Australian Government

Geoscience Australia

Using seascapes to help predict Australia's benthic marine habitat diversity in the development of a national system of marine protected areas

A.D. Heap[1], T. Whiteway[1], V. Lucieer[2], S. Nichol[1]

1. Geoscience Australia, Canberra, Australia

2. University of Tasmania, Hobart, Australia

Australia's UN Obligation

- Australia signed UN Convention on Biological Diversity (1994):

  Conservation of Earth's Biodiversity

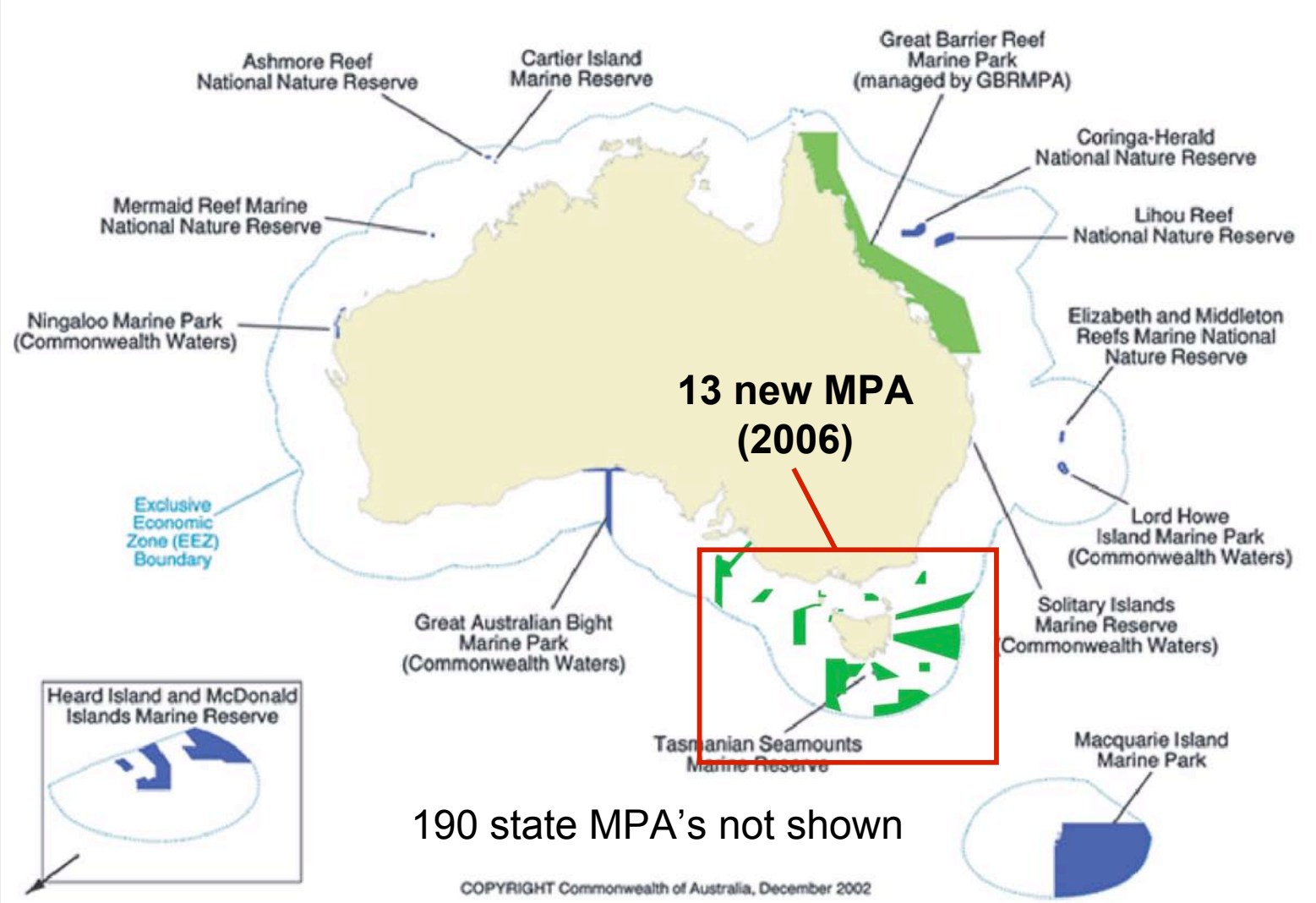
- Australia's Oceans Policy (1998):

