Applying MangroveWatch for Broad-Scale Condition Assessment of Mangroves in Torres Strait Islands

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MMM4 22nd July St Augustine, Florida

MangroveWatch

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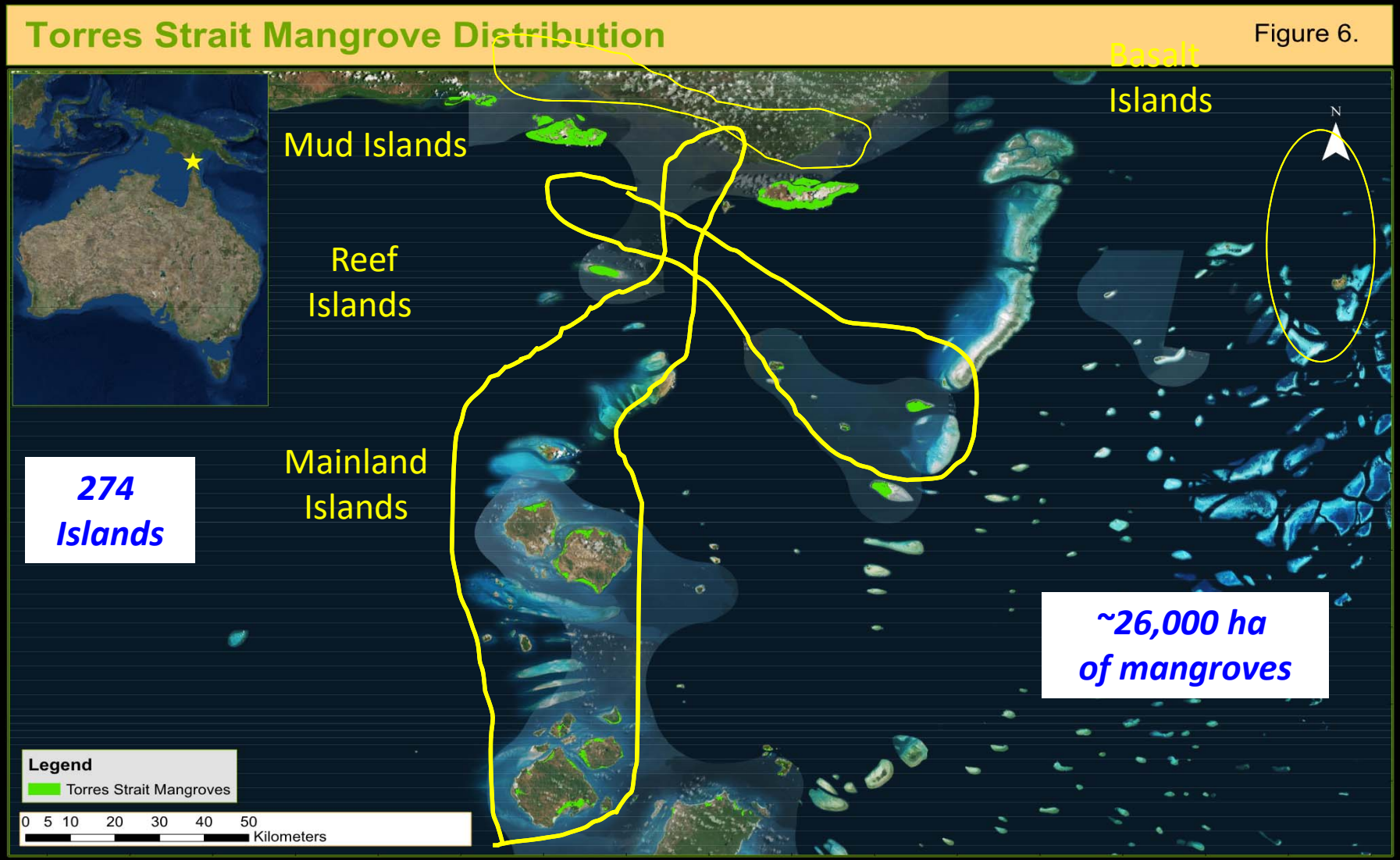
Torres Strait – Northern Australia



