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Measuring public values for marine reserve networks and the effect of how information is delivered

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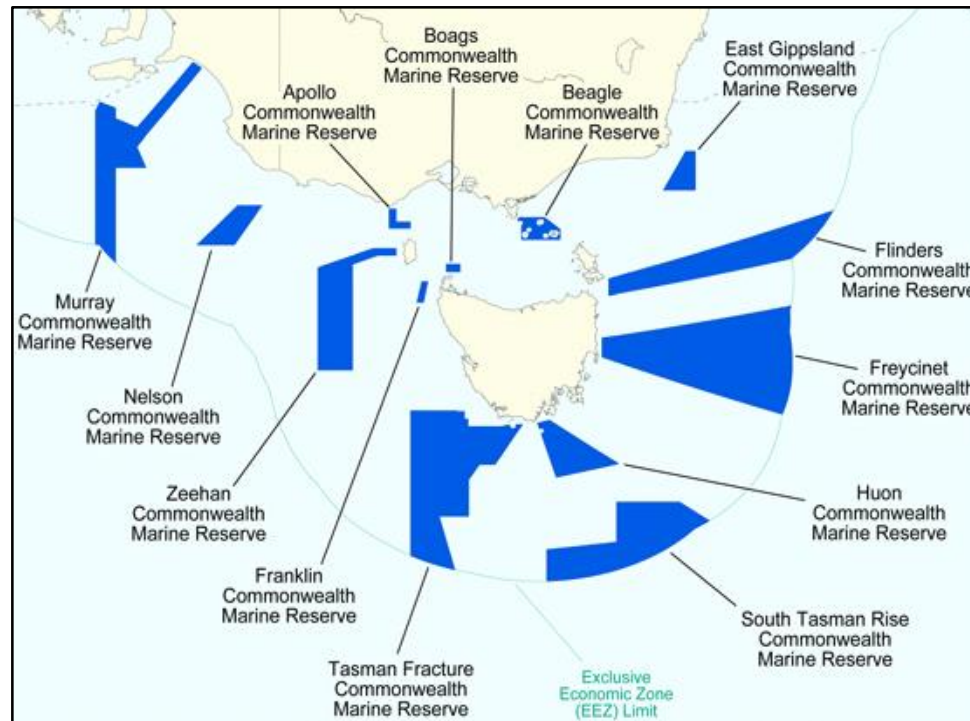
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Motivation

- Marine reserve networks are intended to protect biodiversity and maintain the ecological integrity of marine ecosystems
- Trade-offs between the extent to which they are effective in protecting various features of the marine region are inevitable in their design, so priorities need to be identified for effective management
- The costs and benefits of different designs, and priorities for stakeholders that have direct links to the ocean, such as fisheries, are relatively easy to quantify
- Less so are the costs and benefits of management alternatives for the general public, who may hold non-use values for ecological assets protected by these marine reserve networks
- Identifying and quantifying public preferences will help identify publically acceptable trade-offs, providing guidance to managers

This study

- We focus on five features of the South-east Australian marine region which have been identified as important by scientists and managers, and occur in the South-east Commonwealth Marine Reserves Network (SECMRN)



This study

- We collected data from the general public in the South-east marine region to:
 1. Identify their preferences for the level of protection provided to various key features of the South-east marine region by the SECMRN and its management plan
 2. Determine the effect on these measured public preferences of providing information about key features in different ways, and of explaining the importance of affording protection to a representative range of features through a network of reserves

