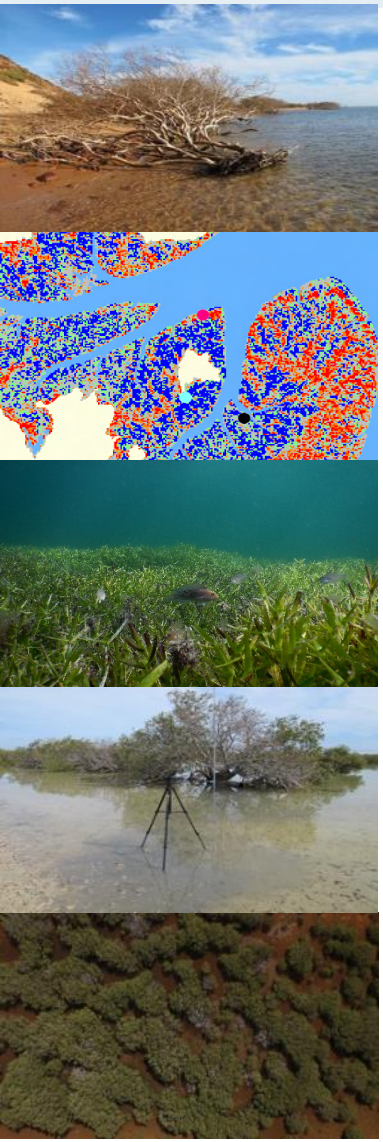
Department of Biodiversity, Conservation and Attractions

GOVERNMENT OF WESTERN AUSTRALIA



MONITORING IN SHARK BAY MARINE PARK WESTERN AUSTRALIA

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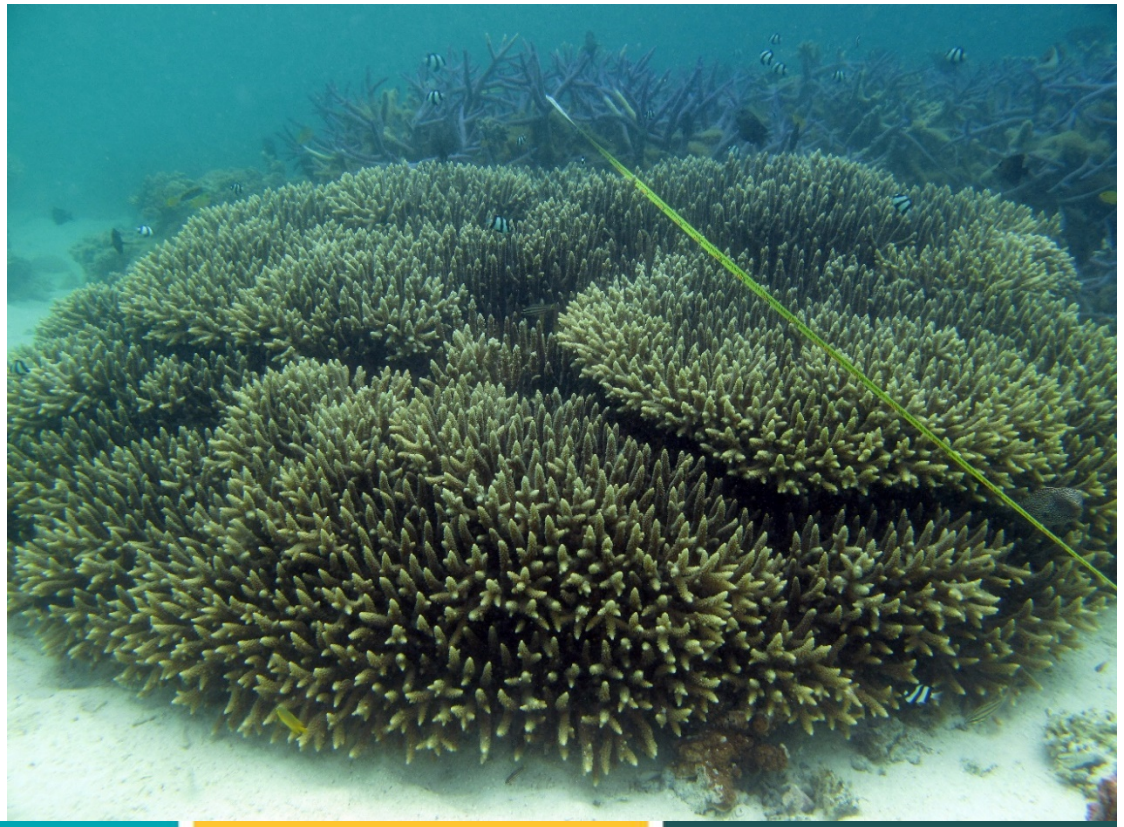
Marine Monitoring

- Legislated role to manage it's estate
- Establish long-term MER on ecological assets

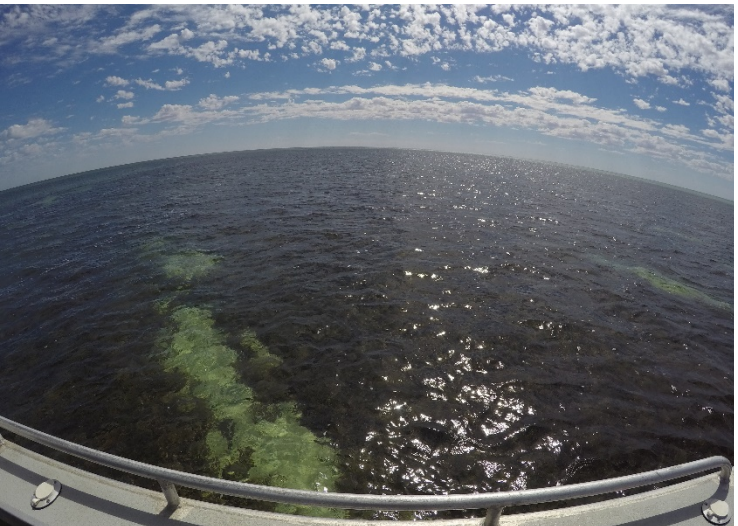
- Conduct LTM on key assets & pressures to support management

