Marine Biodiversity Hub & Future Research

MPA Workshop

Tuesday 16th November 2010

Nic Bax University of Tasmania/CSIRO

Main Questions

CERF 2008-10

- How can we describe and predict marine biodiversity?
- What are the options for management?

NERP Bid 2011-14

- How do we monitor national ecosystem health?
- Integrated management of marine biodiversity
- Biodiversity discovery and Ecosystems knowledge in support of marine bioregional planning
- How can we improve management of listed species?

Stakeholders & Collaborators

- DEWHA
- AFMA
- NGOs
- Fishing Industry
- Oil & Gas Industry
- Tourism Industry

- NSW DECCW
- SA Marine Parks
- NT
- DSTO
- Hydographic Office
- Integrated Marine Observing System (IMOS)
- MACC R&D Committee
- MACC Marine Biodiversity Working Group
- National Marine Protected Area Working Group
- Census of Marine Life
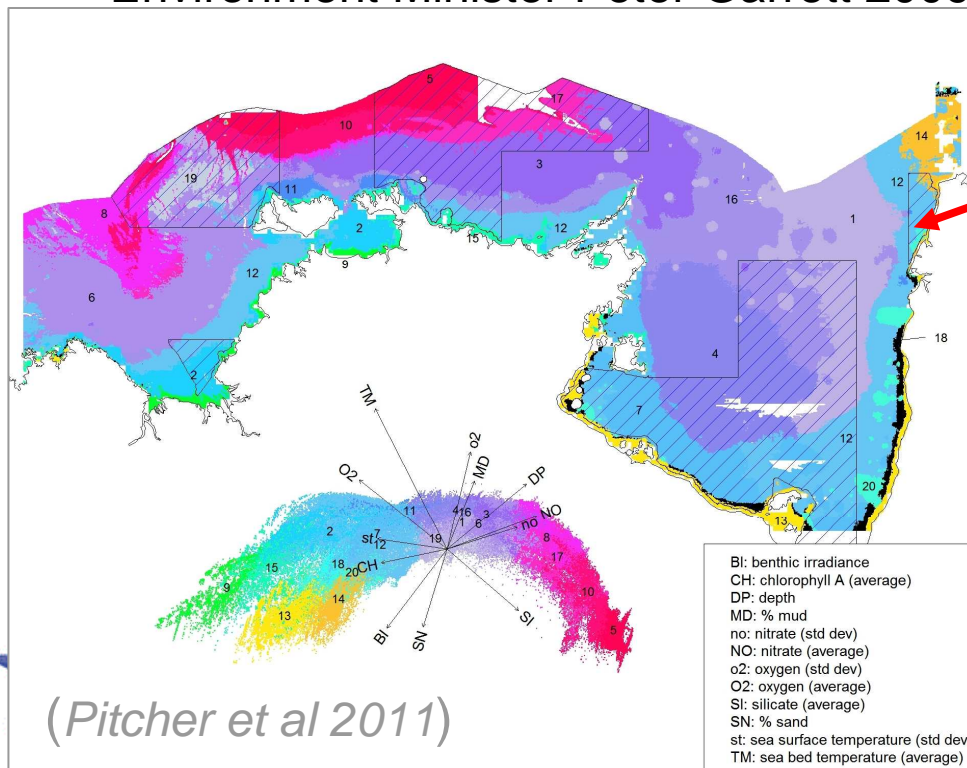- Global Ocean Biodiversity Initiative
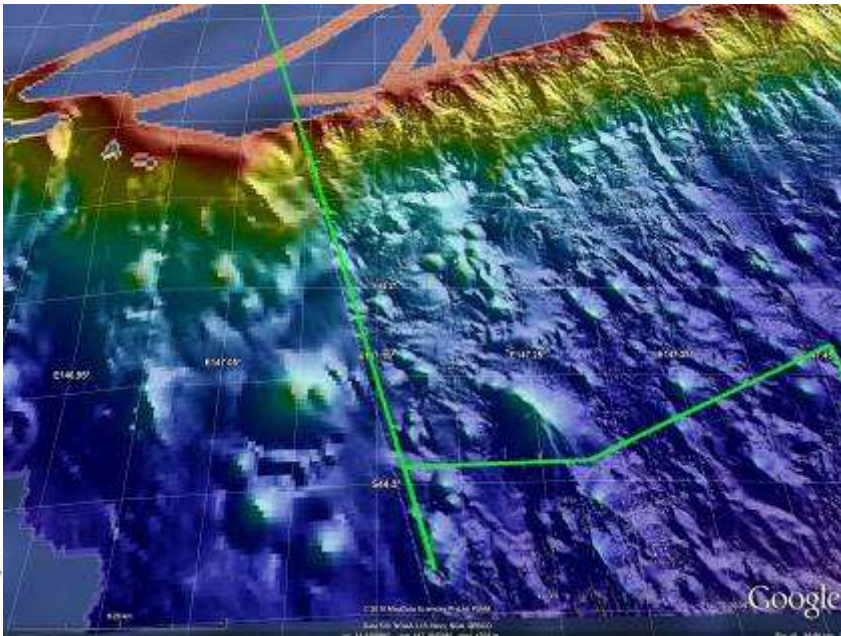
Prediction and Management of Australia's Marine Biodiversity

Describing and Predicting Biodiversity Nationally

"Limited information about Australia's marine biodiversity, especially for the species and ecosystems of the more remote and deeper areas, has been a barrier to developing a strategic approach to the sustainable management of our oceans."

\- Environment Minister Peter Garrett 2009

Bathymetry

Current stress

Oxygen SD

BI: benthic irradiance
CH: chlorophyll A (average)
DP: depth
MD: % mud
no: nitrate (std dev)
NO: nitrate (average)
o2: oxygen (std dev)
O2: oxygen (average)
SI: silicate (average)
SN: % sand
st: sea surface temperature (std dev)
TM: sea bed temperature (average)

(*Pitcher et al 2011*)

37 GA and CSIRO datasets

Predicting Biodiversity – one key point

Predictions are probabilistic and include uncertainty
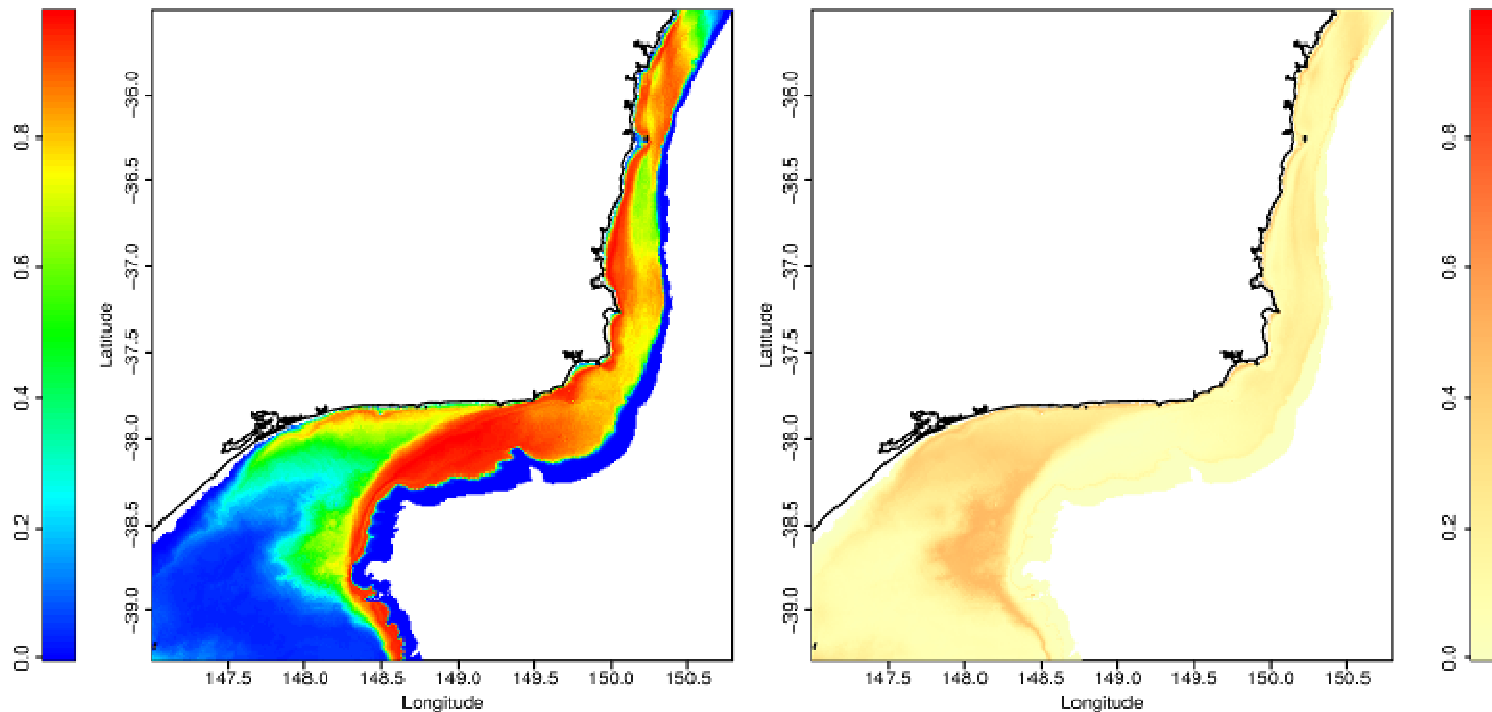
Group 4 – mid-shelf species include Southern Eagle ray,
longspine flathead, eastern school whiting