  Ecosystem-based Management

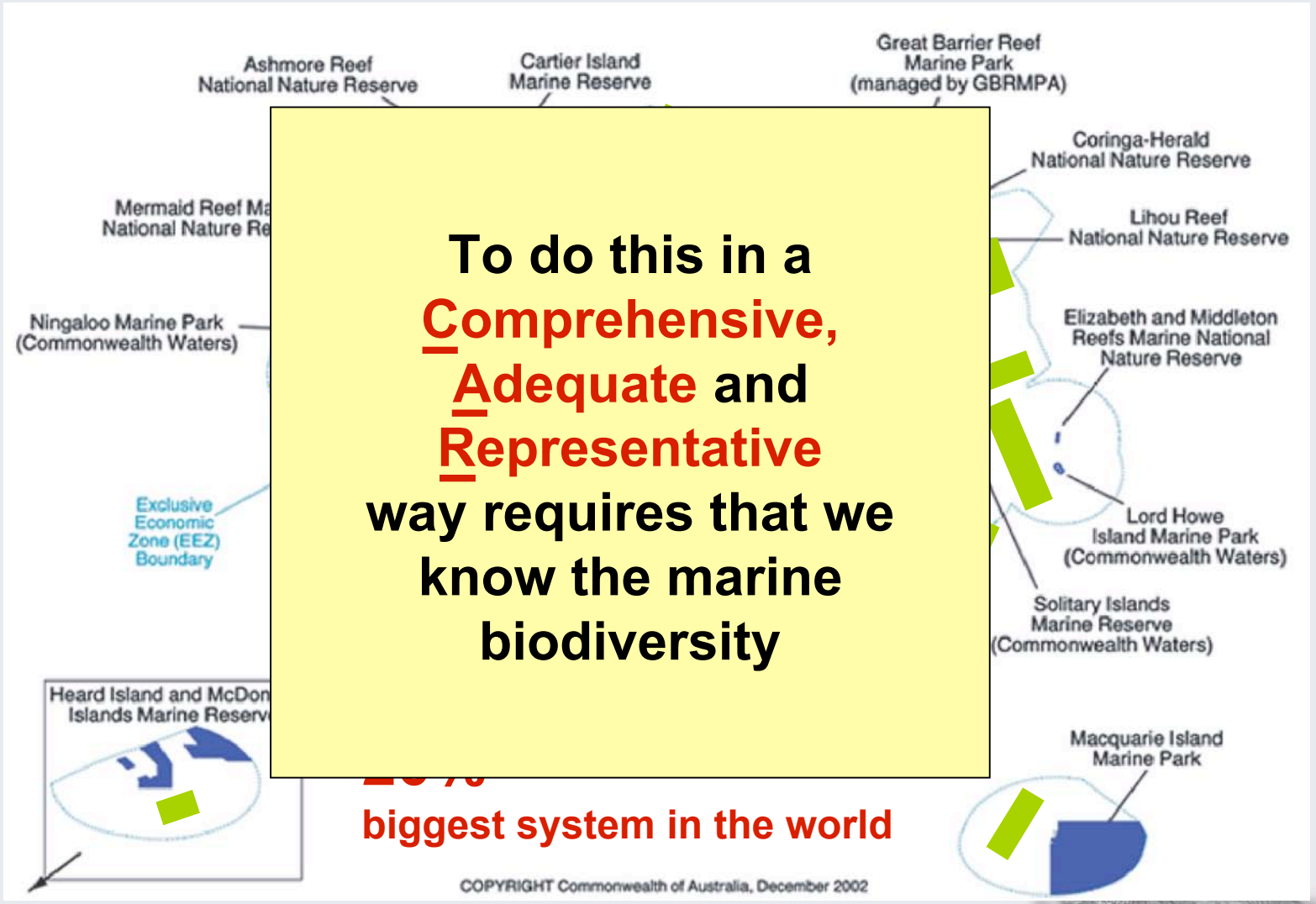
  National Representative System of

  Marine Protected Areas (deadline: 2012)

MPAs in Australia now



Australia's MPA target for 2012



To do this in a Comprehensive, Adequate and Representative way requires that we know the marine biodiversity

The Challenge of Scale

Australia's oceans cover 14 million km^2 (**2x** mainland area)

The Challenge of the Unknown

There is no practical way of analysing the distribution and abundance of **ALL** marine organisms

"Squid common enough to be frequently served on marinara pizzas have still not been described scientifically"

(Luntz, 1999)

Biological sampling is time consuming & costly

Habitat Mapping

It is comparatively easy to map & sample seabed **habitats**

- Water depth
- Seafloor morphology
- Sediment texture
- Sediment composition
- Seabed disturbance
- Biota

Many marine species have known environmental associations

So we can start to use available physical data as a surrogate for marine habitats

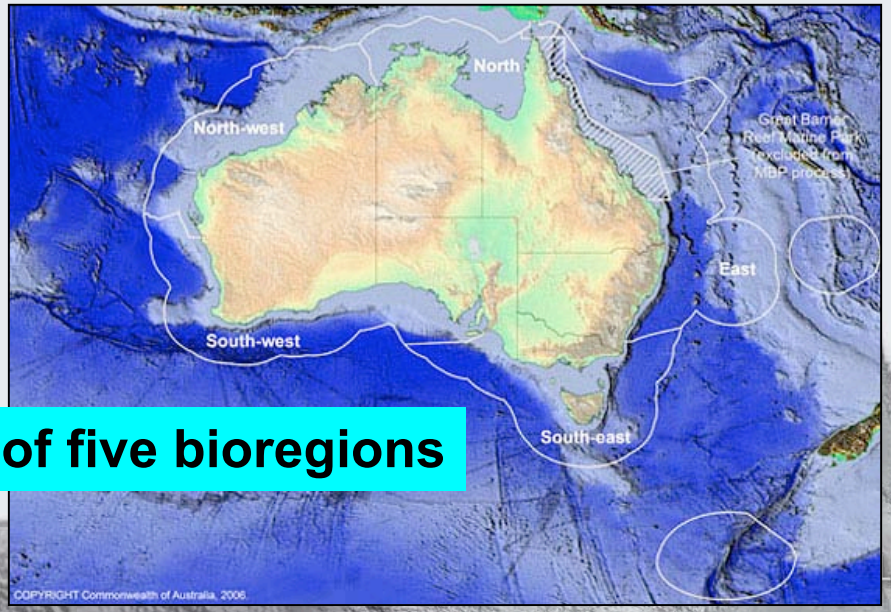
Research Objectives

Objective 1:

Construct a **single map** of seabed habitats/biodiversity using multiple spatial biophysical datasets

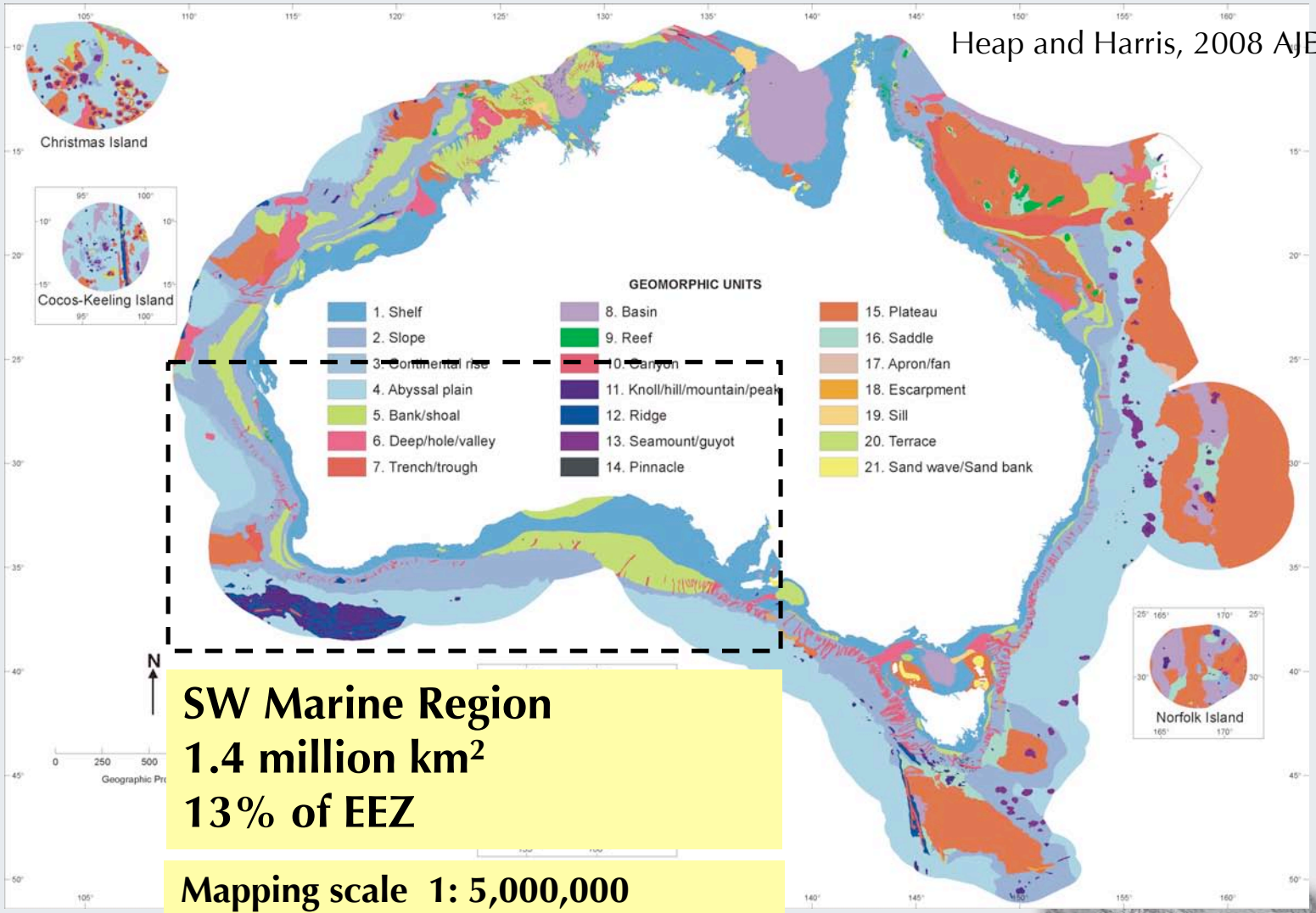
Objective 2:

Identify potential Marine Protected Areas using the seascape map as an objective means to achieve a national **representative system**



