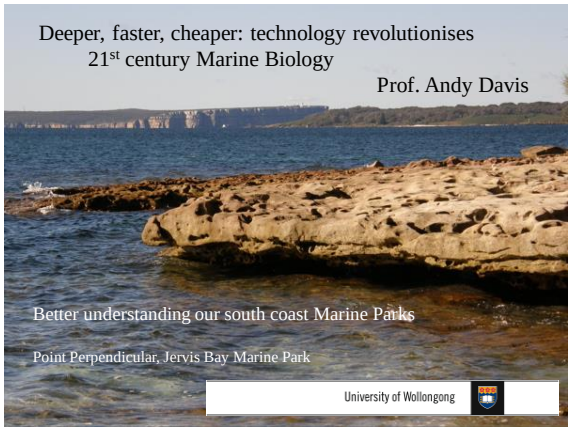
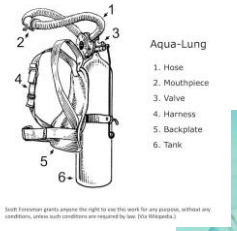


Cousteau & the Aqualung

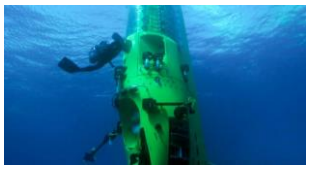


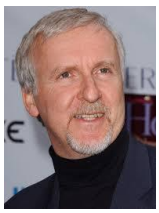
SCUBA

Jacques Cousteau

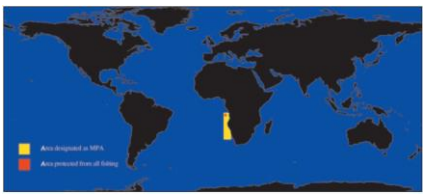
Cameron & the *Deepsea Challenger*

Mariana Trench (>11km)





James Cameron

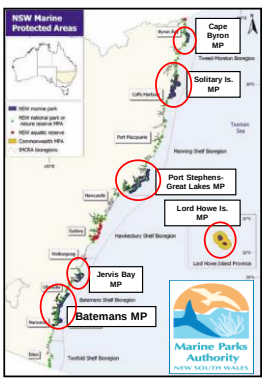


Roberts & Hawkins 2000

NSW Marine Protected Areas

- 6 MPA in NSW
- protect biodiversity

- maintain ecological processes & systems

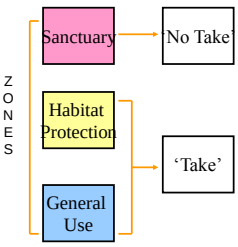


South Coast Marine Parks

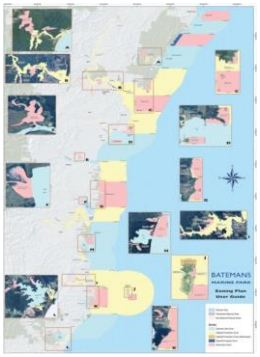
Three questions:

- Are they in the right place?
- Are they effective?
- Do they protect motile organisms eg fish?

Bowen Island, Jervis Bay Marine Park



Batemans Marine Park



Background

Rising threat of substantial marine biodiversity loss

Marine Protected Areas (MPAs) – effective conservation strategy

Location and configuration not often based upon ecological data

MPAs may not be achieving conservation objectives

Biological data = time consuming and expensive

Technological Solutions in 3 parts

(i) Are they in the right place? – Habitat Mapping as a surrogate for Biodiversity

(ii) Are they effective? - Monitoring change with Baited Remote Underwater Video (BRUV).