- Condition-Pressure-Response model

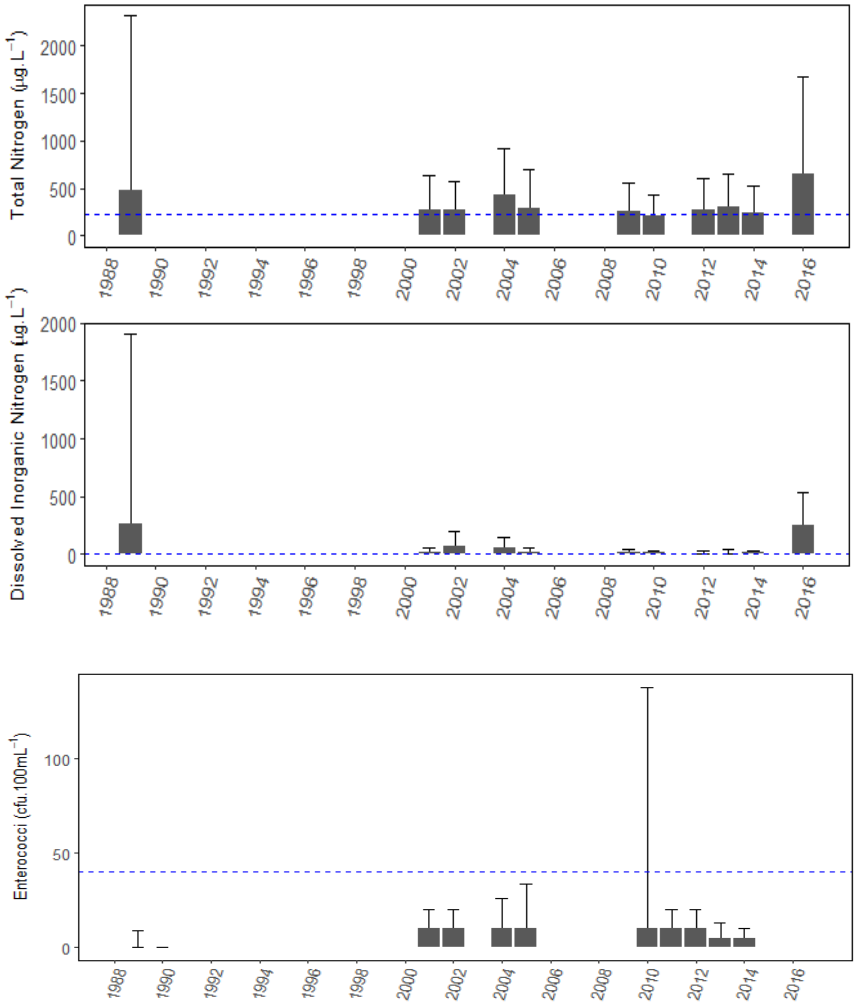


Monitoring in SBMP

- Water quality
  - Nutrients at Monkey Mia
  - Modelled in situ seawater temp (mIST)
- Seagrass
  - In situ transects (shoot density)
  - Drop-camera (% cover)
  - Remote sensing imagery (extent)
- Mangroves
  - Spatial extent
  - Projected foliage cover
- Corals
  - In situ transects (% cover)
  - Recruitment (tiles)
- Fish
  - DOVs & BRUVs in a range of habitats (abundance)