Planning framework of five bioregions

Geomorphology of the Australian margin



SW Marine Region
1.4 million km²
13% of EEZ

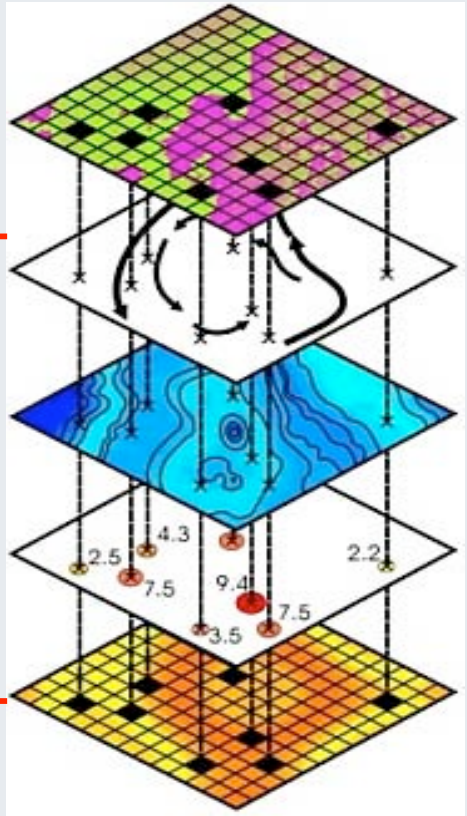
Mapping scale 1: 5,000,000
Based on 250 m bathymetric grid

Seascapes

Integration of ecologically-significant biophysical variables to create a single map (seascapes)

Integrated product

Input bio-physical data



Seascapes

=

(e.g., bed shear stress)

+

(e.g., depth)

+

(e.g., slope)

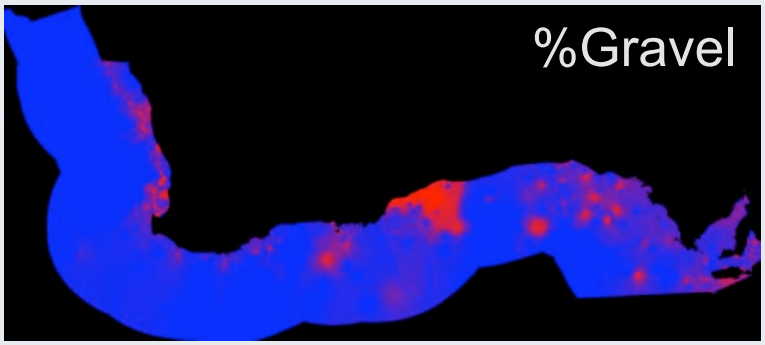
+

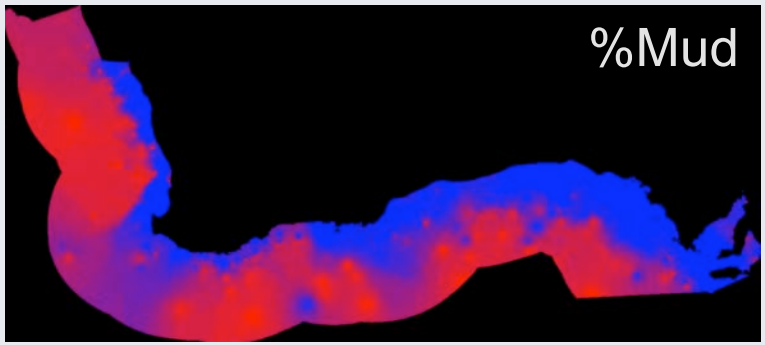
(e.g., %Gravel)

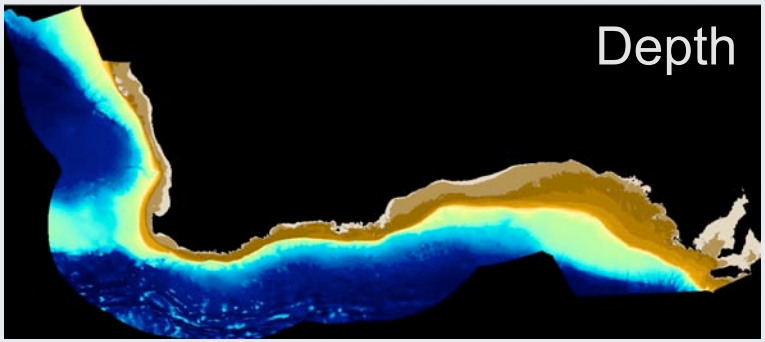
(Roff & Taylor, 2000)

