CLIMATICALLY-DRIVEN SEAGRASS DECLINES IN SHARK BAY MARINE PARK

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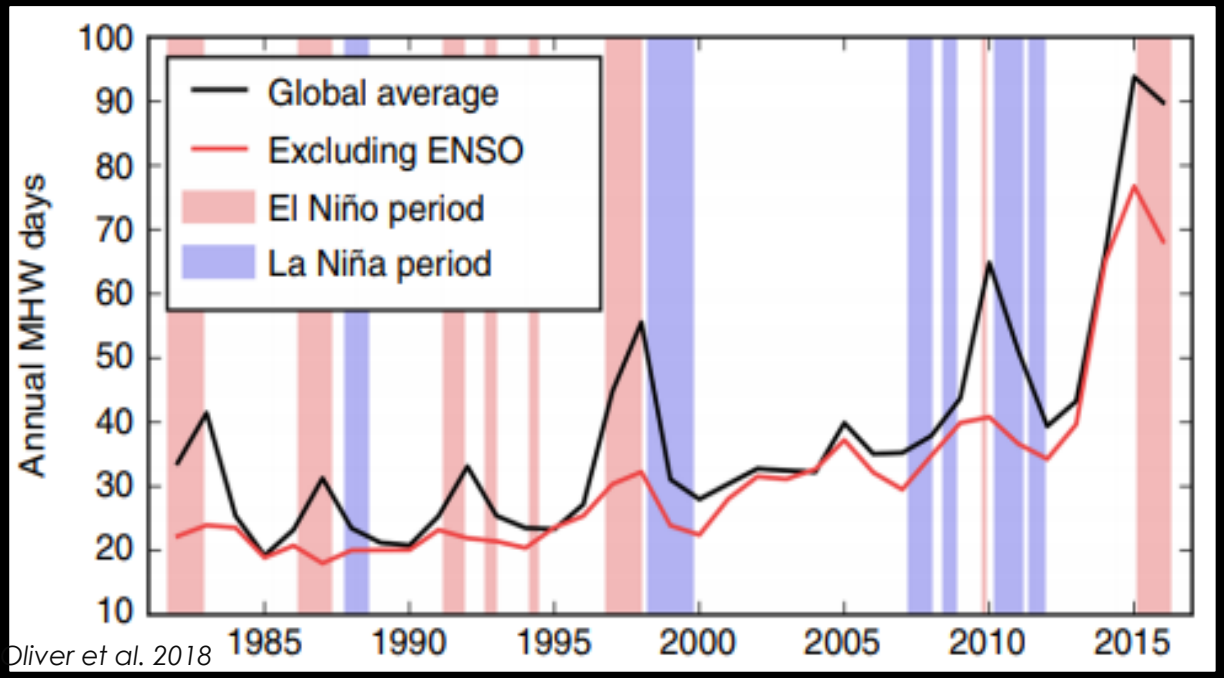
GOVERNMENT OF WESTERN AUSTRALIA

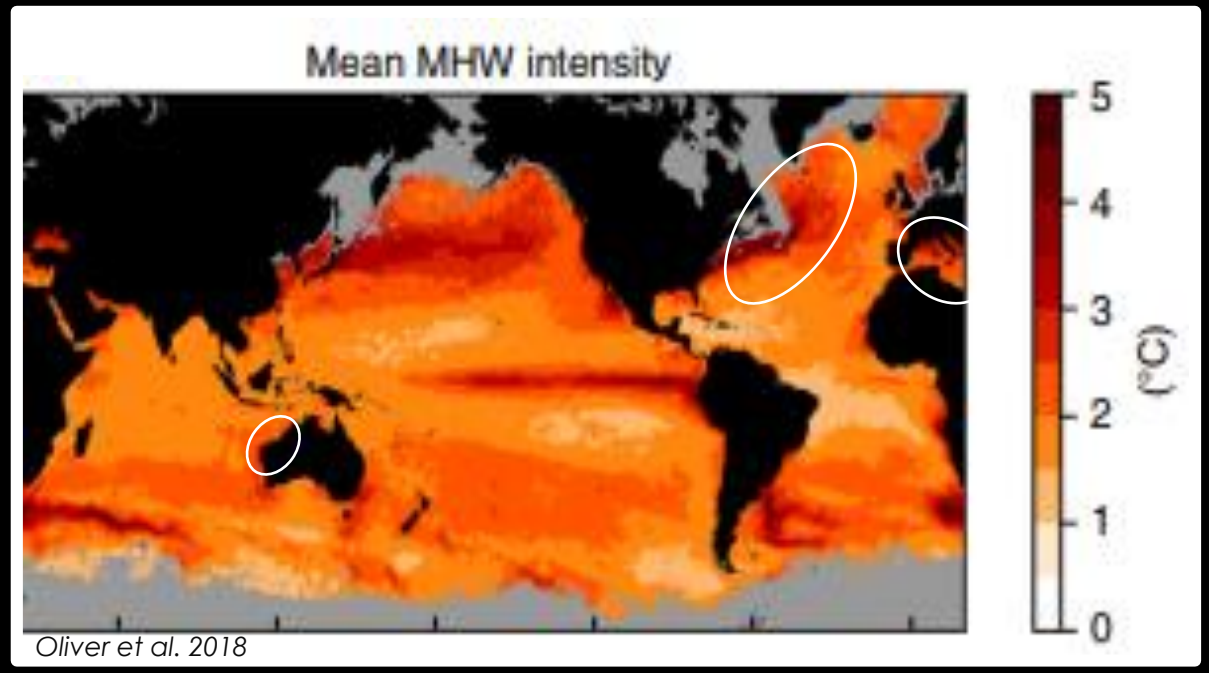
Department of **Biodiversity, Conservation and Attractions**