National Environmental Research Program

Project Objectives

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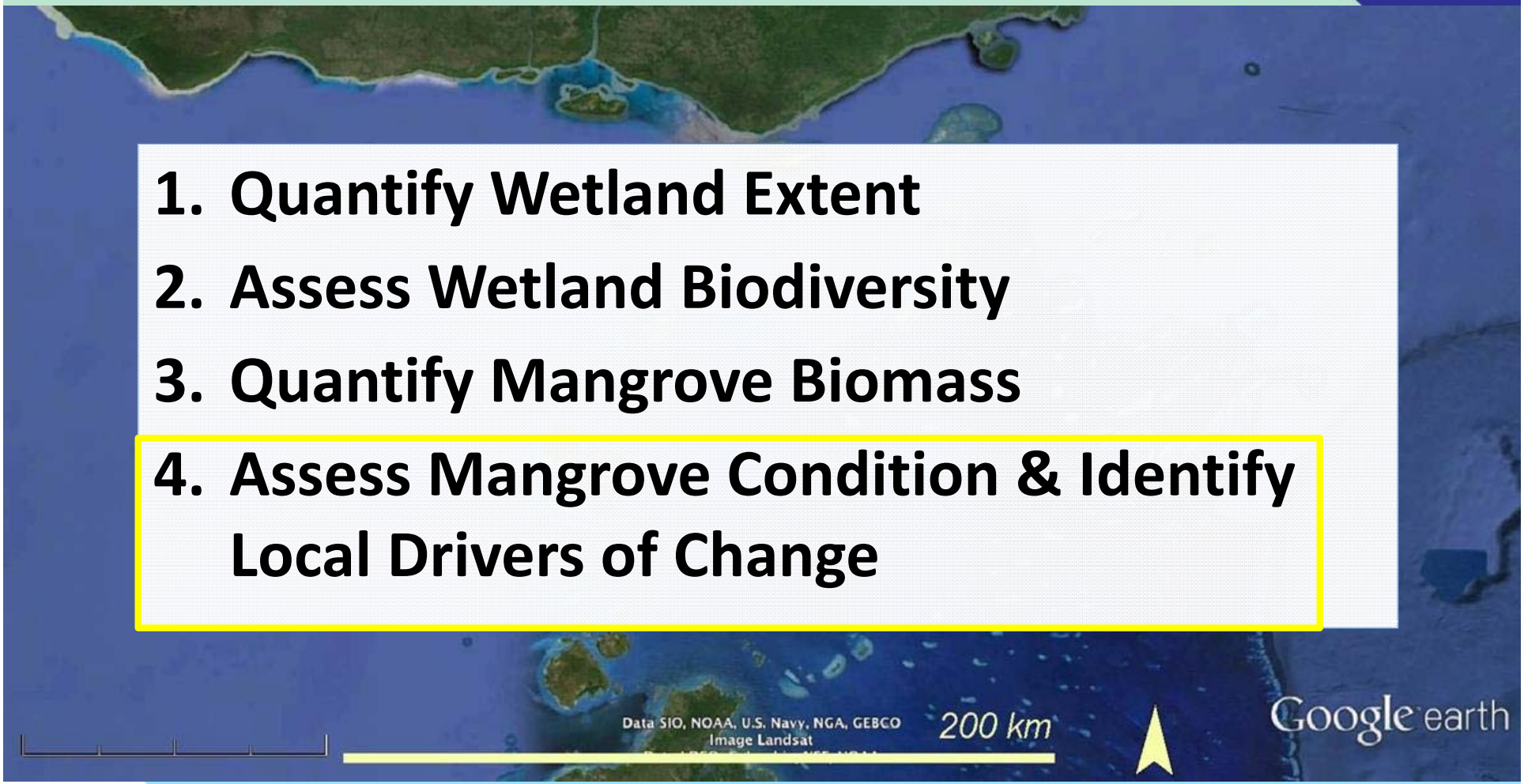
1. **Quantify Wetland Extent**
2. **Assess Wetland Biodiversity**
3. **Quantify Mangrove Biomass**
4. **Assess Mangrove Condition & Identify Local Drivers of Change**



Traditional Owner Capacity Building & Knowledge Sharing

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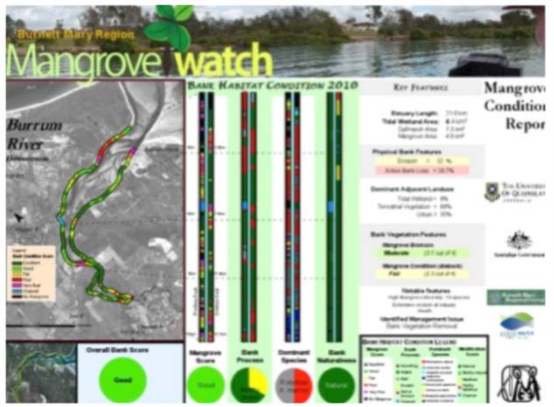
MangroveWatch

A Science-Community Partnership
Mangrove Monitoring Program
that is
Community driven,
Scientifically validated
With ***Practical outcomes for management***



