Working Paper: Public preferences for marine park design in Western Australia

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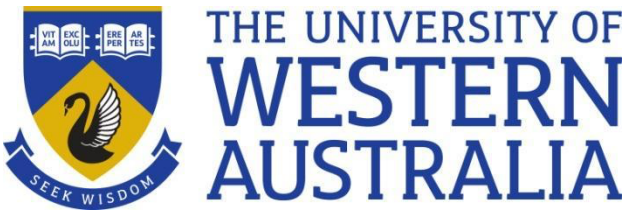

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ABSTRACT

- Effective design and planning of marine protected areas requires an understanding of the socioeconomic uses and values that exist for the proposed marine area. Inevitably, different stakeholders will have different preferences for the spatial design of the no-take sanctuary zones within a marine park. One key stakeholder group that is often missing from marine park planning is the broader community, or public. This group might currently visit and use the proposed marine park area, they might plan to visit in the future, and may also derive benefit from other non-use outcomes such as from marine ecosystem services.
- In 2023, Western Australia started consultation for the establishment of two new marine parks. The extension and rezoning of an existing marine park adjacent to metropolitan Perth, the Marmion Marine Park, and one new marine park on the south coast of the state, named here as the Proposed South Coast Marine Park.
- This working paper presents results from surveys of the Western Australian public that included two stated preference experiments, a single binary choice question and a multiple discrete choice experiment.
- Results demonstrate a strong public desire for world-class conservation outcomes for both the Marmion and the Proposed South Coast Marine Parks, with 75% of the general public supporting the creation of no-take sanctuary zones across at least 31% of both marine park areas. We estimate that Western Australian households are willing to pay more to achieve larger areas of no-take sanctuary zones - A$112 per household per year for 45% at Marmion Marine Park and A$123 per household per year for 45% at the Proposed South Coast Marine Park, for an aggregate value of A$84.3 million and A$92.3 million respectively. We also find that public valuation increases by between 19% and 57% when sanctuary zones include extensive shore protection enabling greater connection with the community.

Keywords Marine protected area (MPA), non-market valuation, choice experiment, contingent valuation, willingness to pay

JEL classifications

Q51 Valuation of Environmental Effects, Q57 Biodiversity Conservation, Q58 Government Policy

1. INTRODUCTION

Highly protected no-take marine sanctuaries, where the community is encouraged to connect and appreciate nature whilst prohibiting all extractive activities, are globally recognised as an effective way to conserve marine biodiversity (Lubchenco et al. 2003). This approach has been strengthened by international targets, such as the Aichi Target 11 which aimed to protect 10% of marine waters globally by 2020 (UNEP 2011-2020). Newer targets are more ambitious, including the "30 x 30", which aims to protect 30% of global marine environments by 2030 and has gained considerable traction globally including commitments to meet this objective by the Australian Federal Government (HAC 2022).

These targets raise questions about where protected areas should be placed, the level of protection they should provide, and how trade-offs with other sectors should be handled.

Past analyses of the decisions made for protection have criticised placement decisions, highlighting a tendency to place highly restrictive no-take marine sanctuaries in remote and residual areas where no fishing activity takes place (Edgar 2011; Devillers et al. 2015). This has occurred, in part, due to a limited assessment of the socioeconomic benefits of marine zoning, focusing on perceived costs to active user groups like recreation and commercial fishing through established consultation processes (Pascual et al. 2016; Fortnam et al. 2023).

Instead, a more comprehensive approach to marine spatial planning includes economic viability along with society's preferences for zone features and their outcomes, and includes assessment of the trade-offs involved (Grafton, Akter, and Kompas 2011; Fortnam et al. 2023). Non-market valuation approaches can measure these preferences in a way that can inform trade-offs with other sectors, for example in a benefit-cost analysis. Despite the need, the measurement of the broader community preferences for marine sanctuary zoning and its outcomes are rarely included in decision-making (Grafton, Akter, and Kompas 2011). This is possibly due to a lack of familiarity with non-market valuation approaches amongst marine park planners and decision makers who tend to come from different science and policy backgrounds (Rogers et al. 2015). As a result, the potential for non-market valuation of community preferences and its ability to inform zoning decisions has been under-explored.

In Western Australia, two networks of no-take marine sanctuaries are being designed concurrently. One involves the establishment of a new marine park along 1,000 km of the South Coast of Western Australia (Figure 1). The region is relatively remote and has a low population, 16,645 residents (2021), but is often visited by tourists from the capital of Perth and from other towns and cities

in Western Australia. The second involves the extension of an existing marine park, the Marmion Marine Park, in the Perth metropolitan area (Figure 2). Both parks are being informed by a community and sector consultation approach but currently no mechanisms have been put in place to understand the broader Western Australian public preferences for zoning in these parks.

In this study we explore preferences for marine parks and no-take marine sanctuaries held by the Western Australian public using standard survey questions and economic stated preference methods. Using stated preference methods allows us to estimate the non-market values for different marine park design features. Both stated preference questions include a household cost that the individual would have to pay to achieve the marine park outcomes presented and we use this to estimate the willingness to pay for marginal changes in the marine park attributes.

This working paper introduces the design and initial method of analysis (using multinomial logit models) of the two choice experiments. We then present results from survey questions along with insights about preferences from choice modelling.

Figure 1. Map showing the planning area for the Proposed South Coast Marine Park.

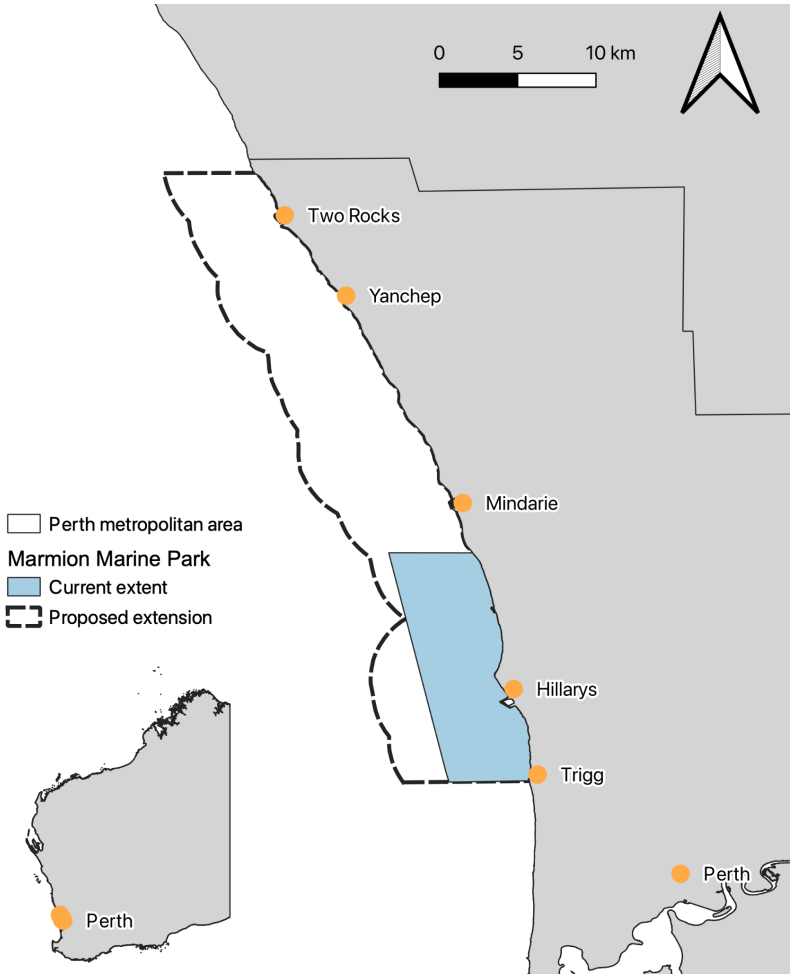


Figure 2. Map showing Marmion Marine Park off the coast of Perth metropolitan region with the new planning boundaries.

