

# South Coast and Capes Region



*western australian*  
marine science institution



# Information for South Coast Regional Marine Planning

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# Overview

- What is South Coast Regional Marine Planning (SCRMP)?
- Information for SCRMP
- Information projects/research underway as part of SCRMP

# Aim of RMP

Through a partnership of Government, community and stakeholder groups, establish and promote a scientifically robust framework that:

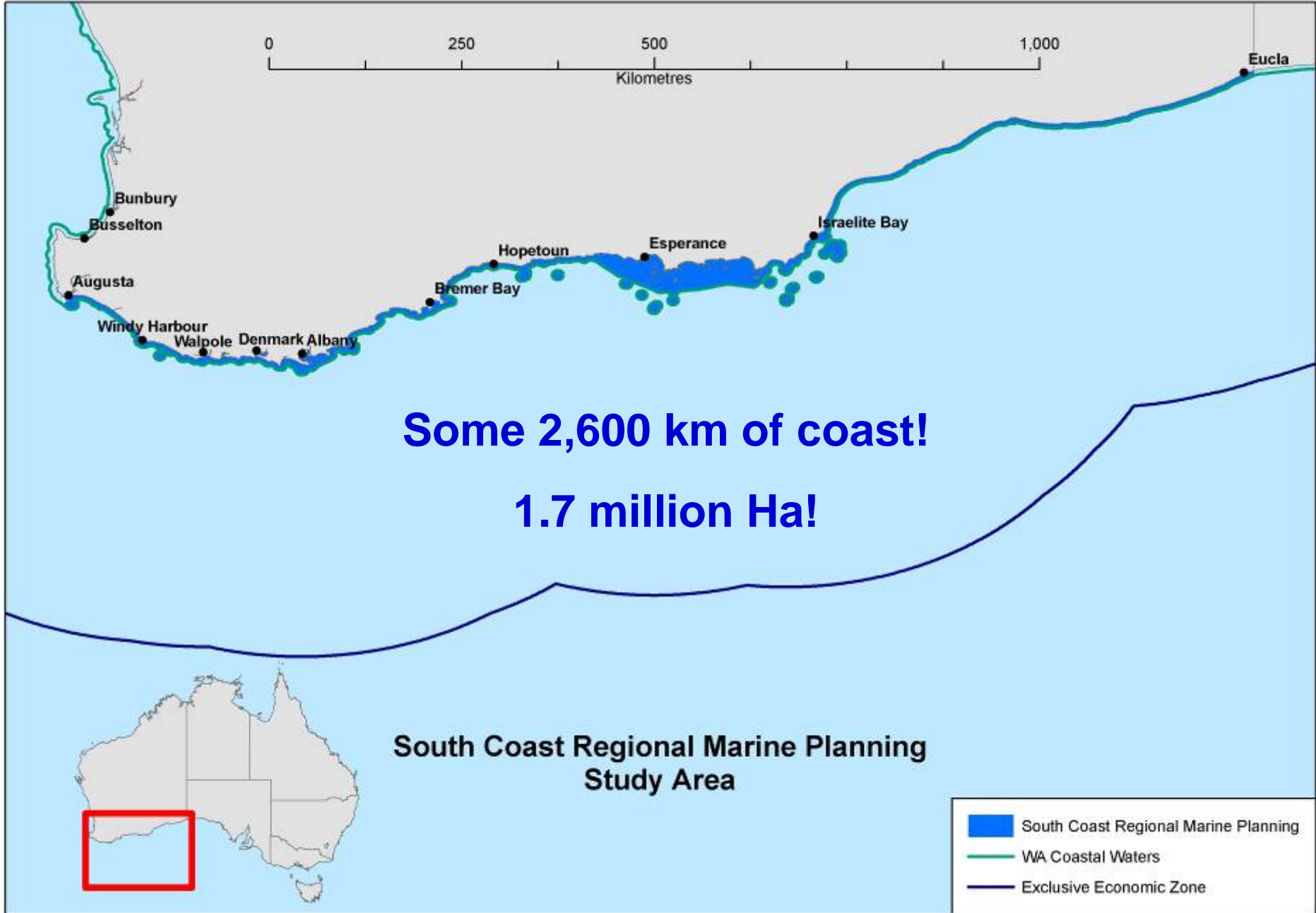
- enhances cooperation and integration between sectors
- recognises the importance of social, cultural and economic values that the marine environment can provide for current and future generations
- protects and maintains ecological integrity and biological diversity

# South Coast Regional Marine Planning will...

- Be the first in WA
- Integrate planning and management of marine sectors
- Develop a Regional Marine Strategic Plan for the South Coast
- Lead to release of a Draft Strategic Plan for public comment
  - mid-2008

# South Coast Regional Marine Planning will not...

- Identify specific Marine Parks and Reserves
- Determine resource allocations
- Deal with specific management actions



# Information for Planning...

- Good planning and good decision-making needs good information!
- South Coast Regional Marine Planning covers over 2,500km of coast...
- So the information to support SCRMP needs to cover the whole region at an appropriate (broad) scale
- Also needs to be *spatial* information, to allow analysis of where things overlap or where things are in relation to each other