Baseline Assessment

Environmental Stewardship

Capacity Building

Identify drivers of change

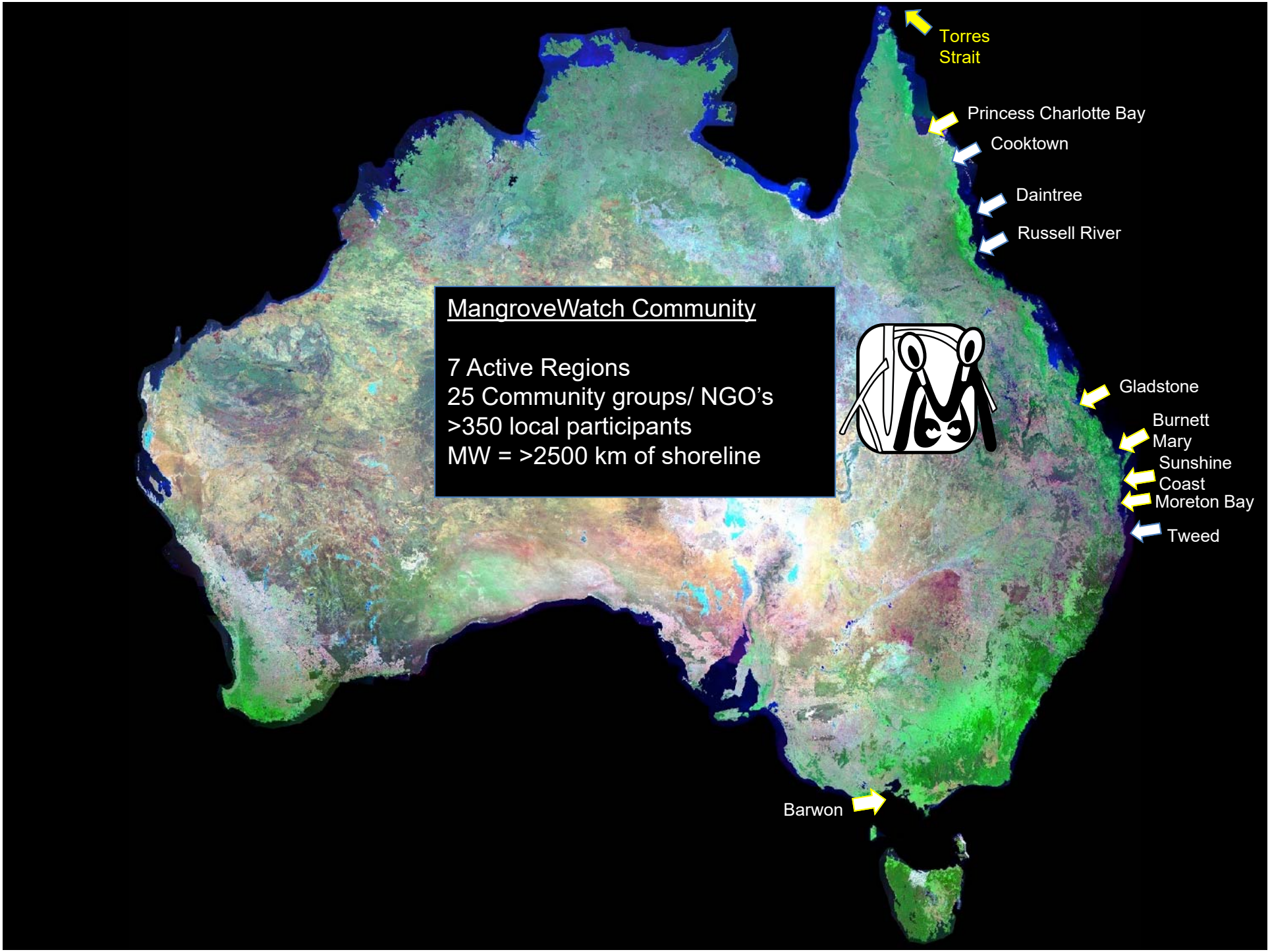
Empower local Communities

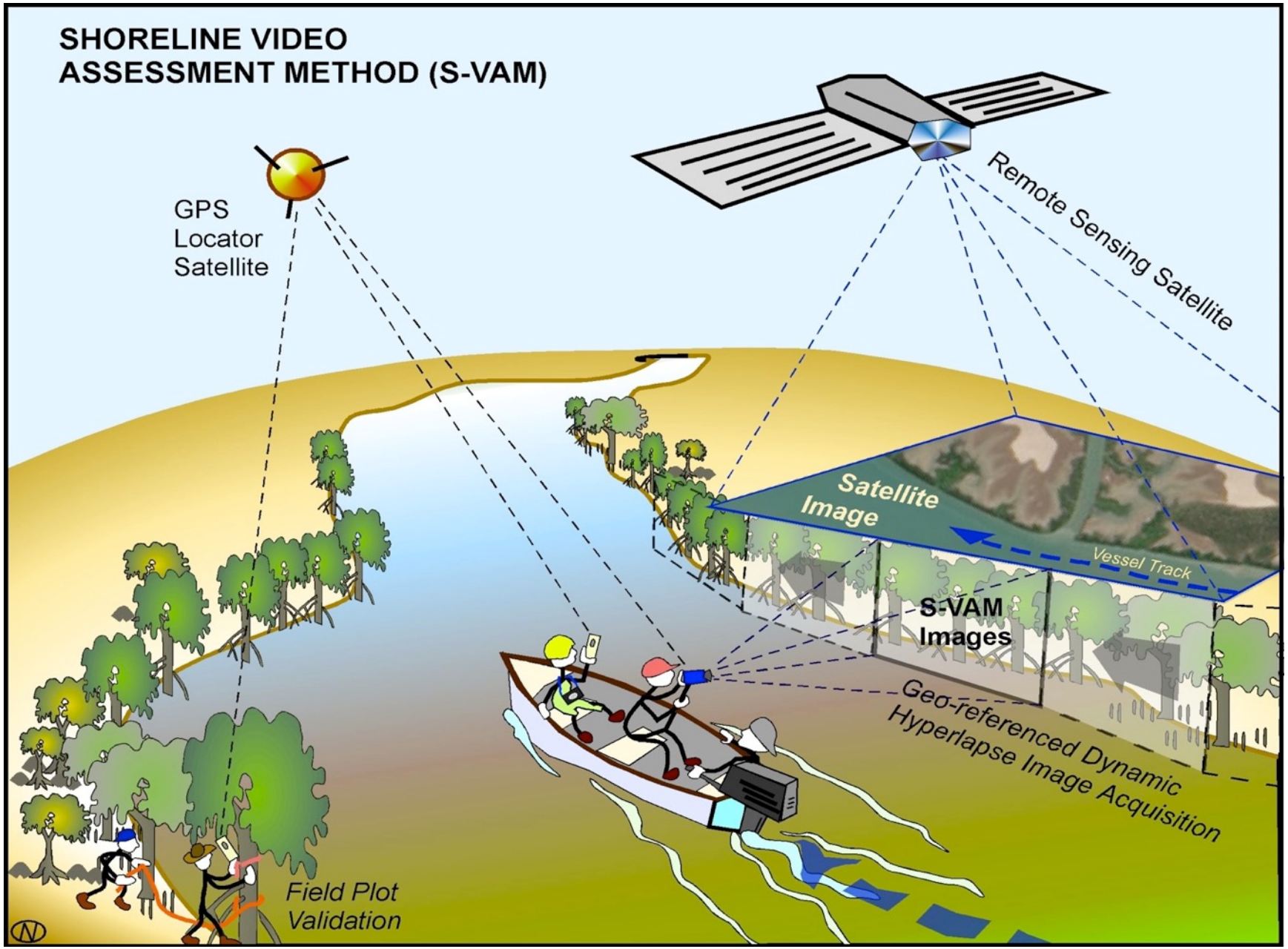
Long-term Monitoring

Mangrove Conservation

Inform on-ground management

Improve scientific understanding


Torres Strait
Princess Charlotte Bay
Cooktown
Daintree
Russell River
MangroveWatch Community
7 Active Regions
25 Community groups/ NGO's
>350 local participants
MW = >2500 km of shoreline
Gladstone
Burnett
Mary
Sunshine Coast
Moreton Bay
Tweed
Barwon



