



western australian  
marine science institution



THE UNIVERSITY OF  
WESTERN AUSTRALIA

*Achieve International Excellence*

# Seagrasses of the Kimberley

PROF GARY KENDRICK – UWA

DR MAT VANDERKLIFT - CSIRO

---



Department of  
Parks and Wildlife



# Acknowledgments

WA State Government and WAMSI partners for supporting this research.

Collaborators: Doug Bearham, James McLaughlin, Lucie Chovrelat, (CSIRO), Andrea Zavala Perez, Bonnie Laverock (UWA), Christin Säwström (ECU), and the **Bardi Jawi Rangers and Traditional Owners**



# Seagrasses grow like our urban lawns

Landscapes

Patches

ramets

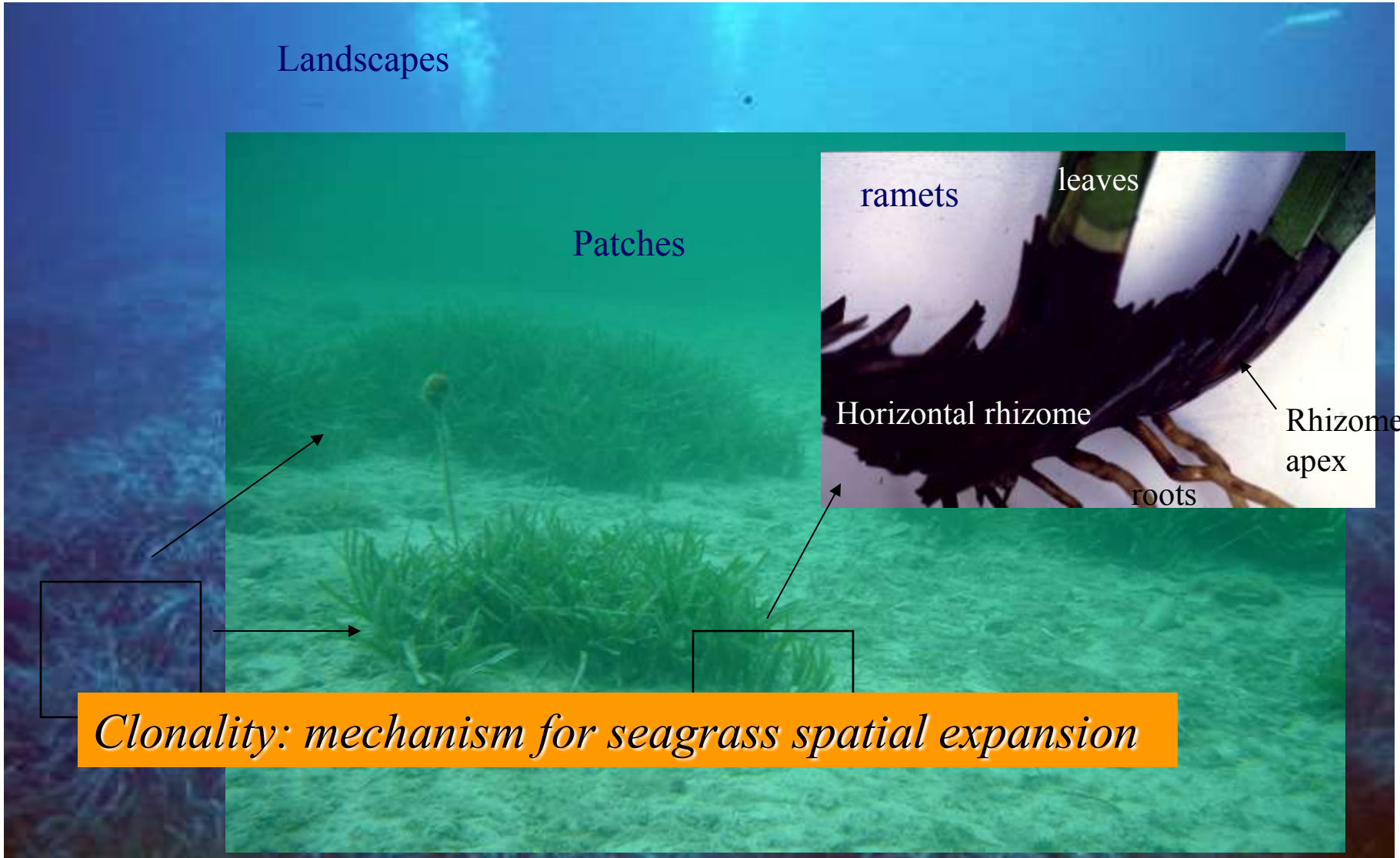
leaves

Horizontal rhizome

Rhizome  
apex

roots

*Clonality: mechanism for seagrass spatial expansion*



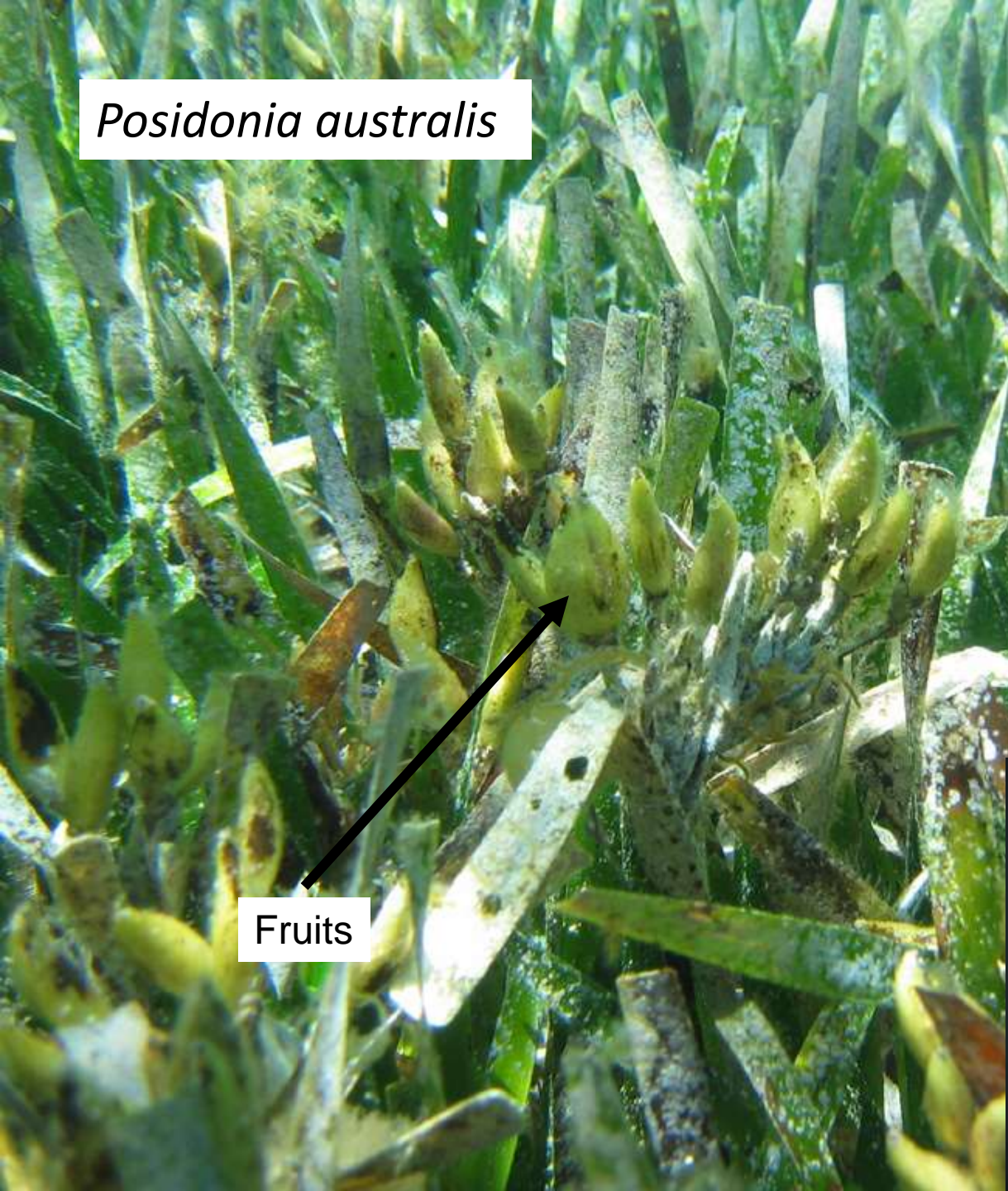
*Posidonia australis*

Fruits

Flower

Seed

15-20 mm

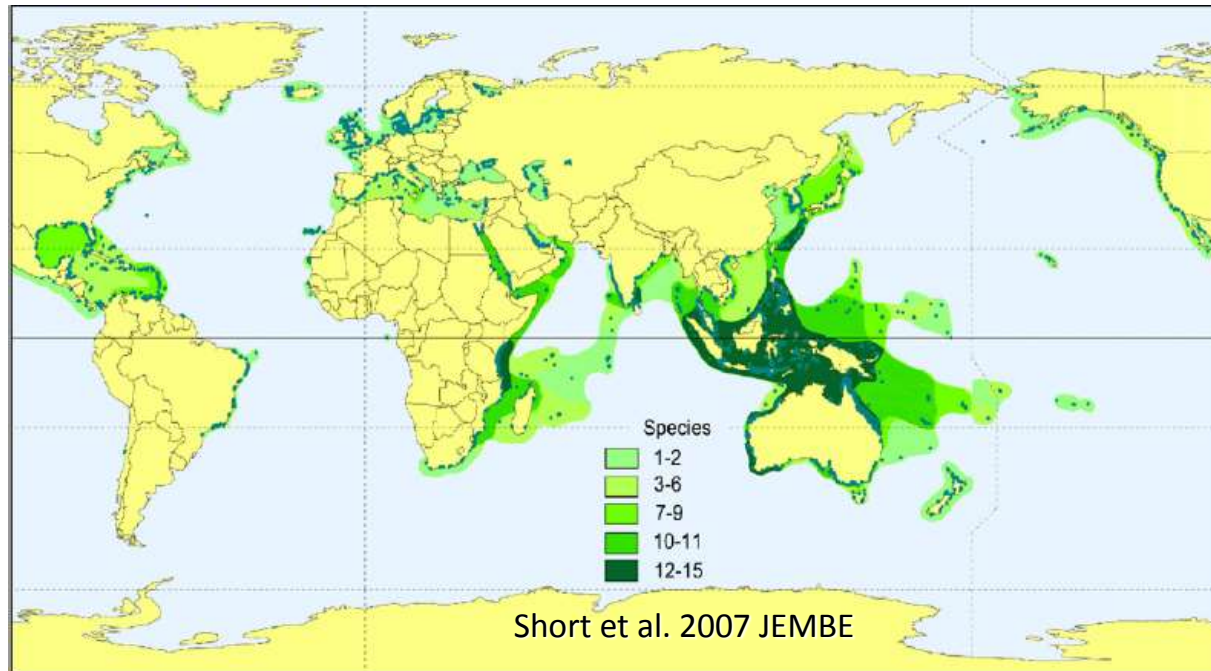




Food Web: Dugong grazing in Shark Bay  
(Cindy Bessey)



# Global Distribution and Diversity



T. Carruthers

*Halophila:*  
Bocas del Toro, Panama



T. Carruthers

*Thalassia:*  
Kuna Yala, Panama



T. Carruthers

*Ruppia:*  
Morro Bay, USA

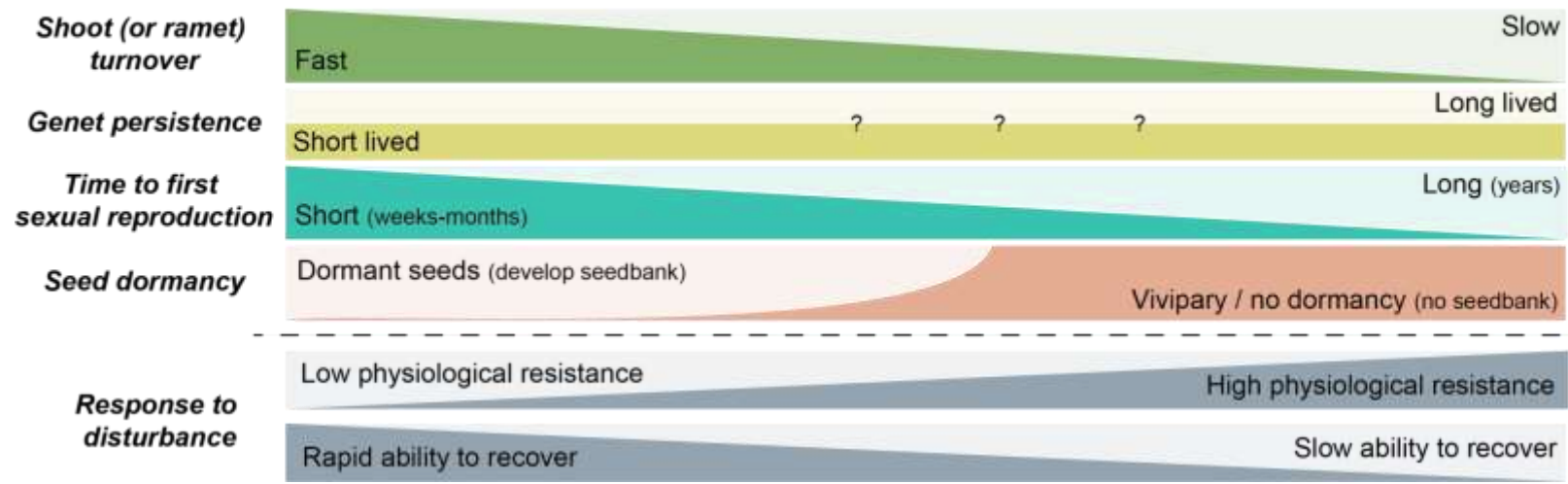
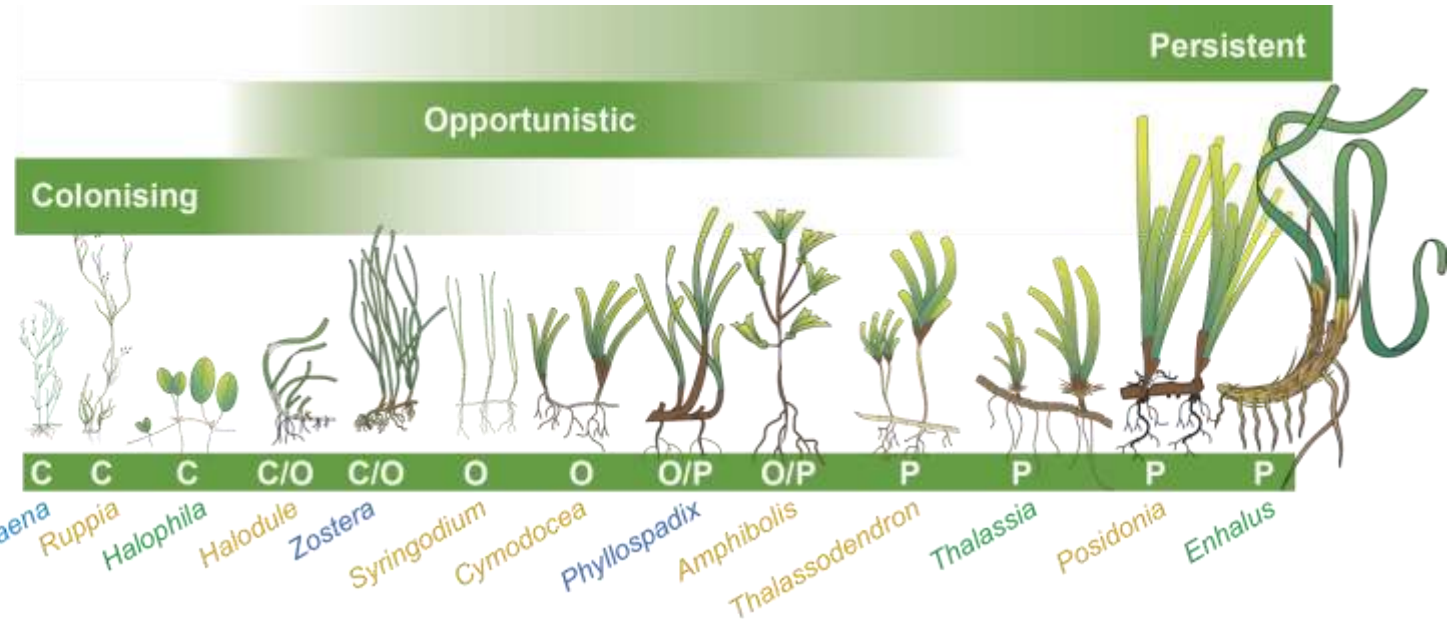