EXTREME CLIMATIC EVENTS

- Climate change → increased frequency, intensity & duration of extreme events



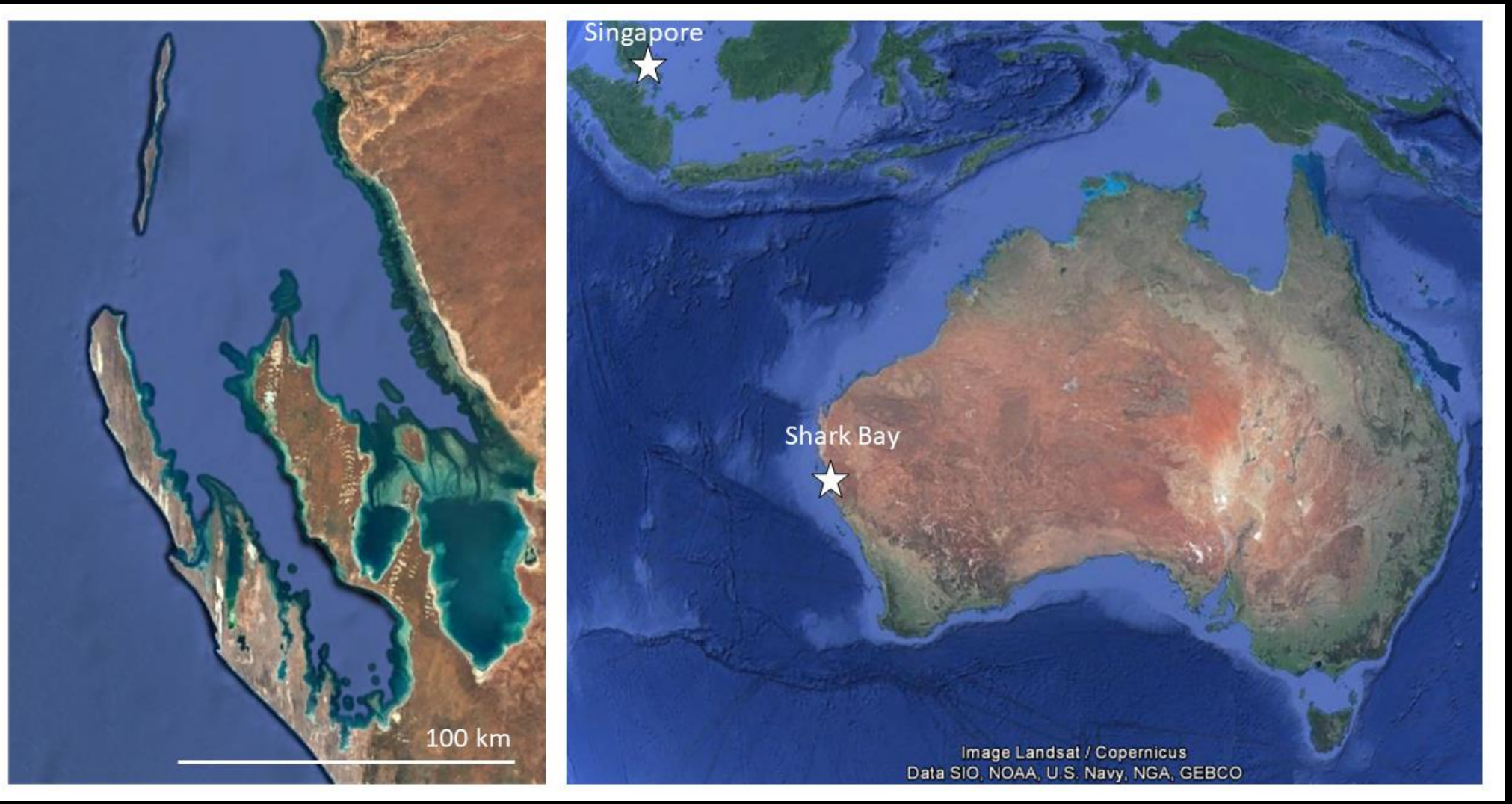
Oliver et al. 2018



Oliver et al. 2018

- Can induce changes in community composition, species range shifts

SHARK BAY


Singapore
Shark Bay
100 km
Image Landsat / Copernicus
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

SHARK BAY MARINE PARK

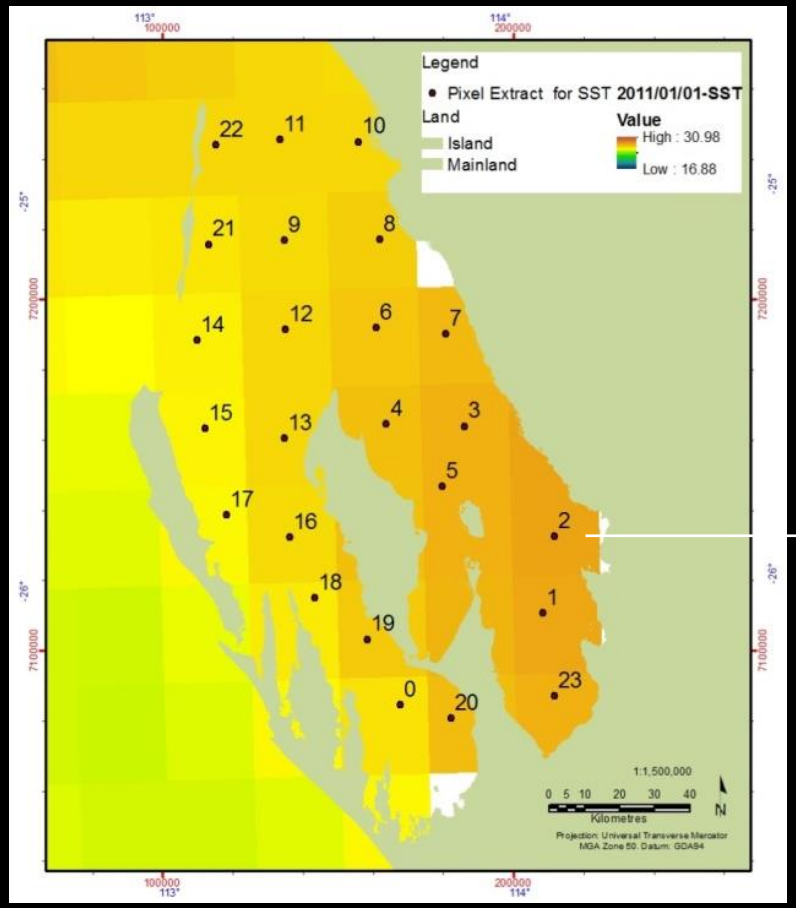
- World Heritage site, temperate–tropical transition zone
- Ecological valuable: seagrass, turtles, dugongs, sharks
- *Amphibolis* & *Posidonia* dominant + multiple colonising spp.
- Unprecedented Marine Heat Wave in summer 2010/2011 resulted in seagrass loss in some areas

