

Assessment of the social and economic impacts of recreational fishing on other user groups in NSW

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Synopsis: This report documents the outcomes of a threat and risk assessment process that has been used to assess the risks from saltwater recreational fishing activities on the flow of social and economic benefits from the marine environment. It also provides a review of the social and economic benefits derived from recreational fishing.		

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1 Introduction

1.1 Study Background

The NSW Department of Primary Industries (DPI) is undertaking an environmental assessment of recreational fishing in NSW. The complete environmental assessment will consider the environmental, cultural, social and economic impacts of recreational fishing.

This report documents the threats and risks associated with recreational fishing on the flow of social and economic benefits to the marine environment. It also provides a review of the social and economic benefits derived from the activity of recreational fishing. The Australian National Centre for Ocean Resources and Security (ANCORS) from the University of Wollongong are the principal authors of the research and other key documentation, with inputs from the DPI. BMT was engaged to facilitate the threat and risk assessment workshop and to coordinate a joint report (this document) on the outcomes of the assessment.

The scope of the benefit research and risk assessment is described more fully in Sections 2 and 3 of this report, but in summary–

- The assessment was state wide across the marine environment with assignment of risk levels for the State's three marine bioregions (North, Central and South);
- The spatial extent of the assessment was from estuaries out to the limit of State waters and further into the broader marine jurisdiction at the edge of Australia's exclusive economic zone where relevant. The assessment does not assess impacts of recreational fishing outside the marine environment (e.g. impacts of recreational fishing in the freshwater environment);
- The risk assessment focussed on the potential impacts of recreational fishing activities on the social and economic benefits that the community derives from the NSW marine environment. In this context the assessment sought to identify the risks of impacts to other water users – e.g. commercial fishers, dive boat operators, swimmers, snorkelers, surfers, divers, boaters etc. with consideration also given to the general community who may still value the aquatic environment without directly interacting with it; and
- Aboriginal fishers, the Aboriginal community and cultural heritage and use were excluded from this assessment as they will be considered under a separate assessment, as will the environmental impacts from recreational fishing.

1.2 Report Structure

The Report is structured as follows:

- Section 2. Summary of key terminology and outputs of the social and economic benefits research on recreational fishing undertaken by ANCORS
- Section 3. Methodology for undertaking the risk assessment (Social and Economic) for recreational fishing
- Section 4. Initial risk assessment, workshop proceedings and final risk assessment
- Section 5. Discussion and Conclusions
- Section 6. References

The assessment is supported by the following:

- Appendix A contains the Social and Economic Benefit Research Papers prepared by ANCORS
- Appendix B contains the detailed evidence tables prepared to support the risk assessment (prepared by ANCORS and DPI)
- Appendix C contains a review of the key socio-economic impacts of recreational fishing on the NSW Marine Estate prepared by ANCORS and DPI. It also contains more detailed information about the risk assessment process and methodology used.

2 Summary of Social and Economic Benefits

2.1 Scope of Benefit Assessment

The key terms and benefit categories used in this assessment are defined below and flow into the research papers on the benefits from recreational fishing contained in Appendix A as well as the risk assessment for recreational fishing as described later in Section 3 and 4 of this report.

Definitions for these terms are sourced from the document, BMT WBM (2017) *New South Wales Marine Estate Threat and Risk Assessment Report Final Report* (prepared for the Marine Estate Management Authority (MEMA) and the MEMA document, *Glossary of Terms* (2017) both of which are available from <https://www.marine.nsw.gov.au/>.

2.2 Key Terms - Benefits

Social and economic benefit, also called community benefit, is defined as anything that contributes to the wellbeing of the community.

There are three separate categories of community benefits considered as part of the assessment: economic, social and environmental benefits. Many community benefits are based on what people think is important (what they value). A community benefit of the marine environment could be:

- swimming at the beach,
- boating in an estuary,
- doing something as a hobby (e.g. fishing, kayaking, surfing, bird watching, etc.),
- running a business (e.g. whale watching business, charter fishing, commercial fishing, etc.),
- clean waters and marine biodiversity,
- intrinsic values i.e. valuing the environment regardless of direct benefits. The *Marine Estate Management Act 2014* uses the term 'community value' for this.

2.3 Social and Economic Benefit Categories

The social and economic benefit categories that are used in the research papers and that flow through to the risk assessment are further described below:

Social Benefit Categories

Safety, Health & Wellbeing [including relaxation]

The tangible or material benefits to wellbeing, including physical or mental health outcomes, human safety (e.g. safety from injury or death) as well as stress relief and relaxation benefits.

Summary of Social and Economic Benefits

Socialising & Sense of Community

The relational aspects of wellbeing, including opportunities to interact with family, friends and the broader community. We also considered benefits (or impacts) to community cohesion and harmony, including impacts on a community's sense of identity.

Enjoying the Biodiversity & Beauty of the Marine Environment (social intrinsic value)

The subjective aspects of wellbeing, including how people feel about or relate to the marine environment. This benefit is strongly linked to the values and worldviews of individuals and groups within the community which influence how they perceive and interact with the natural environment.

Consumptive Use [e.g. extracting]

The wellbeing benefits associated with extractive use – i.e. fishing – within the marine environment and therefore concentrates largely on the commercial and recreational fishing sectors, including charter fishing operators. These benefits may be physical (i.e. the health benefits of eating seafood) or mental (e.g. relating to enjoyment or relaxation).

Economic benefit categories

Indirect economic values

These are values that are less direct and can be monetary or non-monetary in nature. For example, a business which supplies fishers with equipment or supplies for fishing. Alternatively, the values of appreciation of the environment, such as a nice view or clean water are indirect economic values.

Intrinsic & bequest values (economic intrinsic value)

An intrinsic value reflects the inherent characteristics of an environmental asset e.g. a marine ecosystem, that are not related to use. The value that people put on knowing that future generations will have the option to enjoy an environmental asset is the bequest value.

Viability of businesses

The capacity of a business to meet all of its costs including opportunity costs from its gross revenue, thus remaining profitable and sustainable in the long term.

Employment and the value of production

Employment is where a resource, usually labour, is used in production, earning wages. The value of production can be gross value ($\text{price} \times \text{catch} = \text{gross revenue}$ for a commercial fish catch sale). In an economy the value of production is revenue less the costs of the inputs used in production, giving an added value measure, referred to as a gross state product.

Direct economic values

These are values that are monetary and associated with the direct use of the resources in the marine environment. An example of a direct economic value is the monetary value of a commercial fish catch ($\text{price} \times \text{catch} = \text{gross revenue}$).

Summary of Social and Economic Benefits

Individual enjoyment values (consumer surplus)

Consumers have a willingness to pay for a good or service. On paying the required price, the consumer may enjoy a consumer surplus, which is the difference between the amount spent and their willingness to pay.

2.4 Benefits from Recreational Fishing

Research papers on the social benefits and economic benefits that specifically flow from recreational fishing have been reviewed and summarised by ANCORS and are attached as part of Appendix A of this report.

The papers have been prepared in accordance with the key terms and concepts outlined above.

Social Benefits of Recreational Fishing - Summary

Recreational fishing provides **safety, health and well-being** benefits to people by providing an avenue for physical exercise and opportunities to explore natural environments. Exposure to nature and nature-based recreation has positive effects on mental health and emotional wellness, relieves stress, increases positive moods and concentration, and reduces mental fatigue and aggressive behaviour. Fishing can help to reduce anxiety and promote relaxation by lowering stress by escaping from work and/or family demands or to connect with nature or to recover from physical and mental trauma.

Recreational fishing promotes **socialising and a sense of community** by providing an opportunity to participate in family, social and club-based activities and thereby contributes to a sense of community cohesion across diverse groups. Several studies indicate that recreational fishing provides people across different cultural backgrounds the opportunity to 'hunt and gather' and is a social means of providing food for family and friends.

Recreational fishers spend a considerable amount of time on or adjacent to water bodies and develop an intimate knowledge of these areas, **enjoying biodiversity and beauty of marine estate**. This enables them to report incidences of illegal behaviour resulting in pollution or change in ecosystems and get involved in habitat enhancement projects.

The social benefits associated with **consumptive use** are related to the regular consumption of fresh fish which can improve physical health, and the act of catching the fish can improve mental health and the interaction with nature can increase appreciation of the natural environment.

Economic Benefits of Recreational Fishing - Summary

The **intrinsic value** reflects the inherent characteristics of the marine estate that are not related to use, while the **bequest value** indicates the value people place on knowing that future generations will have the option to enjoy the marine estate in the same condition as the present generation. Recreational fishers seek fishing experiences that they value highly and so they assign a high intrinsic and bequest value to fish stocks, their sustainable management and the management of the ecosystem they inhabit.

Summary of Social and Economic Benefits

Recreational fishing expenditures are made by individual fishers from their household budgets when they go fishing and indicate **values of production and employment**. Recreational fishers in NSW spend around \$1.6bn per year in fishing-related expenses, which generates an economic output in the NSW economy of \$3.42bn per year and supports an estimated 14,254 full time equivalent jobs (DPI 2018). There are further economic benefits from charter fishing businesses and over 200 tackle retail businesses. Many recreational fishers also retain catch for home consumption as food, deriving the economic benefit of not having to purchase seafood at retail market prices. Recreational fishing is an important part of the NSW tourist industry with interstate and Sydney anglers spending in coastal towns, supporting these rural communities. Events such as recreational fishing tournaments also bring considerable numbers of tourists and expenditure to coastal towns.

The **individual enjoyment value** from fishing to an angler will either equal or exceed their actual trip expenditures. The difference between the individual enjoyment value from fishing and the expenditure associated with fishing, is called consumer surplus. This can provide a dollar estimate of what consumers would have paid for different quantities of the fishing experience over actual trip expenditure. The NSW Recreational Fishing Licence fee is a small part of the total consumer surplus and is used to improve fishing access and facilities, aquatic habitat protection and rehabilitation, and enhancing fisheries thus increasing enjoyment benefits from the management of ecologically sustainable fisheries.

3 Methodology – Threat and Risk Assessment

3.1 Methodology

In approaching the threat and risk assessment component of the project, DPI sought that the risk assessments be conducted using a consequence/likelihood approach in accordance with AS / ISO 31000:2018 (TARA originally completed under AS/NZS ISO 31000:2009) and must align with the NSW State wide Threat and Risk Assessment (BMT WBM, 2017).

Appendix C contains further methodological information about the risk assessment including the risk matrix, likelihood and consequence tables used in the assessment.

The aim of the assessment was to build on the information gathered within the 2017 TARA and specifically include the relevant benefits and threats categories identified from the previous assessment. Literature review (not primary research) was used to expand existing information and justify the risk scoring. This included both quantitative and qualitative information, where available.

The current risk assessment focused specifically on the potential impacts of recreational fishing activities on the social and economic benefits that the community derives from the NSW marine environment. In this context the assessment sought to identify the risks of impacts to other water users – e.g. commercial fishers, dive boat operators, swimmers, snorkelers, surfers, divers, boaters etc. with consideration also given to the general community who may still value the aquatic environment without directly interacting with it.

The spatial extent of the assessment was state wide across the marine environment, from estuaries out to the limit of State waters and further into the broader marine jurisdiction at the edge of Australia's exclusive economic zone where relevant. It excluded freshwater environments.

The attribution of risk scores was made in the three regions identified as part of the assessment; northern, central, and southern.

The temporal scale of the assessment focuses on current impacts from recreational fishing and the risk scores were generated based on existing management and regulations that are currently in place at the time of the assessment in 2021.

As not all stressors are relevant to recreational fishing activity, a subset of the stressors from the 2017 TARA were identified for use as part of the specific assessment. These included:

- Resource use conflict (Conflict over access and use; anti-social behaviour and unsafe practices; overcrowding/ congestion, loss or decline of marine industries, excessive or illegal extraction).
- Environmental (Water pollution on environmental values, wildlife disturbance, habitat, reduction in abundances of species and trophic levels; pests and diseases).
- Governance of the marine environment (Lack of compliance with regulations (by users) or lack of compliance effort by agencies); and
- Public safety (Wildlife interactions).

Methodology – Threat and Risk Assessment

The stressor 'Conflict over access and use' was further broken down between: (a) conflicts between recreational fishing and commercial fishing, (b) conflicts between recreational fishing and other water borne uses and (c) conflict within the recreational fishing sector (intra-sectoral).

Further information about the key socio-economic threats and stressors of recreational fishing are summarised in Appendix C.

4 Initial Risk Assessment, Workshop Proceedings and Final Risk Assessment

4.1 Initial Risk Assessment

The ANCORS and DPI team prepared a detailed justification narrative/evidence document which formed the basis for setting the initial risk scores for the identified threats to social and economic benefits from recreational fishing.

Based on this evidence, an initial risk assessment matrix was prepared. A copy of the Initial matrix (representing the starting point for the workshop) is shown in Table 4-1.

4.2 Workshop Proceedings

A risk workshop was held with experts from across relevant NSW Government Departments as well as invited stakeholder participants (local government, community representatives from existing DPI working groups), independent academic experts and some targeted industry involvement (commercial fishing).

A copy of the initial risk matrix and evidence document was provided to participants in advance of the workshop for review.

The workshop was carried out on 3 June 2021 at a Sydney Airport hotel venue and included both in-room participants as well as a small contingent of participants joining via video conference.

To facilitate getting through the assessment in the time allotted, the facilitator's approach was to have the ANCORS team (as the primary author of the evidence report) to focus on each threat/stressor category within the Initial Risk Assessment using a standard 'script' approach as follows –

- (1) Explain the working definition of the threat/stressor as it relates to recreational fishing.
- (2) Provide an example(s) of the types of activities that would fit in this category – and what it includes or excludes (if relevant).
- (3) Describe how the threat or stressor affects the flow of social benefits (undertaken by the social expert) – to overview the risk score allocated against the four (4) social benefit categories and highlight any specific evidence that has influenced the scores and any different risk scores between the three regions; and
- (4) Describe how the threat or stressor affects the flow of economic benefits (undertaken by the economic expert) – to overview the risk scores allocated against the three (3) economic benefits categories and highlight any specific evidence that has influenced the scores including any different risk scores between the three regions.

Initial Risk Assessment, Workshop Proceedings and Final Risk Assessment

Table 4-1 Initial Risk Assessment matrix

		SOCIAL BENEFITS												ECONOMIC BENEFITS								
		Safety, health and wellbeing			Socialising and sense of community			Enjoying the biodiversity and beauty of the marine estate			Consumptive use (extracting)			Intrinsic and bequest values			Employment and value of production			Individual enjoyment value (consumer surplus)		
	STRESSORS	North	Central	South	North	Central	South	North	Central	South	North	Central	South	North	Central	South	North	Central	South	North	Central	South
Resource Use Conflict	Conflict over access and use																					
	Inter-sector (commercial and rec)	1			2			3			4			5			6			7		
	Inter-sector (rec and other)	8			9			10			11			12			13			14		
	Intra-sector (rec)	15			16			17			18			19			20			21		
	Anti-social behaviour	22			23			24			25			26			27			28		
	Unsafe practices	29			30			31			32			33			34			35		
	Overcrowding/congestion	36			37			38			39			40			41			42		
	Loss or decline of marine industries	43			44			45			46			47			48			49		
Environmental	Excessive or illegal extraction	50			51			52			53			54			55			56		
	Water pollution on environmental values - litter, solid waste, marine debris and microplastics	57			58			59			60			61			62			63		
	Wildlife disturbance	64			65			66			67			68			69			70		
	Habitat disturbance	71			72			73			74			75			76			77		
	Reductions in abundance of species and trophic levels	78			79			80			81			82			83			84		
	Pests and diseases	85			86			87			88			89			90			91		
Governance of the marine estate	Climate change stressors - 50 years	92			93			94			95			96			97			98		
	Inadequate/inefficient regulation or over regulation	99			100			101			102			103			104			105		
	Lack of or ineffective community engagement	106			107			108			109			110			111			112		
	Lack of compliance with regulations (by users)	113			114			115			116			117			118			119		
Public safety	Wildlife interactions	120			121			122			123			124			125			126		

KEY	Minimal	Low	Moderate	High

Initial Risk Assessment, Workshop Proceedings and Final Risk Assessment

A discussion was then held with workshop participants around –

- Any suggested or proposed changes to the initial risk scores and the associated reasons/evidence for this.
- Any new evidence that was relevant and could be presented or tabled; and
- Any changes to the metadata underpinning the risk – as it relates to the adequacy of the information (Adequate, Limited or Inferred), trend information (increasing, decreasing or stable), timing of when the impact is likely to occur (if not happening now), and scale (is risk highly localised or region-wide)

Notes and recommended changes to the evidence and risk rating were documented by the ANCORS team with DPI support staff taking details notes of the proceedings and discussions.

4.3 Changes to the Evidence Document and Risk Scores

A summary of the discussions, resolutions and actions for each group of cells in the initial risk matrix from the workshop proceedings was used by the ANCORS expert team and DPI to revise the evidence document and final risk register.

In addition to supplementing the evidence document with new information and material, key changes to risk scores that affected either ‘moderate’ or ‘high’ risk ratings coming out of the workshop can be summarised as follows –

- Conflict between recreational fishing and commercial fishing (inter-sectoral) – increased the consequence of impact causing an upgrade of the risk scores to ‘Moderate’ for the economic benefit categories of **employment and value of production** and **individual enjoyment value (consumer surplus)**
- Conflict between recreational fishing and other passive and recreational users groups (inter-sectoral) – increased the consequence of impact causing an update of the risk score to ‘Moderate’ on the social benefit category of **enjoying the biodiversity and beauty of the marine environment**
- Conflict between recreational fishing and other passive and recreational users groups (inter-sectoral) – increased the consequence of impact causing an update of the risk score to ‘Moderate’ on the economic benefit category of **employment and value of production**
- Reductions in abundances of species and trophic levels - increased the likelihood of impact causing an update of the risk score to ‘Moderate’ on the social benefit category of **enjoying the biodiversity and beauty of the marine environment**
- Reductions in abundances of species and trophic levels - increased the consequence of impact causing an update of the risk score to ‘Moderate’ on the economic benefit category of **individual enjoyment value (consumer surplus)**
- Pests and diseases – increased the consequence of impact causing an update of the risk scores to ‘High’ for the social benefit category of **consumptive use (extracting)**

Initial Risk Assessment, Workshop Proceedings and Final Risk Assessment

- Pests and diseases – increased the consequence of impact causing an update of the risk scores to 'High' for the economic benefit category of **employment and value of production** and 'Moderate' risk for the economic benefit category of **intrinsic and bequest values and individual enjoyment value (consumer surplus)**
- Inadequate regulation of recreational fishing – increased the likelihood of impact causing an update to risk score to 'Moderate' in the Southern Region on the social benefit category of **enjoying the biodiversity and beauty of the marine environment**
- Lack of compliance with regulation (by users) – increased the consequence of impact causing an update to risk scores to 'Moderate' for the social benefit of **consumptive use (extracting)**
- Lack of compliance with regulation (by users) – increased the likelihood of impact causing an update of the risk score to 'Moderate' for the economic benefit category of **intrinsic and bequest values, employment and value of production and individual enjoyment value (consumer surplus)**

In addition to the above changes to 'Moderate' and 'High' risks, a range of new evidence was presented and incorporated that changed several risk ratings across the Initial Risk Assessment from 'minimal' to 'low' (not specifically listed on the basis that they still remain 'acceptable' risks).

The following was also undertaken in relation to threat categories:

- Further clarity and agreement on the scope of the **Climate Change stressor** as it relates to recreational fishing and time scale changed from 50 years to 20 years
- Modifications and improvements to the wording of the stressors within the **Governance of the Marine Environment** threat category and the stressor, **Lack of recreational fisher awareness of the marine estate** was added as a new threat category to the risk matrix and scored
- **Critical Knowledge Gaps** and the stressor, **Inadequate social and environmental information** was added as a new threat category to the risk matrix and scored

4.4 Final Risk Assessment

In accordance with the above changes, a copy of the Final risk matrix is shown in Table 4-2.

The final evidence document prepared by ANCORS is contained in Appendix B.

Both documents were provided to workshop participants for final comments before inclusion into this report.

Initial Risk Assessment, Workshop Proceedings and Final Risk Assessment

Table 4-2 Final Risk Assessment matrix (8 July version)

		SOCIAL BENEFITS												ECONOMIC BENEFITS								
		Safety, health and wellbeing			Socialising and sense of community			Enjoying the biodiversity and beauty of the marine estate			Consumptive use (extracting)			Intrinsic and bequest values			Employment and value of production			Individual enjoyment value (consumer surplus)		
	STRESSORS	North	Central	South	North	Central	South	North	Central	South	North	Central	South	North	Central	South	North	Central	South	North	Central	South
Resource Use Conflict	Conflict over access and use																					
	Inter-sector (commercial and rec)	1			2			3			4			5			6			7		
	Inter-sector (rec and other)	8			9			10			11			12			13			14		
	Intra-sector (rec)	15			16			17			18			19			20			21		
	Anti-social behaviour	22			23			24			25			26			27			28		
	Unsafe practices	29			30			31			32			33			34			35		
	Overcrowding/congestion	36			37			38			39			40			41			42		
	Loss or decline of marine industries	43			44			45			46			47			48			49		
Environmental	Excessive or illegal extraction	50			51			52			53			54			55			56		
	Water pollution on environmental values - litter, solid waste, marine debris and microplastics	57			58			59			60			61			62			63		
	Wildlife disturbance and interactions	64			65			66			67			68			69			70		
	Habitat disturbance	71			72			73			74			75			76			77		
	Reductions in abundance of species and trophic levels	78			79			80			81			82			83			84		
	Pests and diseases	85			86			87			88			89			90			91		
	Climate change stressors - 20 years	92			93			94			95			96			97			98		
Governance of the marine estate	Inadequate regulation of recreational fishing	99			100			101			102			103			104			105		
	Lack of or ineffective community engagement	106			107			108			109			110			111			112		
	Lack of recreational fisher awareness of the marine estate	113			114			115			116			117			118			119		
	Lack of compliance with regulations (by users)	120			121			122			123			124			125			126		
Public safety	Wildlife interactions	127			128			129			130			131			132			133		
Critical knowledge gaps	Inadequate social and economic information	134			135			136			137			138			139			140		

KEY	Minimal	Low	Moderate	High

5 Discussion and Conclusions

Based on the final risk matrix refer Table 4-2:

'High' risks have been identified for the following stressors:

- Unsafe practices in relation to the social benefit of **safety, health and wellbeing**
- Pests and diseases in relation to the social benefit of **consumptive use (extracting)** and the economic benefit of **employment and value of production**

'Moderate' risks to one or more social or economic benefit category have been identified for the following stressors:

- Conflict over access and use across: Inter-sector (commercial and recreational fishing), Inter-sector (recreational fishing and other users) and Intra-sector (within recreational fishing)
- Overcrowding/congestion
- Loss or decline of marine industries
- Water pollution on environmental values - litter, solid waste, marine debris and microplastics
- Wildlife disturbance and interactions
- Reductions in abundance of species and trophic levels
- Pests and diseases
- Inadequate regulation of recreational fishing
- Lack of compliance with regulations by users

Consistent with the 2017 TARA methodology, these 'High' and 'Moderate' risks represent priorities for management coming out of the assessment.

The 'Low' or 'Minimal' risks identified represent issues that should be regarded with a watching brief as part of future reviews of this assessment.

In general, the risk scores are the same across the three regions. However, there are number of instances where the risk scores are higher in the Central region than in other Regions, owing to the higher population and the recreational fishing effort present in that region. Similarly, the evidence presented often involves highly localised incidents and issues. In this context, there may be grounds for consideration of regional and local management responses to risk treatment as opposed to state wide responses.

6 References

BMT WBM (2017) New South Wales Marine Estate Threat and Risk Assessment Report Final Report prepared for the Marine Estate Management Authority (MEMA). Accessed via <https://www.marine.nsw.gov.au/>.

DPI (2018). Performance, Data and Insights 2018. Published by the NSW Department of Primary Industries. November.

Marine Estate Management Authority (2017) Glossary of Terms (2017) accessed via <https://www.marine.nsw.gov.au/>.

Appendix A Research Papers on Social and Economic Benefits from Recreational Fishing (ANCORS)

The Economic Benefits of Recreational Fishing

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Recreational fishing is popular outdoor leisure activity in which people of all ages and backgrounds are motivated to catch fish using a range of different methods¹. Globally, there are estimated to be 220 million recreational fishers (Arlinghaus *et al.* 2019) enjoying a range of psychological, social, educational, and economic benefits to fishers and society that are not associated with commercial fisheries (FAO 2012). Internationally recreational fishing participation rates are reducing in response to increased urbanisation and industrialisation and cultural and corresponding value changes (Arlinghaus *et al.* 2015; 2020). Declines are also evident in other forms of outdoor leisure activities including running (Kennedy *et al.* 2019), hunting (Robison and Ridenour, 2012; Winkler and Warnke 2013), and golf (McGinnis *et al.* 2021)². Outdoor leisure activities are increasingly substituted with indoor leisure activities including electronic entertainment and has the potential to decrease direct interactions with wildlife (Pergams and Zaradic 2006; Robison and Ridenour, 2012). However, there is growth in this beneficial pastime in some developing economies (Arlinghaus *et al.* 2020) and surveys have shown that recreational fishing continues to be a popular activity in Australia with 3.6 million anglers in 2000 (Henry and Lyle 2001). One million people of all ages were fishing recreationally in NSW in 2000 (Henry and Lyle 2001). In 2013-14, there were reported to be 850,000 recreational fishers resident in NSW/ ACT (West *et al.* 2015).

A challenge for managing recreational fisheries is that in a jurisdiction or a region, it is a heterogeneous activity. Motivations, aspirations, target species, fishing styles, fishing priorities, participation rates, compliance, engagement and interest with fisheries management and fisheries science can all differ between individual recreational fishers or groups of recreational fisheries (Hutt and Bertoli, 2007). Studies of recreational fisher activity measuring trips or days fished, confirm the differing levels of fishing activity among anglers, referred to as their “avidity” (West *et al.* 2015, Murphy *et al.* 2021). There are broad range of activity levels from many fishers who fish just a few days a year, to more dedicated hobbyists and enthusiasts who can fish many days per year (Henry and Lyle 2001, West *et al.* 2015). Given this heterogeneity among fishers, each fisher will experience a differing benefit from their fishing activity. This benefit is difficult to measure, being similar to valuing a “tourism experience”, rather than recording production in a commercial fishery.

In analysis of the economic benefits, recreational fishers value both the experience as a form of leisure and also the capture of a fish. The benefits to the individual angler include the expectation of catching a fish and the challenge and thrill of the fishing experience. The fish caught can be considered food, or it may be caught and released, helping to retain the quality of fishing. The benefits from a recreational fishing trip are personal, reflecting a range of leisure and capture motivations in planning, travelling to a site, undertaking a fishing experience, travelling back and recollecting the trip (Cunningham *et al.* 1985).

These benefits to society and to anglers from recreational fishing can be assessed by estimating:

- the intrinsic and bequest values;
- the employment and value of production; and

¹ line fishing (bait and/or lure/jig/fly lines); pot/trap (baited, passive use); net (including scoop and drag/seine nets); dive collection (underwater spearfishing and hand collection by snorkel, scuba or hookah); and other methods (e.g. other hand collection and the use of pumps and spades) (West *et al.* 2015).

² Thanks to Dr Daryl McPhee for these observations.

- the value of individual enjoyment as measured by consumer surplus.

Intrinsic and bequest values

Intrinsic values reflect the inherent characteristics of an environmental asset that are not related to use, while bequest values indicate the value people place on knowing that future generations will have the option to enjoy an environmental asset in the same condition as the present generation.

Recreational fishers seek fishing experiences that they value highly and so they assign a high intrinsic value to fish stocks and their sustainable management. Recreational fishers are the main alternative user group to commercial fishers, and their high value of access benefits the intrinsic value of a shared stock under management (FAO 2012). Fisheries management uses input regulations to control fishing effort via licences, fees, gear and method restrictions, closed times, areas and seasons. Catch output is limited by size limits, bag and possession limits and not being able to sell catch. These input and output controls enable management to reduce fishing mortality and allow more recreational fishers to share the benefits from access (FAO 2012). Management maintains sustainable recreational fishing and enhances the intrinsic value of fish stocks which benefits society.

Management of recreational fishing also supports the bequest value of fish stocks for future generations in line with the principles of ecologically sustainable development. Recreational fishers see their fishing and conservation ethic as contributing to the value of access of these fisheries to future generations.

Recreational fishing can also increase the intrinsic and bequest values of the fish stock where fishery management improves fish habitat, biotic manipulations, such as stocking, removal of predators, pest species and developing artificial reefs. The development of added value through “put and take” fisheries and fish tourism may also enhance the intrinsic value of these fishery assets (FAO 2012). In NSW the recreational fishing licence fee supports research, conservation and other functions that maintain or may even increase the benefits from access, through for example, habitat enhancement, artificial reefs and fish stocking which enhance the intrinsic and bequest values of the resources.

Employment and the value of production

Recreational fishing expenditures are made by individual anglers from their household budgets in pursuit of their hobby and leisure priorities. These expenditures are an input to the general economy and can be estimated by surveys and regional economic modelling. However expenditures alone do not measure the total net economic value of the benefits experienced by fishers.

The direct expenditures by recreational fishers into businesses generate an economic contribution in the economy contributing to business incomes and employment. For example, wages paid to those who work in tackle shops, boat repair, fuel, bait and ice suppliers which also have indirect “flow on” benefits to a regional economy. The initial expenditures by recreational fishers, have indirect benefits to economies in a similar way to tourism, with expenditure on accommodation, dining and travel. There are also larger capital investment expenditures by recreational fishers on holiday accommodation, caravans, boats and vehicles with some portion being attributable to recreational fishing activity (McIlgorm and Pepperell 2013, Ridge Partners 2013).