T. Carruthers

*Zostera:*  
Ria Formosa, Portugal



# Seagrass life history



*Halophila decipiens*







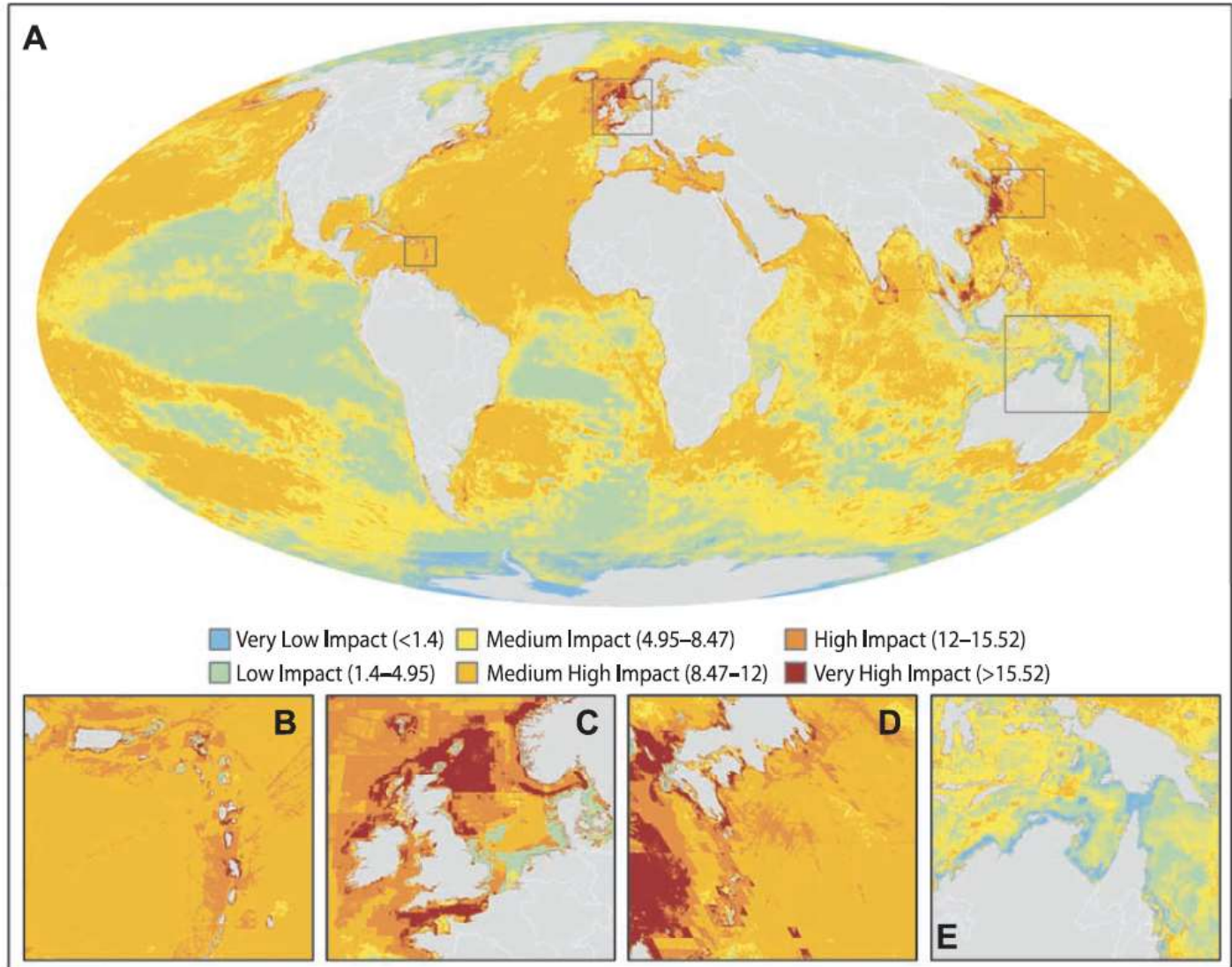
*Thalassia*

Images: Korjent Van Dijk



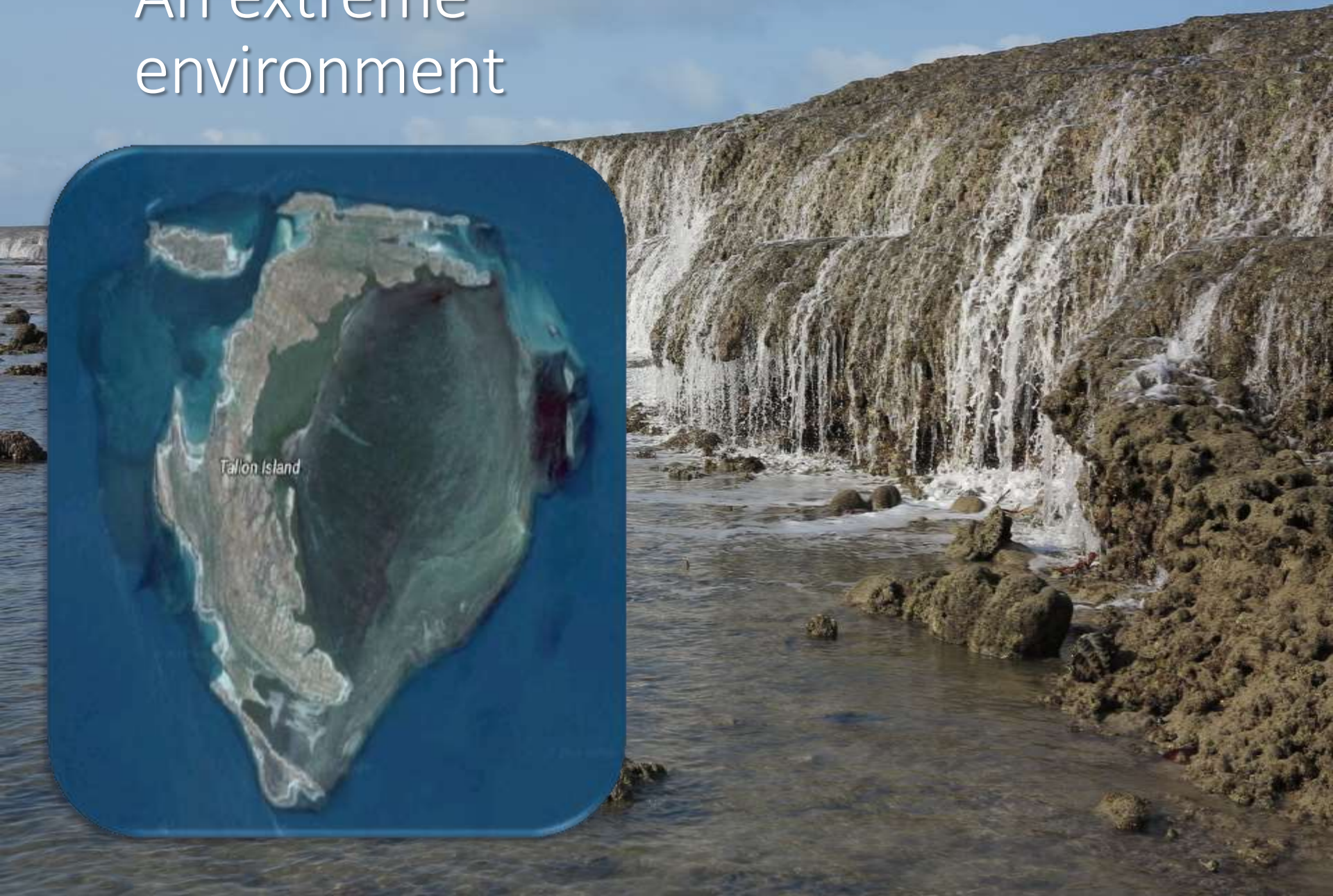
# Global map of human impacts

**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).



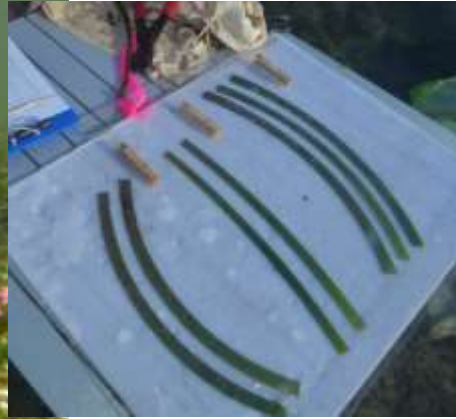
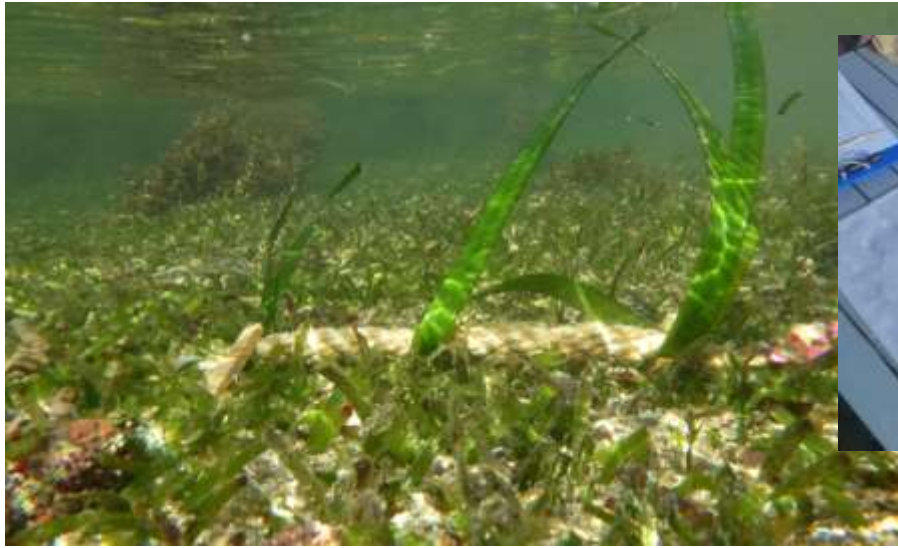