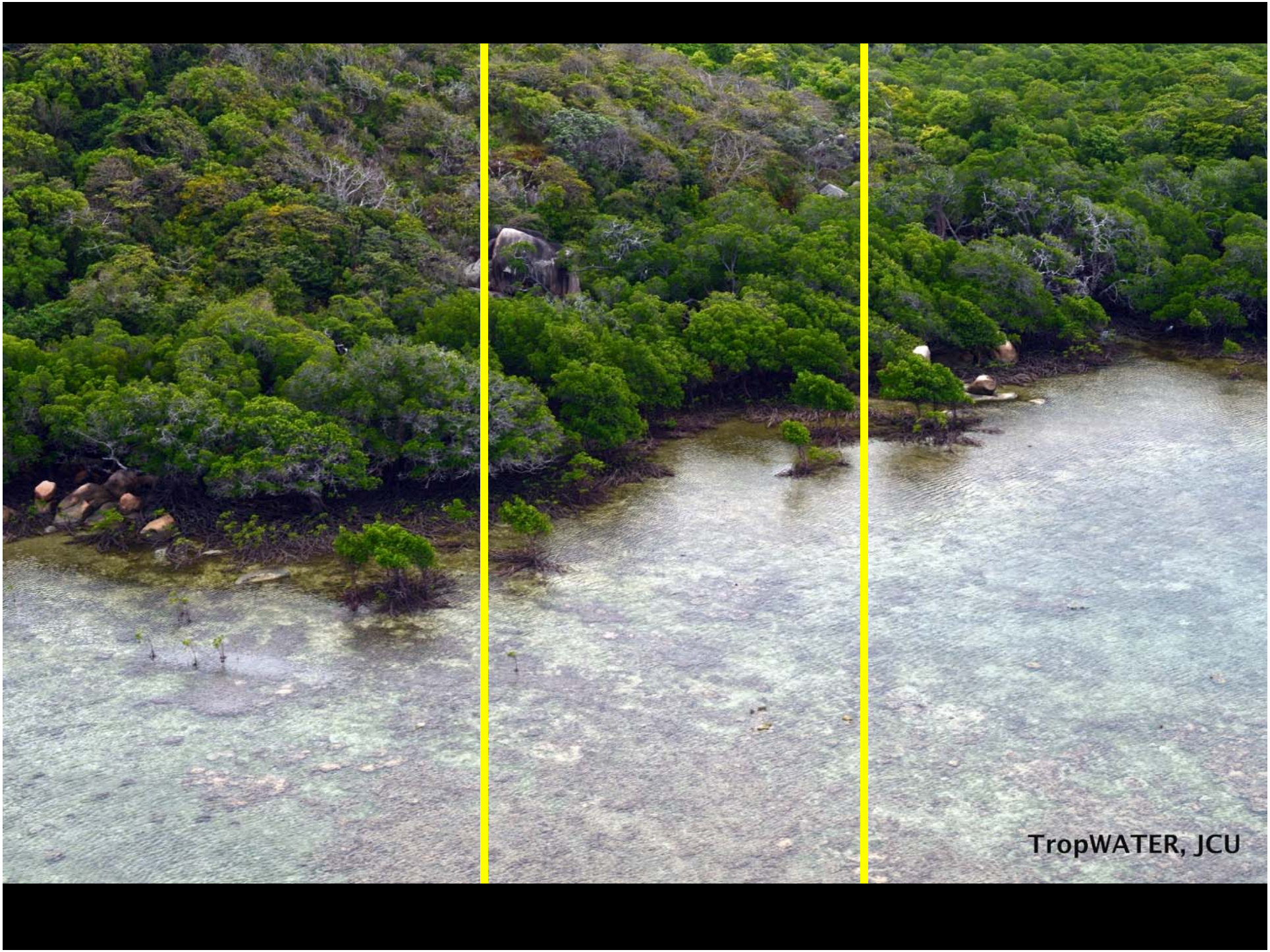
Mackenzie, J. R., Duke, N. C., & Wood, A. L. (2016). The Shoreline Video Assessment Method (S-VAM): Using dynamic hyperlapse image acquisition to evaluate shoreline mangrove forest structure, values, degradation and threats. *Marine Pollution Bulletin*.

Shoreline Video Assessment Method (S-VAM)

Shoreline Video Assessment Method (S-VAM)

Shoreline Video Assessment Method (S-VAM)

Saibai, Torres Strait, Australia


TropWATER, JCU

Field Surveys – Biodiversity & Biomass

Results– Biodiversity

Saibai senior ranger Herbert Wamurasan standing next to Avicennia officinalis

Boigu senior ranger Nelson Gibuma standing next to the only Sonneratia ovata tree known in Australia

Invasive climbing perch (Anabas testudineus)

- **35 mangrove species including 2 new Australian records and 3 new Torres Strait records**

- Tripled aquatic biodiversity records on most islands
- 49 species of freshwater and brackish fish including 18 new records for Torres Strait
- New species of freshwater/estuarine crabs, turtles and snakes
- Documented invasive climbing perch (*Anabas testudineus)*