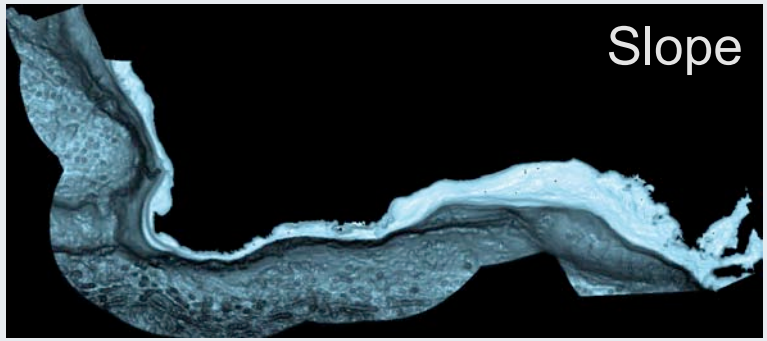
SW Marine Region – Input Data

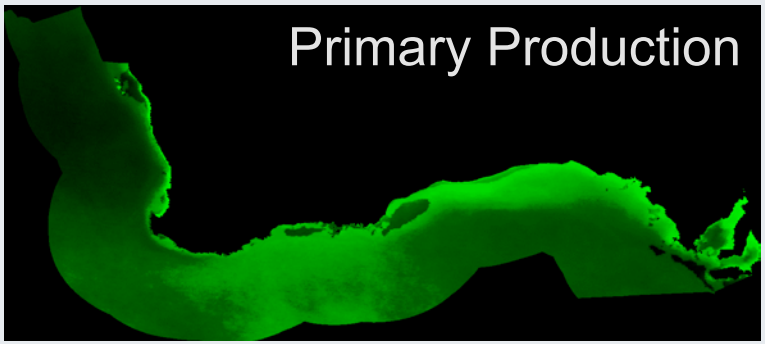
2,500 sediment samples; interpolation grid 0.01° (~5km)