## Marine Information and Resource Compilation Project

- Joint project between DEC, South Coast NRM with input from SW Catchments Council
- Gathering information useful for marine planning in the south coast region into a single information system
- Acquisition of spatial information describing the distribution of:
  - Environmental characteristics and values
    - Biological (habitats, fauna, etc)
    - Physico-chemical (temp/salinity, geology, bathymetry, etc)
  - Human usage
    - Social (recreation, etc)
    - Cultural (indigenous/non-indigenous heritage, etc)
    - Economic (fishing, aquaculture, ports, tourism etc)
    - Administration (jurisdiction/management boundaries, etc)
    - Infrastructure (port facilities, jetties, boat ramps, etc)

# Marine Information and Resource Compilation Project

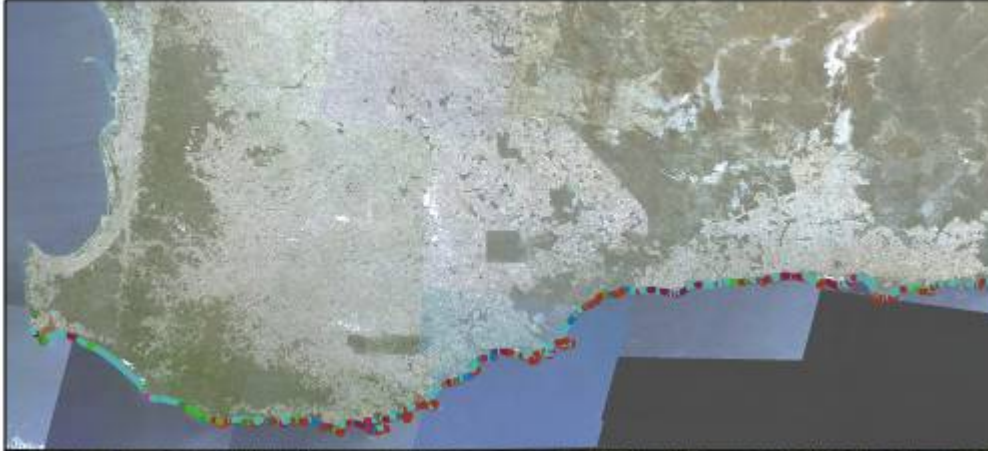
- Acquisition of available data
  - National and State Govt. agencies, Universities, NGOs, local expertise, etc
- Creation of new data – main focus areas
  - Coastal landforms (Smartline – w/ Australian Greenhouse Office)
  - Marine recreation (surveys dist. through SCRMP process)
  - Coastal marine geomorphological units (littoral sediment cells)
  - Sub-regional environmental characterisation (GIS-based with advice from marine science and local expertise)
  - Benthic habitat remote sensing (proposed - CSIRO)
- Other data projects
  - Creating spatial data from non-spatial information, adding to currently available information, etc.

# Marine Information and Resource Compilation Project

- New data

- **National Shoreline Geomorphic and Stability Mapping - Smartline**

- Based on **Smartline** developed By Dr Chris Sharples (Uni. Tas.), for National Land and Water Resource Audit/Australian Greenhouse Office
- Classifies coastal geomorphology
  - by attributing a single Mean High Water Mark line with classes of backshore, intertidal and subtidal landform types, oceanic exposure, underlying geology, broadscale shore profile and others
- Local scale (1:10,000 to 1:24,000) mapping and classification done by Michael Higgins, Ewan Buckley and Dr Ian Eliot from Eucla to Augusta
- Significant value-adding being done by national project team in Hobart
- Useful for coastal vulnerability assessment, shoreline habitats, marine safety, oil spills response, etc



These maps show the line symbolised by intertidal geomorphology

e.g. sandy beach, sloping rocky shore, cliff, intertidal sediment flats, beach with rock platforms, etc. Many different types!

