Seagrasses of the Kimberley

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Acknowledgments

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Seagrasses grow like our urban lawns

Clonality: mechanism for seagrass spatial expansion
Posidonia australis

Fruits 15-20 mm

Flower Images: R. Hovey & J. Statton

Seed
Food Web: Dugong grazing in Shark Bay
(Cindy Bessey)
Global Distribution and Diversity

Halophila: Bocas del Toro, Panama
Thalassia: Kuna Yala, Panama
Ruppia: Morro Bay, USA
Zostera: Ria Formosa, Portugal
Seagrass life history

- **Shoot (or ramet) turnover**: Fast, Slow
- **Genet persistence**: Short lived, Long lived
- **Time to first sexual reproduction**: Short (weeks-months), Long (years)
- **Seed dormancy**: Dormant seeds (develop seedbank), Vivipary / no dormancy (no seedbank)
- **Response to disturbance**: Low physiological resistance, High physiological resistance, Rapid ability to recover, Slow ability to recover
Thalassia

Images: Korjent Van Dijk
Fig. 1. Global map (A) of cumulative human impact across 20 ocean ecosystem types. (Insets) Highly impacted regions in the Eastern Caribbean (B), the North Sea (C), and the Japanese waters (D) and one of the least impacted regions, in northern Australia and the Torres Strait (E).

Halpern et al. (2008)
An extreme environment
... and the dangers ...
Seagrass biomass and productivity
Enhalus biomass
**Thalassia growth rates**

Between 0.5 and 1.0 cm leaf extension per day
BETWEEN 0.5 AND 1.5 CM LEAF EXTENSION PER DAY
Huge biomass in little volume of water at low tide!
High Temperatures (35-38°C)

How stressful is this for seagrasses?
4 m tall scaffold to keep equipment dry at high tide
The experimental set-up

- Aluminum profile
- Micromanipulator
- Temperature probe
- $O_2$ optode

The equipment is positioned underwater with various cables connected to it.
The $O_2$ optode and temperature sensor
Seagrasses photosynthesize and have a positive O₂ balance up to 40 degrees.
Plants supersaturated in oxygen during the daytime low tides and hypoxic for 8-11 hours every night.
Conclusion

With environmental temperatures of up to 40 °C both species are living **on the edge**!

Both species experience up to 8-11 h of severe shoot tissue hypoxia/anoxia each 24 h.

Temperatures of 40+ °C would lead to tissue damage that needs repair during the night – with little O₂ available!
Seagrass Grazing Studies

- Rabbit Fish Grazing
- Turtle Grazing and Movement
Before

After

Thalassia: 27% consumed
Google Earth: Outcomes from Turtle Tagging
Outreach

Sharing Knowledge with One Arm Point School
Collaboration with Bardi Jawi Rangers

- Provides *traditional ecological knowledge*

- Sustains traditional owners’ livelihoods and *connection to land*
Management implications

• Seagrasses in the Kimberley survive extreme physical conditions, yet maintain high productivity

• This productivity supports a diverse animal community, and must be managed accordingly

• Growth rates and productivity more valuable than biomass or cover measurements

• Further need to understand recruitment and seed ecology to understand pressures and future trajectories of Kimberley seagrasses

• Community outreach and citizen science will be critical for driving the management of these meadows
Thank you to The Bardi Jawi Rangers

Questions?