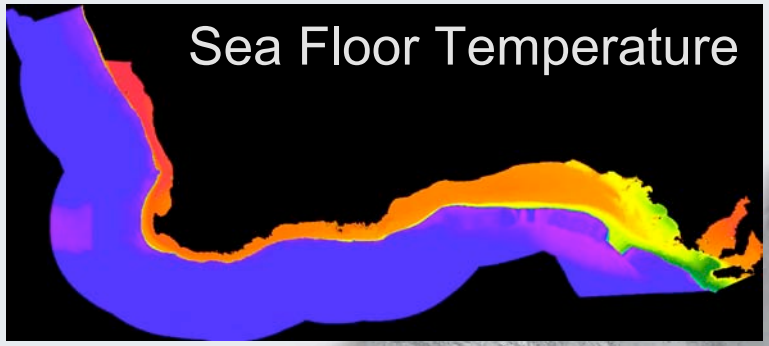










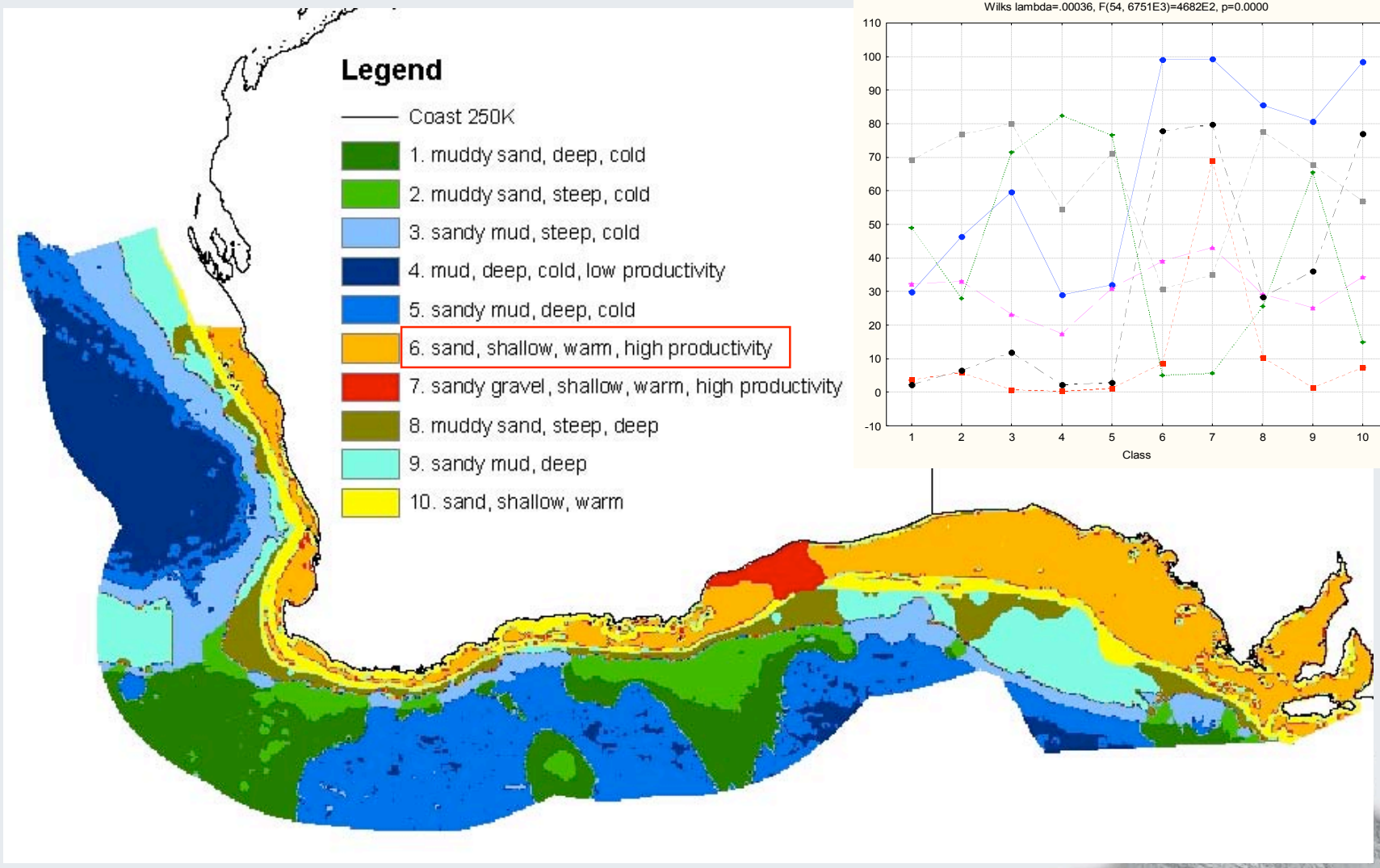


Unsupervised Crisp Classification

Characteristics of an unsupervised classification:

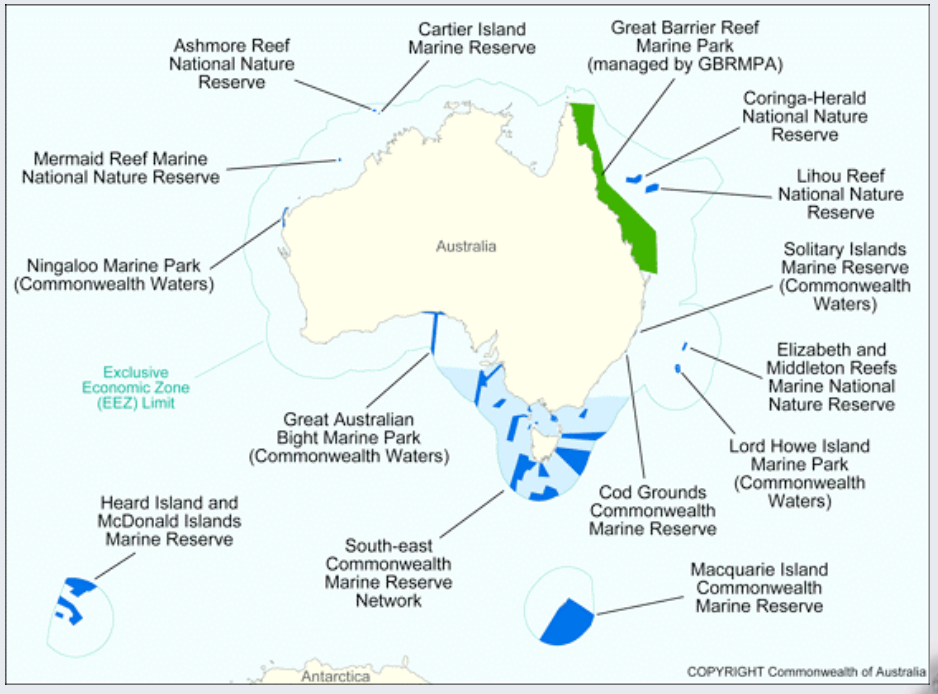
- Completed using ERMapper ISOClass facility
  (Iterative Self Organising Classification)
- Unbiased classification of data (objective)
- Use of mathematical indices to select the best number of classes (defined by properties of the data)
- The classification program groups the data into seascapes based on their clusters in space

SW Marine Region – Seascapes



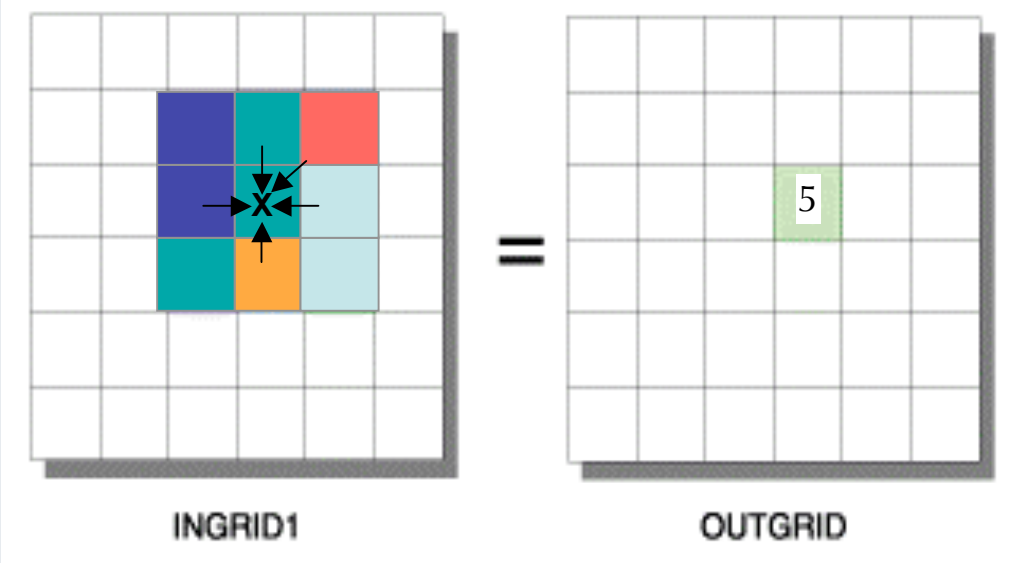
Objective 2

Identify potential Marine Protected Areas using the seascape map as an objective means to achieve a **representative MPA system**