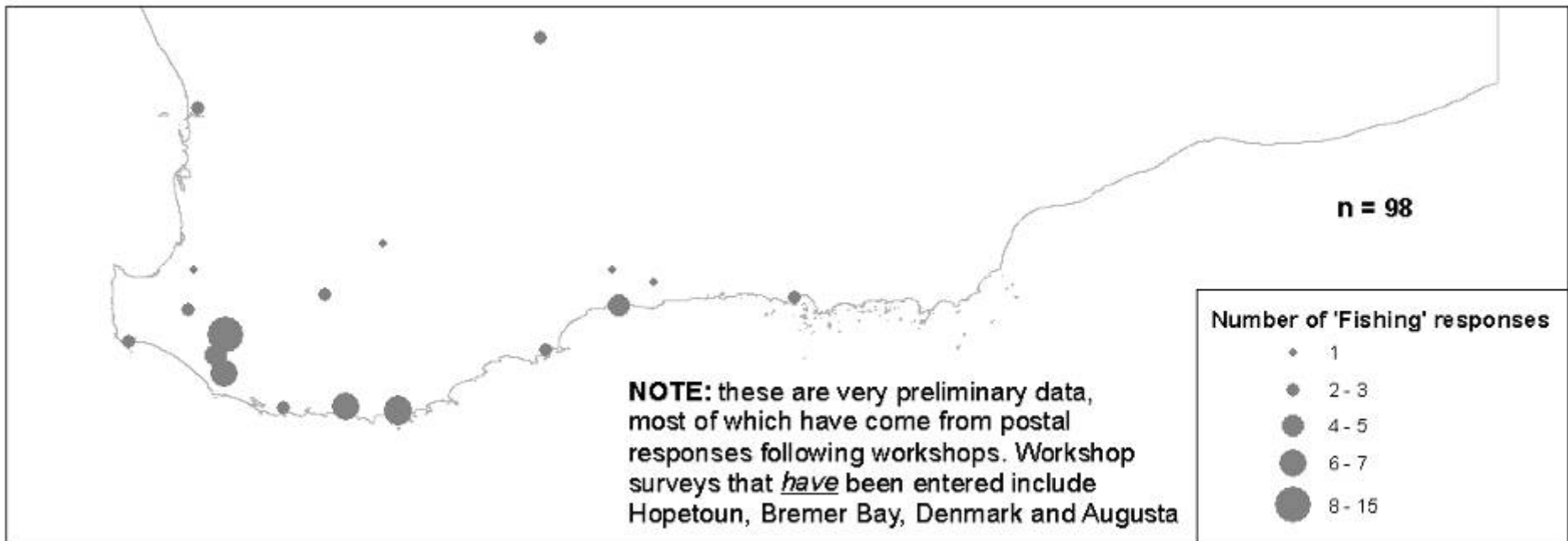
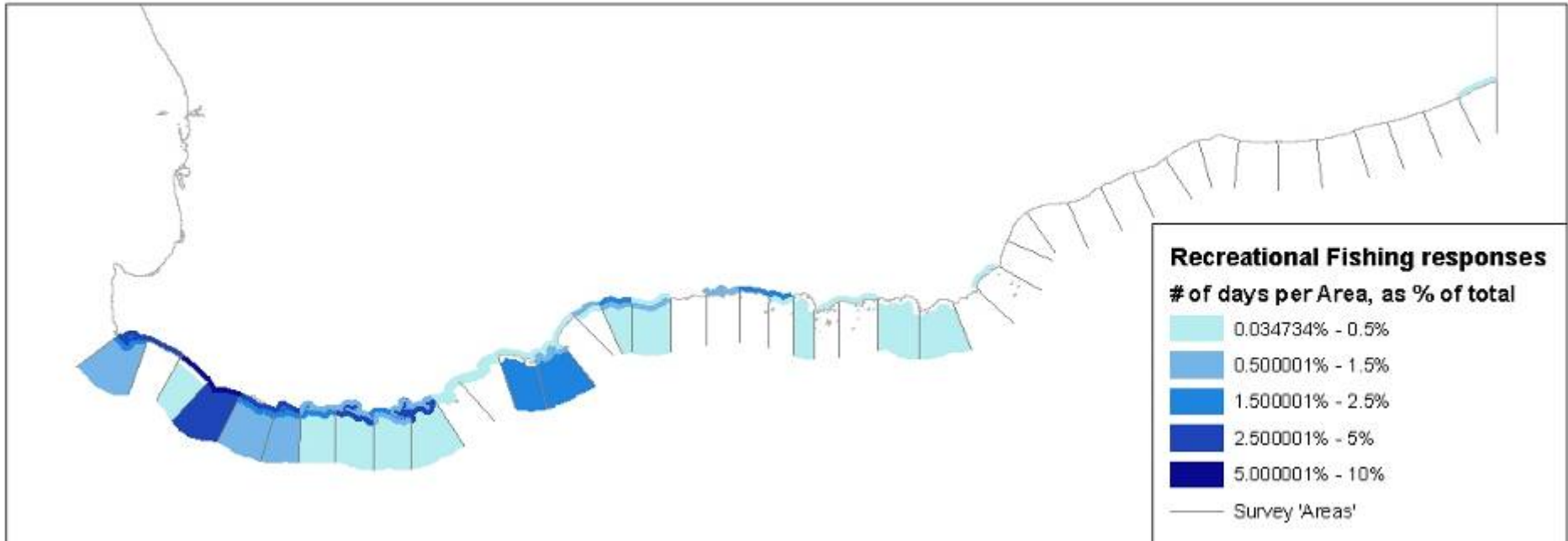


# Marine Information and Resource Compilation Project

## - New data

- **Recreational Marine Usage Survey**

- Created after identification of knowledge gap through this project and the SCRMP process
- Surveys distributed through:
  - SCRMP Community Workshops (completed)
  - Postage to local shops/groups for distribution (current)
  - Via SCRMP website (current)
  - Peak representative organisations (current)
- Closing date 28<sup>th</sup> March 2008
- Approx 200 returns so far, 100 entered into database
- Covers all kinds of marine recreation, the following map shows fishing only...