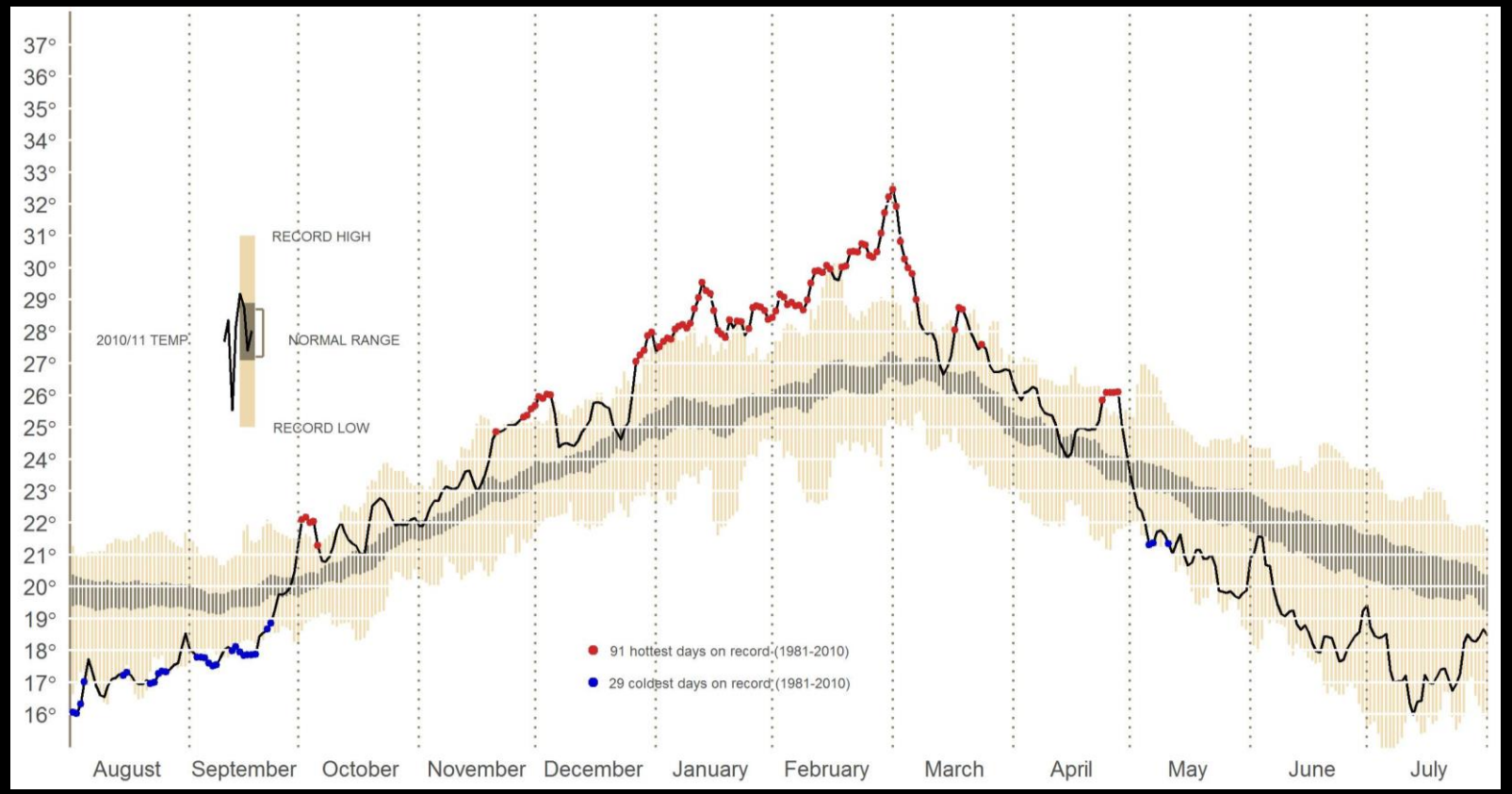

Scott Eanes


Alex Brown

SEA SURFACE TEMPERATURE

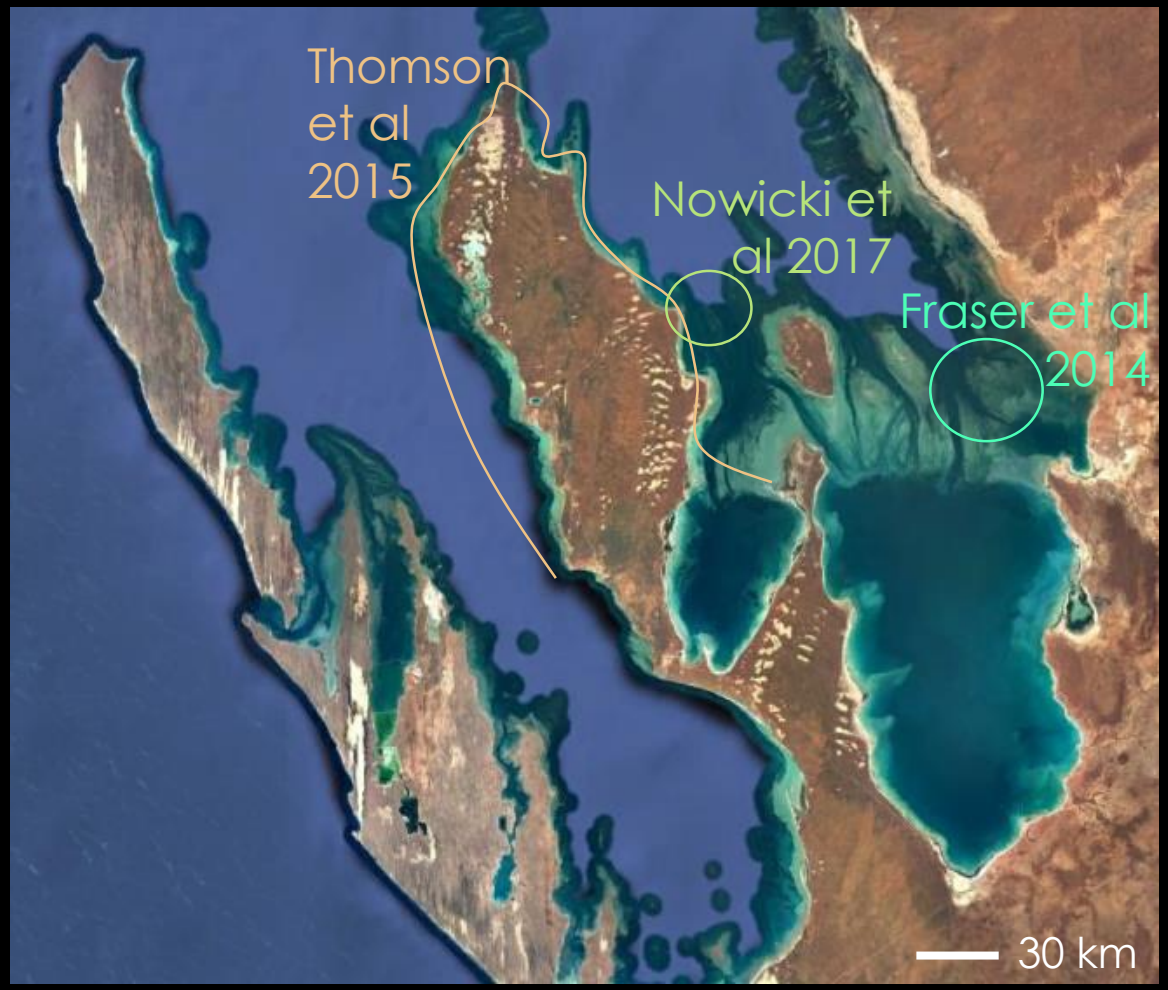
- NOAA dataset, 25x25km pixels, daily SST data extracted for each pixel using R https://coralreefwatch.noaa.gov/satellite/sst.php
- Time series (1981 - 2011)

