Habitats on NWS

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CSIRO Marine Research

Acknowledgements

Classification

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Benthic Habitat Model

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Xi He

Role of Habitat

- Multifunctional
  - support diversity
  - life history dependencies (including of target species)
- Impacts
  - sectors
  - natural disturbance

Role of Classification Study

- Integrated information collection
- CSIRO Hierarchical Habitat classification scheme
- Output
  - Input to models (e.g. InVitro)
  - Assist planning in WA

Biophysical Hierarchy

Hierarchy of spatial habitat units

- L0 Realms
- L1 Provinces
- L2 Biomes
- L3 Biogeomorphological Units
- L4 Primary Biotopes
- L5 Secondary Biotopes
- L6 Facies

An ecological unit can occupy any spatial scale (e.g. a population or an ecosystem can be limited to one L6 unit or occur throughout an L1 unit).

Ecological processes

- life history (e.g. growth, mortality, dispersal)
- feeding
- competition
- production

Ecological characteristics

- biodiversity
- trophic connectedness
- movement connectedness
- resilience

Hierarchy of ecological units

- Ecosystems
- Communities
- Species
- Populations
- Genes

Data Types

Ecological Data

- Topography
- Marine habitats
- Terrestrial habitats
- Aerial photography
- Satellite imagery

Human Usage Data

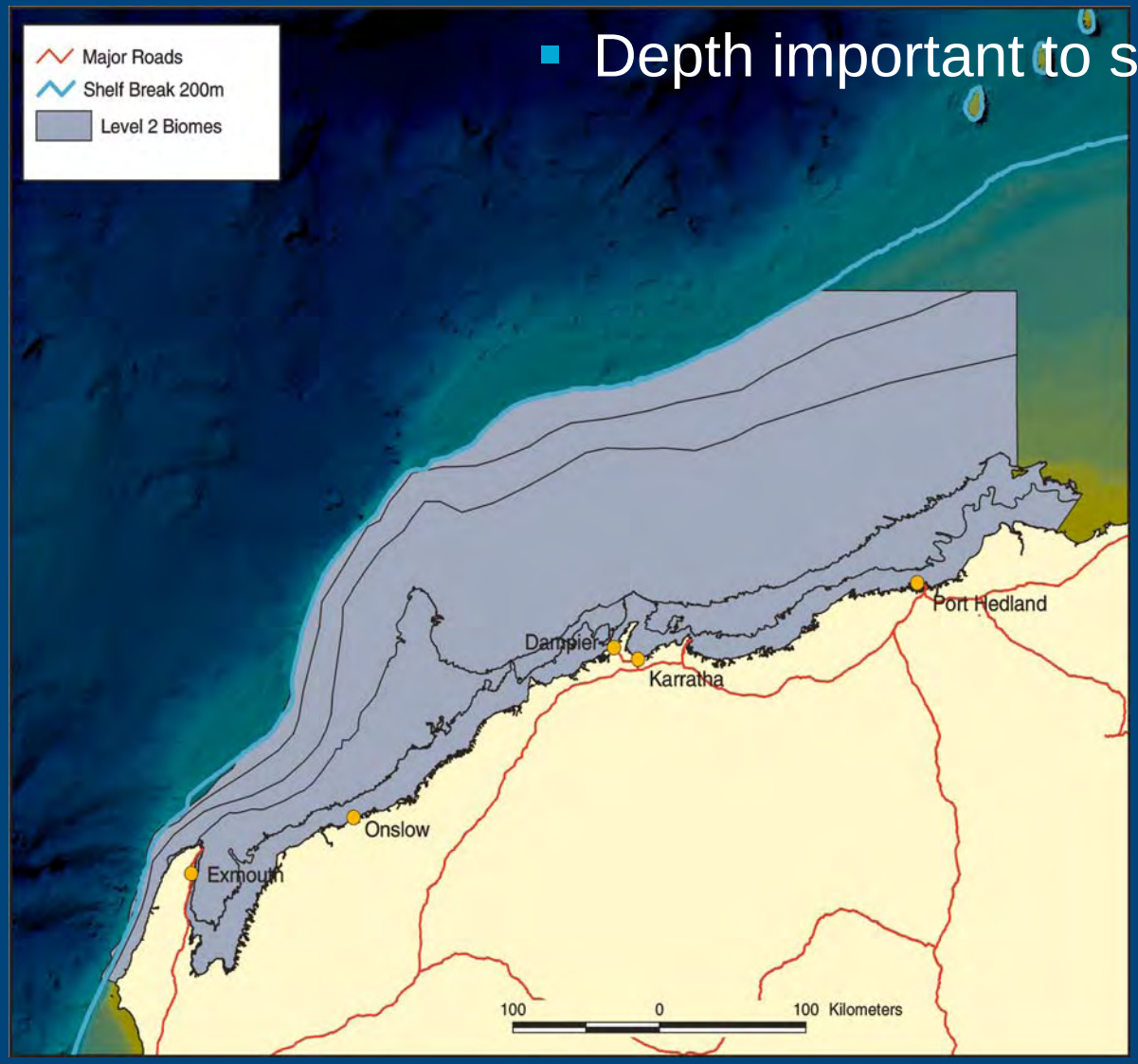
- Infrastructure & development
- Contaminants inventory
- Fisheries licence areas
- Petroleum licence areas
- Tenure
- Conservation zones
- National parks & reserves
- Recreational use
- Aerial photography
- Satellite imagery