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Dunstan and Foster 2010

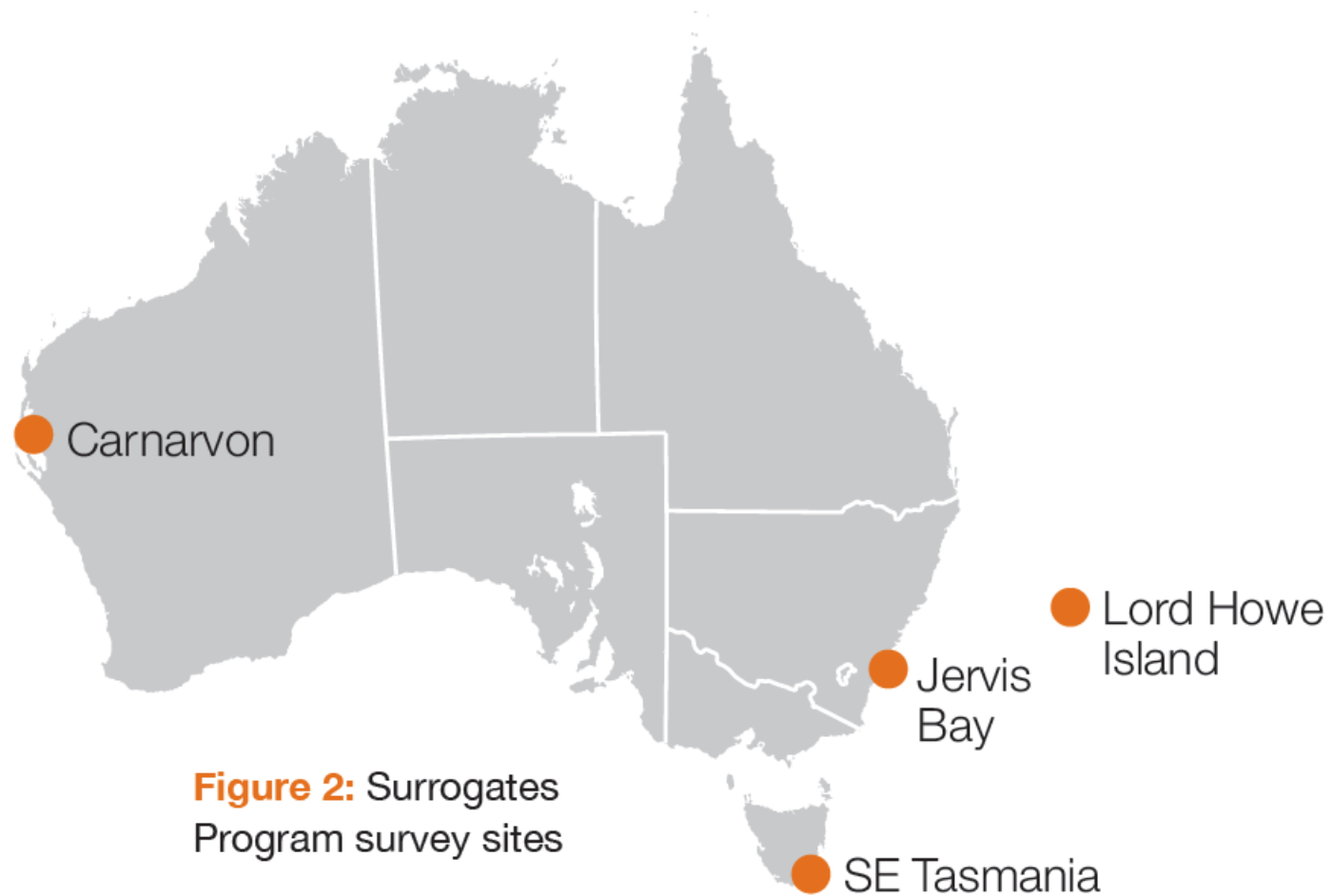# Potential Connectivity to support Network Design

2001-04-02:06hr
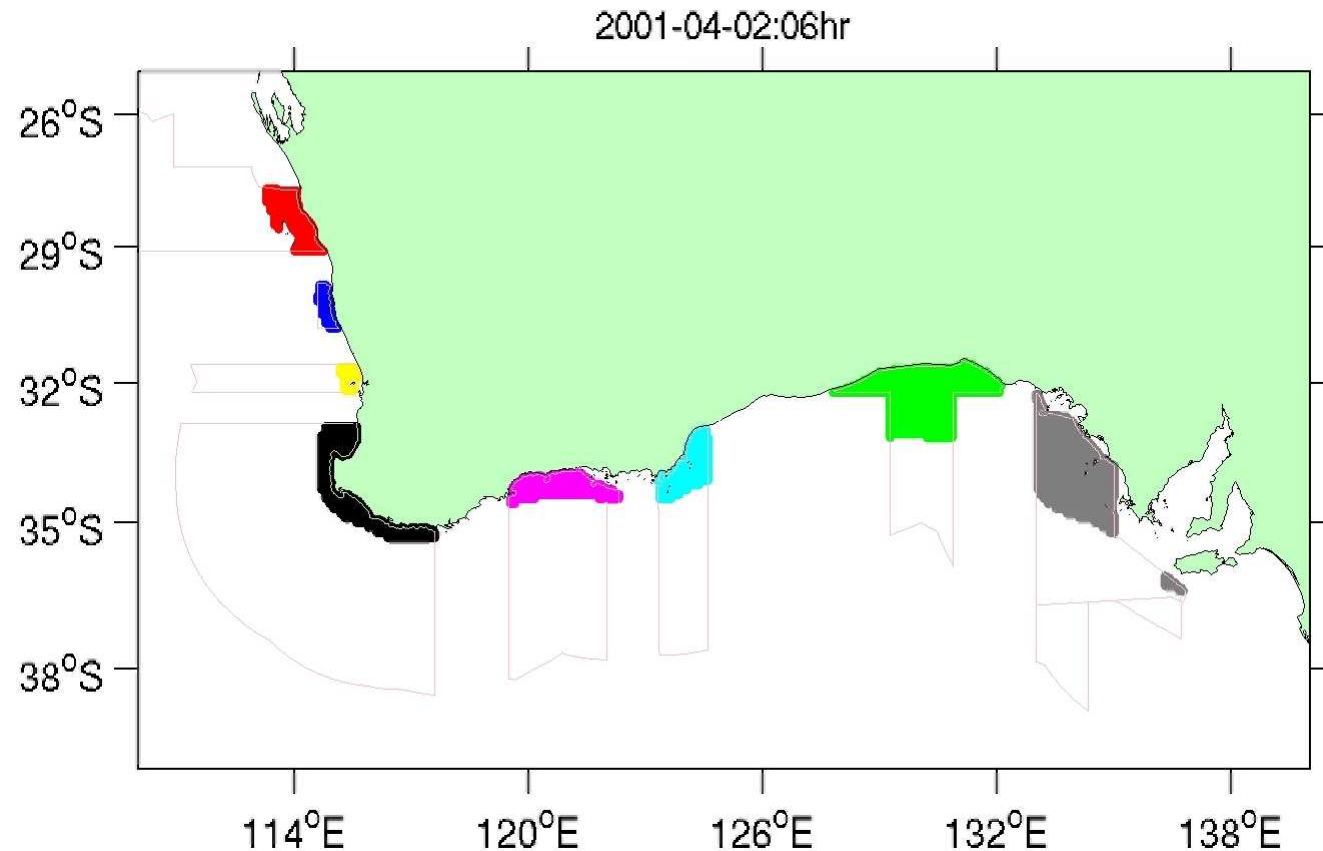
"The South-west Connectivity Report is helping the department design new marine reserves that will improve the resilience of marine biodiversity to the impacts of climate change and other pressures."
DEWHA MBP Bulletin April 2010