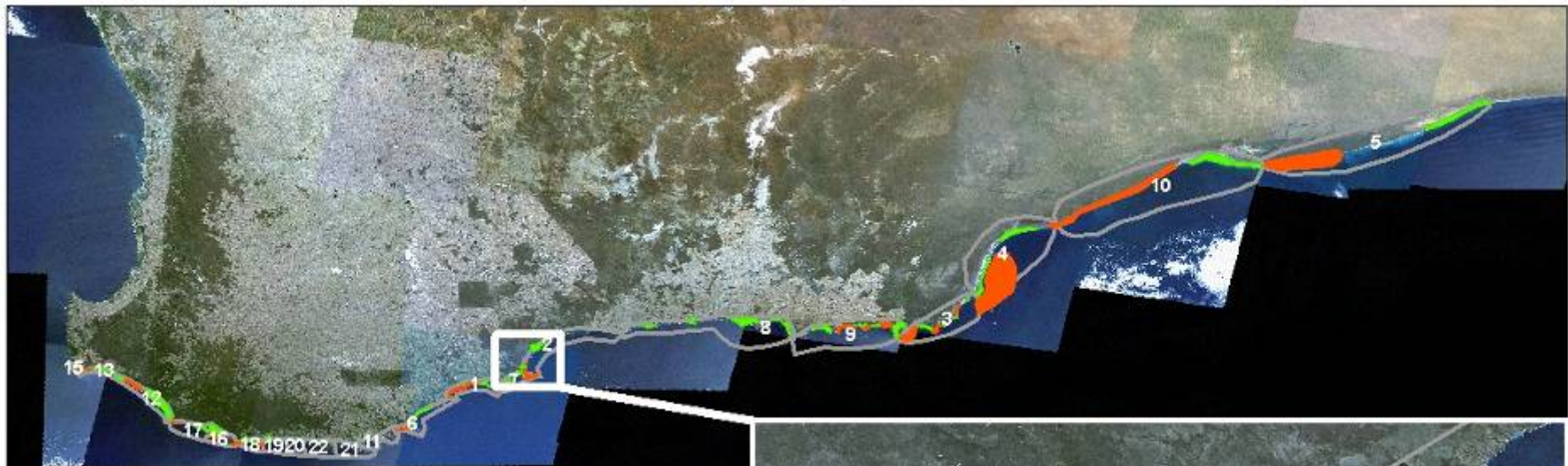


# Marine Information and Resource Compilation Project

## - New data

- **Littoral sediment cells**

- Original, preliminary work, for SCRMP
- Analogous to hydrologic catchments, but relates to movement of near-shore sediments
- Maps likely sediment sources
  - Erosion of beaches and dunes, rocky coasts and reefs
  - Biogenic production of sediment by organisms
  - Little terrestrial (river) input
- Maps likely sinks (losses)
  - estuaries, beaches, dunes
  - Offshore (submarine canyons that intrude onto nearshore shelf)
- Important for coastal development/management, coastal vulnerability assessment and other marine management/planning



Primary Sediment Cells

**Net sediment movement**

Sink - sediment loss through deposition to dunes or offshore

Source - sediment inputs through erosion or production

Work in progress...primary cells have been identified from visual analysis of Landsat imagery.

Secondary cells and Source/Sinks are being completed, and mapping is being 'cleaned'