Demersal Classification

Level	*Name*	*Description*	*Example*
D0	Realms	Large regions where ecosystems share similar evolutionary histories	Australasian region
D1	Provinces	Large-scale regions of biotic endemism	Australia's western margin
D2	Biomes (and sub-biomes)	Subregions within provinces differentiated by water depth and latitude	Australia's northwest shelf (inner, mid, outer shelf)
D3	Biogeomorphological	Geomorphic features and associated biota (reef to seamount sized structures)	reef
D4	Primary Biotopes	Soft, hard and mixed substrate-based units, together with their associated floral and faunal communities	sand region within reef
D5	Secondary Biotopes	Sediment types or biogenic habitat	limestone sands, seagrass
D6	Facies	Units defined by a biological indicator	seagrass species
D7	Microcommunities	Units based on microbial distributions.	seagrass roothold community

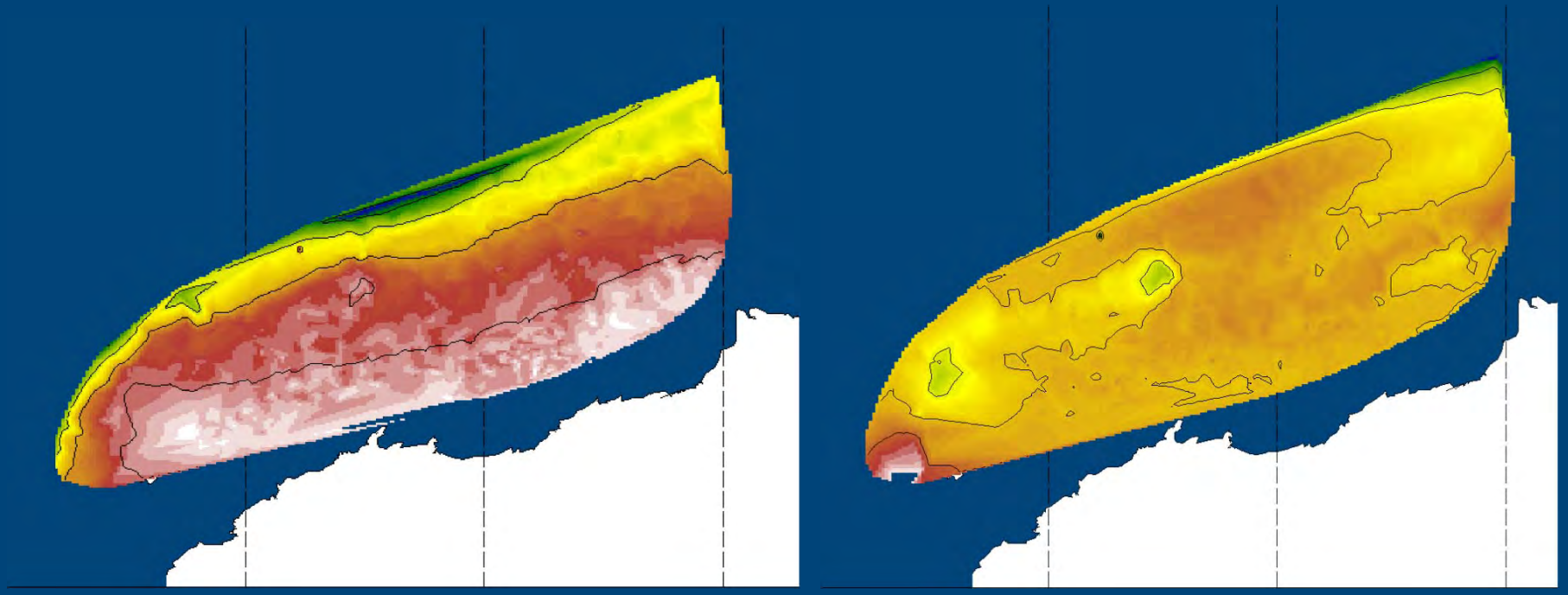
Biomes – D2a-b

- Depth important to structure at this level



Biogeomorphological – D3

- Biodiversity and ecological properties kick-in at levels 2 and 3
  - e.g. weight species data with & orthogonal to depth



Biogeomorphological – D3a-c

Level 3A

- broad regional suites of geomorphic units
- expert interviews & delphic analysis