National Environmental Research Program

Shoreline Surveys

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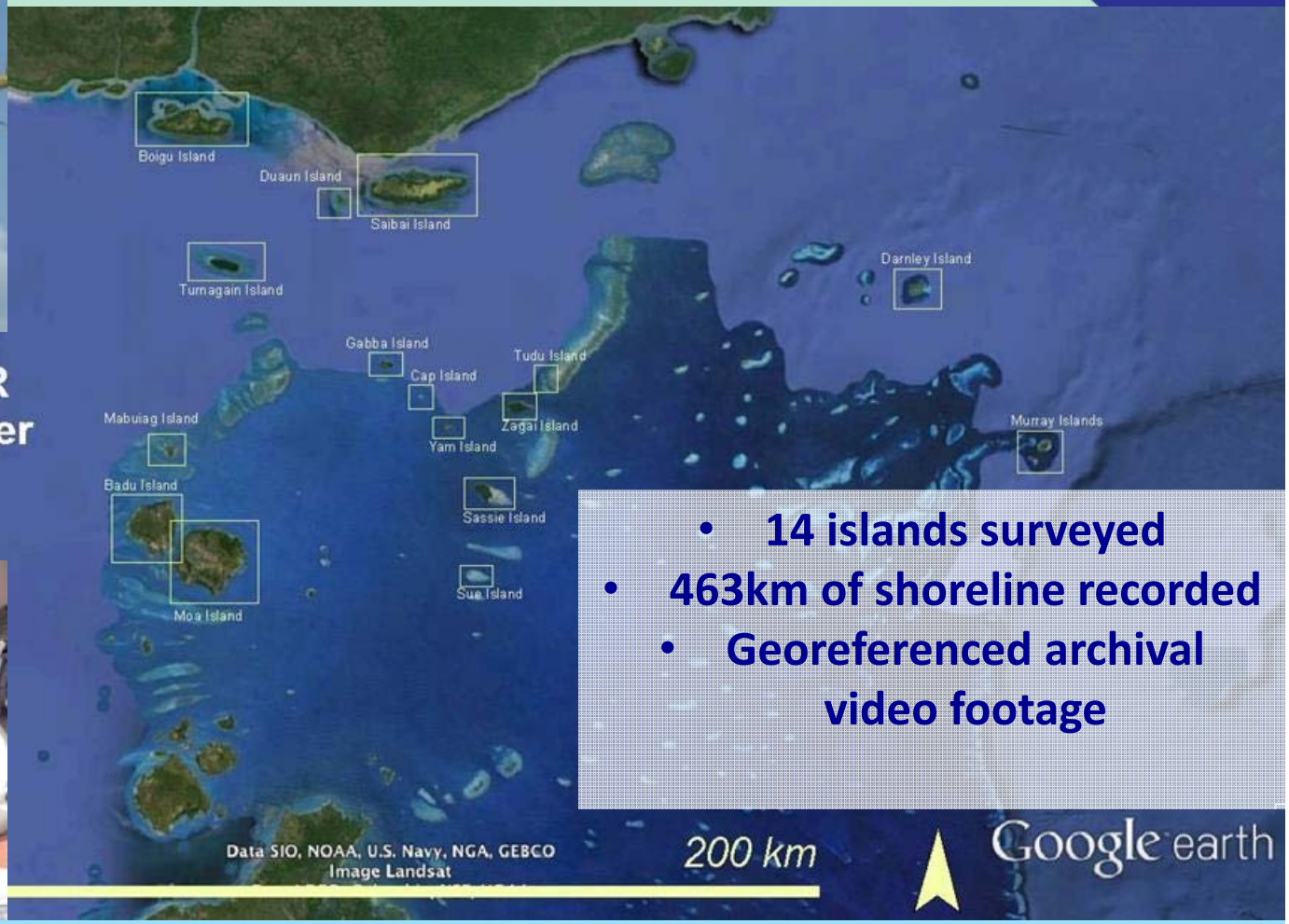
NERP JCU TropWATER Mangrove & Freshwater Aerial Video Surveys 2011-1013



- 14 islands surveyed
- 463km of shoreline recorded
- Georeferenced archival video footage

Results– Mangrove Condition

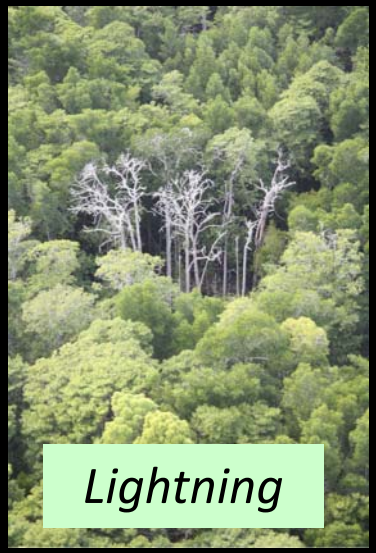
Island	Healthy Mangrove (%)	Mangroves in Poor Condition (%)	Poor to Healthy Condition Ratio	Weighted Condition Score*
Mua	80	20	0.25	11.4
Badu	84	16	0.19	4.75
Mabuiag	71	18	0.25	2.99
Sassie	52	15	0.29	9.61
Zagai	48	24	0.50	10.06
Tudu	64	19	0.30	0.19
Iama	64	13	0.20	1.94
Cap	38	21	0.55	0.33
Gebar	28	34	1.21	6.50
Erub	77	15	0.19	0.95
Buru	39	11	0.28	5.42
Dauan	67	12	0.18	0.83
Boigu	58	15	0.26	13.13
Saibai	59	18	0.31	17.23

*The weighted condition score provides an indication of the extent of poor condition mangroves relative to island size.