2. METHODS

2.1. Stated preference survey design

In addition to using standard survey methods (and ordinary least squares regression), we use economic stated preference methods to understand public preferences for marine parks and sanctuary zones. Stated preference methods are used for valuing non-market goods and services such as environmental amenities and public goods (Johnston et al. 2017; Hanley and Czajkowski 2019). Based on the theory that individuals will choose the outcome that provides the maximum benefit for them, these methods ask participants to make hypothetical choices that reveal their preferences for proposed

bundles of goods or policy changes. The inclusion of a cost, that the participant has to pay, allows choices to be modelled to determine the willingness to pay for the bundle, and for the marginal contributions of different parts of the bundle, if the design allows. Other factors that may influence preferences can also be explored in modelling such as a person's interests and their gender.

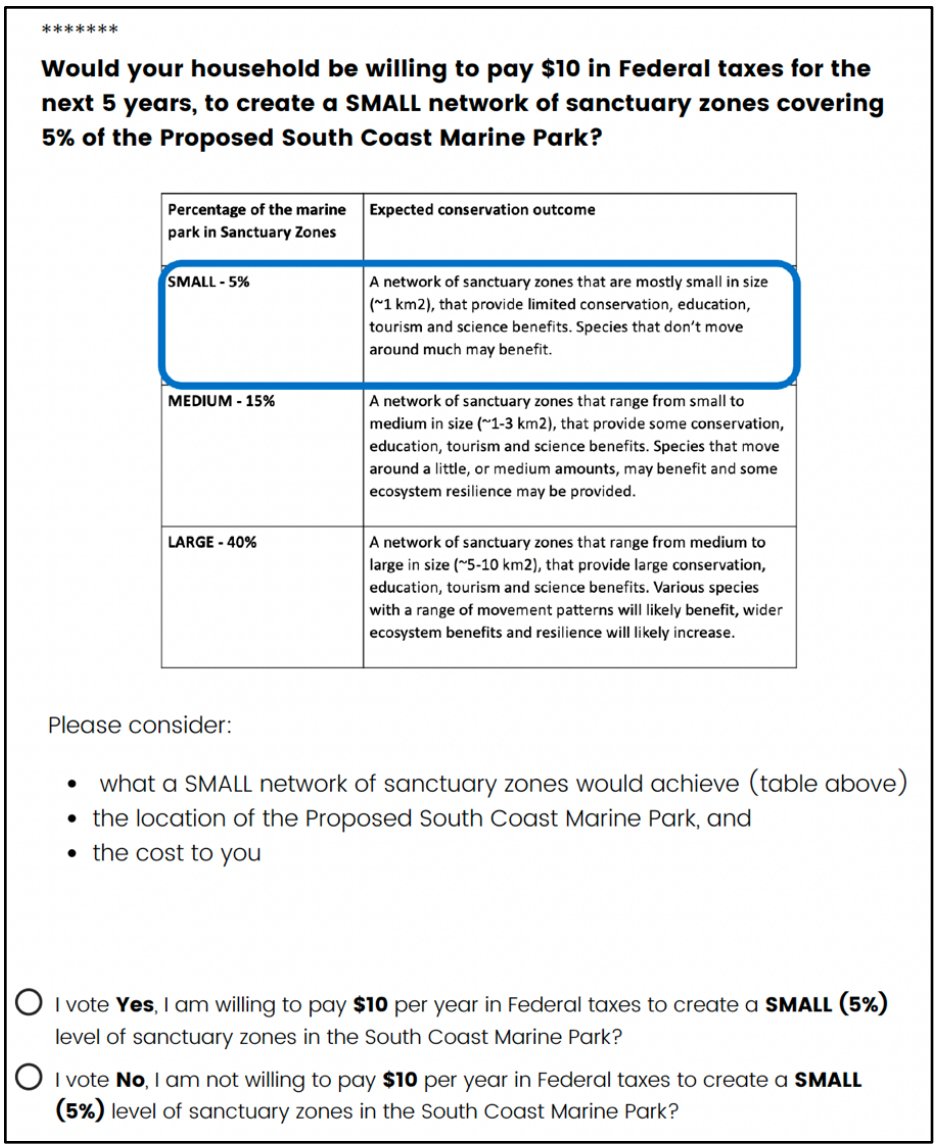
To assess values held by the Western Australian public for marine sanctuary zones and their outcomes, we explore data from two stated preference approaches: a single binary choice experiment (sometimes known as contingent valuation) and a multiple discrete choice experiment.

2.1.1. Single binary choice experiment

The single binary choice experiment focused on measuring values for the size of sanctuary zones allocated within the two parks. Levels were determined through expert advice and investigation of current marine park sanctuary zones around Australia (Table 1). Levels used are 5% as a SMALL level of sanctuary zone, 15% as a MEDIUM level, and 40% considered a LARGE amount of the sanctuary zones within a marine park. Management costs to achieve the marine sanctuary outcome range from $10-$250. The top bound of the cost vector was increased from $200 to $250 following investigation of pilot (n=101) data results. The choice question presented the park design option as text in a table along with text in dot points in an attempt to make the choice question easy to understand (Figure 3). The table and blue box, highlights what level of sanctuary zone is on offer in each question and is intended to prompt respondents to pay attention to the trade-off between costs and the outcome achieved. The design, along with increasing the top bound of the cost vector, was developed in response to higher-than-expected "Yes" votes observed during pilot testing.

Table 1. Attributes used in the single binary choice experiment.

Attribute	Level	Description
Percentage of the marine park in sanctuary zones	SMALL - 5%	A network of sanctuary zones that are mostly small in size (~1 km2), that provide limited conservation, education, tourism and science benefits. Species that don't move around much may benefit.
	MEDIUM - 15%	A network of sanctuary zones that range from small to medium in size (~1-3 km2), that provide some conservation, education, tourism and science benefits. Species that move around a little, or medium amounts, may benefit and some ecosystem resilience may be provided.
	LARGE - 40%	A network of sanctuary zones that range from medium to large in size (~5-10 km2), that provide large conservation, education, tourism and science benefits. Various species with a range of movement patterns will likely benefit, wider ecosystem benefits and resilience will likely increase.
Management cost (AUD)	$10, $25, $50, $75, $125, $200 (Pilot only), $250	The management cost would be collected through an increase in Federal taxes (income and other taxes) for the next 5 years and would be used solely for implementing the marine sanctuary zones.



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Would your household be willing to pay $10 in Federal taxes for the next 5 years, to create a SMALL network of sanctuary zones covering 5% of the Proposed South Coast Marine Park?

Percentage of the marine park in Sanctuary Zones	Expected conservation outcome
SMALL - 5%	A network of sanctuary zones that are mostly small in size (~1 km2), that provide limited conservation, education, tourism and science benefits. Species that don't move around much may benefit.
MEDIUM - 15%	A network of sanctuary zones that range from small to medium in size (~1-3 km2), that provide some conservation, education, tourism and science benefits. Species that move around a little, or medium amounts, may benefit and some ecosystem resilience may be provided.
LARGE - 40%	A network of sanctuary zones that range from medium to large in size (~5-10 km2), that provide large conservation, education, tourism and science benefits. Various species with a range of movement patterns will likely benefit, wider ecosystem benefits and resilience will likely increase.

Please consider:

- what a SMALL network of sanctuary zones would achieve (table above)
- the location of the Proposed South Coast Marine Park, and
- the cost to you

○ I vote **Yes**, I am willing to pay **$10** per year in Federal taxes to create a **SMALL (5%)** level of sanctuary zones in the South Coast Marine Park?

○ I vote **No**, I am not willing to pay **$10** per year in Federal taxes to create a **SMALL (5%)** level of sanctuary zones in the South Coast Marine Park?

Figure 3. An example of a single binary choice question.