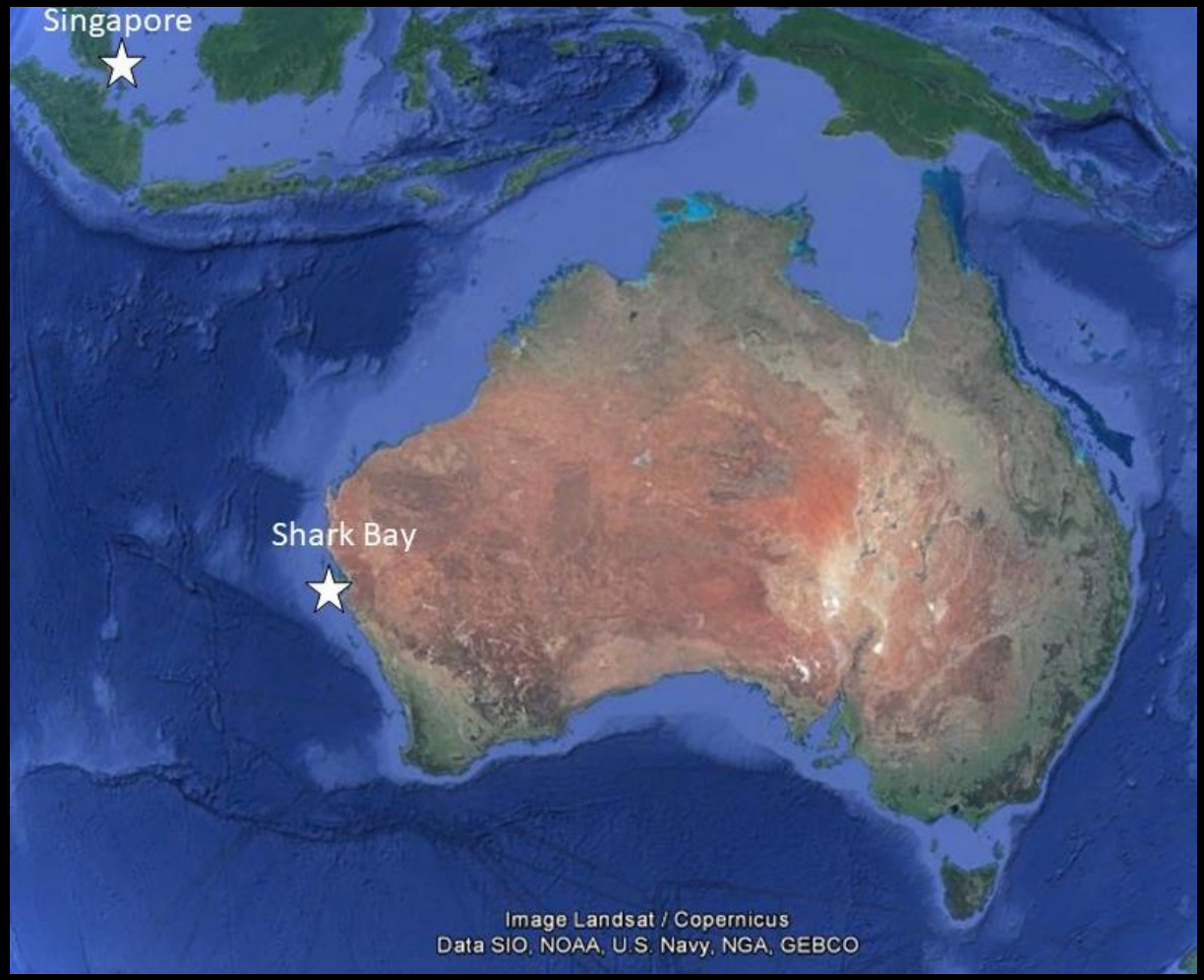




Processed by Bart Huntley

SHARK BAY


Thomson et al 2015
Nowicki et al 2017
Fraser et al 2014
30 km


Singapore
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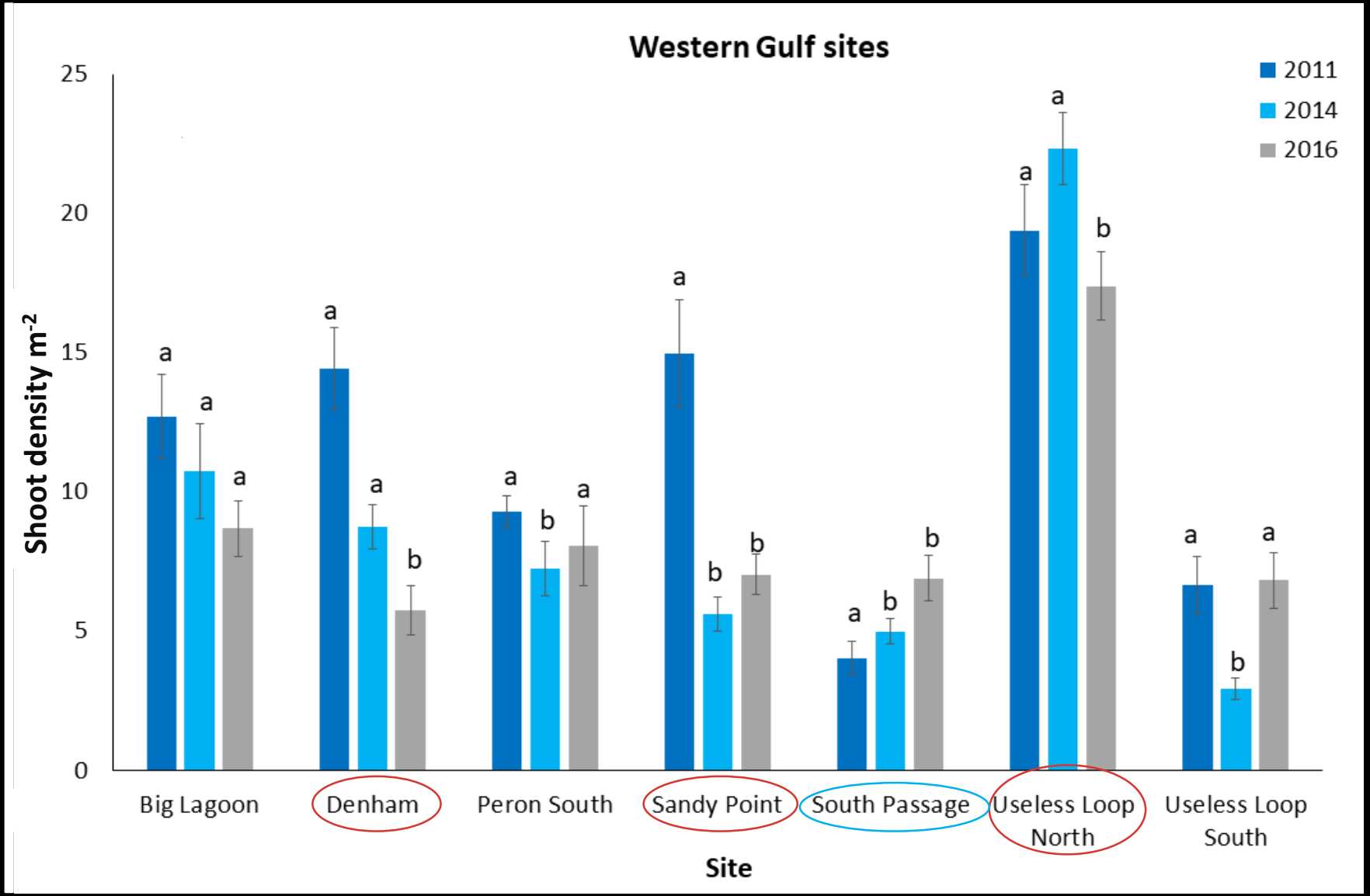
AIMS & METHODS