England et al. 2009

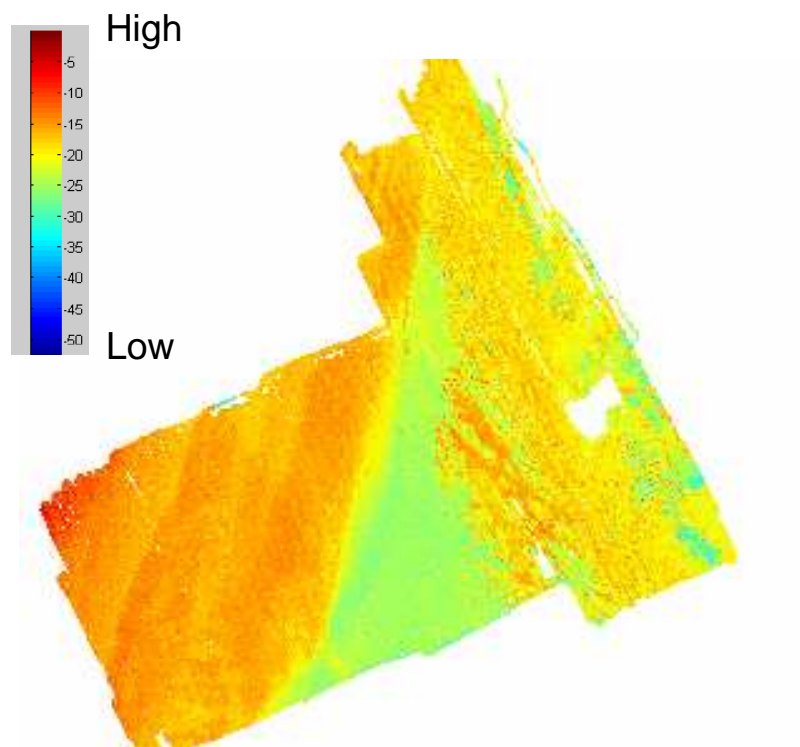# New biodiversity surrogates at the regional level

Figure 2: Surrogates Program survey sites

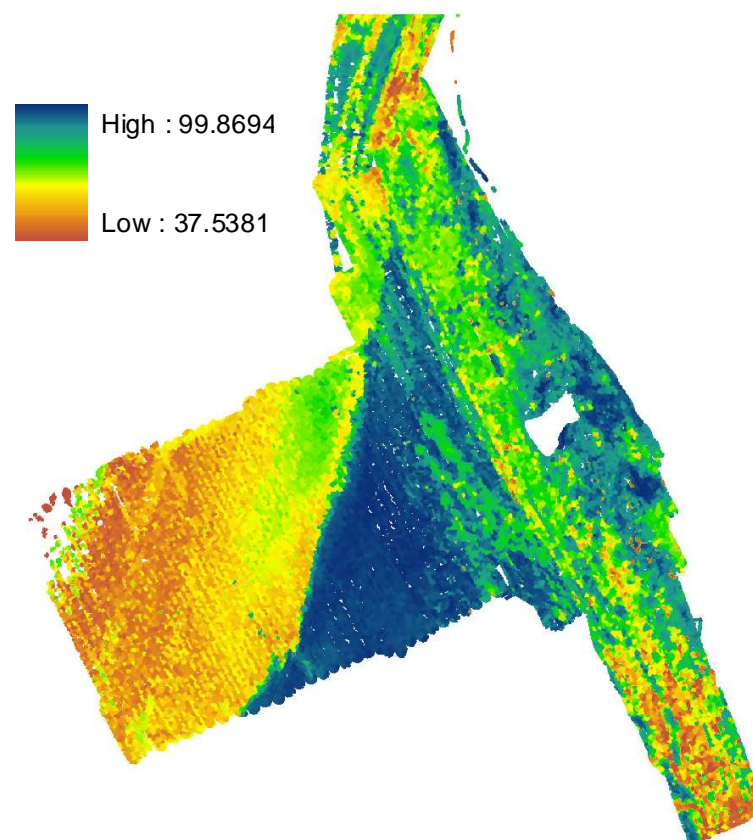Carnarvon

Lord Howe Island

Jervis Bay

SE Tasmania

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Point Cloates Survey Area

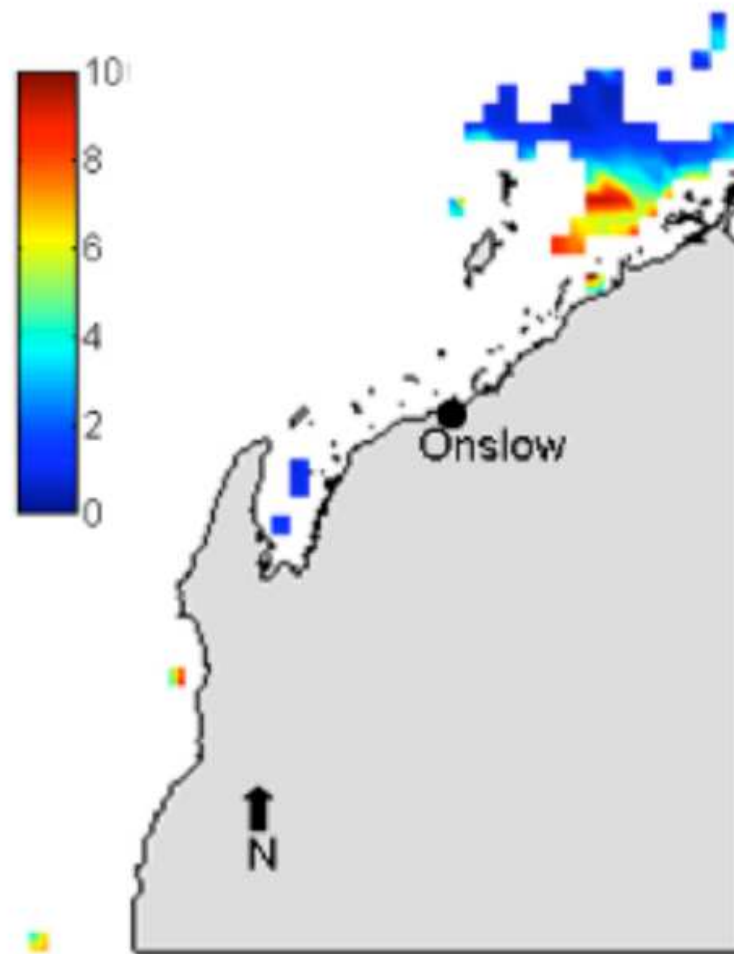## Backscatter intensity

Predicted sand distribution

Zhi Huang GA

Ecological Disturbance Index

Higher EDI values indicate extended periods of time when disturbed/recovering habitats are present.