Survey

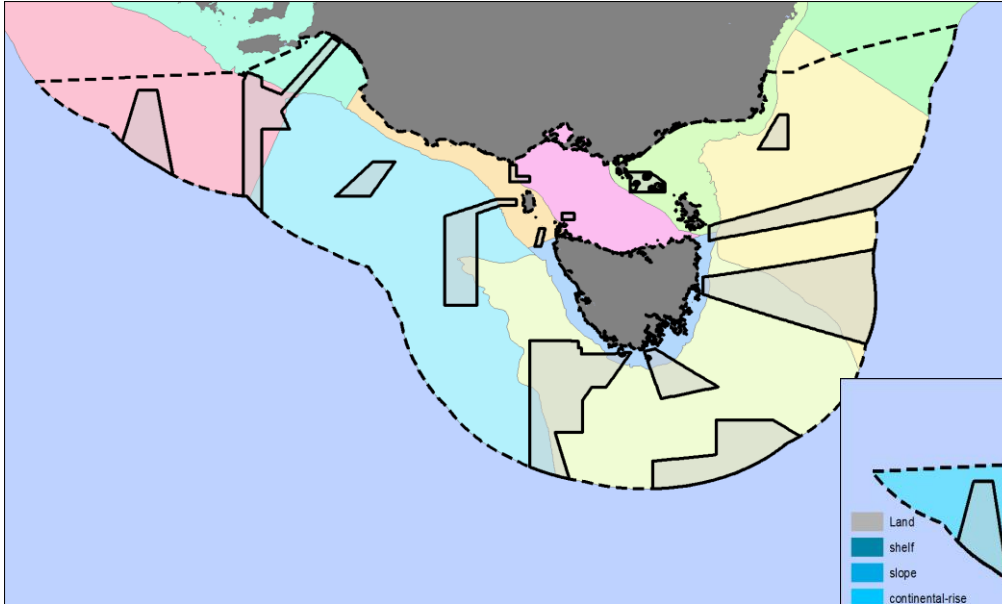
- Online survey was administrated by a market research company and data was collected in June 2015.
- Targeted the broad general public in the South-east region (TAS, SA, VIC)
- In total 1122 completed responses were received.
- The questionnaire consists of 6 parts:
 1. Demographics
 2. Attitudes to the marine ecosystems
 3. Knowledge and perceptions to the South-east Commonwealth Marine Reserves Network
 4. Participation in marine based activities
 5. Choice experiment
 6. Education, income, opinion about the survey

Choice experiment

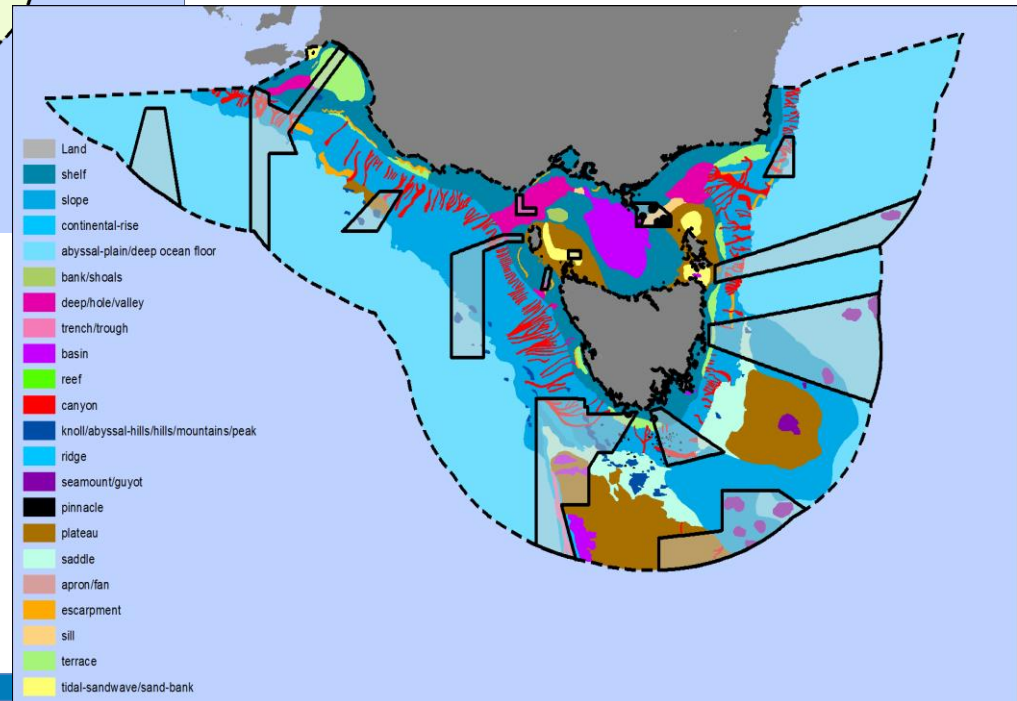
- We first described five key “features” of the South-east marine estate that the SECMRN aims to protect, namely
 - Bioregions
 - Seafloor types
 - Important ecological areas
 - Important areas for white shark populations
 - Areas less than 1500m depth