- Illustrate changes in total seagrass extent across SBMP (spatial & temporal losses/gains)
- Determine changes in shoot density, cover & species composition

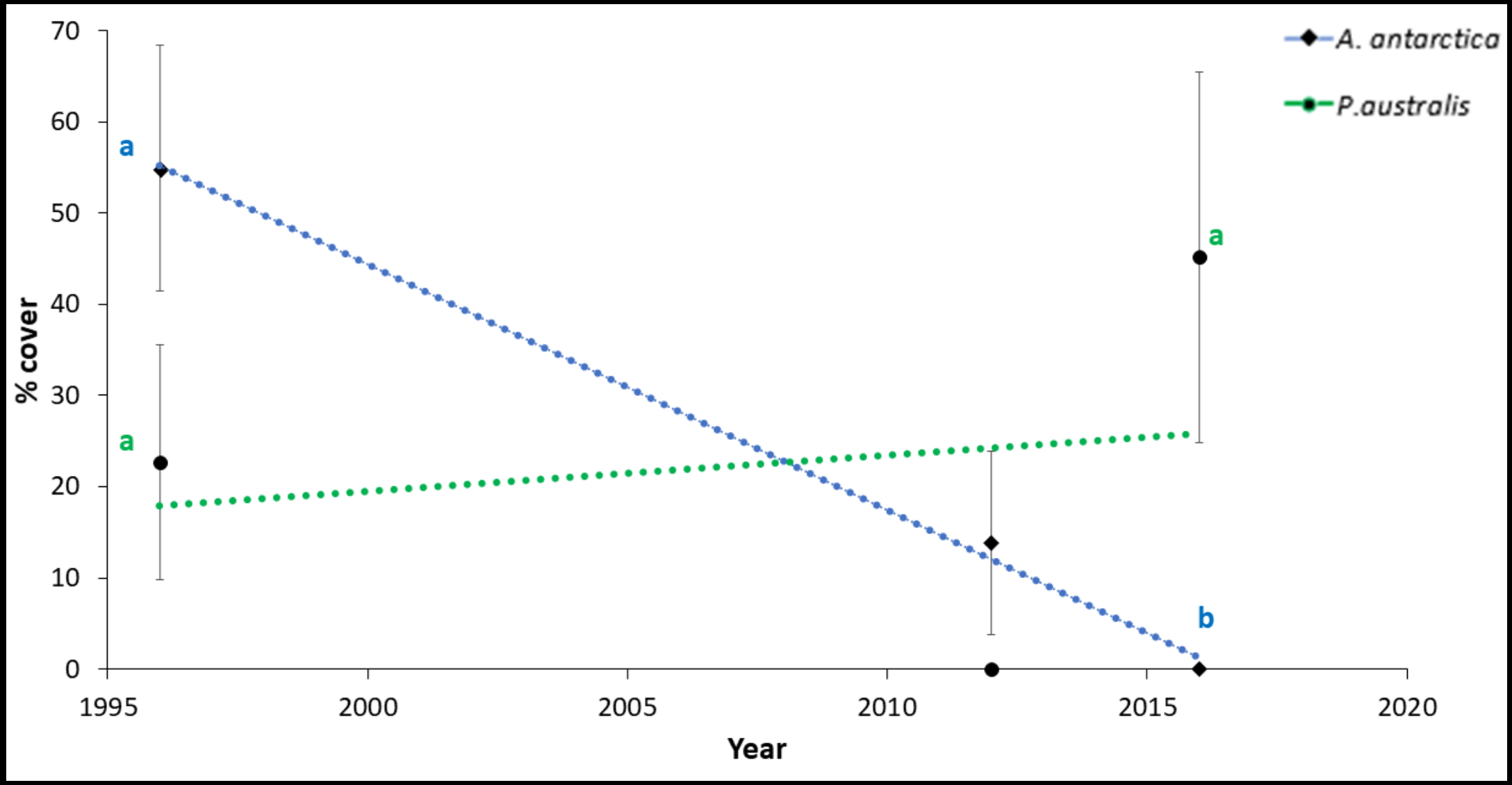
Data collected:

- **1)** Sea Surface Temperature
- **2)** Shoot density m^{-2} (long-term monitoring)
- **3)** % cover (drop-camera)
- **4)** Spatial extent (habitat mapping)