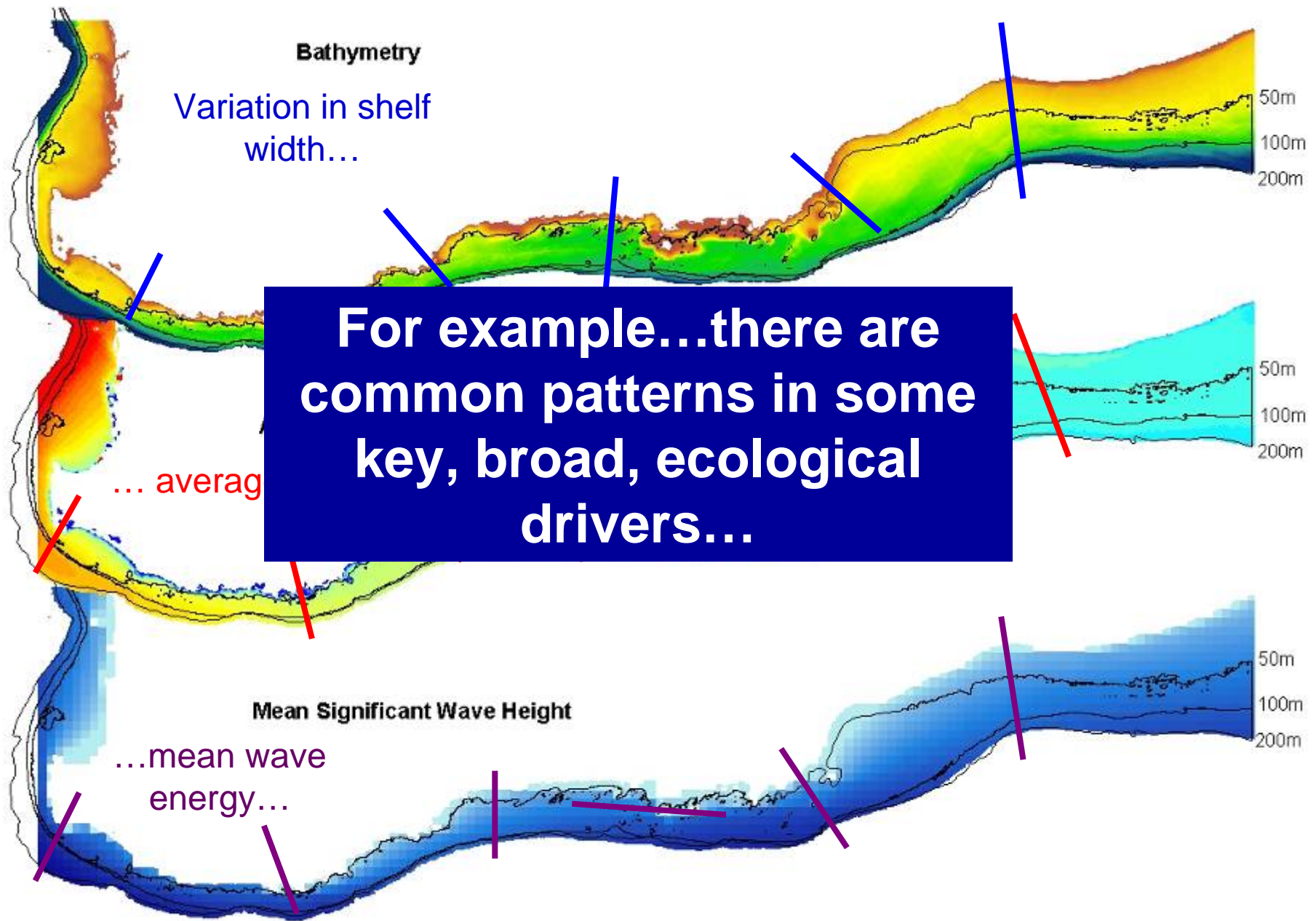


# Marine Information and Resource Compilation Project

- New data

- **Sub-regional characterisation of the south coast marine environment**

- Compare region-scale bio-physical information layers
- Analyse for similarity/dissimilarity of different spatial areas across a range of parameters which drive ecosystems, for e.g.
  - Depth/light
  - Average sea surface temp/variability
  - Wave energy/benthic shear stress
  - Geology/geomorphology
  - Known marine habitat/fauna distributions
  - Other factors such as offshore islands, shore aspect, oceanic currents, local knowledge
- Both a GIS-based and expert-knowledge driven process
- Will identify sub-regional variation in the south coast marine environment



For example...there are common patterns in some key, broad, ecological drivers...

Bathymetry  
Variation in shelf width...

... average

Mean Significant Wave Height

...mean wave energy...

# Marine Information and Resource Compilation Project

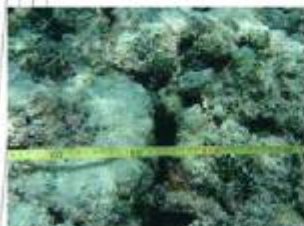
## - New data

- **Remote sensing of benthic habitats**

- Proposal to commission CSIRO Aquatic Remote Sensing (Dr Arnold Dekker and team)
- Advanced, repeatable, physics-based modeling of atmospheric and marine interference in satellite imagery -SAMBUCA
  - Can 'model-off' interference (water vapour, sea surface reflectance, Chl-a, depth, etc), leaving a signal that is primarily substrate (habitat) reflectance
  - Compare this with spectral libraries which characterise different substrates...
- With good imagery, can produce broadscale maps of marine habitat in remote or difficult areas, also model bathymetry
- Archives of QuickBird and Landsat imagery have been searched with some suitable images identified...

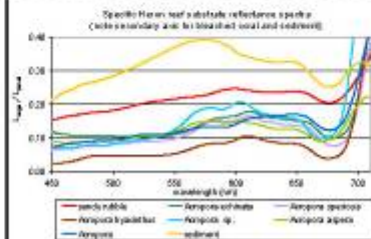
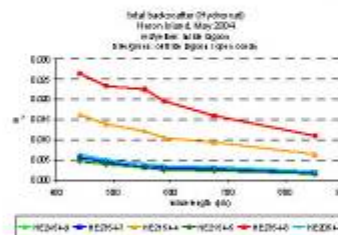
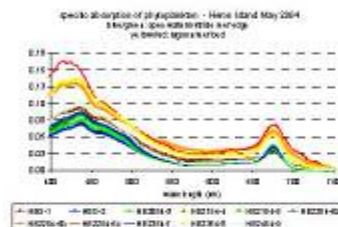
# The SAMBUCA approach applied on Coringa-Herald Quickbird data

water measurements



substrate measurements

spectral absorption and backscattering of water



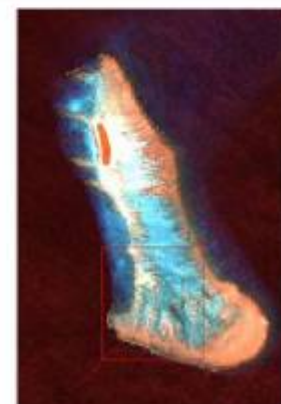
spectral reflectance of substrates

system-wide noise

SAMBUCA

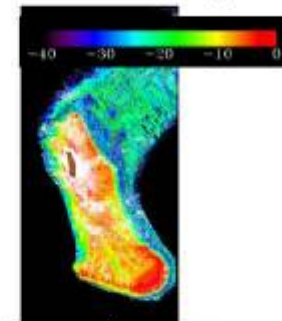
$$T_{\text{net}}(\lambda)_{\text{net}} = f(C_{\text{chl a}}, C_{\text{CDOM}}, C_{\text{tripton}}, X_{\text{tripton}}, H, S_{\text{tripton}}, S_{\text{tripton}}(\lambda_{\text{tripton}}), T)$$