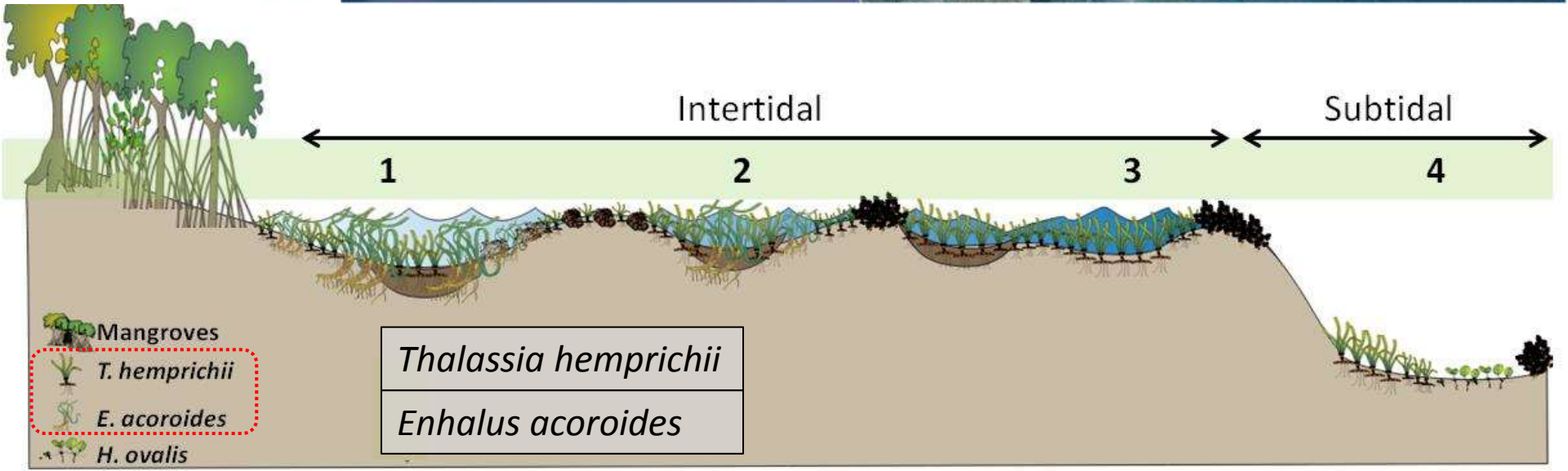
# An extreme environment



... and the dangers ...



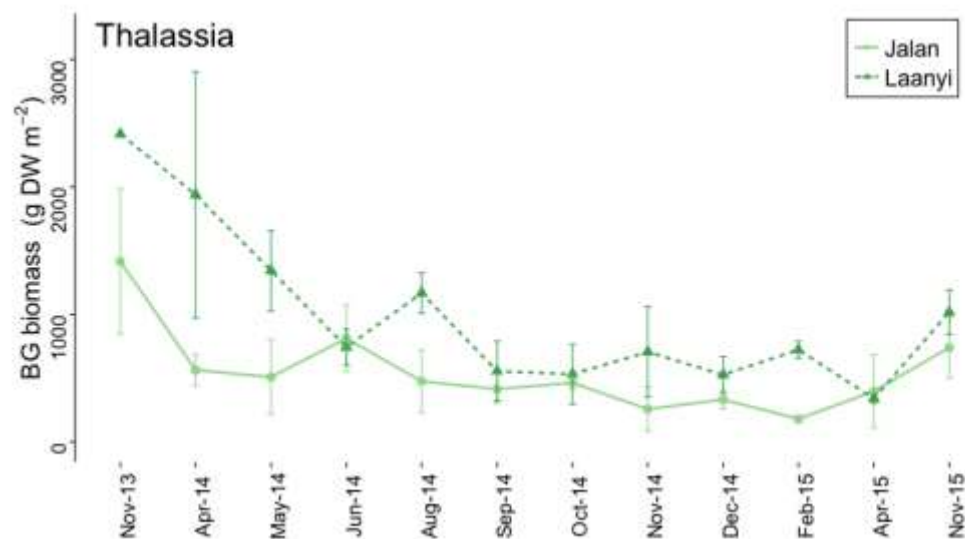
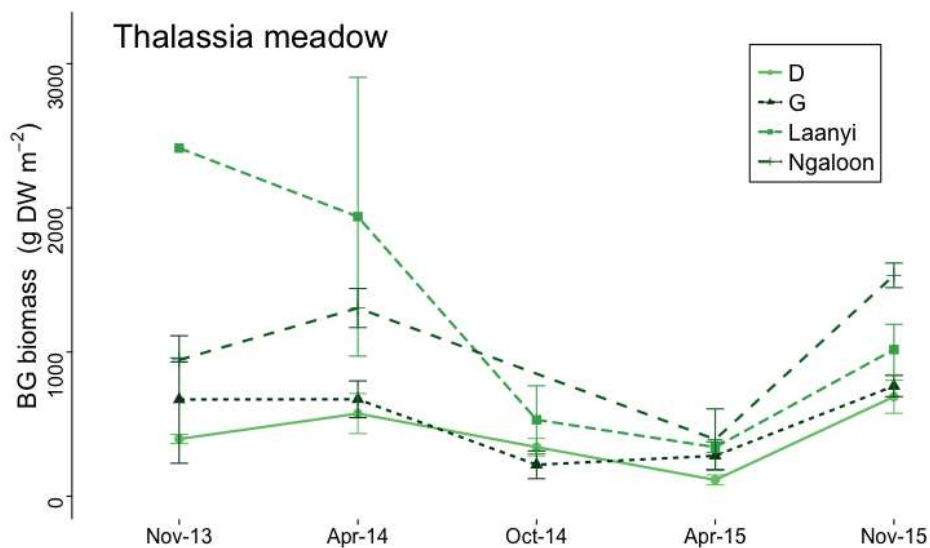
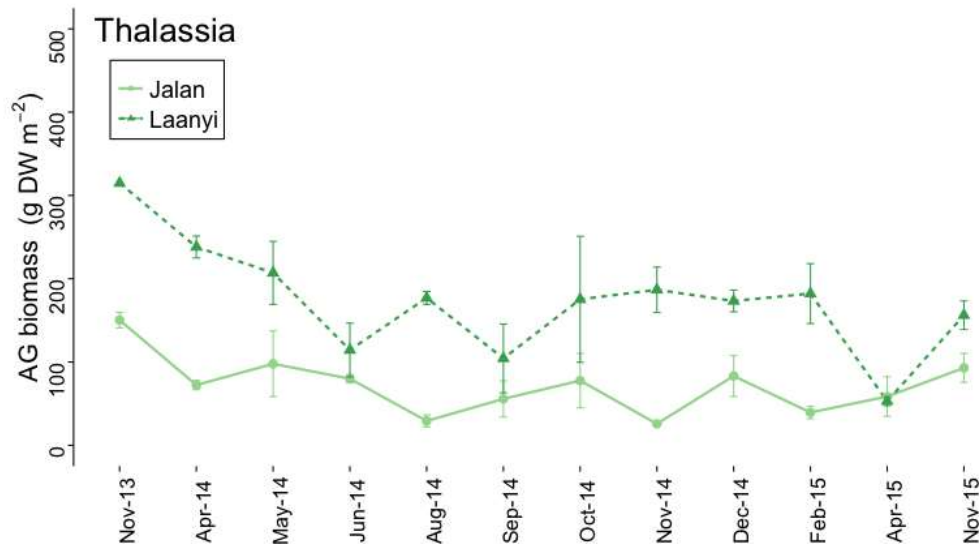
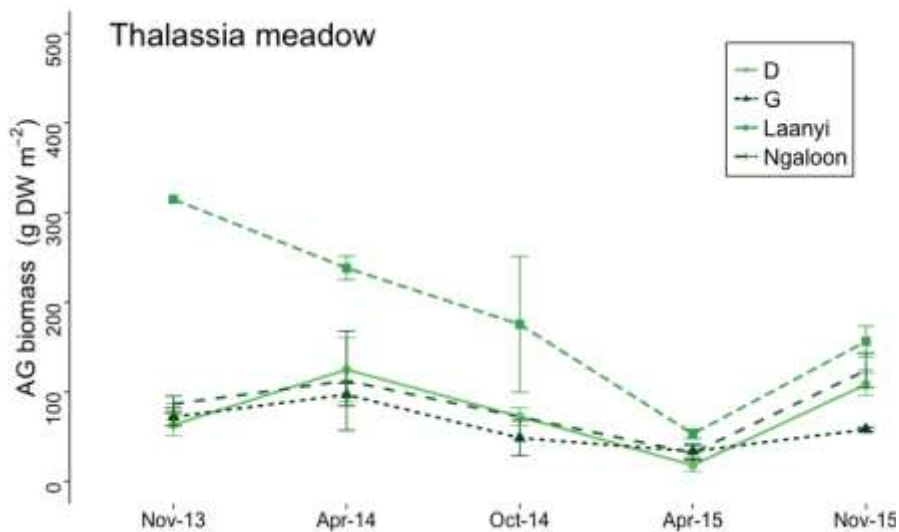