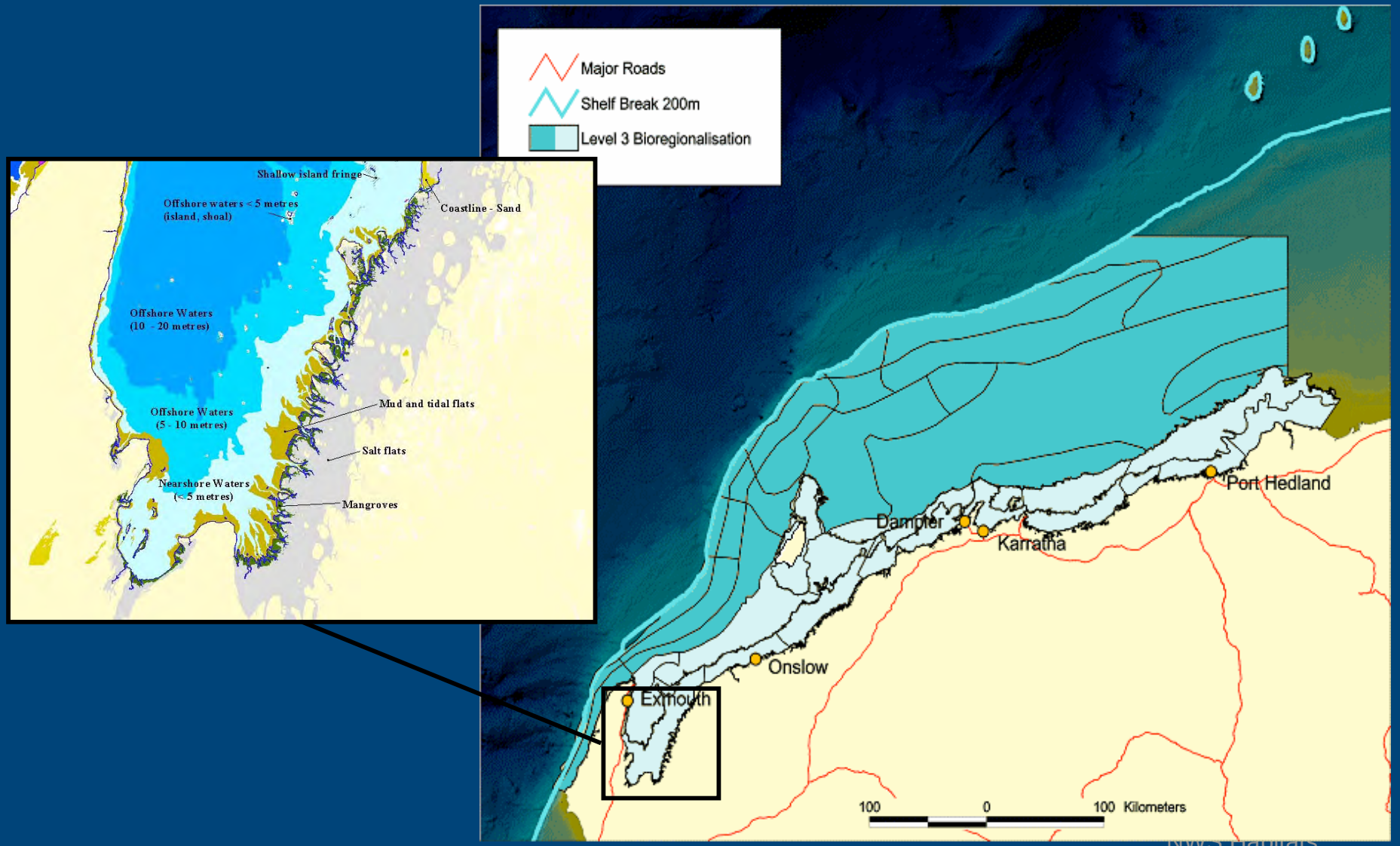
Level 3B

- geomorphic sub units

Level 3C

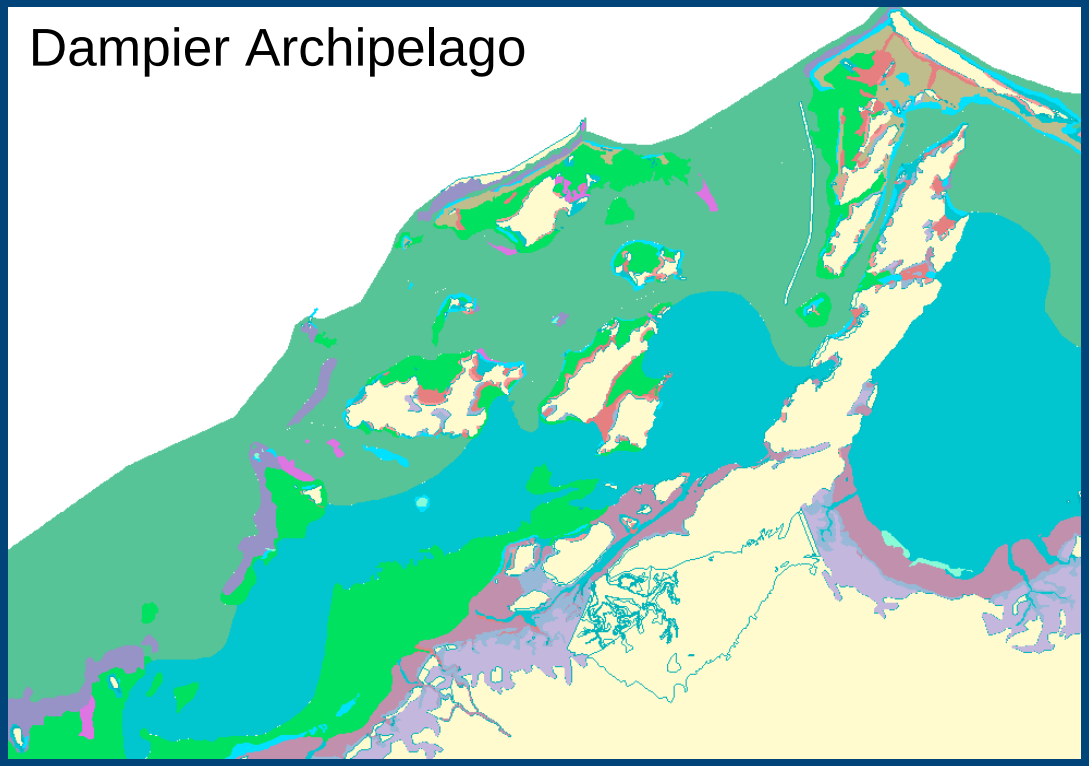
- elemental structure
- data gaps <20m in east = problem

Biogeomorphological – D3a-c



Primary Biotopes – D4

- Closer to “ecological units”