- $C_{\text{chl a}}$  is the concentration of chlorophyll a
- $C_{\text{CDOM}}$  is the concentration of CDOM, i.e. a(380) (Reppas et al 2010)
- $S_{\text{tripton}}$  is the slope of the CDOM absorption
- $C_{\text{tripton}}$  is the concentration of tripton
- $S_{\text{tripton}}$  is the slope of tripton absorption
- $a(\lambda_{\text{tripton}})$  is specific absorption of tripton at  $\lambda_{\text{tripton}}$ , which is sample dependent
- $X_{\text{tripton}}$  is the specific backscattering due to tripton
- $T_{\text{net}}$  is the specific backscattering due to tripton
- $f(\lambda)$  is the ratio of substrate 1 to substrate 2 within each pixel

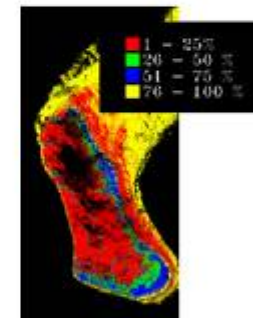


Quickbird image

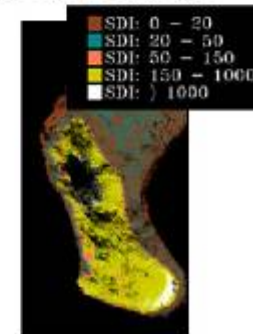
SAMBUCA output:



bathymetry map



substrate maps



accuracy maps

**Target areas are where no habitat mapping currently exists**

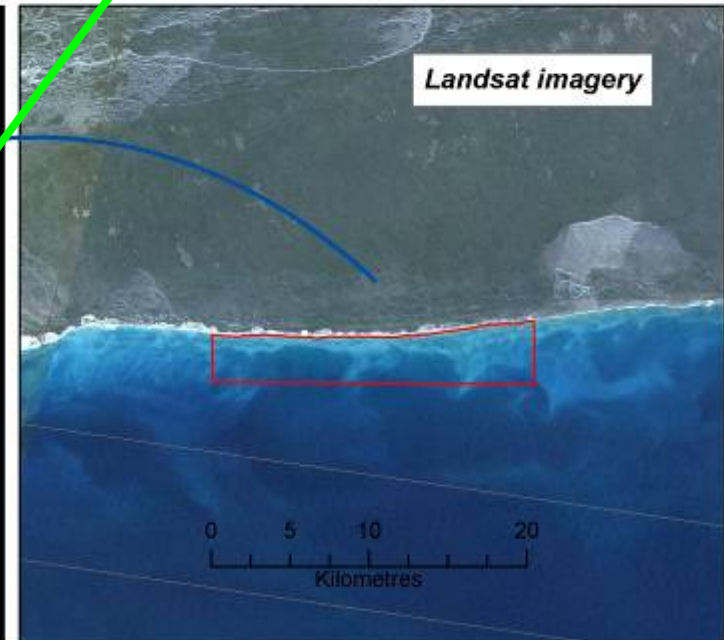


**Prospective QuickBird Images for Aquatic Remote Sensing of Marine Benthic Habitats**

**South Coast Regional Marine Planning**

-  Existing habitat mapping  
DEC, CSIRO, UWA, MF
-  QuickBird Image extent
-  Landsat Scene Index