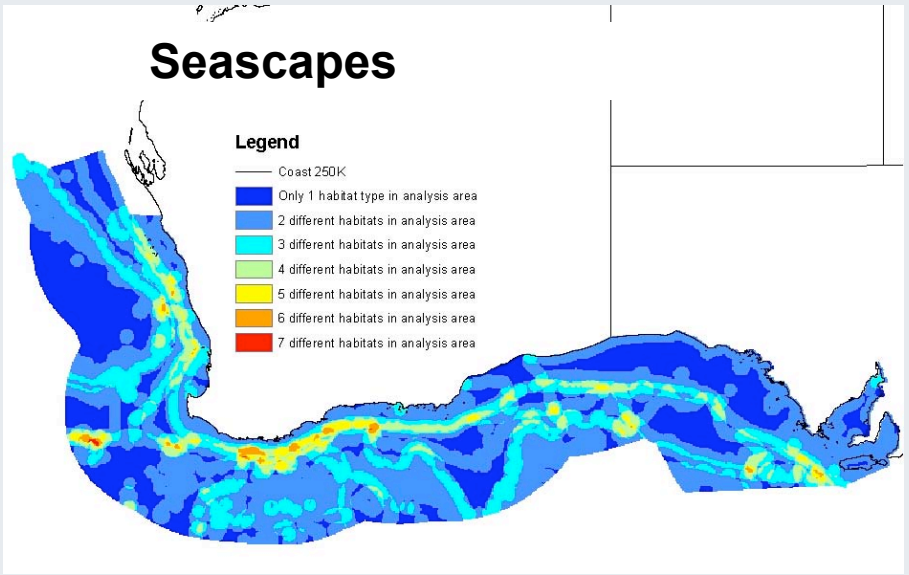
Focal Variety Analysis

Aim: capture spatial heterogeneity in seabed habitats



- Counts up the number of class boundaries adjacent to a cell
- Used 20 cell (**20 km**) radius in our analysis
- Identifies “hotspots” where most class boundaries occur

Focal Variety Analysis



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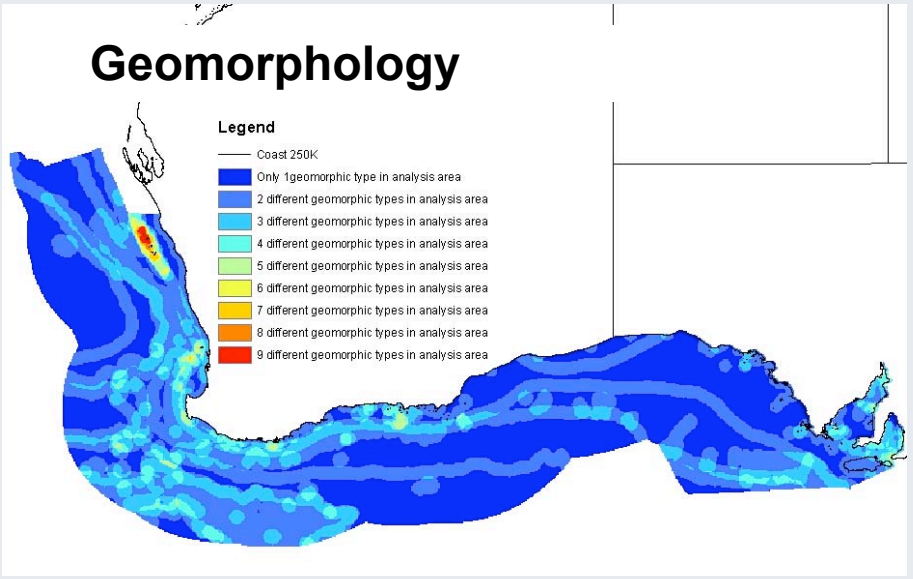