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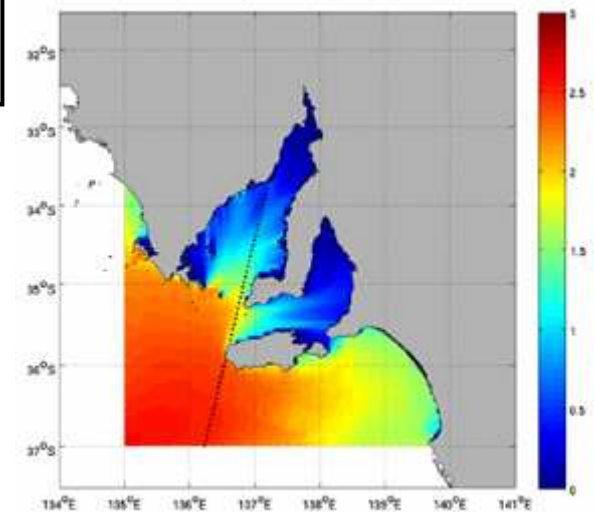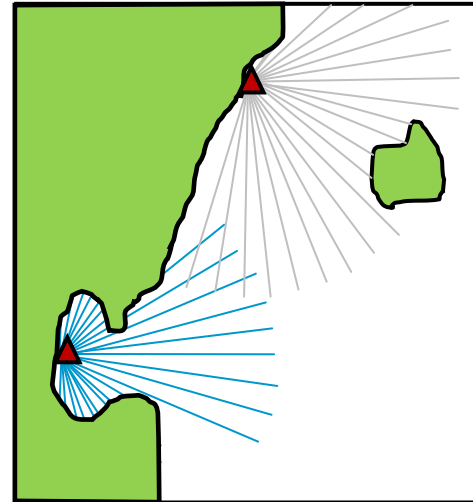Australia's Marine Biodiversity

Exposure Indices

Approach used fetch modelling in GIS framework

Incorporated swell information

Looked at variation in algal communities explained by indices

Hill et al 2010

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Multibeam Swath Mapping

QLD EPA
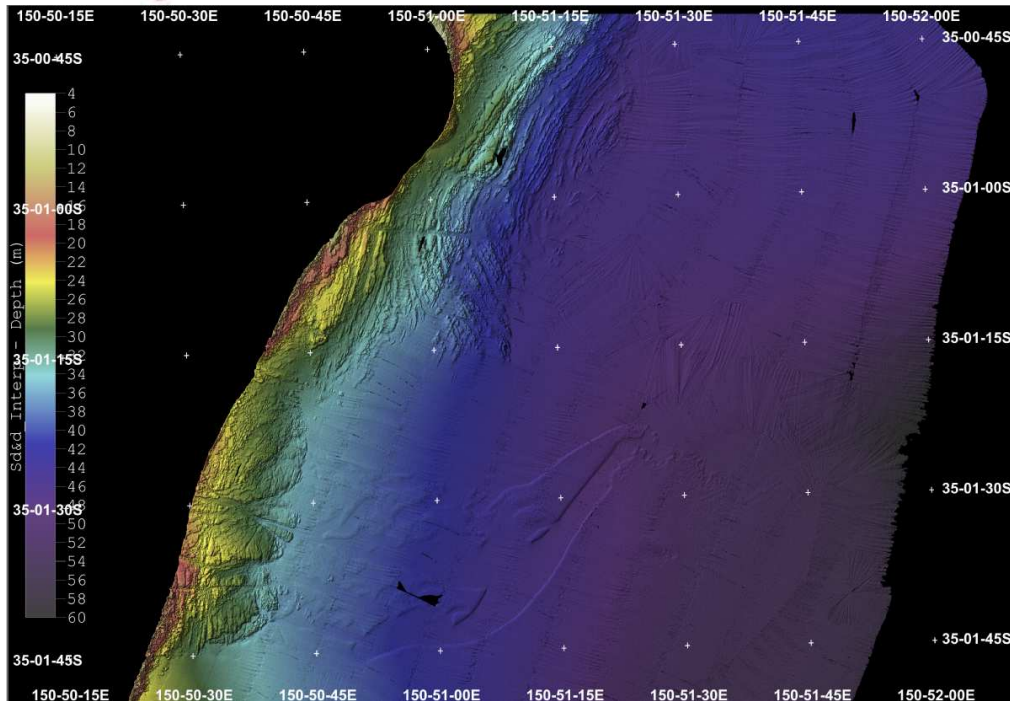
"…..the Marine Biodiversity Hub program is an important contributor to the information required by the NSW Marine Parks Authority" (Alan Jordan NSW DECCW 2010)

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GA, UTAS, NSWDECC, DSTO

The Hippolytes
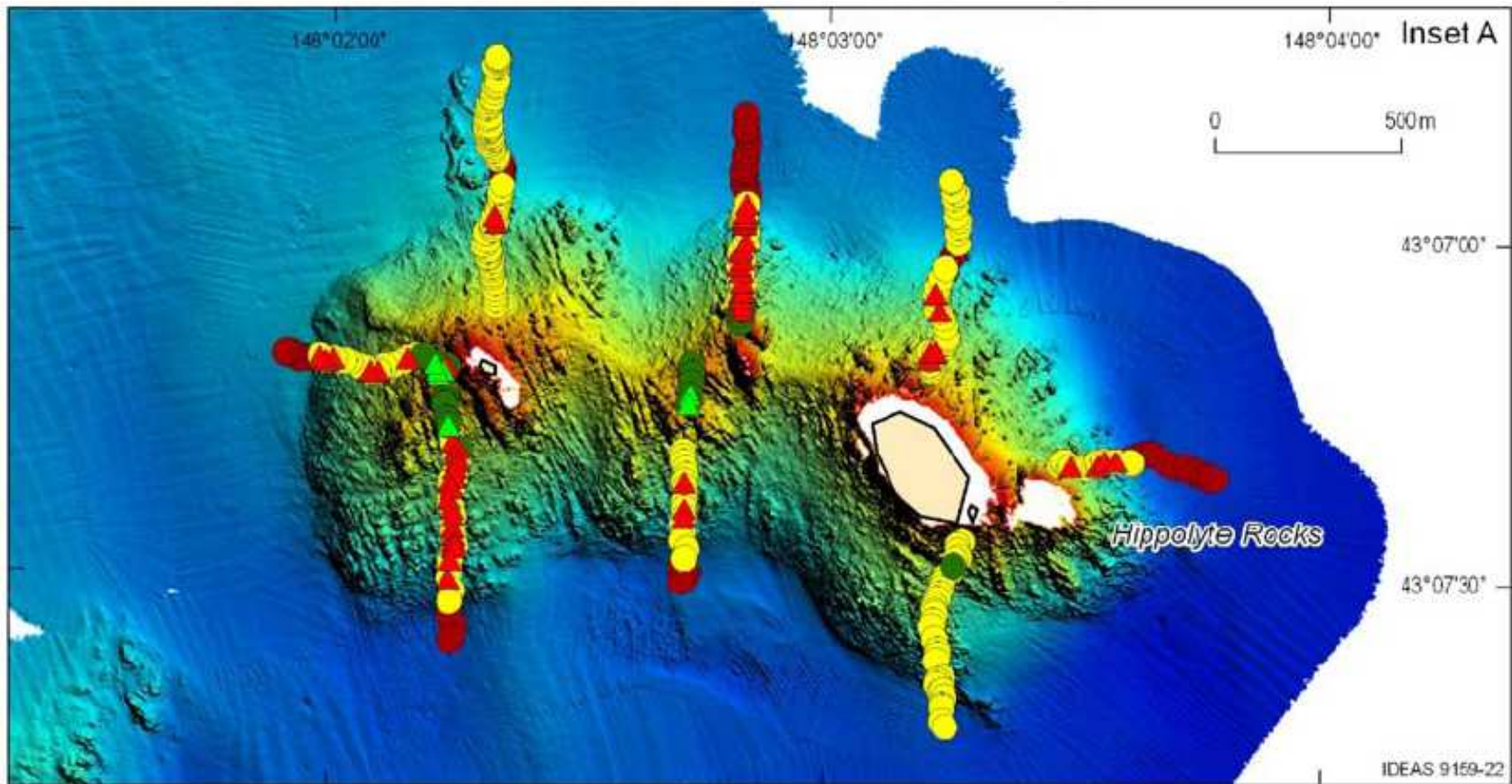
Caulpera
Massive Sponge
Phyllospora
Kelp (Ecklonia)
Sponge
Screw Shell
Squat Lobster
Red Foliose algae
Video transect