A full factorial design of 18 choice situations was used and each respondent answered one choice question placed in each marine park. Each respondent was randomly assigned to see one question in Marmion Marine Park first, followed by one in the Proposed South Coast Marine Park, or visa-versa. After the two choice experiments respondents were asked follow-up questions about the choices they had made. Respondents were also asked about what they considered the optimal level of sanctuary zones within the second marine park that they saw in the choice experiment.

2.1.2. Multiple discrete choice experiment

The multiple discrete choice experiment explored several aspects of marine sanctuary zone design simultaneously, exploring how respondents make trade-offs between the different attributes (example question in Figure 4). Attributes were identified as those most pertinent to questions of marine

sanctuary zone design in the context of the Proposed South Coast and extended Marmion Marine Parks. Attributes included: the percentage of the marine park as sanctuary zone, shore accessibility to sanctuary zones (i.e., whether the sanctuary zone has good connection with the coast, allowing shore access), impacts on recreational fishers, impacts on commercial fishers, and a payment attribute. All attributes and their levels are described in Table 2. Building on the single-bounded choice experiment, slight modifications were made to the sanctuary zone attribute; slightly increasing the LARGE network of marine sanctuaries from 40% to 45% and simplifying the language around the likely outcomes from the different levels of marine sanctuaries.

To design the choice questions we used an efficient *D*-error design to create 48 choice questions in six blocks, maximising our ability to distinguish preferences for each attribute (ChoiceMetrics 2012). Each respondent was randomly assigned to one block of choice questions, with question order randomised within each block. Priors to inform the D-error design were selected based on expected mean attribute levels, with these priors revised for the final design based on a pilot sample of 102 respondants. Two constraints were imposed in the choice question designs due to them being unlikely combinations in practice:

(1) A marine park with a SMALL, 5%, level of sanctuary zones could not have HIGH impacts on either recreation or commercial fishing, and

(2) A marine park with NONE impacts on recreation and commercial fishing could only have a SMALL, 5%, level of sanctuary zones.

Table 2. Attribute description and levels using the multiple discrete choice experiment.

Attribute	Description as shown in survey	Levels (dummy coded except cost) BOLD are No-Change levels
Sanctuary zone size (%)	Sanctuary Zones are areas of the ocean for biodiversity conservation, and where the public is encouraged to visit and appreciate marine life. These areas typically provide opportunities for education, tourism and scientific research activities. No fishing, extraction or disturbance is allowed within Sanctuary Zones. In Western Australia, there are multiple Sanctuary Zones within each marine park (e.g., the Ningaloo Marine Park) to protect a variety of different habitats. This also means people cannot access the area for fishing - both recreational and commercial fishing.	**No change to sanctuary zones** Small (5%) *Limited conservation benefits* *Limited science benefits* *No ecosystem resilience* Medium (15%) *Some conservation benefits* *Some science benefits* *Limited ecosystem resilience* Large (45%) *Large conservation benefits* *Large science benefits* *Wider ecosystem resilience*
Shore access to sanctuary zones	This feature describes if the Sanctuary Zones in the marine park have good accessibility from the shore, and so you would not need a boat to visit them.	Yes Sanctuary Zones have extensive shore access that would provide many opportunities for education, tourism, and engagement with the community. **No** Sanctuary Zones have no shore access and would provide less opportunities for education, tourism, and engagement with the community.
Impacts on recreational fishing	This feature describes how many fishing sites inside the marine park are closed to fishing as a result of the marine park zoning, mostly from the placement of Sanctuary Zones.	**None** (0 in 10 sites closed) Low (1 in 10 sites closed) Medium (2 in 10 sites closed) High (4 in 10 sites closed)
Impact on commercial fishing	This feature describes the impact on the current income commercial fisheries gain from fishing in the marine park area, over the next 10 years. Drop in income is mostly due to placement of the Sanctuary Zones.	**None (0%)** Low (- 5%) Medium (- 25%) High (- 50%)
Cost: household tax payment	The management costs associated with implementing the marine park will be raised through increased State and Federal taxes, with payments collected from all Western Australian households. The funds collected would be used for the implementation, administration, regulation and ongoing management of the marine park features described in each scenario.	**$0,** $25, $50, $75, $125, $250, $400

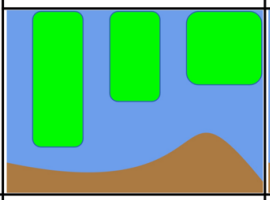
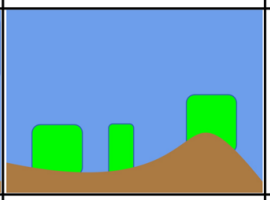
	Marine Park A	Marine Park B	No Change
			
Sanctuary zone size	**LARGE** 45% of marine park	**MEDIUM** 15% of marine park	**No increase** in sanctuary zones
Shore access to sanctuary zones	**NO**	**YES**	**NO**
Impact on recreational fishing	**HIGH** 4 in 10 fishing sites closed	**MEDIUM** 2 in 10 fishing sites closed	**NO** fishing sites closed
Impact on commercial fishing	**HIGH** 50% of income lost	**LOW** 5% of income lost	**NO** income lost
Cost to you, tax every year for 10 years	**$25**	**$50**	**$0**

Figure 4. An example of a multiple discrete choice question, where you choose your preferred option; Marine Park A, Marine Park B, or No Change.

2.2. Choice experiment analysis

To analyse both the single binary and multiple discrete choice experiment responses we applied McFaddon theory of random utility. In this framework a part of an individual's preferences and underlying utility function is known, or can be explained, while another part is unknown to the analyst (ε_{nit}). The utility from respondent *n* from selecting alternative *i* in choice situation *t* is:

$$U_{nit} = B'X_{nit} + \varepsilon_{nit} = V_{nit} + \varepsilon_{nit}\,, \tag{1}$$

where, B' is a vector of estimated coefficients and X_{nit} is a vector of attribute levels of alternative *i* in choice situation *t.* The respondent is assumed to be making choices that maximise their own utility.

All data are analysed using nonlinear probability models, modelling the choices made by the respondent. The single binary choice data was modelled using probit models, where the probability of respondent *n* of voting in favour of the marine park (*t*), with the error, ε_{nt}, assumed to be normally distributed (ϕ);

$$Prob(vote\ yes)_{nt} = \phi(V_{nt}), \tag{2}$$

where, ϕ is the standard normal cumulative density function.

For the multiple discrete choice data, the probability of a respondent choosing one alternative out of the three available alternatives was modelled using multinomial logit models. The multinomial logit models assume that ε_{nit} is an alternative specific error with an assumed Type I extreme value distribution, and the probability of respondent *n* choosing alternative *i* in choice situation *t* is;

$$Prob_{nit} = \frac{exp(V_{nit})}{\sum_{i=1}^{I} exp(V_{nit})}, \quad i = 1,\ldots I. \tag{3}$$

Data was analysed and models were estimated using maximum likelihood estimation in Stata (StataCorp 2021).

The willingness to pay for the change in policy is estimated as the amount a respondent is willing to pay, from a baseline level, to achieve the new policy level, also known as the compensating variation. It is conveniently calculated from the models as the inverse ratio between the marginal change in the attribute or change being evaluated and the marginal utility of the cost attribute:

$$WTP_{attribute} = -\frac{\hat{B}\ attribute}{\hat{B}\ cost}$$

The hypothetical nature of the described goods or policy changes and the way choices are made when using stated preference methods can generate bias in respondents' answers, which can lead to bias in estimates of willingness to pay (Hanley and Czajkowski 2019). In this study we asked respondents if they thought their answers to the survey would be consequential, both for influencing policy decisions and in deciding payment amounts (Herriges et al. 2010), which can be used to assess the amount of hypothetical bias present in our data (not presented in the Working Paper). We also identify respondents who reveal protest (Jorgensen et al. 1999) and yae-say responses (Kahneman and Knetsch 1992), which are well-known issues for stated preferences data, and estimate models without these respondents. Models specification and fit are compared using Likelihood Restriction tests, and Aikie Information Criteria (AIC) and Bayesian Information Criteria (BIC) (Ward 2008).