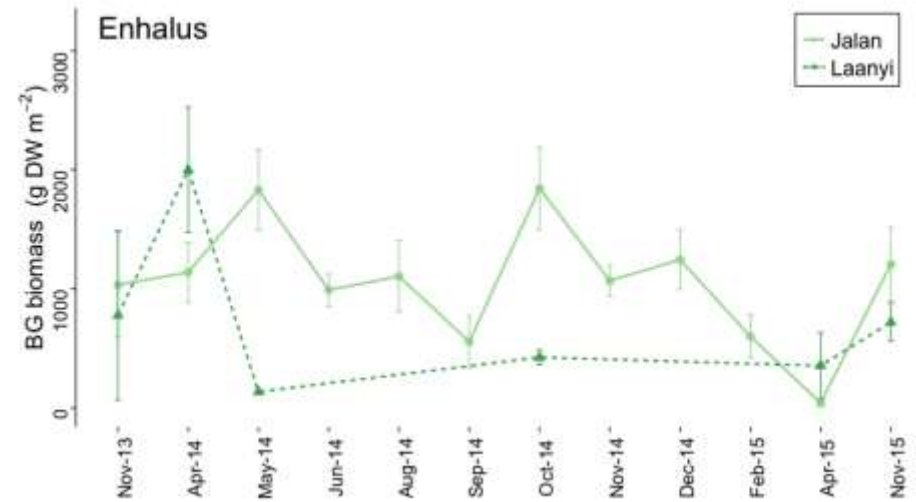
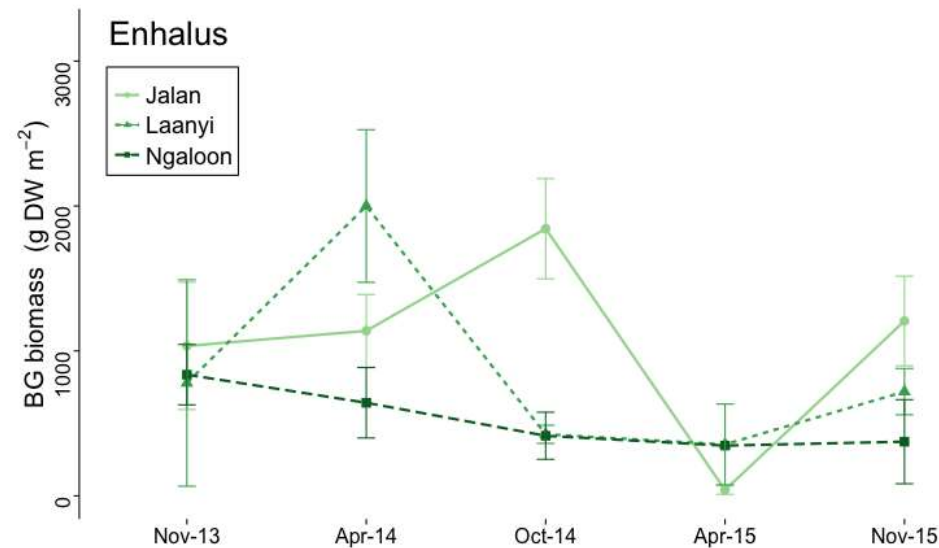
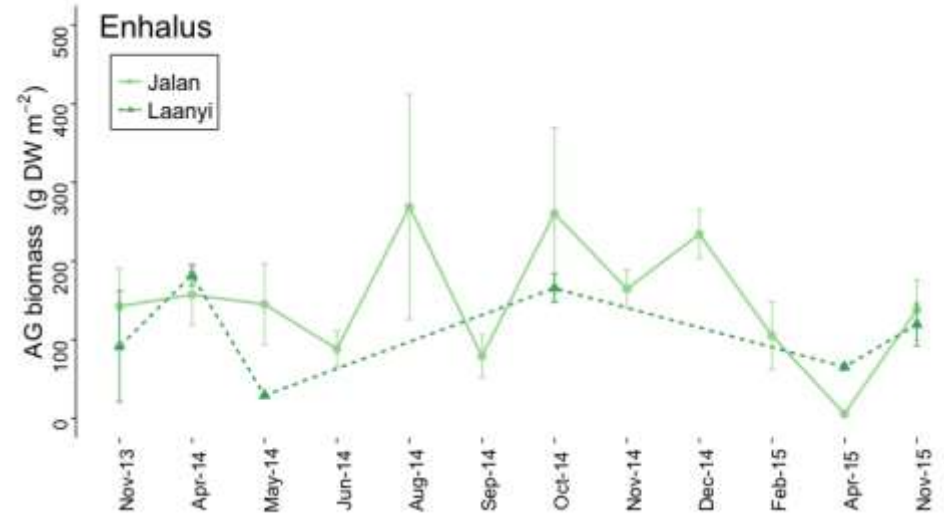
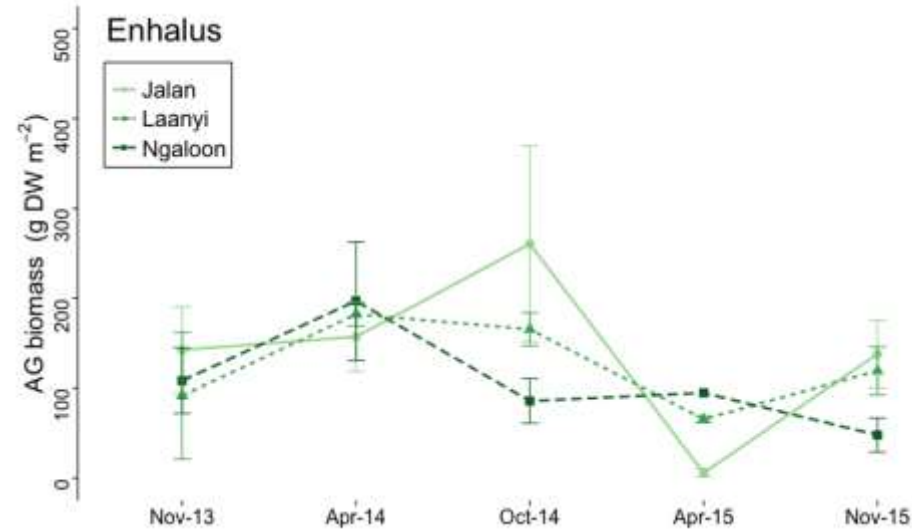


