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# Pilbara Habitats and Biodiversity Characterisation and Mapping: Seabed and Reefs

Roland Pitcher and many others

CSIRO Oceans & Atmosphere

Also staff from Western Australian Museum,  
plus Museum Victoria, WA Fisheries & Murdoch University

*This project was funded by the Gorgon Barrow Island Net Conservation Benefits Fund,  
which is administered by the WA Department of Parks and Wildlife.*



# Objectives



## *Characterise regional patterns of habitats & biodiversity*

### Specific objectives:

- Acquire available **existing data** and conduct an initial biophysical characterisation of the west Pilbara region
  - **Survey** spatial patterns of biodiversity of **seabed** and **reef** ecosystems across the entire west Pilbara region
  - Analyse data to **characterise & map** the biodiversity of the west Pilbara region
- information to inform the design of sampling in the PMCP Coral Reef Health and Fish & Sharks projects













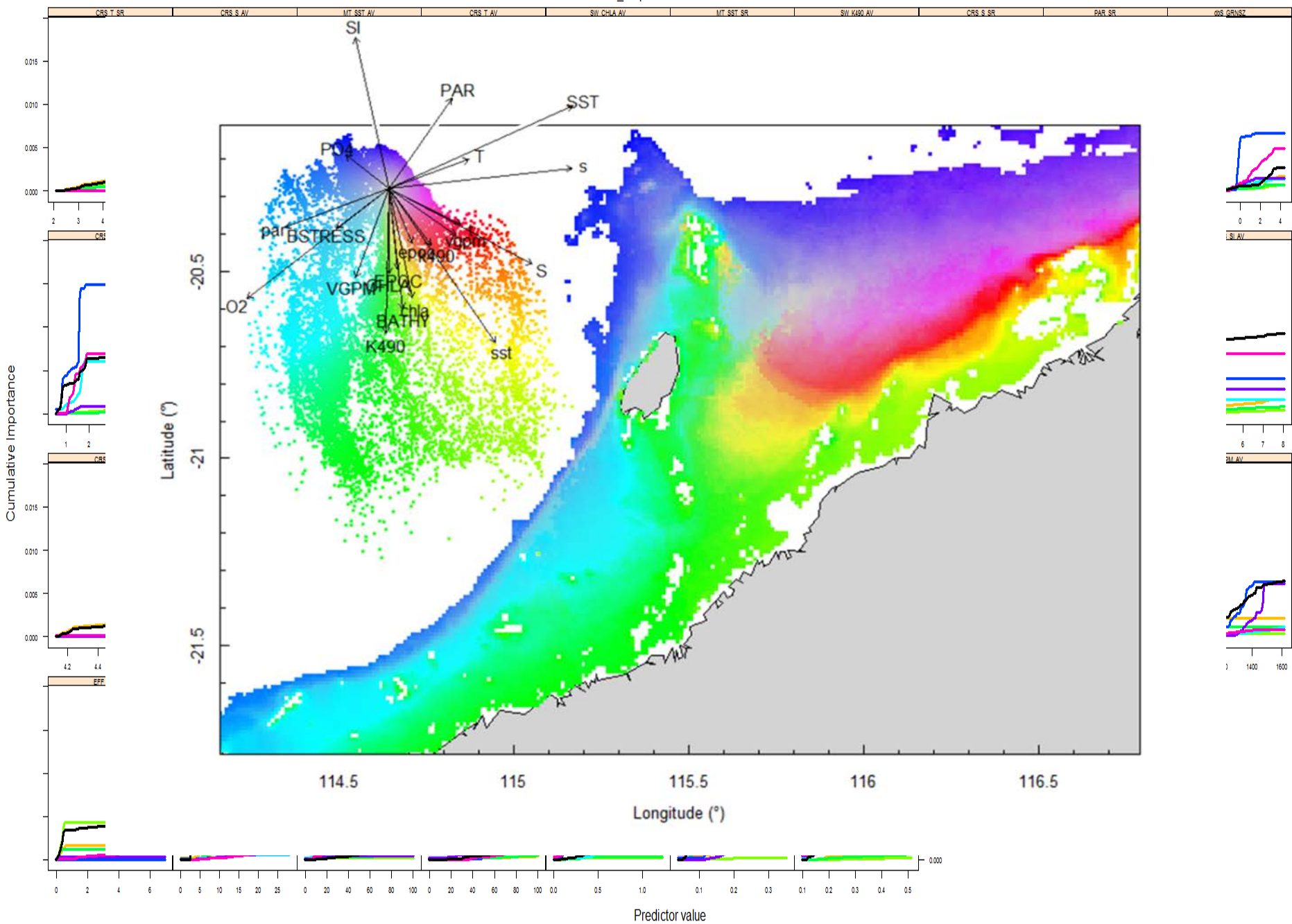
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# 1. Seabed Habitats, Biodiversity and Characterisation



NWS\_EoT            DEC\_Rfs            DOF\_EGsurvey        
 Soviet            DOF\_Trawl            combined.site.rsq.total        
 Warehouse            DOF\_Trap      

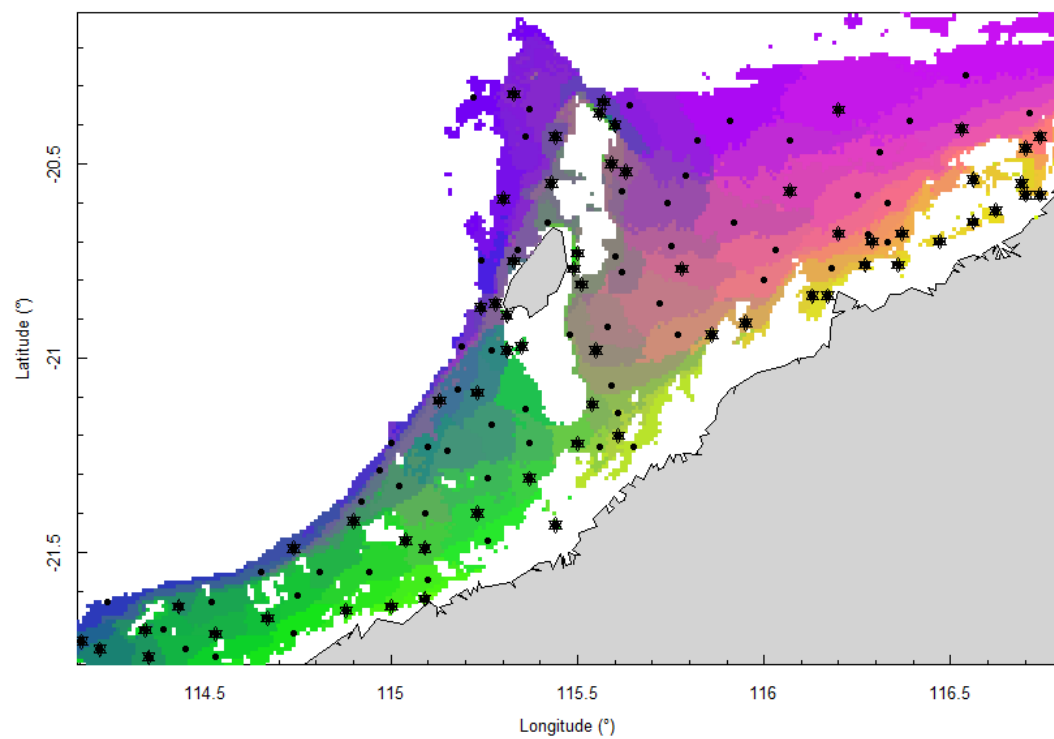




# Seabed biodiversity survey June 2013

125 sites sampled:

- 125 towed video
- 111 benthic sled
- ☆ 43 trawls

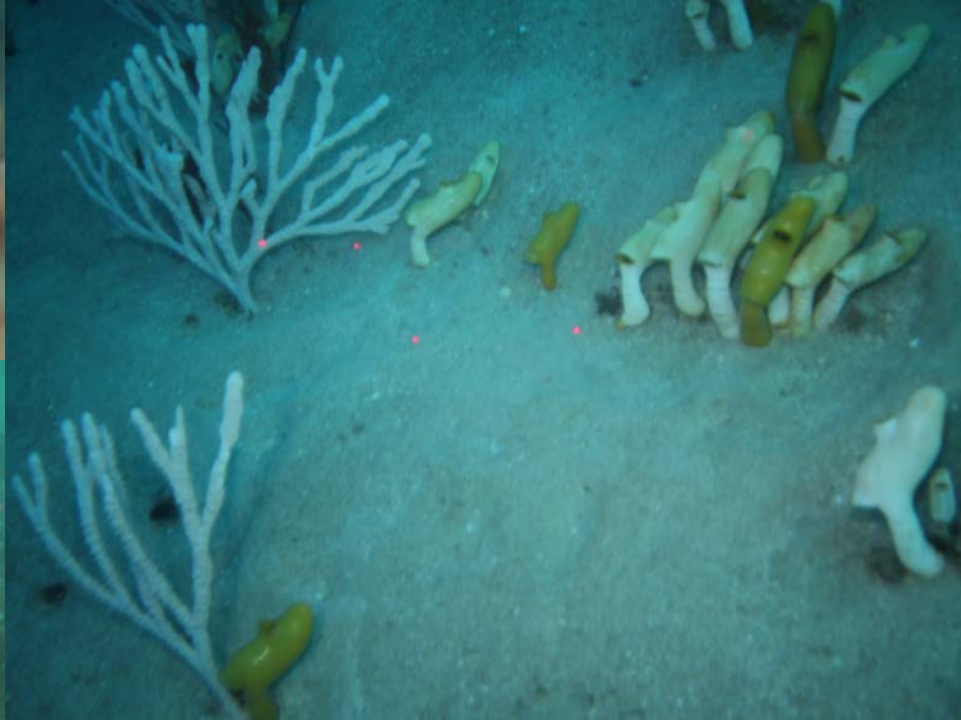


CSIRO R/V Linneaus:  
video + some sleds



WA Fisheries R/V Naturaliste:  
trawls + most sleds



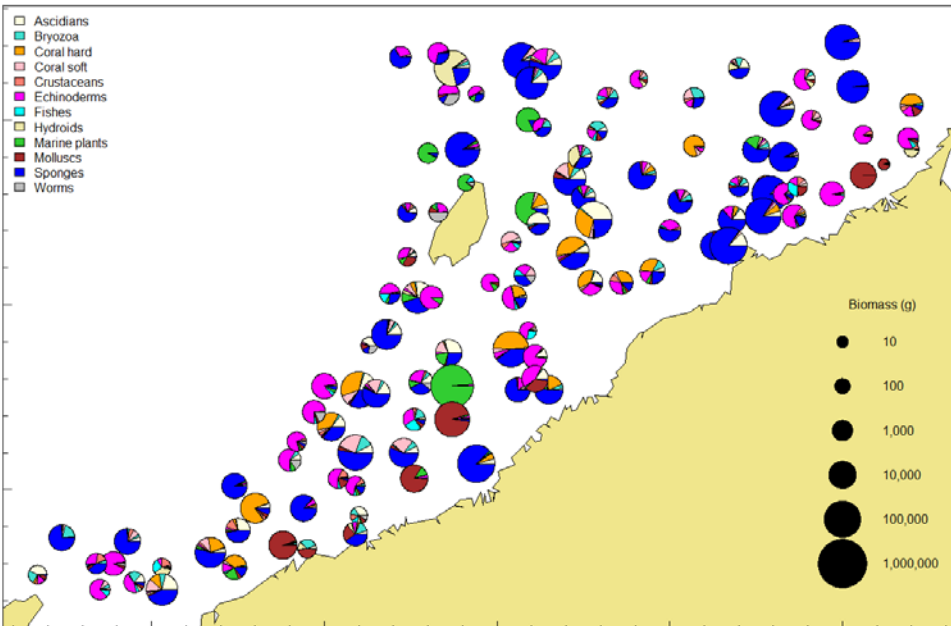




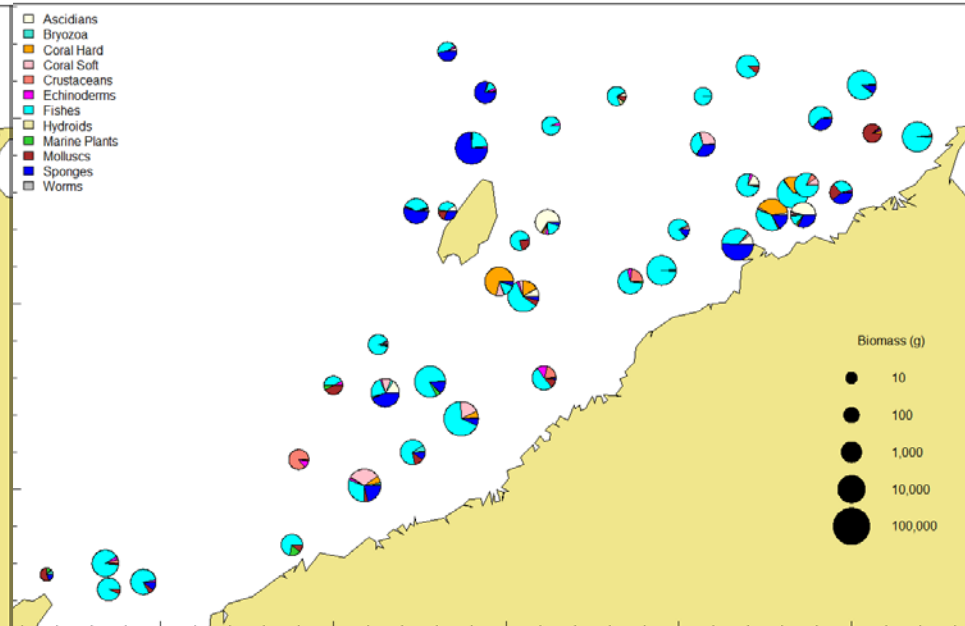
# Characterisation of biodiversity: 1943 samples collected from 14 taxonomic groups



