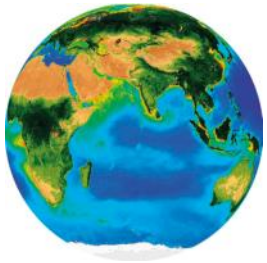
Australian plans for the International Indian Ocean Expedition (2016-2020)

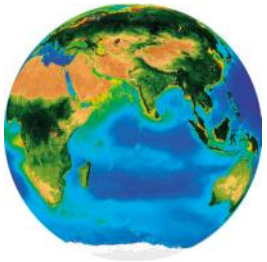
Lynnath E. Beckley

(on behalf of Australian National Committee for IIOE-2)



Australian National Committee for IIOE-2

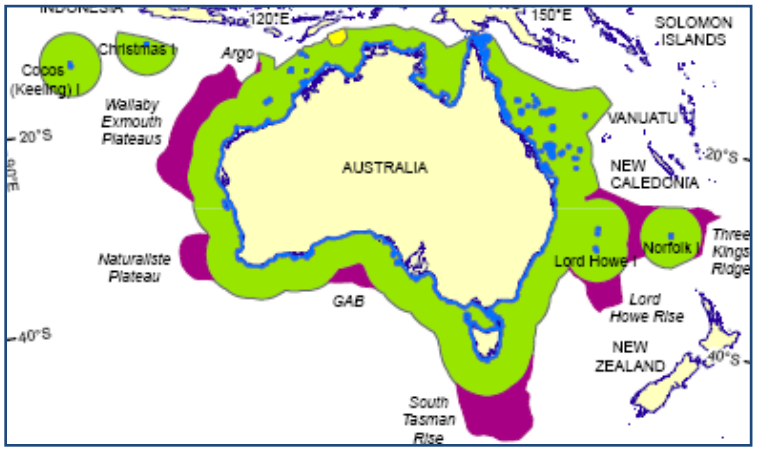
- Australian marine science community established a representative national committee in May 2015
- Membership comprises:
  - Federal agencies & departments
  - WA government departments
  - Universities
  - Others

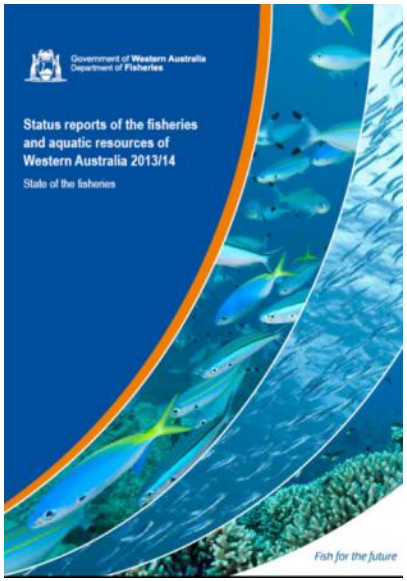


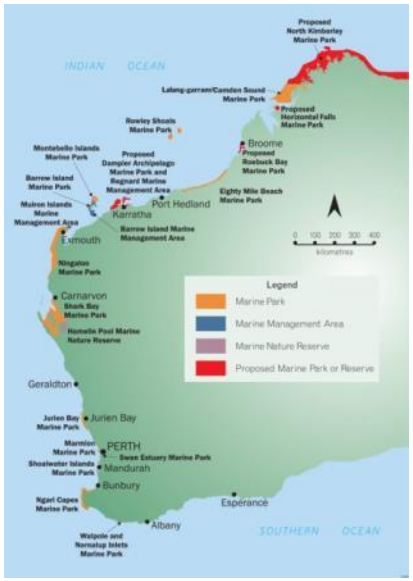
- Terms of reference:
  - Represent Australian institutions engaged in IO research
  - Facilitate engagement of Australian scientists in IIOE-2
  - Maintain contact with the Australian IOC delegation
  - Collate a data base of Australian IO research projects
  - Develop implementation plans for IIOE-2