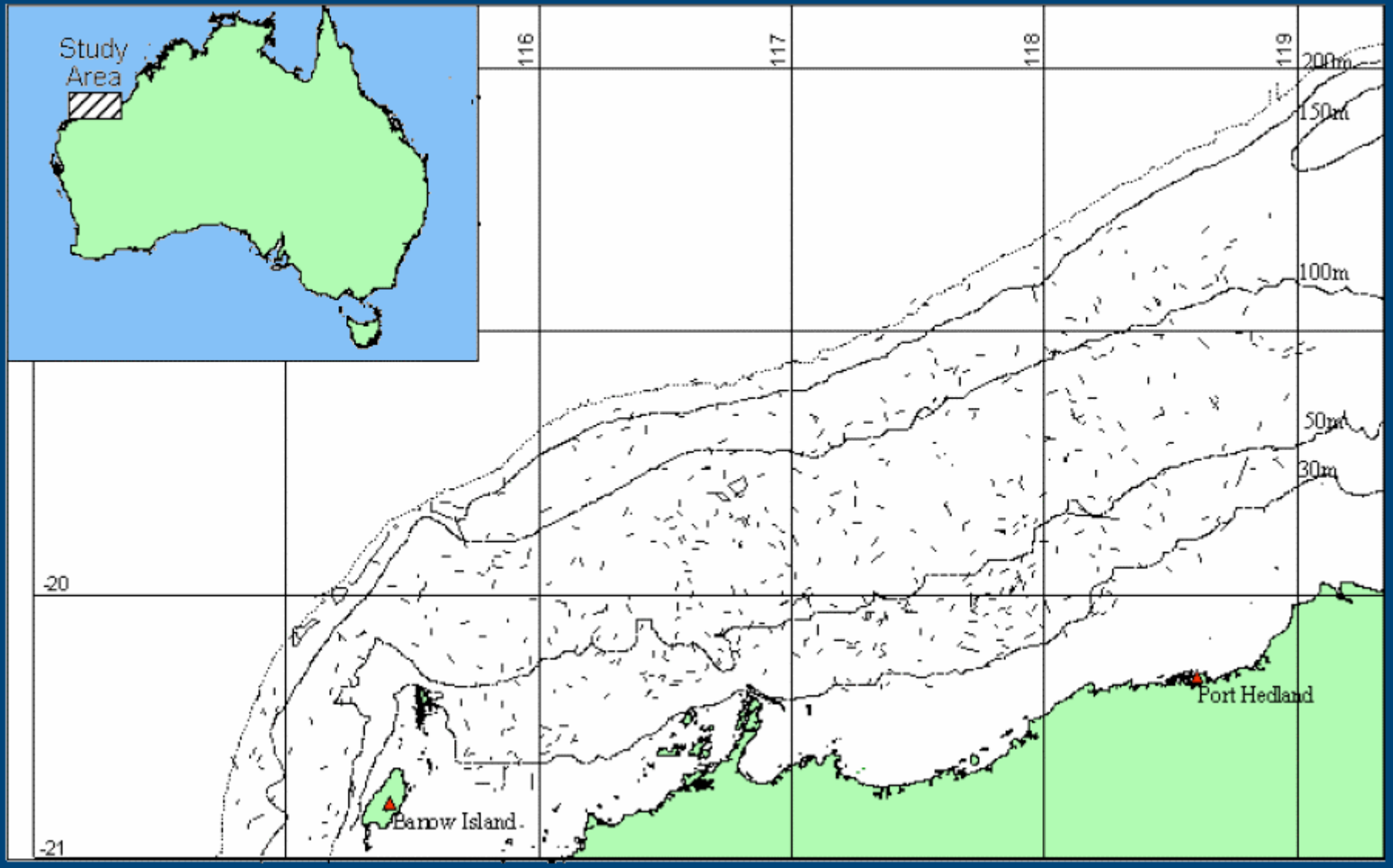


Habitat Data

- Expert information

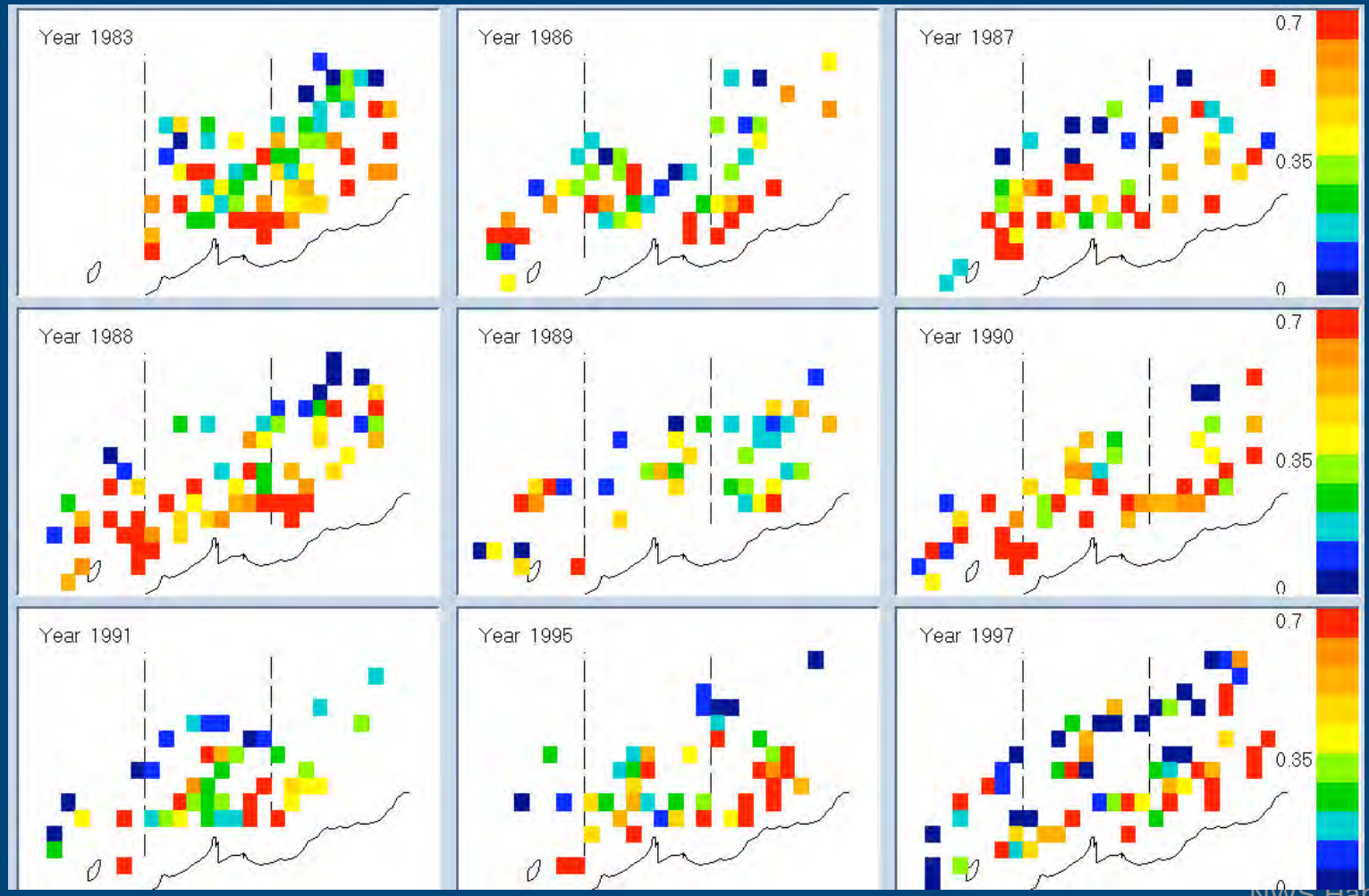
- 1983 – 1997
  - photos to help characterise habitats
  - small (≤ 25cm) and large (> 25cm) epibenthos