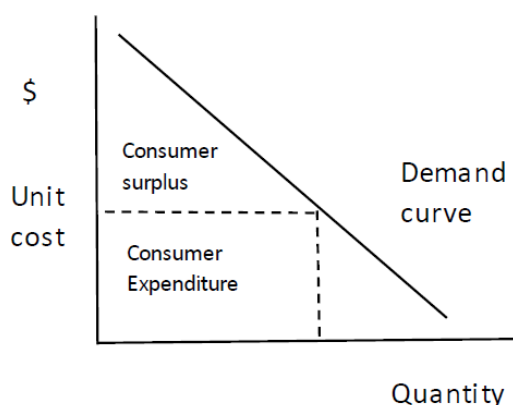
Many recreational fishers retain catch for home consumption as food giving it a shadow value at least equivalent to a commercial landed value, or more due to not having to purchase seafood at

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retail market values. This benefit is not recorded in national accounts and is regarded as a form of the “home production of food” (ABS 1992, Ridge Partners 2013).

Measuring individual enjoyment value (consumer surplus)

The benefits from fishing to an angler must be either equal to or in excess of their expenditure, otherwise they would not be incentivised to fish. When all expenditure is made and the fisher is about to fish, what is the value of access to the fisher of the fishing experience at that point (i.e. what is the dollar value they place on the benefit they expect to receive from the fishing experience?). If a fishery was privately owned, like a “put and take fishery”, the value of access is an entry fee, which is a market measure. If the angler is willing to pay this fee, this indicates the benefit they receive from fishing must be at least equal to the value of this fee³. Access to a marine fishery does not attract an access fee, and so the value of this access is not given by a market and so must be estimated using non-market valuation methods. Common techniques include “revealed preference” methods that use fishery behaviour to estimate value. The most popular is the travel costs method which uses fisher travel behaviour to a fishing site to form a demand curve (Mazur and Curtotti 2015). This demand curve indicates the value of fishing to anglers expressed as a dollar value against the quantity of fishing experiences. The difference between the benefits from fishing and the expenditure associated with fishing, is called “consumer surplus”.



The consumer surplus measures the “use” value and not the total net economic value which includes less tangible benefits valued by the fisher (Mazur and Curtotti 2015). The diagram above shows the demand for recreational fishing and the consumer surplus area under the demand curve, less associated angler expenditures, and so provides a dollar estimate of what consumers would have paid for different quantities of the fishing experience over and above the observed expenditure.

Estimates of the benefits of recreational fishing in NSW

The current total net economic benefits of recreational fishing in NSW has not been determined but estimates of expenditure have been made through surveys. In 2012 the total expenditure on travel for recreational fishing trips, fishing tackle and boat-related items by 770,000 adult anglers in NSW was estimated as \$1.625bn (McIlgorm and Pepperell 2013). The total expenditure estimate reflects the number of anglers, the number of days fished and their expenditure per day.

The total impact in the NSW economy state wide of this expenditure was a direct and indirect economic output of \$3.42 billion (DPI 2018). The associated Gross Value Added (GVA), the

³ A purchase of a recreational fishing (RF) licence, is a cost to the fisher for access in addition to fishing expenditures, and reflects forgoing part of the total net value they attribute to their potential fish catch and other non-market benefits they gain from fishing access (FAO 2012).

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preferred economic indicator, was \$1.625bn which was 0.36% of the Gross State Product (GSP) in the total NSW economy (McIlgorm and Pepperell 2013). There was \$877.3m of Household income generated as wages in retail, finance and insurance, hospitality, professional and technical services and the wholesale trade sectors. There were a total of 14,254 full time equivalent jobs in the retail trade sector, hospitality, personal and other services and in the transport and storage sector (McIlgorm and Pepperell 2013).

In 2018-19, Tourism contributed \$46.5 billion (Tourism Consumption) to the NSW economy and employed 296,200 people (Destination NSW, 2020). Whilst the link between recreational fishing and tourism is not necessarily direct, it is evident that it is one of the activities that many tourists participate in whilst on holidays (Voyer et al. 2017 Page 9).

The economic benefits from recreational fishing in NSW also have a strong regional element with Sydney anglers taking fishing trips inland and to towns along the NSW coastline. This leads to direct and indirect expenditures of \$818m, supporting 2,183 FTE direct and indirect jobs in both Sydney and in their regional destination (Dominion, 2003).

A 2005 report investigating the importance of recreational fishing expenditure to the economies of two coastal towns in northern and southern New South Wales. In Port Macquarie and Narooma/Bermagui, it was estimated that annual expenditure by local anglers was \$7.9m and visiting anglers \$14.8m, totalling \$22.8m per annum in Port Macquarie and expenditure by local anglers was \$4.3m and visiting anglers \$20.6m, totalling \$25.0m per annum in Bermagui/Narooma (McIlgorm et al. 2005 p46-47).

Recreational fishing visitors to Port Macquarie and Narooma-Bermagui directly and indirectly supported 276 and 209 FTE jobs respectively (McIlgorm et al. 2005). Tourism expenditure by all visitors accounted for more than 60% of jobs in these towns, with recreational fishing being an important component and attraction within and outside of the tourist high season (McIlgorm et al. 2005).

Interstate recreational fishers, mainly from Victoria and Queensland, spent an average of \$393.31 per trip, while NSW recreational fishers spent \$184.63 per trip on average (McIlgorm and Pepperell 2013). Fishers also spend money on restaurants, shopping, accommodation services and fuel, bait and tackle. The recreational fishing industry supports an estimated 200 tackle retail businesses.

Catching high quality fresh fish is also a benefit. The estimated total catch of 10 popular recreational finfish species⁴ was 1,584 tonnes in 2013-14 (West et al. 2015) or 943 tonnes in 2017-18⁵ by recreational fishing licence holder households (Murphy et al. 2021). This would equate to a food consumption value of between \$9.4m to \$15.8m per annum enjoyed in home consumption by recreational fishers⁶.

The annual revenue from the NSW Recreational Fishing Licence (fee) is approximately \$16.1m in the period 2018-19 (DPI pers. comm.). This is indicative of an unknown fraction of the current value put on access to fish by recreational fishers (i.e. part of their “willingness to pay” as seen in consumer surplus). The funds from the fee have a range of economic benefits to the sector funding research, improving fishing access and facilities, aquatic habitat protection and rehabilitation, and enhancing fisheries (e.g. artificial reefs, fish stocking and FADs), which enhance the sustainability of the fish stocks and their ecological service benefits long term. Funding of recreational fishing education, and

⁴ Bream, Dusky Flathead, Sand Flathead, Mulloway, Australian Salmon, Silver Trevally, Snapper, Tailor, Sand Whiting, Yellowtail Kingfish

⁵ Noting that the 2017-18 survey data provided estimated catches for recreational fishing licence holders and their households only.

⁶ This assumes a price at first sale of \$10/kg whole fish averaged for indicative purposes. An equivalent retail price would exceed this.

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enforcement of rules also support the management regime integrity which benefits the sector and intrinsic and bequest values. There are approximately 520 recreational fishing licence fee agents who sell recreational fishing licences statewide from their fuel retail, bait and tackle shops and various other businesses in rural areas (DPI pers. comm.).

Non line fishing methods

Line fishing is used by 82% of NSW recreational fishers and in 2017-18 contributed 91% of fishing effort (Murphy et al. 2021). There is little economic information on specific catch weights of non-line fishing methods such as recreational spearfishing, trapping, netting or by hand gathering in NSW. The experiential value, or expenditure made by these fishers has not been specifically determined. There is strong targeting, catch retention and home consumption of catch for finfish species, as well as invertebrates such as prawns, mud crabs, blue swimmer crabs, abalone, rock lobster etc. (West et al. 2015 Murphy et al. 2021).

The DPI data on non-commercial catch are for both recreational and indigenous fishing, for example in 2018-19 annual catch of abalone 5.4t (DPI 2019), rock lobster 15.4t (DPI 2020a). The need for more accurate recreational catch data on these high commercial value species is recognised, as the total commercial catch is limited by quotas (DPI 2019, 2020a). The data for recreational catch in the statewide survey are estimated in numbers, for species such as prawns, mud crabs, blue swimmer crabs, and also invertebrate species, such as cockles, pipis, beachworms and nippers (Murphy et al. 2021). Collection and harvesting recreational bait such as beachworms and nippers benefits fishers as they purchase less from the retail bait market. Purchasing bait benefits commercial fishing industry suppliers.

Charter fishing

The charter sector enables anglers to take angling trips on a hire basis. An estimated \$24 million was spent on fishing fees and non-charter items, such as food and accommodation in 2017-18, with approximately half of the expenditure coming from charter fishing fees. The charter sector contributed \$50.17m in output, \$23.48m in added value, \$12.36m in household incomes and a total of 188FTE jobs to the state economy (Dominion, 2014). There is a significant capital investment in charter vessel businesses with economic benefits to the community.

Fishing tournaments

In NSW fishing tournaments have been developed to provide opportunities to help the sport, while bringing additional economic benefits to the hosting communities. Fishing tournaments include game fishing, spear fishing, general coastal (mixed species) and inland events and a number of specialist species competitions such as snapper, bream, dusky flathead, bass and golden perch. Online fishing tournaments are also increasing in popularity and are run Australia wide with thousands of dollars' worth of prizes offered to winning fishers each month.

Popular tournaments, such as the Evans Head Fishing Classic and the Port Stephens Club Marine Trailer Boat Fishing Tournament have high participation rates with over 1,000 anglers and 300-400 boats taking part to compete for over \$80,000 in species and lucky draw prizes each year (Port Stephens 2019). Game fishing tournaments such as the Port Stephens Billfish Shootout can also attract in excess of 800 anglers with individual prizes of up to \$200,000 offered.

Game fishing tournaments increase economic activity by attracting visitors to regional coastal communities (Pepperell 2002, Ward et al. 2012). In an Australian East Coast study which included

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NSW, total expenditure (including fuel, equipment, accommodation, travel, food and travel) reported by tournament participants for all their trips in 2011 was \$20.0m for Port Stephens and \$7.0m for Bermagui (Ward et al. 2012).

Summary

In summary, there are a range of economic benefits seen in angler participation and expenditure data that have considerable beneficial impacts in NSW. The benefits can also be seen in regional areas where recreational fishers provide significant economic benefits to coastal towns and communities dependent on tourists. There are also additional economic and community benefits associated with charter fishing and tournament events.

References

- ARLINGHAUS, R., TILLNER, R., & BORK, M. (2015). Explaining participation rates in recreational fishing across industrialised countries. *Fisheries Management and Ecology*, 22(1), 45-55.
- ARLINGHAUS, R. J.K. ABBOTT, E.P. FENICHEL, S. R. CARPENTER, L.M. HUNT, J. ALÓS, T. KLEFOTH, S.J. COOKE, R. HILBORN, O. P. JENSEN, M. J. WILBERG, J. R. POST, MICHAEL J. MANFREDO (2019). Opinion: Governing the recreational dimension of global fisheries, *Proceedings of the National Academy of Sciences* Mar 2019, 116 (12) 5209-5213; DOI: 10.1073/pnas.1902796116
- ARLINGHAUS, R., AAS, O., ALOS, J., ARISMENDI, I., BOWER, S., CARLE, S., CZARKOWSKI, T., FREIRE, K. M. F., HU, J., HUNT, L. M., LYACH, R., KAPUSTA, A., SALMI, P., SCHWAB, A., TSUBOI, J., TRELLA, M., MCPHEE, D. P., POTTS, W., WOLOS, A., & YANG, Z-J. (2020). Global Participation in and Public Attitudes Toward Recreational Fishing: International Perspectives and Developments. *Reviews in Fisheries Science and Aquaculture*, 29(1), 58-95.
<https://doi.org/10.1080/23308249.2020.178234>
- CUNNINGHAM, S., M.R. DUNN & D. WHITMARSH (1985). Fishing as Recreation. Chapter 12 of *Fisheries Economics- an Introduction*. Mansell Publishing Ltd.
- DESTINATION NSW (2020). Economic Contribution to Tourism to NSW 2018-19. Destination NSW, NSW Government. <https://www.destinationnsw.com.au/wp-content/uploads/2020/06/economic-contribution-of-tourism-to-nsw-2018-2019.pdf>
- DOMINION CONSULTING (2003). An economic & social survey of Sydney anglers and regional NSW Dominion Consulting Pty Ltd. A report to the NSW Recreational Fishing Trusts. May.
- DPI (2018). Performance, Data and Insights 2018. Published by the NSW Department of Primary Industries. November.
- DPI (2019). Abalone Fishery, NSW Total Allowable Fishing Committee Report and Determination. Report to the DPI, 19th November.
- DPI (2020a). Rock Lobster Fishery, NSW Total Allowable Fishing Committee Report and Determination 2020–21, 13th June.
- DPI (2020b). NSW Estuary General Fishery: Pipis, Cockles, Ghost Nippers, and Beachworms. Report and Determinations for the 2020–21 Fishing Period, 9th April.
- FAO (2012). Recreational fisheries. *FAO Technical Guidelines for Responsible Fisheries*. No. 13. Rome, FAO. 2012. 176p.
- HUTT, C. P., & BETTOLI, P. W. (2007). Preferences, specialization, and management attitudes of trout anglers fishing in Tennessee tailwaters. *North American Journal of Fisheries Management*, 27(4), 1257-1267.
- KENNEDY, H., BAKER, B. J., JORDAN, J. S., & FUNK, D. C. (2019). Running recession: A trend analysis of running involvement and runner characteristics to understand declining participation. *Journal of Sport Management*, 33(3), 215-228.

Research Papers on Social and Economic Benefits from Recreational Fishing (ANCORS)

MAZUR, K. & R. CURTOTTI (2016). A theoretical framework for resource sharing between commercial and recreational fishers. Research by the Australian Bureau of Agricultural and Resource Economics and Sciences, Conference paper, February 2016.

MCGINNIS, L. P., GENTRY, J. W., & HALTOM, T. M. (2021). Gender, Millennials, and leisure constraints: Exploring golf's participation decline. *Journal of Policy Research in Tourism, Leisure and Events*, 13(1), 59-76.

MCILGORM, A., A. MCFARLANE & J. PEPPERELL (2005). The importance of recreational fishing expenditure to the economies of two coastal towns in northern and southern New South Wales: Port Macquarie and Narooma/Bermagui. A report to the NSW Recreational Fishing Trusts. March.

MCILGORM, A. AND J. PEPPERELL (2014). An economic survey of the Recreational fishing charter boat industry in NSW. A report to the NSW Department of Primary Industries by Dominion Consulting Pty Ltd.

MCILGORM, A. & J. PEPPERELL (2013). Developing a cost effective state wide expenditure survey method to measure the economic contribution of the recreational fishing sector in NSW in 2012. A report to the NSW Recreational Fishing Trust, NSW Department of Primary Industries, by ANCORS, University of Wollongong, November.
https://www.dpi.nsw.gov.au/_data/assets/pdf_file/0009/499302/UOW-statewide-economic-survey-final-report.pdf

MURPHY, J. J., OCHWADA-DOYLE, F. A., WEST, L. D., STARK, K. E. & HUGHES, J. M. (2021). Survey of recreational fishing in NSW, 2017/18. Fisheries Final Report Series | No. 158, April.

PEPPERELL, J. (2002). Regional Economic Impact of the Toyota Sportivo 40th New South Wales Interclub Game Fishing Tournament, Port Stephens 2002. A report to the New South Wales Game Fishing Association by Pepperell Research & Consulting Pty Ltd.

PERGAMS, O. R., & ZARADIC, P. A. (2006). Is love of nature in the US becoming love of electronic media? 16-year downtrend in national park visits explained by watching movies, playing video games, internet use, and oil prices. *Journal of environmental Management*, 80(4), 387-393.

RIDGE PARTNERS (2013). Measuring the economic value of recreational fishing at a national level. Workshop Report, FRDC project 2012/214. Ridge Partners. 17th October.

ROBISON, K. K. & RIDENOUR, D. (2012). Whither the love of hunting? Explaining the decline of a major form of rural recreation as a consequence of the rise of virtual entertainment and urbanism. *Human Dimensions of Wildlife*, 17(6), 418-436.

PORT STEPHENS (2019). Trailer Boat fishing Tournament.
<https://www.portstephens.org.au/events/show/trailer-boat-fishing-tournament-2019>

VOYER, M, K. BARCLAY, A. MCILGORM & N. MAZUR (2017). 'Connections or conflict? A social and economic analysis of the interconnections between the professional fishing industry, recreational fishing and marine tourism in coastal communities in NSW, Australia. 76 Marine Policy 114-121.

WARD, P. K. MAZUR, N. STENEKES, R. KANCANS, R. CURTOTTI, R. SUMMERSON, C. GIBBS, N. MARTON, A. MOORE AND J. ROACH (2012). A socioeconomic evaluation of three

Research Papers on Social and Economic Benefits from Recreational Fishing (ANCORS)

eastern Australian game-fishing regions. Research by the Australian Bureau of Agricultural and Resource Economics and Sciences Report to client prepared for the Fisheries Research and Development Corporation, August.

<https://www.agriculture.gov.au/sites/default/files/abares/documents/2010-050-dld.pdf>

WEST L. D., K. E. STARK, J. J. MURPHY, J. M. LYLE & F. A. OCHWADA-DOYLE (2015). Survey of Recreational Fishing in New South Wales and the ACT, 2013/14. NSW DPI – Fisheries Final Report Series No. 149. Published by the NSW Department of Primary Industries, December.

WINKLER, R., & WARNKE, K. (2013). The future of hunting: an age-period-cohort analysis of deer hunter decline. *Population and Environment*, 34(4), 460-480.

The Social Benefits of Recreational Fishing

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There have been a number of studies on recreational fishing which provide insight into the benefits that are derived from this activity. The majority of these focus on the benefits to the individuals involved in the activity, however a number also give insights into the broader societal benefits.

Globally, approximately 11% of the population participate in the sporting and social aspects of recreational fishing (van Putten et al., 2017). Within developed nations participation rates in recreational fishing is estimated to be 1 in 10 people, accounting for 220 million fishers (Arlinghaus et al., 2019).

Recreational fishing is an activity accessible to wide section of the community and is therefore often promoted as an inclusive activity open to all ages, genders, ethnicities and levels of ability. In practice, recreational fishing in Australia is largely dominated by men (McManus et al., 2014, West et al., 2015), with female participation seen at lower levels. In a 2015 study of recreational fishing in NSW, males accounted for over two-thirds of the participation rate in recreational fishing (16.9%) compared with females (6.6%)(West et al., 2015).

Within NSW recreational fishing is viewed as an important pastime for 1 in 8 residents, and in total, represents the third highest annual participation rate within all physical/recreational activities (Murphy et al., 2021). In 2017, 432,218 NSW residents held recreational fishing licences (Murphy et al., 2021). Among licence holders, the majority (62%) fished in estuaries, followed by oceanic waters (35%) highlighting the dominance of saltwater fishing in NSW. The highest rates of participation in recreational fishing in NSW are children (5-14 years) and adults in the 33-44 years age group (West et al., 2015).

In 2016, a survey of recreational fishers in NSW found that recreational fishers tended to fall into one of five classes of recreational fishers, as summarised below.

1. Social fishers (21.7%): these fishers prioritise the social and escapism aspects of the fishing experience.
2. Generalists (14.4%): these fishers have no clear motivational preferences
3. Hunter gatherers (22.6%): these fishers are motivated primarily by catching, retaining, and eating fish.
4. Trophy fishers (12.5%): this group are motivated by the challenge and skill involved in catching large trophy fish.
5. Outdoor enthusiasts (28.9%): these fishers are particularly motivated by a desire to be outdoors and with nature. Outdoor enthusiasts are interested in challenging themselves against nature or against the fish through experimentation with gear (e.g. using light line), location or technique (Magee et al., 2018, McIlgorm et al., 2016).

The following sections outlines the social benefits of recreational fishing. These are grouped in accordance with the broader social benefits of the Marine Estate, as identified in the State-wide Threat and Risk Assessment process (NSW Marine Estate Management Authority, 2018). Consideration is given to both the individual and collective benefit to participants, as well as broader societal benefits where information exists.

Safety, health and wellbeing

The primary social benefits in this category relate to individual benefits to health and wellbeing. It is thought that recreational fishing contributes, both economically and socially, to the well-being of anglers, as it fosters active engagement in society and biodiversity conservation (Birdsong et al., 2021). A small number of studies have considered the health and wellbeing impacts of recreational fishing on participants. For example Griffiths et al. (2017) utilised a medical health science conceptual framework, and psychometrically valid Health-Related Quality Of Life (HRQOL) measures to quantify the HRQOL of recreational fishers. They found a number of biopsychosocial benefits arising from this relationship and concluded that recreational fishing is likely to reduce burdens on society via relief on public health and support services by increasing self-esteem, strengthening social ties between friends, family and the wider community, reducing heart rate and anxiety, and reducing incidences of delinquency among disadvantaged youth (Wightman et al., 2008).

Physical Health

Fishing is recognised as providing a low to moderate level of physical exercise and this is dependent on the form of fishing and duration. It can provide an easy form of exercise for people who suffer from long-standing illness, disability or are inactive (Brown et al., 2012). Sport England's SQSE survey in 2009/10 showed that 39% of the 1,469 surveyed anglers had a long-standing illness, disability or infirmity (80% with affected activity), double the proportion of other sport respondents (19%). Recreational fishing also provides significant health benefits for seniors, through social interaction, physical activity and Vitamin D, through exposure to sunlight (McManus et al., 2011). In a study of Western Australian fishers, 48.8% of participants commonly cited fitness and/or exercise as a health benefit of fishing (McManus et al., 2014). Long energetic fishing sessions can result in significant energy demands that can exceed that of other more typical exercise-based activities. For example, in a study comparing physical exertion in angling to six other activities, angling was half as vigorous as activities like mountain biking or horse riding. However, because of the longer duration, the total energy used per session for fishing was greater than any other activity (Pretty et al., 2007).

There is clear evidence supporting physical activity and a diet high in seafood as beneficial to health and the prevention of chronic health conditions (McManus et al., 2011, Newton and McManus, 2011). In 2011, a Fisheries Research and Development Corporation (FRDC) report "Identifying the health and well-being benefits of recreational fishing", identified and highlighted that there is an urgent need to provide outdoor social opportunities and activities for children to encourage habitual healthy behaviours (McManus et al., 2011).

Mental Health & wellbeing

It has been widely documented that exposure to nature and nature-based recreation has positive effects on emotional wellness, relieves stress, increases positive moods and concentration, and reduces mental fatigue and aggressive behaviour (Brymer et al., 2010, Bratman et al., 2015). The mental health benefits specifically attributed to fishing are thought to be associated with the need for focus and awareness, which takes participants minds off internal conflict and stress, and acts like a form of meditation. As a result, fishing can help to reduce anxiety, and promote relaxation by lowering the stress hormone, cortisol (Mowatt and Bennett, 2011).

In the UK, a youth intervention project "Get Hooked On Fishing" has provided positive mental health outcomes for young people with anxiety disorders. Fishing has also been used as a tool to minimise anxiety during engagement sessions between patients and mental health workers. As a result, workers were able to discuss difficult issues or introduce participants into social situations that would have potentially triggered anxiety attacks¹.

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Recreational fishers have often described fishing as their “escape.” Escapism includes stimulus-avoidance and relaxation and includes the pursuit of an activity to escape stressful situations and work and/or family demands or connect with nature (White, 2008, Dillard and Bates, 2011, Kuehn et al., 2013, Hunt and Ditton, 2001, Beardmore et al., 2011). A 2016 study of recreational fishers in Western Australia highlighted that participating in fishing provides relief from stress and helps people relax and unwind (Hunt et al., 2016). Within the study anglers also stated that positive mood and mental well-being was a clear benefit of their involvement in fishing, with more than 75% of participants stating that they obtained health benefits from fishing in the form of relaxation and stress relief (Hunt et al., 2016, McManus et al., 2014). Anglers expressed these characteristics as one of the key drivers for going fishing. The study also uncovered that 48.8% of participants explicitly identified pleasure as a motivation to fish, with fishers describing how fishing provided an escape from the pressures and stresses of modern society, work and personal difficulties. They also explained that the activity allowed them to clear their minds and refresh.

Recovery

Recreational fishing has also been seen as a useful tool in helping individuals recover from physical and mental trauma. Taking individuals fishing informally, or through tailored programs, has resulted in positive health in some studies. For example, a study in the USA found that returned servicemen had reduced incidences of post-traumatic stress disorder when they added recreational fishing to their lifestyle (Mowatt and Bennett, 2011). There are a number of specific programs worldwide that directly use the activity of recreational fishing for recovery, examples in Australia include “Casting for Recovery”² and “The Fly Program”³.

Socialising and sense of community

A large number of studies of fishing motivations point to the importance of social factors in relation to recreational fishing, including the benefits associated with enhanced relationships (Beard and Ragheb, 1983, White, 2008, Beardmore et al., 2011, Kuehn et al., 2013, Dillard and Bates, 2011). Recreational fishing can be a social and community-based activity – providing an opportunity to participate in social and club-based activities. This is evidenced by the large infrastructure of recreational fishing clubs. Within NSW there more than 800 fishing clubs (DPI pers comm) which help to support participation, improve local fishing opportunities, develop skills and run competitions as well as generate social capital for individuals and communities (Murphy et al., 2021).

Fishing may also contribute to a sense of community through assisting with cohesion across diverse groups and individuals. For example, fishing has been shown to provide particular benefits for people with disabilities. As a form of low to moderate exercise fishing can be utilised by those who are less mobile or suffer from illness or disability (Brown et al., 2012). The social and self-improvement benefits associated with recreational fishing have been found to be higher for anglers with disabilities compared to anglers without disabilities (Freudenberg and Arlinghaus, 2009).

[1] <https://ghof.org.uk/>

[2] <https://castingforrecovery.org/>

[3] <https://flyprogram.org.au/>

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Recreational fishing in schools has been found to benefit children who do not find classroom social dynamics easy, by giving them the opportunity to shine and to form friendships outside their own school. For example, in a study in the UK fishing was found to provide older children the opportunity to mentor younger children which increased their own self efficacy and self-confidence (Brown et al., 2012). This study also indicated positive findings associated with juniors with behavioural and learning difficulties. For example, studies that showed hyperactive children were able to sit quietly by the water for long periods of time and uncommunicative children vocally expressed that they want to fish (McManus et al., 2011). In Australia, the “Hey kids let’s go fishing” was an initiative seen in Australian schools, which allowed children to engage with the environment and each other, outside of school. The program fostered the building of peer relationships, providing behavioural incentives and building self-esteem among children (McManus et al., 2011).

The appeal of fishing to diverse ethnicities has been explored in a number of studies in NSW. Goodall et al. (2011) found that some Asian cultures have strong cultural connections to water. For example, they found that for some Vietnamese migrants fishing provides a means to connect with nature. Once in Australia, they found that migrants were motivated to fish to explore a different environment and as well as perform a ‘productive’ form of leisure (Cadzow et al., 2010). Furthermore, practices like fishing in Australian parks were a way for Vietnamese migrants to socialise across ethnic groups, and make new memories in Australia. Goodall et al. (2011) have argued that building positive shared memories makes new places become significant for people. Indeed, fishing provides Vietnamese Australians with a way of engaging with the environment and being Vietnamese in Australia. Similarly, Waite et al. (2020) uncovered ways in which recreational fishing is used by Chinese fishers as a means through which to build and maintain a sense of belonging within the dominant white culture and assert their citizenship.

Finally, whilst an understudied area, some literature does suggest that recreational fishing plays a unique cultural role amongst young men. For example, Young et al. (2016) point to the gendered participation in fishing in both Australia and argue that young males are particularly drawn to the sport as a demonstration of masculinity and ego, through the opportunity it provides to ‘hunt and gather’ and a means of providing food for family and friends.

Enjoying biodiversity and beauty of marine estate

Recreational fishers spend a considerable amount of time on or adjacent to water bodies and develop an intimate knowledge of these areas. This enables them to often be the first to report incidents of pollution or change in ecosystems as well as reports of illegal behaviour. A survey of young anglers undertaken as part of the research conducted in the United Kingdom found that 84.4% said that fishing had taught them more about caring for the environment. The same report stated that, environmental awareness can motivate anglers to participate in planned environmental work and become involved in environmental education (Brown et al., 2012). In Australia, Copeland et al. (2017) found that recreational fishers were involved in habitat management largely due to a desire to ‘give back’. They found that those involved in habitat management activities, such as picking up litter and contacting government or the media about issues of concern, generally self-rated their knowledge of fish ecology as very good.

Fishers have been found to be active participants in citizen science activities, which assists in building social license and connecting with other users groups around areas of common interest (Kelly et al., 2019).

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School based fishing programs have reported that providing responsible fishing-based education focused on minimisation of environmental impacts can ensure recreational fishers of today and tomorrow are aware of sustainable fishing practices (McManus et al., 2011).

Fishing is likely to provide an important gateway to nature and appreciation of the wild environment. As well as the considerable mental benefits from participating in nature-based recreation, fishing also provides a clear path for anglers to become more environmentally aware, improving an individual's understanding of the natural world and also helps with the sharing of this knowledge, in formal and informal ways (McManus et al., 2014, Kelly et al., 2019).

Consumptive use (extracting)

The benefits associated with consumptive use connect strongly with the other benefits outlined above. For example, regular consumption of fresh fish can improve physical health, the act of catching the fish can improve mental health and the interaction with nature associated with fishing can increase appreciation of the natural environment. Beardmore et al. (2011) found that different fish species were targeted by different recreational fisher groups, and their motivations were influenced by the biological characteristics of the target species. For example, abundant and easy-to-catch species were targeted and retained by social and nature-oriented recreational fishers, while larger, harder to catch species were targeted by trophy and challenge-oriented fishers. Therefore, classification studies have indicated that specific species can fulfil very specific expectations and recreational opportunities for particular groups of recreational fishers (Beardmore et al., 2011). Therefore, the benefits derived from consumptive use are likely to vary considerably across the recreational fishing community.

Conclusion

Recreational fishing provides a diverse range of benefits to the individuals that participate in this activity, which has broader implications for society, including public health. In addition, recreational fishing is likely to increase environmental stewardship and appreciation of natural environment, enhancing appreciation and knowledge of the marine estate.