Context of Australian IIOE-2 contributions

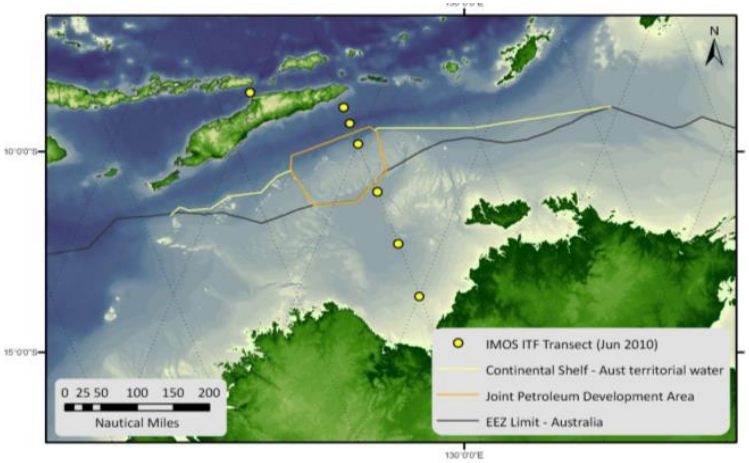
- Australia has a vast seaboard bordering the Indian Ocean
- Large part of the EEZ is located in the Indian Ocean
- Routine research & monitoring takes place in EEZ
  - Fisheries
  - Biodiversity
  - Meteorology etc
- Much other research can contribute to IIOE-2 themes
  - Ongoing research
  - Planned research



