Appendix 6: Analysis options and management implications

This field manual for collecting MPA recreational users' KAP data is a flexible tool which offers diverse options for data analysis and can inform MPA planning, management and monitoring and can identify research priorities. Table A6.1, outlines possible analyses, some applicable statistical approaches (this is not an exhaustive list and other statistical approaches may be applicable) and their management implications. The table contains a list of questions relevant to each analysis from the recreational users' KAP survey template found in Appendix 1.

Table A6.1, outlines options for analysis, some applicable statistical approaches and their management implications. Relevant questions for each analysis can be found in Appendix 1.

Relevant questions	Analysis	Statistical approach	Management implications
M3, 9, 10, 10a, 11a, 11b, 14, 15a, 15b	Spatial analysis of recreational activities	Spatial plotting (points or lines) and/or analysis, e.g., kernel density (heatmap) or hotspot analysis (heatmap with significant estimates)	Target enforcement where there is high density of fishing near a no-take zone Target ecological monitoring and education near high use areas Used to inform MPA zoning during planning
18, 18a, 19, 19a, 19b	Spatial analysis of user identified pressures	Spatial plotting (points or lines) and/or analysis, e.g., kernel density (heatmap) or hotspot analysis (heatmap with significant estimates)	Inform tourism and visitor experience management Target monitoring, management and education where user identified pressures exist
3, 4, 5, 9, 10, 10a, 11a, 11b, 12, 13, 13a, 13b, 13c, 14, 15a, 15b, 16, 17, 20, 21, 33, 34, 35, 36, 37, 38, 39, 40, 40a, 40b, 41, 42, 43, 44	Estimate recreational value of MPA and predict impact of zoning arrangements on marine recreators	Revealed preference non-market valuation, e.g., travel cost method, random utility modelling	Understand MPA recreational value (as a dollar value) Quantitatively test and compare the recreational impact of different zoning arrangements during MPA planning
9, 10, 10a, 11a, 11b,	Displaced use of zoning	Inferential statistics, e.g.,	Quantify the number of

14, 15a, 15b, 20, 21	arrangement (data needed before and after zoning implemented)	linear regression	displaced recreational activities.
22, 23, 24a, 25, 25a, 26, 26a	Percentage of users aware of MPAs, their zonation and jurisdictional differences (e.g., between management in state and Commonwealth waters)	Calculate raw proportions of users awareness Proportion test Kruskal-Wallis test	Inform communication and education programs
22, 23, 24a, 25, 25a, 26, 26a	Changes in percentage of users aware of MPA and jurisdictional differences overtime	Kruskal-Wallis test	Adaptive management of communication and education programs
20, 21, 22, 23, 24a, 25, 25a, 26, 26a, 33, 34, 37, 38, 39, 40, 40a, 41, 43, 44	Awareness modelling	Binomial regression Ordinal regression	Target communication and awareness amongst user groups with low awareness
28, 29	Percentage of support of MPA and zonation	Calculate raw proportions Proportion test Kruskal-Wallis test	Inform communication and compliance management
28, 29	Changes in percentage of support of MPA and zonation overtime	Kruksal-Wallis test	Measure the success of support and compliance management
20, 21, 28, 29, 33, 34, 37, 38, 39, 40, 40a, 41, 43, 44	Support modelling	Binomial regression Ordinal regression	Target communication amongst user groups with low support
10, 10a, 11a, 11b, 27	Percentage of recreational fishers fishing in no-take zones	Proportion test Kruksal-Wallis test	Inform compliance management
10, 10a, 11a, 11b, 20, 21, 27, 33, 34, 37, 38, 39, 40, 40a, 41, 43, 44	Compliance modelling	Ordinal regression	Identify levers to increase compliance and target communication and educational efforts towards effective levers
18, 18a, 19, 19a, 19b, 29	Perceived impacts on activities and environment	Binomial regression Ordinal regression	Inform communication and education programs

An example of an output from MPA recreational user attitude data is displayed in Fig A6.1, which shows how recreational fishers support for sanctuary zones in 11 state marine parks across Australia has changed over time (Navarro *et al.*, 2018, 2021). Following a consistent protocol facilitates comparison against national averages, allowing for easier communication of results to marine resource managers. If the level of support for an MPA is low, supplementary modelling to understand the attributes of MPAs and recreators which drives their support (McNeill, Clifton and Harvey, 2018; Navarro *et al.*, 2018) could be conducted to target MPA communications and compliance management towards those specific users.