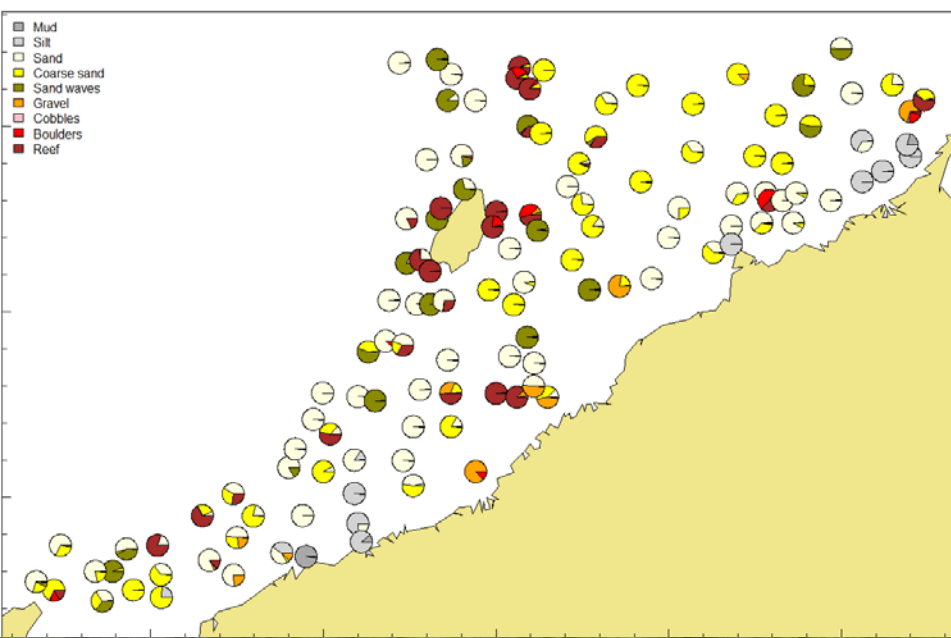
## Sled: benthic invertebrates



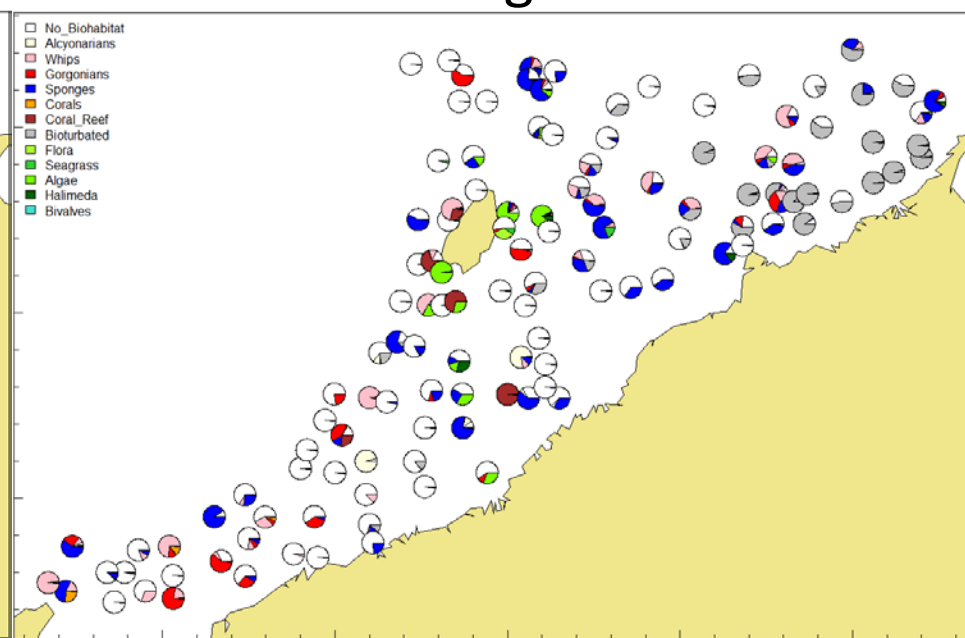
## Trawl: fishes & mobile inverts



## Video: Substratum habitat



## Video: Biological habitat







# Regional seabed biodiversity characterisation



- Sorting & identifications completed:

Group	Sorting & Identifications	No of Samples	OTUs/species
Crustaceans	CSIRO/WAM	125	201
Fish	CSIRO/WAM	219	202
Molluscs	CSIRO/WAM	196	191
Hard corals	CSIRO/WAM	68	47
Soft corals	CSIRO/WAM	114	111
Sponges	CSIRO/WAM	135	303
Plants	CSIRO/Murdoch	118	75
Echinoderms	CSIRO/WAM/VicM	487	170

- Sponges dominated the biomass and were most diverse.

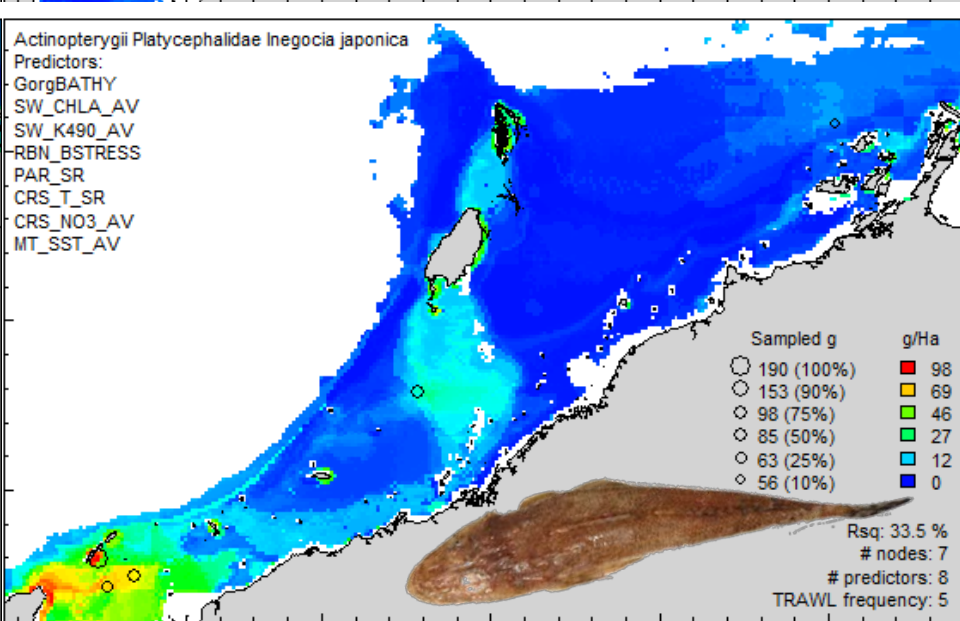
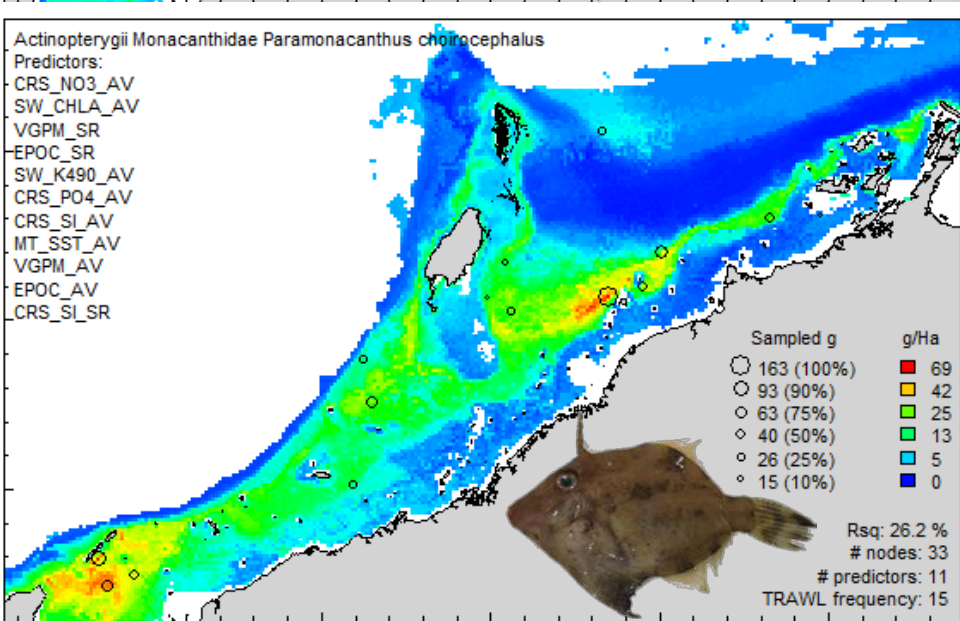
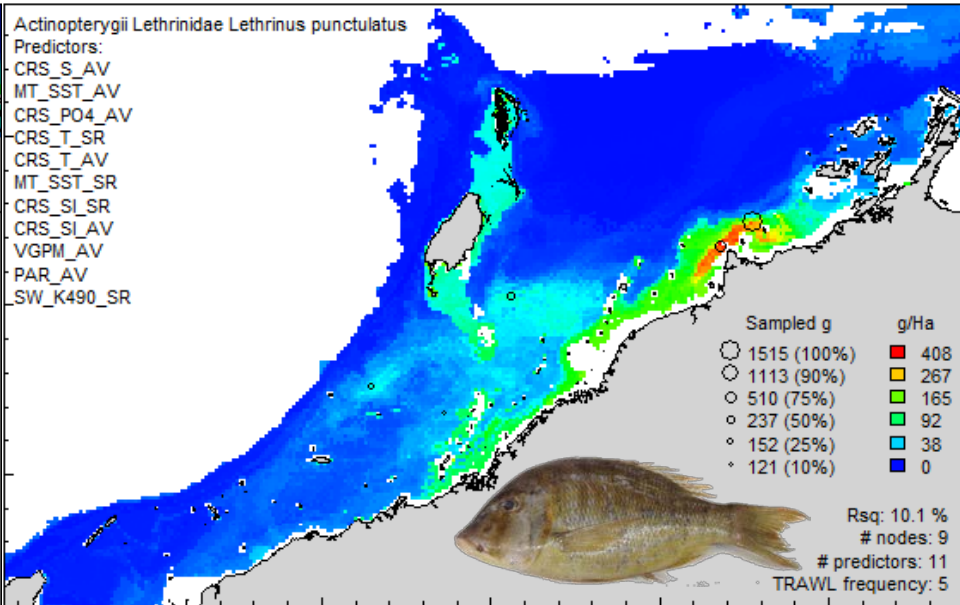
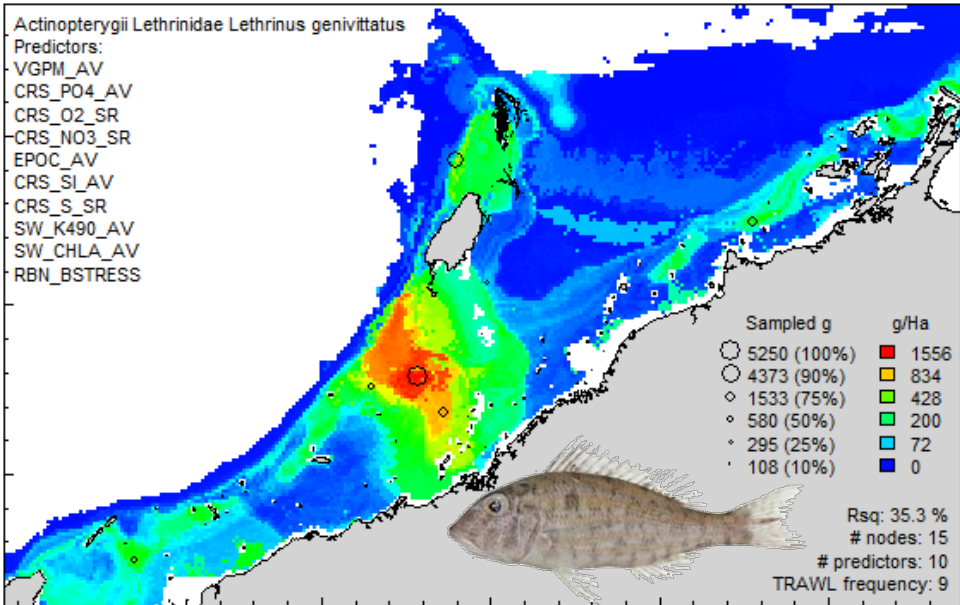