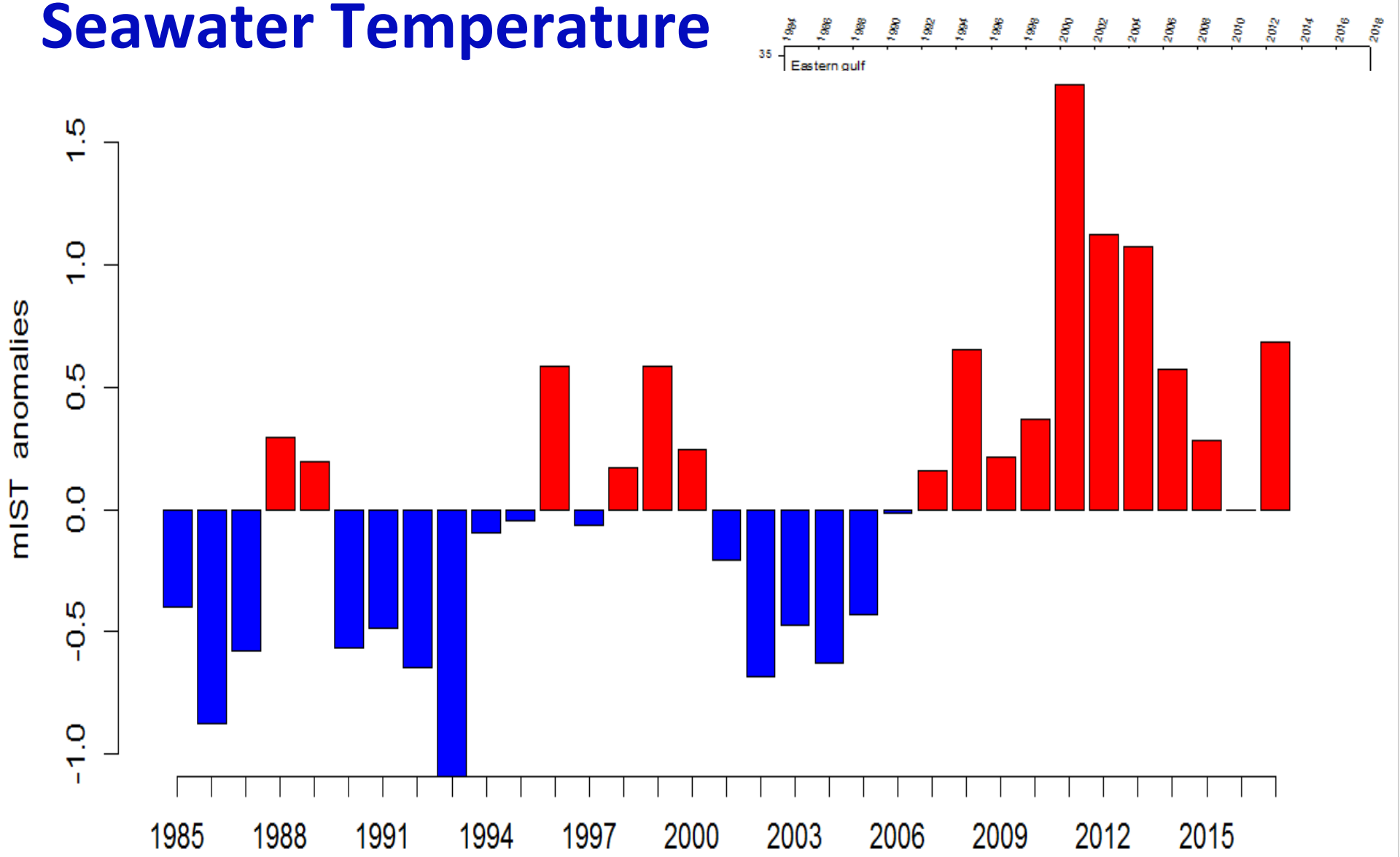


Water Quality

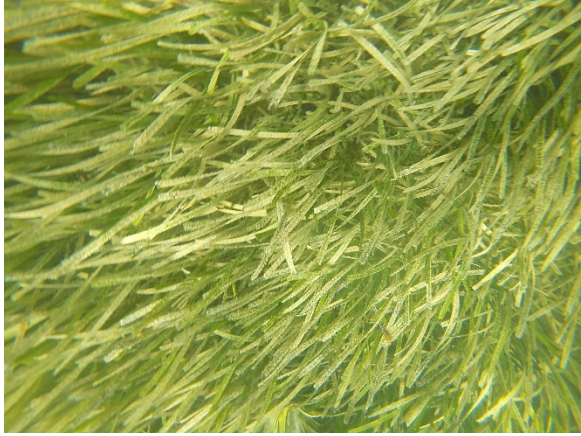


- Pressure = Terrestrial run-off
  - Monkey Mia
- Indicator = Nutrients
  - Nitrogen, Phosphates
- Indicator = Pathogens
  - *Enterococci* spp.
- Trend = Stable