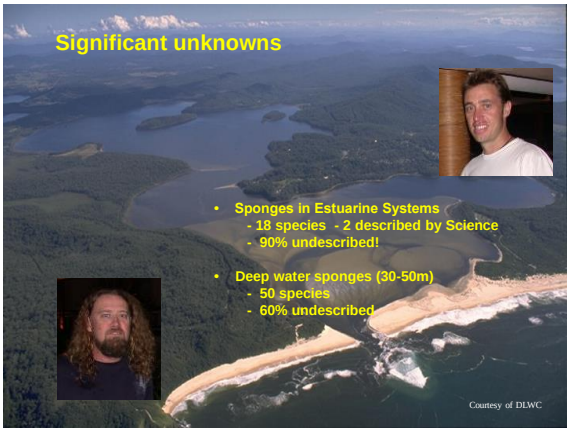
(iii) Do they protect motile organisms eg fish? Using Acoustic Tags to reveal patterns of fish movement

1. Habitat mapping as a surrogate for reef Biodiversity

A well characterised fauna?

Some taxa are poorly known

Sponges – difficult to identify



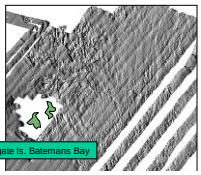
Side scan sonar to assess reef Heterogeneity

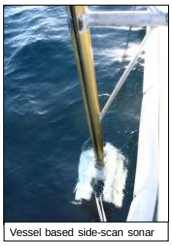
Can we use remotely-sensed abiotic measures to predict temperate reef biodiversity?

Use remotely sensed habitat info as surrogates to indirectly measure biodiversity and guide MPA boundaries

Advantages:

Easy to obtain
Affordable and time efficient




Vessel based side-scan sonar

Swath Mapping

Batemans Marine Park

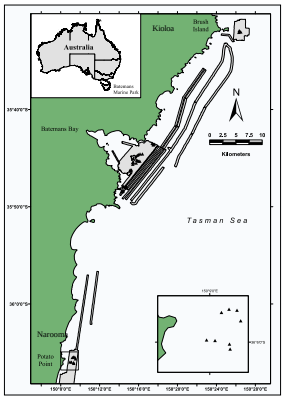
40 sites

Each site was:

1) Swath mapped

2) Filmed using BRUV

3) 32 of the sites were photographed



Automated Underwater Vehicle - AUV

- Raft of instruments;

- high resolution stereo camera pair & strobes
- multibeam sonar
- depth and conductivity/temperature sensors
- Ultra Short Baseline Acoustic Positioning System (USBL)
- Forward looking obstacle avoidance sonar.

Results

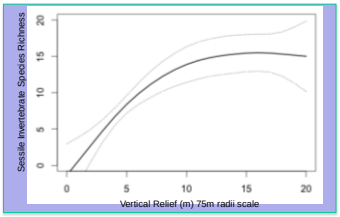
2206 fish were observed which comprised of 58 species represented by 33 families

61 species of sessile invertebrates were observed including:

- 51 sponge species
- 8 ascidian species
- 1 hydroid and bryozoan species

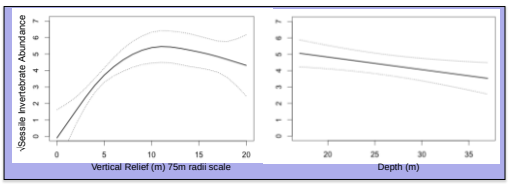
Sessile Invertebrate Species Richness

Model and Terms	F	*P*	r^2
SI Species Richness			**0.683**
s(Vertical Relief 75m)	17.62	**<0.001**	



Sessile Invertebrate Relative Abundance

Model and Terms	Estimate	F	SE	t	*P*	r^2
SI Abundance						**0.636**
s(Vertical Relief 75m)		13.76			**<0.001**	
Depth	-0.07		0.03	-2.37	**0.026**	

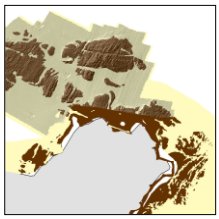


Conclusions

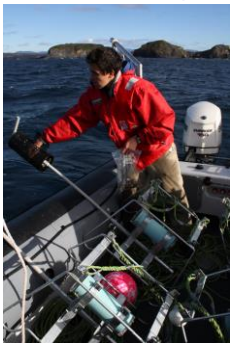
Sidescan sonar derived abiotic variables are potential surrogates for invertebrate assemblages