# Example species distribution prediction maps



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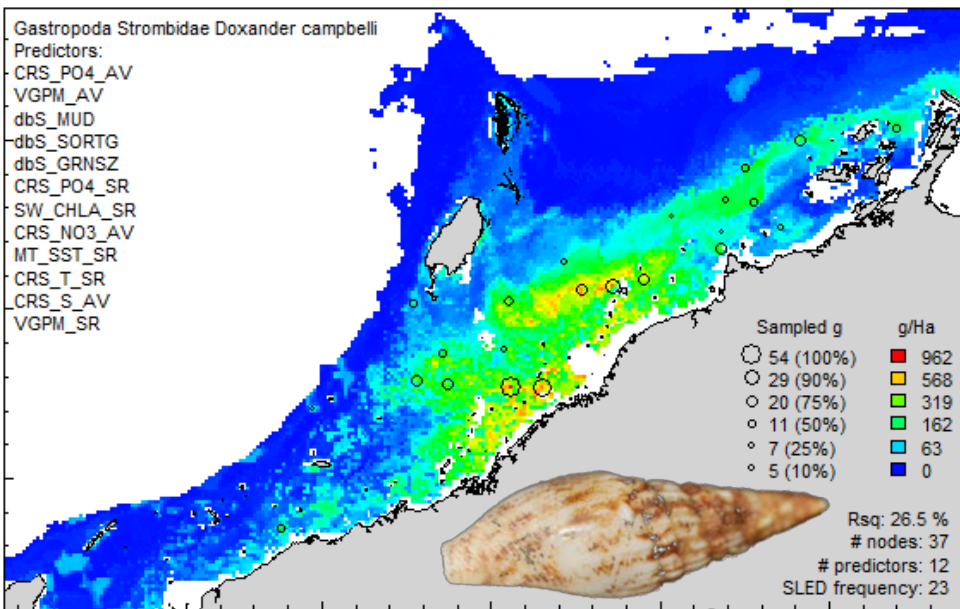
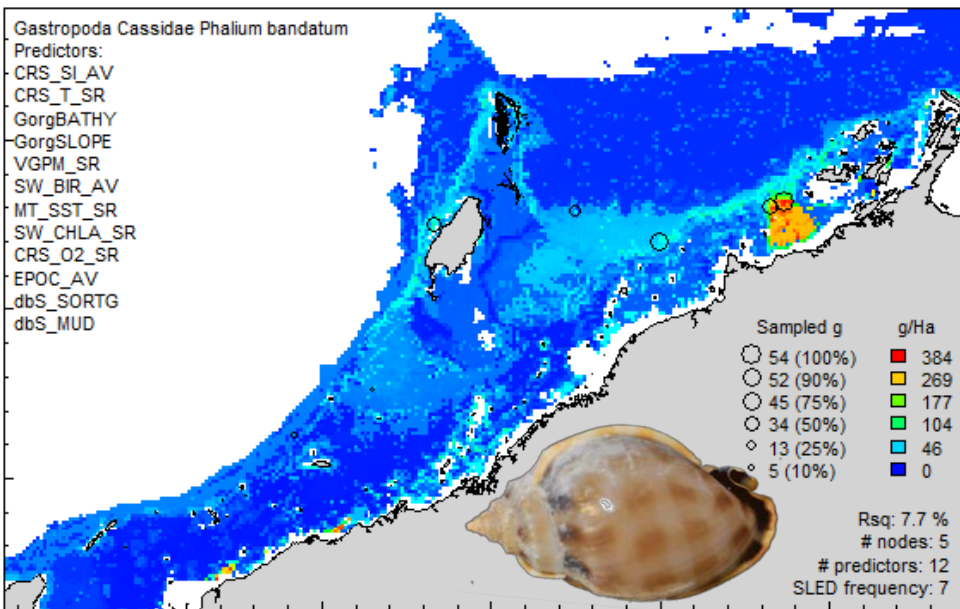
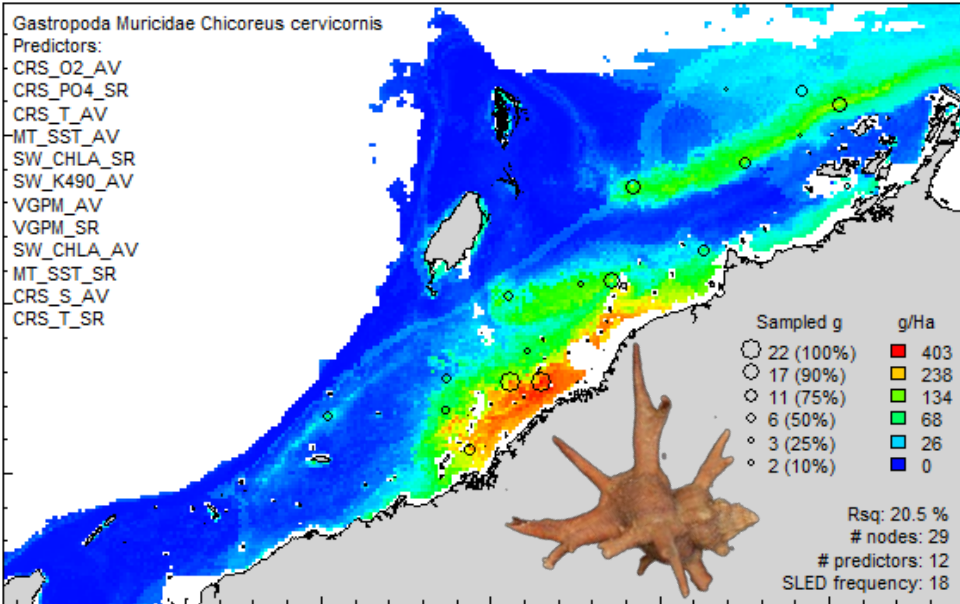
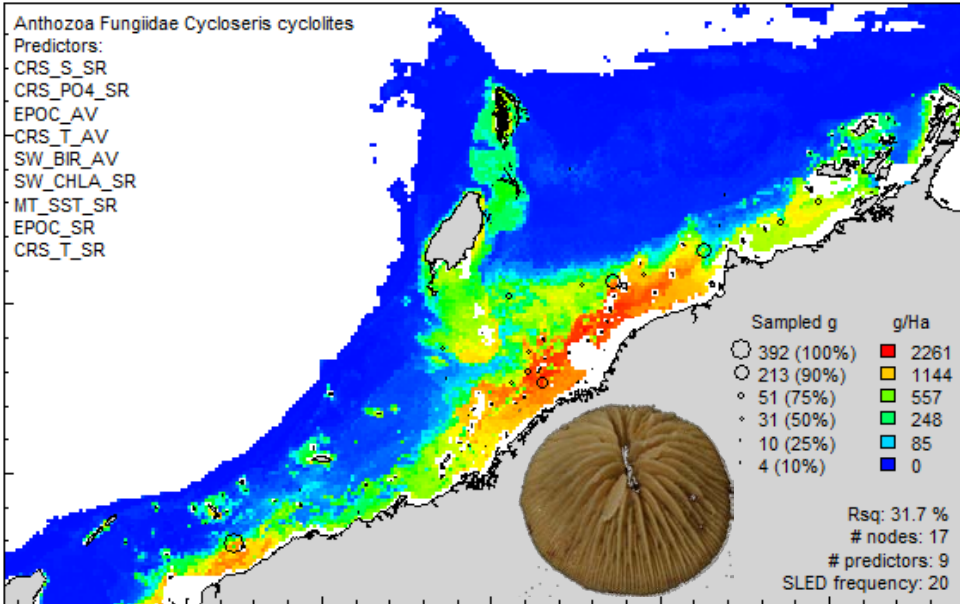