References

- ARLINGHAUS, R., ABBOTT, J. K., FENICHEL, E. P., CARPENTER, S. R., HUNT, L. M., ALÓS, J., KLEFOTH, T., COOKE, S. J., HILBORN, R., JENSEN, O. P., WILBERG, M. J., POST, J. R. & MANFREDO, M. J. 2019. Opinion: Governing the recreational dimension of global fisheries. 116, 5209-5213.
- BEARD, J. G. & RAGHEB, M. G. 1983. Measuring leisure motivation. *Journal of Leisure Research*, 15, 219-228.
- BEARDMORE, B., HAIDER, W., HUNT, L. M. & ARLINGHAUS, R. 2011. The Importance of Trip Context for Determining Primary Angler Motivations: Are More Specialized Anglers More Catch-Oriented than Previously Believed? *North American Journal of Fisheries Management*, 31, 861-879.
- BIRDSONG, M., HUNT, L. M. & ARLINGHAUS, R. 2021. Recreational angler satisfaction: What drives it? *Fish and Fisheries*, n/a, 1-25.
- BRATMAN, G. N., DAILY, G. C., LEVY, B. J., GROSS, J. J. J. L. & PLANNING, U. 2015. The benefits of nature experience: Improved affect and cognition. 138, 41-50.
- BROWN, A., DJOHARI, N. & STOLK, P. 2012. Fishing For Answers. The Final Report of the Social and Community Benefits of Angling Project. Manchester: Big Lottery Fund research programme.
- BRYMER, E., CUDDIHY, T. F., SHARMA-BRYMER, V. J. A.-P. J. O. H., SPORT & EDUCATION, P. 2010. The role of nature-based experiences in the development and maintenance of wellness. 1, 21-27.
- CADZOW, A. J., BYRNE, D. & GOODALL, H. 2010. Waterborne: Vietnamese Australians and river environments in Vietnam and Sydney. *Transforming Cultures*, 5.
- COPELAND, C., BAKER, E., KOEHN, J. D., MORRIS, S. G. & COWX, I. G. 2017. Motivations of recreational fishers involved in fish habitat management. 24, 82-92.
- DILLARD, J. E. & BATES, D. L. 2011. Leisure motivation revisited: Why people recreate. *Managing Leisure*, 16, 253 - 268.
- FREUDENBERG, P. & ARLINGHAUS, R. J. L. S. 2009. Benefits and constraints of outdoor recreation for people with physical disabilities: inferences from recreational fishing. 32, 55-71.
- GOODALL, H., CADZOW, A., BYRNE, D. & WEARING, S. 2011. *Waterborne : Vietnamese Australians and Sydney's Georges River parks and green spaces*, UTS ePRESS.
- GRIFFITHS, S. P., BRYANT, J., RAYMOND, H. F., NEWCOMBE, P. A. J. F. & FISHERIES 2017. Quantifying subjective human dimensions of recreational fishing: does good health come to those who bait? 18, 171-184.
- HUNT, K. M. & DITTON, R. B. 2001. Perceived benefits of recreational fishing to Hispanic-American and Anglo anglers. *Human Dimensions of Wildlife*, 6, 153-172.
- HUNT, W., MCMANUS, A. J. A. & HEALTH, N. Z. J. O. P. 2016. Recreational fishing supports health and wellbeing in Western Australia. 40, 292-292.
- KELLY, R., FLEMING, A. & PECL, G. T. 2019. Citizen science and social licence: Improving perceptions and connecting marine user groups. *Ocean & Coastal Management*, 178, 104855.
- KUEHN, D., LUZADIS, V. & BRINCKA, M. 2013. An Analysis of the Factors Influencing Fishing Participation by Resident Anglers. *Human Dimensions of Wildlife*, 18, 322-339.

Research Papers on Social and Economic Benefits from Recreational Fishing (ANCORS)

- MAGEE, C., VOYER, M., MCILGORM, A. & LI, O. 2018. Chasing the thrill or just passing the time? Trialing a new mixed methods approach to understanding heterogeneity amongst recreational fishers based on motivations. *Fisheries Research*, 199, 107-118.
- MCILGORM, A., C, M., VOYER, M., PEPPERELL, J., O'TOOLE, E. & LI, O. 2016. Improving our understanding of the values, beliefs, motivations and attitudes of recreational fishers in NSW. Report to New South Wales Department of Primary Industry Recreational Fishing Trusts. . Wollongong.
- MCMANUS, A., HUNT, W., MCMANUS, J. & CREEGAN, R. 2014. *Investigating the health and well-being benefits of recreational fishing in Western Australia*.
- MCMANUS, A., NEWTON, W., STOREY, J. & WHITE, J. 2011. Identifying the health and well-being benefits of recreational fishing. *Report No. 2011/217*. Melbourne: Curtin University of Technology, Centre of Excellence for Science, Seafood & Health (CoESSH).
- MOWATT, R. A. & BENNETT, J. 2011. Veteran stories, PTSD effects and therapeutic fly-fishing. *Therapeutic Recreation Journal*, 45, 286-308.
- MURPHY, J. J., OCHWADA-DOYLE, F. A., WEST, L. D., STARK, K. E. & HUGHES, J. M. 2021. Survey of recreational fishing in NSW, 2017/18. *Fisheries Final Report Series | No. 158*. Nelson Bay: NSW Department of Primary Industries.
- NEWTON, W. & MCMANUS, A. 2011. Consumption of fish and Alzheimer's Disease. *The journal of nutrition, health & aging*, 15, 551.
- NSW MARINE ESTATE MANAGEMENT AUTHORITY 2018. NSW Marine Estate Management Strategy 2018–2028. Sydney: Marine Estate Management Authority.
- PRETTY, J., PEACOCK, J., HINE, R., SELLENS, M., SOUTH, N. & GRIFFIN, M. 2007. Green exercise in the UK countryside: Effects on health and psychological well-being, and implications for policy and planning. *Journal of Environmental Planning and Management*, 50, 211-231.
- VAN PUTTEN, I. E., JENNINGS, S., HOBDAV, A. J., BUSTAMANTE, R. H., DUTRA, L. X., FRUSHER, S., FULTON, E. A., HAWARD, M., PLAGÁNYI, É. & THOMAS, L. J. M. P. 2017. Recreational fishing in a time of rapid ocean change. 76, 169-177.
- WAITT, G., VOYER, M. & FONTAINE, C. 2020. Recreational fishing and citizenship: a sensory ethnography of fishermen with Asian ancestry, Sydney, Australia. *Gender, Place & Culture*, 1-23.
- WEST, L. D., K. E. STARK, J. J. MURPHY, LYLE, J. M. & OCHWADA-DOYLE, F. A. 2015. Survey of Recreational Fishing in New South Wales and the ACT, 2013/14. . Wollongong.
- WHITE, D. D. 2008. A structural model of leisure constraints negotiation in outdoor recreation. . *Leisure Sciences*, 30, 342 - 359.
- WIGHTMAN, R., SUTTON, S., MATTHEWS, B. E., GILLIS, K., COLMAN, J. & SAMUELSEN, J.-R. 2008. Recruiting New Anglers: Driving Forces, Constraints and Examples of Success. *Global Challenges in Recreational Fisheries*.
- YOUNG, M. A. L., FOALE, S. & BELLWOOD, D. R. 2016. Why do fishers fish? A cross-cultural examination of the motivations for fishing. *Marine Policy*, 66, 114-123.

Appendix B Evidence Tables to Support the Risk Assessment (ANCORS)

Cell no.	Consequence (C)	Likelihood (L)	Overall risk rating (CxL)	Justification narrative/evidence	Confidence A, L, I	Spatial extent Local -Regional	Temporal 1-2, 10, 20 years	Trend: Decreasing Stable, Increasing
1	Moderate	Almost certain	Moderate	Conflict between recreational fishing and other sectors, and within recreational fishing sub-groups, relating to resource access and use Inter sectoral - Recreational fishing sector and Commercial fishing sector There is a range of literature that suggests that recreational fishing is conflicting with other sectors (Kearney, 2002; Voyer et al., 2017), especially commercial fishers, often through active campaigns by recreational fishing groups to restrict or ban fishing access for commercial fishers such as net free zones, and recreational fishing only areas (for example recreational fishing havens) (Momtaz and Gladstone 2008; Boucquey 2017; Voyer et al., 2017, Brown, 2016). The consequences of this stressor on safety, health and wellbeing are <i>moderate</i> due to major impacts on a local scale, and measurable impacts more broadly across all regions for one sector (commercial fishers). Consequences listed in the Statewide TARA which are relevant to recreational fishing include: Implications on mental and physical health of commercial fishers (<i>Statewide TARA</i>). This is supported by existing literature. E.g. Voyer et al. (2016), and King et al. (2015) highlighted the significant mental health impacts of commercial fishers who feel besieged by ongoing campaigns against them. In Australia, nearly 23% of commercial fishers surveyed experienced high or very high levels of psychological distress, compared to less than 12% in the general population (King et al., 2021). Momtaz and Gladstone (2008) identified a loss of lifestyle, identity and pride among NSW estuary fishermen due to recreational fishing havens, that were not necessarily mitigated by simply finding another source of employment. (<i>Literature</i>) Additional consequences that are not listed in the state-wide TARA include: - Brown (2016) highlighted a range of socio-economic impacts of commercial fishing closures for recreational fishing included a loss of access to local seafood to consumers and loss of livelihoods. (<i>Literature</i>) - Safety: anecdotal reports of physical threats assaults and intimidations between competing sectors or between individuals within a sector and links between high value resources (esp. abalone) and organised crime (expert opinion) (Statewide TARA 1) - Social media has the potential to exacerbate and further polarise existing conflicts within the community and has been found in other contexts to create an ‘echo chamber’ in which opinions can become entrenched and	Adequate	All regions	10 years	Increasing

				radicalised (Bail et al., 2018, Cinelli et al., 2021). This can lead to increased incidences of bullying and intimidation (trolling) of stakeholders with alternative, or more moderate opinions. This has significant implications for community cohesion and harmony. - Social media campaigns by recreational fishers have become an increasing feature of fisheries management. Social media campaigns by recreational fishers have become an increasing feature of fisheries management. For example, the infamous ‘super trawler’ campaign, undertaken by recreational fishing (and conservation) groups, overturned Government licencing decisions (Tracey et al., 2013). (<i>Literature</i>). More recently, the ‘Stop the Lockout’ campaigns by recreational fishing groups lobbied against a proposal for the Hawkesbury Shelf Marine Park illustrating the increasing role and use of social media in influencing fisheries and Marine Estate management. (Expert advice). The likelihood of this consequence is <i>almost certain</i>, given the Statewide TARA which considered these impacts to be happening with sufficient frequency and regularity to justify consideration at a state wide spatial scale and additional evidence of likelihood that is not listed in the state-wide TARA including: - lobbying campaigns, which have been a feature of state elections in NSW, Queensland and Victoria over the last decade or more, as well as stated objectives of recreational fishing lobby groups to further restrict commercial fishing in a number of inshore and estuarine areas across the state (<i>Expert advice, online news sources, election campaign material/position statements e.g. https://www.rfansw.com.au/nsw-state-election-2019/</i>) Overall risk rating: Moderate				
2	Moderate	Almost certain	Moderate	Conflict between recreational fishing and other sectors, and within recreational fishing sub-groups, relating to resource access and use Inter sectoral - Recreational fishing sector and Commercial fishing sector There is a range of literature that suggests that recreational fishing is conflicting with other sectors, especially commercial fishers, often through active campaigns by recreational fishing groups to restrict or ban fishing access for commercial fishers such as net free zones, and recreational fishing only areas (for example recreational fishing havens) (Voyer et al., 2017, Brown, 2016). The consequence of this stressor on socialising and sense of community is common across each of the state regions. While highly localised and sectoral (rather than community wide) these issues were considered to be of a <i>moderate</i> consequence because they may have a measurable negative impact and occur with sufficient frequency and regularity to justify consideration at a state wide spatial scale. Consequences listed in the Statewide TARA which are relevant to recreational fishing include: Increasing feelings of marginalisation occurring within the NSW commercial fishing industry as a result of poor relationships with some sections of the community, including ongoing lobbying throughout the state to have areas closed to commercial fishing (<i>Statewide TARA</i>). This is supported by existing literature as indicated in cell 1a. (<i>Literature</i>)	Adequate	All regions	10 years	Increasing

				- There are also various examples from DPI concerning conflicts between commercial and recreational fishers, including recent examples such as a commercial fisher attempting to gain access to a north coast RFH, recreational fishers complaining about impacts of commercial netting at north coast creek and a recreational fisher struggling to access a south coast estuary due to commercial fishers blocking the boat ramp with vehicles and trailers for extended periods of time. There are many briefings received on similar issues over the years and these issues are regularly discussed at ministerial advisory councils (<i>Literature, Departmental reports, expert advice</i>). The likelihood of this consequence is <i>almost certain</i>, given the Statewide TARA which considered these impacts to be happening with sufficient frequency and regularity to justify consideration at a state wide spatial scale and additional evidence of likelihood that is not listed in the state-wide TARA including: - lobbying campaigns as outlined in cell 1a (<i>Expert advice, online news sources, election campaign material/position statements e.g. https://www.rfansw.com.au/nsw-state-election-2019/</i>) Overall risk rating: Moderate				
3	Insignificant	Rare	Minimal	Conflict between recreational fishing and other sectors, and within recreational fishing sub-groups, relating to resource access and use Inter sectoral - Recreational fishing sector and Commercial fishing sector There is a range of literature that suggests that recreational fishing is conflicting with other sectors, especially commercial fishers, often through active campaigns by recreational fishing groups to restrict or ban fishing access for commercial fishers such as net free zones, and recreational fishing only areas (for example recreational fishing havens) (Voyer et al., 2017, Brown, 2016). The consequences of this stressor on enjoying biodiversity and beauty of marine estate is <i>insignificant</i> as impacts are considered to be <i>minor</i> at a local scale in one or several localities in a region. There are no consequences listed in the Statewide TARA which are relevant to recreational fishing conflict with commercial fishing. The likelihood of this consequence is <i>rare</i> as there have been no reports of these consequences. Overall risk rating: Minimal	Limited	All regions	10 years	Increasing

4	Major	Possible	Moderate	Conflict between recreational fishing and other sectors, and within recreational fishing sub-groups, relating to resource access and use Inter sectoral - Recreational fishing sector and Commercial fishing sector There is a range of literature that suggests that recreational fishing is conflicting with other sectors, especially commercial fishers, often through active campaigns by recreational fishing groups to restrict or ban fishing access for commercial fishers, net free zones and recreational fishing only areas (Voyer et al., 2017, Brown, 2016). The consequences of this stressor on consumptive use (extracting) was considered to have <i>major</i> consequences for the commercial sector. Its consequence was moderate in the Statewide TARA and included the following reasoning: - Both sectors believe the actions of the other results in decline in their consumptive use values – recreational fishers consider commercial extraction to be impacting their catches which influences them to lobby for closures or further restrictions in commercial fishing. If successful, this has the potential to limit the ability of the industry to supply seafood markets despite widespread consumer demand for local seafood and bait products. This priority benefit was also similar across the North. The NSW Marine Estate Community Survey results highlighted that the NSW general population values the variety of seafood to catch and eat (34%). This priority benefit was also similar across the North East, Central and South East regions. (<i>Statewide TARA</i>) Additional consequences that are not listed in the state-wide TARA include: - Commercial production by weight according to ABARES, commercial fishing and aquaculture production by weight was 15,911 tonnes in all NSW state fisheries in 2017-18 and 29,579 tonnes when Commonwealth catch in NSW is included (Steven et al. 2020). - The recreational catch was measured in numbers of fish for the year 2000, the recreational catch in NSW not being estimated by weight (Henry and Lyle 2003). - The NSW Statewide recreational fishing catch by numbers is estimated by West et al. (2015) and again by Murphy et al. (2021) “Overall, the total recreational catch was estimated to be 9,336,314 individual organisms, with half (51%) being kept and the remainder (49%) released. Large fish (scale fish, sharks and rays) dominated the total catch, accounting for 69% of the total numbers (6,466,978), followed by prawns and yabbies (1,820,875), small fish used primarily as bait (485,635), crabs & lobsters (217,677), molluscs (148,637), cephalopods (135,957), worms (54,046) and other taxa (such as sea urchins and cunjevoi, 6,509). Among the saltwater finfish species, Bream was the most common species/group caught by RFL households, with an estimated total catch of 944,288 individuals. Dusky Flathead accounted for a similar total (886,749), followed by Sand Flathead (648,602) Snapper (451,427), Sand Whiting (340,783) and Tailor (227,200). Yellowtail Scad (238,626) dominated the total catch among small baitfish”. Murphy et al. (2021) “The non-fish species component of the total catch was dominated by crustaceans and in particular, the small species primarily used for bait such as Ghost Nippers (700,810), followed by Freshwater Shrimp (468,314), Saltwater Prawns (328,698) and Freshwater Yabbies (280,681). For larger crustaceans, Mud Crabs (111,425) dominated the total catch, followed by Blue Swimmer Crabs (84,000), Murray Crayfish (42,373), other crab species (11,513) and Rock Lobsters (10,329). Excluding key bait species, such as Pipis	Adequate	All regions	10 years	Increasing
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		(144,296) and Beach Worms (54,046), the remainder of the non-finish species catch was mainly the various species of cephalopod including squids (116,485) and Southern Calamari (15,247)” Murphy et al. (2021). - The most relevant assessment of the potential “overlap” between recreational and commercial catch is for the catch of some finfish species reported in West et al. (2015) and Murphy et al. 2021). It is noted that recreational catch sometimes exceeds commercial catch but only takes 13-14% by weight of total catch (Murphy et al. (2021). Table of estimated recreational and commercial catches for finfish species in NSW 2017-18. (Source: Murphy et al. 2021. <table><tr><th>Species</th><th>Recreational catch (tonnes)</th><th>Commercial catch in (tonnes)</th><th>Total catch (tonnes)</th><th>Recreational catch %</th></tr><tr><td>Dusky Flathead</td><td>190</td><td>124</td><td>314</td><td>60.4%</td></tr><tr><td>Sand Flathead</td><td>129</td><td>135</td><td>265</td><td>48.8%</td></tr><tr><td>Yellowtail Kingfish</td><td>129</td><td>93</td><td>222</td><td>58.1%</td></tr><tr><td>Bream</td><td>124</td><td>265</td><td>388</td><td>31.8%</td></tr><tr><td>Snapper</td><td>107</td><td>176</td><td>283</td><td>37.8%</td></tr><tr><td>Mulloyay</td><td>90</td><td>72</td><td>162</td><td>55.5%</td></tr><tr><td>Australian Salmon</td><td>83</td><td>851</td><td>934</td><td>8.9%</td></tr><tr><td>Tailor</td><td>49</td><td>88</td><td>137</td><td>35.9%</td></tr><tr><td>Blue Mackerel</td><td>41</td><td>393</td><td>434</td><td>9.5%</td></tr><tr><td>Sand Whiting</td><td>34</td><td>78</td><td>112</td><td>30.0%</td></tr><tr><td>Luderick</td><td>30</td><td>241</td><td>272</td><td>11.2%</td></tr><tr><td>Yellowtail Scad</td><td>30</td><td>438</td><td>468</td><td>6.4%</td></tr><tr><td>Morwong, Grey</td><td>22</td><td>25</td><td>46</td><td>47.0%</td></tr><tr><td>Blue Swimmer Crab</td><td>14</td><td>94</td><td>108</td><td>13.1%</td></tr><tr><td>Silver Trevally</td><td>8</td><td>70</td><td>79</td><td>10.8%</td></tr><tr><td>Ghost Nipper</td><td>2</td><td>4</td><td>6</td><td>31.4%</td></tr></table> (Government department and Literature) The Statewide TARA considered the likelihood of this consequence to be influenced by the regulations and management arrangements implemented to mitigate resource conflict between all marine estate sectors rating it (moderate * possible = low) (Statewide TARA 4). The specific impacts of recreational conflict with commercial fishers is considered slightly higher. - Whilst recreational fish catches for some species are on par or greater than commercial catch (Murphy et al. al 2021), at present there is no evidence that this is substantially impacting on the catches of commercial	Species	Recreational catch (tonnes)	Commercial catch in (tonnes)	Total catch (tonnes)	Recreational catch %	Dusky Flathead	190	124	314	60.4%	Sand Flathead	129	135	265	48.8%	Yellowtail Kingfish	129	93	222	58.1%	Bream	124	265	388	31.8%	Snapper	107	176	283	37.8%	Mulloyay	90	72	162	55.5%	Australian Salmon	83	851	934	8.9%	Tailor	49	88	137	35.9%	Blue Mackerel	41	393	434	9.5%	Sand Whiting	34	78	112	30.0%	Luderick	30	241	272	11.2%	Yellowtail Scad	30	438	468	6.4%	Morwong, Grey	22	25	46	47.0%	Blue Swimmer Crab	14	94	108	13.1%	Silver Trevally	8	70	79	10.8%	Ghost Nipper	2	4	6	31.4%				
Species	Recreational catch (tonnes)	Commercial catch in (tonnes)	Total catch (tonnes)	Recreational catch %																																																																																							
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Silver Trevally	8	70	79	10.8%																																																																																							
Ghost Nipper	2	4	6	31.4%																																																																																							

				operators. Instead the main way in which this impact is being felt is through campaigns by recreational fishers to have areas closed to commercial fishing. This impact is largely concentrated on inshore, estuary general fishers in popular waterways along the NSW coast (<i>Literature, Departmental reports, expert advice</i>) Share management fisheries, broadly introduced in 2007, gave NSW commercial fishers improved security of access to the resource. More recently, in 2017, the NSW Government's Commercial Fisheries Business Adjustment Program (BAP) introduced linkages between shares and catch or effort, to provide greater certainty and ensure the long-term viability and sustainability of the NSW commercial fishing industry. There is also currently a Business Efficiency Program underway that is reviewing existing commercial fisheries regulations that, following the BAP process, are considered no longer necessary and continue to impede business efficiency. All of these programs have been put in place after 2002 (when the RFHs were implemented) and provide improved viability and greater security for the NSW commercial fishing sector. It should also be noted that despite there being representations to government from time to time for more RFHs, no new RFHs have been introduced in over 19 years (Departmental statement). Given that inter sectoral conflict is not a new issue and that long term management policy has provided commercial fishers with secure "use rights", the likelihood of recreational fishing impacting existing long term management arrangements that impact the consumptive use benefits accruing to users of the marine estate is considered <i>possible</i>. Overall risk rating: Moderate				
5	Minor	Likely	Low	Conflict between recreational fishing and other sectors, and within recreational fishing sub-groups, relating to resource access and use Inter sectoral - Recreational fishing sector and Commercial fishing sector There is a range of literature that suggests that recreational fishing is conflicting with other sectors, especially commercial fishers, often through active campaigns by recreational fishing groups to restrict or ban fishing access for commercial fishers such as net free zones, and recreational fishing only areas (for example recreational fishing havens) (Voyer et al., 2017, Brown, 2016). The consequences of this inter-sectoral Recreational fishing and Commercial fishing conflict on Intrinsic and bequest values (economic intrinsic value) are <i>minor</i> given they are discernible, temporary impacts at a regional scale. This may be some moderate impacts at a local scale. The intrinsic benefit of the marine estate was identified as one of the most important economic benefits identified in the Marine Estate Community Survey [1]. Conflict between sectors diminishes the intrinsic and bequest values held by people, although given these incidents are highly localised, the consequence at a community-wide scale is expected to be only minor. See examples of conflict over resource use provided in justification for instances that could impact intrinsic values (<i>Statewide TARA 6</i>).	Limited	All regions	10 years	Stable

				Safety: anecdotal reports of physical threats assaults and intimidations between competing sectors or between individuals within a sector and links between high value resources (esp. abalone) and organised crime (expert opinion) (<i>Statewide TARA 1</i>) Additional consequences that are not listed in the state-wide TARA include: Anecdotal reports from DPI indicate fishing competitions by recreational fishers have caused concern around localised depletion of resources and conflicts over access within local communities in the past (2000-2010's). (<i>Departmental reports and social media reports</i>) The likelihood of this consequence is <i>likely</i>, due to the following reasons: Recreational fishing takes place throughout a wide range of different coastal locations where there are commercial fishing operations and may <i>Likely</i> impact other marine estate users. Overall risk rating: Low				
6	Major	Possible	Moderate	Conflict between recreational fishing and other sectors, and within recreational fishing sub-groups, relating to resource access and use Inter sectoral - Recreational fishing sector and Commercial fishing sector There is a range of literature that suggests that recreational fishing is conflicting with other sectors, especially commercial fishers, often through active campaigns by recreational fishing groups to restrict or ban fishing access for commercial fishers, net free zones, recreational fishing havens and recreational fishing only areas (Voyer et al., 2017, Brown, 2016). Such initiatives are a risk to the commercial fishing industry which provides substantial economic benefits to NSW and community employment. The consequences of inter-sectoral Recreational fishing and Commercial fishing conflict on the value of production and employment in marine estate businesses may have a <i>major</i> consequence at a regional scale. Resource use conflict can have impacts on the viability of businesses (e.g. commercial fishing vs. recreational fishing will impact the viability of commercial fishers and businesses that support recreational fishers). These impacts have the potential to be significant for a given user group. Extractive industries which negatively impact the marine estate by disturbing habitats or removing environmental assets could also negatively impact on other businesses such as tourism operators. However, the net economic impact of such activities may not necessarily be negative (i.e. the economic benefits of additional extraction could equal or outweigh the lost economic benefits from tourism activities). (<i>Statewide TARA 7</i>) Additional consequences that are not listed in the state-wide TARA include:	Limited	All regions	10 years	Increasing

