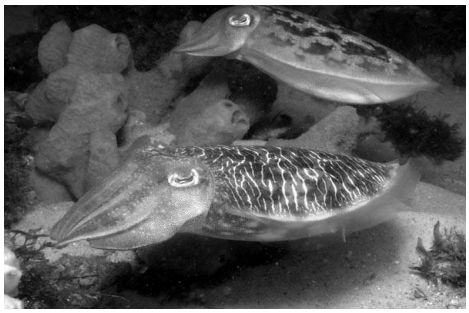
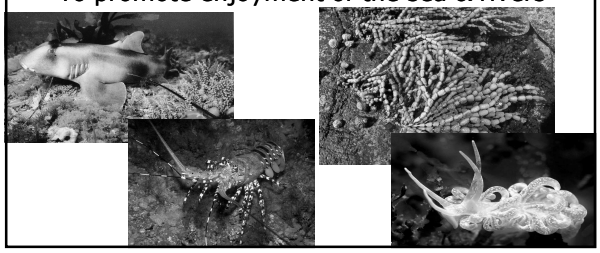
Mapping & Monitoring Rocky Reef Biota



Bob Creese & Tim Glasby
Port Stephens Fisheries Institute
NSW Dept of Primary Industries

NSW Fisheries Management Act 1994

- To conserve fish stocks, aquatic biodiversity & fish habitats for current & future generations
- To ensure sustainable fishing & aquaculture
- To promote enjoyment of the sea & rivers



M E R

'An evolving juggernaut with an uncertain trajectory' ?

MARINE:

- *By 2015, there is no decline in the condition of marine waters & ecosystems*

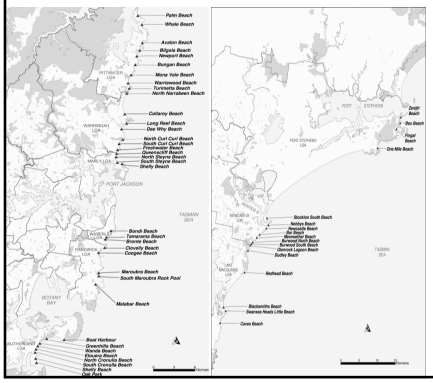
ESTUARIES:

- By 2015, there is an improvement in the condition of estuaries and coastal lake ecosystems

Present indicators (marine)

Frequency of Algal Blooms (developmental work needed)	**As an indicator of pelagic algal biomass (determined from measures of ocean colour)**
Rocky Reef biota (developmental work needed)	**Spatial extents of: kelp beds/urchin barrens, *Caulerpa filiformis* and *Pyura stolonifera*** **Other potential indicators (eg harvested species, reef fish, corals)**
Beachwatch (existing program)	**As an indicator of recreational water quality**
Marine Protected Areas (easily adapted from previous work)	**As an indicator of coastal environment managed to protect marine biodiversity (by habitat)**

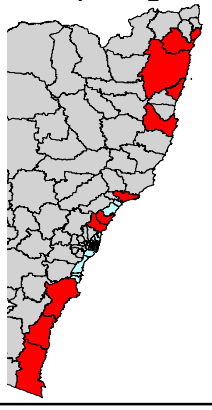
Indicator 1: Beachwatch



- Samples collected weekly by council or DECC staff
- Standard microbiological analysis
- Data synthesised on Beachwatch website

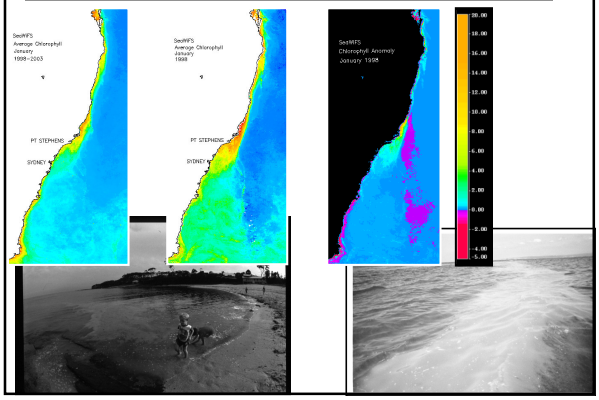
Beachwatch Partnership Program

- **NSW coast**
  - **153 swimming locations**
  - **Samples collected by 12 local councils (red)**
  - **Quality assurance by Beachwatch**