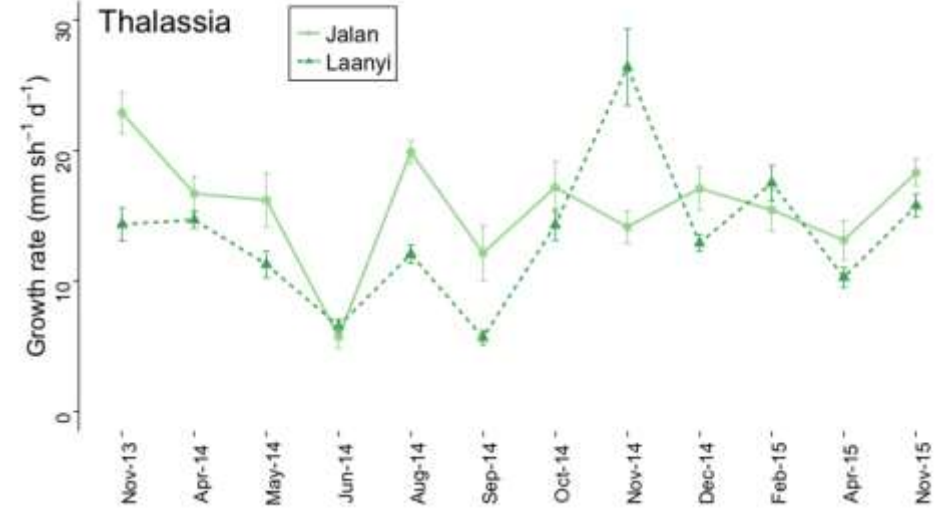
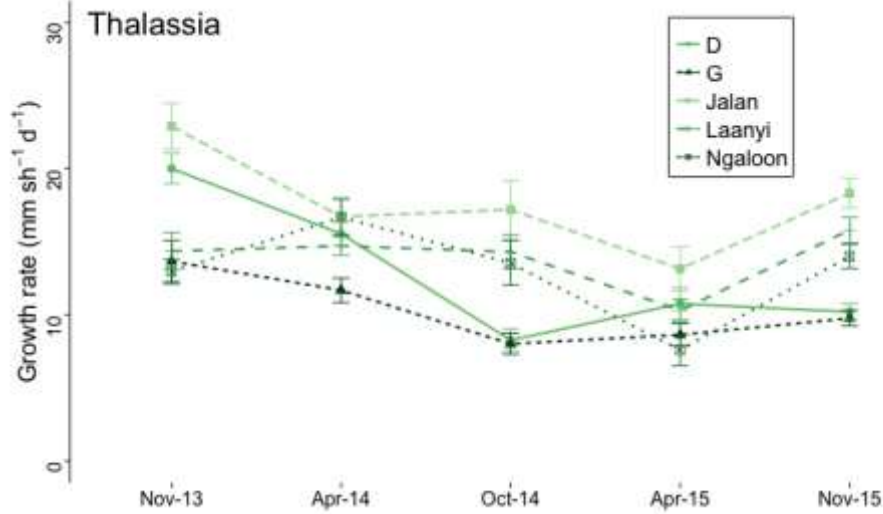




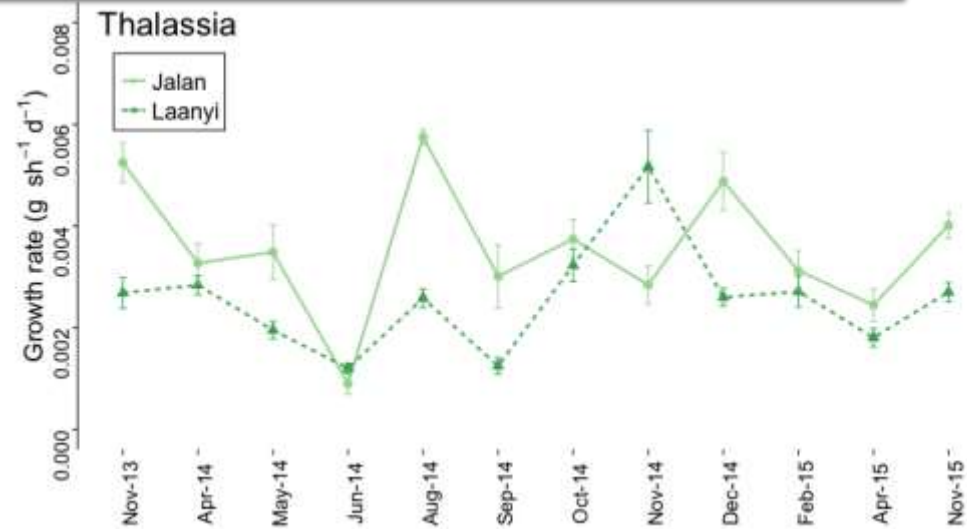
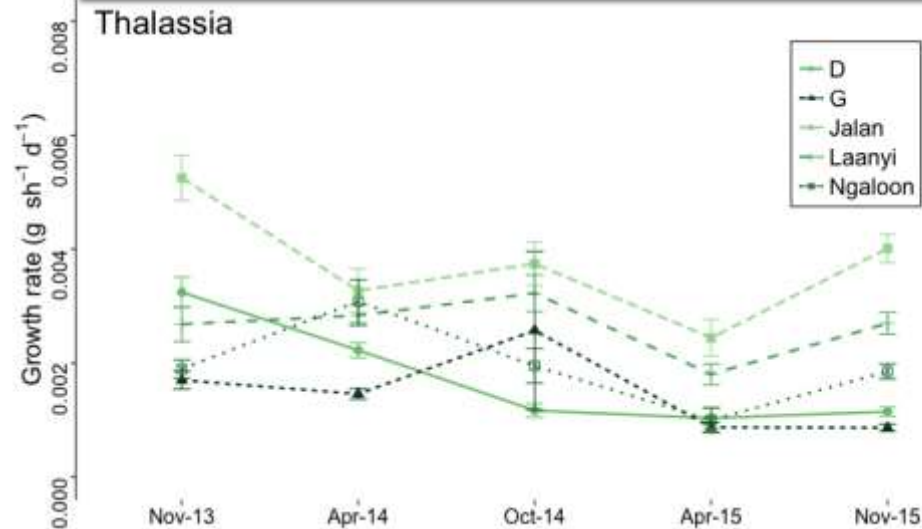


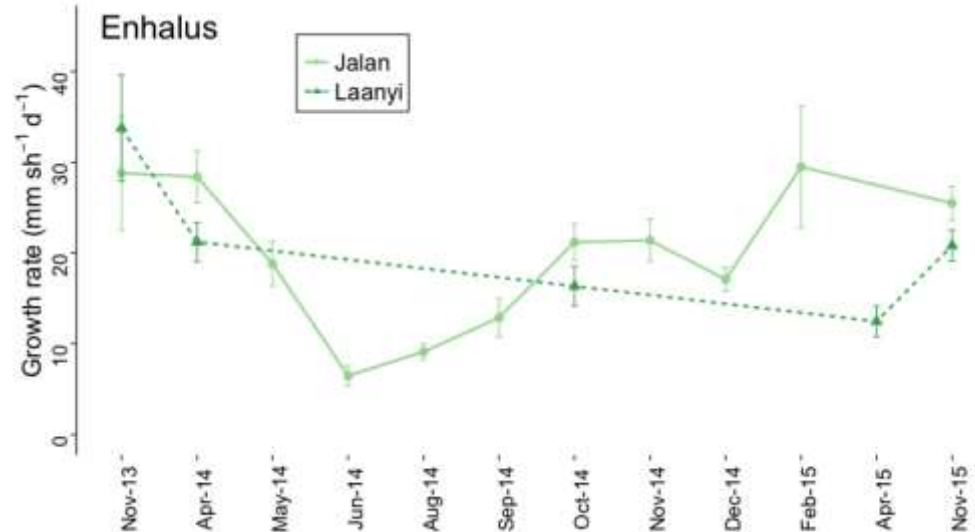
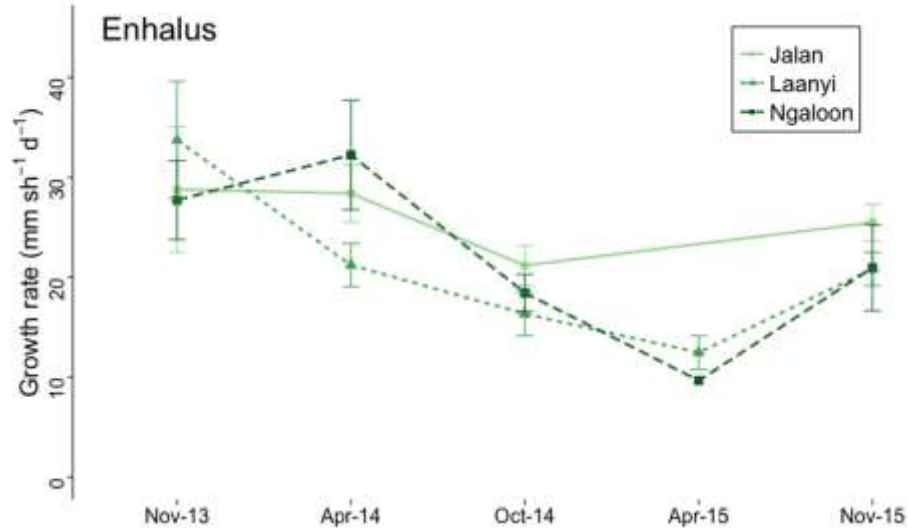