Habitat Data



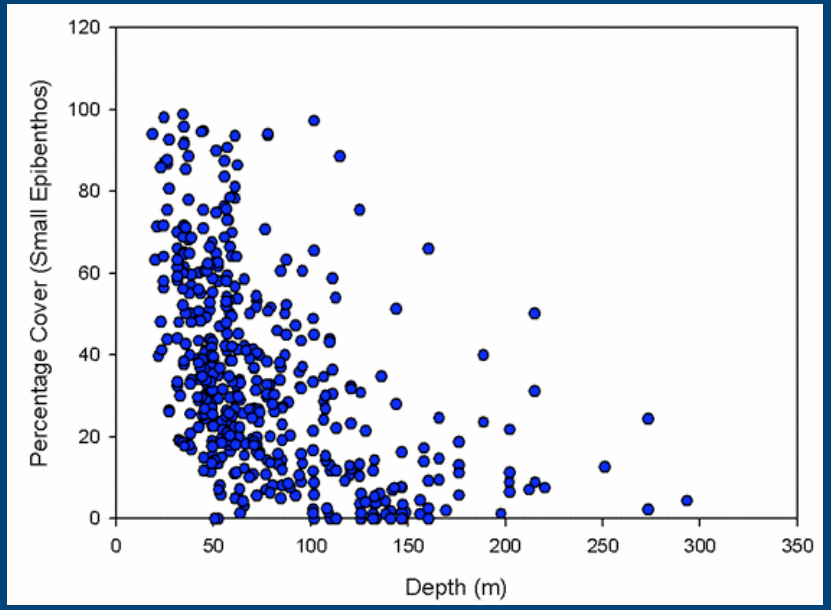
Maps

- Coverage maps & Spadyno software



Habitat Data

- 1983 – 1997
  - photos to help characterise habitats
  - small (≤ 25cm) and large (> 25cm) epibenthos
  - depth dependent distribution
    - ⇨ sediments
    - ⇨ NOT bottom stress

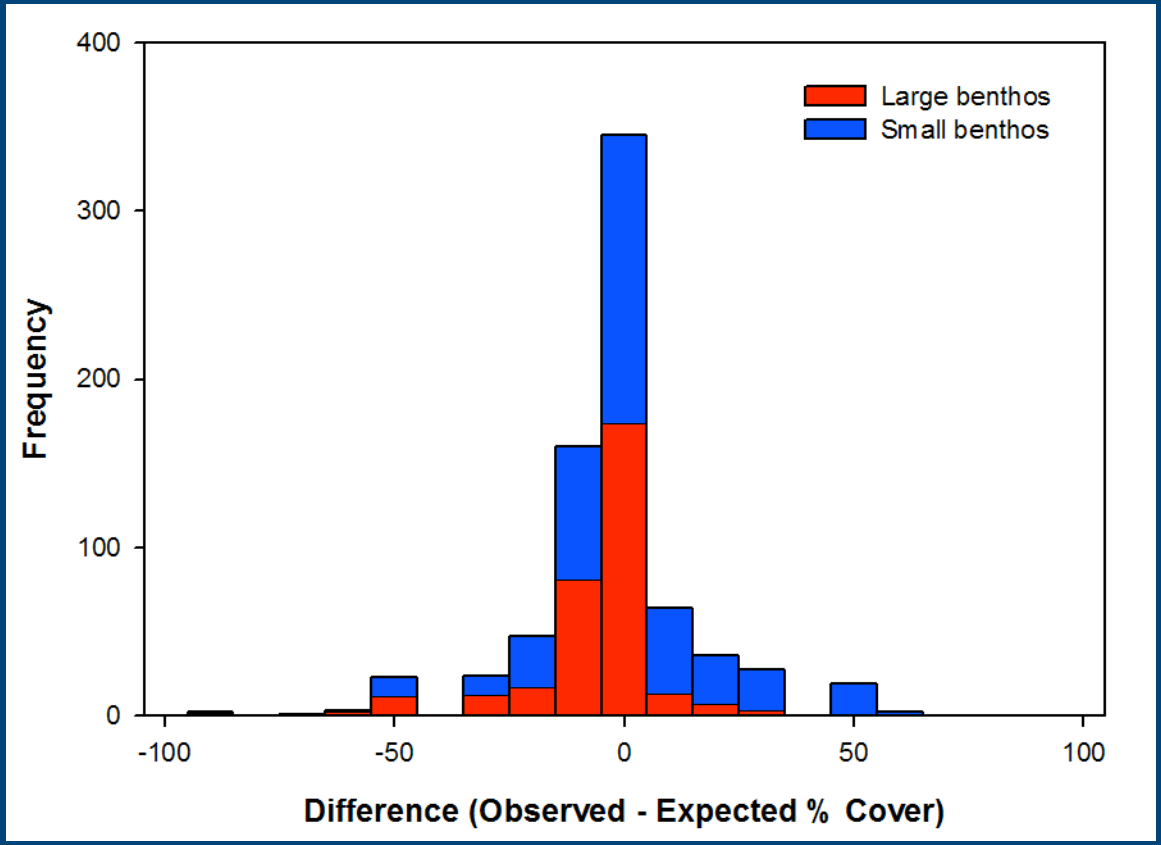


Habitat Modelling

- Age-structured metapopulation analysis
  - recruitment (depth, substrate & regional biomass)
  - growth (horizontal, vertical)
  - natural mortality
  - removal (trawling, cyclones)