Seawater Temperature

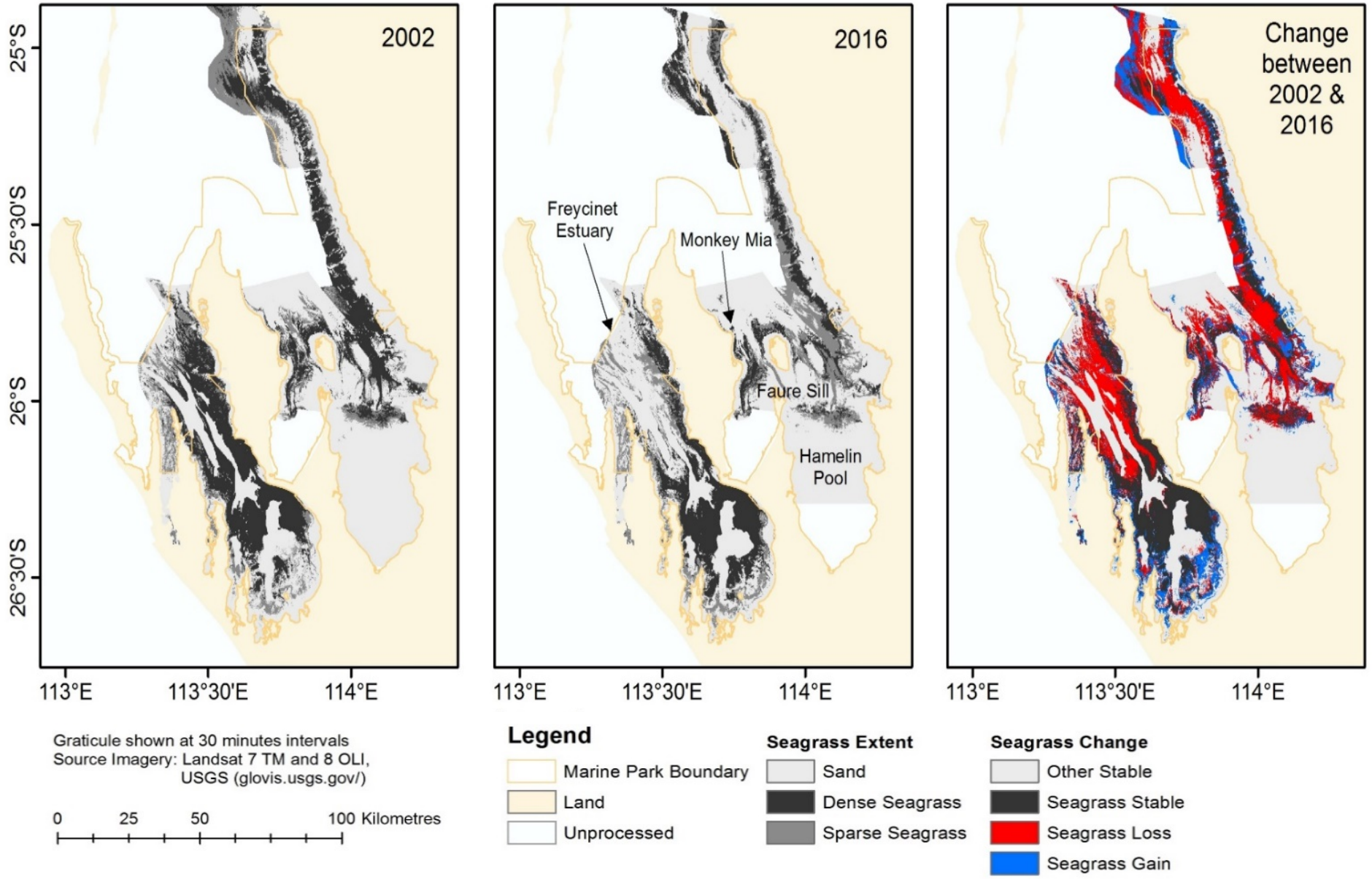


Seagrass



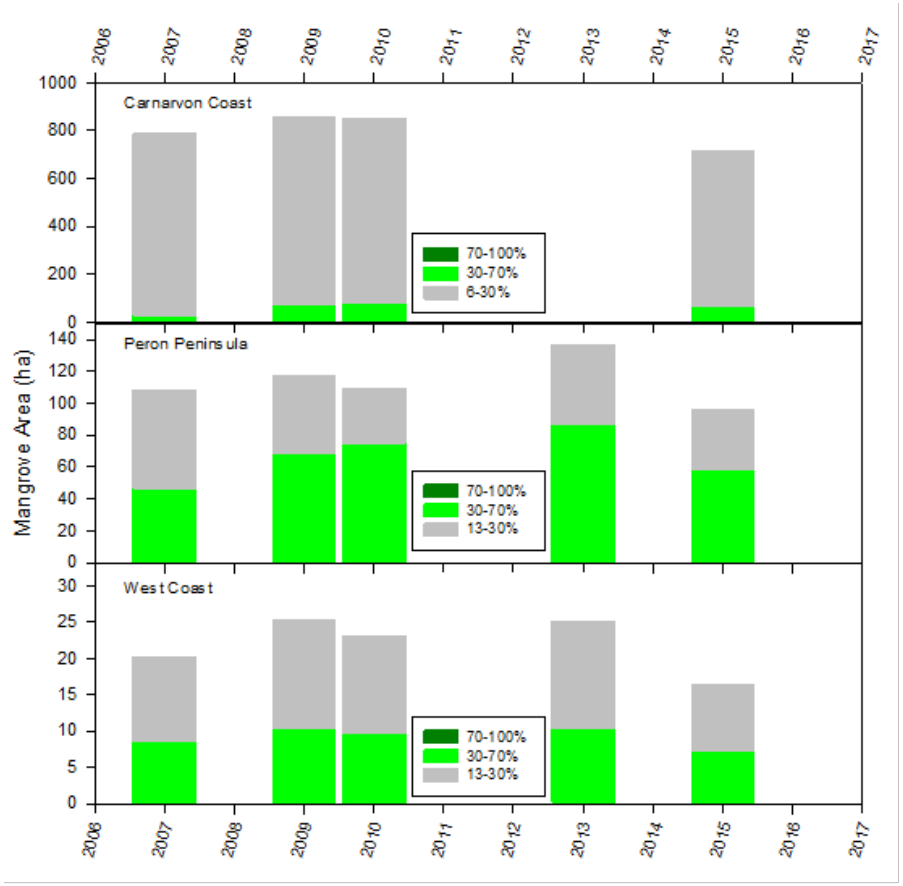
- Pressure = ↑ Seawater Temperature
- Indicator = Shoot density, canopy height, morphology metrics, community composition, % cover, spatial extent*
- Trend = Declining*
  - Shoot density = stable for *Posidonia*
  - Canopy height = decreasing for *Posidonia*
  - Morphology metrics = insufficient data for *Amphibolis*
  - Community composition = decrease in *Amphibolis*
  - % cover = decrease in *Amphibolis*