Willingness to pay is aggregated across the relevant households in Western Australia to estimate total value to the public of different marine park design features. There are notable

opportunities for bias and different value judgements that can influence the process of transferring and aggregating individual WTP estimates (Nyborg 2014; Morrison 2000). One possible approach for estimating population WTP is via a straightforward aggregation of the marginal sample WTP estimates (Mariel et al. 2021) however, this does not account for differences between the sample and relevant population. We use a straight-forward and conservative approach to aggregation (Morrison 2000). Given that the survey asked respondents about marine parks and sanctuary zones we cannot assume that people who did not complete the survey have the same preferences as those that did complete the survey. In this case, not wanting to participate in the study might suggest that they hold less value for this topic, or think it is less interesting or important. We therefore assign non-responses in the population to have a WTP of zero. Thus, mean household WTP is calculated by multiplying willing to pay estimates by an indicative response-rate. We cannot be certain of the specific non-response rate for this sample as the data was collected by a commercial online panel company. People are invited to participate in the surveys via emails and the survey links also appear in users 'dashboards', their recruitment process to participate in the survey is not completely transparent and the actual invite rate is hard to determine. They may also have closed the survey before people could respond or people might not be reading their emails due to travel or other engagements. As an indicative response rate we use a completion rate (number of survey completes divided by the number of people who started the survey) of 60%, similar to another Australia study by Rolfe and Windle (2013). Mean household WTP estimates are then multiplied by the number of tax-paying households[1] in WA to estimate the aggregate annual WTP (compensating variation), held by the WA public.

2.3. Data

This study uses survey data from online panels provided by reputable market research companies. Data was collected November-December 2022 using two surveys that both consisted of three parts. The first part of the survey included questions asking respondents for their perceptions of marine conservation, including their opinion on what would be the optimal percentage of a marine park as sanctuary zone, and their personal use of the coastal region. The middle section presented the stated preferences choice experiment along with follow-up questions. In the final part of the survey, we asked socio-demographic questions such as age, gender, occupation and income.

The first sample requested from the panel, for the single binary choice experiment, was for 1,000 completes with 75% of the sample Western Australian residents over 18 years of age, controlling for age and gender representation. We are interested in the preferences of Western Australians giving us a sample of 821. The second sample, for the multiple binary choice experiment, was for 1,000

[1] Relevant households in WA are estimated at 752,492 houses that are occupied with Australian residents for taxation purposes (ABS 2021).

completes of Western Australian residents over 18 years of age, controlling for age and gender representation, resulting in a final sample of 1,054.

3. RESULTS AND DISCUSSION

Table 3 presents the socio-economic descriptive statistics for the two survey datasets. Both samples have acceptable representation of age and income levels. Our samples have good representation of the different levels of education attainment, except for University graduates who are slightly over-represented compared to the Western Australian average. Females are over-represented in the multiple discrete choice dataset; this is mostly due to limitations in the overall panel size for Western Australian residents. We also had slightly more households with children under 15 years than the Western Australia population average, 34% and 37% compared with 27%.

In both samples, 32% go recreational fishing at least once a year and around 64% have visited the Marmion Marine Park in the past 5 years, while 28% have visited the Proposed South Coast Marine Park region in the past 5 years. A small portion of the sample are identified as giving protest responses to the choice experiment questions, 6% is not unexpected from stated preference studies. This protest behaviour was indicated by respondents who always selected not to pay for the marine park option and then in follow-up questions suggested they were exhibiting protest behaviour, possible answers to the follow-up questions that reveal protest behaviour are shown in Table A.4 Appendix A.

Table 3. Descriptive statistics for the data and modelling variables.

			Single binary choice data N=821	Multiple discrete choice data N=1,054	WA Population >18 years [b]
VARIABLE NAME	**SOCIO-DEMOGRAPHICS**				
	Gender [a]				
Female		Female	0.51	0.58	0.50
	Age[a]				
Age		18-30	0.22	0.26	0.17
		31-45	0.29	0.30	0.29
		46-60	0.23	0.23	0.25
		61-75	0.21	0.18	0.20
		Over 75	0.06	0.03	0.09
	Highest educational attainment [a]				
		Completed year 11 or below	0.13	0.12	0.25
		Completed year 12	0.18	0.20	0.15
		TAFE/Trade/Technical certificate	0.34	0.38	0.27
Deegree		University graduate	0.35	0.30	0.24
		Not stated	-	-	0.09
	Household [a]				
		Median household weekly income (AUD)	$1,250 - $1,999	$1,250 - $1,999	$1, 815
High Income		Household weekly income>$2,000 (AUD)	0.32	0.35	
Kids		Children live in the household (under 15 years)	0.34	0.37	0.27
	SURVEY QUESTIONS				
Marine related job	Work in a marine-related industry [a] =1 if a respondent is currently employed or work in any marine industries, such as tourism or commercial fisheries		0.03	0.04	
Fisher	Fisher[a] = 1 if a respondent goes fishing at least once a year		0.32	0.31	
Boater	Boater[a] = 1 if a respondent goes boating at least once a year		0.25	0.28	
Diver	Diver[a] = 1 if a respondent goes diving at least once a year		0.14	0.14	
Snorkel	Snorkeler [a] = 1 if a respondent goes snorkelling at least once a year		0.25	0.30	
Visited South Coast MP in the past 5 years	Visit SC [a] = 1 if a respondent has visited the Proposed South Coast Marine Park region in the previous 5 years		0.28	0.28	
Visited Marmion MP in the past 5 years	Visit M [a] = 1 if a respondent has visited the Marmion Marine Park in the previous 5 years		0.64	0.63	

TABLE CONTINUED.

		Single binary choice data N=821	Multiple discrete choice data N=1,054
PROTESTER	Protester [a] = A respondent who suggests protest behaviour by always selecting NOT to pay and answered follow-up questions on motivation [c]	0.06	0.06
YAE-SAY	Yae-say = A respondent who always selected YES to pay and answered follow-up questions on their reasons [c]	0.01	na
	OR = A respondent who selected YES to pay at least once and answering follow-up questions on their reasons [ac]	na	0.05

[a] No significant difference between the split samples for the different marine parks (using Pearson's chi-squared tests) in the multiple discrete choice experiment data. [b] WA population statistics from Australia Bureau of Statistics Census data (ABS 2021), adjusted for the population over 18 years as they would not qualify to complete the survey. [c] See Appendix A for classifications of the reasons for protest and yae-say behaviour.

There is strong support for the environmental benefits of sanctuary zones in marine parks with 85 % of respondents agreeing, or strongly agreeing, with the statement *Sanctuary Zones protect the marine environment* (Table 4). Meanwhile, 70% of respondents think we should be doing more to protect Australia's marine environment with 70% of respondents disagreeing, or strongly disagreeing, with the statement *We do not need to do more to protect the marine environment in Australia.* Providing support for marine conservation through the establishment of more sanctuary zones in Australia.

Respondents, on average, nominated that they thought an average of 56% would be the best, or optimum, percentage of a marine park to be sanctuary zones (before the multiple discrete choice question, n=746 as respondents could select "I do not know").

Respondents, on average, significantly reduced their percentage areas (for all split samples of the survey) that they think would be the best, or optimum area of a marine park to be sanctuary zones after they completed either of the choice experiment exercises (see Table A.1 Appendix A for the percentage means). Figure 5 shows a density plot of respondents' answers to the question before and after completing the multiple discrete choice experiment and shows a significant percentage reduction from 56% to 49%. The reduction in mean percentage could be due to respondents having time to reflect on their answer and maybe consider more of the trade-offs that were presented in the choice questions, although the mean is still larger than the highest percentage of sanctuary zones used in the choice questions, and well above the 30% targets often discussed in policy. After the multiple discrete choice experiment, 75% of respondents support the creation of sanctuary zones across at least 30% of both the Proposed South Coast and Marmion Marine Park areas.