				Recent data on the value of commercial fisheries and aquaculture production to the NSW economy including employment indicates the flow of benefits from commercial fishing activity in the NSW marine estate that could be impacted or disrupted: • The Gross Value of Production (GVP) of State and Commonwealth fisheries, aquaculture and processing NSW in 2017-18 was \$323m. There was \$98m from managed fisheries, \$55m Commonwealth fisheries \$77 in NSW aquaculture and \$93m in processing (FRDC 2019). The total fishery Gross Value Added (GVA) was \$374m, of which \$130 m is generated by fishing and aquaculture, \$46m by associated seafood processing activities and \$198m generated by flow-on business activity in other sectors of the economy and \$28m associated with processing indirectly in other states (FRDC 2019, See also Voyer et al. 2016). • In 2017/18 this activity provided 3,530 full time equivalent jobs (FTE), of which 1,672 were in fisheries and aquaculture, 462 in associated seafood processing and 1,396 FTE jobs as flow on in other sectors and 193 FTE associated with processing indirectly in other states (FRDC 2019). The associated Household Income, (wages, salaries, drawing etc.) were \$230m in total, with \$76m income from fishing and aquaculture and \$25m in seafood processing with \$129 in other businesses associated with fisheries and aquaculture and \$15m associated with processing in other states (FRDC 2019, See also Voyer et al. 2016). (<i>Literature</i>) • Share management fisheries, broadly introduced in 2007, gave NSW commercial fishers improved security of access to the resource. More recently, in 2017, the NSW Government's Commercial Fisheries Business Adjustment Program (BAP) introduced linkages between shares and catch or effort, to provide greater certainty and ensure the long-term viability and sustainability of the NSW commercial fishing industry. There is also currently a Business Efficiency Program underway that is reviewing existing commercial fisheries regulations that, following the BAP process, are considered no longer necessary and continue to impede business efficiency. All of these programs have been put in place after 2002 (when the RFHs were implemented) and provide improved viability and greater security for the NSW commercial fishing sector. It should also be noted that despite there being representations to government from time to time for more RFHs, no new RFHs have been introduced in over 19 years (<i>Departmental statement</i>). Given that inter sectoral conflict is not a new issue and that long term management policy has provided commercial fishers with secure "use rights", the likelihood of recreational fishing impacting existing long term management arrangements that impact the production and employment benefits accruing to users of the marine estate is considered <i>possible</i>. Overall risk rating: Moderate				
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7	Moderate	Likely	Moderate	Conflict between recreational fishing and other sectors, and within recreational fishing sub-groups, relating to resource access and use Inter sectoral - Recreational fishing sector and Commercial fishing sector There is a range of literature that suggests that recreational fishing is conflicting with other sectors, especially commercial fishers, often through active campaigns by recreational fishing groups to restrict or ban fishing access for commercial fishers such as net free zones, and recreational fishing only areas (for example recreational fishing havens) (Voyer et al., 2017, Brown, 2016). The consequences of this inter-sectoral Recreational fishing and Commercial fishing conflict on Individual enjoyment value (consumer surplus) are <i>moderate</i> given they are discernible, temporary impacts at a regional scale or moderate at a local scale. Conflict over resource use will diminish direct values where people are unable to access or enjoy the marine estate. For instance, conflict between competing sectors may make recreational (only) fishing areas more threatening for people to visit, thereby diminishing their enjoyment value. Groups that are marginalised or isolated as a result of conflict over resource use are also likely to see their direct use benefits diminished (<i>Statewide TARA 8</i>) Additional consequences that are not listed in the state-wide TARA include: • Those using the marine estate enjoy benefits not captured in market prices. Consumers have a willingness to pay for seafood available at a market price, where the consumer surplus is the difference, reflecting their enjoyment in consumption. This has not been estimated in total for NSW commercially produced fish, but a recent study of Sydney Fish Market found that many of the quota species sold at market prices had consumer surplus for those purchasing (Pascoe et al. 20121). Should access to commercial fishing be reduced, the public would be impacted through loss of fish and the associated consumer surplus representing the enjoyment derived from eating seafood. There are no current evaluations of the extent of gains and losses in consumer surplus from different degrees of recreational fishing and commercial fishing access. • Fresh fish is also recognised as providing health benefits, which are a form of consumer surplus, as well as contributing to food supply (Sharpless and Evans 2013) with a willingness to pay for the local seafood experience (Voyer et al. 2016). (<i>Literature</i>) • Anecdotal reports from DPI indicate fishing competitions and harvesting of large fish by recreational fishers have caused concern around localised depletion of resources and conflicts over access within local communities in the past (2000-2010's). (<i>Departmental reports and social media reports</i>) The likelihood of this consequence is <i>likely</i>, due to the following reasons: Recreational fishing takes place in a range of different coastal locations where there are commercial fishing operations and may Likely impact other marine estate users. Overall risk rating: Moderate	Limited	All regions	10 years	Stable
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8	Minor	Likely (C) Possible (N, S)	Low (C) Minimal (N, S)	Conflict between recreational fishing and other sectors, and within recreational fishing sub-groups, relating to resource access and use Inter sectoral – Recreational fishing sector and other passive and recreational user groups Conflict is also known to occur between recreational fishing and other recreational activities (boats, swimming and tourism) with aquaculture or passive users appreciating the marine estate. The consequences of this stressor on safety, health and wellbeing are <i>minor</i> as impacts are considered to be moderate at a local scale in one or several localities in a region. Consequences listed in the Statewide TARA which are relevant to recreational fishing include: • Safety, relating to physical altercations and disputes (<i>Statewide TARA 1 & 9</i>). • The following activities groups or industries were noted in the NSW marine estate: Recreation, Recreational fishing, Recreational boating, Research and education, Conserving heritage and the environment, Cruise shipping, Ports and shipping, Boating – commercial and charter, Water transport services, Maritime related activities, Tourism and accommodation, Coastal urban settlement, Commercial fishing, Aquaculture, Retail and trade and extractive and disposal industries (see Vanderkooi 2015). Additional consequences that are not listed in the Statewide TARA include: • Whilst considered to be only occasional in nature, the DPI have noted anecdotal reports of conflict between spear and line fishers and swimmers raising safety concerns. Incidences around Sydney suburbs - Bondi Beach, Little Bay, Clovelly Bay, Balmoral as well as isolated cases elsewhere including Jervis Bay. This impacts safety through potential injury to swimmers from mishandled spear guns and entanglements with fishing lines. (<i>Departmental reports</i>). • A modelling process in Sydney Harbour identified hotspots of boat and shore fishing that could represent areas of user-user, user-regulator or user-environment conflict. Drawing from that, even at the region of a waterway, potential for conflict is not spatially uniform (Griffin et al. 2021). (<i>Departmental reports, Literature, social media reports, expert advice</i>). • Damage may be caused to fixed aquaculture structures by vessels and shade cloth covering oysters can be snagged by hooks and lures. Work health and safety issues for farm labourers when hooks and line are left in aquaculture structures (<i>Departmental advice</i>). According to the Transport for NSW licence data base, 145,138 vessels were registered with the anticipation that they will be used for recreational fishing out of a total of 240,040. Thus 60.5 % of licensee's have indicated that they will use their newly registered vessel for recreational fishing (<i>Government data -Transport for NSW</i>). • Transport for NSW, Maritime in the last year (June 2020-21) received 10 complaints per month from the public about recreational fishing and Sydney ferry wharf cleanliness (<i>Transport for NSW</i>). The likelihood of this consequence is <i>likely</i> for Central region based on evidence above and increased likelihood in metropolitan areas and <i>possible</i> for North and South regions. This is consistent with the Statewide TARA. Overall risk rating: Low (C), Minimal (N&S)	Limited	All regions	10 years	Stable
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9	Moderate	Likely	Moderate	Conflict between recreational fishing and other sectors, and within recreational fishing sub-groups, relating to resource access and use Inter sectoral - Recreational fishing sector and other passive and recreational user groups Conflict is also known to occur between recreational fishing and other recreational activities (boats, swimming and tourism) with aquaculture or passive users appreciating the marine estate. The consequences of this stressor on socialising and sense of community are <i>moderate</i> consequence because they may have a measurable negative impact and likely to have occur with sufficient frequency and regularity to justify consideration at a statewide spatial scale. Consequences listed in the Statewide TARA which are relevant to recreational fishing include: - Safety, relating to physical altercations and disputes (<i>Statewide TARA</i>). Additional consequences that are not listed in the state-wide TARA include: - Conflict between different recreational fishers and members of the community who prioritise wilderness style or no take modes of protection, including other users (scuba divers, snorkelers) who benefit from no take zone (Voyer et al., 2013) due to ongoing campaigns to prevent or overturn existing MPAs (<i>Literature and Expert opinion</i>). - Conflict between anglers and divers is recorded from a part of the Jervis Bay Marine Park but was identified as highly localised and able to be mitigated (Lynch et al., 2004). - Most interactions between recreational fishers and aquaculture operators are positive, however there are a limited number of recreational fishers that cause negative interactions (<i>Departmental reports</i>). “Relationships between oyster farmers and recreational fishers, however, are not always cordial; many of our interviewees mentioned that boaters sometimes damage equipment on the oyster leases”. (Barclay et al. 2016). (<i>Literature</i>). The likelihood of this consequence is <i>likely</i>. These impacts appear to be happening with sufficient frequency and regularity to justify consideration at a statewide spatial scale. Evidence of likelihood includes: - Voyer (2014) found a number of examples in which considerable rifts had formed within the Batemans and Port Stephens Marine Park catchment areas in relation to disputes over no take zone (<i>Literature</i>) - Social media campaigns over ‘Stop the Lockouts’ displayed evidence of conflict between different sections of the community over no take MPAs, but are subjective in nature (<i>Social media and Departmental reports</i>) - lobbying campaigns as outlined previously (<i>Online news sources, election campaign material/positions statements e.g. https://www.rfansw.com.au/nsw-state-election-2019/</i>) Overall risk rating: Moderate	Adequate	All regions	10 years	Increasing
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10	Moderate	Almost certain	Moderate	Conflict between recreational fishing and other sectors, and within recreational fishing sub-groups, relating to resource access and use Inter sectoral - Recreational fishing sector and other passive and recreational user groups Conflict is also known to occur between recreational fishing and other recreational activities (boats, swimming and tourism) with aquaculture or passive users appreciating the marine estate. The consequences of this stressor on enjoying biodiversity and beauty of marine estate are <i>moderate</i> consequence at a regional scale as the impacts may be major at a local scale in one or several localities in a region. Consequences listed in the Statewide TARA which are relevant to recreational fishing include: - Conflict over resource use and access may impact enjoyment and appreciation of biodiversity if members of the community believe that beauty or biodiversity values are declining as a result of the actions of a particular sector or user group. For example, divers/passive users may feel that their enjoyment and appreciation is impacted by extractive users (e.g. divers and impacts of fishing in Sweeney report, also known as the Marine Estate Community Survey) (<i>Statewide TARA</i>). - This is supported in the literature from around the world. In NSW Voyer et al. (2013) drew attention to the ways in which values will influence how different sections of the community value the marine estate. This study highlighted how the values of some sections of the community align with a ‘no take’ model of conservation whilst others are more inclined to support sustainable use models of protection. These values can come into conflict particularly in relation to recreational fishing and MPAs. In addition, Voyer’s doctoral research indicated that conservation management (especially marine parks) can come into conflict with existing recreational fishing uses and this can impact on the social acceptability of both MPAs and recreational fishing (depending on the value systems involved), cause conflict and division within the community and exacerbate existing tensions between users (Voyer et al., 2015). (<i>Literature</i>) - Recent campaigns by the recreational fishing sector to block new MPAs and campaign for repeal of regulations in some existing MPAs is likely to further exacerbate these tensions and lead to a diminished sense of confidence in the effectiveness of biodiversity conservation measures amongst users who prioritise no take protection. In addition, users who enjoy snorkelling and SCUBA diving may have diminished experiences if previously protected areas are opened to recreational fishing (<i>Expert opinion</i>) Additional consequences that are not listed in the state-wide TARA include: - Concerns around animal welfare and the impacts of fishing practices on the natural environment. There has been very limited research into the extent to which animal welfare concerns are associated with recreational fishing. However, DPI has received anecdotal evidence of recreational targeting of large stingrays at jetties and boat ramps on the south coast of NSW, causing angst within the community. In addition, community concerns in relation to overfishing or overharvesting are often raised in a number of contexts, including recently significant community concern in relation to overharvesting cockles in Lake Illawarra with reports of groups of people and families travelling from western Sydney to intensively harvest cockles from the lake. (<i>Departmental reports</i>)	Adequate	All regions	10 years	Increasing
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			- Fishing competitions that have had a large number of competitors participating in the “catch and keep” fishing competition format have resulted in localised community issues – mostly occurred in 2000s and 2010s. (<i>Departmental reports</i>) The likelihood of these consequence are <i>almost certain</i>. These impacts appear to be happening with sufficient frequency and regularity to justify consideration at a state wide spatial scale. Evidence of likelihood includes: - Voyer (2014) found a number of examples in which considerable rifts had formed within the Batemans and Port Stephens Marine Park catchment areas in relation to disputes over no take zone (<i>Literature</i>) - Social media campaigns over ‘Stop the Lockouts’ displayed evidence of conflict between different sections of the community over no take MPAs and included examples of bullying, intimidation and trolling occurring between the groups (<i>Social media and Departmental reports</i>) - lobbying campaigns as outlined in cell 1a (<i>Online news sources, election campaign material/positions statements e.g. https://www.rfansw.com.au/nsw-state-election-2019/</i>) Overall risk rating: Moderate				
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11	Minor	Possible	Minimal	Conflict between recreational fishing and other sectors, and within recreational fishing sub-groups, relating to resource access and use Inter sectoral - Recreational fishing sector and other passive and recreational user groups Conflict is also known to occur between recreational fishing and other recreational activities (boats, swimming and tourism) with aquaculture or passive users appreciating the marine estate. The consequences of this stressor on consumptive use (extracting) is <i>minor for aquaculture and insignificant for other groups</i>, as most other groups are not directly extractive. There are no consequences listed in the Statewide TARA which are relevant to recreational fishing conflict with other non-extractive user groups. Additional consequences that are not listed in the state-wide TARA include: • Aquaculture operators holding oyster leases find damage and experience theft issues from boat users, and other persons, including recreational fishers. Recreational fishers may set traps in aquaculture lease areas causing access issue for growers. • DPI have created education and advisory information to address impacts on the aquaculture sector with messaging including: Not mooring on lease infrastructure and avoiding damage if fishing around aquaculture leases; Avoiding snagging lures on aquaculture infrastructure; Avoiding disposing of anything overboard as the oyster industry requires high water quality and no human pathogens e.g. sewage; and damage caused by wakes from any boats going too fast ((<i>Departmental reports</i>)). The likelihood of this consequence is <i>possible</i> for aquaculture and <i>rare</i> for other passive users as there have been no reports of these consequences. Overall risk rating: Minimal	Limited	All regions	10 years	Stable
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12	Minor	Likely	Low	Conflict between recreational fishing and other sectors, and within recreational fishing sub-groups, relating to resource access and use Inter sectoral - Recreational fishing sector and other passive and recreational user groups Conflict is also known to occur between recreational fishing and other recreational activities (boats, swimming and tourism) with aquaculture or passive users appreciating the marine estate. The consequences of intra sectoral conflict on value of intrinsic and bequest values are <i>minor</i> as they are discernible, temporary negative impacts at a regional scale with some moderate impacts at a local scale. The Marine Estate Community Survey results identified danger to swimmers from watercraft as the third priority social threat for the NSW general population (31%) and the South East (36%) region. Intercept survey participants in Hawkesbury / Pittwater shared this third priority (23%). Impacts of fishing on snorkelling and Scuba diving were identified as a lower priority threat [1]. (<i>Statewide TARA 1</i>) Additional consequences that are not listed in the Statewide TARA include: _The DPI have provided anecdotal reports of conflict between spear and line fishers and swimmers around Sydney suburbs - Bondi Beach, Little Bay, Clovelly Bay, Balmoral as well as isolated cases elsewhere including Jervis Bay. (<i>Departmental advice and social media reports</i>) The likelihood of this consequence is <i>likely</i>, due to the following reasons: Recreational fishing takes place in area used by other sectors and may <i>Likely</i> impact other marine estate users leading to impacts on intrinsic values. Overall risk rating: Low	Limited	All regions	20 years	Stable
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13	Moderate	Likely	Moderate	Conflict between recreational fishing and other sectors, and within recreational fishing sub-groups, relating to resource access and use Inter sectoral - Recreational fishing and other passive and recreational user groups Conflict is also known to occur between recreational fishing and other recreational activities (boats, swimming and tourism) with aquaculture or passive users appreciating the marine estate. The consequences of this stressor on value of production and employment are <i>moderate</i> given they are discernible, temporary negative impacts at a regional scale with some moderate impacts at a local scale. Resource use conflict can have impacts on the viability of businesses. For example, recreational fishing may impact the viability of commercial diving and tourism businesses in the Marine Estate. Extractive industries which negatively impact the marine estate by disturbing habitats or removing environmental assets could also negatively impact on other businesses such as tourism operators. (<i>Statewide TARA 7</i>) (RF is an extractive use). Additional consequences that are not listed in the Statewide TARA include: • DPI have provided anecdotal reports of conflict between spear and line fishers and swimmers around Sydney suburbs - Bondi Beach, Little Bay, Clovelly Bay, Balmoral as well as isolated cases elsewhere including Jervis Bay (<i>Departmental reports</i>). • Aquaculture operators holding oyster leases find damage and experience theft issues from boat users, including recreational fishers. Recreational fishers may set traps in aquaculture lease areas causing access issue for growers. Aquaculture is impacted by pollution effects from recreational boating and fishing, such as plastic, human waste, and wash down of vessels. (<i>Departmental reports and social media reports</i>) • DPI have created education and advisory information to address impacts on the aquaculture sector with messaging including: Not mooring on lease infrastructure and avoiding damage if fishing around aquaculture leases; Avoiding snagging lures on aquaculture infrastructure; Avoiding disposing of anything overboard as the oyster industry requires high water quality and no human pathogens e.g. sewage; and damage caused by wakes from any boats going too fast (<i>Departmental reports</i>). • Transport for NSW, Maritime, in the last year (June 2020-21) received 10 complaints per month from the public about recreational fishing and Sydney ferry wharf cleanliness (<i>Transport for NSW</i>). • Concerns that the interactions between recreational fishing and the economic benefits from marine diving and snorkelers has not been studied (Leadbitter 2018). For example Leadbitter and Pollard (1983) estimate 30,000-50,000 SCUBA divers annually dived in Jervis Bay in 1983-84 spending \$1.3m. The likelihood of this consequence is <i>likely</i>, due to the following reasons: Recreational fishing takes place in area used by other sectors and may <i>Likely</i> impact businesses dependent on other marine estate users, such as tourism. Overall risk rating: Moderate	Limited	All regions	10 years	Stable
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14	Minor	Likely	Low	Conflict between recreational fishing and other sectors, and within recreational fishing sub-groups, relating to resource access and use Inter sectoral - Recreational fishing sector and other passive and recreational user groups Conflict is also known to occur between recreational fishing and other recreational activities (boats, swimming and tourism) with aquaculture or passive users appreciating the marine estate. The consequences of this stressor on Individual enjoyment value (Consumer surplus) are <i>minor</i> given they are discernible, temporary negative impacts at a regional scale with some moderate impacts at a local scale. Conflict over resource use will diminish direct values where people are unable to access or enjoy the marine estate. For instance, the perception of conflict between competing sectors may make some areas more threatening for people to visit, thereby diminishing their enjoyment value. Groups that are marginalised or isolated as a result of conflict over resource use are also likely to see their direct use benefits diminished. (<i>Statewide TARA 8</i>) Additional consequences that are not listed in the Statewide TARA include: - DPI have provided anecdotal reports of conflict between spear and line fishers and swimmers Sydney suburbs - Bondi Beach, Little Bay, Clovelly Bay, and Balmoral as well as isolated cases elsewhere including Jervis Bay. (<i>Departmental reports and social media reports</i>) - There is increasing conflict globally between recreational fishers and animal rights groups as there is a shift in pro-animal values which is most evident in urban areas (Jamieson et al., 2011; Arlinghaus et al., 2005; 2012; 2020). This conflict is particularly notable for catch and release sport fishing where about 25% of survey respondents already morally question recreational fishing for sport (Arlinghaus et al., 2012). Published research from the University of Wollongong (Wadiwel, 2019) has sought to guide animal rights activists on developing effective strategies to combat recreational fishing. - There is a loss of consumer surplus for oyster purchasers when any theft reduces commercial aquaculture production. - Recreational fishing on Sydney ferry wharfs may hinder cleaning of wharfs and cause commuter safety concerns reducing their enjoyment (<i>Transport for NSW</i>). - Pascoe (2019) estimated the consumer surplus of different types of beach goers in Sydney, NSW It found that “<i>beach use is not a homogeneous product, and the consumer surplus generated by beach use is dependent on what activities visitors undertake</i>”. Consumer surplus was found to be higher for those undertaking “beach activities” as opposed to those relaxing (Pascoe 2021). (<i>Literature Expert Advice</i>). The likelihood of this consequence is <i>likely</i>, due to the following reasons: - Recreational fishing takes place in area used by other sectors and may impact the enjoyment other less extractive marine estate users. Overall risk rating: Low	Limited	All regions	10 years	Stable
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15	Minor	Likely	Low	Conflict between recreational fishing and other sectors, and within recreational fishing sub-groups, relating to resource access and use Intra sectoral – between sub-groups of recreational fishers In addition to competition between sectors there is also evidence of intra sectoral competition amongst recreational fishers (for example line fishers and spear fishers using the same fishing grounds or competing for access to fish aggregating devices (FADs). The consequences of this stressor on safety, health and wellbeing are <i>minor</i> as impacts are considered at a regional scale and could be moderate at one or more localities in a region. Consequences listed in the Statewide TARA which are relevant to recreational fishing include: • Safety, the TARA reported anecdotal evidence of physical threats between individuals within a sector (<i>Statewide TARA</i>). Additional consequences that are not listed in the state-wide TARA include: • Conflict between different sub-groups of fishers, especially in relation to cultural and ethnically diverse communities can lead to impacts on wellbeing of members of these communities (<i>Expert opinion</i>). • Animosity towards Asian, European and Pacific Island nationalities around different conceptions of what constitutes acceptable fishing practices has been documented in a number of studies in NSW (Cadzow et al., 2010, Waite et al., 2020, Li et al., 2019, Fontaine, 2017). (<i>Literature</i>) • Interactions between sub-groups has also been reported by DPI in several instances, including invertebrate collecting across the state (<i>Departmental reports</i>) • The likelihood of this consequence is <i>likely</i>. Whilst not explicitly discussed in detail in the TARA, these impacts appear to be happening with sufficient frequency and regularity to justify consideration at a statewide spatial scale. Overall risk rating: Low	Limited	All regions (Central region, higher incidences)	10 years	Stable
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16	Moderate	Likely	Moderate	Conflict between recreational fishing and other sectors, and within recreational fishing sub-groups, relating to resource access and use Intra sectoral – between sub-groups of recreational fishers In addition to competition between sectors there is also evidence of intra sectoral competition amongst recreational fishers (for example line fishers and spear fishers using the same fishing grounds or competing for access to fish aggregating devices (FADs). The consequences of this stressor on socialising and sense of community are <i>moderate</i> consequence because they may have a measurable negative impact and occur with sufficient frequency and regularity to justify consideration at a state wide spatial scale. Consequences listed in the Statewide TARA which are relevant to recreational fishing include: - Socialising and sense of community are threatened when groups become marginalised or isolated. The TARA references conflict between different cultural groups within the community – e.g. animosity towards Asian, European and Pacific Island nationalities around different conceptions of what constitutes acceptable fishing practices. (<i>Statewide TARA</i>) Additional consequences not mentioned in the TARA include: - This is supported by the literature with Asian fishers reporting feelings of racism and marginalisation in a number of studies NSW (Cadzow et al., 2010, Waite et al., 2020, Li et al., 2019, Fontaine, 2017). (<i>Literature</i>) - The DPI has gathered anecdotal evidence that disputes over cockle harvesting in Lake Illawarra have caused tensions in that community. The community set up a local task force to address the problem. This impacts the sense of community local users hold through the perceived threat of ‘outsiders’ stealing and depleting a local resource. It also has impacts on the harvesters with reports of legitimate and legal fishers of Asian descent being targeted by community members who jump to assumptions that they are illegally fishing (<i>Departmental reports</i>). Similar ‘racial profiling’ of Asian fishers has been highlighted by Fontaine (2017) and Li et al. (2019) and can undermine community cohesion. - Conflict is also known between different subgroups of anglers. For example, between catch and release sport fishers and those that are orientated towards retaining legal catch (Aas et al., 2002; Arlinghaus, 2007) (<i>Literature and Expert Opinion</i>) - Conflict between different sub-groups of fishers in relation to modes of fishing (e.g. spearfishing vs line fishers) can lead to disputes and breakdowns in community cohesion, including cohesion and social capital within the recreational fishing community (<i>Expert opinion</i>). - Examples of community of animosity towards sub-groups of fishers (e.g. Asian, European and Pacific Island nationalities) (<i>Literature</i>) - Interactions between sub-groups has also been reported by DPI in several instances, including invertebrate collecting across the state (<i>Departmental reports</i>) - The likelihood of this consequence is <i>likely</i>. These impacts appear to be happening with sufficient frequency and regularity to justify consideration at a state wide spatial scale. Overall risk rating: Moderate	Limited	All regions, regional incidence	10 years	Stable
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17	Minor	Likely	Low	Conflict between recreational fishing and other sectors, and within recreational fishing sub-groups, relating to resource access and use Intra sectoral – between sub-groups of recreational fishers In addition to competition between sectors there is also evidence of intra sectoral competition amongst recreational fishers (for example line fishers and spear fishers using the same fishing grounds or competing for access to fish aggregating devices (FADs). The consequences of this stressor on enjoying biodiversity and beauty of marine estate are <i>minor</i> at a regional scale but may be moderate at a local scale in one or several localities in a region. There are no consequences listed in the Statewide TARA which are relevant to recreational fishing conflict amongst sub groups of fishers. Additional evidence of consequences include: - Feelings of isolation or marginalisation amongst some recreational fishing sub-groups (e.g. Asian, European and Pacific Island nationalities) may impact their ability or willingness to engage with and enjoy the marine estate (<i>Expert advice</i>) - Concern over animal welfare, overharvesting, or inappropriate fishing activities that may occur between different sub groups of fishers (e.g. sustainable catch vs catch and release, trophy fishers vs hunter gatherers, perceptions of overfishing by particular ethnic groups) (Magee et al., 2018) may impact the enjoyment of the marine estate for some fishers (<i>Expert advice, Literature</i>) - Examples of community of animosity towards sub-groups of fishers (e.g. Asian, European and Pacific Island nationalities) (<i>Literature</i>) - Interactions between sub-groups has also been reported by DPI in several instances, including invertebrate collecting across the state (<i>Departmental reports</i>) - The likelihood of this consequence is <i>likely</i>. These impacts appear to be happening with sufficient frequency and regularity to justify consideration at a statewide spatial scale.) Overall risk rating: Low	Limited	All regions, regional incidence	10 years	Stable
18	Minor	Likely	Low	Conflict between recreational fishing and other sectors, and within recreational fishing sub-groups, relating to resource access and use Intra sectoral – between sub-groups of recreational fishers In addition to competition between sectors there is also evidence of intra sectoral competition amongst recreational fishers (for example line fishers and spear fishers using the same fishing grounds or competing for access to fish aggregating devices (FADs). The consequences of this stressor on consumptive use (extracting) are <i>minor</i> because impacts are considered at a regional scale but may be moderate at a local scale in one or several localities in a region. There are no consequences listed in the Statewide TARA relevant to recreational fishing conflict amongst sub groups of fishers (Statewide TARA N/A). Additional evidence of consequences include: Conflict is also known between different subgroups of anglers. Concern over overharvesting, or (perceived) inappropriate fishing activities that may occur between different sub groups of fishers (e.g. sustainable catch	Limited	All regions, regional incidence	10 years	Stable

				vs catch and release, trophy fishers vs hunter gatherers, perceptions of overfishing by particular ethnic groups) (Magee et al., 2018) may impact the consumptive use values of other fishers Conflict between catch and release sport fishers and those that are orientated towards retaining legal catch is documented (Aas et al., 2002; Arlinghaus, 2007) (<i>Expert advice, Literature</i>) The likelihood of this consequence is <i>likely</i>. These impacts appear to be happening with sufficient frequency and regularity to justify consideration at a statewide spatial scale. Evidence of likelihood includes: Interactions between sub-groups has also been reported by DPI in several instances, including invertebrate collecting across the state (<i>Departmental reports</i>) Overall risk rating: Low				
19	Minor	Likely	Low	Conflict between recreational fishing and other sectors, and within recreational fishing sub-groups, relating to resource access and use Intra sectoral – between sub-groups of recreational fishers In addition to competition between sectors there is also evidence of intra sectoral competition amongst recreational fishers (for example line fishers and spear fishers using the same fishing grounds or competing for access to fish aggregating devices (FADs).The consequences of this Intra – sectoral recreational fishing stressor on Intrinsic and bequest values (economic intrinsic value) are <i>minor</i> given they are discernible, temporary impacts at a regional scale. Submissions received during the public engagement period of the draft TARA demonstrated that conflict over resource access and use are occurring on an ongoing basis (<i>Statewide TARA 1</i>) The intrinsic benefit of the marine estate was identified as one of the most important economic benefits identified in the Marine Estate Community Survey [1]. Conflict between sectors diminishes the intrinsic and bequest values held by people, although given these incidents are highly localised, the consequence at a community-wide scale is expected to be only minor. <i>Statewide TARA 6</i>) Additional consequences that are not listed in the state-wide TARA include: Potential differences in perspectives between use harvesters versus those who practice catch and release fishing. There can also be differences between the perspectives of spear fishers and line fishers as noted by the department ((<i>Departmental reports, social media reports, expert advice</i>) The likelihood of this consequence is <i>likely</i>, due to the following reasons: Recreational fishing has various sub-groups that utilize different fishing methods and will Likely impact other less extractive marine estate users. Overall risk rating: Low	Limited	All regions	10 years	Stable