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GA/TAFI

Lord Howe Island – geomorphic features, species richness and abundance
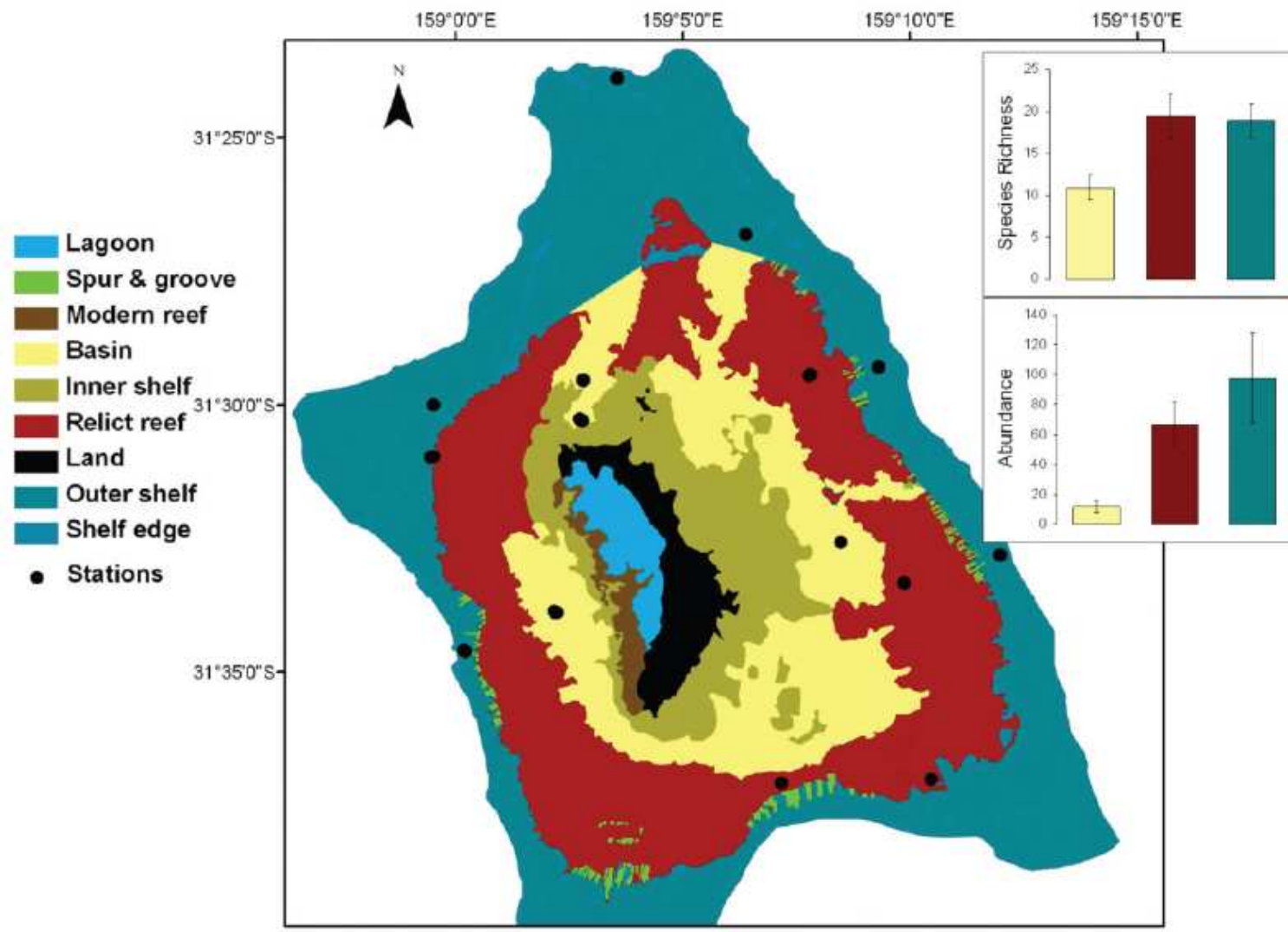
Australia's First Deepwater MPA Monitoring Sites
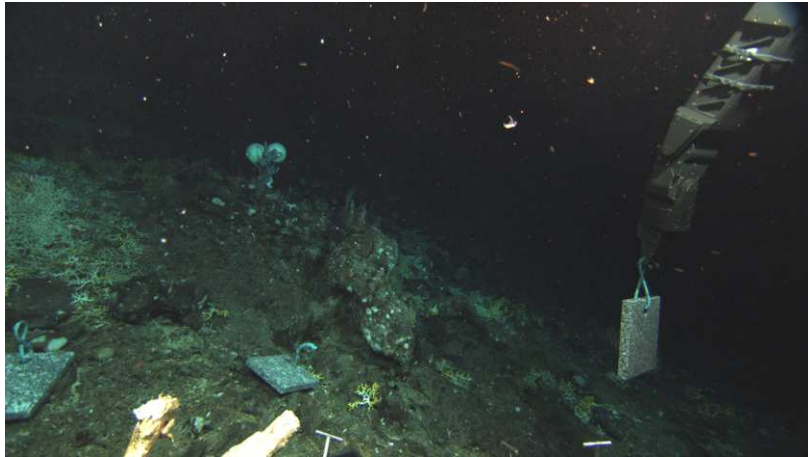
Two monitoring sites on Sisters compare recovery rates of biota in adjacent trawl-impacted and unimpacted sites on the same seamount (875m depth at 44.26598845°S, 147.23591447E; 924m depth at 44.26488078S, 147.23683238E) (each ~ 60 x 60 m)

Williams and Thresher CSIRO
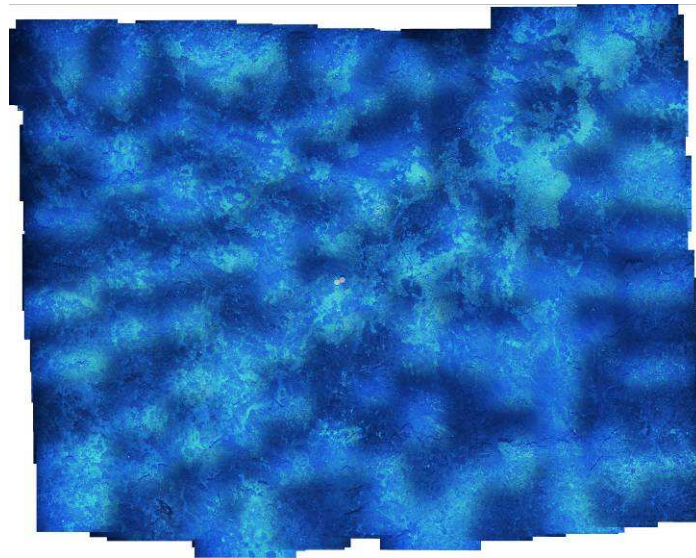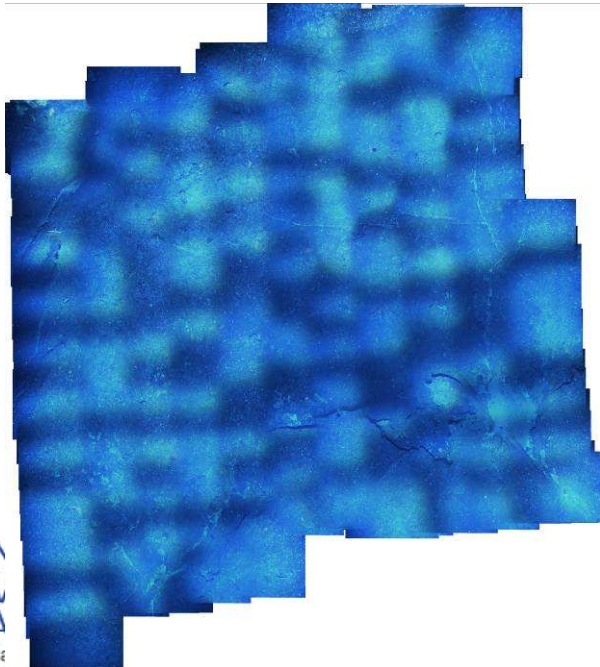
Off-Reserve Management

- Expert elicitation
- Stakeholder consultation
- Offsets
- Incentives

- Marine reserves
  - Design
  - Structural adjustment
  - Management

Ghost Net – QLD NRM

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Formal Elicitation Process – Marine Turtles

- Web-based survey – 244 responses
- Major hazards – fishery bycatch and coastal development, then nest predation and direct take
- Major conservation expenditure biased towards land-based activities
- Expert surveys can assist in targeting resources
- Expert bias
  - Respondents with no specific experience for a species, tended to rank hazards higher for that species
  - The greater the respondent's experience with a hazard, the higher the threat ranking.