Produced by EBU  
Marine Policy and Planning Branch  
DEC  
14/12/2007

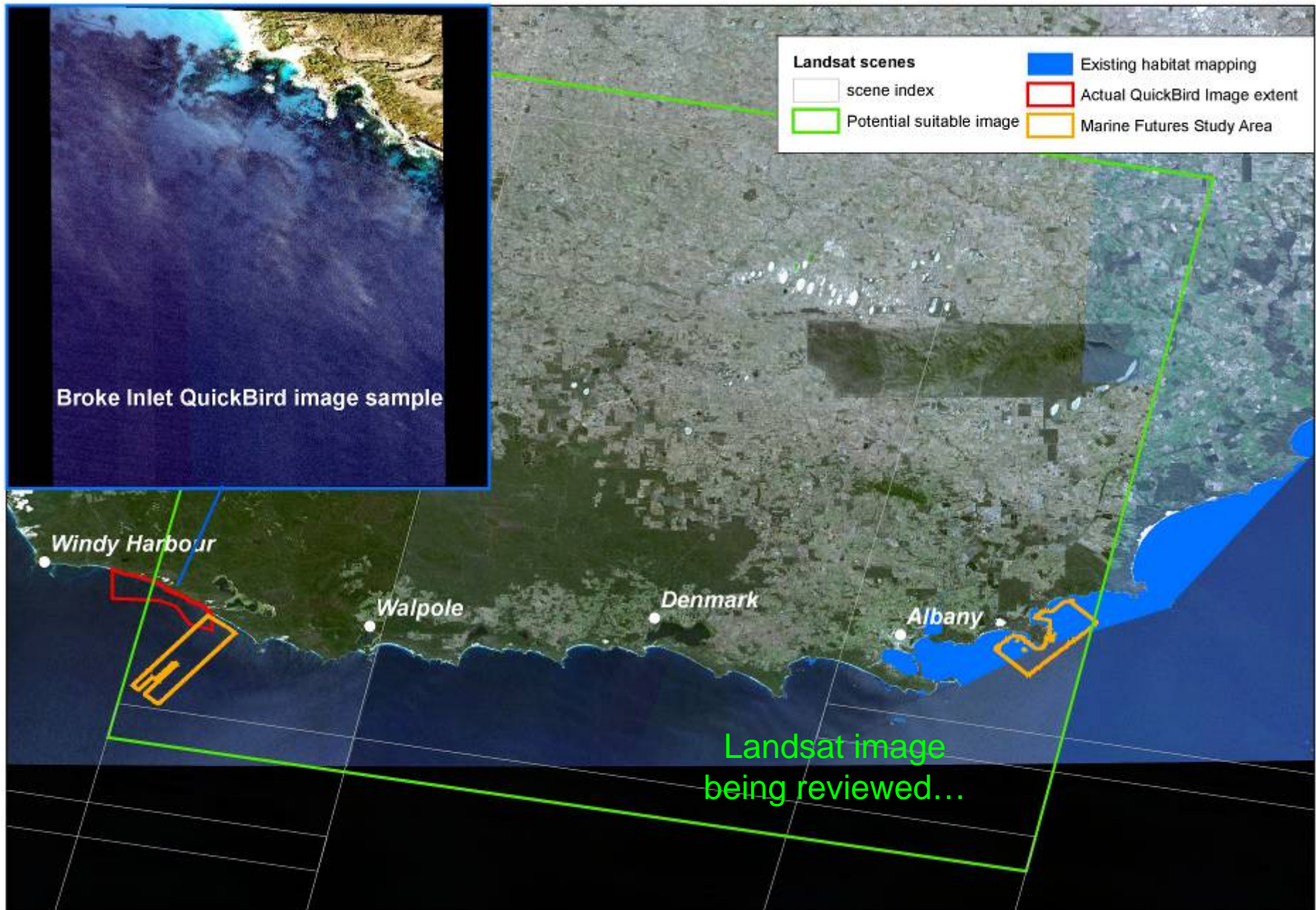


Samples given to CSIRO for review...



Good!  
Some surface  
glint, but is  
removable...

Not good  
- Too choppy, turbid, etc.