20	Minor	Possible	Minimal	Conflict between recreational fishing and other sectors, and within recreational fishing sub-groups, relating to resource access and use Intra sectoral – between sub-groups of recreational fishers In addition to competition between sectors there is also evidence of intra sectoral competition amongst recreational fishers (for example line fishers and spear fishers using the same fishing grounds or competing for access to fish aggregating devices (FADs). The consequences of intra sectoral conflict on value of production and employment are <i>Minor</i> as they are discernible, temporary impacts at a regional scale, but will be moderate impact at a local scale at various localities Resource use conflict could have impacts on the viability of businesses that support recreational fishers. These impacts have the potential to be significant for that user group, but minor at a community-wide scale. (<i>Statewide TARA 7</i>) Additional consequences that are not listed in the state-wide TARA include: Example of where different subgroups of recreational fishers impact on others - Trophy Catch and Release fishers pursuing large flathead in trophy waters (including charter boat operators) impacted by harvesters that choose to keep catch and choose to harvest large flathead. Potential impacts to charter boat operators business and local tourism impacts. For example, campaign for slot limit on dusky flathead: https://www.change.org/p/nsw-dpi-a-nsw-slot-limit-for- ((<i>Departmental reports and social media reports</i>)) The likelihood of this consequence is <i>Possible</i>, due to the following reasons: Recreational fishing has various sub-groups that utilize different fishing methods and will possibly impact other less extractive marine estate users with impacts on businesses supplying different groups of fishers or tourism. Overall risk rating: Minimal	Limited	All regions	10 years	Stable
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21	Minor	Possible	Minimal	Conflict between recreational fishing and other sectors, and within recreational fishing sub-groups, relating to resource access and use Intra sectoral – between sub-groups of recreational fishers In addition to competition between sectors there is also evidence of intra sectoral competition amongst recreational fishers (for example line fishers and spear fishers using the same fishing grounds or competing for access to fish aggregating devices (FADs).The consequences of this intra sectoral conflict between recreational on Individual enjoyment value (consumer surplus) are <i>Minor</i> given they are discernible, temporary impacts at a regional scale or moderate at a local scale. “Conflict between competing sub-sectors may make recreational areas more threatening for people to visit, thereby diminishing their enjoyment value” (<i>Statewide TARA 8</i>) The likelihood of this consequence is <i>possible</i>, as recreational fishing has various sub-groups with different fishing methods and conflict or competing between sub-sectors may possibly impact the enjoyment of other marine estate users. This will possibly impact other less extractive marine estate users with impacts on businesses supplying different groups of fishers or tourism and the general public. Overall risk rating: Minimal	Limited	All regions	10 years	Stable
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22	Minor	Likely (C), Possible (N&S)	Low (C) Minimal (N&S)	The impact of anti-social behaviour by recreational fishers. Recreational fishers are a diverse group from all age groups and social backgrounds. Inevitably there are behaviours by some of the many fishers that can be considered as anti-social. The consequences of this stressor on safety, health and wellbeing to be <i>minor</i>, due to their short term, localised and episodic nature. Consequences listed in the Statewide TARA which are relevant to recreational fishing include: - Continued and ongoing experiences of anti-social behaviour may deter community use of the marine estate. The notion of what constitutes anti-social behaviour is likely to differ significantly across the community. Inappropriate use or anti-social behaviour is variously described as loud or obnoxious behaviour, leaving rubbish behind, drunkenness, illegal fishing or overfishing etc. (<i>Statewide TARA 9</i>) Additional consequences that are not listed in the state-wide TARA include: - This is supported by the nature of complaints received by the department around anti-social behaviour by a small minority of recreational fishers. This includes isolated incidences of antisocial behaviour at Sydney ferry wharves and other wharf areas involving fishers littering and acting offensively towards the community (Central). There are also incidences of animal welfare concern or fishers targeting iconic species (blue groper, stingrays, large sharks) - which can be legally undertaken but may not be socially acceptable to some parts of the community. The importance of such incidents may change through time as the awareness and values of parts of the community change. Changes are particularly evident in relation to sharks (Pepin-Neff and Wynter, 2018). Such concerns differ from concerns about the sustainability of harvested stocks. This impacts safety, health and wellbeing through both potential injury from litter and potential altercations between groups. There have also been reports of conflict between spear and line fishers and swimmers around Sydney suburbs - Bondi Beach, Little Bay, Clovelly Bay, Balmoral as well as isolated cases elsewhere including Jervis Bay. (<i>Departmental reports</i>) - Aquaculture operators holding oyster leases find damage and experience theft issues from boat users, including recreational fishers. A limited number of recreational fishers cause negative interactions with oyster growing operations (<i>Departmental reports</i>). - Concerns that waste from recreational fishing cleaning tables and improper disposal of fish frames and unwanted fish carcasses disposed in waterways can attract predators with safety implications (<i>Departmental reports</i>). The likelihood of this consequence is <i>likely</i>, consistent with the Statewide TARA, given the high level of community concern in regard to anti-social behaviour which was identified in the Marine Estate Community Survey (Sweeney Research, 2014). The likelihood is possible in the northern and southern regions. Overall risk rating: Low (C) Minimal (N&S)	Limited	All regions	10 years	Stable (increasing for central region – population growth)
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23	Minor	Likely	Low	The impact of anti-social behaviour by recreational fishers. Recreational fishers are a diverse group from all age groups and social backgrounds. Inevitably there are behaviours by some of the many fishers that can be considered by others as anti-social. The consequences of this stressor on socialising and sense of community are <i>minor</i>, due to their short term, localised and episodic nature. Consequences listed in the Statewide TARA were not specifically linked to recreational fishing but noted the following There was a high level of concern in relation to this threat in the Marine Estate Community Survey across all three regions, suggesting this may already be impacting community cohesion and social relationships. (<i>Statewide TARA 10</i>) Additional consequences that are not listed in the state-wide TARA include: This is supported by the nature of complaints received by the department around anti-social behaviour by recreational fishers as detailed in cell 22. The impacts on aquaculture are also noted in cell 22 (<i>Departmental reports</i>) The likelihood of this consequence is <i>likely</i>, consistent with the Statewide TARA, given the high level of community concern in regard to anti-social behaviour which was identified in the Marine Estate Community Survey (Sweeney Research, 2014) Overall risk rating: Low	Limited	All regions	10 years	Stable (increasing for central region – population growth)
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24	Minor	Likely	Low	The impact of anti-social behaviour by recreational fishers. Recreational fishers are a diverse group from all age groups and social backgrounds. Inevitably there are behaviours by some of the many fishers that can be considered as anti-social. The consequences of this stressor on enjoying biodiversity and beauty of marine estate are <i>minor</i> at a regional scale, due to moderate impacts that are measurable and ongoing in one or more localities. Consequences listed in the Statewide TARA were not specifically linked to recreational fishing but noted the following: - Major impacts may be felt by all users who value non-consumptive wilderness experiences, which can be recreational fishing or others. More broad community wide impacts are likely if continued anti- social behaviour diminishes the ability for people to connect with and appreciate the natural environment. (<i>Statewide TARA</i>) - This is supported by the nature of complaints received by the department around anti-social behaviour by recreational fishers as detailed in cell 22 (<i>Departmental reports</i>) Additional consequences not listed in the Statewide TARA specifically linked to recreational fishing include: - Incidences of animal welfare concern. For example, in several locations in the marine estate large stingrays regularly frequent jetties and boat ramps, often feeding on fish scraps left behind from fishers. Occasionally recreational fishers target these large animals, causing angst within the community (<i>Departmental reports</i>) - Other societal impacts come from fish cleaning tables and fish waste. When fishers discard fish frames and bait, particularly large gamefish in small waterways, and around boat ramps and cleaning tables, there can be an associated bad smell, pollution concerns, and perceptions of attracting scavengers and undesirable predators among the public (McPhee et al. 2002). (<i>Literature and Departmental reports</i>) The likelihood of this consequence is <i>likely</i>, consistent with the Statewide TARA, given the high level of community concern in regard to anti-social behaviour which was identified in the Marine Estate Community Survey (Sweeney Research, 2014) Overall risk rating: Low	Limited	All regions	10 years	Stable (increasing for central region – population growth)
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25	Minor	Rare (N&S) and Possible (C)	Minimal (C) Minimal (N&S)	The impact of anti-social behaviour by recreational fishers. Recreational fishers are a diverse group from all age groups and social backgrounds. Inevitably there are behaviours by some of the many fishers that can be considered as anti-social. The consequences of this stressor on consumptive use are <i>minor</i> for all regions and may be <i>moderate</i> at a local scale due to their measurable ongoing negative impacts in one or more localities. Consequences listed in the Statewide TARA which are relevant to recreational fishing include: - Moderate impacts (overall minor community wide consequences) may be associated with a loss of consumptive use if recreational fishing declines in response to anti-social behaviour. (<i>Statewide TARA 12</i>). Additional consequences not listed in the Statewide TARA specifically linked to recreational fishing include: - Aquaculture operators holding oyster leases find damage and experience theft issues from boat users, including commercial fishers and recreational fishers. A limited number of recreational fishers cause negative interactions with oyster growing operations ((<i>Departmental reports</i>)). The Statewide TARA considered the likelihood of these consequences is unknown but <i>possible</i>. The greater population of the Central Region increased the likelihood to <i>likely</i>. Given this assessment focuses on the specific likelihood of recreational fisher behaviour being the stressor, we have downgraded the likelihood to <i>rare</i> (N&S) and <i>possible</i> (C). Overall risk rating: Minimal (Central region) and Minimal (North & South regions)	Limited	All regions	10 years	Stable
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26	Minor	Possible (N&S) Likely (C)	Minimal (N&S) Low (C)	The impact of anti-social behaviour by recreational fishers Recreational fishers are a diverse group from all age groups and social backgrounds. Inevitably there are behaviours by some of the many fishers that can be considered as anti-social. The consequences of anti-social behaviour on Intrinsic and bequest values (economic intrinsic value) are <i>minor</i> given they are discernible, temporary impacts at a regional scale. Anti-social behaviour and unsafe practices are seen as key threats to the safety and enjoyment people derive from the marine estate as identified by the Marine Estate Community Survey [1] which diminishes the intrinsic and bequest values they derive. The impacts may be more significant at a localised scale where people have strong perceptions about some localities (e.g. perceptions of Cronulla remain as a result of the 2005 riots (Wise, 2017). Anti-social behaviour is highly localised and therefore unlikely to directly have widespread or long-term impacts on intrinsic and bequest values, however such localised events can have a wider geographic reach (Wise, 2017), leading to a consequence rating of moderate. The strong focus on anti-social behaviour in the community survey suggests that the community is aware of current issues and that future consequences may occur. Occurrence and impacts are expected to be greater in the higher density Central region. (<i>Statewide TARA 14</i>) Additional consequences that are not listed in the state-wide TARA include: The DPI have provided anecdotal reports of antisocial behaviour on Sydney wharves and other wharf areas. The activity takes place mostly at night by groups of youth recreational fishers that are reported to be littering (in the form of fish frames and bait, hooks and similar debris) and acting offensively towards the community. There are news reports that the anti-social behaviour at the wharves is impacting ferry commuters and ferry staff. This anti-social behaviour may impact the intrinsic value through litter and debris, if caused by the anti-social behaviour. (<i>Departmental reports and social media reports</i>) It should be noted that recreational fishing can be a positive deterrent for anti-social behaviour among youths (McManus et al., 2011; Hunt and McManus, 2016) The likelihood of this consequence is <i>likely</i>, due to the following reasons: Anti-social behaviour by some Recreational fishers may <i>likely</i> impact other marine estate users and detract from the intrinsic value of the marine estate in the Central area, less in North and South (<i>Possible</i>). Overall risk rating: Minimal (N&S) and Low (C).	Limited	All regions	10 years	Stable
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27	Minor	Likely (C) Possible (N&S)	Low (C), Minimal (N &S)	The impact of anti-social behaviour by recreational fishers Recreational fishers are a diverse group from all age groups and social backgrounds. Inevitably there are behaviours by some of the many fishers that can be considered by others as anti-social. The consequences of Anti-social behaviour on value of production and employment in businesses in the marine estate are <i>minor</i> given they are discernible, temporary impacts at a regional scale. The consequences may be moderate for some localities within the central region. Anti-social behaviour may have significant impacts on the viability of businesses and on employment in situations where people are deterred from visiting the marine estate. In particular, businesses that rely on visitors & tourists could be significantly impacted (e.g. tourism operators, cafes & restaurants, fishing operators). (<i>Statewide TARA 15</i>) Additional consequences that are not listed in the state-wide TARA include: • The DPI have provided anecdotal reports of antisocial behaviour on Sydney ferry wharves and other wharf areas. The activity takes place mostly at night by groups of youth recreational fishers that are reported to be littering (in the form of fish frames, hooks and similar debris) and acting offensively towards the community. <i>Departmental reports and social media reports</i>). The anti- social behaviour on Sydney Ferry terminals can negatively impact commuters and those wishing to take this mode of transport (Advice: Transport NSW). • Aquaculture operators holding oyster leases find damage and experience theft issues from boat users, including commercial and recreational fishers. A limited number of recreational fishers cause negative interactions with oyster growing operations with impacts on production (<i>Departmental reports</i>). The likelihood of this consequence is <i>likely</i> (Central) and <i>possible</i> (North & South), due to the following reasons: • Anti-social behaviour by some Recreational fishers may likely impact other marine estate users with impacts on local businesses and tourism. Higher in Central than North and South. Overall risk rating: Low (C), Minimal (N& S)	Limited	All regions	10 years	Stable
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28	Minor	Likely (C) Possible (N&S)	Low (C) Minimal (N &S)	The impact of anti-social behaviour by recreational fishers Recreational fishers are a diverse group from all age groups and social backgrounds. Inevitably there are behaviours by some of the many fishers that can be considered as anti-social. The consequences of Anti-social behaviour on Individual enjoyment value (consumer surplus) are <i>minor</i> given they are measurable ongoing impacts at a regional scale. The consequences may be moderate for some localities in the central region. Different user groups in the community engage in different activities in the marine estate, and some activities for which people gain enjoyment value may be perceived by others as anti-social (e.g. loud and disruptive activities generate individual enjoyment value for those engaged in the activity but diminish usage value for others). In some cases, anti-social behaviour may deter people from visiting the marine estate, thereby diminishing the direct value that would be derived. (<i>Statewide TARA 16</i>) Given the trade-offs of enjoyment value between competing users, the net impact is likely to be only low, with moderate impacts in the higher population density Central region. (<i>Statewide TARA 16</i>) Additional consequences that are not listed in the state-wide TARA include: • The DPI have provided anecdotal reports of antisocial behaviour on Sydney wharves and other wharf areas. The activity takes place mostly at night by groups of youth recreational fishers that are reported to be littering (in the form of fish frames and bait, hooks and similar debris) and acting offensively towards the community. (<i>Departmental reports and social media reports</i>). • There is a loss of consumer surplus for oyster purchasers when any theft reduces commercial aquaculture production. (<i>Expert Advice</i>). • Pascoe (2019) estimated the consumer surplus of different types of beach goers in Sydney, NSW Consumer surplus was found to be higher for those undertaking “beach activities” as opposed to those relaxing (Pascoe 2021). These values may be impacted by anti-social behaviour reducing visitor numbers and enjoyment (<i>Literature, Expert Advice</i>). The likelihood of this consequence is <i>likely</i> (Central) and <i>Possible</i> (North & South), due to the following reasons: • Anti-social behaviour by some Recreational fishers may likely impact other marine estate users with Likely impacts on local businesses and tourism. Higher in Central than North and South Overall risk rating: Low (C), Minimal (N&S)	Limited	All regions	10 years	Stable
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29	Major	Likely	High	The impact of unsafe practices by recreational fishers. A proportion of recreational fishers can knowingly or unknowingly engage in behaviours that are unsafe to themselves and the public. The consequences of this stressor on safety, health and wellbeing to be <i>major</i>, since they may result in loss of life or permanent injury and will have substantial measurable impacts at a regional scale and catastrophic impacts at a local scale. Consequences not listed in the Statewide TARA which are relevant to recreational fishing include: • Unsafe practices by recreational fishers including rock fishing and crossing dangerous bars in poor weather conditions can endanger the lives of the fishers themselves as well as first responders and emergency services when things go wrong. As well as immediate physical harm, these events can also have long lasting mental impacts on those involved in these events, from fishers and their families to first responders and emergency services (<i>Expert advice, NSW Maritime information</i>). • Rock fishing accounts for an average of eight deaths a year in NSW and considered the 3rd most dangerous individual activity in Australia (https://www.surflifesaving.com.au). • Trend for boating fatalities in NSW are down overall – this is likely attributable to the increased use of lifejackets – (Transport NSW). The likelihood of this consequence is <i>likely</i>, based on data associated with loss of life by rock fishers and boating accidents. Overall risk rating: High	Adequate	All regions	10 years	Stable
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30	Minor	Likely	Low	The impact of unsafe practices by recreational fishers. A proportion of recreational fishers can knowingly or unknowingly engage in behaviours that are unsafe to themselves and the public. The consequences of this stressor on socialising and sense of community are <i>minor</i>, due to their short term, localised and episodic nature. Consequences listed in the Statewide TARA were not specifically linked to recreational fishing nor unsafe behaviour. They would largely relate to community disharmony and concern over the danger associated with unsafe practices by recreational fishers and the associated danger for first responders and emergency services. The perception that rock fisher deaths are largely associated with particular ethnicities has the potential to cause disharmony in the community. Communicating more effectively with NSW recreational fishers from a Chinese background was examined by Li et al. (2019). The likelihood of this consequence is <i>likely</i>, consistent with the Statewide TARA, based on data associated with loss of life by rock fishers and boating accidents. Between 1992 and 2010 more than 140 lives have been lost in NSW to rock fishing with fatalities being almost all males, with an average age in the mid-40s (Mitchell et al., 2014). The majority of victims were identified as being of Asia-Pacific island origin (Mitchell et al., 2014). The likelihood of an accident is site specific but there are a relatively large number of sites where an incident can occur. The most hazardous segments are concentrated along sections of the platforms between Coalcliff and Austinmer, Woonona, Port Kembla south and Red Point (Carvalho et al., 2019). Overall risk rating: Low	Limited	All regions	10 years	Stable
31	Insignificant	Rare	Minimal	The impact of unsafe practices by recreational fishers. A proportion of recreational fishers can knowingly or unknowingly engage in behaviours that are unsafe to themselves and the public. This stressor is considered to be not applicable or of negligible consequence on enjoying biodiversity and beauty of marine estate.	Limited	All regions	10 years	Stable

32	Minor	Possible	Minimal	The impact of unsafe practices by recreational fishers. A proportion of recreational fishers can knowingly or unknowingly engage in behaviours that are unsafe to themselves and the public. The consequences of this stressor on consumptive use are <i>minor</i>, as they would be expected to be concentrated on a small sub section of fishers. Consequences not listed in the Statewide TARA which are relevant to recreational fishing include: • Minor impacts on willingness of ability to continue fishing if unsafe activities lead to continued fatalities. For example, this may result in burdensome regulatory restrictions for fishers undertaking these practices. • Aquaculture operators holding oyster leases find damage and experience theft issues from boat users, including recreational fishers. Recreational fishers may cast too close to aquaculture infrastructure leaving behind hooks and lures or causing damage to aquaculture infrastructure. ((<i>Departmental reports, expert advice</i>)). The likelihood of this consequence is <i>possible</i>. Overall risk rating: Minimal	Limited	All regions	10 years	Stable
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33	Minor	Possible	Minimal	The impact of unsafe practices by recreational fishers. A proportion of recreational fishers can knowingly or unknowingly engage in behaviours that are unsafe to themselves and the public. The consequences of this unsafe fishing practices on intrinsic value are <i>minor</i> given they are discernible, temporary impacts at a regional scale with moderate impacts at a local scale. Anti-social behaviour and unsafe practices are seen as key threats to the safety and enjoyment people derive from the marine estate as identified by the Marine Estate Community Survey [1] which diminishes the intrinsic and bequest values they derive. (<i>Statewide TARA 14</i>) Additional consequences that are not listed in the Statewide TARA include: Issue with spearfishers accessing the water in heavily populated areas in Sydney, specifically Bondi Beach and Little Bay have created local community issues. These areas in Sydney are recognised as important local spearfishing areas providing safe entry points and calm water which are also ideal locations for beginner spearfishers. Examples of conflict have arisen in these heavily populated areas with swimmers and the broader community raising safety concerns. Also, some complaints regarding line fishing in areas used by swimmers/snorkellers – particularly in busy metropolitan areas. Examples that have involved DPI include Clovelly Bay, Balmoral and a beach at Jervis Bay where anglers were shark fishing. (<i>Departmental reports and social media reports</i>) Fishing from the shore particularly exposed rocky headlands has inherent risks and can create a significant safety risk for participants and rescuers in exposed and dangerous locations. Between 1992 and 2010 more than 140 lives have been lost in NSW to rock fishing with fatalities being almost all males, with an average age in the mid-40s (Mitchell et al., 2014). Also, injuries and deaths when fishing from rocks has impacts on families and local communities in particular for witnesses and first responders (<i>Literature, media reports of incidents</i>). The likelihood of this consequence is possible due to the following reasons: Unsafe practices by some Recreational fishers may likely impact other marine estate users and detract from the intrinsic value of the marine estate in the Central area, less in North and South. Overall risk rating: Minimal	Limited	All regions	10 years	Stable
34	Minor	Likely	Low	The impact of unsafe practices by recreational fishers. A proportion of recreational fishers can knowingly or unknowingly engage in behaviours that are unsafe to themselves and the public. The consequences of unsafe fishing practices on value of production and employment are <i>minor</i> given they are discernible, temporary impacts at a regional scale or moderate at a local scale. Submissions received during the public engagement period of the draft TARA highlighted that unsafe practices, (e.g. recreational boating and fishing) may impact the viability of aquaculture businesses (such as oyster production) in the	Adequate	All regions	10 years	Stable

				form of damage to oyster racks and other related infrastructure. Unsafe piloting of vessels have also been noted to impact marine tourism businesses such as the whale watching industry. (<i>Statewide TARA 15</i>) Additional consequences that are not listed in the Statewide TARA include: Deaths from rock fishing are a form of premature human mortality and reduces economic productive capacity (<i>Expert advice</i>) The likelihood of this consequence is <i>likely</i>, due to the following reasons: Unsafe practices by some Recreational fishers may <i>likely</i> impact other marine estate users and detract from the viability of businesses in the marine estate in the Central area, less in North and South. Overall risk rating: Low				
35	Minor	Possible	Minimal	The impact of unsafe practices by recreational fishers. A proportion of recreational fishers can knowingly or unknowingly engage in behaviours that are unsafe to themselves and the public. The consequences of unsafe fishing practices on the Individual enjoyment value (consumer surplus) are <i>minor</i> given they are discernible, temporary impacts at a regional scale. NSW Marine Estate Community Survey identified danger to swimmers (e.g. from jet skis and boats) as the fourth most significant threat to social benefits and by extension, to the economic benefits of direct use. (<i>Statewide TARA 16</i>) Additional consequences that are not listed in the Statewide TARA include: - Issue with spearfishers accessing the water in heavily populated areas in Sydney, specifically Bondi Beach and Little Bay have created local community issues. These areas in Sydney are recognised as important local spearfishing areas providing safe entry points and calm water which are also ideal locations for beginner spearfishers. Examples of conflict have arisen in these heavily populated areas with swimmers and the broader community raising safety concerns. - There are also some ongoing complaints over a significant period of time regarding line fishing in areas used by swimmers/ snorkellers – particularly in busy metropolitan areas. Examples that have involved DPI include Sydney suburbs - Bondi Beach, Little Bay Clovelly Bay, Balmoral and a beach at Jervis Bay where anglers were shark fishing. (<i>Departmental reports and social media reports</i>). - Pascoe (2019) estimated the consumer surplus of different types of beach goers in Sydney, NSW Consumer surplus was found to be higher for those undertaking “beach activities” as opposed to those relaxing (Pascoe 2021). These values may be impacted by unsafe practices and behaviour reducing visitor numbers (<i>Literature, Expert Advice</i>). The likelihood of this consequence is <i>possible</i> due to the following reasons: - Unsafe practices by some Recreational fishers may <i>likely</i> impact other marine estate users and detract from the enjoyment value of other users in the marine estate in the Central area, less in North and South. Overall risk rating: Minimal	Adequate	All regions	10 years	Stable

36	Minor	Likely (C), Possible (N&S)	Low (C) Minimal (N&S)	The impact of overcrowding and congestion associated with recreational fishing Many of the NSW public, including recreational fishers, like to visit the Marine Estate and enjoy a time that is away from the congestion and crowding of urban life. Having some space to pursue leisure and recreational fishing is valued by everyone in an Estate that is popular with the public in NSW. The consequences of this stressor on safety, health and well-being are <i>minor</i> given they are discernible, temporary impacts at a regional scale. There may be more moderate consequences experienced at a local scale at various locations. The Statewide TARA did not specifically address threats from recreational fishing but noted: - Threats related to resource conflict and anti-social behaviour may be exacerbated by overcrowding or congestion issues. Drivers include reduced access (regulatory or physical) for some or all sectors, causing concentration of use, and increasing population. The Marine Estate Community Survey identified overcrowding as a potential social threat that may impact on their desire to use the marine estate (<i>Statewide TARA 9</i>) Additional consequences that are not listed in the Statewide TARA include: Crowding is a subjective perception that the level of use of an area will negatively influence one's ability to achieve one's desired trip outcomes (Manning et al 2000). - The DPI have provided anecdotal reports that there have been incidences of conflict associated with groups of fishers competing for access in busy metropolitan areas (e.g. anti-social activities by groups on Sydney ferry wharves, and spearfishers and swimmers competing for access at busy Sydney beaches) (<i>Departmental reports</i>) - Impacts of congestion amongst recreational fishing sub groups: Extensive literature exists around the heterogeneity that exists within the recreational fishing community, including how motivations and consumptive orientation influence levels of satisfaction with fishing experience (and the social benefits derived from fishing). This research is significant in that it provides insights into the range of fishing experiences that can be impacted by conflict, overcrowding or regulation (Beardmore et al., 2011, Sutton, 2006, Li et al., 2010, Hunt et al., 2013, Ditton and Sutton, 2004, Oh and Ditton, 2008, Arlinghaus, 2006). Fishers seeking solitude and escape are more likely to be negatively impacted by overcrowding or conflict with other users. (<i>Literature</i>) - A report from McIlgorm et al. (2016a) found that fishers with higher mastery motivations (approx. 43% of fishers surveyed) are most sensitive to over-crowding concerns.(<i>Literature</i>) The likelihood of this consequence is <i>likely (C) and possible (N & S)</i>, due to the following reasons: - Higher population in the central area. - Recreational fishing takes place in a range of different coastal habitats and are therefore likely to come into contact with other marine estate users. Overall risk rating: Low (C) and Minimal (N&S).	Adequate	All regions	10 years	Stable
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37	Minor	Likely	Low	The impact of overcrowding and congestion associated with recreational fishing Many of the NSW public, including recreational fishers, like to visit the Marine Estate and enjoy a time that is away from the congestion and crowding of urban life. Having some space to pursue leisure and recreational fishing is valued by everyone in an Estate that is popular with the public in NSW. The consequences of this stressor on socialising and sense of community relate to disharmony and disputes across sections of the community in relation to access and use. These are considered <i>minor</i> given they are discernible, temporary impacts at a regional scale. There may be more moderate consequences experienced at a local scale at various locations. The Statewide TARA noted the threats related to resource conflict and anti-social behaviour are likely to be exacerbated by overcrowding or congestion issues and this is supported by departmental advice. (<i>Statewide TARA</i>) Additional consequences that are not listed in the Statewide TARA include: The likelihood of this consequence is <i>likely</i>, due to the following reasons: Recreational fishing takes place in a range of different coastal habitats and are therefore likely to come into contact with other marine estate users. Overall risk rating: Low	Inferred	All regions	10 years	Stable
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38	Minor	Likely	Low	The impact of overcrowding and congestion associated with recreational fishing Many of the NSW public, including recreational fishers, like to visit the Marine Estate and enjoy a time that is away from the congestion and crowding of urban life. Having some space to pursue leisure and recreational fishing is valued by everyone in an Estate that is popular with the public in NSW. The consequences of this stressor enjoying the biodiversity and health of the marine estate <i>minor</i> given they are discernible, temporary impacts at a regional scale. There may be more moderate consequences experienced at a local scale at various locations. The Statewide TARA noted that overcrowding can have a negative impact on people's enjoyment of the marine estate as well as impacting on the environment (<i>Statewide TARA</i>). Additional consequences that are not listed in the Statewide TARA include: • Unpublished findings of intercept surveys conducted in Batemans Marine Park found that recreational fishing was perceived as a particular threat to the values of the BMP. This related to a sense that there were 'too many' fishers, which in turn led to a sense that the area was being over fished (<i>Expert opinion</i>) • Concentration of fishers in particular areas may potentially lead to localised depletions, and increased environmental impacts of fishers (e.g. litter, hooked animals etc.) which impact on the ability of other users to enjoy the natural beauty of the marine estate (<i>Expert opinion</i>). The likelihood of this consequence is <i>likely</i>, due to the following reasons: • Recreational fishing takes place in a range of different coastal habitats and are therefore likely to come into contact with other marine estate users. Overall risk rating: Low	Limited	All regions	10 years	Stable
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39	Minor	Likely	Low	The impact of overcrowding and congestion associated with recreational fishing Many of the NSW public, including recreational fishers, like to visit the Marine Estate and enjoy a time that is away from the congestion and crowding of urban life. Having some space to pursue leisure and recreational fishing is valued by everyone in an Estate that is popular with the public in NSW. The consequences of this stressor consumptive use (extracting) minor given they are discernible, temporary impacts at a regional scale. There may be more moderate consequences experienced at a local scale at various locations. Additional consequences that are not listed in the Statewide TARA include: - Crowding of sites by recreational fishers can bring about access issues, may potentially lead to local depletion impacts and result in a reduction in local catch rates for fishers a reducing benefits in the marine estate (<i>Expert opinion</i>). Sutton & Bushnell (2007) suggest that crowding may reduce catching power at artificial reefs because anglers will waste time manoeuvring around each other during their fishing trip. Such a finding may also be relevant to fishers accessing natural reef area. Overcrowding has been identified as a particular issue for recreational fishing in urban settings (McPhee, 2017). The likelihood of this consequence is <i>likely</i>, due to the following reasons: - There may be conflict between community groups from different backgrounds, within recreational fishing and impacts on wider community also. For example, different attitudes towards fishing/ gathering and the retaining of fish for the table between differing groups. Examples include; groups of fishers intensively collecting invertebrates which may draw attention from other fishers or water users, or fishers catching various small fish and keeping them in a bucket to be retained at the end of the fishing session causing concern to passers-by. Cockle collecting at Lake Illawarra drew significant community concern even when, for the majority of fishers, bag limits were being observed. Excessive invertebrate collection by groups of fishers from rock platforms is a relatively common issue for Fisheries Officers and occurs throughout the state (<i>Departmental reports</i>). Overall risk rating: Low	Limited	All regions	10 years	Stable
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40	Minor	Likely (C) Possible (N&S)	Low (C), Minimal (N&S)	The impact of overcrowding and congestion associated with recreational fishing Many of the NSW public, including recreational fishers, like to visit the Marine Estate and enjoy a time that is away from the congestion and crowding of urban life. Having some space to pursue leisure and recreational fishing is valued by everyone in an Estate that is popular with the public in NSW. The consequences of overcrowding by recreational fishers on intrinsic value and bequest value of the marine estate are <i>minor</i> given they are discernible, temporary impacts at a regional scale or moderate at a local scale. The ‘loss of appeal due to overcrowding’ was identified as the third most significant social threat to the marine estate as identified in the Marine Estate Community Survey [1], which suggests the community is concerned with this issue and that their intrinsic and bequest values are under threat. In the central region where the population density is greater, the likelihood of negative consequences is expected to be higher. (<i>Statewide TARA 22</i>) Additional consequences that are not listed in the Statewide TARA include: Overcrowding in general is well recognised as a specific issue for management of outdoor leisure activities and enjoyment of the natural environment (Gramann, 1982; Davis and Tisdell, 1995, 1996; Brouwer et al., 2001; Chen and Teng, 2016) (<i>Literature, Expert Advice</i>). The likelihood of this consequence is <i>likely</i>, due to the following reasons: Limited information on congestion arising from recreational fishing indicates the likelihood is <i>likely</i> in the central region and <i>possible</i> in the north and south regions. Overall risk rating: Low (C), Minimal (N&S)	Limited	All regions	10 years	Stable
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41	Minor	Likely	Low	The impact of overcrowding and congestion associated with recreational fishing Many of the NSW public, including recreational fishers, like to visit the Marine Estate and enjoy a time that is away from the congestion and crowding of urban life. Having some space to pursue leisure and recreational fishing is valued by everyone in an Estate that is popular with the public in NSW. The consequences of overcrowding by recreational fishers on the value of production and employment are <i>minor</i> given they are discernible, temporary impacts at a regional scale. There may be more moderate consequences experienced at a local scale at various locations. Overcrowding and congestion by anglers may increase apparent sales and in marine estate businesses, but the sustainability of this may not necessarily be long term if fishers choose alternative sites. Overcrowding and congestion are unlikely to have negative impacts on the viability of businesses and on employment, as overcrowding should contribute to more business opportunities rather than less (more visitors means more customers). Therefore, the negative consequences are rated as insignificant. In the long term and without adequate policy responses, overcrowding and congestion may potentially cause areas to become run-down, thereby negatively impacting business viability. (<i>Statewide TARA 23</i>) Additional consequences that are not listed in the Statewide TARA include: • While there are no specific studies looking at the impacts of overcrowding on the economic components of recreational fishing, economic impacts of crowding in other outdoor leisure activities has been considered (Davis and Tisdell, 1996; Jakus and Shaw, 1997; Budruk et al., 2008; Ávila-Foucat et al., 2013). (<i>Literature</i>) • Sydney Ferries note that recreational fishing on busy wharves leads to a reduction in use by commuters who fear being impacted by anti-social behaviour from recreational fishers with some unknown financial impact (<i>Advice: Transport for NSW</i>). • In some estuarine fisheries there is considered to be a link between high use by visiting recreational fishers (usually during busy holiday periods) and impacts on both local recreational and commercial fishers – either through local fishers choosing to avoid busy areas or through impacts on fishing success (<i>Workshop comment, Government compliance</i>). The likelihood of this consequence is <i>likely</i>, due to the following reasons: Congestion due to recreational fishing does not have automatically predictable consequences on production and employment. Negative impacts are possible. Overall risk rating: Low	Limited	All regions	10 years	Stable
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42	Moderate	Likely (C), Possible (N&S)	Moderate (C), Low (N&S)	The impact of overcrowding and congestion associated with recreational fishing Many of the NSW public, including recreational fishers, like to visit the Marine Estate and enjoy a time that is away from the congestion and crowding of urban life. Having some space to pursue leisure and recreational fishing is valued by everyone in an Estate that is popular with the public in NSW. Many recreational fishers dislike overcrowding and congestion as it reduces their Individual enjoyment value (consumer surplus), but this also impacts the consumer surplus of other marine estate users too. The consequences are <i>moderate</i> given they are discernible, temporary impacts at a regional scale or there may be more moderate consequences experienced at a local scale at various locations. The ‘loss of appeal due to overcrowding’ was identified as the third most significant social threat as identified in the Marine Estate Community Survey [1], which directly impacts the individual enjoyment value people derive. As with justification 25, the likelihood in the central region is expected to be higher than in the northern and southern regions. Conversely, overcrowding suggests that many people currently derive value from using the marine estate (because they choose to visit it), and therefore the net enjoyment value impact may be overstated. Overcrowding is expected to increase as an issue due to population increases in NSW (<i>Statewide TARA 24</i>). Additional consequences that are not listed in the Statewide TARA include: - While there are no specific studies looking at the impacts of overcrowding on the economic components of recreational fishing, economic impacts of crowding in other outdoor leisure activities has been considered (Davis and Tisdell, 1996; Jakus and Shaw, 1997; Budruk et al., 2008; Ávila-Foucat et al., 2013).(<i>Literature and Expert Advice</i>) - Pascoe (2019) estimated the consumer surplus of different types of beach goers in Sydney, NSW Consumer surplus was found to be higher for those undertaking “beach activities” as opposed to those relaxing (Pascoe 2021). These values will be impacted by overcrowding and congestion in the marine estate reducing individual enjoyment (<i>Literature, Expert Advice</i>). The likelihood of this consequence is <i>likely</i>, due to the following reasons: Overcrowding and congestion is likely at some local areas, such as those near large population centres, but will vary between regions. Overall risk rating: Moderate (C), Low (N&S)	Limited	All regions	10 years	Stable
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43	Minor	Possible	Minimal	Loss or decline of marine industries Recreational fishing involves catching fish and can impact other extractive users of the Marine Estate, such as commercial fishers with less direct impacts on other tourism industries depending on the Marine Estate. The consequences of this stressor safety, health and well-being are <i>minor</i> given they are discernible, temporary impacts at a regional scale. There may be more moderate consequences experienced at a local scale at various locations. The Statewide TARA noted that marine industries deliver a range of social and economic benefits to community wellbeing, including the mental and physical wellbeing associated with employment and income, potential health benefits associated with seafood consumption and the possibility of future health benefits associated with marine biotechnology and pharmaceuticals. Consequences of relevance to recreational fishing: • Social licence: currently a major concern for the commercial fishing industry which in part is due to poor relations with the recreational fishing sector • Competition with other sectors for limited resources or access (see cell 42): currently of concern to the commercial and recreational sectors These concerns are of greater significance (moderate) in rural areas which are TARA (2017) identified that marine industries deliver a range of social and economic benefits and contribute to community wellbeing. The likelihood of this consequence is <i>possible</i>, due to the following reason: • There are competitive links between commercial and recreational fishing for fishing access and fishing areas, and this can include onshore infrastructure and space limitations for boat access sites. These marine industries are highly regulated and are vulnerable to economic downturns and can be impacted by changes in policy on area access and resource use through political pressure. Recreational fishers are a major user group and their desire for improved access and to exclusive fishing areas, can impact the commercial fishing industry (<i>Literature, expert opinion</i>). Overall risk rating: Minimal	Adequate	All regions	10 years	Stable
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44	Moderate	Possible (N&S) Unlikely (Central)	Low (N&S) Minimal (Central)	Loss or decline of marine industries Recreational fishing involves catching fish and can impact other extractive users of the Marine Estate, such as commercial fishers with less direct impacts on other tourism industries depending on the Marine Estate. The impact of this stressor on socialising and sense of community relates largely to community cohesion and harmony. The Statewide TARA noted the following consequences of relevance to recreational fishing: Changes in the economic viability of traditional maritime industries can impact the community sense of identity and place e.g. recent research undertaken indicated that the majority of NSW coastal residents would be concerned about the potential loss of community identity and character from further declines in the NSW commercial fishing and aquaculture industries (Voyer et al., 2016), indicating an impact on the sense of community would be <i>possible</i>. The consequences of this decline will be consistent with the Statewide TARA assessment (<i>moderate</i> for regional communities and minor in more diversified economies in the Central Region), the likelihood that recreational fishing alone is the cause of those consequences is considered <i>possible</i> in North and South regions and <i>unlikely</i> in Central region given the range of economic and social pressures experienced by marine industries. Overall risk rating: Low (N&S) Minimal (Central)	Limited	All regions	10 years	Stable
45	Insignificant	Rare	Minimal	Loss or decline of marine industries Recreational fishing involves catching fish and can impact other extractive users of the Marine Estate, such as commercial fishers with less direct impacts on other tourism industries depending on the Marine Estate. The impact of this stressor on enjoying the biodiversity and health of the marine estate. This stressor is considered to be not applicable or of negligible consequence on enjoying biodiversity and beauty of marine estate. Overall risk rating: Minimal	Limited	All regions	10 years	Stable