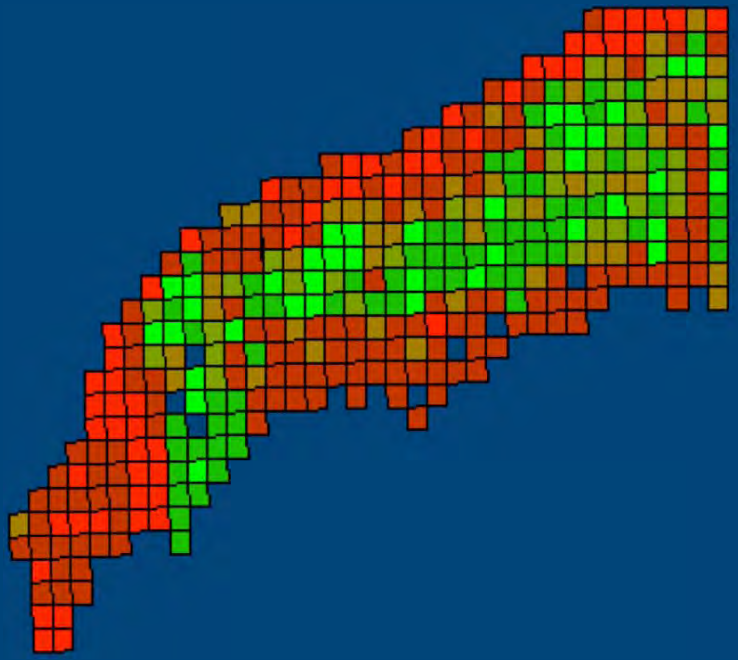
Model Fit

- Pretty good fit to observations
  - slightly underestimates “large” due to spatial resolution



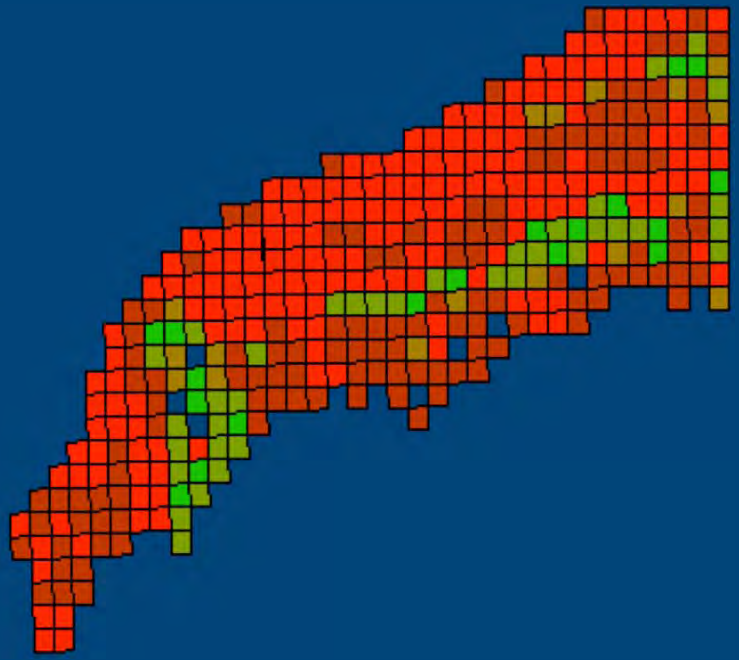
Spatial predictions

- Benthic habitat and trawling



1969

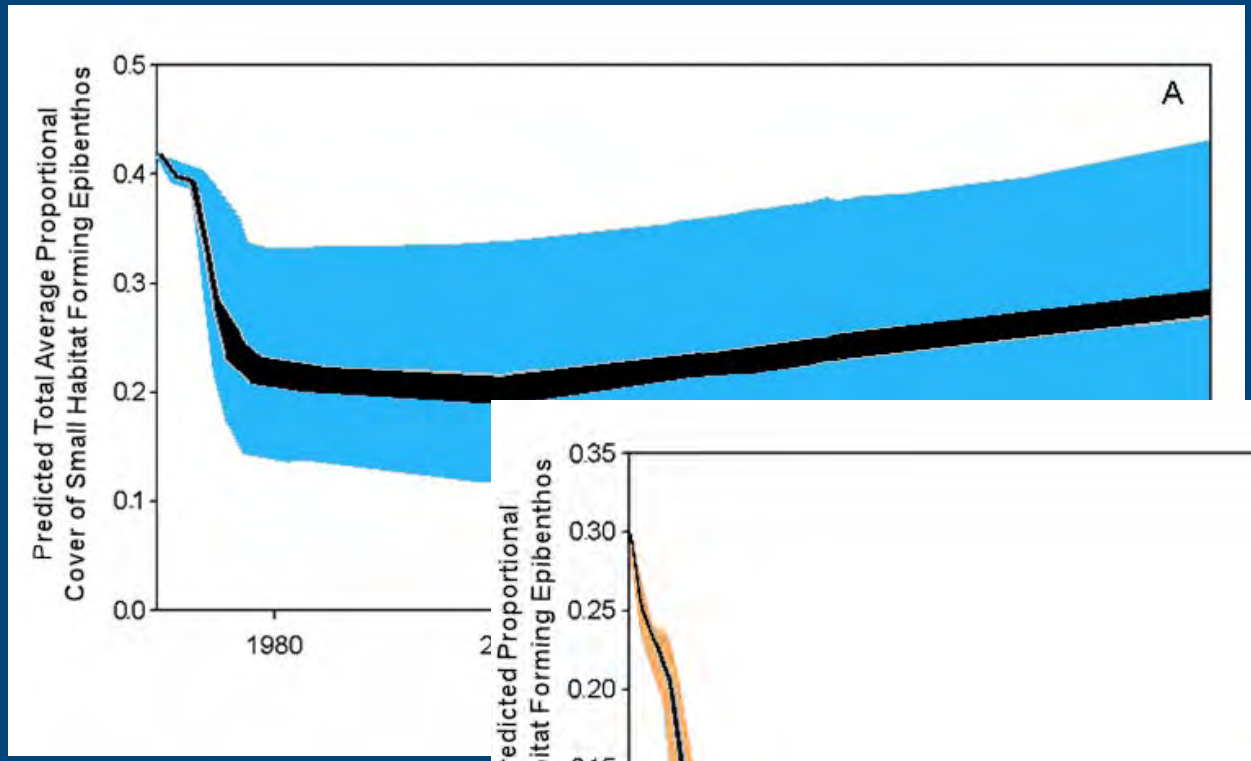
(Before)