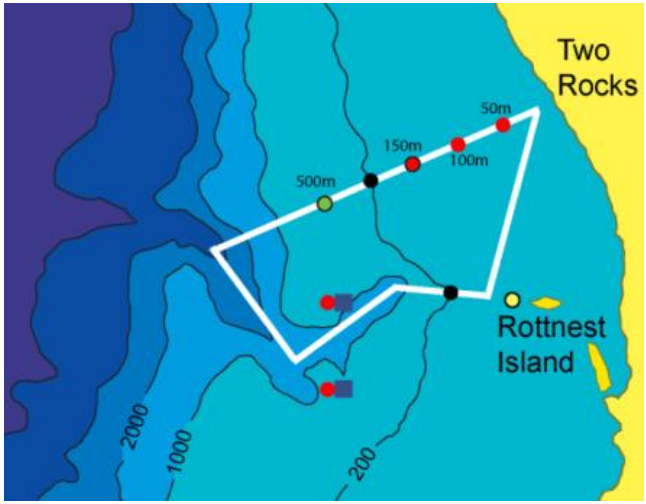




Integrated Marine Observing System

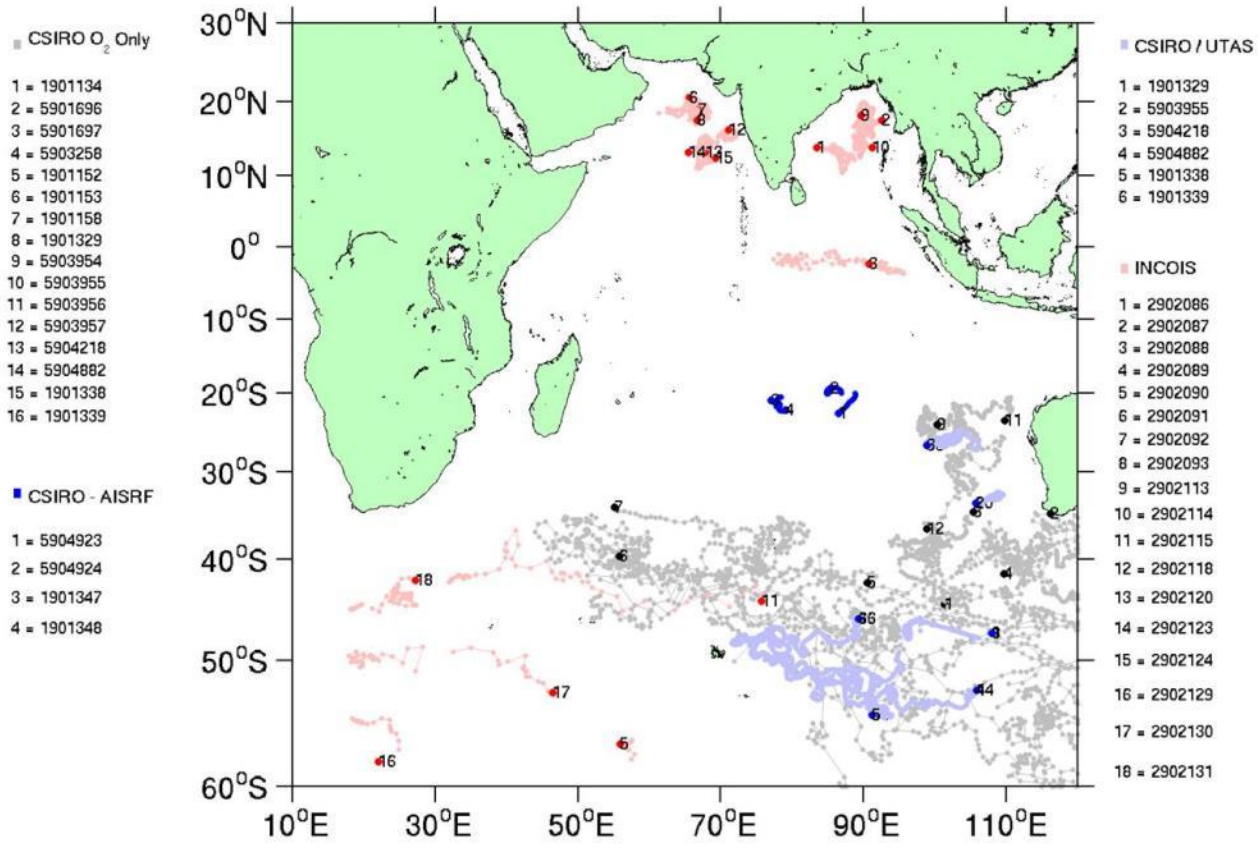


- IMOS provides sustained observations in the Indian Ocean
- Will continue during the IIOE-2
- Moorings, gliders, remote sensing products, radar, ARGO floats, reference stations, acoustic tracking & observatories, AUV, data management & storage etc



Indian Ocean bio-Argo pilot observing system

Collaboration between Australia & India to pilot biogeochemical floats as part of Indian Ocean GOOS / SIBER

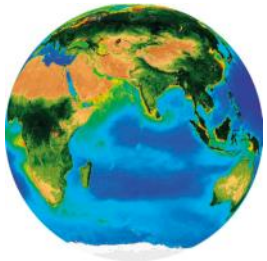


44 deployed:

- 18 India Bio
- 10 Australia Bio
- 16 Australia O_2

Planned (3 years):

- 32 India
- 15 Australia

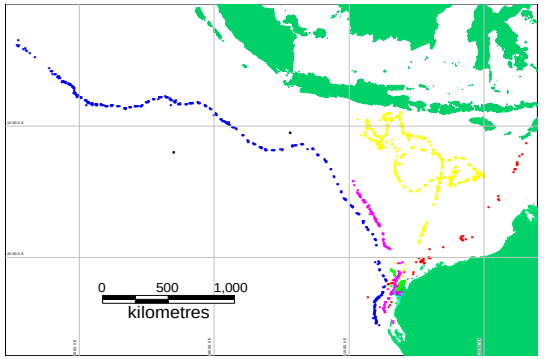


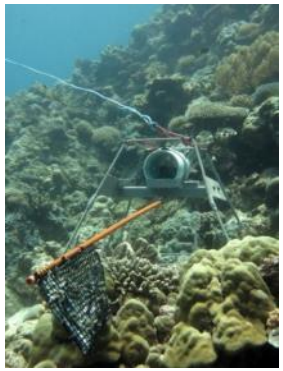
PIs: N Hardman-Mountford, T Trull (CSIRO), W Naqvi (NIO), M Ravichandran (INCOIS)

NW Marine Ecosystems Programme

Australian Government | Australian Institute of Marine Science

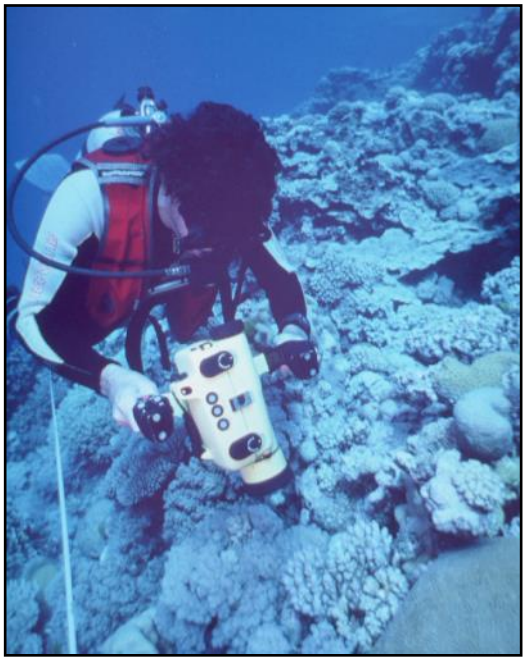
- Ongoing Indian Ocean research over IIOE-2 period
  - Biodiversity & connectivity of tropical marine ecosystems
  - Predicting ecosystem response to natural & human perturbation
  - Understanding dynamics of threatened species
- Habitat mapping, fish & benthic community dynamics, genetic connectivity, physical & biological oceanography, baselines for oil spill monitoring, marine megafauna, shoals, Scott Reef