Table 4. Survey questions asking for perceptions on sanctuary zones and fishing. Using 5-scale Likert (Strongly disagree (1), Disagree (2), Neutral (3), Agree (4), Strongly agree (5), I do not know selections are excluded) from the multiple discrete choice experiment survey n=1054.

	Mean	SD	"I do not know" n=
Sanctuary Zones protect the marine environment	4.27	0.85	30
Sanctuary Zones are annoying for local communities	2.47	1.04	72
Fishing is important for local economies	3.89	0.84	23
Fishing is damaging to local marine environments	3.49	1.00	35
We do not need to do more to protect the marine environment in Australia	2.25	1.28	15

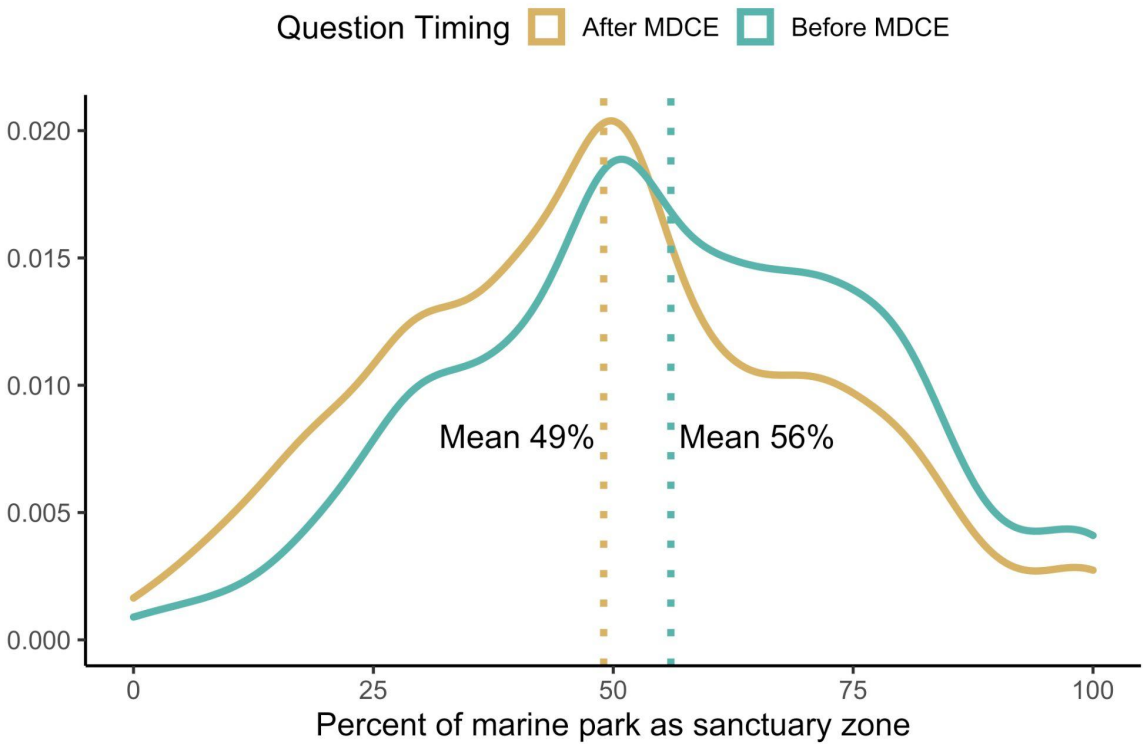


Figure 5. Kernel density plot of respondent's numerical answers to "*In your view, how much area of a marine park would be the best, or optimum, amount to have as Sanctuary Zones?*, asked before completing the multiple discrete choice experiment questions (n=746), along with numerical answers to "*In your view, how much area of the {Proposed South Coast Marine Park} OR {Marmion Marine Park} would be the best, or optimum, amount to have as Sanctuary Zones?*, asked after the respondent has completed the multiple discrete choice experiment questions (n=1,054).

We find that there is no significant difference in the mean percentage for the amount of zones that would be optimum in each marine park (percentage question after the multiple discrete choice experiment). However, regression of respondent characteristics against how much of a marine park would be optimum as a sanctuary zone suggests that there might be some heterogeneity in preferences (Table 5). While the means are not different between the two parks, regression suggests that respondents who have a marine related job or go snorkelling at least once a year nominated higher sanctuary zones in Marmion Marine Park than people who do not have a marine related job. Respondents who go fishing at least once a year, *Fishers*, suggested less sanctuary zone area in the Proposed South Coast Marine Park than people who go fishing less than once a year or never go fishing, but did not have different opinions about the optimum percentage for Marmion Marine Park. People who have visited Marmion Marine Park in the last 5 years thought the optimum percentage of Marmion Marine Park as a sanctuary zone should be higher than if they had not visited the Park in the past 5 years.

Despite, on average, *Fishers* nominating a lower percentage of sanctuary zone as being optimal for the Proposed South Coast Marine Park, 75% of *Fishers* in the sample think that at least 30% sanctuary zone would be optimal for the Proposed South Coast Marine Park.

Table 5. OLS regression of respondent covariates against the percent of marine park that the respondent thinks would be the optimum amount of sanctuary zone (after answering the multiple discrete choice experiment questions).

	Marmion Marine Park	South Coast Marine Park
Percent of marine park as sanctuary zone (1-100)	Estimate (SE)	Estimate (SE)
Female	3.700*	3.707*
	(2.091)	(2.103)
Age groups ~ linear	0.916	-0.177
	(0.932)	(0.951)
Degree	0.182	2.393
	(2.134)	(2.235)
High Income	-0.697	-0.998
	(2.138)	(2.186)
Kids under 15 at home	2.172	2.801
	(2.233)	(2.102)
Fisher	-1.714	-4.964**
	(2.458)	(2.486)
Boater	-3.287	3.503
	(2.596)	(2.799)
Diver	3.491	0.100
	(3.170)	(3.604)
Snorkeler	5.672**	0.522
	(2.551)	(2.746)
Marine related job	11.529**	1.783
	(5.435)	(5.215)
Visited Marmion MP in the past 5 years	3.716*	
	(2.078)	
Visited South Coast MP in the past 5 years		1.508
		(2.270)
Constant	39.245***	46.443***
	(4.652)	(4.389)
N	530	524
R-squared	0.045	0.026

Significance at * p<0.10, ** p<0.05, *** p<0.01
(SE) Standard Error
NOTE: There are low correlations between the covariates, the highest correlations are observed between the marine activities (r= (0.32 - 0.47).

3.1. Single binary choice experiment

We now turn to modelling the stated preference results, starting with the single binary choice experiment. As a reminder, in the single binary choice experiment all respondents saw one choice question that placed sanctuary zones in each marine park (two questions in total).

For sanctuary zones placed in Marmion Marine Park respondents were, on average, willing to pay positive amounts to achieve marine parks with sanctuary zones between 5% and 40% (Table 6). Model 3 in Table 6 is the current preferred model for Marmion Marine Park using the single binary choice data. Model 3 has the lowest BIC, and Likelihood Ratio tests suggest including all levels of sanctuary zone (LR chi(2)=8.24;p=0.016). Modelling suggests that respondents are willing to pay (statistically significant) more to achieve an increase in sanctuaries from 5% to 15% in sanctuary zones. However, they are not willing to pay more (statistically) than the 5% level to achieve 40% coverage of sanctuary zones. This suggests there might be some insensitivity to the level of sanctuary zones, where the 15% level is preferred to both the 5% and 40% levels. This scope insensitivity is tested further in the multiple discrete choice experiment given that the averages for optimal amounts of sanctuary zones offered in the survey questions are well above 40%.