MESO-SCALE: SHOOT DENSITY

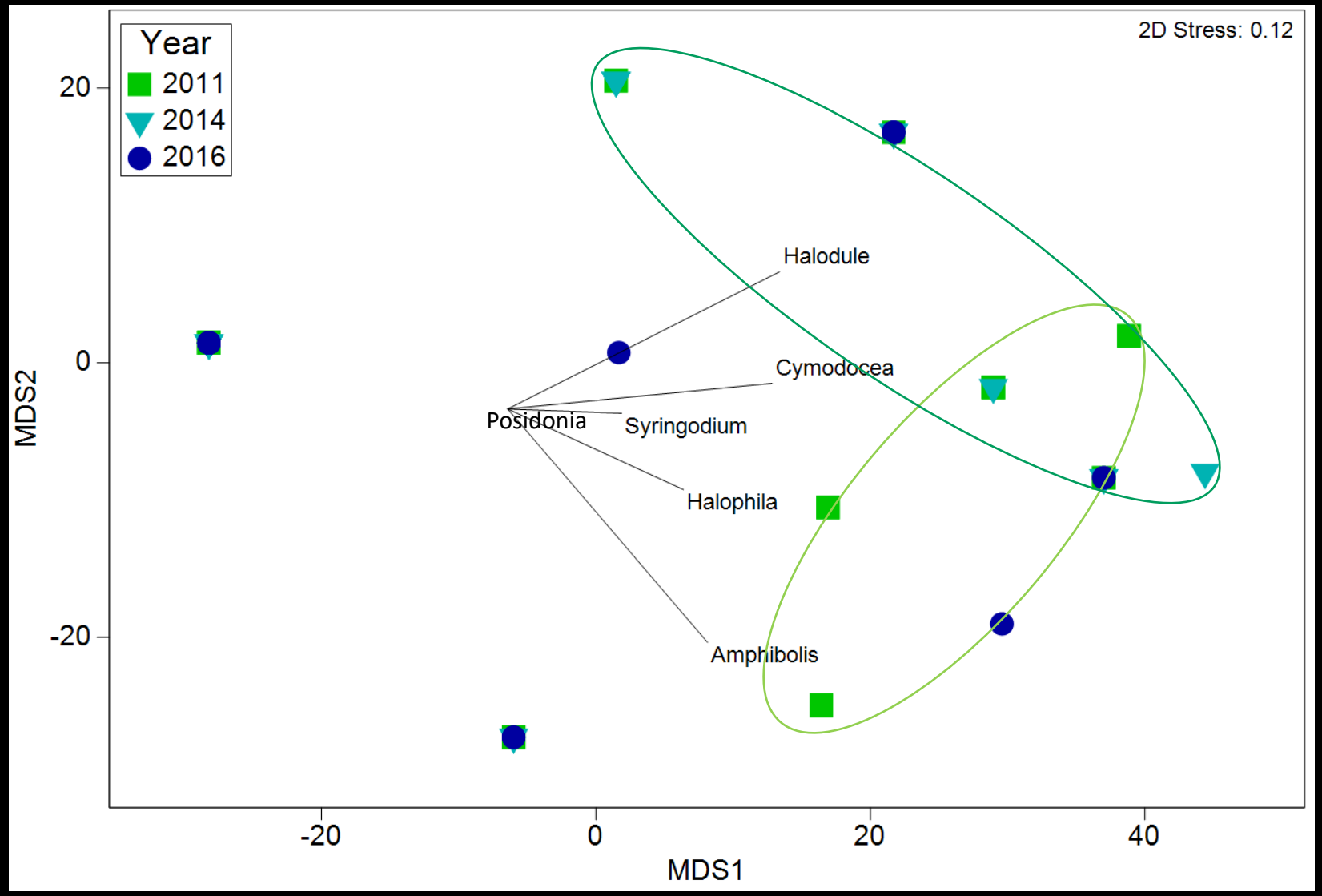


MACRO-SCALE: % COVER

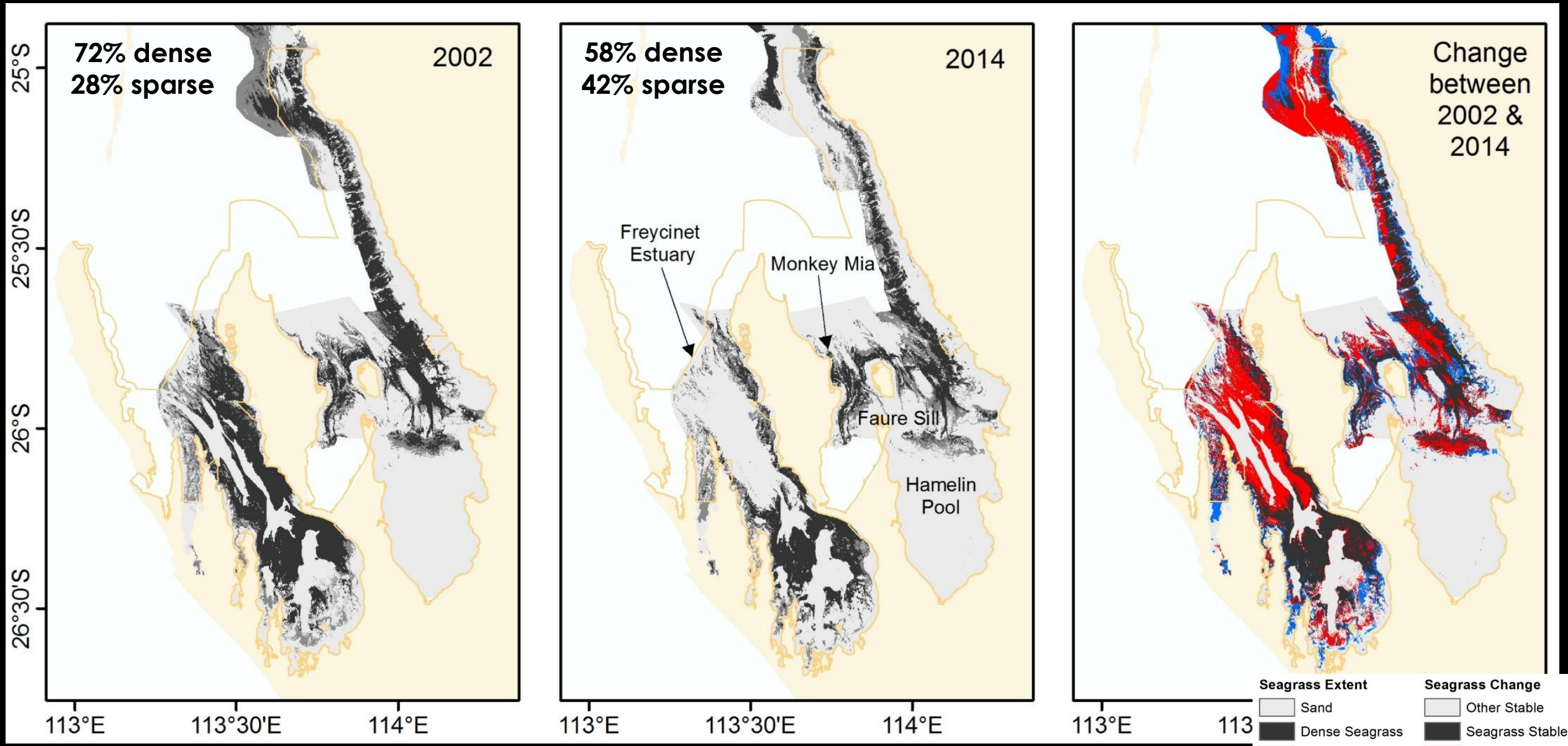


MACRO-SCALE: SPECIES COMPOSITION

- Changes in composition likely driven by significant loss of Amphibolis from 2011