46	Moderate	Possible (N&S) Unlikely (C)	Low (N&S) Minimal (C)	Loss or decline of marine industries Recreational fishing involves catching fish and can impact other extractive users of the Marine Estate, such as commercial fishers with less direct impacts on other tourism industries depending on the Marine Estate. The impact of this stressor on consumptive use (extracting) is <i>moderate</i> and is consistent with the Statewide TARA, which notes: - The cumulative threats on viability of particularly the commercial fishing sector relating to social licence, competition with other sectors and regulatory pressure has potentially significant sectoral specific consequences for that industry and wider implications for the availability of goods or services to local communities. The most likely marine industries facing significant viability challenges in NSW at present appear to be commercial fishing and aquaculture (Statewide TARA 28). - Recent research undertaken indicates that local seafood is highly valued by regional communities (Voyer et al., 2016) and opportunities to access fresh seafood from other sources/areas is more restricted in these regions. Decline in local seafood will also have flow on impacts to a range of businesses that service the fishing industry and sell its products, including regional tourism. Whilst the consequences of this decline will be consistent with the Statewide TARA assessment (moderate), the likelihood that recreational fishing alone is the cause of those consequences is considered <i>possible</i> in North and South regions and <i>unlikely</i> in Central region given the range of economic and social pressures experienced by marine industries. Overall risk rating: Low (N&S) Minimal (C)	Limited	All regions	10 years	Stable
47	Minor	Possible	Minimal	Loss or decline of marine industries Recreational fishing involves catching fish and can impact other extractive users of the Marine Estate, such as commercial fishers with less direct impacts on other tourism industries depending on the Marine Estate. The consequences of recreational fishing impacting on the intrinsic value and bequest value of the marine estate are considered to be minor with impacts declining marine business viability. Where declining business viability is a function of reduced demand, consumer surpluses are not expected to be impacted. (<i>Statewide TARA</i>). Overall risk rating: Minimal	Limited	All regions	10 years	Stable

48	Moderate	Likely	Moderate	Loss or decline of marine industries Recreational fishing involves catching fish and can impact other extractive users of the Marine Estate, such as commercial fishers with less direct impacts on other tourism industries depending on the Marine Estate. The consequences of this stressor on value of production and employment are <i>Moderate</i> given they are measurable and on-going and impact at a regional scale. There may be more major consequences experienced at a local scale at various locations If marine businesses viability declines, this will have direct impact on employment and production. In locations where marine industries are significant, local employers or that contribute significantly to local economies, consequences could be substantial as they would affect multiple user groups (business owners, support business, employees, families of employees etc.) (<i>Statewide TARA</i>). There is limited information on the net decline in marine businesses, and regarding the growth of new marine businesses (such as related to tourism) (<i>Statewide TARA</i>). Recreational and commercial fishing are both influenced by tourism (<i>Statewide TARA</i>) Additional consequences that are not listed in the Statewide TARA include: - The recreational sector's desire for more access and areas to be exclusively for recreational fishing may translate into negative commercial impacts on commercial fishers (noting that this occurs in the opposite direction also). The economic merits of further sectoral re-allocation to recreational fishing have not been studied. The Department Advises that further re-allocation is unlikely as current policy dictates that it will only be considered if all sectors are agreeable and is equally supportive of the commercial and recreational fishing industries. Optimal allocation between sectors may be different from the current situation, especially as the influence of related coastal tourism is unknown (<i>Expert advice, Statewide TARA</i>), - Recent data on the value of commercial fisheries and aquaculture production to the NSW economy including employment indicates the flow of benefits from commercial fishing activity in the NSW marine estate that could be impacted or disrupted: - The Gross Value of Production (GVP) of State and Commonwealth fisheries, aquaculture and processing NSW in 2017-18 was \$323m. There was \$98m from managed fisheries, \$55m Commonwealth fisheries \$77 in NSW aquaculture and \$93m in processing (FRDC 2019). The total fishery Gross Value Added (GVA) was \$374m, of which \$130 m is generated by fishing and aquaculture, \$46m by associated seafood processing activities and \$198m generated by flow-on business activity in other sectors of the economy and \$28m associated with processing indirectly in other states (FRDC 2019, See also Voyer et al. 2016). - In 2017/18 this activity provided 3,530 full time equivalent jobs (FTE), of which 1,672 were in fisheries and aquaculture, 462 in associated seafood processing and 1,396 FTE jobs as flow on in other sectors and 193 FTE associated with processing indirectly in other states (FRDC 2019). The associated Household Income, (wages, salaries, drawing etc.) were \$230m in total, with \$76m income from fishing and aquaculture and \$25m in seafood processing with \$129 in other businesses associated with fisheries and aquaculture and \$15m	Limited	All regions	10 years	Stable
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				associated with processing in other states (FRDC 2019, See also Voyer et al. 2016). (<i>Literature</i>) The likelihood of this consequence is <i>likely</i>, due to the following reasons: Recreational fishing is a nature based extractive use activity and so some competition for resources is inevitable for some species. Recreational fishers are largely supportive of the commercial fishing industry and support the industry by purchasing bait supplied by the sector. The Department advise that regulations such as bag and size limits, as well as resource allocation policy, will ensure that the catch is continued to be shared by the recreational and commercial sectors(<i>Departmental statement, Literature, expert advice</i>). Overall risk rating: Moderate				
49	Minor	Possible	Minimal	Loss or decline of marine industries Recreational fishing involves catching fish and can impact other extractive users of the Marine Estate, such as commercial fishers with less direct impacts on other tourism industries depending on the Marine Estate. The consequences of recreational fishing impacting on the Individual enjoyment value (consumer surplus) are <i>minor</i> not being impacted by declining marine business viability. Where declining business viability is a function of reduced demand, consumer surpluses may <i>possibly</i> be impacted (<i>Statewide TARA</i>). Additional consequences that are not listed in the Statewide TARA include: - Those using the marine estate enjoy benefits not captured in market prices. Consumers have a willingness to pay for seafood available at a market price, where the consumer surplus is the difference, reflecting their enjoyment in consumption. This has not been estimated in total for NSW commercially produced fish, but a recent study of Sydney Fish Market found that many of the quota species sold at market prices had consumer surplus for those purchasing (Pascoe et al. 2021). Should access to commercial fishing be reduced, the public would be impacted through loss of fish and the associated consumer surplus representing the enjoyment derived from eating seafood. There are no current evaluations of the extent of gains and losses in consumer surplus from different degrees of recreational fishing and commercial fishing access. - Fresh fish is also recognised as providing health benefits, which are a form of consumer surplus, as well as contributing to food supply (Sharpless and Evans 2013) with a willingness to pay for the local seafood experience (Voyer et al. 2016). (<i>Literature</i>) Overall risk rating: Minimal	Limited	All regions	10 years	Stable

50	Moderate	Possible	Low	The impact of excess or illegal extraction by recreational fishers. Excessive or illegal fishing takes more fish than is recommended by management for sustainable fisheries and thus risks stock depletion with implications for all users of the Marine Estate. Terminology around illegal fishers can be interpreted in different ways. DPI considers illegal fishers as people who catch/ sell fish and aquatic invertebrates illegally, outside the legal framework of NSW legislation. The consequences of this stressor on safety, health and well-being are noted by the Statewide TARA as <i>moderate</i> due to potentially serious but not irreversible consequences for human health. These consequences are of direct relevance to illegal sale of seafood products: - Illegal market sales of aquaculture and fisheries products presents a serious risk to consumer safety and the reputation of seafood. The extent of illegal market sales is not known, but the impact of seafood safety incident associated with such sales would extend not only to legitimate aquaculture produce but to seafood in general (TARA 33). Additional consequences that are not listed in the Statewide TARA include: - DPI data on non-commercial catch are for both recreational and indigenous fishing, for example in 2018-19 annual catch of abalone 5.4t (DPI 2019), rock lobster 15.4t (DPI 2020). The need for more accurate recreational catch data on these high commercial value species is recognised, as the total commercial catch is limited by quotas (DPI 2019, 2020). There are 100 fisheries officer roles across the state in 17 coastal and 9 inland locations. In the years 2012-2021, out of 45,000 to 49,000 total contacts per annum made by fisheries officers the rates of compliance were between 89.4% and 90.6% (NSW DPI Compliance data). The likelihood of this consequence is <i>possible</i>. Whilst there is an absence of reliable information about the involvement of recreational fishers in illegal sales this assessment is consistent with the Statewide TARA. Overall risk rating: Low	Limited	Regional	10 years	Stable
51	Minor	Likely	Low	The impact of excess or illegal extraction by recreational fishers. Excessive or illegal fishing takes more fish than is recommended by management for sustainable fisheries and thus risks stock depletion with implications for all users of the Marine Estate. The consequences of this stressor on socialising and sense of community are noted by the Statewide TARA as <i>minor</i> at a regional scale. However, local consequences could have a moderate impact. Evidence suggests that: Concern over illegal use lies at the heart of some of the conflict experienced between recreational fishers, with some recreational fishers expressing significant dissatisfaction with enforcement of fishing regulations in	Adequate	All regions	10 years	Stable

				recent research into recreational fishing motivations and attitudes (see also regulation stressors).(McIlgorm et al., 2016b) This is supported by anecdotal reports that there have been incidences of tension and disharmony in the community associated with perceptions of overfishing of shellfish or taking of undersized fish in various parts of the state, such as cockle collecting at on Lake Illawarra, ghost nippers at certain locations on the Tweed River (Terranora), Maianbar in Port Hacking, and invertebrate collection from rock platforms around Sydney and Coffs Harbour. This tension is often exacerbated by cultural and language differences. The likelihood of this consequence is <i>likely</i> given there are multiple instances of disharmony on this issue throughout all the regions. Overall risk rating: Low				
52	Minor	Likely	Low	The impact of excess or illegal extraction by recreational fishers. Excessive or illegal fishing takes more fish than is recommended by management for sustainable fisheries and thus risks stock depletion with implications for all users of the Marine Estate. The consequences of this stressor on enjoying the biodiversity and health of the marine estate are noted by the Statewide TARA as <i>minor</i> as they were regional, sectoral, localised and temporary: - Illegal use has the potential to impact biodiversity values through overharvesting, which will have flow on impacts on people's enjoyment of those values. <i>Statewide TARA</i>) - This is supported by anecdotal reports that there have been incidences of tension and disharmony in the community associated with perceptions of overfishing of shellfish or taking of undersized fish in various parts of the state, such as cockle collecting at on Lake Illawarra, ghost nippers at certain locations on the Tweed River (Terranora), Maianbar in Port Hacking, and invertebrate collection from rock platforms around Sydney and Coffs Harbour. This tension is often exacerbated by cultural and language differences. - Reports of recreational fishing taking place in areas designated as "scientific reference sites" with the potential to impact research and monitoring of biodiversity. For example, illegal recreational fishing occurring in marine protected areas is noted by Harasti et al. (2019) (<i>Literature</i>) <i>Marine Estate reports, Departmental reports, expert advice</i>). The likelihood of this consequence is <i>likely</i> given there are multiple instances of disharmony on this issue throughout all the regions. Overall risk rating: Low	Adequate	All regions	10 years	Stable

53	Minor	Likely	Low	The impact of excess or illegal extraction by recreational fishers. Excessive or illegal fishing takes more fish than is recommended by management for sustainable fisheries and thus risks stock depletion with implications for all users of the Marine Estate. The consequences of this stressor on consumptive use (extracting) are noted by the Statewide TARA as <i>minor</i>. Impacts will largely be concentrated to a local scale and have a <i>moderate</i> impact. The Statewide TARA noted the following: • Theft and poaching of fisheries resources is of concern to the aquaculture and commercial fishing sectors. This impacts the economic viability of these industries and in turn the availability of these resources to seafood consumers. It also has the potential to impact marine tourism operations such as diving charters, who rely on healthy marine ecosystems for their businesses. • Gradual technological innovations in the recreational fishing sector have included improved fish finders for location and targeting of fish, increasing the fishing power of fishers and thus the potential likelihood for taking excessive catch. More recently the use of drones to target species and the use of social media to spread information about fish locations has been noted as having implications for fisheries management and policy (Cooke et al. 2021). (<i>Media and Literature</i>) • DPI data on non-commercial catch are for both recreational and indigenous fishing, for example in 2018-19 annual catch of abalone 5.4t (DPI 2019), rock lobster 15.4t (DPI 2020). The need for more accurate recreational catch data on these high commercial value species is recognised, as the total commercial catch is limited by quotas (DPI 2019, 2020). (<i>Government reports</i>) • There are 100 fisheries officer roles across the state in 17 coastal and 9 inland locations. In the years 2012-2021, out of 45,000 to 49,000 total contacts per annum made by fisheries officers the rates of compliance were between 89.4% and 90.6% (NSW DPI Compliance data). • Illegal recreational fishing occurring in marine protected areas is noted by Harasti et al. (2019) (<i>Literature</i>). The likelihood of this consequence is <i>likely</i>. Whilst there is an absence of reliable information about the involvement of recreational fishers in illegal sales, the Statewide TARA considered it to be <i>almost certain</i>. We have reduced this to <i>likely</i> as illegal sales cannot be solely attributed to recreational fishers. However, there is an ongoing need to monitor the use of fishing and communications technologies in facilitating excessive catch and illegal fishing activity. Overall risk rating: Low	Adequate	All regions	10 years	Stable
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54	Minor	Possible	Minimal	The impact of excess or illegal extraction by recreational fishers. Excessive or illegal fishing takes more fish than is recommended by management for sustainable fisheries and thus risks stock depletion with implications for all users of the Marine Estate. The consequences of the impact of excess or illegal extraction by recreational fishers on intrinsic and bequest values to be <i>minor</i> given the limited evidence available of a reduction in the natural assets of the marine estate. As identified in the <i>Statewide TARA</i>, the Marine Estate Community Survey did not identify excessive or illegal extraction as an economic or social threat, implying that the impacts on intrinsic and bequest values are only minor. Additionally, there is no consequence specific to recreational fishing listed. In the longer term and in cases where fish stocks are depleted or habitats significantly disturbed etc., consequences may be more significant but there is limited evidence suggesting this will occur. The likelihood of this consequence is <i>possible</i>, given the limited evidence. Overall risk rating: Minimal	Adequate	All regions	10 years	Stable
55	Minor	Likely (S) Possible (N&C)	Low (S) Minimal (N&C)	The impact of excess or illegal extraction by recreational fishers. Excessive or illegal fishing takes more fish than is recommended by management for sustainable fisheries and thus risks stock depletion with implications for all users of the Marine Estate. The consequences of the impact of excess or illegal extraction by recreational fishers on value of production and employment to be <i>minor</i> at the regional level. Moderate local impacts experienced at several localities which have been documented (DPI). Stock depletion compromises the value of production and employment by compromising the viability of businesses which rely on sustainable fisheries, including commercial fishers and tourism operators. Consequences listed in the <i>Statewide TARA</i> which are likely relevant to recreational fishing, include excessive harvest of abalone on the NSW South Coast by a variety of persons which impacted the viability of commercial operators (<i>Statewide TARA</i> 39). Additional consequences that are not listed in the <i>Statewide TARA</i> include: - DPI data on non-commercial catch are for both recreational and indigenous fishing, for example in 2018-19 annual catch of abalone 5.4t (DPI 2019), rock lobster 15.4t (DPI 2020). The need for more accurate recreational catch data on these high commercial value species is recognised, as the total commercial catch is limited by quotas (DPI 2019, 2020). (<i>Government reports</i>) - There are 100 fisheries officer roles across the state in 17 coastal and 9 inland locations. In the years 2012-2021, out of 45,000 to 49,000 total contacts per annum made by fisheries officers the rates of compliance were between 89.4% and 90.6% (NSW DPI Compliance data).	Adequate	Regional	10 years	Stable

				Aquaculture operators holding oyster leases find damage and experience theft issues from boat users, including commercial and recreational fishers. A limited number of recreational fishers cause negative interactions with oyster growing operations (<i>Departmental reports</i>). The likelihood of this consequence is <i>likely (S)</i> and <i>possible (N&C)</i>, given the multiple documented incidences of the illegal harvest on the south coast for which recreational fishers may contribute. Overall risk rating: Minimal (N&C), Low (S)				
56	Minor	Possible	Minimal	The impact of excess or illegal extraction by recreational fishers. Excessive or illegal fishing takes more fish than is recommended by management for sustainable fisheries and thus risks stock depletion with implications for all users of the Marine Estate. The consequences of the impact of excess or illegal extraction by recreational fishers on individual enjoyment value (consumer surplus) to be <i>minor</i> given the moderate local impacts. Local impacts may be moderate as documented (DPI). Stock depletion by these stressors may impact the individual enjoyment value (consumer surplus) of legitimate marine estate users by making it more difficult to catch, produce fish in aquaculture or observe fish when diving. There is no consequence listed in the <i>Statewide TARA</i> which are relevant to recreational fishing. Excessive or illegal extraction is expected to have only minor impacts on individual enjoyment value, as the threats from this stressor are not identified by the community in the Marine Estate Community Survey [1] (<i>Statewide TARA 40</i>). Additional consequences that are not listed in the <i>Statewide TARA</i> include: - Negative impacts seen in individual enjoyment and hence consumer surplus are expected to be more significant for user groups who derive their enjoyment value from the (depleted) resources (e.g. recreational fishers, tourism operators, scuba divers). - Reports of recreational fishing taking place in areas designated as “scientific reference sites” with the potential to impact research and monitoring of biodiversity. For example, illegal recreational fishing occurring in marine protected areas is noted by Harasti et al. (2019) (Literature). (<i>Marine Estate advice, Departmental reports, expert advice</i>). The likelihood of such consequences are considered to be <i>possible</i>. Overall risk rating: Minimal	Limited	Regional	10 years	Stable