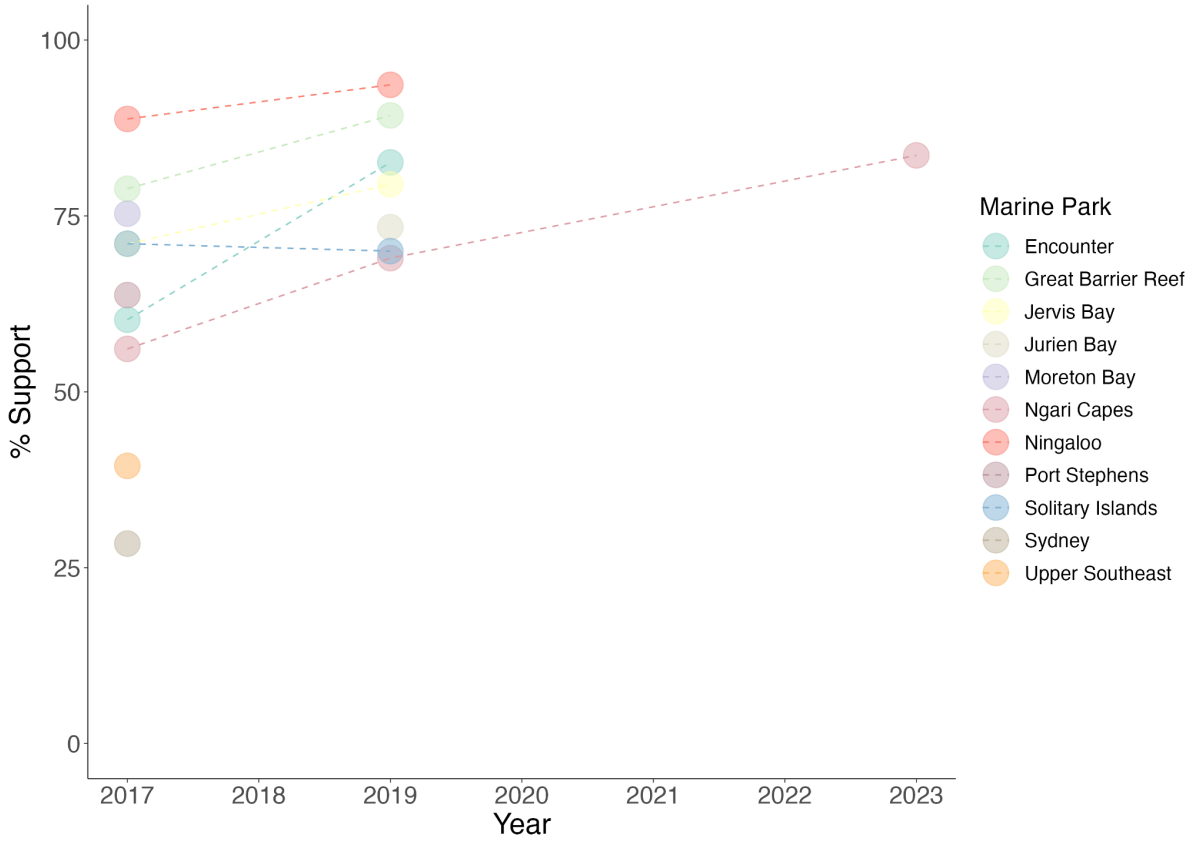

Fig A6.1: The percentage of marine recreational fishers that support state sanctuary zones across 11 marine parks in Australia from (Navarro *et al.*, 2018, 2021) as well as more recent 2023 surveys in the south-west of Australia.

Fig A6.2 is a map of recreational boat use in the Geographe, South-west Corner and Ngari Capes Marine Park in south-west Australia in 2023. This data is generated from MPA recreational users' KAP practice data. This data can be used to understand the spatial distribution of recreational activities, enabling policy makers and managers to target MPA communications, educational initiatives and compliance management to relevant audiences. The data can also be used to estimate an MPA's recreational value and predict the impact of different zoning arrangements on marine users through revealed preference modelling (e.g., random utility models) (Navarro *et al.*, 2022).