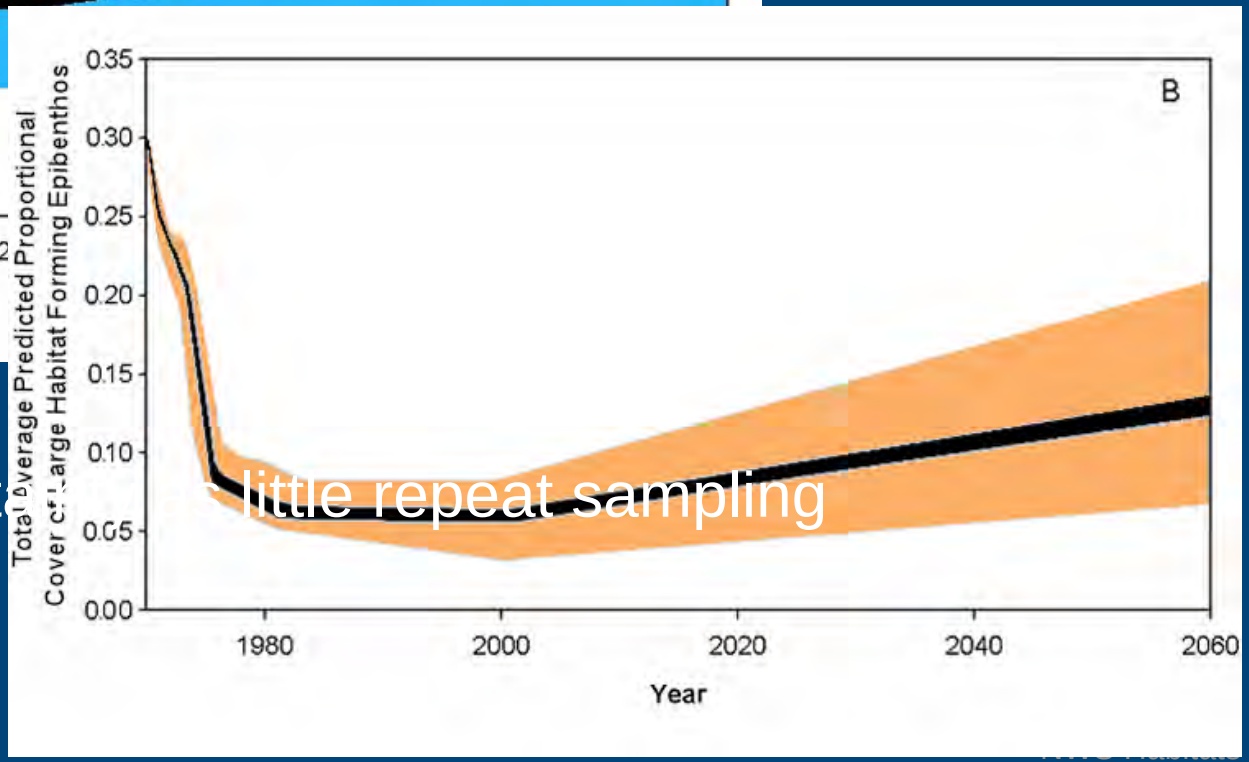


2001

(After)

Regional predictions





- Broad uncert[illegible] little repeat sampling

Usefulness (Maps and Models)

Provide a structured approach to understanding and managing the oceans

- Regional Marine Planning
  - national MPA and other conservation initiatives
  - assessing marine use applications

- Underlie Ecological Risk Assessment and ecosystem modelling studies
  - e.g. InVitro (MSE)