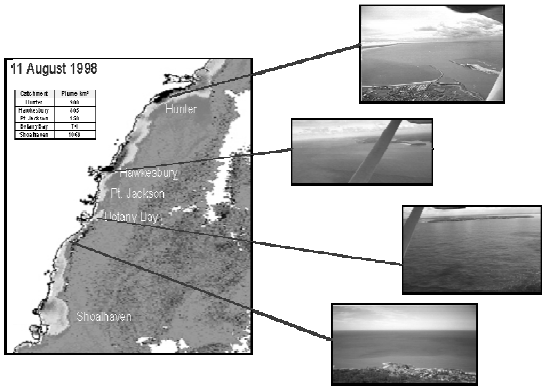


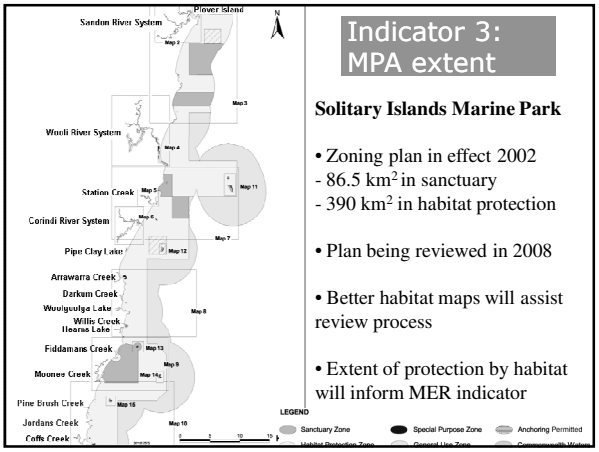
Ballina
Clarence Valley
Richmond Valley
Kempsey
Coffs Harbour
Port Stephens
Newcastle
Wyong
Gosford
Shoalhaven
Eurobodalla
Bega Valley

Indicator 2: Algal blooms (CHL)



Other ocean colour products (?)



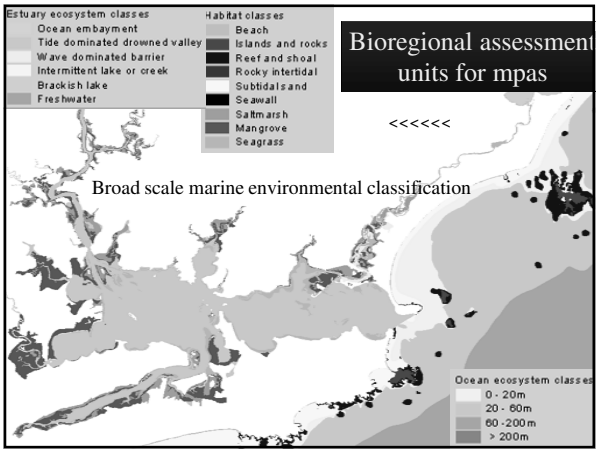


Indicator 3: MPA extent

Solitary Islands Marine Park

- Zoning plan in effect 2002
  - 86.5 km^2 in sanctuary
  - 390 km^2 in habitat protection
- Plan being reviewed in 2008
- Better habitat maps will assist review process
- Extent of protection by habitat will inform MER indicator