BROAD-SCALE: SEAGRASS EXTENT



Maps created by Kathy Murray

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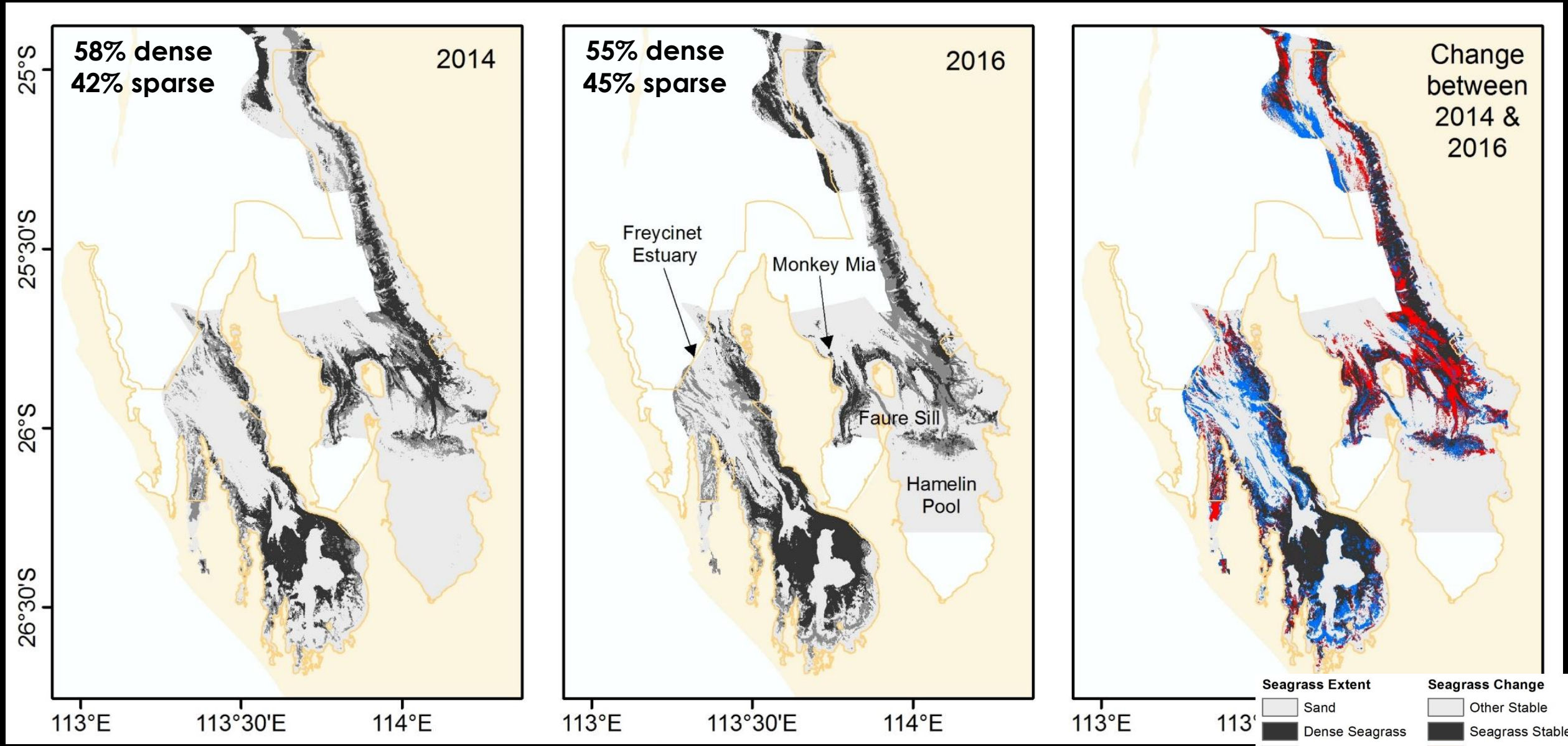

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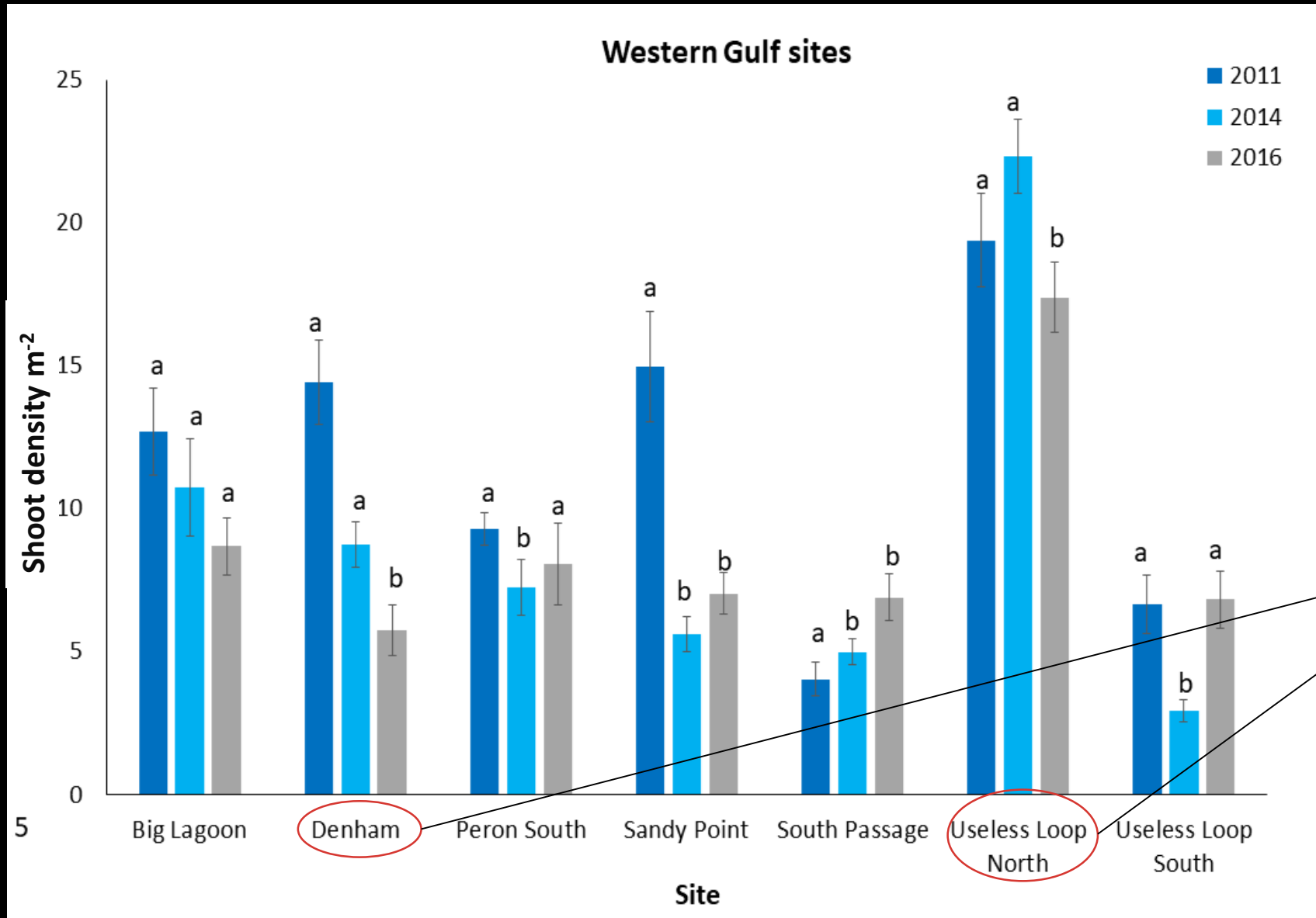
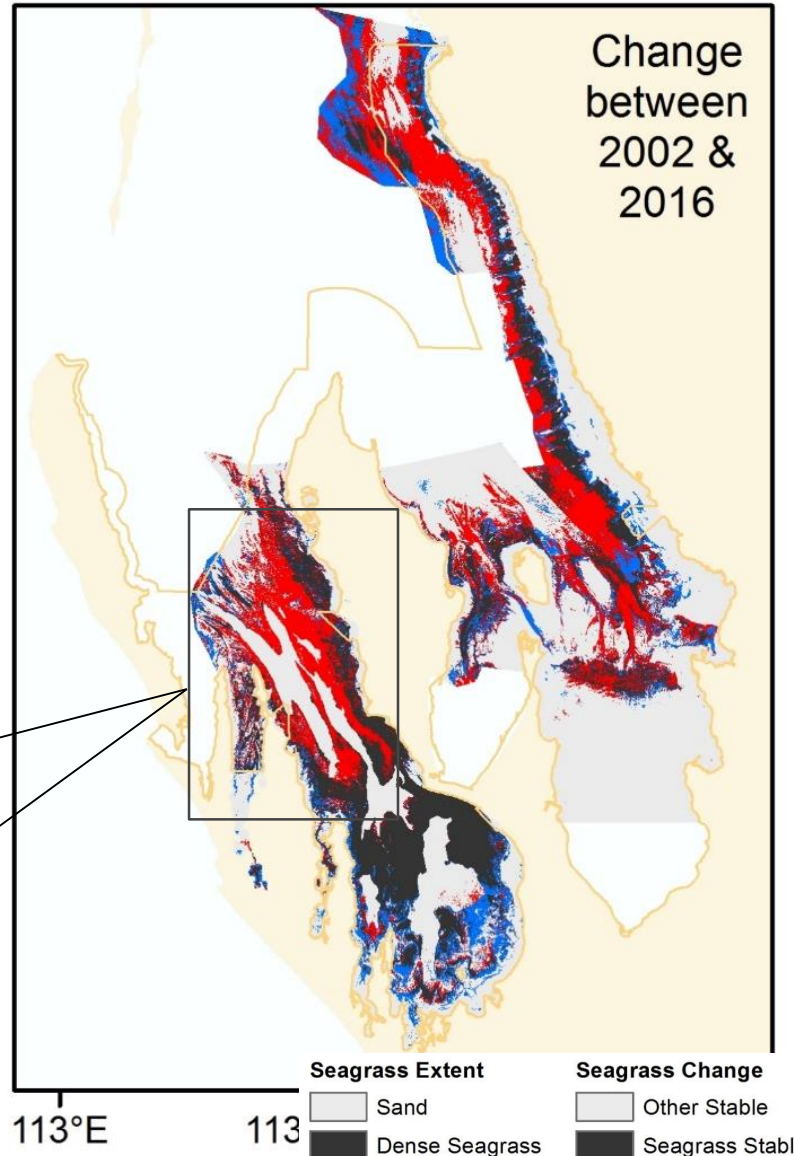