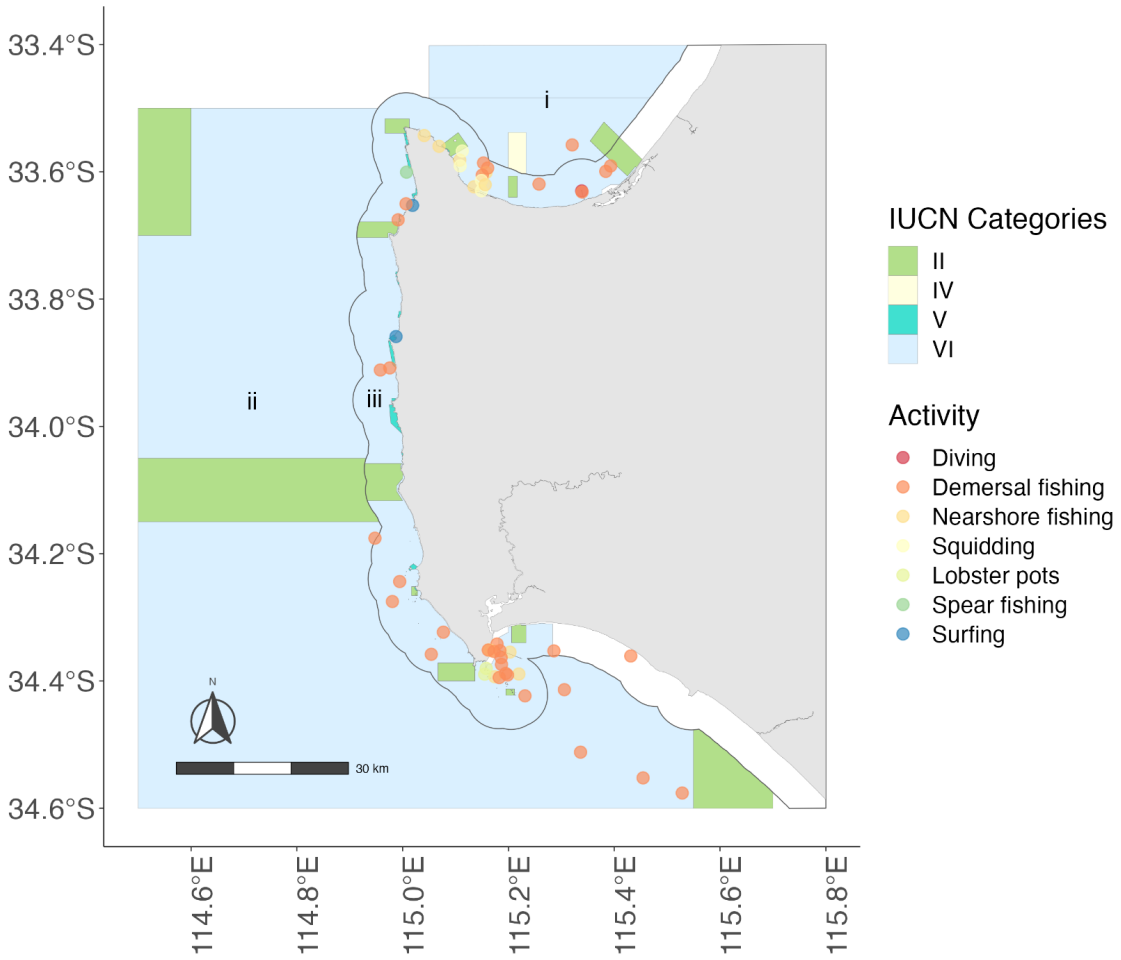

Fig A6.2:. A map of recreational boat trips from a 2023 boat ramp survey of i) Geographe, ii) South-west Corner and iii) Ngari Capes Marine Parks, where each point represents an individual recreational trip the colour indicates what activities the recreator was participating in.

References

McNeill, A., Clifton, J. and Harvey, E.S. (2018) ‘Attitudes to a marine protected area are associated with perceived social impacts’, *Marine Policy*, 94, pp. 106–118.

Navarro, M. *et al.* (2018) ‘Recreational fishers’ support for no-take marine reserves is high and increases with reserve age’, *Marine Policy*, 96, pp. 44–52.

Navarro, M. *et al.* (2021) *Social and economic benchmarks of the Australian Marine Parks*. Report to the National Environmental Science Program, Marine Biodiversity Hub.

Navarro, M. *et al.* (2022) ‘Combining spatial ecology and economics to incorporate recreational fishing into marine spatial planning’, *ICES Journal of Marine Science*, 79(1), pp. 147–157.