	Port Stephens-Great Lakes Marine Park Zone							
Habitat Type	**General Use Zone**		**Habitat Protection Zone**		**Special Purpose Zone**		**Sanctuary Zone**	
	Area (ha)	Percent	Area (ha)	Percent	Area (ha)	Percent	Area (ha)	Percent
Beach		0.00	202.49	85.82		0.00	33.47	14.18
Rocky intertidal	0.09	0.10	83.32	89.60		0.00	9.58	10.31
Shallow Reef (0-20metres)	7.68	0.55	1205.06	86.67	0.08	0.01	177.62	12.77
Intermediate Reef (20-60 metres)	135.86	10.79	587.71	46.69		0.00	535.05	42.51
Deep Reef (60-200 metres)	15.96	59.93		0.00		0.00	10.67	40.07
Saltmarsh	2.25	12.41	2.58	14.24	0.02	0.09	13.27	73.26
Mangroves	80.67	32.40	39.35	15.81	3.04	1.22	125.91	50.57
Posidonia	282.57	79.00	20.41	5.71	10.20	2.85	44.52	12.45
Posidonia/Zostera	14.40	27.86	0.27	0.52	0.93	1.79	36.09	69.82
Zostera	831.69	56.60	195.73	13.32	83.72	5.70	358.18	24.38
Ruppia	282.48	72.96	0.00	0.00		0.00	104.68	27.04
Halophila	2.41	4.25	2.43	4.28	0.23	0.40	51.74	91.07
Mud	3069.52	75.78	491.80	12.14	126.51	3.12	362.55	8.95
Muddy sand	6399.55	69.29	1121.47	12.14	158.41	1.72	1556.92	16.86
Shallow Sand	1967.06	14.41	9952.15	72.89	34.83	0.26	1699.35	12.45
Intermediate Sand	13352.61	33.00	21688.17	53.59		0.00	5426.84	13.41
Deep Sand	13460.86	70.77	1901.93	10.00		0.00	3657.18	19.23
Total	43051.04	43.86	37520.79	38.23	417.97	0.43	17162.40	17.49

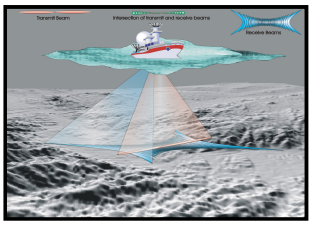


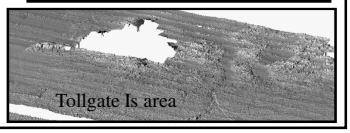
Mapping aquatic habitats & species

- Indicator for MER Estuaries (extent of seagrass)
- Indicator for MER Marine (extent of kelp beds)
- Indicator for MER Invasive Species (extent of *Caulerpa*)
- Is an ongoing activity for DECC & DPI
- NHT II funding for Seabed Mapping project in 2008/09
- mapping provides opportunity to integrate MER themes

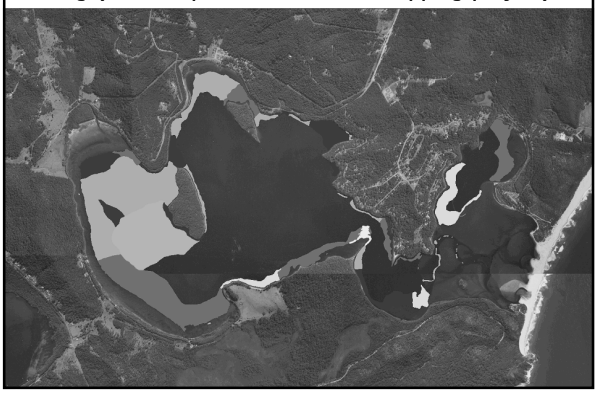
Offshore field surveys with bathymetric sidescan sonar

Courtesy Alan Jordan, DECC





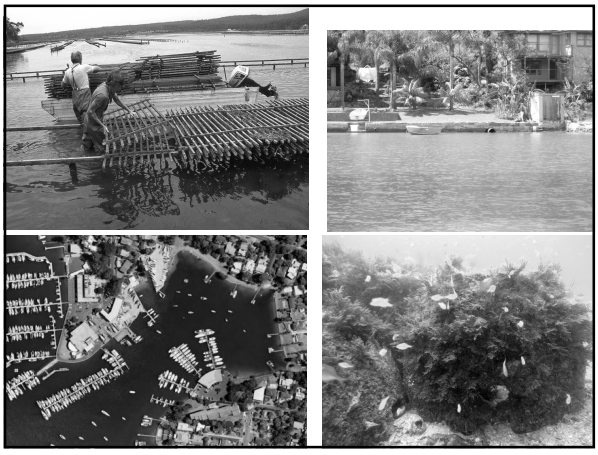
Estuarine habitat mapping; aerial photos + ground-truthing (DPI component of Seabed Mapping project)