Seagrass

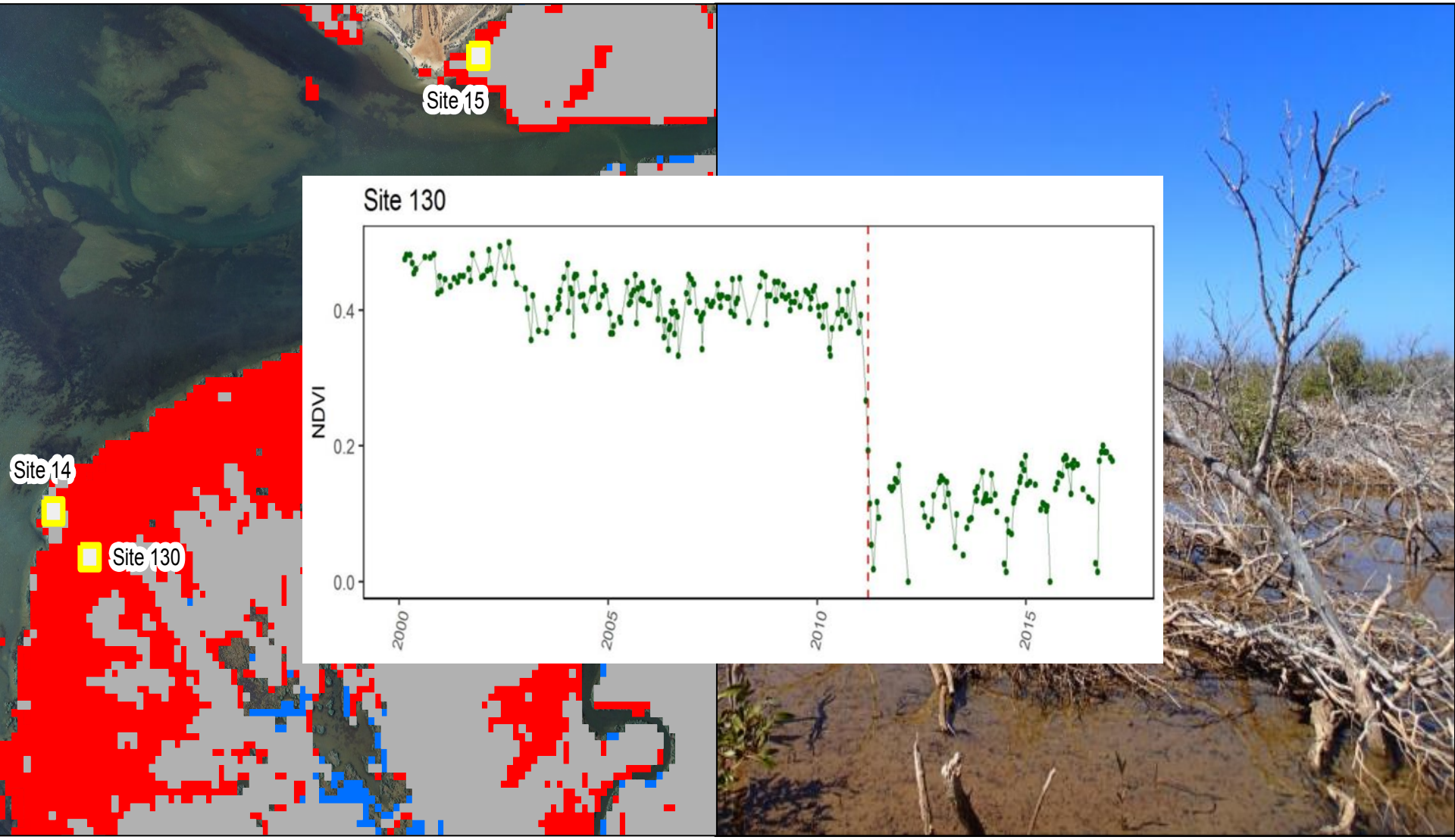

2002
2016
Change between 2002 & 2016
Freycinet Estuary
Monkey Mia
Faure Sill
Hamelin Pool
25°S
25°30'S
26°S
26°30'S
113°E
113°30'E
114°E
Graticule shown at 30 minutes intervals
Source Imagery: Landsat 7 TM and 8 OLI, USGS (glovis.usgs.gov/)
0 25 50 100 Kilometres
Legend
Marine Park Boundary
Land
Unprocessed
Seagrass Extent
Sand
Dense Seagrass
Sparse Seagrass
Seagrass Change
Other Stable
Seagrass Stable
Seagrass Loss
Seagrass Gain

Mangroves

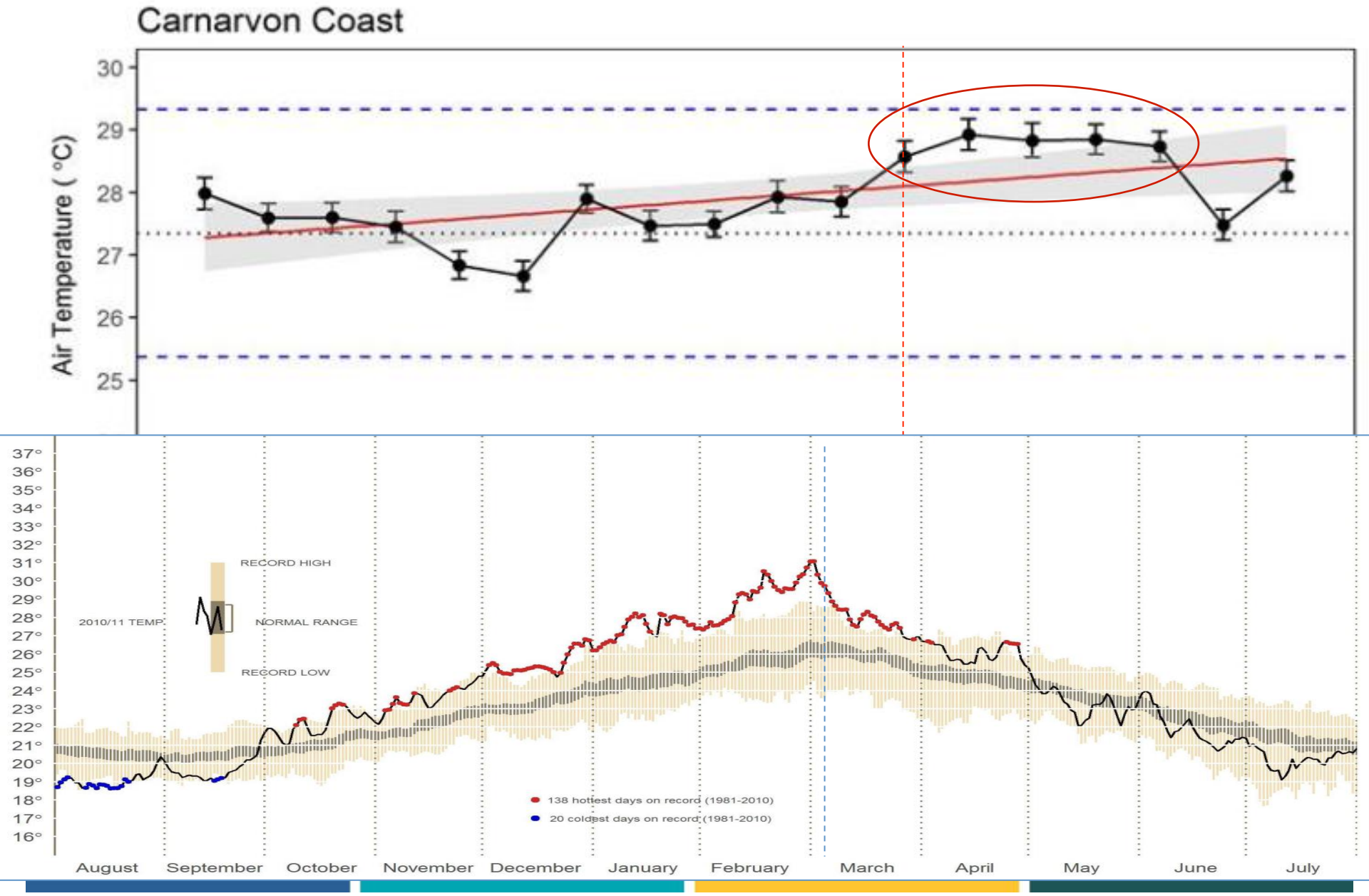
- Indicator = Spatial extent*
- Indicator = Canopy density
- Trend = Declining*