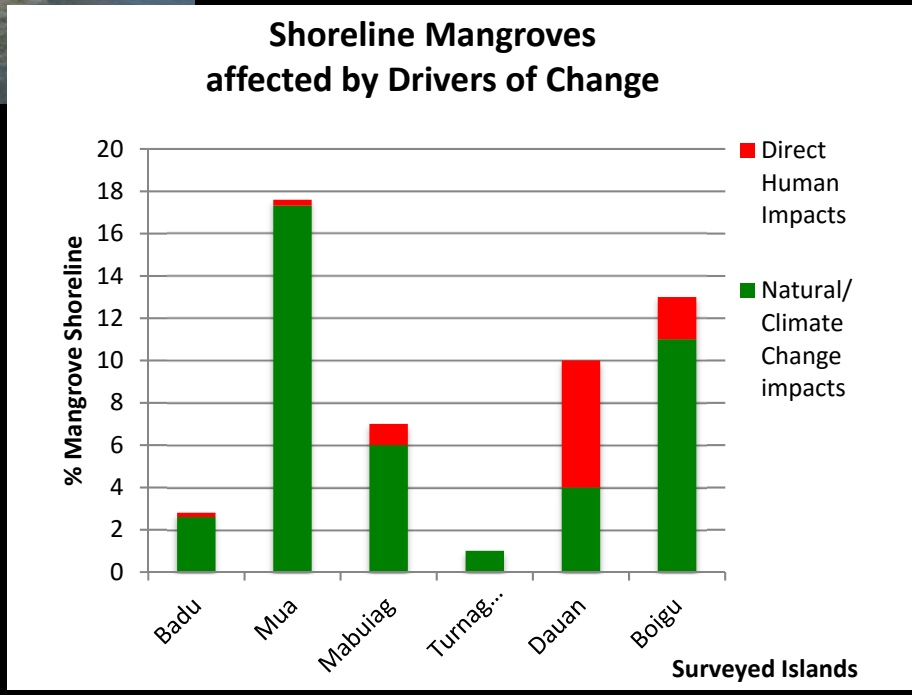
Zagai, Torres Strait, Australia

- 59% of shoreline mangrove healthy
- 18% in poor condition

Results– Drivers of Change



Drivers of change and thus the management responses vary from island to island



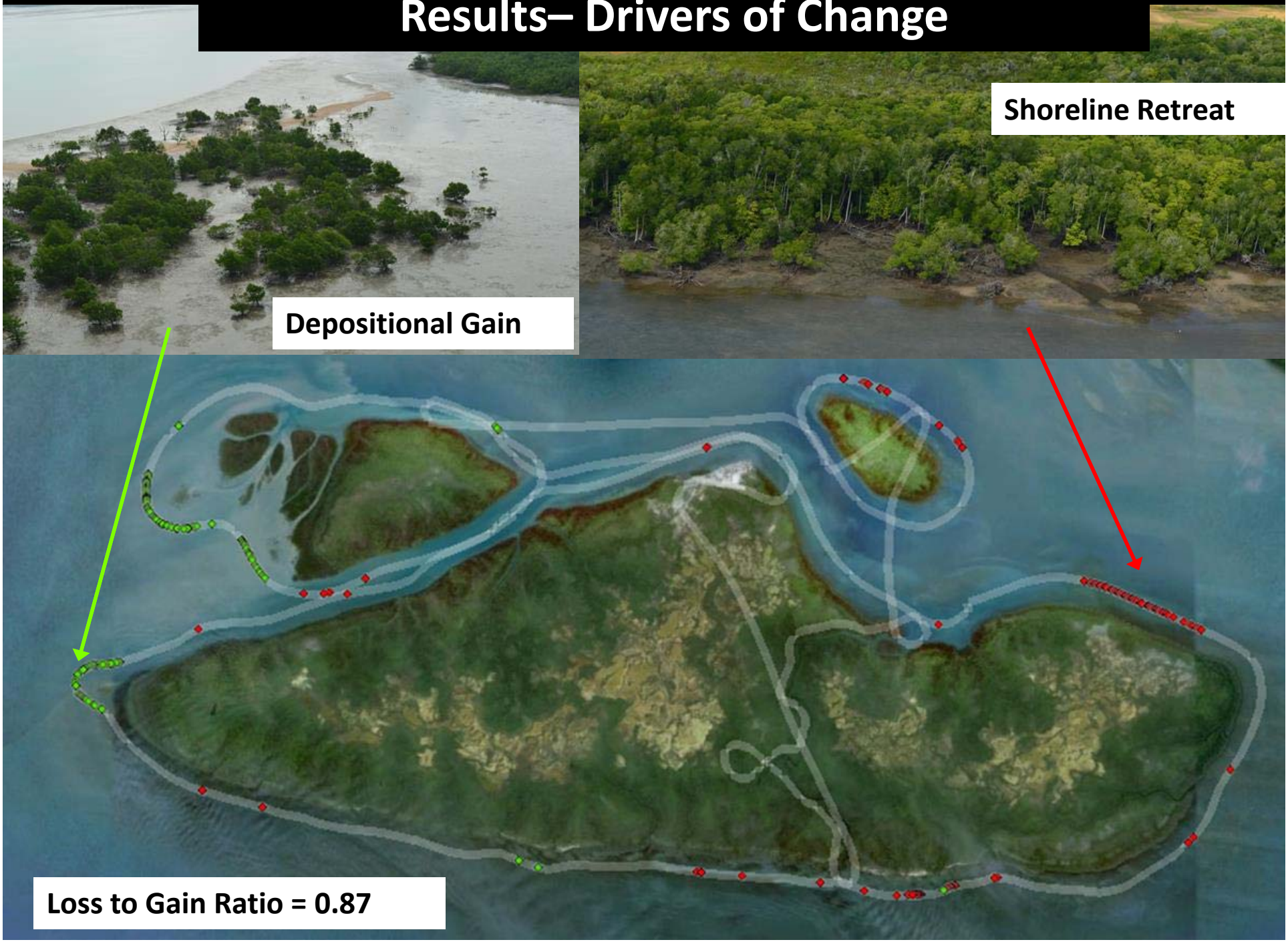
Torres Strait Island Shoreline Process

	Mangrove Expansion	Mangrove Retreat	Retreat to Expansion Ratio
Total Shoreline Length (km)	40.3	48.8	1.21