Table 6. Estimated probit models for single binary choice question in Marmion Marine Park.

	Model 1 **All data**	**Model 2** **All data – with levels**	**Model 3** **No PROTESTERS & YAE-SAY – with levels**
Explanatory variables	Estimate (SE)	Estimate (SE)	Estimate (SE)
Cost	-0.004***	-0.004***	-0.004***
	(0.001)	(0.001)	(0.001)
Policy Constant	0.363***		
	(0.066)		
SMALL - 5% Sanctuary zone (0,1)		0.308***	0.422***
		(0.090)	(0.095)
MEDIUM - 15% Sanctuary zone (0,1)		0.530***	0.650***
		(0.091)	(0.095)
LARGE - 40% Sanctuary zone (0,1)		0.228***	0.333***
		(0.093)	(0.097)
Model statistics			
Observations	821	821	760
Log Likelihood	-547	-542	-495
AIC	1097	1092	997
BIC	1107	1112	1016
Willingness-to-pay $AUD/year for 10 years [95% Confidence Interval]			
Average for park	$98 [74-121]		
Park with 5% Sanctuary Zone		$85 [43-127]	$107 [65-148]
Park with 15% Sanctuary Zone		$147 [100-194]	$164 [117-211]
Park with 40% Sanctuary Zone		$63 [21-106]	$84 [45-123]

Significance at * p<0.10, ** p<0.05, *** p<0.01
(SE) Standard Error
Note: Confidence intervals estimated using delta method.

Estimated models for the single binary choice questions in the Proposed South Coast Marine Park find that people were willing to pay to achieve marine parks with sanctuary zones, $116 on average (Table 7). However, modelling suggests some choice insensitivity to scope for the level of sanctuary zones. There was no significant difference in the willingness to pay between the three levels of sanctuary zones however the sign of the differences is as expected e.g., it is positive for moving from SMALL areas to MEDIUM or LARGE areas of sanctuary zones. Model 4 (Table 7) is the current preferred model as it the best fitting model, having the lowest BIC, and Likelihood Ratio tests suggest no modelling gains from including all levels of sanctuary zone (Model 3 restricted to Model 4: LR chi(2)=8.24; p=0.294), and so a single estimator is sufficient. This insensitivity could suggest that people are showing their general support for sanctuary zones in the South Coast Marine Park but didn't differentiate between the different levels of zones on offer in this choice experiment, particularly between the MEDIUM and LARGE levels.

We suspect that the observed scope insensitivity in the modelling of the single binary choice experiment may not accurately reflect the structure of preferences for sanctuary zones. This observation is made considering the overall support for sanctuary zones as a tool for protecting the marine environment and the optimal percentages in marine parks nominated in other sections of the survey. We propose that in the single binary question respondents may have been less sensitive to the level of sanctuary zone on offer if they wanted to show broad support for sanctuary zones in marine parks, and so not wanting to select the no-pay option. In other words, respondents may have been worried that selecting the no-pay, no sanctuary zone answer, might be interpreted as not supporting sanctuary zones in general. The multiple discrete choice experiment, results presented in the next section, encourages respondents to make trade-offs between the different levels of sanctuary zones along with additional features of marine park design. Namely, the accessibility to the sanctuary zone from the shore and impacts to both commercial and recreational fishers. This second experiment provides an additional opportunity to confirm the structure of preferences for sanctuary zones in the WA community.

Table 7. Estimated probit models for single binary choice question in the Proposed South Coast Marine Park.

	Model 1 **All data**	**Model 2** **All data – with levels**	**Model 3** **No PROTESTERS & YAE-SAY – with levels**	**Model 4** **No PROTESTERS & YAE-SAY**
Explanatory variables	Estimate (SE)	Estimate (SE)	Estimate (SE)	
Cost	-0.004***	-0.004***	-0.004***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
Policy Constant	0.358***			0.461***
	(0.066)			(0.069)
SMALL - 5% Sanctuary zone (0,1)		0.281***	0.355***	
		(0.093)	(0.097)	
MEDIUM - 15% Sanctuary zone (0,1)		0.376***	0.513***	
		(0.090)	(0.095)	
LARGE - 40% Sanctuary zone (0,1)		0.409***	0.505***	
		(0.090)	(0.095)	
Model statistics				
Observations	821	821	760	760
Log Likelihood	-546	-546	-499	-500
AIC	1097	1099	1006	1004
BIC	1106	1118	1024	1014
Willingness-to-pay $AUD/year for 10 years [95% Confidence Interval]				
Average for park	$97 [73-120]			$116 [92-141]
Park with 5% Sanctuary Zone		$76 [34-118]	$90 [50-130]	
Park with 15% Sanctuary Zone		$102 [60-143]	$130 [88-173]	
Park with 40% Sanctuary Zone		$111 [70-152]	$128 [87-167]	

Significance at * p<0.10, ** p<0.05, *** p<0.01
(SE) Standard Error
Note: Confidence intervals estimated using delta method.

3.2. Multiple discrete choice experiment

3.2.1. Preferences for marine park design

Now turning to the multiple discrete choice experiment data. To start, we are primarily interested in mean values for changes in utility, as such preference space multinomial models with no interactions on the attributes are presented for each site (Table 8 and Table 9).

Models are estimated using the same data selection that was preferred in the single binary discrete choice experiment, i.e. without respondents who are protestors or yaysayers. Model testing (using Likelihood Ratio tests) suggests that using dummy variables for sanctuary zone percentage levels is a better model fit than using a continuous variable.

For both marine parks, Marmion Marine Park and the Proposed South Coast Marine Park, the WA public prefers marine parks with more area zoned as sanctuary zones. The 45% percent level of sanctuary zones is valued the highest in both locations. Extensive shore access to the sanctuary zone was also positively valued for both parks.

Respondents appear to have negative preferences for (i.e., did not like to see) higher impacts to both recreation and commercial fishing, and this pattern was consistent for both parks although only statistically significant for commercial fishing. There was also some indication of positive preferences for higher impacts to recreation and commercial fishing although we cannot say that this is a consistent average result yet, further analysis of the heterogeneity in the sample might reveal more about this effect. It could be that survey participants understand that to achieve effective sanctuary zones in marine parks then some impacts to recreational and commercial fishers would be inevitable (i.e., that a sanctuary zone with no impact on fishers might not achieve biodiversity conservation outcomes).

Respondents were willing to pay $94, $144 and $187, on average, to achieve 5%, 15% and 45% coverage of sanctuary zones in Marmion Marine Park. In the Proposed South Coast Marine Park, respondents were willing to pay more; $118, $159 and $204, on average per year, to achieve 5%, 15% and 45% coverage of sanctuary zones. Respondents were willing to pay an additional $93 and $86 to move from 5% to 45% sanctuary zones in Marmion Marine Park and the Proposed South Coast Marine Park, respectively. Conversely, respondents were willing to pay more, on average, for extensive shore access in Marmion Marine Park than the Proposed South Coast Marine Park, $53 and $40, respectively.

As an aside, the main limitation introduced from the constraints on the experimental design are that the marginal utilities cannot be applied to some situations. Specifically, (1) we cannot estimate the willingness-to-pay for a marine park with a SMALL, 5%, level of sanctuary zones that also has a HIGH impacts on either recreation or commercial fishing, and (2), a marine park with no (NONE) impacts on recreation and commercial fishing can only have a SMALL, 5%, level of sanctuary zones.

It is interesting to note that further testing suggests that there are no statistical differences in mean preferences between the two marine park locations, Marmion and South Coast, tested using restriction tests on model interactions in the multinomial logit models.

Table 8. Estimated logit model from the multiple discrete choice experiment for Marmion Marine Park.