57	Moderate	Likely (N&S) Almost certain (C)	Moderate Moderate	Litter, solid waste, marine debris and microplastics Recreational fishing contributes to litter, solid waste, marine debris and microplastics finding its way into the marine environment with implications for amenity, wildlife and health of fish, humans and the environment. The consequences of addition of plastic waste to the marine environment are <i>moderate</i> as they have measurable impacts on the Safety health and wellbeing of the community at a regional scale. Consequences of marine debris from recreational fishing sources considered in the Statewide TARA include: • In particular discarded fishing gear and debris from rec fishers poses a threat to turtles, seals and seabirds through ingestion and entanglement (<i>Statewide TARA</i>. 65). • As noted in the Statewide TARA, the community survey indicated that the greatest threat to social benefits identified was loss of appeal due to water pollution/littering (55%) and also littering/dumping/rubbish/marine debris was identified as the greatest threat to the environment (47%). Impacts on iconic wildlife species from recreational fishing gear are likely to cause distress within the community, impacting on wellbeing and faith in the health and cleanliness of the marine estate. It will also likely impact on the social license of recreational fishing which could impact on the viability of the sector. Additional consequences not included in the Statewide TARA include: • The impact of microplastic on human health through ingestion of contaminated fish. Recreational fishing contributes to this threat through the common use of plastic lures and other forms of plastics (bait bags etc.) that can be washed into the marine estate. • Aquaculture is impacted by pollution effects from recreational boating and fishing, such as plastic, human waste, and wash down of vessels (<i>Departmental reports</i>). • Recent investigation in NSW indicates the work is pointing towards the issue being a local issue restricted to certain hotspots “...based on the sheer number of recreational fishermen, potential for activity to be concentrated, potential loss rates of some types of fishing gear (particularly terminal tackle on fishing lines) and correlations of loads of marine debris that include fishing material at popular fishing locations” (Watson et al. in publication page 44). This is supported by evidence of recreational fishing debris which is often very visible around recreational fishing hotspots (Oceanwatch 2013) (<i>Literature</i>) • The annual report "NSW Wildlife Rehabilitation" is based on data collected on the thousands of animals rescued each year in NSW and is collated by the Department of Planning, Industry and Environment. “In 2018–19, 2687 entangled animals were rescued across 139 species. About 56% of all entanglement rescues were from miscellaneous or undetermined items: ‘Entanglements – other’, while 33% were from netting and wire and 10% from fishing tackle.” (DPIE 2020 Page 12) • “Social values analysis undertaken in the marine debris threat and risk assessment found the risk level of fishing line, as marine debris, on the human wellbeing was moderate” (DPIE 2020b, and E. Foulsham pers. comm., June 2021) (<i>Literature and expert advice</i>).	Adequate	Regional	10 years	Stable
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			In the Hawkesbury, Brisbane waters, Tuggerah and Hunter river, Clean4Shore (2019) found approximately 3.3% of plastic waste items were from recreational fishing. Wastes from recreational fishing was not in the top ten most frequently found plastic waste items. Clean4Shore (2019). <table><tr><th>Recreational fishing item</th><th>Numbers</th></tr><tr><td>Plastic bait & tackle bags & packaging</td><td>967</td></tr><tr><td>Plastic bait containers & lids, bait savers</td><td>747</td></tr><tr><td>Fishing line in metres (recreational)</td><td>360</td></tr><tr><td>Recreational fishing items (lures, floats, rods,)</td><td>338</td></tr><tr><td>Total Plastic items.</td><td>72,596</td></tr><tr><td>Plastic recreational fishing items as percent of total</td><td>3.3%</td></tr></table> The likelihood of these consequences is <i>likely</i> (N&S) and <i>almost certain</i> (C), due to the evidence given above, with likelihood higher in central region due to the impacts from the increased population size. Overall risk rating: Moderate	Recreational fishing item	Numbers	Plastic bait & tackle bags & packaging	967	Plastic bait containers & lids, bait savers	747	Fishing line in metres (recreational)	360	Recreational fishing items (lures, floats, rods,)	338	Total Plastic items.	72,596	Plastic recreational fishing items as percent of total	3.3%			
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58	Moderate	Likely (N&S) Almost certain (C)	Moderate Moderate	Litter, solid waste, marine debris and microplastics Recreational fishing contributes to litter, solid waste, marine debris and microplastics finding its way into the marine environment with implications for amenity, wildlife and health of fish, humans and the environment. Socialising and sense of community is impacted by the plastic waste from recreational fishing reducing the social participation and enjoyment of others seeking to enjoy activities in the marine estate. These consequences are considered to be <i>moderate</i>. The Statewide TARA did not reference any specific consequences of marine debris from recreational fishing sources however noted the following: - It is known that 92% of people believe that littering is socially unacceptable, and that litter makes an area look dirty and uncared for, unpleasant to be in and less likely to be used and enjoyed by the community. Therefore, individuals are less likely to socialise in an area where litter is present which adversely impacts the ability to create a sense of community. (<i>Statewide TARA</i>. 66). Additional consequences not included in the Statewide TARA include: - Aquaculture is impacted by pollution effects from recreational boating and fishing, such as plastic, human waste, and wash down of vessels (<i>Departmental reports</i>). - Watson et al. (in publication) indicate that in NSW “<i>the work is pointing towards the issue being a local issue restricted to certain hotspots</i>” This is supported by evidence of recreational fishing debris which is often visible around recreational fishing hotspots (Oceanwatch 2013) (<i>Literature</i>) - The annual report "NSW Wildlife Rehabilitation" is based on data collected on the thousands of animals rescued each year in NSW and is collated by the Department of Planning, Industry and Environment. “<i>In 2018–19, 2687 entangled animals were rescued across 139 species. About 56% of all entanglement rescues were from miscellaneous or undetermined items: ‘Entanglements – other’, while 33% were from netting and wire and 10% from fishing tackle.</i>” (DPIE 2020 Page 12) “<i>Social values analysis undertaken in the marine debris threat and risk assessment found the risk level of fishing line, as marine debris, as Moderate on recreation (A reduction in the ability to participate in human, recreational activities and/or a reduction in the enjoyment derived from those activities)</i> (DPIE 2020b, and E. Foulsham pers. comm., June 2021) (<i>Literature and expert advice</i>). The likelihood of this consequence is <i>likely</i> (N&S) and <i>almost certain</i> (C), due to the evidence given above. - As noted in cell 57 above. This is supported by evidence of recreational fishing debris which is often very visible around recreational fishing hotspots. Overall risk rating: Moderate	Adequate	Regional	10 years	Stable
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59	Moderate	Likely (N&S) Almost certain (C)	Moderate Moderate	Litter, solid waste, marine debris and microplastics Recreational fishing contributes to litter, solid waste, marine debris and microplastics finding its way into the marine environment with implications for amenity, wildlife and health of fish, humans and the environment. Marine debris and littering from recreational fishing impacts those seeking to enjoy the biodiversity & beauty of Marine estate (social intrinsic value) are <i>moderate</i> as they cause measurable impacts on a regional scale. Consequences of marine debris from recreational fishing sources considered in the Statewide TARA include: - The impacts of marine debris and littering on enjoyment of biodiversity and beauty refer mostly to impacts on the aesthetic beauty of the landscape from visible litter and rubbish, as well as a decline in enjoyment and appreciation from witnessing impacts on marine animals from plastic and fishing debris (e.g. entanglement, ingestion etc.). At least 77 species of marine wildlife found in Australian waters have been impacted by entanglement in, or ingestion of, plastic debris during the last thirty years. The affected species include six species of marine turtles, 12 species of cetaceans, at least 34 species of seabirds, dugongs, six species of pinnipeds, and at least 10 species of sharks and rays, and at least eight other species groups. This contributes to an inability of individuals to enjoy and appreciate the biodiversity of the marine estate. (<i>Statewide TARA</i>. 67). Additional consequences not included in the Statewide TARA include: - Aquaculture is impacted by pollution effects from recreational boating and fishing, such as plastic, human waste, and wash down of vessels (<i>Departmental reports</i>). - Watson et al. (in publication) indicate that in NSW “<i>the work is pointing towards the issue being a local issue restricted to certain hotspots</i>” (<i>Literature</i>). - This is supported by evidence of recreational fishing debris which is often very visible around recreational fishing hotspots (Oceanwatch 2013) (<i>Expert advice, Departmental reports and Literature</i>) - The annual report "NSW Wildlife Rehabilitation" is based on data collected on the thousands of animals rescued each year in NSW and is collated by the Department of Planning, Industry and Environment. “<i>In 2018–19, 2687 entangled animals were rescued across 139 species. About 56% of all entanglement rescues were from miscellaneous or undetermined items: ‘Entanglements – other’, while 33% were from netting and wire and 10% from fishing tackle.</i>” (DPIE 2020 Page 12) “<i>Social values analysis undertaken in the marine debris threat and risk assessment found the risk level of fishing line, as marine debris, as: High on the social value of aesthetics of the marine estate; Moderate on the social value of quality of nature</i>” (DPIE 2020b, and E. Foulsham pers. comm., June 2021) (<i>Literature and expert advice</i>). The likelihood of this consequence is <i>likely</i> (N&S) and <i>almost certain</i> (C), due to the evidence given above. - As noted in cell 57 above. This is supported by evidence of recreational fishing debris which is often very visible around recreational fishing hotspots Overall risk rating: Moderate	Adequate	Regional	10 years	Stable
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60	Minor	Likely (N&S) Almost certain (C)	Low	Litter, solid waste, marine debris and microplastics Recreational fishing contributes to litter, solid waste, marine debris and microplastics finding its way into the marine environment with implications for amenity, wildlife and health of fish, humans and the environment. Marine debris and littering from recreational fishing impacts those seeking to consumptive use are <i>minor</i> as they cause moderate impacts on a local scale. Consequences of marine debris from recreational fishing sources considered in the Statewide TARA include: - The impacts of recreational and commercial fishing plastics that may flow from increases in micro-plastics are ingested by target species. Species for consumptive use are also impacted by entanglement in, or ingestion of litter and debris. With reduced species this impacts the recreational and commercial fishers. Fishing rubbish and litter may also impact the social licence of recreational fishers which may in turn impact overall participation. (<i>Statewide TARA</i>. 68). Additional consequences not included in the Statewide TARA include: - The impact of microplastic on human health through ingestion of contaminated fish. Recreational fishing contributes to this threat through the common use of plastic lures and other forms of plastics (bait bags etc.) that can be washed into the marine estate. - Aquaculture is impacted by pollution effects from recreational boating and fishing, such as plastic, human waste, and wash down of vessels (<i>Departmental reports</i>. Watson et al. (in publication) indicate that in NSW “the work is pointing towards the issue being a local issue restricted to certain hotspots” (<i>Literature</i>). Recreational fishing debris is often very visible around recreational fishing hotspots (Oceanwatch 2013) (<i>Expert advice</i>, <i>Departmental reports and Literature</i>) - The annual report "NSW Wildlife Rehabilitation" is based on data collected on the thousands of animals rescued each year in NSW and is collated by the Department of Planning, Industry and Environment. “In 2018–19, 2687 entangled animals were rescued across 139 species. About 56% of all entanglement rescues were from miscellaneous or undetermined items: ‘Entanglements – other’, while 33% were from netting and wire and 10% from fishing tackle.” (DPIE 2020 Page 12) “Social values analysis undertaken in the marine debris threat and risk assessment found the risk level of fishing line, as marine debris, as low on the reduction of business” (DPIE 2020b, and E. Foulsham pers. comm., June 2021) (<i>Literature and expert advice</i>). - Research shows that ingested plastic waste fragments reduces fish growth and condition and that microplastics may accumulate in fish (GESAMP 2016). This reduces the potential consumptive enjoyment of those consuming fish from the Marine estate. The likelihood of this consequence is <i>likely</i> (N&S) and <i>almost certain</i> (C) - this is supported by evidence given above. Recreational fishing is not the main source of plastic waste on the coastline but can be reduced by fishers more readily than generic industrial plastic waste sources on land. Overall risk rating: Low	Adequate	Regional	10 years	Stable
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61	Moderate	Likely (N&S) Almost certain (C)	Moderate	Litter, solid waste, marine debris and microplastics Recreational fishing contributes to litter, solid waste, marine debris and microplastics finding its way into the marine environment with implications for amenity, wildlife and health of fish, humans and the environment. The consequences of addition of plastic waste to the marine environment are <i>moderate</i> as they considered to have measurable impacts on the Intrinsic and bequest values (economic intrinsic value) at a regional scale. Intrinsic values are likely to be threatened, although given marine litter is only one component of the broader concerns about pollution, the impact of this stressor is assigned as a moderate consequence level (<i>Statewide TARA. 70</i>). In the central region the likelihood is higher due to increased population density, however in the North and South regions whilst there may not be as much pollution individuals place higher value on the cleanliness of the marine estate and therefore are less likely to litter in these regions and therefore be less tolerant of litter and marine debris (<i>Statewide TARA. 70</i>). Additional consequences that are not listed in the state-wide TARA include: • The recreational sector is aware that fishing line, lures and plastics are recognised as being reasonably attributable to their activity but are less in volume than main sources of marine plastics (Oceanwatch 2013, Watson et al. in publication) (<i>Expert advice, Departmental reports and Literature</i>). • The annual report "NSW Wildlife Rehabilitation" is based on data collected on the thousands of animals rescued each year in NSW and is collated by the Department of Planning, Industry and Environment. "<i>In 2018–19, 2687 entangled animals were rescued across 139 species. About 56% of all entanglement rescues were from miscellaneous or undetermined items: 'Entanglements – other', while 33% were from netting and wire and 10% from fishing tackle.</i>" (DPIE 2020 Page 12) • "<i>Social values analysis undertaken in the marine debris threat and risk assessment found the risk level of fishing line, as marine debris, as: HIGH on the social value of aesthetics of the marine estate; Moderate on the social value of quality of nature</i>" (DPIE 2020b, and E. Foulsham pers. comm., June 2021) (<i>Literature and expert advice</i>). The likelihood of this consequence is <i>likely</i> (N&S) and <i>almost certain</i> (C), due to the evidence given above. The recreational fishing sector recognises the role of plastics in their sport and seek to mitigate its use through a number of dedicated programs such as clean-up operations in hot spot areas, installation of fishing line bins as well as increased education and advisory material. Recreational fishing is not the main source of plastic waste on the coastline but can be reduced by fishers more readily than generic industrial plastic waste sources on land. Overall risk rating: Moderate	Adequate	All Regions	10 years	Stable
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62	Moderate	Likely (N&S) Almost certain (C)	Moderate Moderate	Litter, solid waste, marine debris and microplastics Recreational fishing contributes to litter, solid waste, marine debris and microplastics finding its way into the marine environment with implications for amenity, wildlife and health of fish, humans and the environment. Plastics waste can reduce the appeal, enjoyment and demand for tourism and seafood, impacting tourism, aquaculture and commercial fishing businesses value of production with a <i>moderate consequence</i> (Statewide TARA 71). Loss of business may translate into less employment. Perversely, local government and community groups incur the expense to clean-up litter with apparent gains in employment that are a cost impost from those creating plastic waste and also has a <i>Moderate consequence</i>. The environmental TARA considered marine debris and littering from a range of sources and references evidence of microplastics, marine debris and other contaminants impacting marine fauna. In particular, discarded fishing gear and debris from recreational fishers poses a threat to turtles, seals and seabirds through ingestion and entanglement (Statewide TARA 71) Additional consequences not included in the Statewide TARA include: • The impact of microplastic on human health through ingestion of contaminated fish. Recreational fishing contributes to this threat through the common use of plastic lures and other forms of plastics (bait bags etc.) that can be washed into the marine estate. • Aquaculture is impacted by pollution effects from recreational boating and fishing, such as plastic, human waste, and wash down of vessels (<i>Departmental reports</i>). • Watson et al. (in publication) indicate that in NSW “<i>the work is pointing towards the issue being a local issue restricted to certain hotspots</i>” Recreational fishing debris is often very visible around recreational fishing hotspots (Oceanwatch 2013) (<i>Literature</i>). • The annual report "NSW Wildlife Rehabilitation" is based on data collected on the thousands of animals rescued each year in NSW and is collated by the Department of Planning, Industry and Environment. “<i>In 2018–19, 2687 entangled animals were rescued across 139 species. About 56% of all entanglement rescues were from miscellaneous or undetermined items: ‘Entanglements – other’, while 33% were from netting and wire and 10% from fishing tackle.</i>” (DPIE 2020 Page 12) • “<i>Social values analysis undertaken in the marine debris threat and risk assessment found the risk level of fishing line, as marine debris, as LOW on the reduction of business</i>” (DPIE 2020b, and E. Foulsham pers. comm., June 2021) (<i>Literature and expert advice</i>). The likelihood of this consequence is <i>likely</i> (N&S) and <i>almost certain</i> (C), due to the evidence given above. Also, the higher likelihood is due to the increased population density in the central region and recording the highest number of recreational fishers in the state in the 17/18 recreational fishing survey (38% in the region) Murphy et al (2021). Overall risk rating: Moderate	Limited	Regional	10 years	Stable
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63	Moderate	Likely (N&S) Almost certain (C)	Moderate Moderate	Litter, solid waste, marine debris and microplastics Recreational fishing contributes to litter, solid waste, marine debris and microplastics finding its way into the marine environment with implications for amenity, wildlife and health of fish, humans and the environment. Unsightly or smelly waste from recreational fishing may reduce the Individual enjoyment value (consumer surplus) of visitors to the marine estate impacting tourism, aquaculture and commercial fishing businesses. Other types of lost plastic fishing line, lures and gear diminish the enjoyment of other marine estate users meriting a <i>moderate consequence</i>. The environmental TARA (within the Statewide TARA) considered marine debris and littering from a range of sources and references evidence of microplastics. Discarded fishing gear and debris from recreational fishers poses a threat to turtles, seals and seabirds through ingestion and entanglement (<i>Statewide TARA 72</i>). Litter in oceans and seas is an aesthetic problem, incurs considerable costs to clean and can have severe impacts on marine organisms and habitats. In 2014-15 litter costs \$180 million with much of this funding delegated to cleaning up litter so that the aesthetic appeal and ability to enjoy public places particularly in the marine environment is not limited [48] (<i>Statewide TARA 72</i>). Individuals that use the marine estate for recreational purposes, such as swimmers, surfers and tourists will likely see major impacts on their enjoyment value (if not be deterred from using the marine estate because of litter), therefore resulting in a moderate consequence rating (<i>Statewide TARA 72</i>). Additional consequences not included in the Statewide TARA include: • The impact of microplastic on human health through ingestion of contaminated fish. Recreational fishing contributes to this threat through the common use of plastic lures and other forms of plastics (bait bags etc.) that can be washed into the marine estate. • Aquaculture is impacted by pollution effects from recreational boating and fishing, such as plastic, human waste, and wash down of vessels (<i>Departmental reports</i>). • Watson et al. (in publication) indicate that in NSW “<i>the work is pointing towards the issue being a local issue restricted to certain hotspots</i>” Recreational fishing debris is often very visible around recreational fishing hotspots (Oceanwatch 2013) (<i>Literature</i>). The annual report “NSW Wildlife Rehabilitation” is based on data collected on the thousands of animals rescued each year in NSW and is collated by the Department of Planning, Industry and Environment. “<i>In 2018–19, 2687 entangled animals were rescued across 139 species. About 56% of all entanglement rescues were from miscellaneous or undetermined items: ‘Entanglements – other’, while 33% were from netting and wire and 10% from fishing tackle.</i>” (DPIE 2020 Page 12) • “<i>Social values analysis undertaken in the marine debris threat and risk assessment found the risk level of fishing line, as marine debris, as: HIGH on the social value of aesthetics of the marine estate; Moderate on the social value of quality of nature; Moderate on recreation; Moderate on human wellbeing ; LOW on the reduction of business</i>”. (DPIE 2020b, and E. Foulsham pers. comm., June 2021) (<i>Literature and expert advice</i>).	Limited	Regional	10 years	Stable
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				The likelihood of this consequence is <i>likely</i> (N&S) and <i>almost certain</i> (C), due to the evidence given above and the increased population density in the central region. Overall risk rating: Moderate				
64	Minor	Likely (N&S) Almost certain (C)	Low	Wildlife disturbance (shorebirds, turtles, whales) and interactions, including impacts to ecological health Recreational fishing is an outdoor activity and will interact with wildlife on occasions. The use of boats and four wheel drives by fishers may also have associated wildlife interactions. The consequences of this stressor on safety, health and wellbeing (including relaxation) are <i>minor</i> given they are discernible, temporary impacts at a regional scale. There may be more moderate consequences experienced at a local scale at various locations. Consequences listed in the Statewide TARA which are relevant to recreational fishing include: - Physical and wildlife disturbance from recreational fishing and associated activities (i.e. use of 4WD and boats etc.) results in a reduced opportunity to enjoy wildlife such as marine animals, shorebirds and turtles and their habitats. - Physical disturbance from recreational fishers causing habitat impacts and substrate compaction, particularly in areas of saltmarsh around coastal lagoons. Risk to endangered shorebirds at roost and feeding sites with impacts on breeding success and migration. (<i>Statewide TARA 73</i>). "Given the known presence of roosting and foraging areas for many threatened and protected bird species, it is likely that some disturbance occurs from the level of shore and boat based recreational activity on the open coast (including recreational fishing). However, in comparison to other shore based activities, such as walking and dog-walking, the degree of disturbance caused by recreational fishers is likely to be relatively low." (DPI 2016 page 324 TARA Background report). (<i>Departmental reports</i>) Additional consequences that are not listed in the Statewide TARA include: - Accidental or intentional injuries to wildlife from fishing activity (e.g. through hooks or other fishing gear) which lead to distress or anxiety within the community, particularly wildlife carers and members of the public that witness injured animals. - The annual report "NSW Wildlife Rehabilitation" is based on data collected on the thousands of animals rescued each year in NSW and is collated by the Department of Planning, Industry and Environment. "In 2018–19, 2687 entangled animals were rescued across 139 species. About 56% of all entanglement rescues were from miscellaneous or undetermined items: 'Entanglements – other', while 33% were from netting and wire and 10% from fishing tackle" (DPIE 2020 Page 12) . The likelihood of this consequence is <i>likely</i> (N&S) and <i>almost certain</i> (C), due to the following reasons: - Recreational fishing is a nature based extractive use activity and therefore some interactions with non-targeted wildlife are inevitable (<i>Departmental reports, social media reports, expert advice</i>)	Adequate	Regional	10 years	Stable

				Recreational fishing is often conducted in conjunction with other activities (4WD, marine vessels) which are considered likely to cause wildlife disturbance (<i>Statewide TARA</i>) Overall risk rating: Low				
65	Minor	Likely (N&S) Almost certain (C)	Low	Wildlife disturbance (shorebirds, turtles, whales) and interactions, including impacts to ecological health Recreational fishing is an outdoor activity and will interact with wildlife on occasions. The use of boats and four wheels drives by fishers may also have associated wildlife interactions. The consequences of this stressor on socialising and sense of community are <i>minor</i> given they are discernible, temporary impacts at a regional scale. There may be more moderate consequences experienced at a local scale at various locations. Consequences listed in the Statewide TARA which are relevant to recreational fishing include: - Impacts on people's relationship with the coast (e.g. loss of appeal due to decline in wildlife) will also impact social connections. - Recreational fishers may disturb wildlife or impact habitat and hence impact relationships with other users of the marine estate (Birdwatchers, whale watching tourists etc). Additional consequences that are not listed in the Statewide TARA include: - The annual report "NSW Wildlife Rehabilitation" is based on data collected on the thousands of animals rescued each year in NSW and is collated by the Department of Planning, Industry and Environment. "<i>In 2018–19, 2687 entangled animals were rescued across 139 species. About 56% of all entanglement rescues were from miscellaneous or undetermined items: 'Entanglements – other', while 33% were from netting and wire and 10% from fishing tackle.</i>" (DPIE 2020 Page 12). The likelihood of this consequence is <i>likely</i> (N&S) and <i>almost certain</i> (C), due to the following reasons: - Recreational fishing is a nature based extractive use activity and therefore some interactions with non-targeted wildlife are inevitable. - Recreational fishing is often conducted in conjunction with other activities (4WD, marine vessels) which are considered likely to cause wildlife disturbance (<i>Statewide TARA</i>) Overall risk rating: Low	Adequate	Regional	10 years	Stable
66	Moderate	Likely (N&S) Almost certain	Moderate	Wildlife disturbance (shorebirds, turtles, whales) and interactions, including impacts to ecological health Recreational fishing is an outdoor activity and will interact with wildlife on occasions. The use of boats and four wheel drives by fishers may also have associated wildlife interactions. The consequences of this stressor on enjoying the biodiversity & beauty of Marine estate (social intrinsic value) are <i>moderate</i> given they are likely to be measurable at a regional scale. Consequences listed in the Statewide TARA were not specific to recreational fishing but noted the high degree of interest and concern in protection of wildlife in the general community.	Adequate	Regional	10 years	Stable

				Specific consequences not listed in The Statewide TARA which are of relevance to recreational fishing include: - Evidence of wildlife injuries caused by recreational fishers on iconic or threatened species from marine debris and accidental interactions. This would include seabirds tangled in fishing line or accidentally hooked, turtle deaths in Port Stephens due to interactions with set crab gear, reports of Grey Nurse Shark trailing fishing gear at various hotspot locations and occasional reports of deliberate injury of animals. These incidences have resulted in complaints to the department and media interest underscoring the high level of public interest in ensuring the safety and conversation of these species (<i>Departmental reports</i>). - McPhee et al. (2002) note “<i>An initial census by the Australian Seabird Rescue Group in the Richmond River revealed that of the 108 resident Australian Pelicans, 37 were suffering injuries from being entangled or hooked by fishing tackle. Subsequent studies in the region have shown that of all the human induced injuries to the Australian Pelican, 92% were from entanglement in fishing lines (Australian Seabird Rescue Group, Unpublished Data)</i>” (<i>Literature</i>) - The annual report "NSW Wildlife Rehabilitation" is based on data collected on the thousands of animals rescued each year in NSW and is collated by the Department of Planning, Industry and Environment. “<i>In 2018–19, 2687 entangled animals were rescued across 139 species. About 56% of all entanglement rescues were from miscellaneous or undetermined items: ‘Entanglements – other’, while 33% were from netting and wire and 10% from fishing tackle.</i>” (DPIE 2020 Page 12) - A national study of marine debris entanglement and ingestion impacts on Australian birds reported that “<i>Seabird rescue organisations report that active recreational fishing gear appears to pose a much greater threat to seabirds around the Australian mainland coast than derelict fishing gear or other types of plastic debris</i>” and that “<i>Seabird rescue organisations state that more than 50% of birds attended to have been affected by entanglement in or ingestion of fishing lines and hooks</i>” (Ceccarelli 2009). The report examines the studies from wildlife rescue and results indicate recreational fishing (2.5%) is a lower source of entanglement than plastics from commercial fishing and that ingestion of kooks and lines impacting wildlife (31.1%). <table><tr><th>Plastic Type</th><th>Entanglement (number of animals)</th><th>Ingestion (number of animals)</th></tr><tr><td>Fishing hooks and lines (Derelict)</td><td>7</td><td>41</td></tr><tr><td>Fishing hooks and lines (Active/Derelict)</td><td>25</td><td>8</td></tr><tr><td>Plastic bag*</td><td>10</td><td>17</td></tr><tr><td>Total</td><td>1,703</td><td>212</td></tr><tr><td>Possible Recfishing sourced items as percentage of total</td><td>2.5%</td><td>31.1%</td></tr><tr><td colspan="3">*Not all from Rec. fishing.</td></tr></table> Source: Ceccarelli (2009) Table 3.Summary of known plastic types impacting marine wildlife through entanglement and ingestion in Australian waters.	Plastic Type	Entanglement (number of animals)	Ingestion (number of animals)	Fishing hooks and lines (Derelict)	7	41	Fishing hooks and lines (Active/Derelict)	25	8	Plastic bag*	10	17	Total	1,703	212	Possible Recfishing sourced items as percentage of total	2.5%	31.1%	*Not all from Rec. fishing.						
Plastic Type	Entanglement (number of animals)	Ingestion (number of animals)																											
Fishing hooks and lines (Derelict)	7	41																											
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Total	1,703	212																											
Possible Recfishing sourced items as percentage of total	2.5%	31.1%																											
*Not all from Rec. fishing.																													

				- At certain locations, recreational fishers use 4WD to access beach fishing locations. 4WD traffic is implicated in impacting key components of sandy beach fauna including ghost crabs (<i>Ocypode</i> spp.) (Moss and McPhee, 2006, Schlacher et al., 2007; Schlacher and Lucrezi, 2007) and pippies (Schlacher et al., 2008). Recreational 4WD can also impact nesting birds and this is documented in northern NSW (Totterman, 2021). Drivers of vehicles with fishing rod holders tended to evade birds more frequently than non-fishing vehicles (Weston et al., 2014). Disturbance of shorebirds may impact enjoyment by bird watchers. The likelihood of this consequence is <i>likely</i> (N&S) and <i>almost certain</i> (C), due to the following reasons: - Recreational fishing is a nature based extractive use activity and therefore some interactions with non-targeted wildlife are inevitable. - Recreational fishing is often conducted in conjunction with other activities (4WD, marine vessels) which are considered likely to cause wildlife disturbance (<i>Statewide TARA</i>) Overall risk rating: Moderate				
67	Minor	Unlikely	Minimal	Wildlife disturbance (shorebirds, turtles, whales) and interactions, including impacts to ecological health Recreational fishing is an outdoor activity and will interact with wildlife on occasions. The use of boats and four wheel drives by fishers may also have associated wildlife interactions. Recreational fishers may disturb wildlife or impact habitat and have impacts on consumptive users (extracting) such as commercial fishers. The consequences of this stressor on consumptive users (extracting) are <i>minor</i>. However, given wildlife watching is not considered an extractive activity, there will be little impact on consumptive use (<i>Statewide TARA 76</i>). The likelihood of this consequence is <i>unlikely</i>. Overall risk rating: Minimal	Limited	Regional	10years	Stable
68	Minor	Likely (N&S) Almost certain (C)	Low	Wildlife disturbance (shorebirds, turtles, whales) and interactions, including impacts to ecological health Recreational fishing is an outdoor activity and will interact with wildlife on occasions. The use of boats and four wheel drives by fishers may also have associated wildlife interactions. Recreational fishers may disturb wildlife or impact habitat and hence reduce the Intrinsic and bequest values (economic intrinsic value) of the marine estate use (Bird watching, Whale watching, and tourism etc.). The consequences are <i>Minor</i>. Concern over habitat disturbance and physical damage were lower in the Marine Estate Community Surveys [1], possibly indicating lower levels of awareness or concern about the impacts of these activities or possibility indicating a belief that these activities are not occurring at significant levels at present. The impacts from dog walkers, four wheel drives and marine vessels are similarly unlikely to be widespread. (<i>Statewide TARA 78</i>)	Adequate	Regional	10 years	Stable

				Additional consequences that are not listed in the state-wide TARA include: The annual report "NSW Wildlife Rehabilitation" is based on data collected on the thousands of animals rescued each year in NSW and is collated by the Department of Planning, Industry and Environment. <i>"In 2018–19, 2687 entangled animals were rescued across 139 species. About 56% of all entanglement rescues were from miscellaneous or undetermined items: 'Entanglements – other', while 33% were from netting and wire and 10% from fishing tackle."</i> (DPIE 2020 Page 12) The likelihood of this consequence is <i>likely</i>, due to the following reasons: Recreational fishing takes place in coastal areas where wildlife is present. Fishers avoid disturbance of wildlife, but none the less have an impact Overall risk rating: Low				
69	Minor	Possible	Minimal	Wildlife disturbance (shorebirds, turtles, whales) and interactions, including impacts to ecological health Recreational fishing is an outdoor activity and will interact with wildlife on occasions. The use of boats and four wheel drives by fishers may also have associated wildlife interactions. Recreational fishers may disturb wildlife or impact habitat with <i>Minor consequence on employment and value of production</i> of industries depending on wildlife such as Birdwatching, Whale watching and tourism at a regional scale. Local consequences may be moderate. The impacts from dog walkers, four wheel drives and marine vessels are unlikely to be widespread, and the threats from habitat disturbance and physical damage are unlikely to cause significant impacts to employment and value of production. (<i>Statewide TARA 79</i>) Additional consequences that are not listed in the state-wide TARA include: The annual report "NSW Wildlife Rehabilitation" is based on data collected on the thousands of animals rescued each year in NSW and is collated by the Department of Planning, Industry and Environment. <i>"In 2018–19, 2687 entangled animals were rescued across 139 species. About 56% of all entanglement rescues were from miscellaneous or undetermined items: 'Entanglements – other', while 33% were from netting and wire and 10% from fishing tackle."</i> (DPIE 2020 Page 12) The likelihood of this consequence is <i>possible</i>, as recreational fishing takes place in coastal areas where wildlife is present. Most fishers avoid disturbance of wildlife, but none the less will have some impact. This may translate into impacts on other business users. Overall risk rating: Minimal	Adequate	Regional	10 years	Stable

70	Minor	Likely (N&S) Almost certain (C)	Low	Wildlife disturbance (shorebirds, turtles, whales) and interactions, including impacts to ecological health Recreational fishing is an outdoor activity and will interact with wildlife on occasions. The use of boats and four wheel drives by fishers may also have associated wildlife interactions. Recreational fishers may disturb wildlife or impact habitat with a <i>minor consequence</i> of reducing the individual enjoyment value (consumer surplus) of those appreciating wildlife (Bird watching, Whale watching and tourism etc.). Local consequences may be moderate. Wildlife disturbance will impact those that value direct interaction and enjoyment of biodiversity and wildlife, including snorkelers, divers; those involved in nature based passive use, and fishers. However, the disturbance itself may be caused by activities that contribute to the individual enjoyment value of other members of the community. The net impacts are likely to be minor, and therefore result an overall risk rating of low (<i>Statewide TARA 80</i>) Additional consequences that are not listed in the state-wide TARA include: - At certain locations, recreational fishers use 4WD to access beach fishing locations. 4WD traffic is implicated in impacting key components of sandy beach fauna including ghost crabs (<i>Ocypode</i> spp.) (Moss and McPhee, 2006; Schlacher et al., 2007; Schlacher and Lucrezi, 2007) and pippies (Schlacher et al., 2008). - Recreational 4WD can also impact nesting birds and this is documented in northern NSW (Totterman, 2021). Drivers of vehicles with fishing rod holders tended to evade birds more frequently than non-fishing vehicles (Weston et al., 2014). Disturbance of shorebirds may impact enjoyment by bird watchers. (<i>Literature, Departmental reports, social media reports, expert advice</i>) - The annual report "NSW Wildlife Rehabilitation" is based on data collected on the thousands of animals rescued each year in NSW and is collated by the Department of Planning, Industry and Environment. "In 2018–19, 2687 entangled animals were rescued across 139 species. About 56% of all entanglement rescues were from miscellaneous or undetermined items: 'Entanglements – other', while 33% were from netting and wire and 10% from fishing tackle." (DPIE 2020 Page 12) The likelihood of this consequence is <i>likely</i> (N&S) and <i>almost certain</i> (C) as recreational fishing takes place in coastal areas where wildlife is present but may impact other marine estate users enjoying wildlife. Overall risk rating: Low	Adequate	Regional	10 years	Stable
71	Minor	Likely	Low	Habitat (physical) disturbance The different methods of recreational fishing and the pursuit of the activity may have implications for the physical disturbance of the environment and impacts on marine and coastal habitats. The consequences of this stressor on Safety health and wellbeing (including relaxation) are <i>minor</i> given they may be highly localised and may cause moderate impacts in those localised areas. Consequences listed in the Statewide TARA were not specific to recreational	Limited	Regional	10 years	Stable

				fishing but noted a lower level of community concern in relation to this impact. The environmental TARA also recorded only minor habitat disturbance from recreational fishing and related to activities such as trampling. Specific consequences not listed in The Statewide TARA which are of relevance to recreational fishing include: Physical disturbance of the environment can have enjoyment impacts, with these being highest for those that value direct interaction and enjoyment of biodiversity and wildlife, including snorkelers, divers and fishers. There are also impacts for the broader community due to the high value placed on abundance of marine life. (<i>Departmental reports</i>). There is evidence of the benthic and habitat impacts of anchoring in marine industries and these are occurring for smaller vessels also (Broad et al. 2020). Anchoring impacts on sensitive benthic fauna like gorgonians, corals and bryozoans have been noted, as has entanglement by fishing lines (McPhee et al. 2002). The likelihood of this consequence is <i>likely</i> as recreational fishing is a minor contributor to this threat overall and largely contributes to relatively minor impacts directly from the activity of recreational fishing (e.g. trampling effects). Overall risk rating: Low				
72	Insignificant	Unlikely	Minimal	Habitat (physical) disturbance The different methods of recreational fishing and the pursuit of the activity may have implications for the physical disturbance of the environment and impacts on marine and coastal habitats. The consequences of this stressor on Socialising and sense of community are <i>insignificant</i> given they may be minor and highly localised. Consequences listed in the Statewide TARA were not specific to recreational fishing. The likelihood of this consequence is <i>unlikely</i> as recreational fishing is a small contributor to this threat overall and largely contributes to relatively minor impacts directly from the activity of recreational fishing (e.g. trampling effects). Overall risk rating: Minimal	Adequate	All regions	10 years	Stable
73	Minor	Likely	Low	Habitat (physical) disturbance The different methods of recreational fishing and the pursuit of the activity may have implications for the physical disturbance of the environment and impacts on marine and coastal habitats. Recreational fishing activity may disturb some habitats and thus impact Enjoying the biodiversity & beauty of Marine estate (social intrinsic value) by users such as the public, snorkelers, divers or fishers. Consequences listed in the Statewide TARA were not specific to recreational fishing but noted:	Adequate	All regions	10 years	Stable