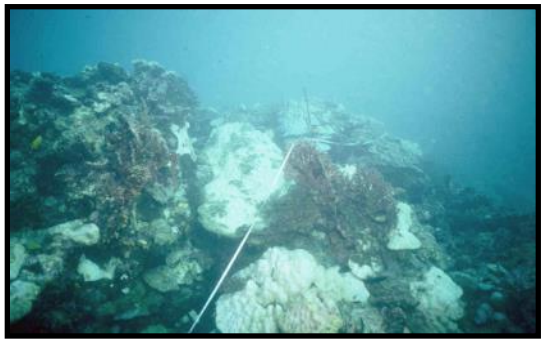


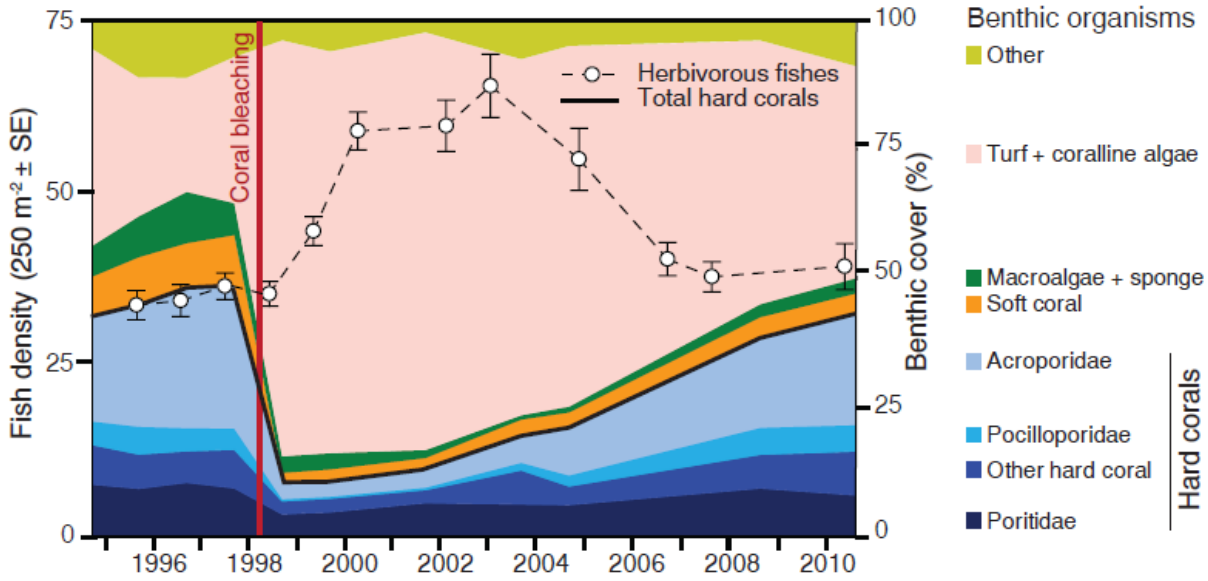


Scott Reef : coral laboratory

AUSTRALIAN INSTITUTE OF MARINE SCIENCE



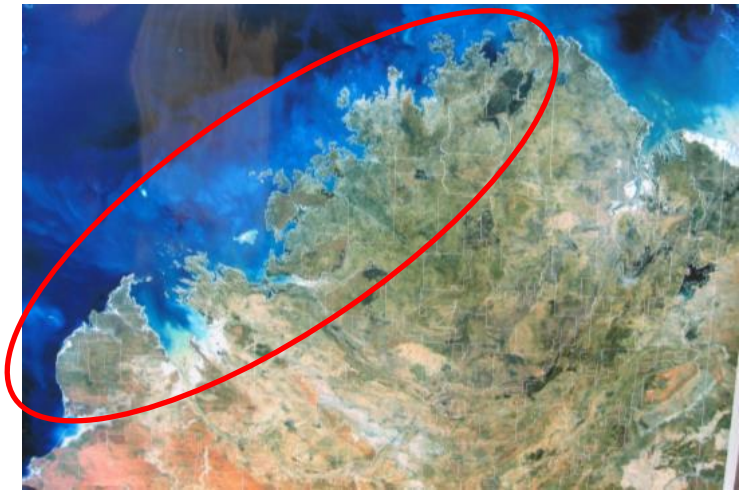




Western Australian Marine Science Institution

western australian
marine science institution

- Ongoing research programmes in Indian Ocean (2013-2018)
- Kimberley marine research programme
  - 24 projects
  - Include oceanography, geomorphology, biogeochemistry, biodiversity, ecology & social science