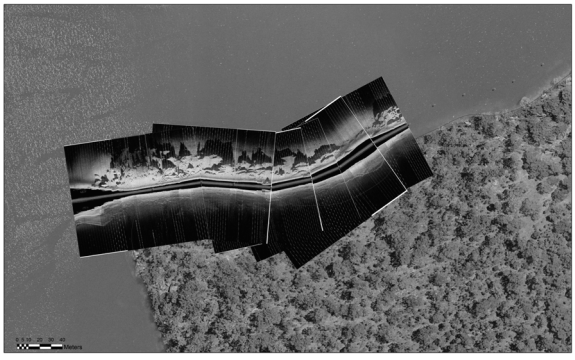
Continued Estuarine mapping

- Fill in gaps in macrophyte extent from CCA. Now virtually complete.
- Develop framework for characterising seagrass condition
- Include other habitat features – rocky reefs, bathymetry, sediments
- Link with offshore habitats
- Link to MER estuarine program

Estuarine foreshore categorisation



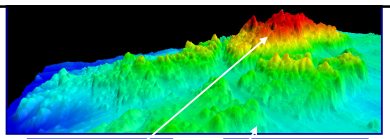
Estuarine rocky reefs



Indicator 4: Rocky Reef Biota

- No clear guidelines on what this should be ('*species abundance in rocky reef communities*')
- Needs to be a suite of species that:
  - can be readily measured across the state (eg by remote sensing, ie linked to habitat mapping)
  - has some clear role within rocky reef communities
  - has some predicted linkages to possible pressures
- Could be:
  - algal species
  - invertebrate species/assemblages
  - fish species
  - intertidal and/or subtidal

Subtidal



Patchy *Ecklonia* dominated reef

Sponge reef >45 m depth

Intertidal:

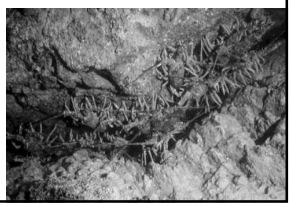
Caulerpa filiformis, *Pyura*

'Obvious' subtidal candidates

Abalone

There are 'fishery independent' survey data for these harvested species

Crayfish



Sampling options:

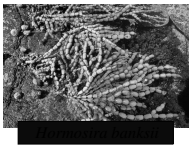
- Field sampling using quadrats or transects
  - resource intensive (time, money), spatial scale too small, dangerous
- Remote sampling (satellite)
  - satellite imagery/spectral analysis problematic for subtidal (absorption of wave lengths) & intertidal (breaking waves)
  - few species can be distinguished
- Remote sampling (photographic)
  - aeroplane fine for shallow subtidal (cf seagrass), problematic for intertidal

Target species - intertidal

↑ with ↑ pollution

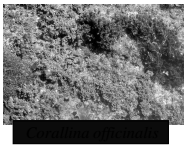
Ulva lactuca

↓ with ↑ humans & storms

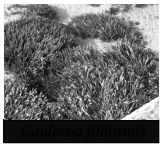


Hormosira banksii

↓ with ↑ pollution



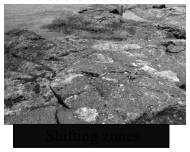
Corallina officinalis



Caulerpa filiformis

Pyura stolonifera

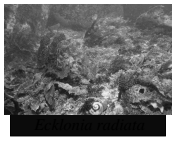
sea level rise



Shifting zones

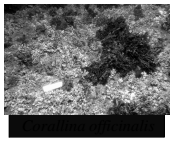
Target species - subtidal

↓ with ↑ pollution & storms
shift south w' ↑ temp



Ecklonia radiata

↑ with ↓ kelp



Centrostephanus rodgersii

↓ with ↑ barrens
shift south w' ↑ temp

Haliotis rubra

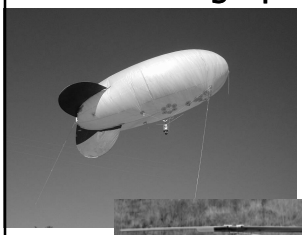
shift south w' ↑ temp

Phyllospora comosa

Urchins/barrens

Jasus edwardsii

Photographic options



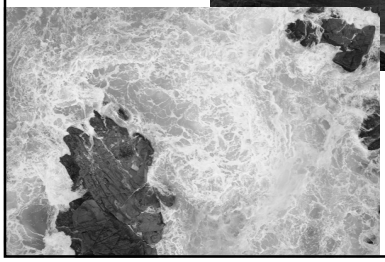
Helicopter sampling

R22 helicopter ($485 per hr)
- 30 m elev. for I/T
- 200m elev. for S/T

Camera
- Nikon D3, 12 megapixels
- 24 mm or 35 mm lens
- 13 MB files

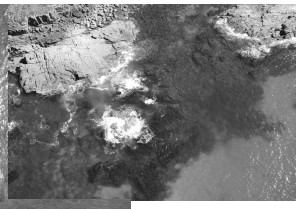
Video camera (to come)