# Example species distribution prediction maps



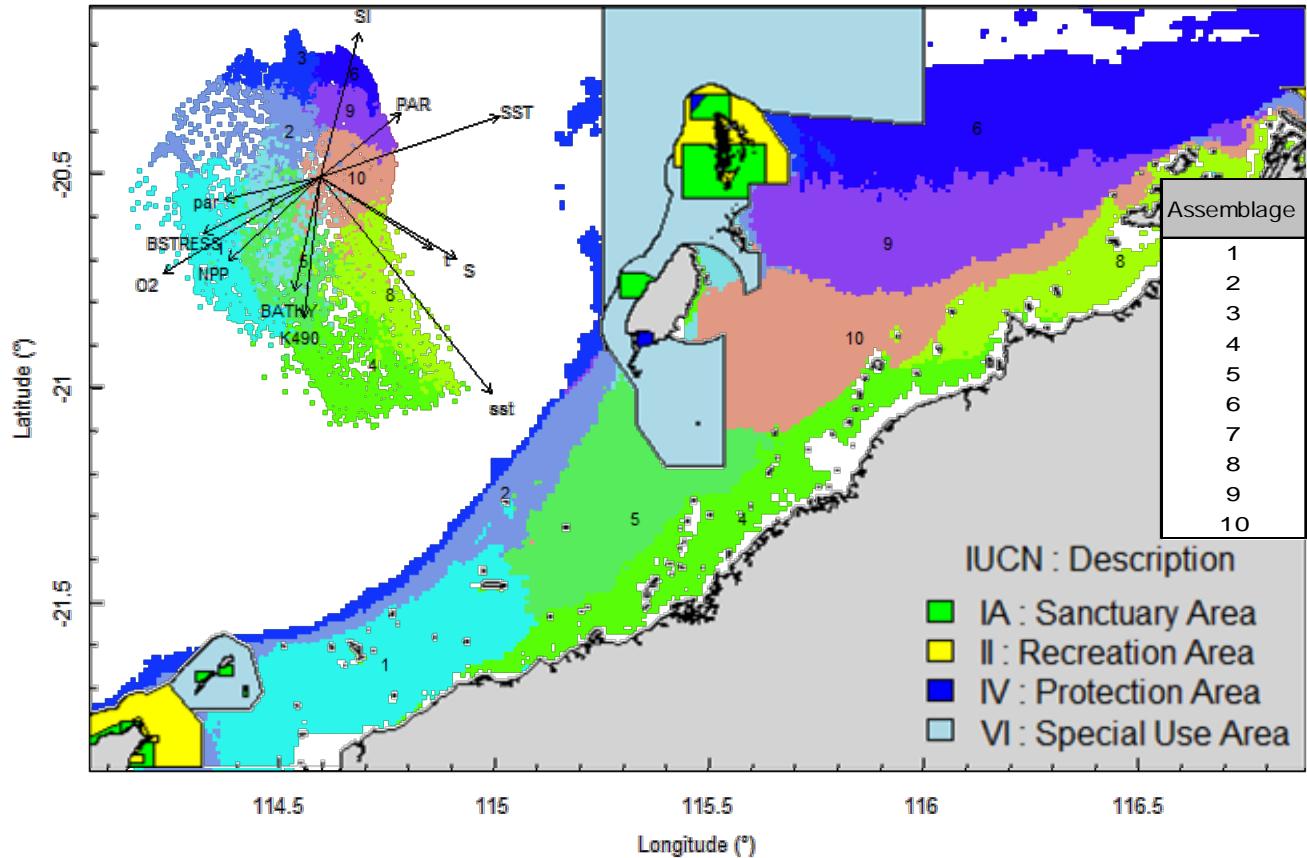
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# Regional bio-physical characterisation



Assemblage	IUCN IA	IUCN II	IUCN IV	IUCN VI	Trawl Footprint
1	1.1	1.1	0	6.4	10.3
2	6.7	22.0	0.4	13.5	6.5
3	0.6	5.7	0.2	56.5	0
4	1.0	0.7	0.5	1.3	4.7
5	0	0	0	15.3	0.8
6	0	0.3	0	8.0	0.3
7	19.0	5.5	0	57.5	0
8	0	0	0	0	0.1
9	0.6	1.2	0	1.0	0.0
10	0	0.2	0	6.1	0.6



# Regional seabed biodiversity characterization



- Sampling, sorting & identifications completed:
  - Video: 125 sites characterized 10 substratum & 22 biological habitat types
  - Sled: 111 sites, 1157 species/taxa, 4982 records
  - Trawl: 43 sites, 427 species/taxa, 1072 records
  - Perhaps >35 new species
- Final analyses completed:
  - Modelled and mapped distributions and abundance of ~185 species/taxa
  - Bio-physical analyses identified & mapped 10 assemblages/eco-regions
    - important variables: sea surface temperature, bottom temperature, nutrients, salinity, current stress, chlorophyll, oxygen, light, sediments, turbidity, productivity
- Final Report completed early 2016.