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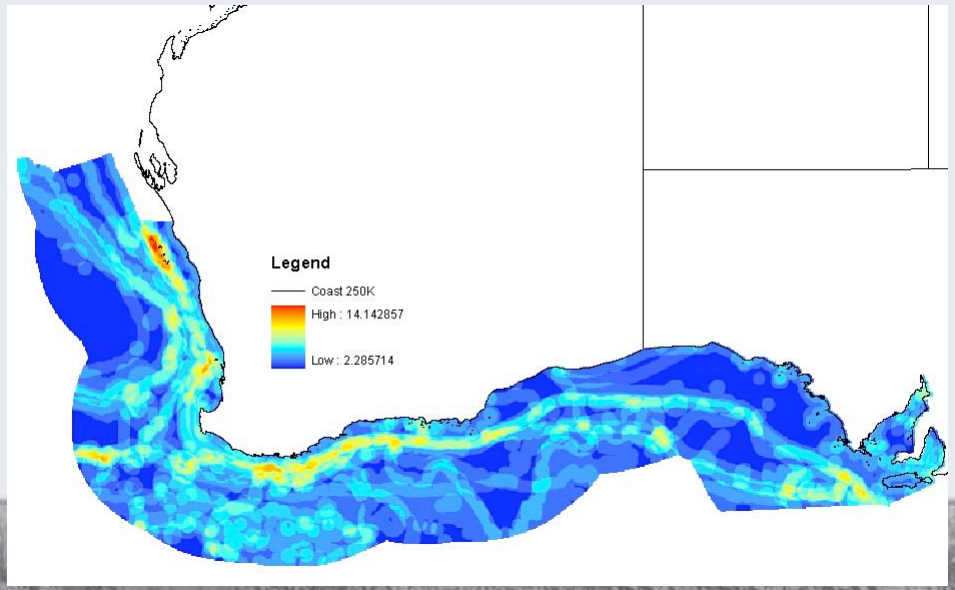
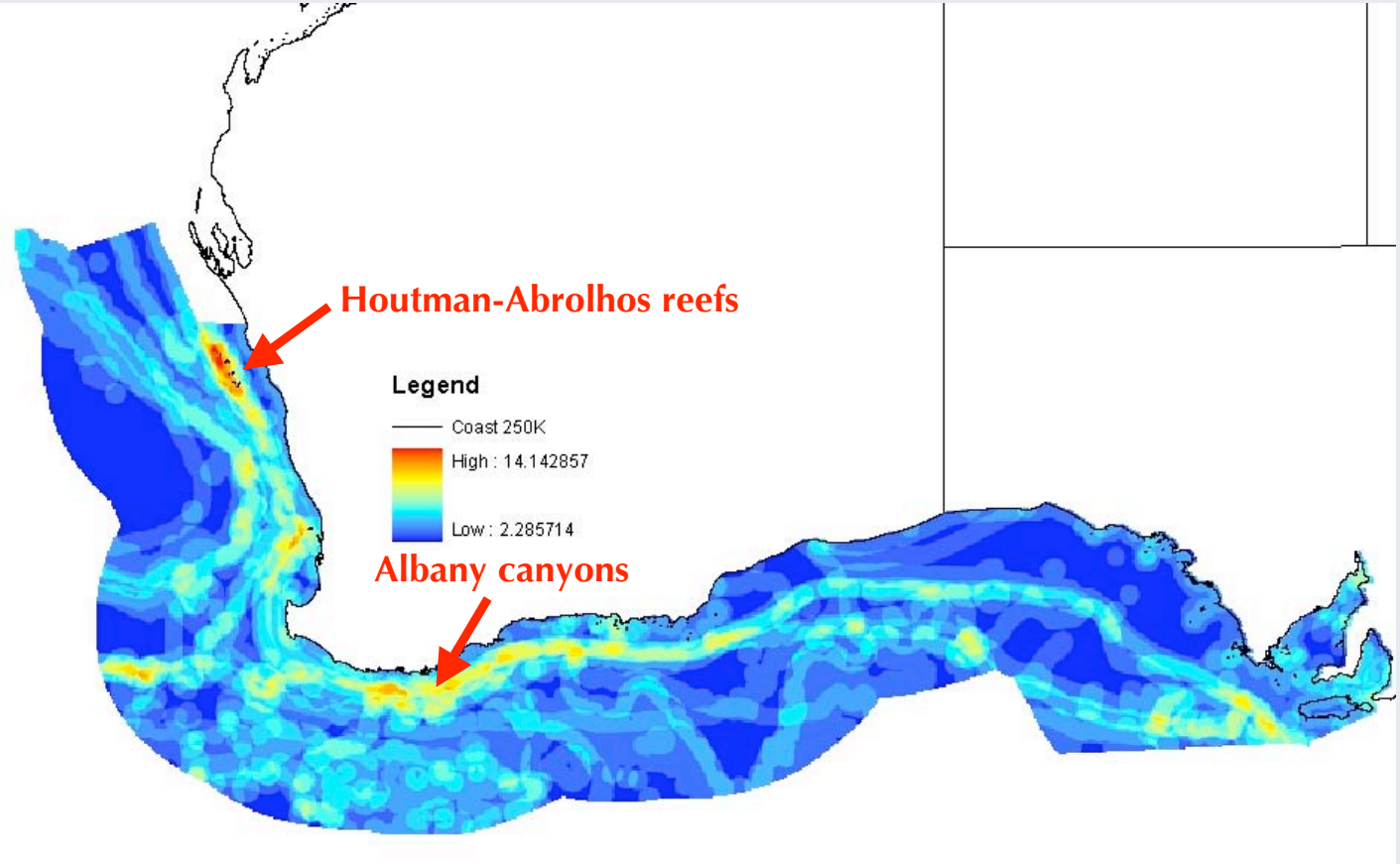


Hotspots: maximum diversity of habitat & geomorphology

Potential ecological hotspots



Optimising location of an MPA to capture greatest habitat diversity in smallest area

Summary

- Seascapes capture broad-scale patterns of seabed habitats & biodiversity
- Focal variety analysis of seascapes and geomorphology identifies areas of seabed heterogeneity that are potential MPAs
- Work in progress: a national scale seascape map and correlation with ecological data