Trialled early in 2008 ……



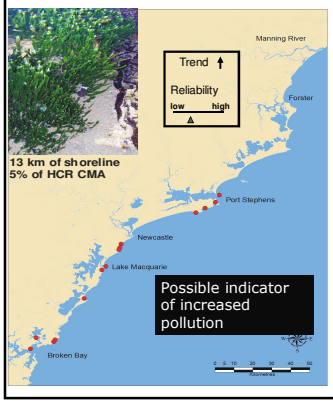
…… in less than ideal conditions !!

When conditions are better ……

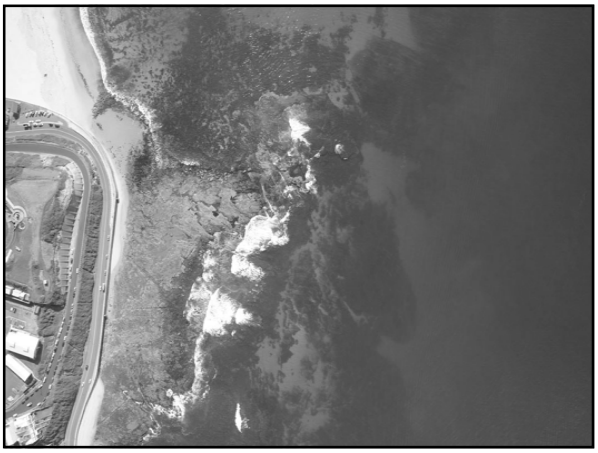


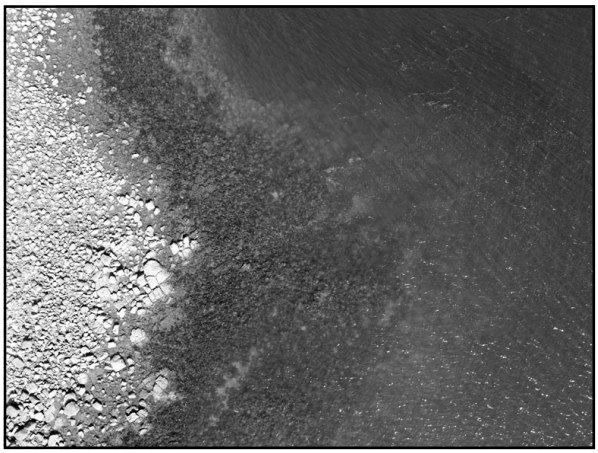
Note generally clear oceanic water

Caulerpa filiformis in HCR CMA

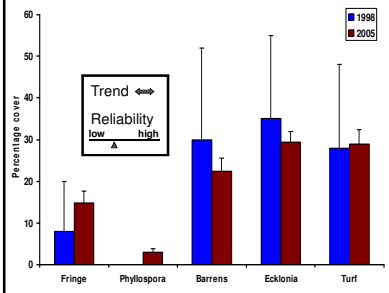


- Presence recored during 2008 helicopter pilot
- Historical data are only anecdotal
- Trend assessment is speculative



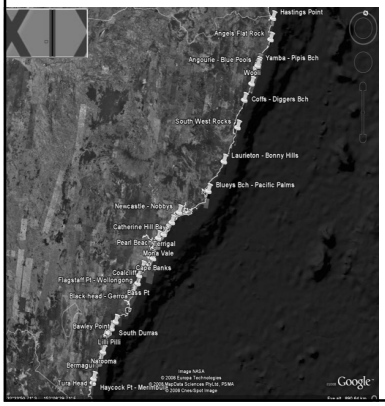


Subtidal Reef Habitats in Hunter region



- Analysis of aerial photos (1998)
- Field sampling 2005 – limited area

Likely sampling locations



Regional monitoring of rocky reefs

– MPA
- Baited video counts for reef fish; all parks but for varying periods
- UW visual census for fish and some invertebrates