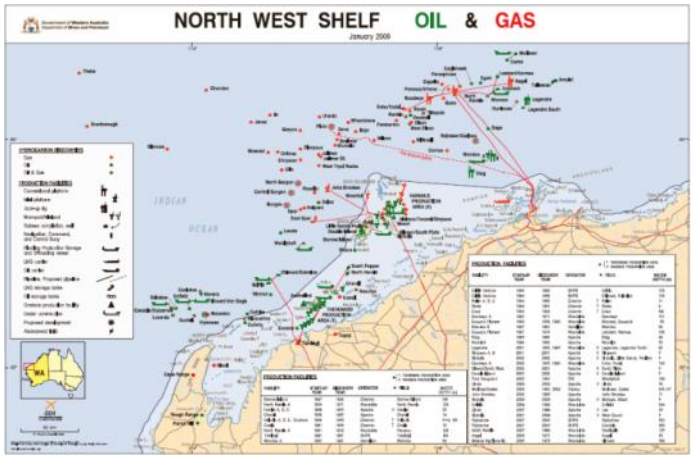


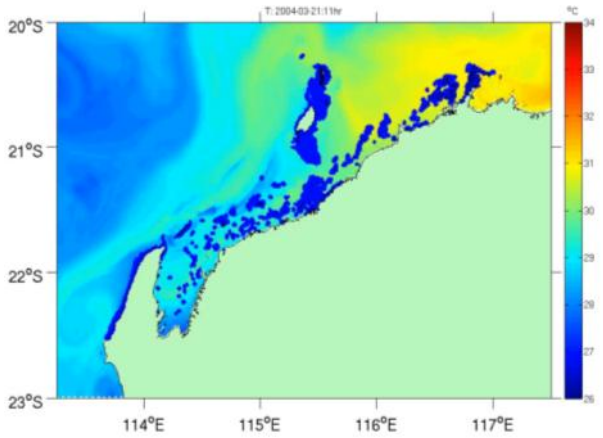
Pilbara Marine Conservation Partnership

CSIRO

THE UNIVERSITY OF WESTERN AUSTRALIA

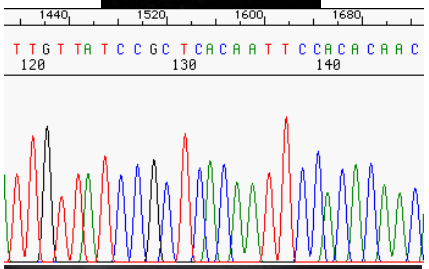
- Major offshore oil & gas developments
- Environmental offsets (2104-2019)
- Focus areas
  - natural hazards & impacts of development
  - coral reef health & resilience
  - fish & shark populations & trophic interactions





Net Conservation Benefits Project

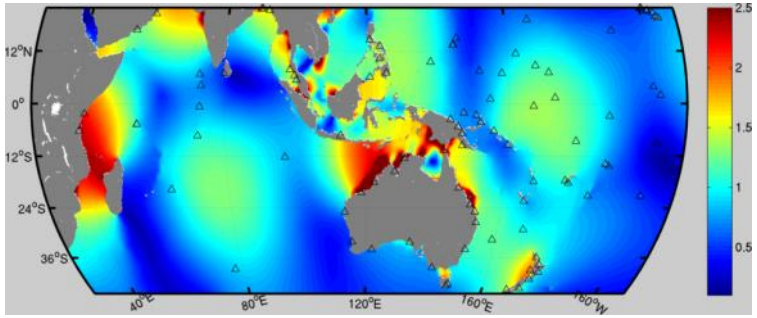
- Using molecular tools to define biodiversity in NW Australia (2014-2019)
  - Understanding biodiversity
  - Estimating distributions
  - Conservation needs



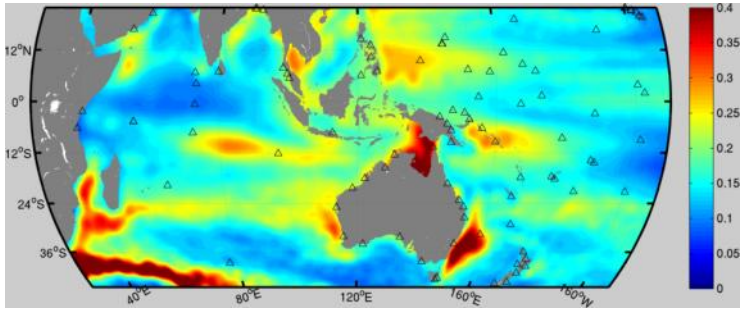
Ocean & Climate Dynamics

- Science to understand & predict coastal hazards & long-term change
- Sea level, waves & coastal extremes
- Tide gauge, satellite & other data combined with numerical models to predict local storm surges, storm waves and other hazards, and how this may change in the future