Stakeholder preferences and triple bottom line management

- Fishery and environmental managers, commercial and recreational fishers, biophysical and social scientists, conservation advocates and economists (74 responses)
- First-stage results used to compare alternative management strategies in ETBF
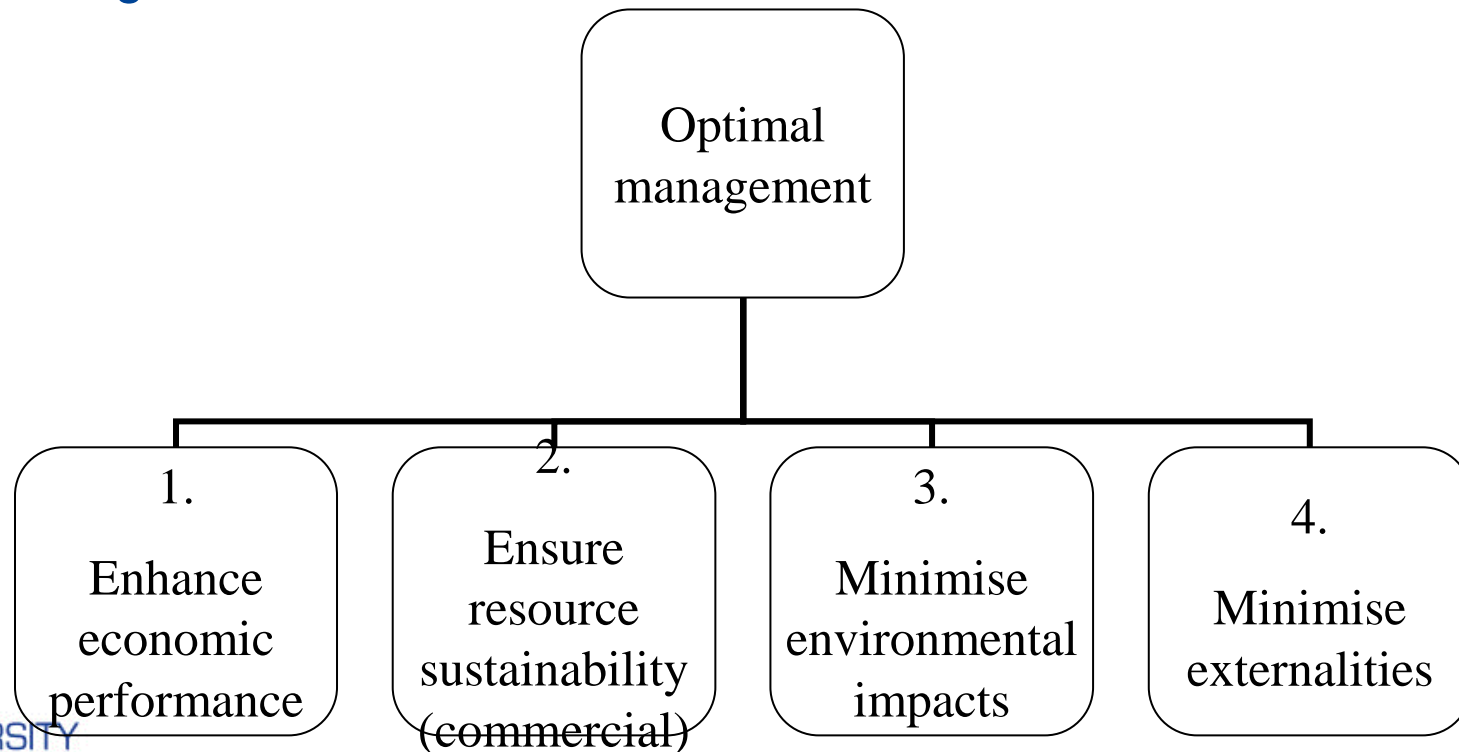
Key Findings

- Main preference followed group membership

- Considerable variability within groups

- Each group recognised importance of other's objectives, especially at higher levels

- Disagreed at lower levels eg. importance of protecting habitat or bycatch species

- After MCDA strong incentives performed best (1.66 hook decrement

Application of offsets to off-reserve management

- develop several case studies for the application of offsets in marine management,

- compare economic cost and biological benefit of offsets and other management actions

- identify the potential complexities in applying offsets

- propose at least one potential implementation of offsets in marine environmental management.

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Key Findings

- Offsets can be a cost-effective option

- Can be controversial

- Potential as interim management tool to promote improved fishing methods

- Biological data not limiting

- Monitoring a key component

- Potential applications include turtles and longline fisheries (Oil and Gas industries?)

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Spatial management with incentives

- Eastern Tuna and Billfish Fishery interactions with seabirds and turtles (AFMA, DEWHA, NGOs, Industry)
- Contrasted hook penalties with area closures
- Models of fishing fleet, target species and bycatch
- Later modifications to support reserve design

Tuna Fishing Activity

Current

With Incentives

Avoid Protected Species

like marine turtles

And nesting seabirds

Modified by fishery management concerns – e.g. catch of southern bluefin tuna

High   Low

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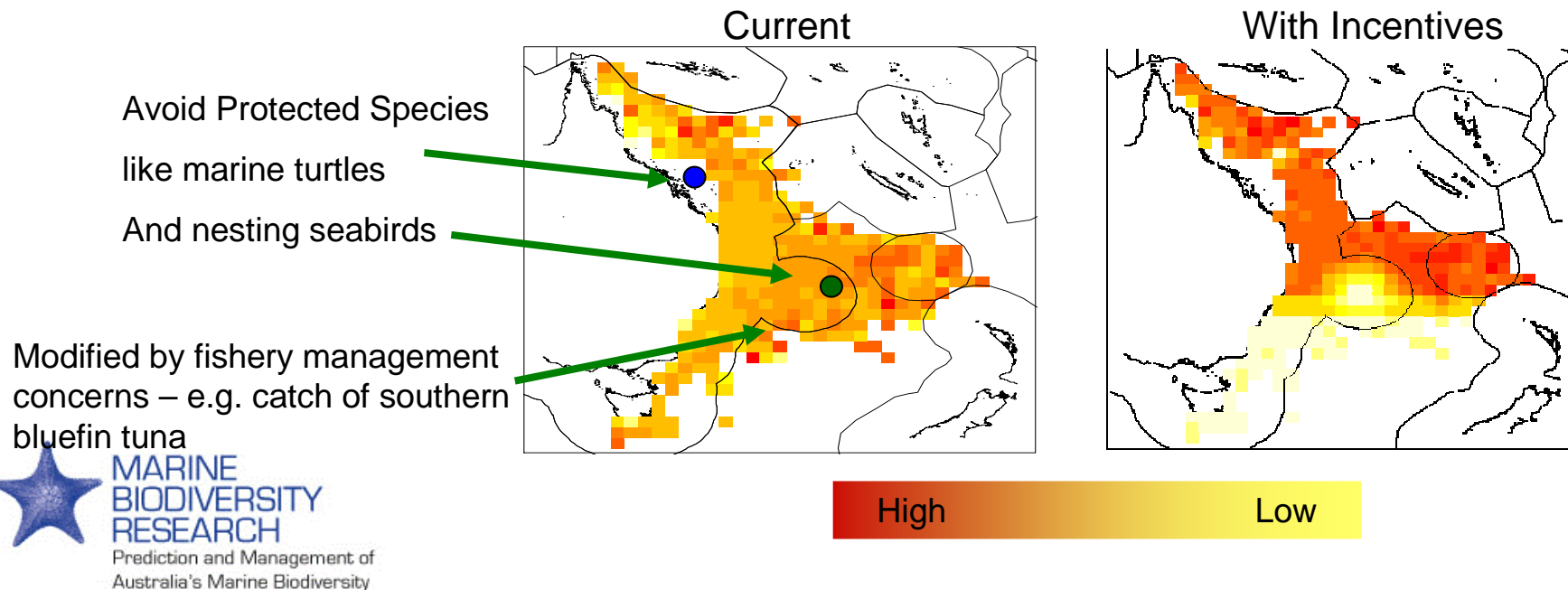
Key Findings – ETBF Incentives

- Hook penalty reduced fishing effort
- No consistent economic or conservation superiority of incentives or closures. Depended on area, port and year
- Variability likely due to variability in availability of resource and variability in costs between ports
- Cases need to be examined individually
- Understanding fishers likely response to closures could produce savings of 20% in predicted lost revenue
- One advantage of hook decrements is their flexibility so they can be fine-tuned as knowledge or management objectives change.