Can determine areas of high conservation value on temperate reefs

Incorporated into new MPA zoning and examine current MPA zoning

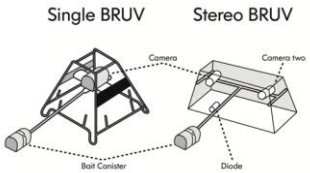


2. Monitoring change with Baited Remote Underwater Video (BRUV)

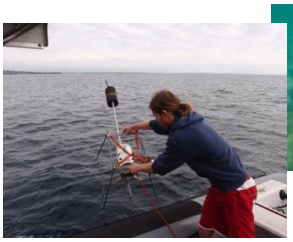


Baited Remote Underwater Video (BRUV)

- Unobtrusive means of sampling fish assemblages
- Cryptic and shy fish
- >1000 metres depth
- Permanent records
- Stereo BRUV allows length calculation



Deploying BRUV



Pic: Ian Osterloh

Deployed for 35 mins ~ 5 min settlement period and a 30 min sample

Baited Remote Underwater Videos (BRUVs)

Measures

1. Max*N*
2. Total Max*N*
3. Species Richness

Max*N*

Onespot Pullers = 14
Painted Basslet = 2
Gunthers Butterflyfish = 1
Spotted Sawtail =1

Total Max*N* = 18; Species Richness = 4

Baited Remote Underwater Videos (BRUVs)

Measures

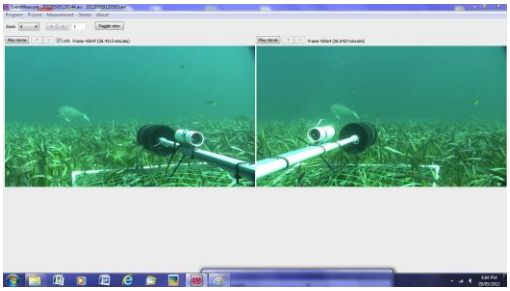
1. Max*N*
2. Total Max*N*
3. Species Richness

Max*N*

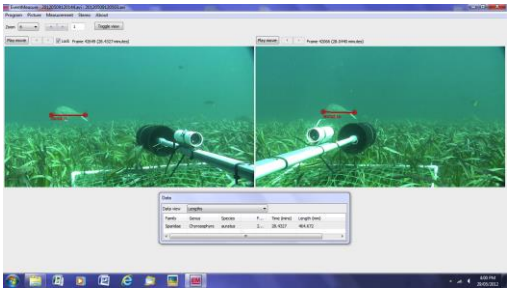
Snapper = 8
Grunter = 6
Maori Wrasse = 4
Tarwhine =1
Longfin Pike = 1
Shovelnose Ray = 1

Total Max*N* = 21; Species Richness = 6

Length Calculation



Length Calculation



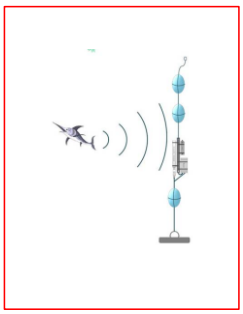
‘MiniBRUVs’: Cryptic fishes in seagrass

Small BRUVs: Species Sampled

- **Blue Weed Whiting**
- **Rough Leather Jacket**
- **Little Weed Whiting**
- **Six-Spine Leatherjacket**
- **Bluestriped Goatfish**
- **Pygmy Leather Jacket**
- **Blue-nose Whiting**
- **Krefft's Frillgoby**
- **Common Weedfish**
- Australian Mado
- Senator Wrasse
- Old Wife
- Southern Eagle Ray
- Common Silverbiddy
- Smooth Stingray
- Snapper
- Eastern Australian Salmon
- Common Stingaree
- Banded Toadfish
- Yelloweye Mullet
- Long-finned Pike
- Sea Mullet
- White Trevally
- Eastern Striped Grunter
- Chinamen Leatherjacket
- Onestripe Seapike
- Fiddler Ray
- Luderick
- Yellow Fin Bream
- Yellow Tail Scad

Key
Unique to small BRUV design
• Cryptic species

3. The movement of fish on sand: Implications for the management of marine protected areas



Acoustic tracking

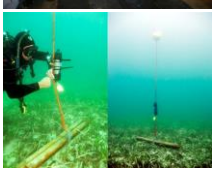
Acoustic tags

- Acoustic tags transmit ultrasonic signals to a submerged receiver (hydrophone).
- Internal battery powers transmitter, size of the battery dictates the size of the tag.
- Tag life depends on the battery size, transmitter size, signal power and rate

40

41

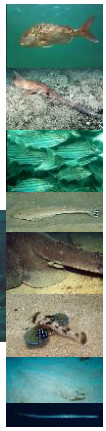
Tracking Array



Gone fishing!