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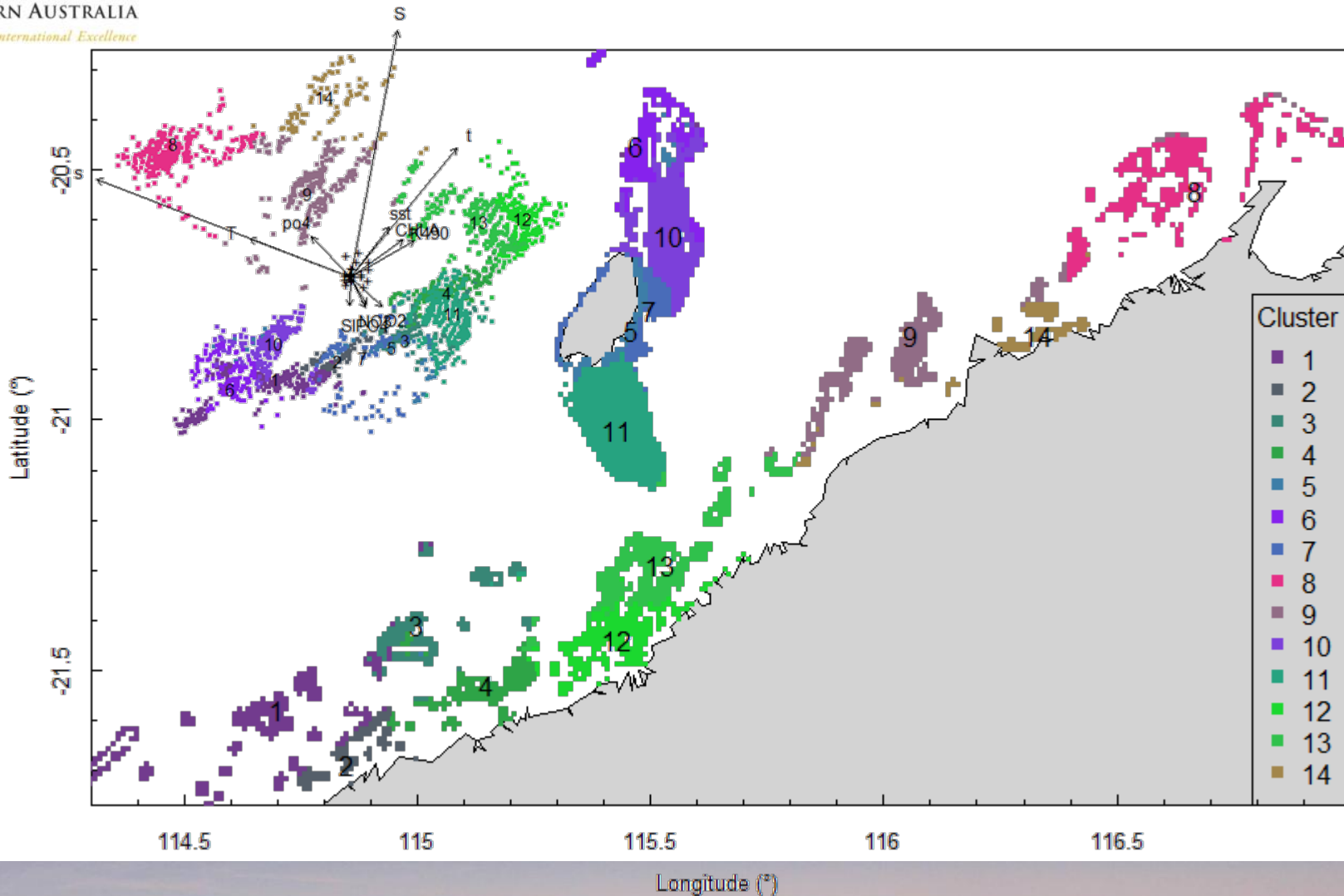
## 2. Reef Habitats, Biodiversity and Characterisation







# Initial reefs characterisation / stratification





## Reefs biodiversity surveys

- **Habitat surveys**, 3 trips in 2013 and 2014
  - photos ~0.5m on short transects, points analysis
- **Algal weights**, 4 trips in 2013 and 2014
  - Extractions from quadrats on long transects
- **Underwater visual census**, 2 trips in 2014
  - cover of corals, algae & seagrass on long transects
- **Macroinvertebrates**, 2 trips in 2013 and 2014
  - counts in 25m × 1m transects
- **Fish UVC**, 6 trips in 2013 and 2014
  - counts of larger fish on long transects (100m × 10m)
  - counts of smaller fish on short transects (25m × 5m)

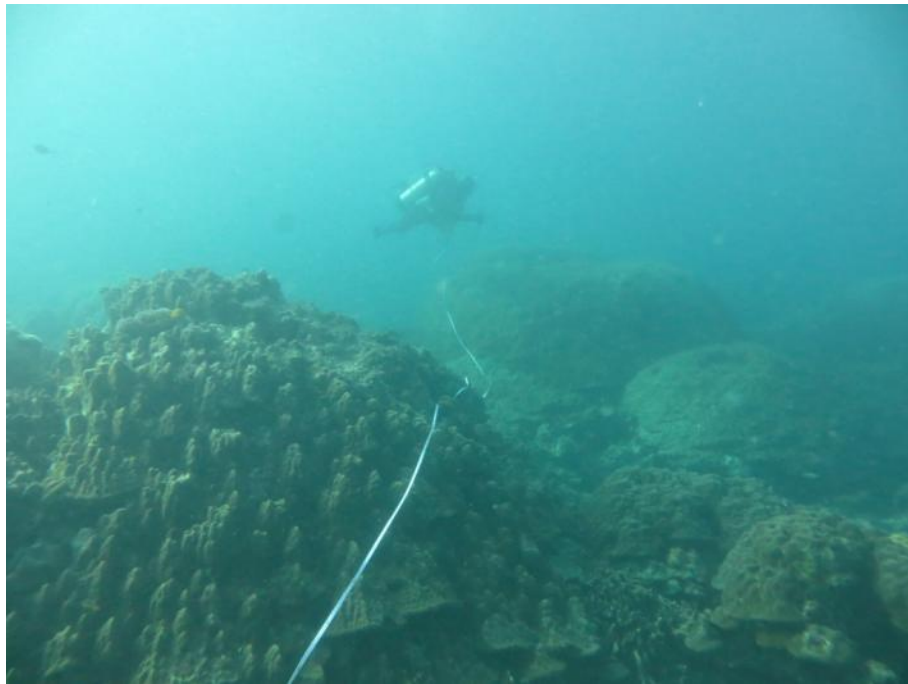




# Reef survey methods



UVC Transects



Biomass quadrats







# Reefs biodiversity surveys



- Summary of data collected:

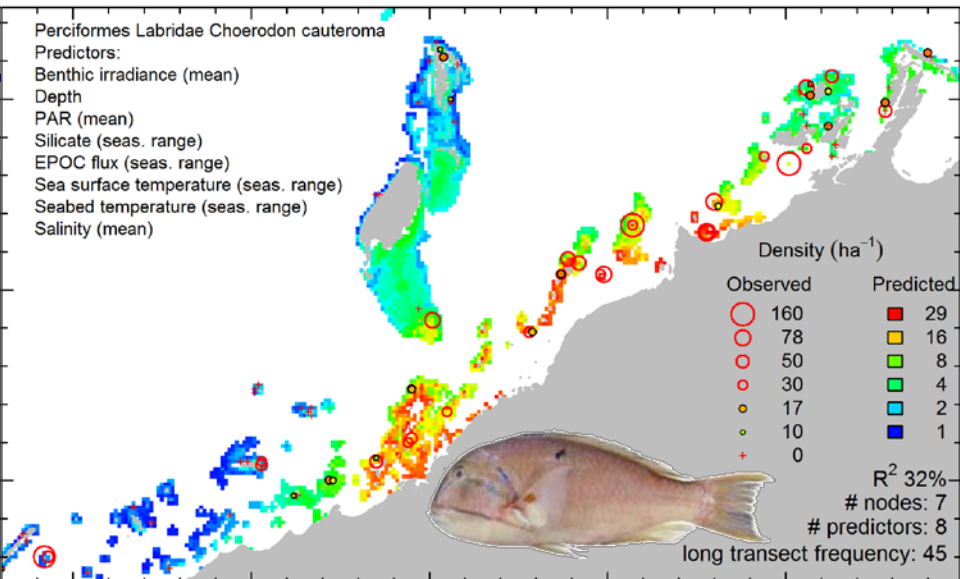
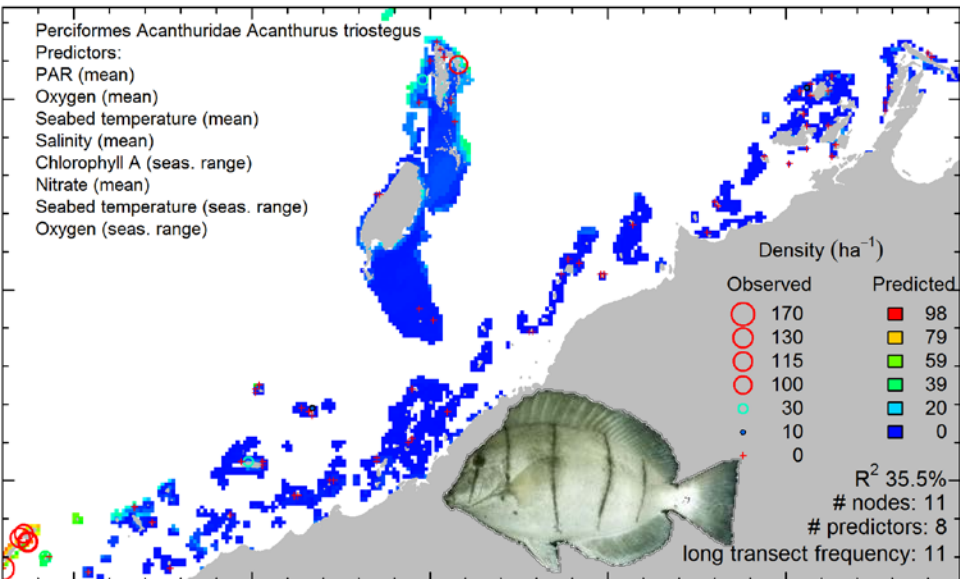
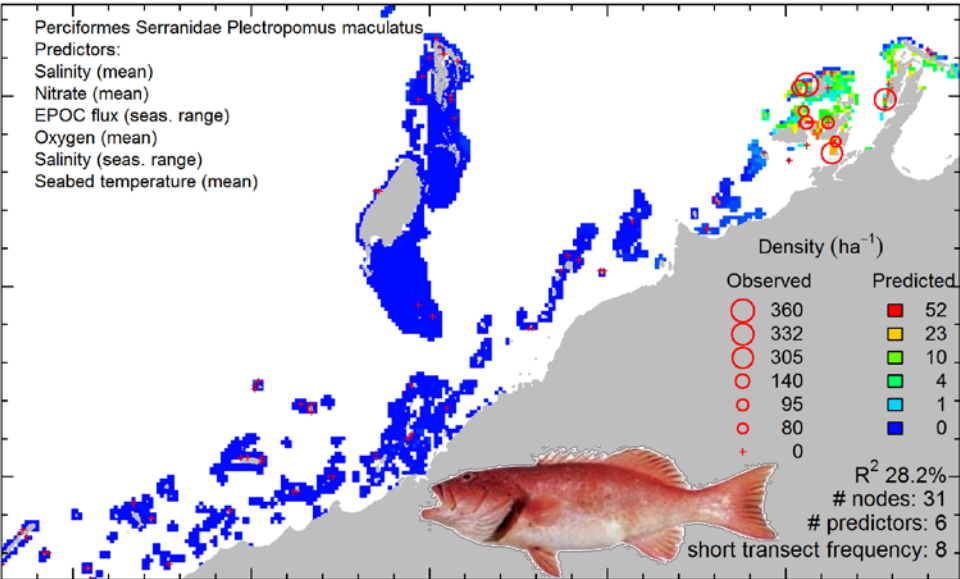
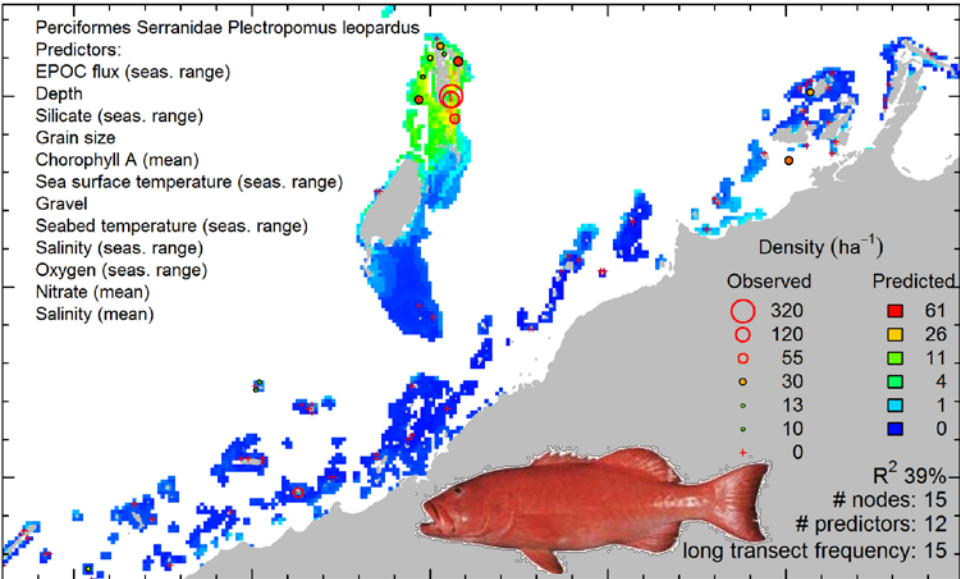
Survey type	Number of Sites	Number of Species
Algae coverage	71	21
Algae weight	75	47
Coral coverage	71	10
Fish long transect	92	236
Fish short transect	92	236
Habitat 'species'	85	209
Habitat broad group	85	8
Macroinvertebrate family	70	22
Macroinvertebrate species	70	46





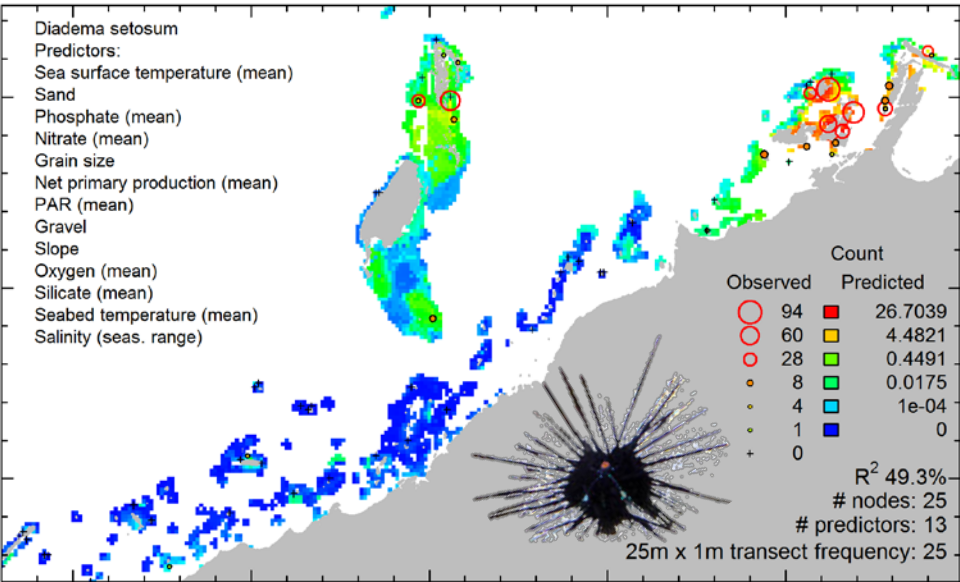
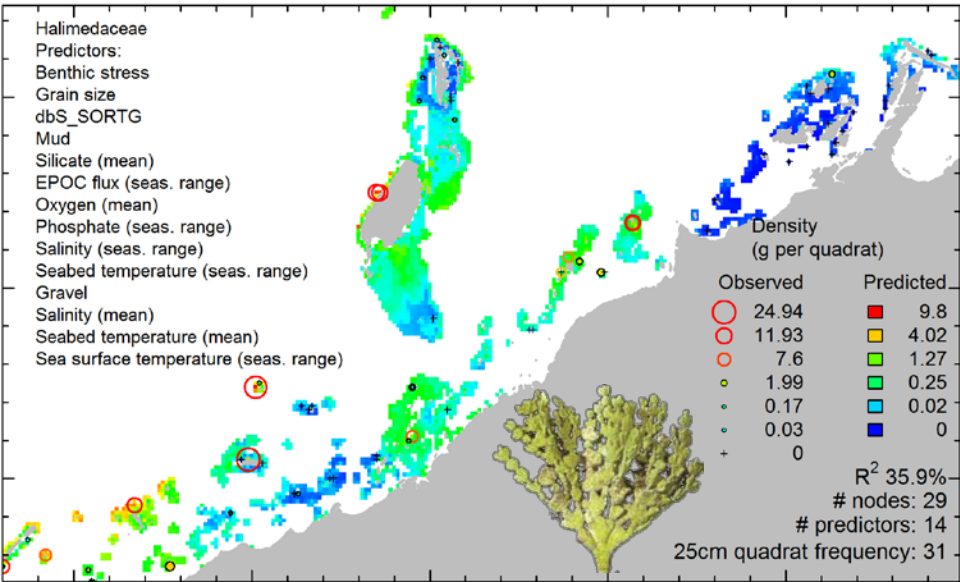
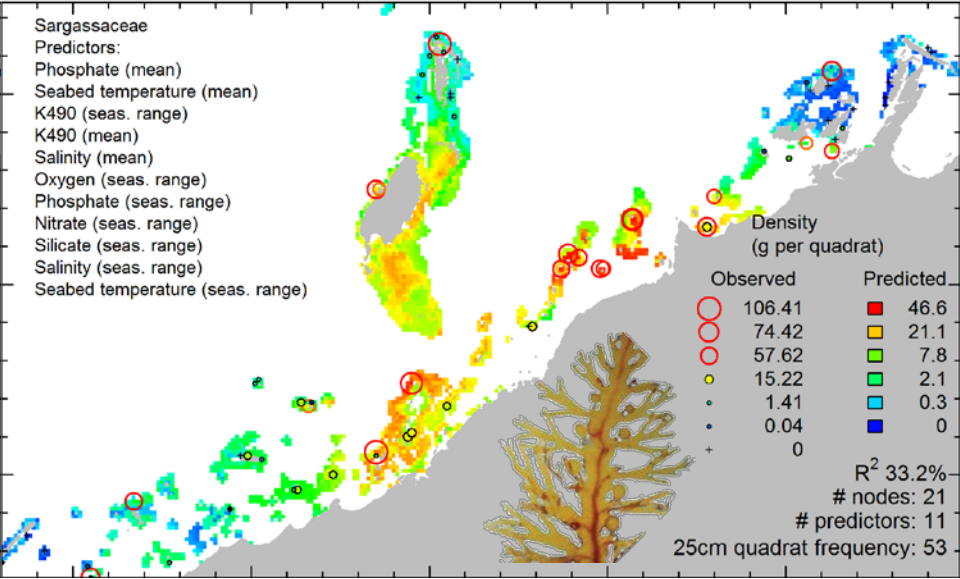
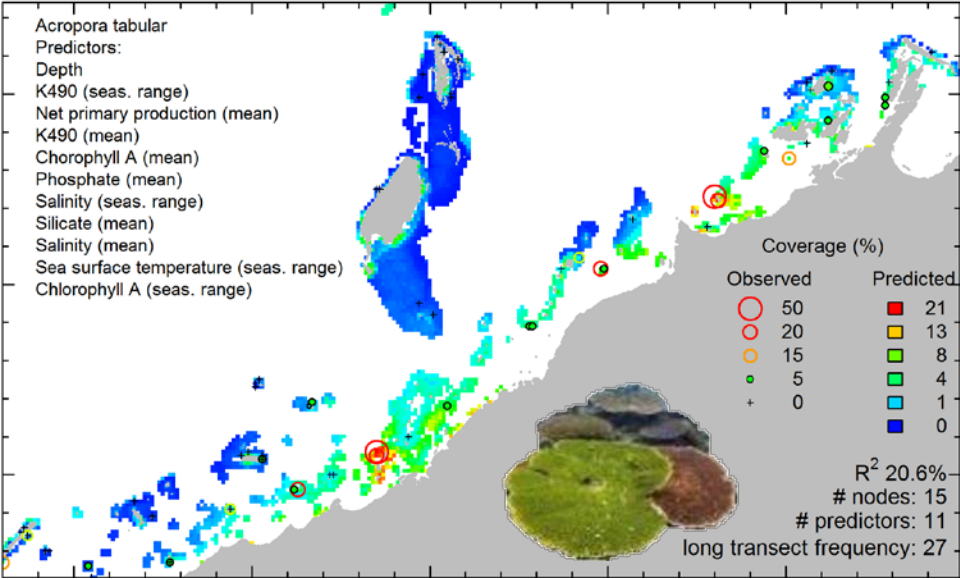
# Example reefs predicted distribution maps