	Mangrove Expansion (%)	Mangrove Retreat (%)	Retreat - Expansion Ratio
Mua	3	7	2.3
Badu	5	3	0.6
Mabuiag	11	2	0.2
Sassie	33	24	0.7
Zagai	30	31	1.01
Tudu	0	0	0
Iama	44	6	0.14
Cap	0	13	*
Gebar	0.9	27	30
Erub	8	0.5	0.06
Dauan	0	13	*
Buru	4	24	6
Boigu	19	23	1.2
Saibai	7	21	3

Most islands undergoing dynamic shoreline change

Results– Drivers of Change



A new process observed – Inner Fringe Collapse

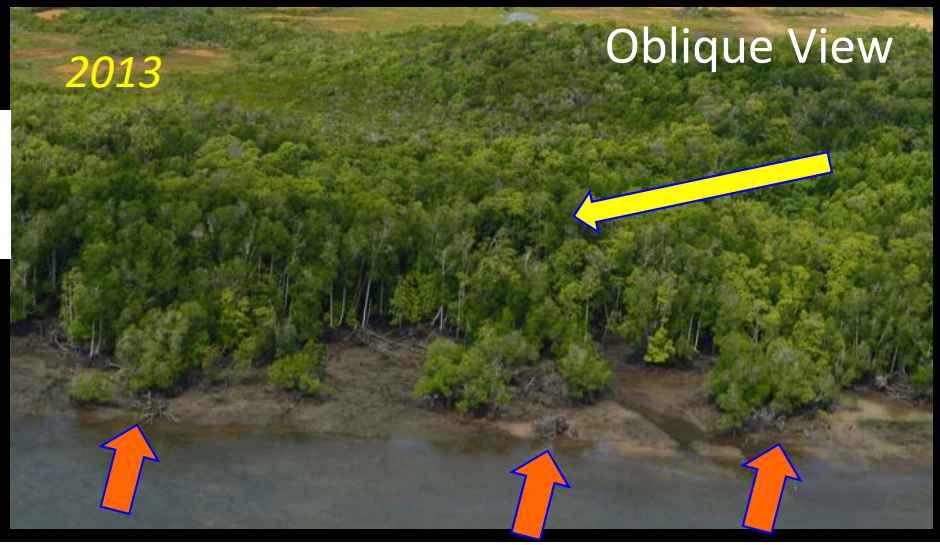
A new process observed – Inner Fringe Collapse

Highly dynamic edges

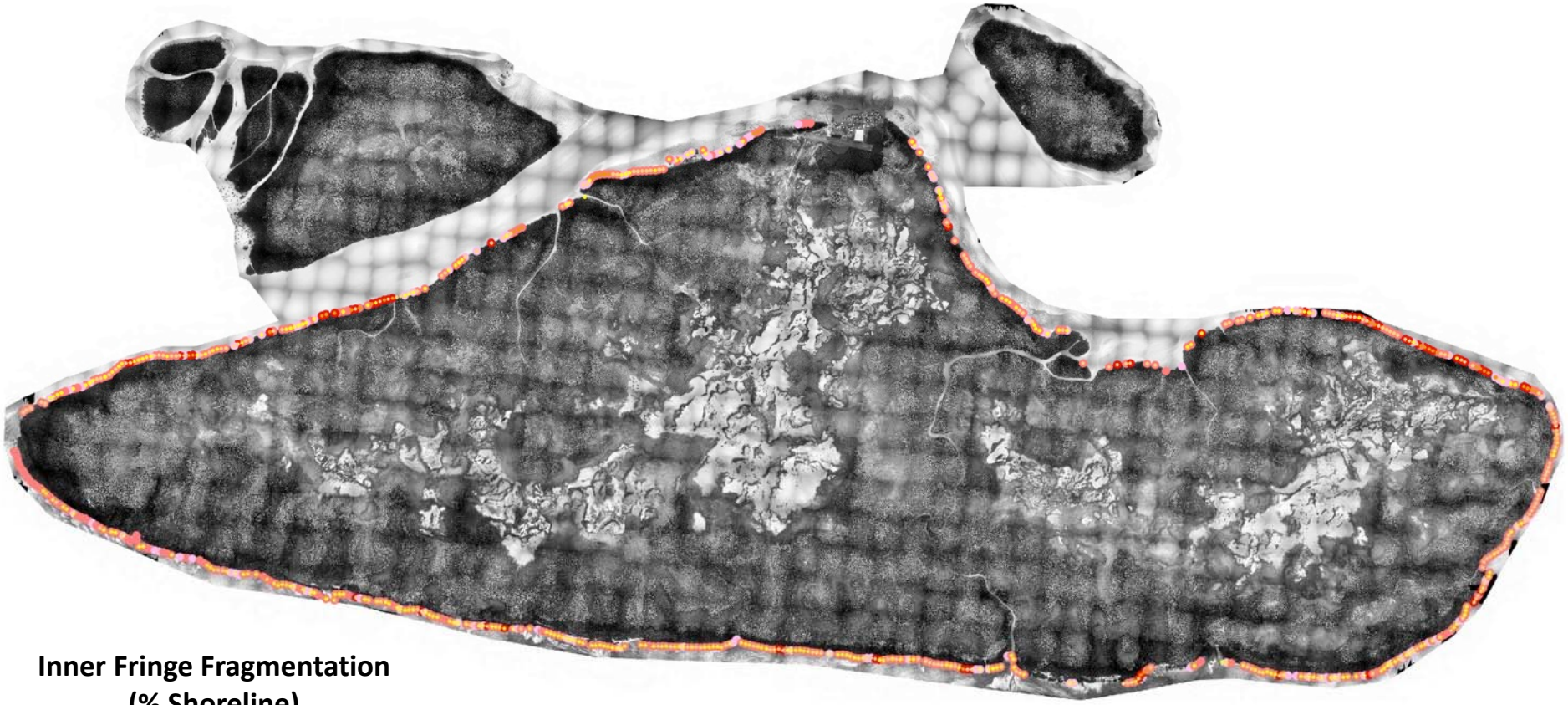
A new process observed – Inner Fringe Collapse