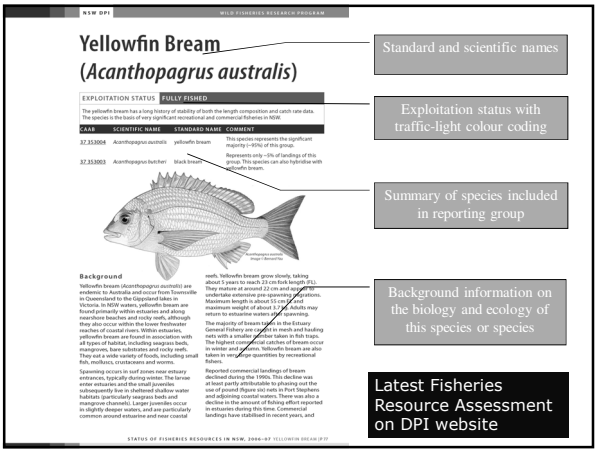
– Universities
- SCU, UNE, Newcastle, UTS, Sydney, Wollongong

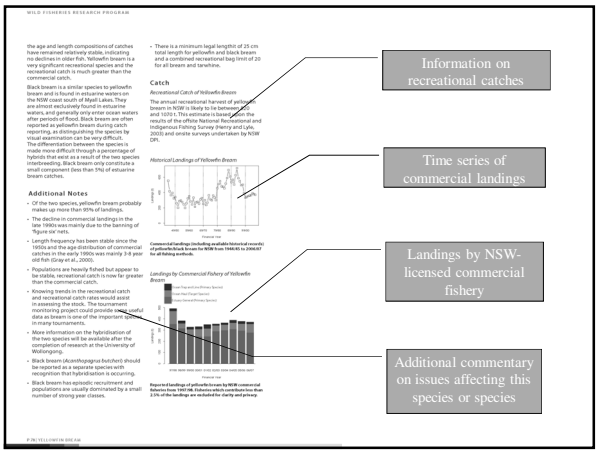
– Community Groups
- SURG, PURG, URG, etc

– Research Institutions
- CSIRO

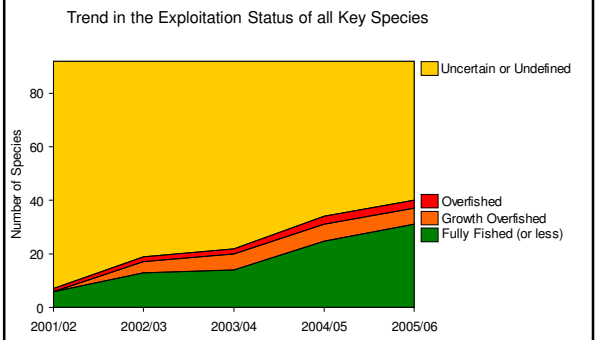
MARINE PRESSURE INDICATORS

- Fishing (but could also be 'condition')
- Climate change (eg temperatures)
- Nutrient/sediment input via estuaries
- Sewage discharge
- Sheer people pressure



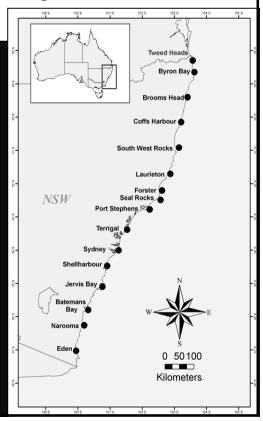


Overall 'Condition Indicator'



Another new data collecting tool: SEACAMS

- 70 listening stations at sites from the Qld to Vic. borders in 10-30 m depth
- Established to determine movement patterns of sharks (esp. GNS)
- Temperature loggers now on all listening stations
- Will provide clues to climate change



MARINE MER – Ongoing challenges

- Reliably measuring condition indicators
- Further development of additional indicators
- Identifying & measuring pressure indicators
- Integrating with other themes (estuaries)
- Establishing regional programs with CMAs
- Establishing local programs with community groups
- Finalising report cards