Mangroves


Site 15
Site 14
Site 130
Site 130
NDVI
0.4
0.2
0.0
2000
2005
2010
2015

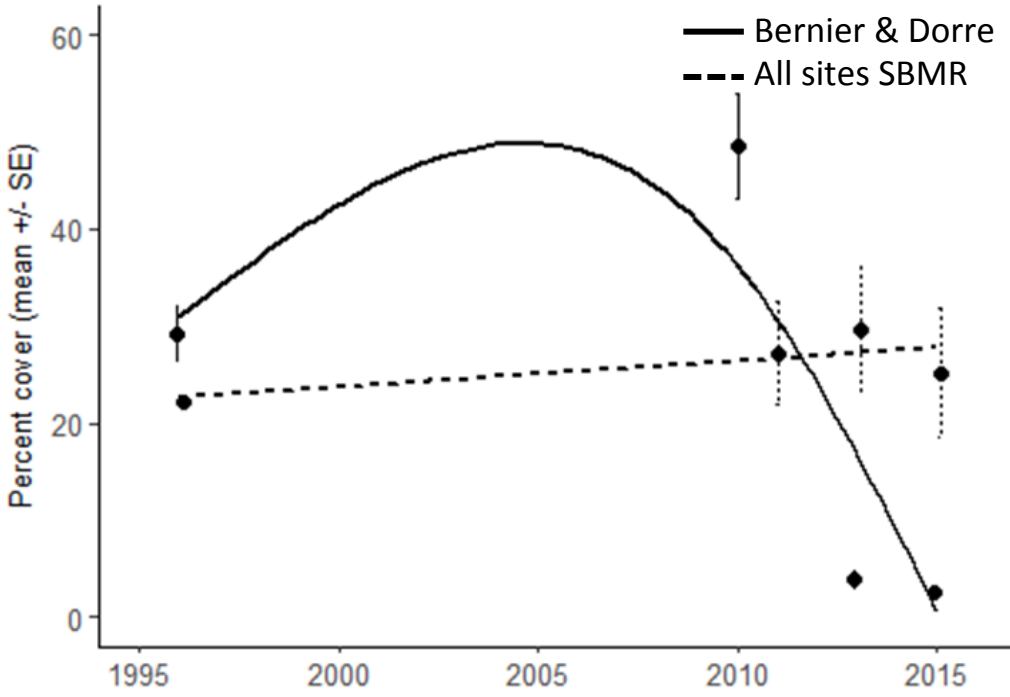
Mangroves


Carnarvon Coast
Air Temperature (°C)
30
29
28
27
26
25
RECORD HIGH
2010/11 TEMP
NORMAL RANGE
RECORD LOW
138 hottest days on record (1981-2010)
20 coldest days on record (1981-2010)
37°
36°
35°
34°
33°
32°
31°
30°
29°
28°
27°
26°
25°
24°
23°
22°
21°
20°
19°
18°
17°
16°
August
September
October
November
December
January
February
March
April
May
June
July

Coral

- Pressure = ↑ Seawater temperature
- Indicator: *m*IST
- Trend = Increasing

- Indicators = Coral cover, community composition, recruitment
- Trend = Uncertain