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Review of Market Based Instruments
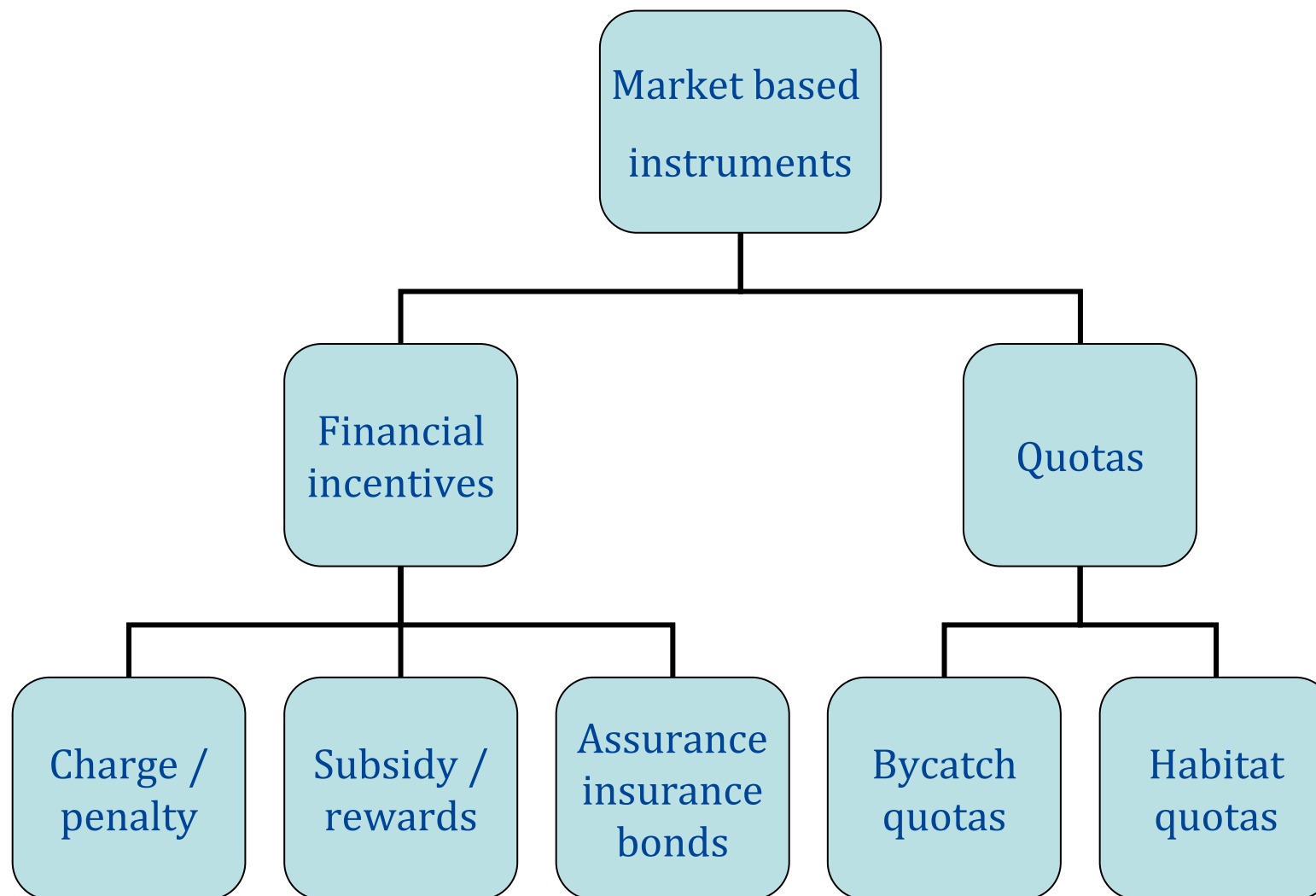
Additional work for SEWPaC

- MBI alternatives to structural adjustment
- A more realistic measure of displaced effort
- Predicted distributions of listed species

Conservation Values/ Fishing method	Seals & sealions	Whales	Dolphins	Seabirds	Turtles	Spatially predictable pelagic features	Sharks (regional priority)	Demersal fish species	Seagrass	Benthic habitats
Demersal/ bottom trawl	P	P	BQ	P/BQ	P	P/HQ	BQ	BQ	HQ/B	HQ/B
Longline demersal	√*	√*	√*	√*	n.a.	n.a	BQ/P	BQ/P	n.a.	HQ
Longline – pelagic	√	√	√	BQ/HQ	√	√	BQ/HQ	√	√	√
Gillnet - demersal	P/BQ*	√*	√*	√*	√*	n.a.	P/BQ	√*	n.a.	HQ

Key:
- √ Acceptable (some conditions may be required)
- √* Acceptable with mitigation measures and conditions
- P Charge/penalty based system
- BQ Bycatch quota
- HQ Habitat (effort)/spatial quota
- B Bond/insurance

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Where are we now - management

CERF   NERP

| Probabilistic prediction of biodiversity | → | **Integrated Management**

Cross-sectoral

Cross-jurisdictional

Whole of Government

On- and off-reserve |

Increased management options →

Where are we now - monitoring

CERF

NERP

Standardised and integrated survey approaches →

New monitoring design strategies →

National Monitoring

Ecosystem health

NRSMPA

Model driven & validated

Access national capacity

SOE and NPEI reporting

Integrated management of marine biodiversity

- How do we value biodiversity?
- What are the key threats facing biodiversity (including cumulative impacts)
- Strategic assessment and spatial management
  - Compare assets and threats
  - Evaluate collective effects of management regulations
  - Develop and communicate management options
  - Facilitate development of quantifiable objectives, targets and indicators for biodiversity management

Future research – supporting the move from planning to implementation of marine bioregional plans

- National monitoring, evaluation and reporting
- Prioritisation and Response to Threats
- Ecosystems Knowledge to Support Implementation of Marine Bioregional Plans
- Biodiversity Discovery to Support Implementation of Marine Bioregional Plans
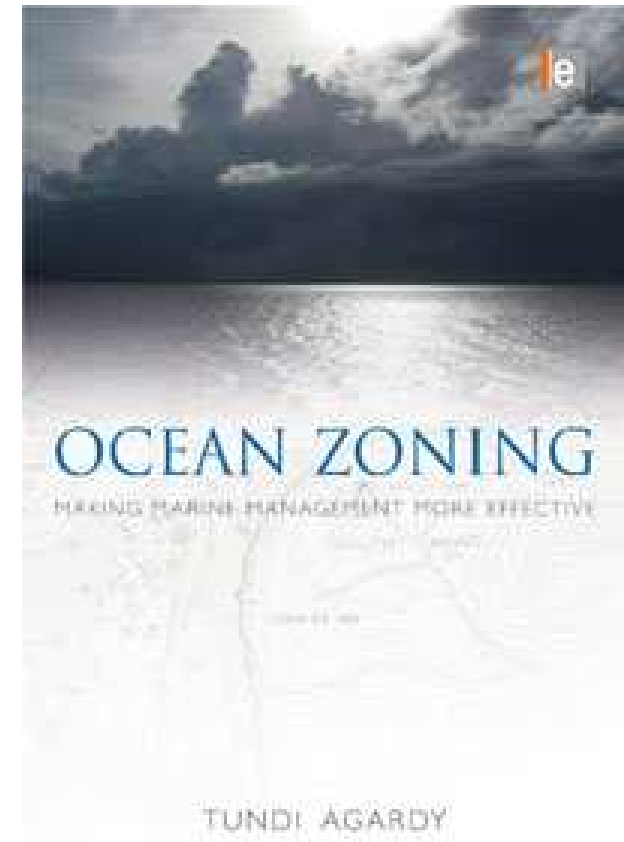- Prioritisation and Improved Management of Listed Species and Communities