Maps created by Kathy Murray

SUMMARY

Land area of Singapore!

- Meso-scale: shoot density variable, several sites decreasing
- Macro-scale: % cover stable for *Posidonia*, declining for *Amphibolis*
- Broad-scale: 21% loss of seagrass 2002-2014 (some recovery in 2014-2016)
  - 72% of seagrass area = **dense** meadows in 2002
  - By 2016 this area reduced to 55%
- A range of methods can help provide holistic information on large spatial scales
- Studying large areas requires a coordinated approach


M. Rule

IMPLICATIONS

- ↓ ecosystem services, ↑ CO_2, ✣ ecological implications

- Reduce pressures that impact resilience (run-off/ herbicides), measure changes in other env variables, track trends + ecological consequences

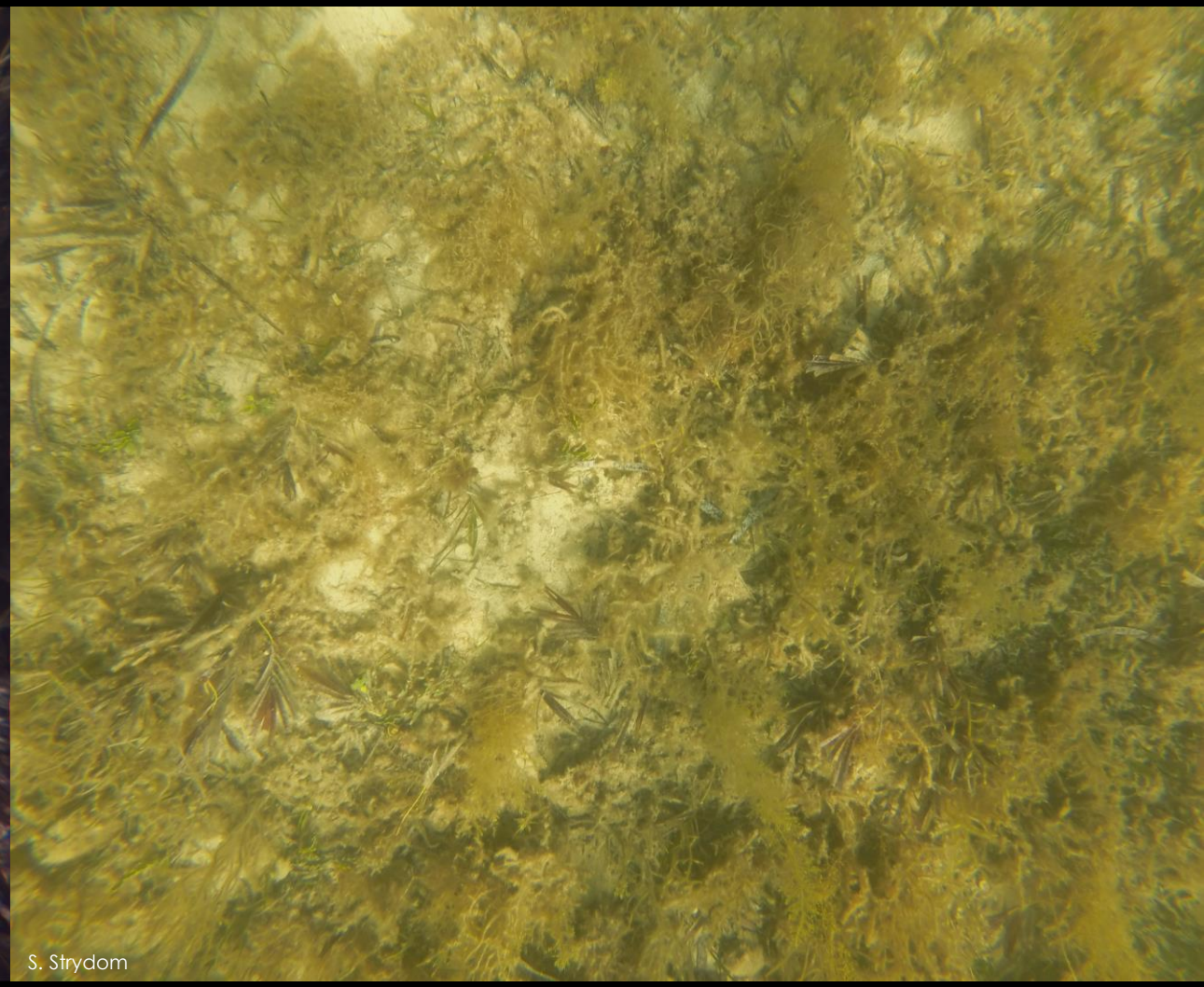
- When proposals for aquaculture facilities or port expansions arrive – make the trends & ecosystem implications known!

- Resilience experiments & thermal stress thresholds required

Thank You

May 2010

May 2018



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