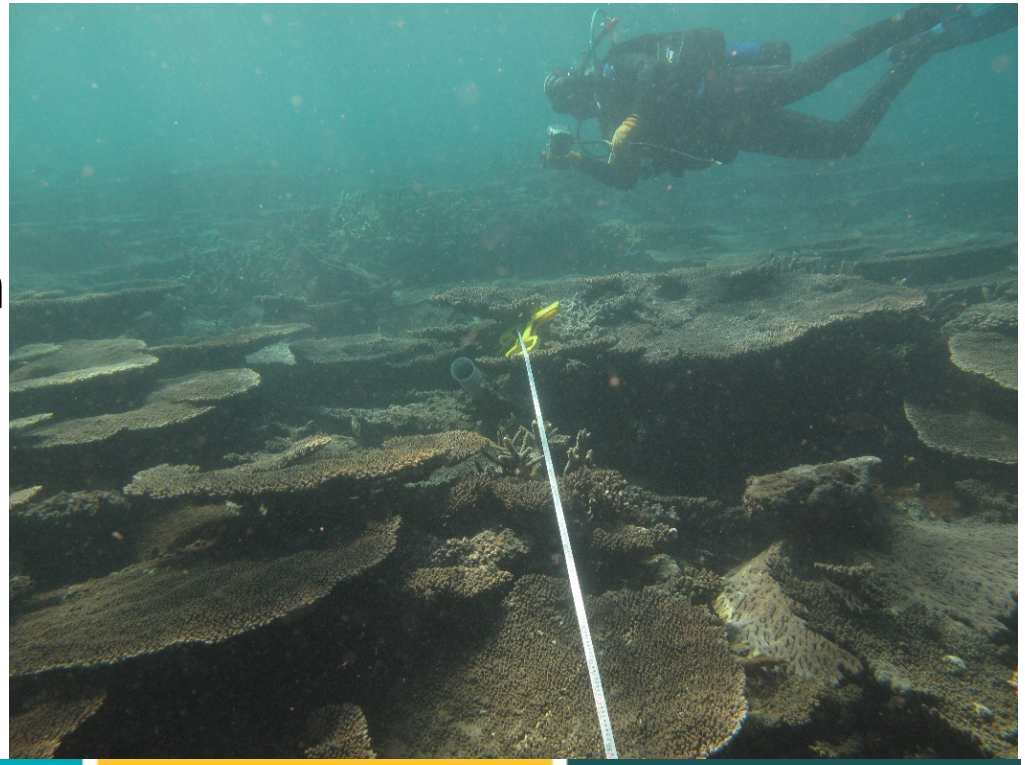
Coral

Temporal differences:
Cover at Bernier and Dorre islands declined by ~90% since 2010 (Ningaloo Niña), especially *Acroporidae*

Coral

- Overall: coral cover in the marine reserves remained stable across the survey period (1996-2015) at 15-25%

- Confidence for the whole area is low (temporal gap between surveys in 1996 & 2010/2011) but will increase over time



Fish

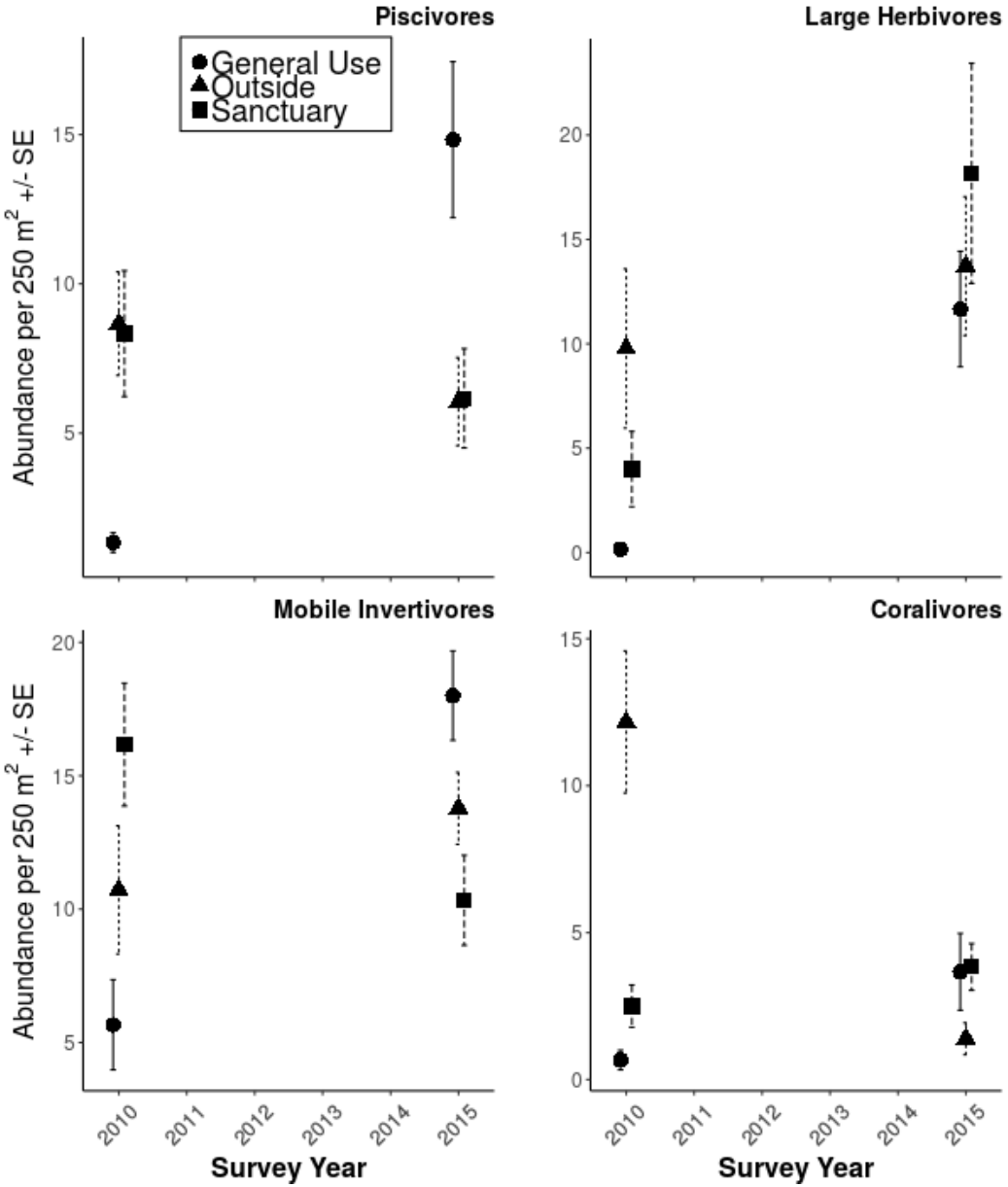
- Indicators =

Abundance, Species richness, Community composition

- Pressures =

Charter/ commercial/ rec fishing & Habitat loss

- Trend = Uncertain



Fish

- Decline in corallivores at Bernier/ Dorre Is. likely associated with declining coral condition

- Commercial & charter fishing declined (2008-2015) & recreational fishing remained stable (2011-2014)

- Confidence in finfish community condition will improve as the program starts to include non-coral habitats & spatial/ temporal resolution improves

Summary

- Temperature = key pressure, mangroves & seagrass extent/ condition declining, unclear coral cover & finfish community trends