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Mark Norman MV
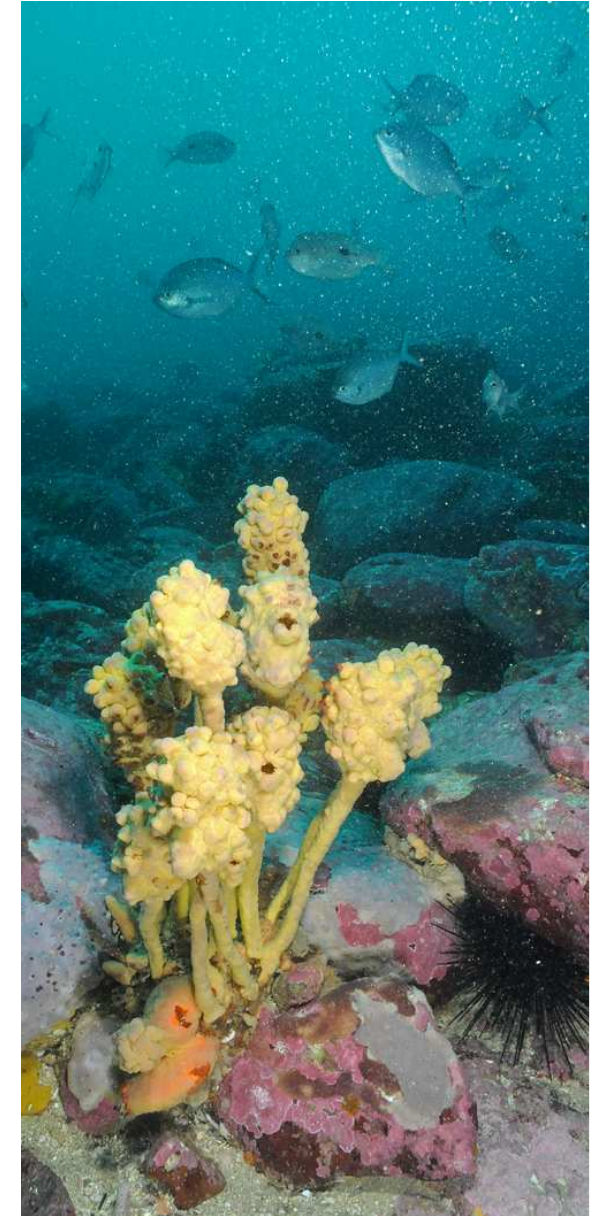
Support move from planning to management

- Assist development of monitoring and indicators
- Continue to increase range of management options and evaluate their cumulative potential to respond to threats
- Expand biodiversity knowledge in priority areas – KEFs, MPAs

OCEAN ZONING

MAKING MARINE MANAGEMENT MORE EFFECTIVE

TUNDI AGARDY

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Improve capability to manage biodiversity

- Identify and map functional attributes of biodiversity - productivity, vulnerability, uniqueness, ecosystem roles

- Predict distributions of priority species, communities and habitats

- Continue to build national effectiveness in biodiversity research

- Promote Australian biodiversity research and management internationally

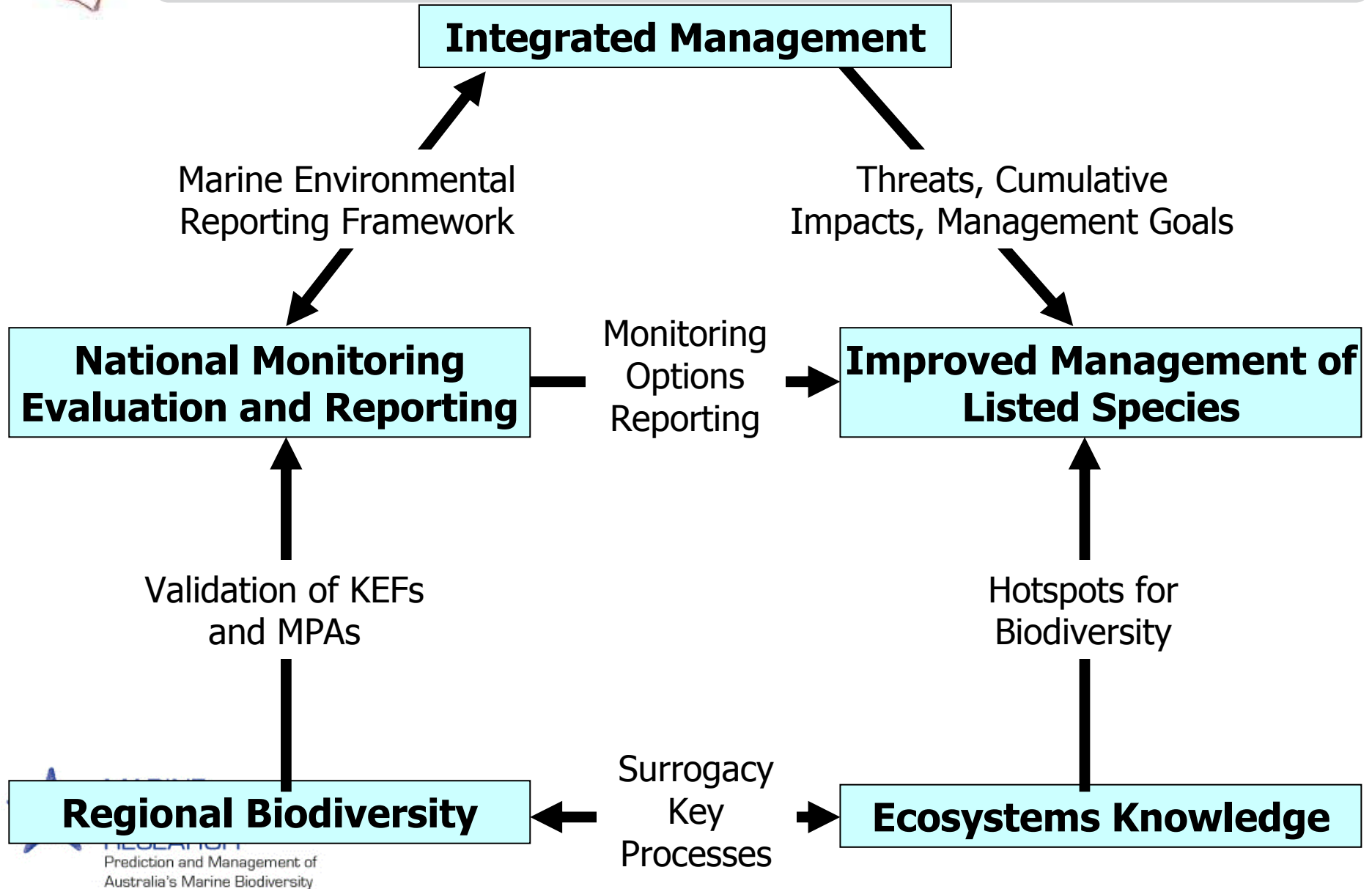# Partners

9 PhD students

10 Postdoctoral students

70 Research scientists

National Monitoring Evaluation and Reporting

- A validated national marine monitoring system for ecosystem health (MERF)
- A framework to monitor management performance of the NRSMPA
- Capability to deliver to NPEI and SOE reporting

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Integrated Management of Marine Biodiversity

- A framework to estimate socioeconomic value of marine biodiversity and costs of management actions
- National threat maps and their cumulative impacts
- A system to evaluate alternative management approaches in a multi-jurisdictional, multi-sectoral environment

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National Ecosystems' Knowledge

- Identification, classification and ranking of key physical features and processes recognised as important to marine biodiversity
- National connectivity maps
- Scientific basis for a new Integrated Marine Classification and Regionalisation of Australia (IMCRA 5)

Regional Biodiversity Discovery to Support Marine Bioregional Plans

- Validation of KEFs and baseline surveys of MPAs off Northern Australia
- Provide knowledge base for monitoring and management consistent with other 3 marine bioregions
- Develop a program of national marine mapping using recent marine infrastructure investment

Improved Management Options for Listed Species and Communities

- Improved predictions of listed species ranges
- A framework for the cost-effective and efficient monitoring and managing of listed marine species
- Improved engagement of Indigenous rangers in monitoring

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