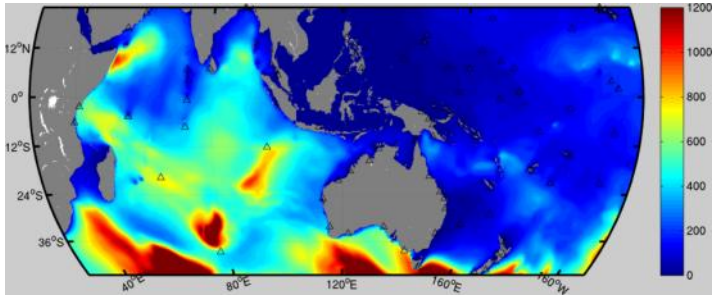
Highest astronomical tide



99th percentile sea level anomaly

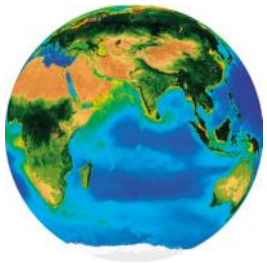


Wave energy flux July 2 2010



Indian Ocean Tuna Research

- Southern bluefin tuna biology, assessment & management
- Indian Ocean tuna stock structure & connectivity
- Climate effects on top predators (CLIOTOP)
- Developing management strategy evaluation tools for tropical tunas
- Developing capacity for management of Indonesia's pelagic fisheries

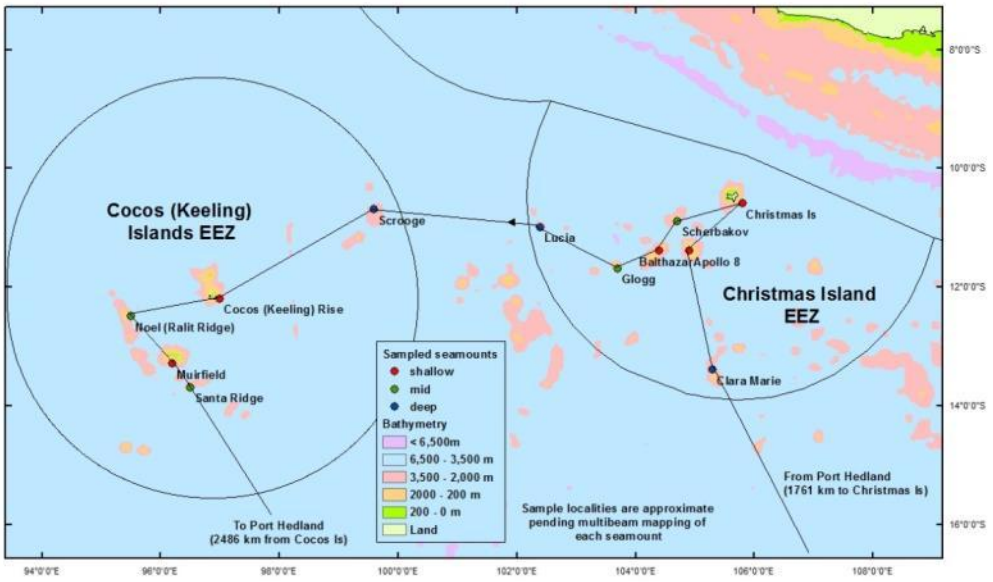


New Proposals for Indian Ocean Research

- Recent call for ship's time proposals for RV *Investigator* for 2017/18
- Selection presented here to give flavour of what research is envisaged for Indian Ocean