- Massive area (748,725ha) makes it difficult to have a high resolution program (coverage of sites + regular sampling intervals)

- Reliance on remote sensing becoming a valuable supplementary tool

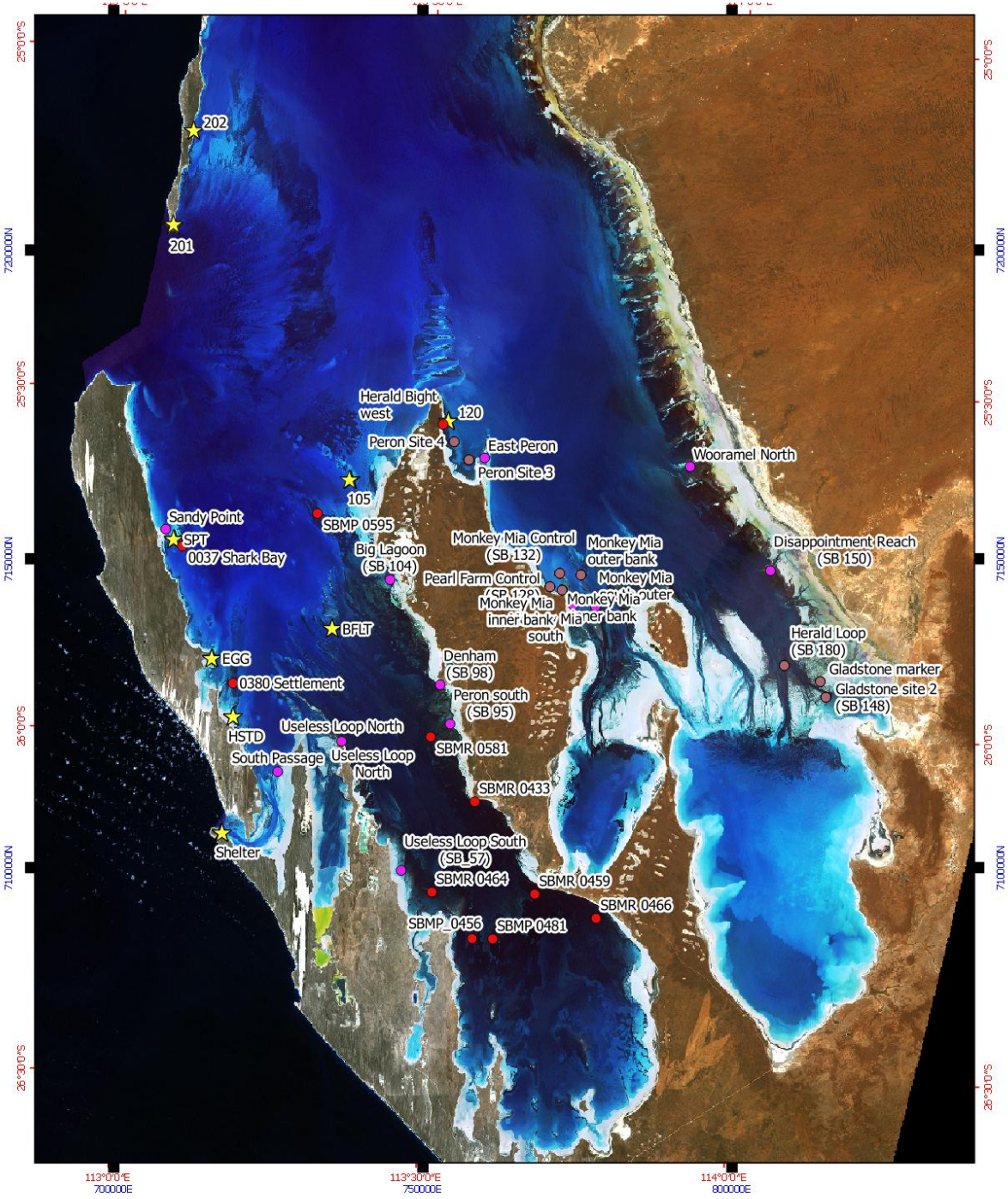
- More details in: "Ecological monitoring in Shark Bay marine reserves report" (due this year)

Going Forward

- Priorities: sediment quality, water quality, filter feeders, mangrove & seagrasses, microbial communities
- What are the ecological consequences of mangrove, seagrass & coral loss (turtles, dugongs, fish, invertebrates)?

- Susceptibility for mangrove loss in a changing global climate: high resolution topography; sediment porewater salinity; sediment accommodation; sea level rise; migration
- Repeated time-series *high resolution* benthic mapping

- How does a change in composition & extent of mangroves & seagrass influence their ecological function?
- Identify & assess areas with high resistance &/or recovery potential
- Assess the level of connectivity of Shark Bay with other regions


202
201
Herald Bight west
120
Peron Site 4
East Peron
Peron Site 3
Wooramel North
105
Sandy Point
SBMP 0595
SPT
0037 Shark Bay
Big Lagoon (SB 104)
Monkey Mia Control (SB 132)
Monkey Mia outer bank
Disappointment Reach (SB 150)
Pearl Farm Control
Monkey Mia inner bank south
BFLT
Herald Loop (SB 180)
EGG
Denham (SB 98)
Gladstone marker
0380 Settlement
Peron south (SB 95)
Gladstone site 2 (SB 148)
HSTD
Useless Loop North
SBMR 0581
South Passage
Useless Loop North
SBMR 0433
Shelter
Useless Loop South (SB 57)
SBMR 0464
SBMR 0459
SBMR 0466
SBMP 0456
SBMP 0481
25°0'0"S
25°30'0"S
26°0'0"S
26°30'0"S
7200000N
7150000N
7100000N
113°0'0"E
700000E
113°30'0"E
750000E
114°0'0"E
800000E