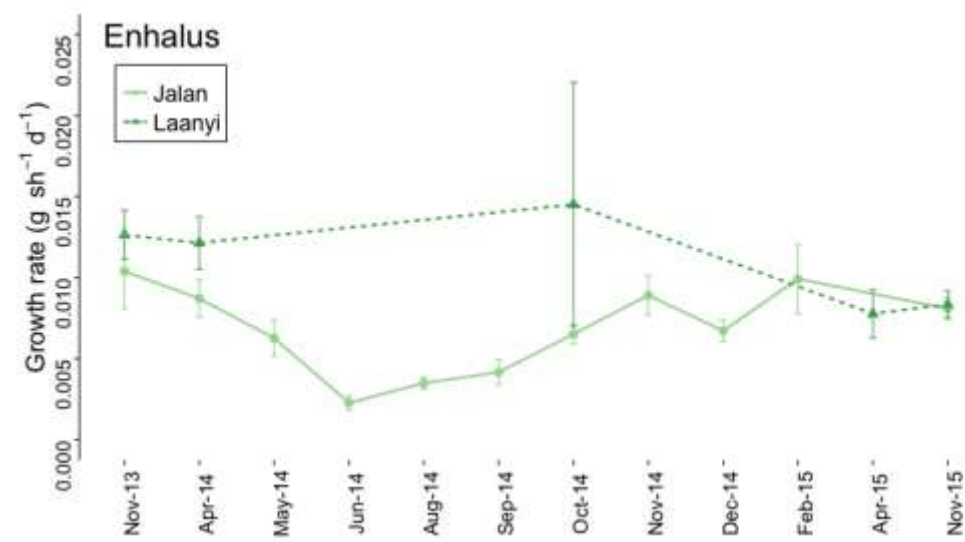
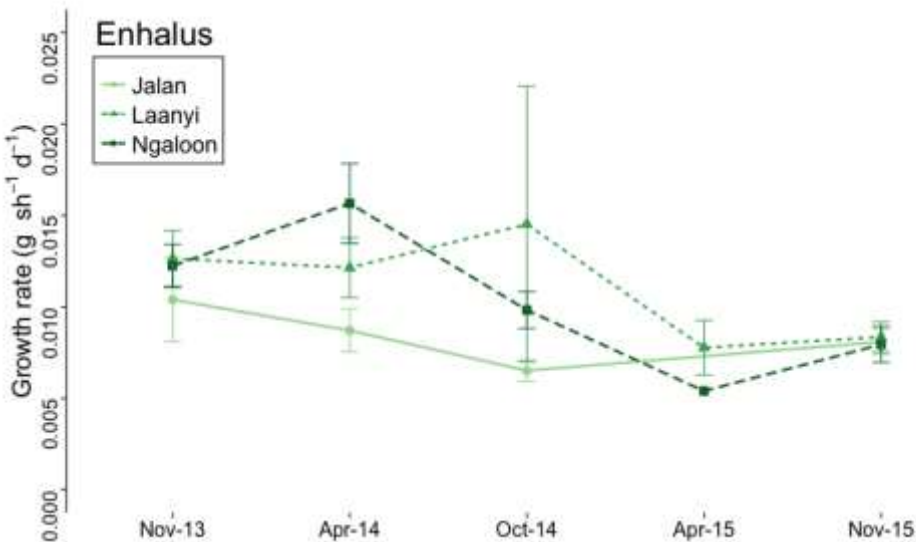


BETWEEN 0.5 AND 1.0 CM LEAF EXTENSION *PER DAY*





**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)

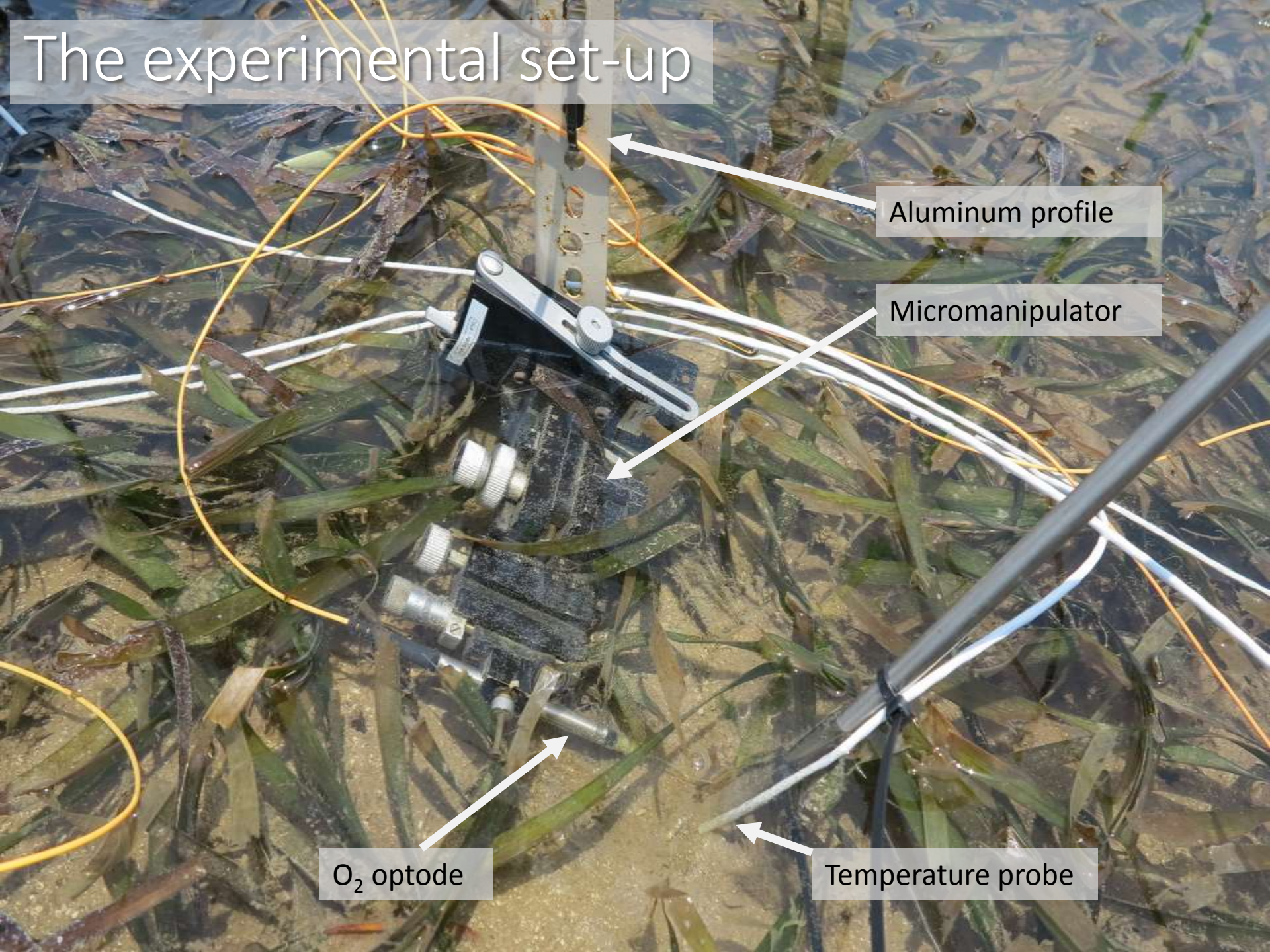


How stressful is this for seagrasses?