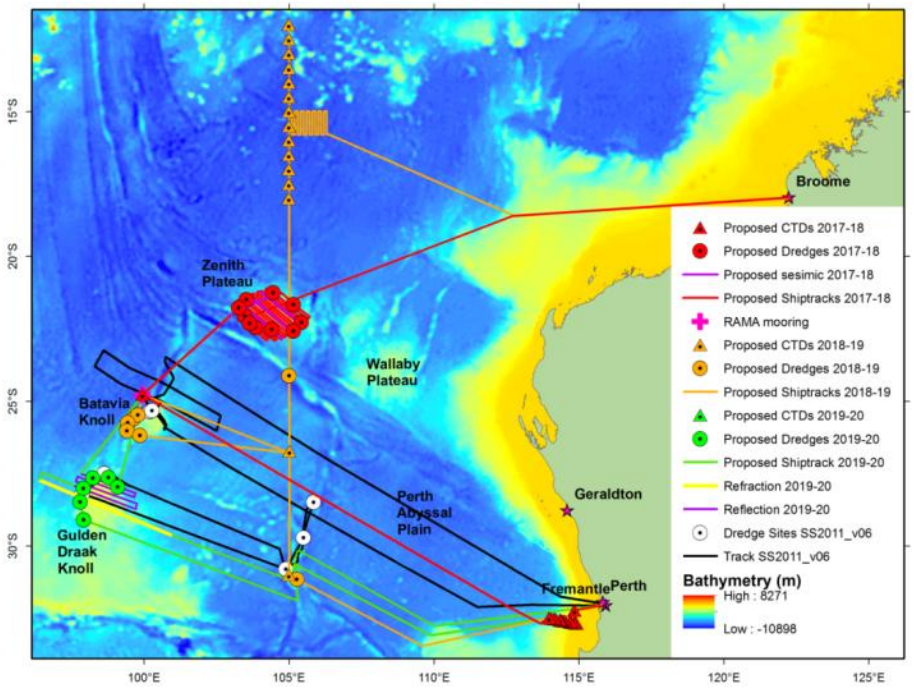
The seamount fauna of Australia's Indian Ocean Territories

- Map the seafloor topography of Indian Ocean seamounts
- Investigate benthic communities of seamounts
- CI: Tim O'Hara (Museum Victoria)



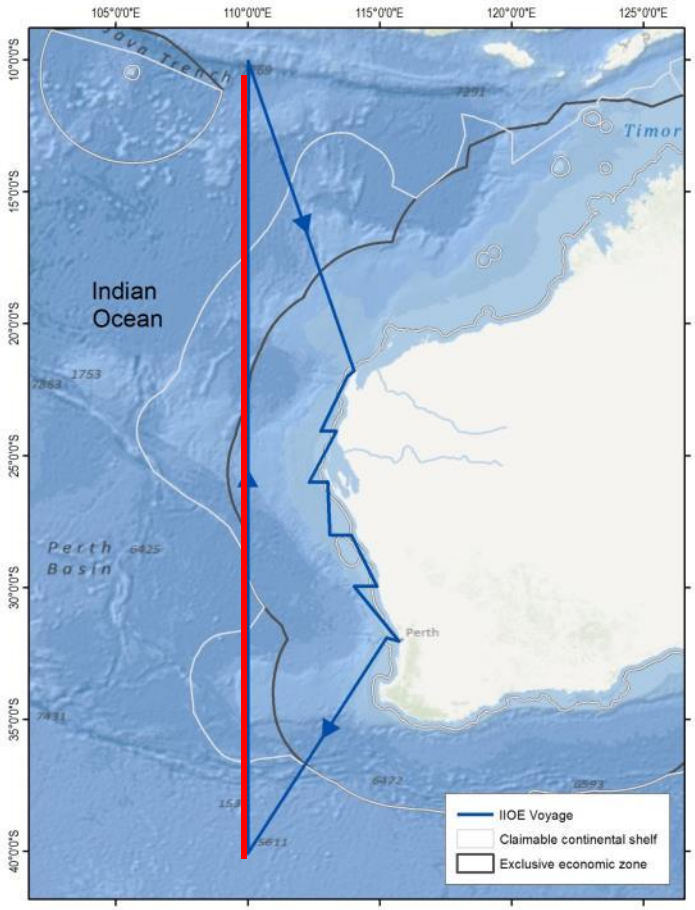
Dynamic oceanographic & geological processes in SE Indian Ocean

- Topography, deep structure & evolution of Gulden Draak & Batavia knolls & Zenith Plateau
- RAMA mooring (25°S,100°E) for *in situ* time-series of air-sea fluxes, upper-ocean physics & biogeochemistry
- Inter-annual variability in physics/biogeochemistry of the Leeuwin Current system
- CIs: Whitaker, Phillips et al.