Key features in the SE marine region: examples

Feature 1: Bioregions

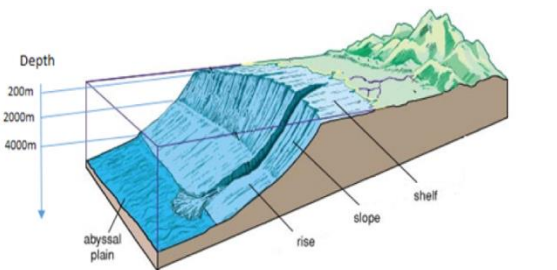


Feature 2: Seafloor types



Three information treatments

- Respondents were randomly assigned to one of three information treatments.
- The key features protected within reserves were described by:
 1. Written information sheets with the location of features and reserve boundaries shown using maps
 2. A video with an oral commentary and footage of key features
 3. Treatment 2 + short video of an expert scientist explaining the importance of protection



Example of choice questions

Features <u>in the reserve network</u>	Option 1	Option 2
Of 9 bioregions...	4 contain zones with high protection level	2 contain zones with high protection level
Of 14 seafloor types...	7 can be found in zones with high protection level	9 can be found in zones with high protection level
Of 8 important ecological areas...	4 are partly covered by zones with high protection level	6 are partly covered by zones with high protection level
Of 3 important areas for White sharks...	1 is partly covered by a zone with high protection level	1 is partly covered by a zone with high protection level
% of areas less than 1500m depth in protection zones (10% in total)	1% is covered by zones with high protection level	5% is covered by zones with high protection level
Additional cost to you each year, for 10 years	\$0	\$50

Estimation of conditional logit model

Do information treatments matter?

	Version 1		Version 2		Version 3		Aggregate	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
Bioregions	0.083	0.000	0.080	0.000	0.059	0.009	0.073	0.000
Seafloor types	0.050	0.001	0.061	0.000	0.045	0.003	0.052	0.000
Ecol. Areas	0.097	0.000	0.120	0.000	0.048	0.074	0.088	0.000
Shark Areas	0.064	0.585	0.112	0.327	-0.074	0.510	0.033	0.614
Shallow Areas	0.022	0.365	0.055	0.018	0.038	0.103	0.038	0.005
Cost	-0.007	0.000	-0.007	0.000	-0.006	0.000	-0.006	0.000
Status quo	-0.921	0.013	-0.569	0.114	-1.070	0.003	-0.852	0.000
Choices	3060		3288		3216		9585	
Individuals	255		274		268		797	
Log likelihood	-982.9		-1053.09		-1044.53		-3088.05	

Test of aggregate model versus sub models: $\chi^2_{(14)}=15.04$, $p=0.3756$

Estimation of latent class model

Marginal utilities by preference class

	Class 2		Class 3	
	Coeff.	p-value	Coeff.	p-value
Bioregions	0.404	0.000	1.220	0.002
Seafloor types	0.141	0.005	0.901	0.004
Ecol. Areas	0.193	0.025	1.329	0.005
Shark Areas	0.753	0.039	1.416	0.037
Shallow Areas	0.265	0.002	0.903	0.013
Cost	-0.046	0.000	-0.028	0.033
Status quo	-2.097	0.034	-4.472	0.210
Prop. of sample in each class				
Class 1	0.1476			
Class 2	0.5145			
Class 3	0.3379			

Class 1 is a random class, i.e., all attributes are insignificant

Estimation of latent class model

Partworths of each attribute by preference class

	Class 2		Class 3	
	PW	z-stat	PW	z-stat
Bioregions	8.8	6.09	43.9	2.67
Seafloor types	3.1	2.71	32.4	2.60
Ecol. Areas	4.2	2.18	47.8	1.79
Shark Areas	16.4	2.04	50.9	1.33
Shallow Areas	5.8	3.54	32.5	1.81

These partworths are measured in dollars per year, for 10 years

Preference class membership

What determines the membership of preference classes

	Class 1 (random)		Class 2		Class 3	
	ME	p-value	ME	p-value	ME	p-value
Female	-0.233	0.019	0.210	0.006	0.023	0.120
Age	-0.011	0.000	0.008	0.000	0.004	0.002
Importance of protecting great white shark	0.025	0.740	-0.184	0.002	0.159	0.010
Importance of protecting whales	-0.196	0.001	0.158	0.002	0.038	0.032

ME = marginal effects

Conclusions

- We explored the public values of ecological assets protected by The South-east Commonwealth marine reserve networks
- Individuals' views on the importance of protecting iconic species (sharks and whales) can inform us of their preferences for the improvement of ecological features in the reserve
- Attitudes towards sharks and whales might be taken as an indicator of values to the broader ecosystems as a whole.
- We find no evidence that different information treatments affect choices made by respondents
- This may be because of the complexity of the information respondents needed to deal with and/or the low visibility of the offshore marine environment



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