	Multinomial logit model [a]
	Marmion split sample
Explanatory variables	Estimate (SE)
Cost	-0.005*** (0.000)
SMALL - 5% Sanctuary zone	0.511*** (0.136)
MEDIUM - 15% Sanctuary zone	0.781*** (0.187)
LARGE - 45% Sanctuary zone	1.012*** (0.186)
Shore access to sanctuary zones	0.289*** (0.049)
Impact on recreation fishing	
LOW	0.216** (0.097)
MEDIUM	0.164 (0.100)
HIGH	-0.224 (0.212)
Impact on commercial fishing	
LOW	0.073 (0.103)
MEDIUM	-0.061 (0.106)
HIGH	-0.264** (0.118)
Model statistics	
Observations (n)	11400 (475)
Log Likelihood	-3781
AIC	7585
BIC	7666
Marginal sample willingness-to-pay $AUD/year for 10 years [95% Confidence Interval]	
5% Sanctuary Zone	$94 [47-141]
15% Sanctuary Zone	$144 [80-208]
45% Sanctuary Zone	$187 [125-249]
Shore access	$53 [35-71]

Significance at * p<0.10, ** p<0.05, *** p<0.01
[a] Model specification shown in Table A.5 Appendix A.
(SE) Standard error
Note: Confidence intervals estimated using delta method.

Table 9. Estimated logit model from the multiple discrete choice experiment for the Proposed South Coast Marine Park.

	Multinomial logit model [a]
Explanatory variables	Estimate (SE)
Cost	-0.005*** (0.000)
SMALL - 5% Sanctuary zone	0.577*** (0.136)
MEDIUM - 15% Sanctuary zone	0.782*** (0.188)
LARGE - 45% Sanctuary zone	1.003*** (0.186)
Shore access to sanctuary zones	0.199*** (0.049)
Impact on recreation fishing	
LOW	0.144 (0.097)
MEDIUM	0.090 (0.099)
HIGH	-0.119 (0.210)
Impact on commercial fishing	
LOW	0.155 (0.104)
MEDIUM	-0.013 (0.107)
HIGH	-0.226* (0.119)
Model statistics	
Observations (n)	11088 (462)
Log Likelihood	-3726
AIC	7474
BIC	7554
Marginal sample willingness-to-pay $AUD/year for 10 years [95% Confidence Interval]	
5% Sanctuary Zone	$118 [67-169]
15% Sanctuary Zone	$159 [89-229]
45% Sanctuary Zone	$204 [136-272]
Shore access	$40 [21-60]

Significance at * p<0.10, ** p<0.05, *** p<0.01
[a] Model specification shown in Table A.5 Appendix A.
(SE) Standard error
Note: Confidence intervals estimated using delta method.

3.2.2. Willingness to pay estimates for Western Australian households

In this section we estimate the average amount that a Western Australian household might be willing to pay to achieve marine parks with different levels of sanctuary zones and shore access, using the modelling output from the multiple discrete choice experiment.

We estimate that Western Australian households could be willing to pay $56, $86 and $112, on average per year, to achieve 5%, 15% and 45% coverage of sanctuary zones in Marmion Marine Park. We estimate that Western Australian households could be willing to pay an additional $56 to move from 5% to 45% sanctuary zones in Marmion Marine Park. We estimate that Western Australian households could be willing to pay $32, on average per year, for extensive shore access in Marmion Marine Park.

We estimate that Western Australian households could be willing to pay $71, $96 and $123, on average per year, to achieve 5%, 15% and 45% coverage of sanctuary zones in the Proposed South Coast Marine Park. We estimate that Western Australian households could be willing to pay an additional $52 to move from 5% to 45% sanctuary zones in the Proposed South Coast Marine Park. We estimate that Western Australian households could be willing to pay $24, on average per year, for extensive shore access in the Proposed South Coast Marine Park.

We also estimate the disutility (negative preferences) associated with a marine park that has a HIGH impact on commercial fishing in the region as $-29 and $-28 per household per year.

Table 10. Estimates of marginal compensating variation from multinomial logit models [a].

	5% Sanctuary Zone	15% Sanctuary Zone	45% Sanctuary Zone	Shore access	High impact to commercial fishing
Mean household willingness-to-pay for Western Australians $AUD/year for 10 years [95% Confidence Interval]					
Marmion Marine Park	$56 [28-85]	$86 [48-125]	$112 [75-149]	$32 [21-43]	$-29 [-54-(-4)]
Proposed South Coast Marine Park	$71 [40-101]	$96[53-138]	$123 [82-163]	$24 [12-36]	$-28 [-56-(0)]
WA aggregate willingness-to-pay $AUD/year (for 10 years) [95% Confidence Interval]					
Marmion Marine Park	$42.5 million [$21.4 million - $63.6 million]	$65.0 million [$36.2 million - $93.8 million]	$84.3 million [$56.3 million - $112 million]	$24.0 million [$15.9 million - $32.2 million]	$-21.9 million [$-40.9 million - $-3.02 million]
Proposed South Coast Marine Park	$53.1 million [$30.0 million - $76.1 million]	$71.9 million [$40.3 million - $104 million]	$92.3 million [$61.5 million - $123 million]	$18.3 million [$9.33 million - $27.2 million]	$-20.8 million [$-41.9 million - $0.3 million]

[a] Using multinomial Model 4 specification and assumes zero WTP for non-response households.
Note: Confidence intervals estimated using delta method.

4. CONCLUSION

Successful marine park planning requires an understanding of the values and preferences that different sectors of the community hold for the area. There are well known, and fairly straightforward processes for engaging with specific sector groups, especially those that are outspoken and have significant use (recreational use or economic use) in the region. However, one of the groups whose voices are often missing from marine park planning, and can be harder to reach, are the broader community. This group might have a mixture of use and non-use (such as conservation) preferences for the marine area.

This working paper presents results from two surveys that ask the WA public about their preferences for sanctuary zones in WA marine parks. There is broad support (from survey questions and two choice experiments) for increasing the size of the sanctuary zones and ensuring that they are connected to and have good visitor access along the shoreline. Regression analysis suggests that there is some heterogeneity in the preferences that people have for sanctuary zones, and further analysis of the multiple discrete choice data, using mixed logit and latent class models, is planned.

Results demonstrate a strong public desire for world-class conservation outcomes for both the Proposed South Coast and Marmion Marine Parks, with 75% of the general public supporting the creation of no-take sanctuary zones across at least 31% of both the Proposed South Coast and Marmion Marine Park areas. We estimate that Western Australian households are willing to pay more to achieve larger areas of sanctuary zones - A$112 per household for 45% at Marmion Marine Park and A$123 per household for 45% at the Proposed South Coast Marine Park, for an aggregate value of A$84.3 million and A$92.3 million respectively. We also find that public valuation increases by between 19% and 57% when sanctuary zones include extensive shore protection enabling greater connection with the community.

Utilising economic non-market valuation to measure preferences, and estimating willingness to pay, rather than relying solely on traditional survey questions allows policymakers to understand the structure of preferences and estimate their magnitude. These estimates can then be used to assess the benefits associated with different marine park policy alternatives.

5. APPENDIX A

Table A.1. Answers to the survey questions asking "*In your view, how much area (%) of marine park would be the best, or optimum, amount to have as Sanctuary Zones?*

	Sample size (% of sample)	Mean (% of marine park)	sd
Single binary choice experiment survey (SBCE)			
BEFORE SBCE			
I don't know	354		
Percent given	467	53	23
AFTER [ab] - Sanctuary zones located in South Coast Marine Park	821	48	24
AFTER [a] - Sanctuary zones located in Marmion Marine Park			
~Marmion Marine Park SBCE first	410	49	24
~South Coast Marine Park SBCE first	411	45	25
Multiple discrete choice experiment survey (MDCE)			
BEFORE MDCE			
I don't know	308 (29)		
Percent given	746 (71)	56	22
AFTER [c] - Sanctuary zones located in either marine park	1054	49	22
Mean percent for all sample means		50	4

[a] No option was provided for respondents to select *"I don't know"* after completing the choice questions.
[b] No significant difference in the percent of area for the South Coast Marine Park that should be a sanctuary zone between respondents who saw Marmion Marine Park SBCE first to those who saw South Coast Marine Park SBCE first.
[c] No significant difference between the two marine parks.