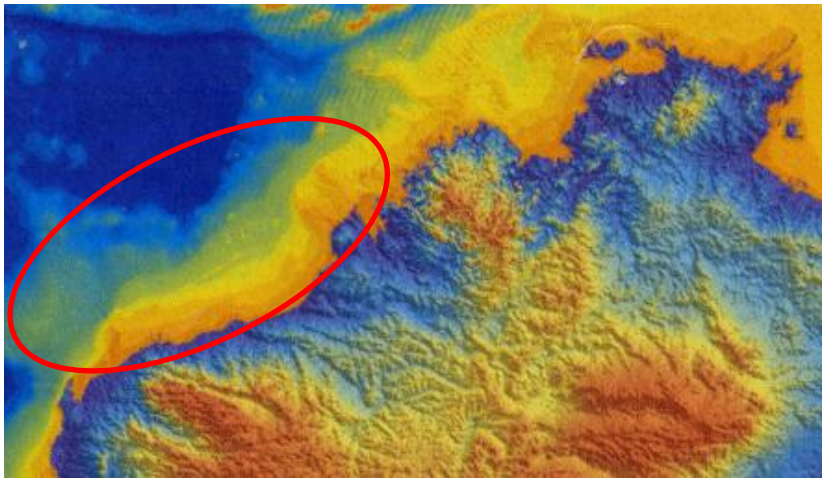


Revisiting Australia's 110°E line

- Quantification of change in water column since 1960s
- Biogeochemistry & ecology
- Trophic relationships (larvae of mesopelagic fishes)
- Field information on bio-optical quantities derivable from ocean colour satellite remote sensing (ESA)
- CIs: Beckley, Antoine et al.



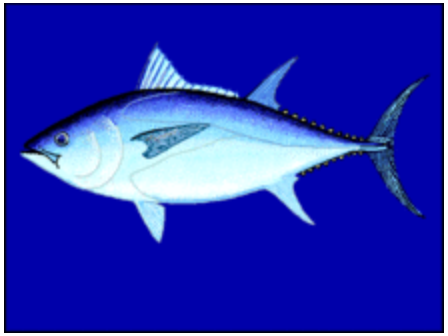
Predictive models of biodiversity, connectivity & geological processes on NW shelf

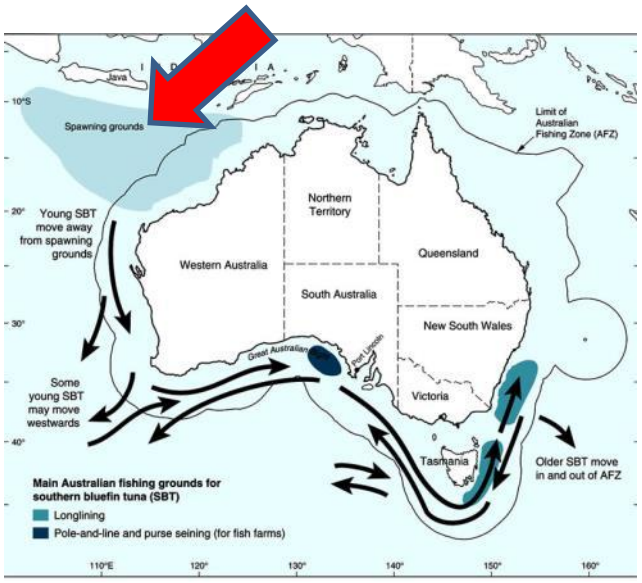


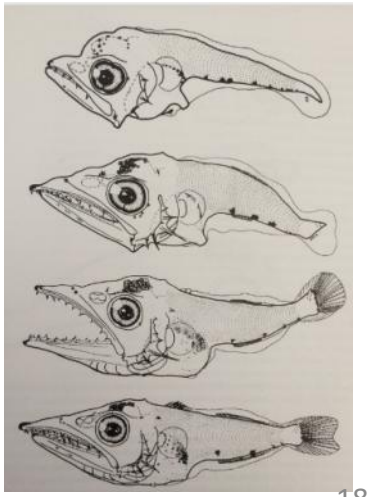
- What are the major sources, sinks & pathways of sediment on the NW Shelf
- How do they influence biologically important areas?
- CI: Brooke, Geoscience Australia

Southern blue fin tuna larval ecology in the Indo-Australian Basin

- Eastern Indian Ocean Upwelling Research Initiative
- Compare upwelling & non-upwelling seasons
- Nitrogen sources & food web pathways to tuna larvae
- Plankton dynamics, larval tuna condition & growth
- CIs: Beckley, Landry, Thompson et al.







Australia & IIOE-2

- Much of Australia's ongoing & proposed research over next 5 years falls within the themes of IIOE-2 science plan
- Australian marine scientists are looking forward to the renewed focus on the Indian Ocean
- Welcome opportunities for collaborative, multi-national research during the IIOE-2