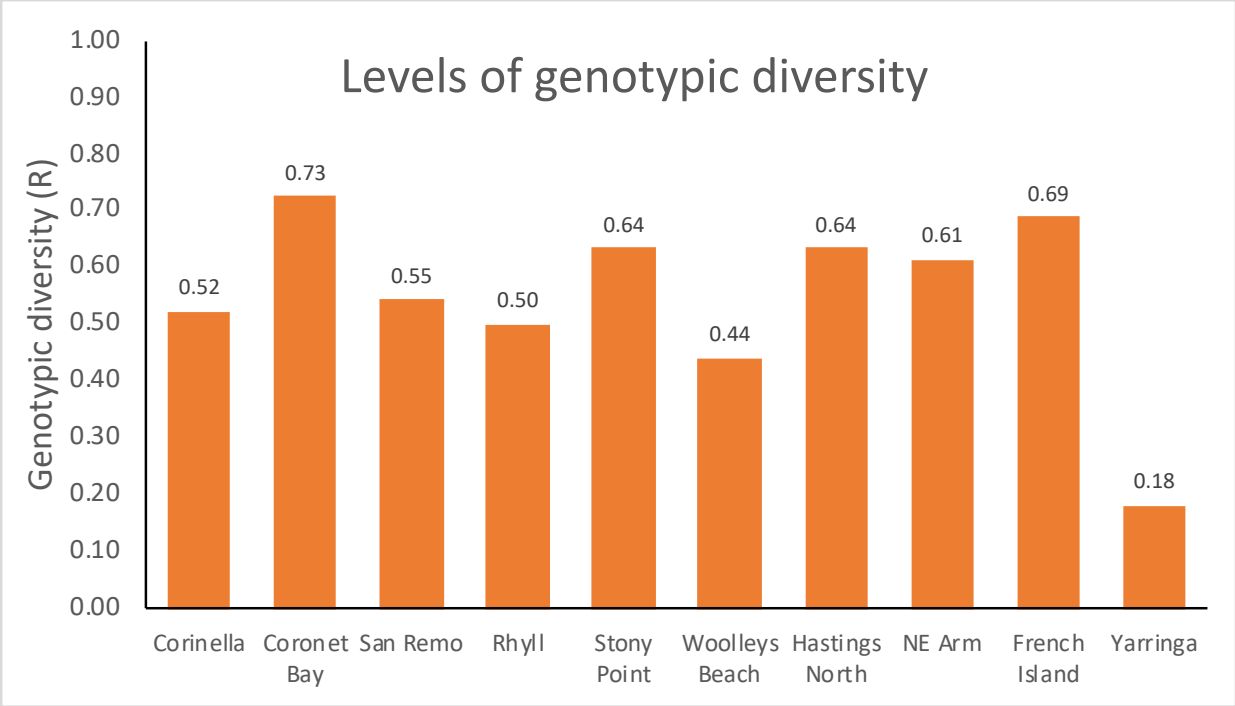
Genetic structure of seagrass in Western Port

- Genetics important tool:
  - Relative importance of sexual and asexual reproduction
  - How diverse (resilient) are populations
  - How connected are populations



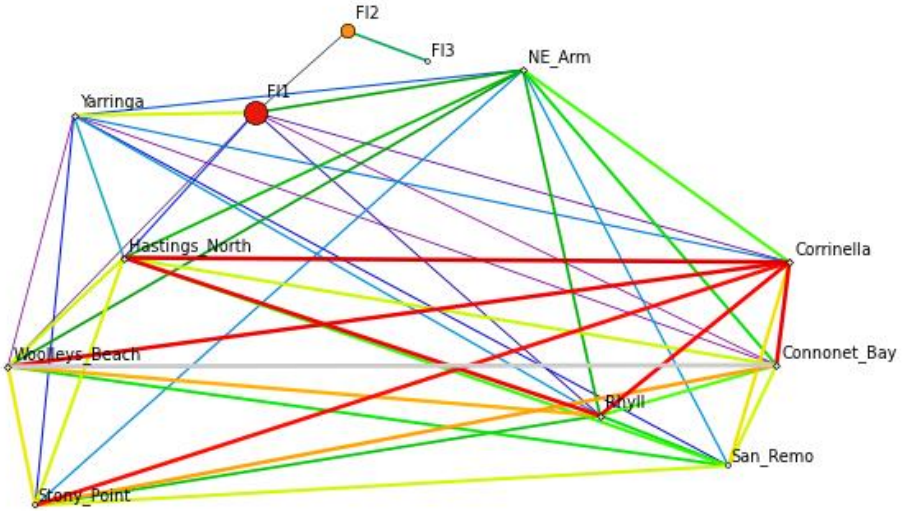
Genetic structure of seagrass in Western Port

- Moderate levels of genotypically diversity (R = 0.55)



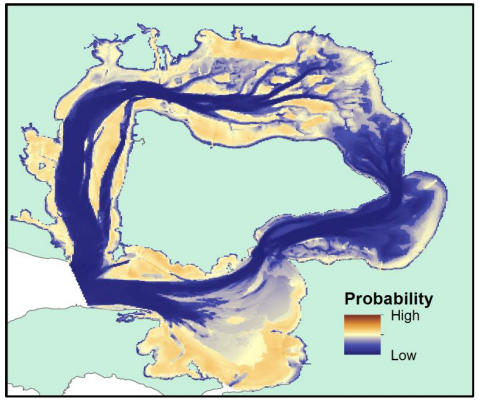
Genetic structure of seagrass in Western Port

- Some connectivity among sites
- Northern (French Island) sites poorly connected
- Some areas may not recover naturally



Summary

- Seagrass in Westernport an important source of nitrogen to this relatively nutrient limited system
- Key threat to seagrass is light limitation caused by high turbidity
- We have identified indicators of light limitation and thresholds
- Moderate levels of genotypic diversity
- Limited connectivity among some sites
- This information will be used to inform new PhD projects on seagrass restoration



Quantify historic losses and current conditions

Identify best approaches to restoration

Seagrass Loss → Conditions needed for seagrass regrowth → Suitable Areas for Restoration → Field Trials → Laboratory Trials → Final Restoration Practices

Yi Mei Tan

Oliver Dalby

Questions?