5.1. Additional results from the single binary choice experiment

Table A.2. Proportion of respondents voting YES to each tax bid level in the single binary choice experiment.

Cost vector ($ AUD)	Marmion	South Coast
10	71	70
25	63	58
50	48	56
75	47	45
125	45	47
200 [a]	33	33
250	32	30
Average	52	51

[a] Cost level used in pilot only (n=101)

Table A.3. Answers for the main reason respondents choose "YES" to pay for all marine park choice questions in the single binary choice experiment.

Option for answers to "*When you selected that you would be willing to pay to achieve the level of marine sanctuaries proposed. Please select your main reason for selecting YES.*"	Number of respondents
I enjoy supporting environmental causes	22
The benefit is worth the cost to me	42
I think we should create marine sanctuaries no matter what the cost	68
I believe it is the answer I should give *(yae-say)*	6
I ignored the cost *(yae-say)*	1
I do not believe I would ever have to pay the tax *(yae-say)*	1
Other	2
Total	142

Table A.4. Answer selections when respondents choose "NO" to pay for all marine park choice questions in the single binary choice experiment.

Option for answers to "*You selected that you would NOT be willing to pay to achieve the level of marine sanctuaries proposed. Please select your main reason for selecting NO.*"	Number of respondents
I prefer this option	10
I could not afford the cost	47
I believe funding for marine sanctuaries should come from somewhere other than my own pocket *(protest)*	26
I do not think we should have any marine sanctuaries	4
I do not believe I should have to make these choices *(protest)*	8
I would like more information to be able to make a choice	1
I do not trust that the funds will be used for the purpose specified *(protest)*	16
Other	7
Total	119

5.2. Additional results from the multiple discrete choice experiment

Table A.5 presents estimation results for five different model specifications pooled for both marine park sites. Each model uses slightly different dataset (e.g., excluding protesters) and/or different specifications of the sanctuary zone attribute, either included as dummy variables for each level or single continuous linear variable with an intercept alternative specific constant (ASC).

Testing for improvements to models (using Likelihood Ratio tests) suggests that using dummy variables for sanctuary zone percentage is a better model fit than using a continuous variable, however the continuous specification could still be used if policy-relevant (for example for predicting values between 5% and 45%). Inspection of the models suggests that the specification used in Model 4 provides the best fit for our use, it has lower AIC for dummy specification and excludes respondents who may have not considered the questions trade-offs.

Model 4 and Model 5, removes the 'protest' voters, there are 63 respondents who always voted for the zero-cost option and then gave a reason that suggested protest behaviour (see Table A.6 Appendix A), and the 'yae-sayers', 54 respondents who always voted to pay for a cost option and then gave a reason that suggested they were not considering the options as presented (see Table A7 Appendix A).

Table A.5. Estimated multinomial logit model results - pooled data for both sites.

	Model 1 All data - dummy	Model 2 All data - continuous	Model 3 No protest – dummy	Model 4 No protesters & yay-sayers dummy	Model 5 No protesters & yay-sayers - continuous
Explanatory variables	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)
Cost	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ASC for marine park alternative		0.224***			0.408***
		(0.083)			(0.088)
SMALL ASC - 5% Sanctuary zone	0.336***		0.596***	0.544***	
	(0.09)		(0.093)	(0.096)	
MEDIUM ASC - 15% Sanctuary zone	0.538***		0.830***	0.782***	
	(0.124)		(0.128)	(0.132)	
LARGE ASC - 45% Sanctuary zone	0.764***		1.055***	1.009***	
	(0.123)		(0.127)	(0.131)	
Additional Sanctuary zone by %		0.009***			0.009***
(continuous)		(0.001)			(0.001)
Shore access to sanctuary zones	0.217***	0.224***	0.288***	0.244***	0.253***
	(0.033)	(0.033)	(0.033)	(0.035)	(0.034)
Impact on recreation fishing from a baseline of NONE to:					
LOW	0.178***	0.235***	0.177***	0.180***	0.255***
	(0.065)	(0.059)	(0.067)	(0.069)	(0.062)
MEDIUM	0.128*	0.190***	0.134**	0.127*	0.207***
	(0.066)	(0.059)	(0.068)	(0.070)	(0.062)
HIGH	-0.240*	-0.165	-0.159	-0.173	-0.078
	(0.138)	(0.133)	(0.143)	(0.149)	(0.144)
Impact on commercial fishing from a baseline of NONE to:					
LOW	0.159**	0.222***	0.136*	0.113	0.195***
	(0.069)	(0.062)	(0.071)	(0.073)	(0.065)
MEDIUM	0.030	0.093	-0.002	-0.037	0.046
	(0.071)	(0.064)	(0.073)	(0.075)	(0.067)
HIGH	-0.181**	-0.095	-0.218***	-0.245***	-0.133*
	(0.079)	(0.067)	(0.081)	(0.084)	(0.071)
Model statistics					
Observations (n)	25,296 (1,054)	25,296 (1,054)	23,784 (991)	22,488 (937)	22,488 (937)
Log Likelihood	-8584	-8587	-7924	-7510	-7514
AIC	17191	17193	15870	15043	15047
BIC	17280	17274	15958	15131	15127
Marginal willingness-to-pay $AUD/year for 10 years [95% Confidence Interval]		$1.87 [1.45 - 2.30] per 1% + $47 [14 - 81]			$1.82 [1.40 - 2.24] per 1% + $80 [48 - 113]
5% Sanctuary Zone	$70 [35 - 105]	*$56*	$117 [84 - 151]	$105 [71 - 140]	*$89*
15% Sanctuary Zone	$112 [64 - 160]	*$75*	$164 [117 - 210]	$151 [104 - 199]	*$107*
45% Sanctuary Zone	$159 [112 - 205]	*$131*	$208 [163 - 253]	$195 [149 - 241]	*$162*
Shore access	$45 [31 - 59	$47 [33 - 61]	$45 [32 - 58]	$47 [34 - 61]	$50 [36 - 63]

TABLE CONTINUED
Significance at * p<0.10, ** p<0.05, *** p<0.01
(SE) Standard Error
Note: Confidence intervals estimated using delta method.

Table A.6. Answers for the main reason respondents choose to pay for a marine park option at least once in the multiple discrete choice experiment (n=887).

Option for answers to "*When you selected that you would be willing to pay to achieve the level of marine sanctuaries proposed. Please select your main reason for selecting NO.*"	Number of respondents	Percent
I enjoy supporting environmental causes	181	20
The benefit is worth the cost to me	326	37
I think we should create marine sanctuaries no matter what the cost	193	22
I believe it is the answer I should give *(yae-say)*	80	9
I ignored the cost *(yae-say)*	19	2
I do not believe I would ever have to pay the tax *(yae-say)*	65	7
Other	23	3
Total	887	

Table A.7. Answer selections when respondents always selected the status quo, zero-cost, option in each choice question in the multiple discrete choice experiment.

Option for answers to "*You selected that you would NOT be willing to pay to achieve the level of marine sanctuaries proposed. Please select your main reason for selecting NO.*"	Number of respondents	Percent
I prefer this option	13	8
I could not afford the cost	53	33
I believe funding for marine sanctuaries should come from somewhere other than my own pocket *(protest)*	36	23
I do not think we should have any new sanctuaries	8	5
I do not believe I should have to make these choices *(protest)*	13	8
I would like more information to be able to make a choice	7	4
I do not trust that the funds will be used for the purpose specified *(protest)*	13	8
Other	16	10
Total	159	

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