Soft sediment fish assemblage

- 50 + species of fish
- Dominant species below



Implanting tags

- Surgery
- Tracking for 700 days +
- 25+ of each species

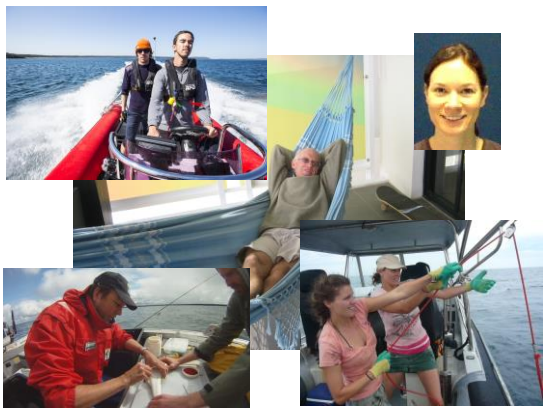
Tagging so far…

- 50 Blue-spotted flathead
- 12 Fiddler Rays

50

SEA SERPENT

SOUTH EAST ASIA
SCIENTIFIC AND ENVIRONMENTAL ROV
PARTNERSHIP USING EXISTING INDUSTRIAL
TECHNOLOGY



UNIVERSITY OF WOLLONGONG

FISH_THINKERS

NSW GOVERNMENT Department of Primary Industries

The Nature Conservancy
Protecting nature. Preserving life.

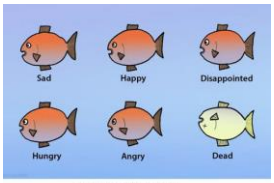
SEA WORLD RESEARCH & RESCUE FOUNDATION

Australian Wildlife Society

ESA ECOLOGICAL SOCIETY OF AUSTRALIA

IMOS

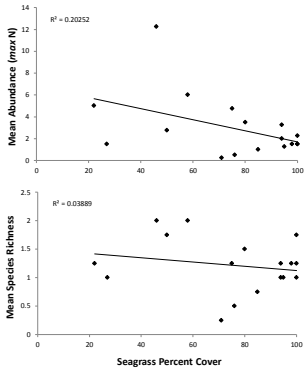
Questions.....



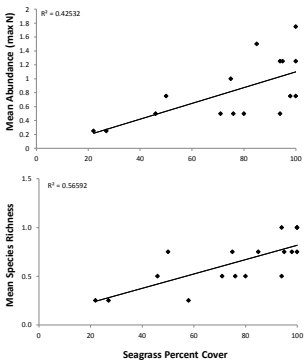
Understand your fish

FISH_THINKERS

Results (Non-cryptic Fish)



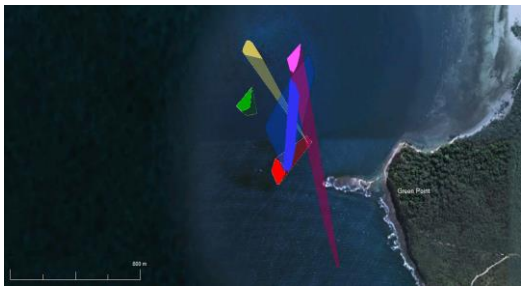
Results (Cryptic Fish)



Release locations

Fish one Fish two Fish three Fish four Fish five .

58



Fish one Fish two Fish three Fish four Fish five .

59

To examine MPA effectiveness we compare a number of fish parameters between no-take and take zones.

- **Species Richness**
  - No. of species
- **Relative Abundance**
  - max no. of a particular species
- **Total Abundance**
  - all species