4 m tall scaffold to keep equipment dry at high tide



# The experimental set-up



Aluminum profile

Micromanipulator

O<sub>2</sub> optode

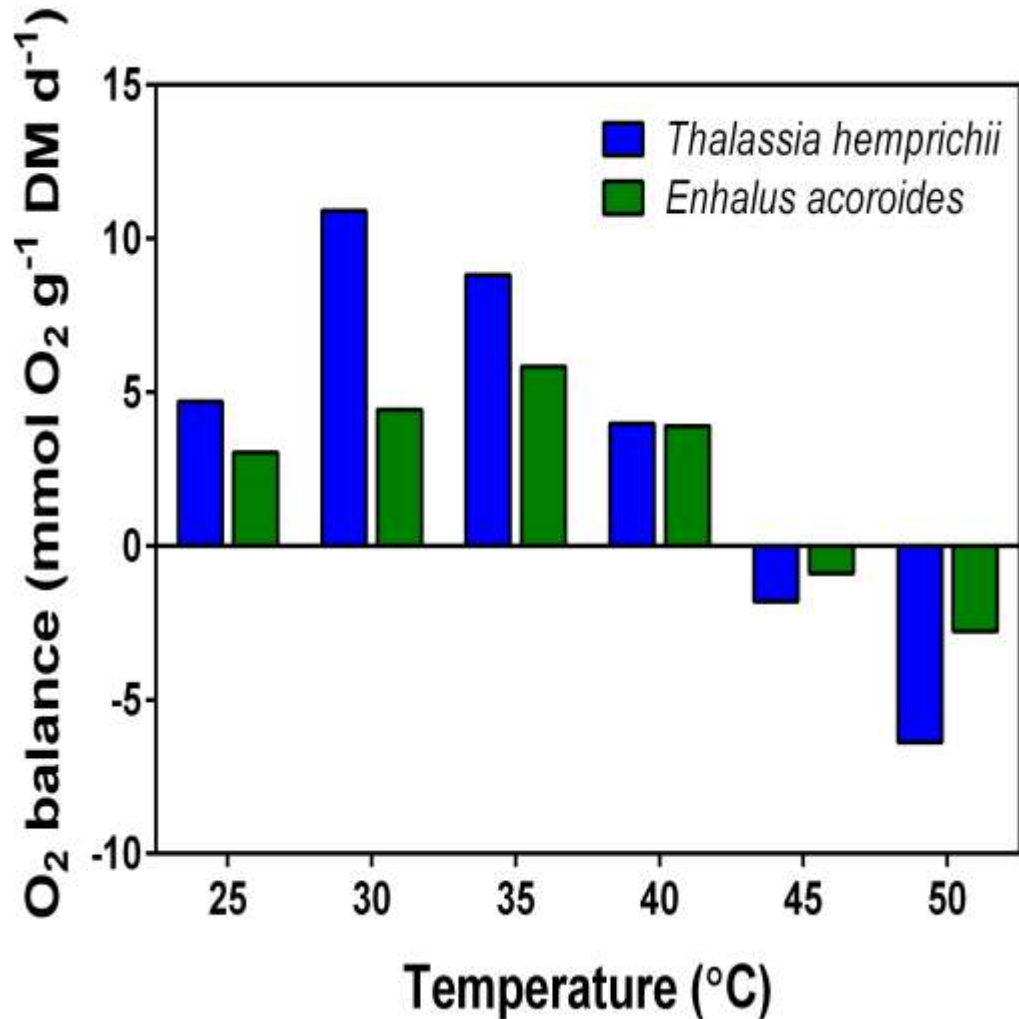
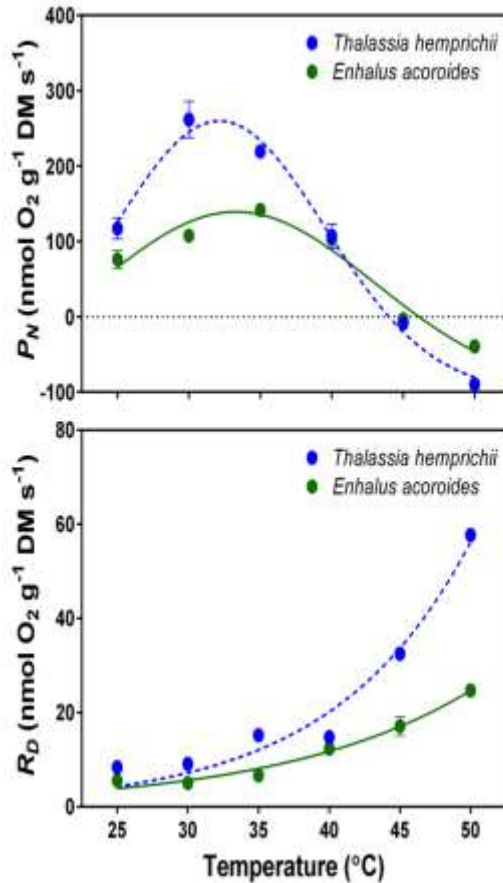
Temperature probe



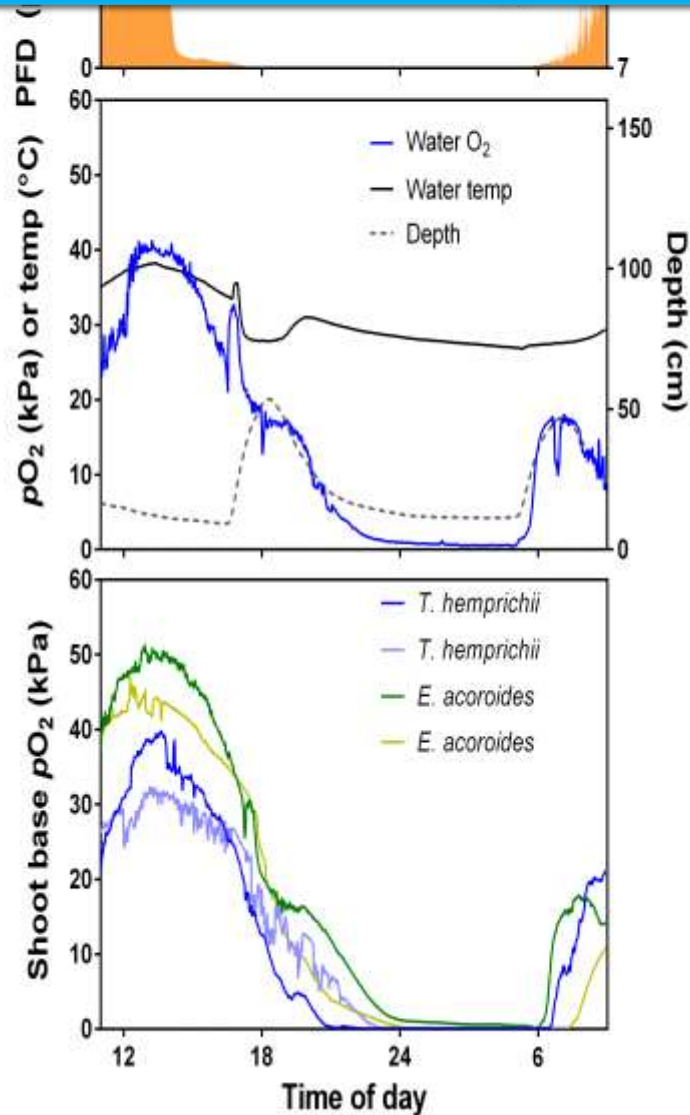
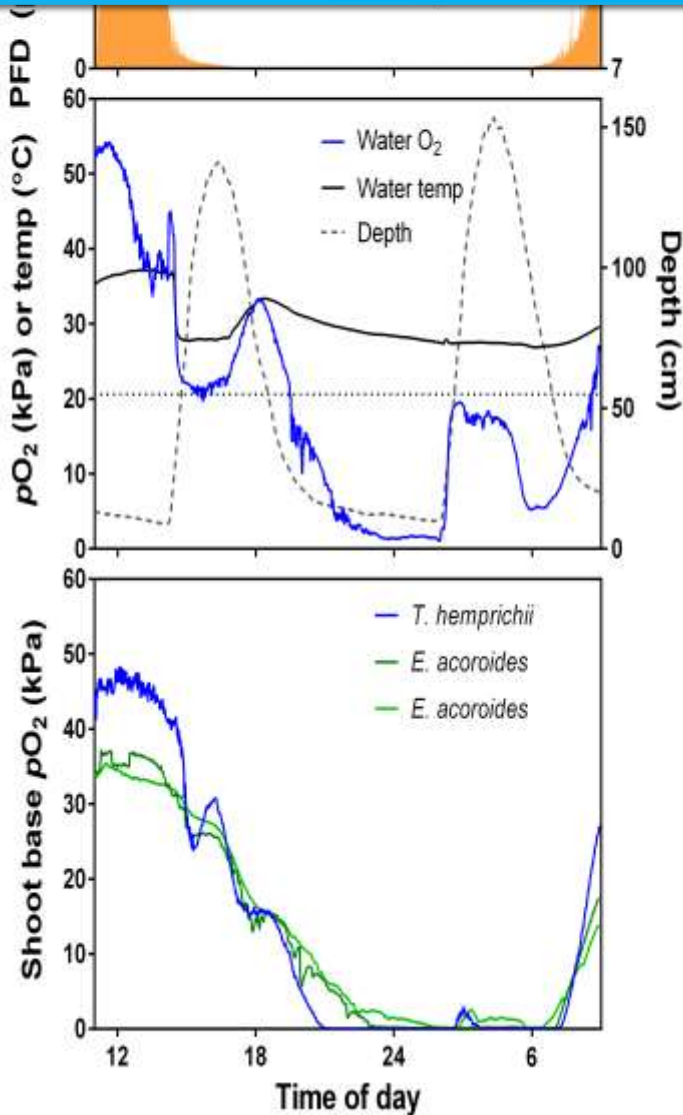
The O<sub>2</sub> optode and temperature sensor



# Seagrasses photosynthesize and have a positive O<sub>2</sub> balance up to 40 degrees



# Plants supersaturated in oxygen during the daytime low tides and hypoxic for 8-11 hours every night



Internal aeration

## 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 O<sub>2</sub> available!

# Seagrass Grazing Studies

- Rabbit Fish Grazing
- Turtle Grazing and Movement





**Before**



**After**

**Thalassia: 27% consumed**







Savannah Iwany Savannah Iwany

Iwany Iwany

Jarmina Jarmina

Data SIO, NOAA, U.S. Navy, NGA, GEBCO  
Image Landsat

Google earth

# 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*



- 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?