Satellite View NDVI

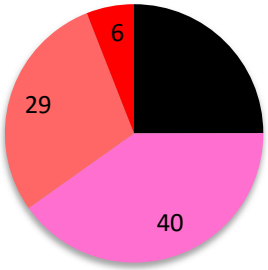
Processes of Change!



Boigu Island Mangrove Inner Fringe Condition - 2013



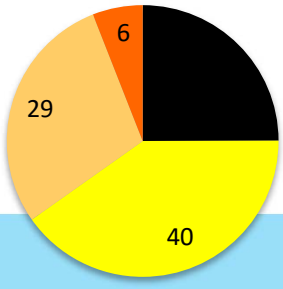
Inner Fringe Fragmentation (% Shoreline)



Legend

- High density gaps
- Moderate density gaps
- Low density gaps

Inner Fringe Dieback (% Shoreline)



Legend

- High density dieback
- Moderate density dieback
- Low density dieback

Is this process a new indicator of Sea Level Rise?

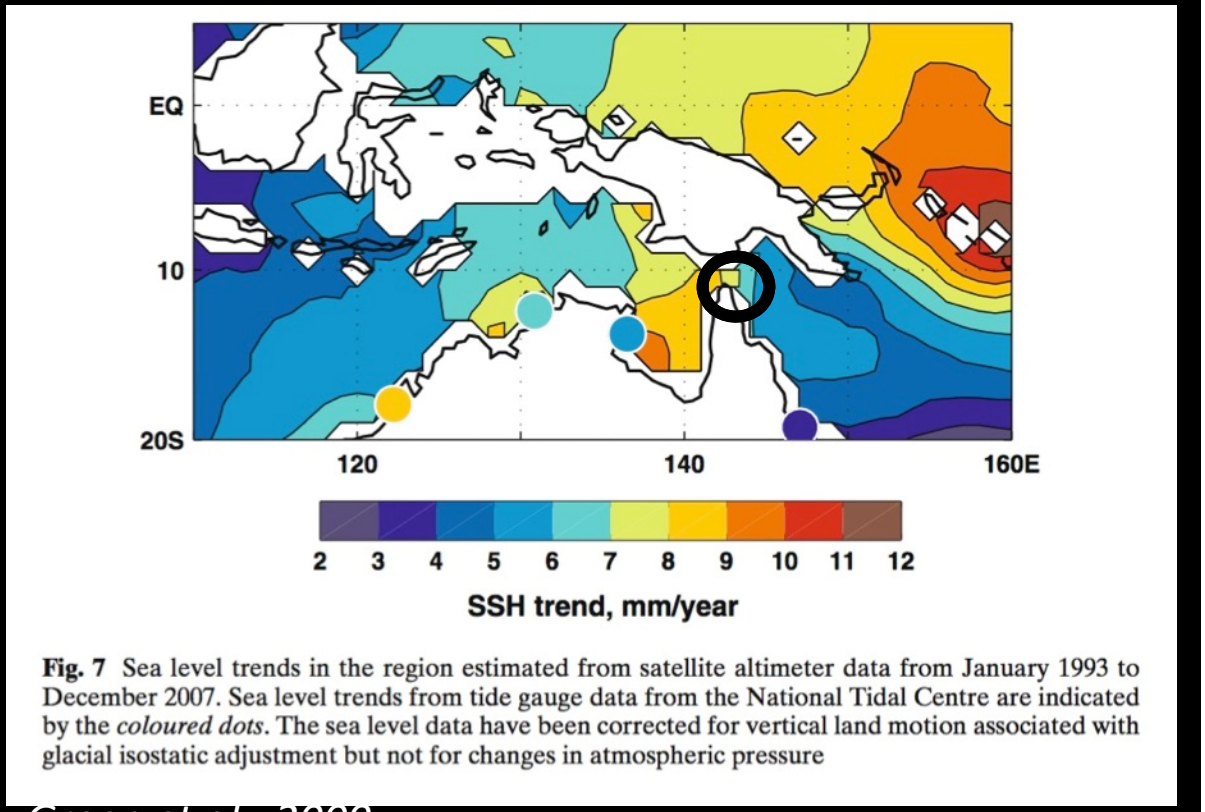


Fig. 7 Sea level trends in the region estimated from satellite altimeter data from January 1993 to December 2007. Sea level trends from tide gauge data from the National Tidal Centre are indicated by the *coloured dots*. The sea level data have been corrected for vertical land motion associated with glacial isostatic adjustment but not for changes in atmospheric pressure

Green et al., 2009

Local Rate is ~8 mm/yr
= 0.8 m in 100 years

The Response of Mangroves to Sea Level Rise

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Review of Expectations & Indicators

Shoreline retreat – loss of low intertidal fringe trees, front edge dieback

Landward expansion – encroachment of mangroves into supra-tidal zone

Inner fringe dieback – loss of inner fringe patches, gaps behind the fringe

Zonal shift – upland migration of species

Conclusions

- Working with local communities presents opportunities for discovery
- There is an increasing need for baseline surveys and long-term monitoring to provide greater insight into landscape scale mangrove processes and change
- Mangroves are not likely to respond linearly to sea level rise

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Acknowledgements

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