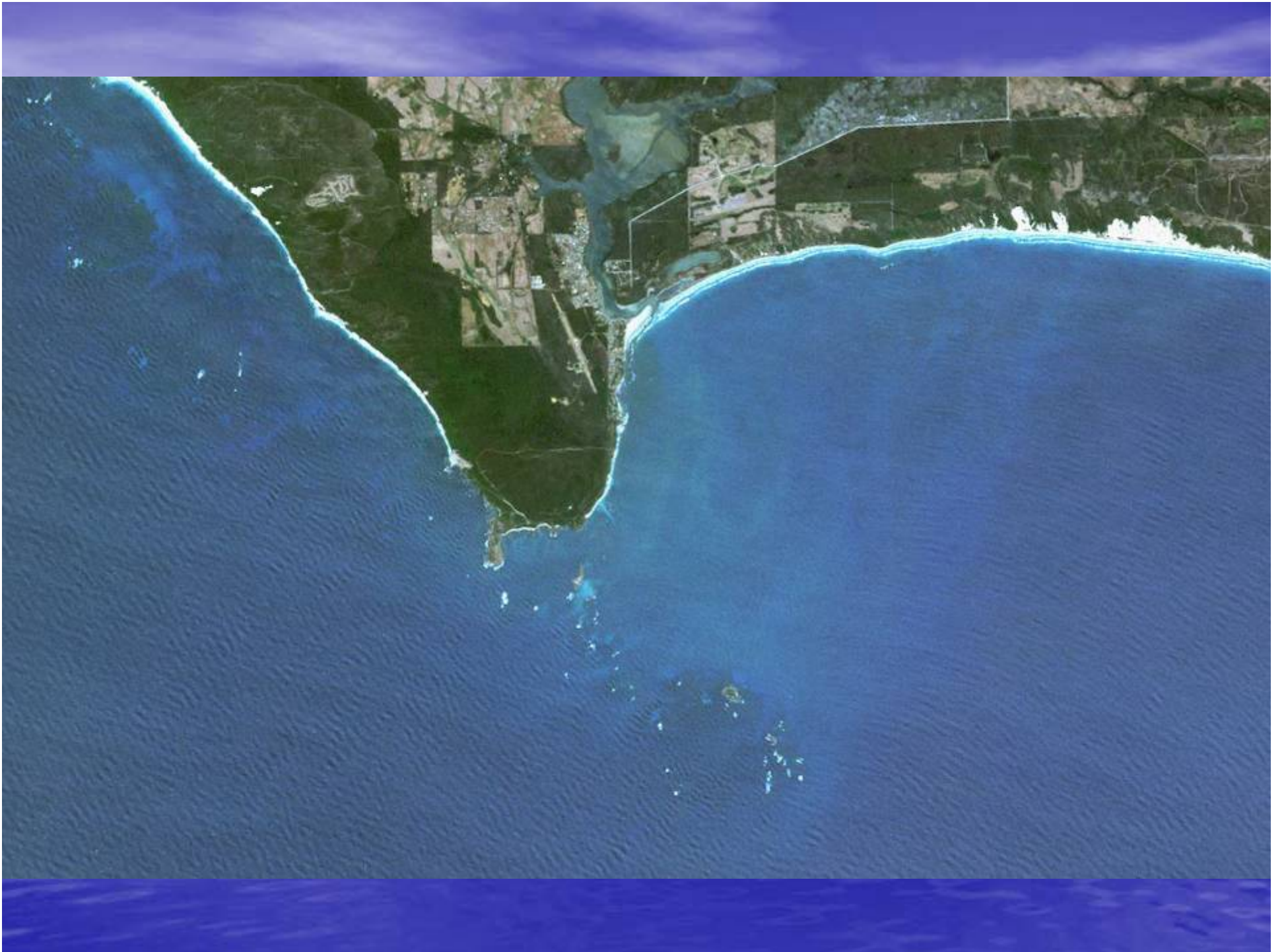


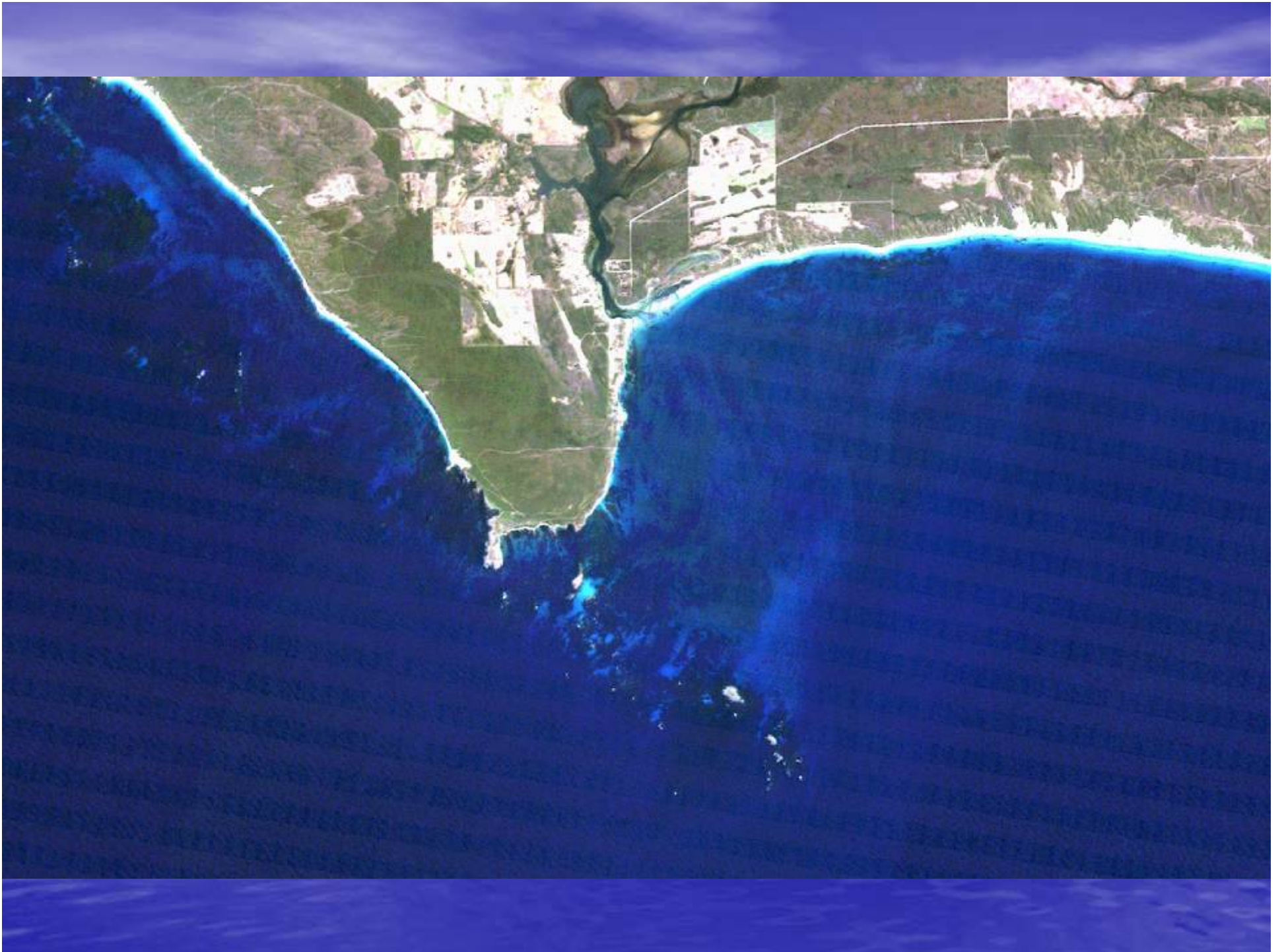
# Marine Information and Resource Compilation Project

- New data

- **Remote sensing products as a base contextual layer**

- DEC Remote Sensing (Graeme Behn)
- Processing of AGO Landsat Epochs (best images for each year, 10 years since 1972)
- Algorithm selects the pixels with the minimum value (i.e. most absorption, darkest colour) of selected bands, out of 10 years of data
- Removes clouds, surface glint, turbidity from image and selects maximum water penetration and darkest substrates
- Serves very well as a base map for expert analysis
- Very broad coverage





# Information for South Coast Regional Marine Planning

- Identifying and integrating available research into region-scale information layers for SCRMP
  - E.g. Marine Futures mapping doesn't cover the whole area, but the knowledge gained through MF can be applied across the region

# Information for South Coast Regional Marine Planning

For further information...

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