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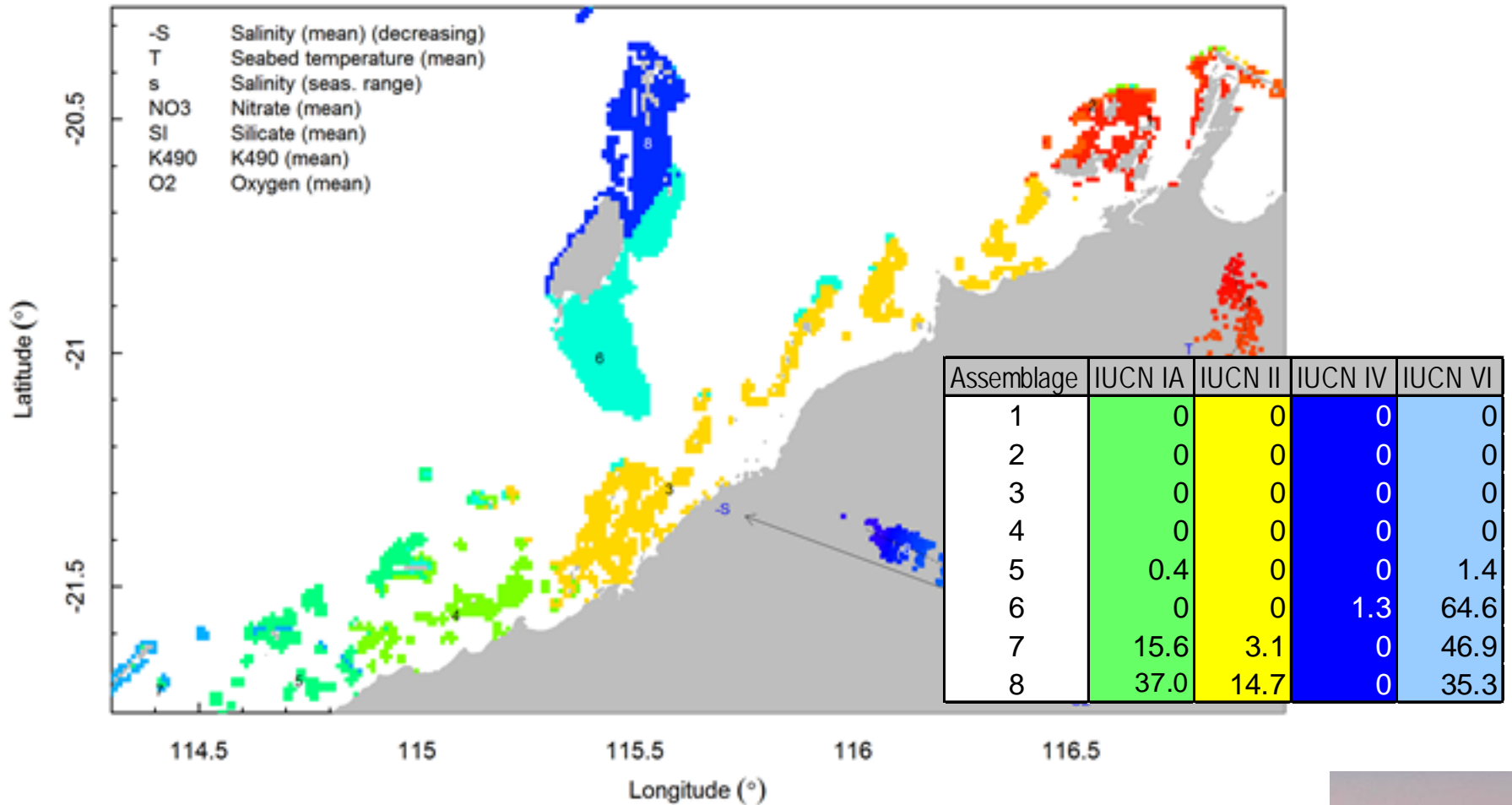
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# Reefs bio-physical characterisation





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# Habitats and Biodiversity Characterisation and Mapping MANAGEMENT APPLICATIONS



The outputs can assist with management questions such as:

*Is the positioning and scale of **current MPA networks** and no-take zones providing comprehensive, adequate and representative protection for marine benthic species, assemblages and habitats?*

*What should be the size and location of **other spatial management** zones in the region?*

*Are **proposed development areas** unique in terms of their biodiversity and habitat values, or for any key threatened species?*

*How do **anthropogenic risk factors map** across various habitats and biodiversity values in the region, including marine parks?*





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# Acknowledgements



Gorgon Barrow Island  
Net Conservation Benefits Fund  
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