				- The collection of nippers (<i>Trypea australiensis</i>) by recreational fishers can cause local habitat disturbance and changes to the structure and function of assemblages of benthic intertidal invertebrates (Skilleter et al., 2005). This however will not flow on to the meaningful or measurable impacts to the intrinsic social values of marine estate given the scale of the impacts and the nature of the habitat impacted. - Habitat disturbance will impact those that value direct interaction and enjoyment of biodiversity and wildlife, including snorkelers, divers; those involved in nature based passive use, and fishers. - Anchoring impacts on sensitive benthic fauna like gorgonians, corals and bryozoans have been noted as has entanglement by fishing lines (McPhee et al. 2002). These impacts were noted in the Illawarra region in a submission to the Hawkesbury Shelf Marine Park (Leadbitter 2018) (<i>Literature</i>) The likelihood of this consequence is <i>likely</i> as recreational fishing is a small contributor to this threat overall and largely contributes to relatively minor impacts directly from the activity of recreational fishing (e.g. trampling effects). Overall risk rating: Low				
74	Minor	Unlikely	Minimal	Habitat (physical) disturbance The different methods of recreational fishing and the pursuit of the activity may have implications for the physical disturbance of the environment and impacts on marine and coastal habitats. The consequences of this stressor on Consumptive use (extracting) are <i>minor</i> given they may be small and highly localised. Consequences listed in the Statewide TARA that were specific to recreational fishing included: Declines in fish abundance associated with loss of nursery areas for important seafood species and flow on impacts on health and wellbeing for seafood consumers and recreational fishers. The likelihood of this consequence being the result of recreational fishing activity is <i>unlikely</i> as recreational fishing is a <i>minor</i> contributor to this threat overall and largely contributes to relatively small impacts directly from the activity of recreational fishing (e.g. trampling effects). Overall risk rating: Minimal	Adequate	All regions	10 years	Stable

75	Minor	Likely	Low	Habitat (physical) disturbance The different methods of recreational fishing and the pursuit of the activity may have implications for the physical disturbance of the environment and impacts on marine and coastal habitats. Recreational fishing activity may disturb some habitats and thus impact the Intrinsic and bequest values (economic intrinsic value) of users such as the public, snorkelers, divers or fishers with <i>Minor consequences</i>. Concerns about habitat disturbance and physical damage were relatively low in the Marine Estate Community Survey. However, where habitat disturbance and physical damage do occur, it is expected that intrinsic and bequest values will be impacted. (<i>Statewide TARA 86</i>) The likelihood of this consequence being the result of recreational fishing activity is <i>likely</i> as recreational fishing is a <i>minor</i> contributor to this threat regionally and largely contributes to relatively small impacts directly from the activity of recreational fishing (e.g. trampling effects). Overall risk rating: Low	Limited	Regional	10 years	Stable
76	Minor	Likely	Low	Habitat (physical) disturbance The different methods of recreational fishing and the pursuit of the activity may have implications for the physical disturbance of the environment and impacts on marine and coastal habitats. Recreational fishing activity may disturb habitats and thus impact the Employment and value of production of users such as the dive boat operators or commercial fishers with <i>Minor consequences</i> in the regions. Impacts on employment and production from habitat and physical disturbances will be mixed; tourism operators may be negatively impacted if resources are depleted or habitats changed, For example, the damage to benthos from anchoring (associated with recreational fishing vessels) may have a negative impact on scuba diving operators. Conversely, some businesses will benefit (cafes and restaurants may attract more customers due to foreshore development improving access). In some cases, business would derive income from the stressor activities (e.g. foreshore development, boating infrastructure and recreation) (<i>Statewide TARA 87</i>) The likelihood of this consequence being the result of recreational fishing activity is <i>likely</i> due to the activity contributing to relatively minor habitat impacts (e.g. trampling effects). Overall risk rating: Low	Limited	Regional	10 years	Stable

77	Minor	Likely	Low	Habitat (physical) disturbance The different methods of recreational fishing and the pursuit of the activity may have implications for the physical disturbance of the environment and impacts on marine and coastal habitats. Recreational fishing activity may disturb habitats and thus impact the Individual enjoyment value (consumer surplus) of users such as the public, snorkelers, divers or commercial fishers with <i>minor consequences</i>. Concerns about habitat disturbance and physical damage were relatively low in the Marine Estate Community Survey, suggesting that the impact of this stressor on individual enjoyment values would be limited. (<i>Statewide TARA 88</i>) The likelihood of this consequence being the result of recreational fishing activity is <i>likely</i> due to the activity contributing to relatively minor habitat impacts (e.g. trampling effects). Overall risk rating: Low	Limited	Regional	10 years	Stable
78	Moderate	Possible	Low	Reductions in abundances of species and trophic levels The total catch of the recreational fishing sector is significant and can reduce the abundance of fish of different species and sizes classes. The consequences of this stressor on Health, safety and wellbeing are <i>moderate</i> given they may be measurable and on-going negative impacts evident at a regional scale for a specific sector or sectors (largely consumptive users and other users that value direct interaction and enjoyment of biodiversity and fish, including snorkelers and divers). Consequences listed in the Statewide TARA were specific to recreational fishing included: • The FRDC Valuing Coastal Fisheries report indicates that the wider NSW public puts a high value on locally caught seafood, and many think local product is better for their health. Decline in availability of local seafood may result in some overall decline in seafood consumption. • Escape and relaxation are one of the primary motivations for recreational fishers. Recreational fishers in NSW show varying levels of 'consumptive orientation' (i.e. desire to catch fish) however the option of catching fish is a large part of the appeal of the fishing experience. There are catch and non-catch related motivations and both interact to contribute to satisfaction with the recreational fishing experience (Graefe and Fedler, 1986; Hunt et al., 2017). Studies of angling populations identify non-catch motivations are important (Hunt et al., 2017); however, avid recreational fishers as a subset may have different focus and these are the recreational fishers which tend to have the most invested in the activity (Bryan, 2000; Beardmore et al., 2011). Therefore, declines in fish abundance have potential to impact the satisfaction of recreational fishers with their fishing experience. The environmental TARA reported commercial fishing impacts on abundances of top and lower trophic levels in ocean and estuary waters as moderate on the basis of potential changes to trophic structure and uncertainties in understanding the effect of the fish stocks on ecosystem function (<i>Statewide TARA 89</i>).	Adequate	Regional	10 years	Stable

				Gradual technological innovations in the recreational fishing sector have included improved fish finders for location and targeting of fish. More recently the use of drones to target species and the use of social media to spread information about fish locations has been noted as having implications for fisheries management and policy (Cooke et al. 2021). (<i>Media and Literature</i>) The likelihood of this consequence being the result of recreational fishing activity is <i>possible</i> as recreational fishing is a large contributor to current fishing catch and effort in NSW, sometimes exceeding commercial catch (West and Gordon, 1994; Steffe and Murphy, 2011) (West et al., 2015, Murphy et al. (2021) but taking 13-14% by weight of total catch (Murphy et al. (2021). In addition, the recreational sector (along with the commercial sector) is experiencing continued 'technology creep', with increasingly sophisticated technology assisting fishers to find, target and catch fish potentially enabling the sectors to further fish down the stock. There are however, a suite of regulations in place to limit the capacity for this likelihood to occur and new policy direction in NSW to introduce harvest strategies will go further to potentially improve fish stocks and fishery performance as they are implemented (<i>Literature</i>). Overall risk rating: Low				
79	Moderate	Possible	Low	Reductions in abundances of species and trophic levels The total catch of the recreational fishing sector is significant and can reduce the abundance of fish of different sizes classes. The consequences of this stressor on socialising and sense of community are <i>moderate</i> given they may be measurable and on-going negative impacts evident at a regional scale for a specific sector or sectors (largely consumptive users and other users that value direct interaction and enjoyment of biodiversity and fish, including snorkelers and divers). Consequences listed in the Statewide TARA were specific to recreational fishing included: Current disputes between commercial and recreational sectors demonstrate the potentially divisive influence that competition for a limited resource can have on community harmony and cohesion. This could be expected to be exacerbated by further reductions in the available resource which will potentially occur. In addition, the socialisation aspects of recreational fishing is a major motivation for participation and this may decline if fish abundances are impacted. The consequences of declines in fish abundance on socialisation are likely to be concentrated more significantly on consumptive users and of major concern for these users.(<i>Statewide TARA 90</i>) The likelihood of this consequence being the result of recreational fishing activity is <i>possible</i> as recreational fishing is a large contributor to current fishing effort in NSW, sometimes exceeding commercial catch (West et al., 2015, Murphy et al. (2021), but taking 13-14% by weight of total catch (Murphy et al. (2021). See cell 78. (<i>Literature</i>) Overall risk rating: Low	Adequate	Regional	10 years	Stable

80	Moderate	Likely	Moderate	Reductions in abundances of species and trophic levels The total catch of the recreational fishing sector is significant and can reduce the abundance of fish of different sizes classes. The consequences of this stressor on Enjoying the biodiversity & beauty of Marine estate (social intrinsic value) are <i>moderate</i> given they may be measurable and on-going negative impacts evident at a regional scale for a specific sector or sectors (largely consumptive users and other users that value direct interaction and enjoyment of biodiversity and fish, including snorkelers and divers). Consequences listed in the Statewide TARA were not specific to recreational fishing but noted: Impacts will be concentrated on those users that value direct interactions with marine wildlife (including fish). The Marine Estate Community Survey results identified that overfishing is considered the second highest threat (18%) when unprompted regarding what threats to the benefits derived from the marine estate. (<i>Statewide TARA 91</i>) The likelihood of this consequence being the result of recreational fishing activity is <i>likely</i> as recreational fishing is a large contributor to current fishing effort in NSW, sometimes exceeding commercial catch (West and Gordon, 1994; Steffe and Murphy, 2011) (West et al., 2015 , Murphy et al. (2021) but taking 13-14% by weight of total catch (Murphy et al. (2021) See cell 78). (<i>Literature</i>) Overall risk rating: Moderate	Adequate	Regional	10 years	Stable
81	Moderate	Likely	Moderate	Reductions in abundances of species and trophic levels The total catch of the recreational fishing sector is significant and can reduce the abundance of fish of different sizes classes. The consequences of this stressor on Consumptive use (extracting) are <i>moderate</i> given they result in substantial, measurable and ongoing impacts for consumptive user groups (including within the recreational fishing sector) at a temporal and local scale with measurable impacts on a regional scale. Consequences listed in the Statewide TARA specific to recreational fishing included: Declines in fish abundance will impact those sectors that value or rely on extractive use (i.e. fishers) by reducing their capacity to catch fish or their ability to go fishing (e.g. through increased regulations or costs introduced to manage this decline). The threats associated with localised depletion of fish stocks, are likely	Adequate	Regional	10 years	Stable

				to contribute to substantial measurable and ongoing negative social and economic impacts on consumptive use overall (major), with potentially catastrophic impacts for the commercial/recreational fishing industry. This threat may have further implications for other industries, who are reliant upon healthy and biodiverse ecosystems, such as the dolphin watch industry, scuba diving, snorkelling and charter vessels. This may threaten the future social benefits and economic viability of some, or all, of these industries (<i>Statewide TARA 92</i>). Gradual technological innovations in the recreational fishing sector have included improved fish finders for location and targeting of fish. More recently the use of drones to target species and the use of social media to spread information about fish locations has been noted as having implications for fisheries management and policy (Cooke et al. 2021). (<i>Media and Literature</i>) The likelihood of this consequence being the result of recreational fishing activity is <i>likely</i> as recreational fishing is a large contributor to current fishing effort in NSW, sometimes exceeding commercial catch (West et al., 2015, Murphy et al. (2021) but taking 13-14% by weight of total catch (Murphy et al. (2021). See cell 78). There is also a need to monitor the impacts of increasing technology on fishing mortality. (<i>Literature</i>). Overall risk rating: Moderate				
82	Moderate	Likely	Moderate	Reductions in abundances of species and trophic levels The total catch of the recreational fishing sector is significant and can reduce the abundance of fish of different sizes classes. Recreational fishing contributes to the reduction of species and trophic levels and have <i>Moderate consequences</i> on the Intrinsic and bequest values (economic intrinsic value) of other users in the marine estate. Declining fish abundance may have some impact on intrinsic values, with the Marine Estate Community Survey identifying the loss of fish resulting from over- fishing as a threat to social benefits [1]. The perceived threat to intrinsic and bequest values is expected to be experienced by a greater breadth of the community than where economic benefits are more directly related to use values (<i>Statewide TARA 94</i>) The likelihood of this consequence being the result of recreational fishing activity is <i>likely</i> as recreational fishing is a large contributor to current fishing effort in NSW, sometimes exceeding commercial catch (West et al., 2015, Murphy et al. (2021) but taking 13-14% by weight of total catch (Murphy et al. (2021). See cell 78. (<i>Literature</i>). Overall risk rating: Moderate	Limited	Regional	10 years	Stable

83	Moderate	Likely	Moderate	Reductions in abundances of species and trophic levels The total catch of the recreational fishing sector is significant and can reduce the abundance of fish of different sizes classes. Recreational fishing contributes to the reduction of species and trophic levels and have <i>Moderate consequences</i> for the Employment and value of production by other users in the marine estate. Declining fish abundance is likely to have significant economic impacts to businesses at a local scale, with the viability of commercial and recreational fishers being significantly affected. Additionally, this may have an impact on tourism operators whom rely on the abundance of fish. Examples include the whale and dolphin watching industries and scuba diving and snorkelling business. The threat of decline may be greater in areas with more pressure on fish habitats (higher in central than in north and south); although the net economic impacts may be felt more in regional economies where there may be a greater dependence upon fisheries or marine tourism businesses. (<i>Statewide TARA 95</i>) The likelihood of this consequence being the result of recreational fishing activity is <i>likely</i> as recreational fishing is a large contributor to current fishing effort in NSW, sometimes exceeding commercial catch (West et al., 2015 , Murphy et al. (2021) but taking 13-14% by weight of total catch (Murphy et al. (2021). See cell 78 (<i>Literature</i>) Overall risk rating: Moderate	Limited	Regional	10 years	Stable
84	Moderate	Likely	Moderate	Reductions in abundances of species and trophic levels The total catch of the recreational fishing sector is significant and can reduce the abundance of fish of different sizes classes. Recreational fishing may contribute to reduction of species and trophic levels and have <i>moderate consequences</i> for the Individual enjoyment value (consumer surplus) of other users in the marine estate that enjoy the abundance of marine life. Declining fish abundance may have some impact on individual enjoyment values, with the Marine Estate Community Survey identifying the loss of fish resulting from over-fishing as a threat to social benefits [1]. The likelihood of this consequence being the result of recreational fishing activity is <i>likely</i> as recreational fishing is a large contributor to current fishing effort in NSW, sometimes exceeding commercial catch (West et al., 2015 , Murphy et al. (2021) but taking 13-14% by weight of total catch (Murphy et al. (2021). See cell 78. (<i>Literature</i>) Overall risk rating: Moderate	Limited	Regional	10 years	Stable
85	Moderate	Possible	Low	Pests and diseases Recreational fishing is an activity which has the potentially to inadvertently introduce pests or infectious diseases into the marine environment through the use of bait and the movement of contaminated fishing gear.	Adequate	Regional	10 years	Stable

			The consequences of this stressor on Safety, health and wellbeing are <i>moderate</i> given they are would result in substantial, measurable and ongoing impacts for consumptive user groups (including recreational fishers). Consequences listed in the Statewide TARA specific to recreational fishing included: - Introduced pests and diseases can result in negative impacts on the aquatic ecosystem but also can have direct impacts on industry such as aquaculture. Particularly significant impacts can occur to the aquaculture industry (for example impacts on the oyster industry caused by the introduction of QX disease) and associated seafood consumers, with a potential loss of trust in seafood impacting the aquaculture, commercial fishing, seafood and tourism industries, and consumptive enjoyment (<i>Statewide TARA 97</i>). Additional consequences that are not listed in the state-wide TARA include: - The importation of prawns to Australia has been the subject several national biosecurity import risk assessments (Biosecurity Australia 2009, DAWE 2020). These have identified the “Use of imported prawns as bait or berley for recreational fishing” as a major import risk pathway, “substantially contributing to the total risk” (DAWE 2020 page 62). (See cell 88). - White Spot Disease in prawns does not pose a risk to human health, does not impact finfish, but impacts other crustaceans and some other marine benthic species (Queensland Government 2021). (<i>Literature, Government websites</i>) Consequences not listed in the Statewide TARA specific to recreational fishing included: - Disease associated with contaminated bait such as white spot on prawns. There is currently only advisory messaging in place to purchase bait prawns rather than prawns for human consumption. Recreational fishers may be insufficiently aware of these potential disease and translocation vectors arising from potential use of prawns from domestic and overseas environments. The likelihood of this consequence being the result of recreational fishing activity is <i>possible</i> as recreational fishers can contribute to this risk by inadvertently facilitating the transfer of aquatic pests and diseases. Pest weed, <i>Caulerpa taxifolia</i> is suspected to have been transferred to various waterways within NSW through contaminated fishing gear or vessels. Recreational fishing activity may lead to the transfer of an aquatic pest or disease. Overall risk rating: Low				
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86	Moderate	Possible	Low	Pests and diseases Recreational fishing is an activity which has the potential to inadvertently introduce pests or infectious diseases into the marine environment through the use of bait and the movement of contaminated fishing gear. The consequences of this stressor on socialising and sense of community are <i>moderate</i> given they would result in discernible, temporary impacts largely concentrated on consumptive user groups (including within the recreational fishing sector). Consequences listed in the Statewide TARA specific to recreational fishing included: - The impacts of pests and disease may result in localised sectoral disputes (e.g. between fishing/aquaculture industry and shipping/boating) over resource allocation and appropriate management of pest and weed species. Impacts are likely to be concentrated more significantly on consumptive users and of moderate concern for these users. (<i>Statewide TARA 98</i>). Additional consequences that are not listed in the state-wide TARA include: - The importation of prawns to Australia has been the subject of several national biosecurity import risk assessments (Biosecurity Australia 2009, DAWE 2020). These have identified the “Use of imported prawns as bait or berley for recreational fishing” as a major import risk pathway, “substantially contributing to the total risk” (DAWE 2020 page 62). (See cell 88). - White Spot Disease in prawns does not pose a risk to human health, finfish, but poses significant impacts on other crustaceans and some other marine benthic species (Queensland Government 2021). (<i>Literature, Government websites</i>) The likelihood of this consequence being the result of recreational fishing activity is <i>possible</i> as recreational fishers can contribute to this risk for example by potentially inadvertently facilitating the transfer of aquatic pests and diseases. Pest weed, <i>Caulerpa taxifolia</i>, is suspected to have been transferred to various waterways within NSW through contaminated fishing gear or vessels. Recreational fishing activity may lead to the transfer of an aquatic pest or disease. (<i>Literature, Government websites</i>). Overall risk rating: Low	Inferred	Regional	10 years	Stable
87	Moderate	Possible	Low	Pests and diseases Recreational fishing is an activity which has the potential to inadvertently introduce pests or infectious diseases into the marine environment through the use of bait and the movement of contaminated fishing gear. The consequences of this stressor on enjoying the biodiversity & beauty of marine estate (social intrinsic value) relates to recreational fishers introducing pests or disease which impact on others in the marine estate through a reduction in amenity. These consequences are considered <i>moderate</i> given they would result in measurable and ongoing negative effects. Consequences listed in the Statewide TARA were not specific to recreational fishing but noted: Impacts will be highly dependent on the nature of the environmental impacts and will be concentrated on those users who value direct interactions with biodiversity values. For example community concern over Crown of Thorns Starfish, <i>Acanthaster planci</i> – thought to be responsible for 50% of the loss of coral cover	Inferred	All regions	10 years	Stable

				in GBRMPA demonstrates however that some pest species can cause wider community impacts relating to loss of intrinsic values (<i>Statewide TARA 99</i>). Additional consequences that are not listed in the Statewide TARA include: - The importation of prawns to Australia has been the subject of several national biosecurity import risk assessments (Biosecurity Australia 2009, DAWE 2020). These have identified the “Use of imported prawns as bait or berley for recreational fishing” as a major import risk pathway, “substantially contributing to the total risk” (DAWE 2020 page 62). (See cell 88). - White Spot Disease may impact farmed and wild prawn stocks, other crustaceans and some marine benthic species (Queensland Government 2021). (<i>Literature, Government websites</i>) The likelihood of this consequence being the result of recreational fishing activity is <i>possible</i> as recreational fishers have been identified as vectors for pests and disease in a number of cases worldwide. Overall risk rating: Low				
88	Catastrophic	Possible	High	Pests and diseases Recreational fishing is an activity which has the potential to inadvertently introduce pests or infectious diseases into the marine environment through the use of bait and the movement of contaminated fishing gear. The consequences of this stressor on Consumptive use (extracting) relates to recreational fishers introducing pests or disease which impact on others in the marine estate of others in the marine estate such as commercial fishers, aquaculture or other recreational fishers whose catches or production may be impacted. These consequences are considered <i>catastrophic</i> given they would result in significant on-going and/or permanent negative impacts at a regional scale. Consequences listed in the Statewide TARA were not specific to recreational fishing but noted: - Pests and disease can have major impacts on consumptive use, especially the aquaculture industry, but may also impact fishers depending on the nature of the threat. Impacts are likely to be concentrated more significantly on these consumptive users and be of major concern for these users. Wider community wide impacts on seafood availability are also likely. (<i>Statewide TARA 100</i>). Additional consequences that are not listed in the Statewide TARA include: - Recreational fishing in Moreton Bay (Queensland) is possibly implicated in introducing White Spot Disease (WSD) (also commonly known as White Spot Syndrome Virus (WSSV)) to natural waterways through the use of imported green aquaculture prawns purchased from supermarkets for bait (Knibb et al., 2018). This has resulted in financial impacts to aquaculture prawn farms, commercial prawn fishers, and live bait harvesters that supply recreational fishers with invertebrates for bait and bait wholesalers (<i>Expert advice, Queensland Government 2021</i>). - White Spot Disease is a highly contagious viral infection that affects crustaceans such as prawns, yabbies and crabs. When found in high intensity production areas, such as prawn farms, white spot disease results in the rapid mortality of prawns (Queensland Government 2021). In Commonwealth government biosecurity	Adequate	All regions	10 years	Stable

				policy there have been concerns about the importation of raw prawns including a temporary ban in 1996, so the risk could be investigated (Biosecurity Australia 2009, DAWE 2020). • The ADVS (1999) report noted: <i>“It is also evident that ... prawns ... are favoured bait used in very significant quantities by recreational fishers”</i> and that <i>“cooked or uncooked prawns and prawn heads or shells left over after the preparation of food for humans are highly valued by many anglers as an attractive berley additive”</i> (ADVS 1999). This is confirmed more recently by Diggles (2020). Kewagama (2002, 2007) estimated prawn use by recreational fishers as probably being less than 100 tonnes per annum nationally at that time. • The 2009 Prawn Import Risk Assessment (IRA) report (Biosecurity Australia 2009) noted the “Use of imported prawns as bait or berley for recreational fishing” as one of three potential pathways <i>“assuming a comparatively low volume would be used or discarded in this manner subsequently thought to be underestimated”</i> (DAWE 2020). • The recent IRA (DAWE 2020) identified the <i>“Use of imported prawns as bait or berley for recreational fishing”</i> as a major import risk pathway, <i>“substantially contributing to the total risk”</i> (DAWE 2020 page 62). • The consequences indicated were <i>“The high predation rate of wild prawns by non-susceptible finfish species may limit the opportunity of establishment or spread of diseases from the limited numbers of index cases of infection that might result from the exposure of wild prawns to recreational fishing bait”</i> (Biosecurity 2009 and DAWE 2020). • In a submission to the IRA (DAWE 2020, page 66-67) state: NSW DPI <i>“Fisheries Compliance reported that they continue to observe recreational fishers using prawns intended for human consumption for bait despite extensive education and awareness campaigns highlighting the risks associated with this activity”</i> and <i>“NSW DPI also report it is not practical, possible or an efficient use of resources to ensure that human consumption prawns are not used as bait”</i> (NSW DPI 2018). Some states have legislative restrictions but <i>“New South Wales does not have specific regulations preventing the use of prawns intended for human consumption being used as bait or berley”</i> DAWE (2020 page 267). • The DAWE (2020) report concludes that <i>“Therefore, this draft risk review assumes that uncooked imported prawns intended for human consumption will be used as bait or berley by recreational fishers, unless their availability or form renders them substantially unsuitable”</i>. In concluding the IRA states: <i>“This draft risk review considers that the use of imported prawns as bait or berley represents the most likely exposure pathway for wild crustaceans to hazards identified”</i> (DAWE 2020 page 71). • The DAWE (2020) is an assessment of the “annual risk of exposure” (likely consequences) through prawn imports (DAWE 2020, Figure 7). • The Partial and Annual Likelihood of Entry and Exposure (PALEE) is the combination of the “partial likelihood of exposure” and the “Likelihood of entry” (DAWE 2020 Fig 4). An example would be a low likelihood as “an event would be unlikely to occur”.				
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				- DAWE (2020) note that “<i>Australia has traditionally maintained a ‘very conservative’ attitude to biosecurity risk. Given this, an overall annual risk that is either ‘very low’ or ‘negligible’, is sufficiently conservative to achieve Australia’s appropriate level of protection (ALOP)”</i>”. - The result of the DAWE (2020) IRA assessment is the “<i>overall annual risk associated with White spot syndrome virus (WSSV) in non-viable, farm-sourced, frozen, uncooked, whole prawns intended for human consumption is extreme</i>” (page 239). Taking biosecurity measures into account, “<i>the overall restricted risk of imported prawns with the biosecurity measure, head and shell removal, applied was determined to be high</i>” (DAWE 2020 page 239). This risk does not achieve Australia’s appropriate level of protection (DAWE 2020). The likelihood of this consequence being the result of recreational fishing activity is <i>possible</i> as recreational fishers have been identified as vectors for pests and disease in a number of cases. We consider the likely consequences of an “outbreak scenario” to be potentially catastrophic as per the DAWE “high” rating. The likelihood is <i>possible</i> and hence a high risk to the benefits from the NSW marine estate. Given the prevalence of commercial prawn stocks and prawn farms in the north of the state, the economic impact would be higher in the North. Overall risk rating: High				
89	Major	Possible	Moderate	Pests and diseases Recreational fishing is an activity which has the potential to inadvertently introduce pests or infectious diseases into the marine environment through the use of bait and the movement of contaminated fishing gear. Recreational fishing activity may lead to the transfer of an aquatic pest or disease with <i>major consequences</i> on the Intrinsic and bequest values (economic intrinsic value) of the marine estate, including commercial fishers or boating and those who enjoy marine recreation. There is limited information on the impact of pests/diseases on intrinsic values. This concern was not highlighted in the Marine Estate Community Survey [1]. Where pests/diseases do occur, it is expected that intrinsic and bequest values will be impacted (<i>Statewide TARA 102</i>). Additional consequences that are not listed in the Statewide TARA include: The importation of prawns to Australia has been the subject several national biosecurity import risk assessments (Biosecurity Australia 2009, DAWE 2020). These have identified the “Use of imported prawns as bait or berley for recreational fishing” as a major import risk pathway, “substantially contributing to the total risk” (DAWE 2020 page 62). (See cell 88).	Limited-Inferred	Regional	10 years	Stable

				The likelihood of this consequence being the result of recreational fishing activity is <i>possible</i> as recreational fishers have been identified as vectors for pests and disease in a number of cases with possible reductions in the intrinsic value of the marine estate. Overall risk rating: Moderate				
90	Catastrophic	Possible	High	Pests and diseases Recreational fishing is an activity which has the potential to inadvertently introduce pests or infectious diseases into the marine environment through the use of bait and the movement of contaminated fishing gear. Recreational fishing activity may lead to the transfer of an aquatic pest or disease with catastrophic consequences for the employment and value of production of others in the marine estate due significant on-going and/or permanent negative impacts evident at a regional scale on other industries, such as commercial fishing, aquaculture, tourism and recreational activities such a swimming. There may also be costs to local government in clearing up pests and diseases. The use of imported prawns for bait and berley risks the introduction of white spot disease with potentially catastrophic consequences for prawn farms and impacts on wild prawn and crustacean stocks, including Rock Lobster. Submissions received during the public engagement period of the draft TARA: - Highlighted that pests and disease outbreaks affecting the availability of seafood may also impact NSW's reputation as a tourism destination. This can impact large tourism operators such as the Sydney Fish Markets (SFM). The SFM is a leading tourism destination for international visitors with the main drawcard being the fresh, local supply of seafood. Outbreaks of pests and diseases have the potential to affect potential visitors at significant cost to the wider economy. - Additionally, the impacts may be felt in the North and South regions. For instance, if visitors are not confident about getting fresh oysters from the Hawkesbury or South Coast due to diseases outbreaks, visitors may choose to visit elsewhere, causing lost business. Impacts are dependent on the scale and impact of the pest/diseases.(<i>Statewide TARA 103</i>). Additional consequences that are not listed in the Statewide TARA include: - Pests/diseases will impact on tourism operators, commercial fishers and aquaculture producers where impacts on habitats and marine life are significant. Recent examples include the outbreak of white spot disease in the Queensland prawn industry and QX disease and POMS in the NSW Oyster industry (Berthe et al., 2004; Whittington et al., 2016). These incidents have resulted in severe disruption to aquaculture businesses and to local communities in general. - Recreational fishing in Moreton Bay (Queensland) is possibly implicated in introducing white spot syndrome virus to natural waterways through the use of imported green aquaculture prawns purchased from supermarkets for bait (Knibb et al., 2018). This has resulted in financial impacts to aquaculture prawn farms,	Adequate	Regional	10 years	Stable

				commercial prawn fishers and live bait harvesters that supply recreational fishers and wholesalers with invertebrates. (Queensland Government 2021 and DAWE 2020) (<i>Expert Advice, Governments and Literature</i>). The likelihood of this consequence is possible due to the following reasons: Unsafe practices by some Recreational fishers may likely impact other marine estate users and detract from the intrinsic value of the marine estate in the Central area, less in North and South. The likelihood of this consequence being the result of recreational fishing activity is <i>possible</i> as recreational fishers have been identified as vectors for pests and disease in a number of cases. The Import risk assessment process in DAWE (2021) is evidence that supports the possible likelihood rating. Overall risk rating: High				
91	Major	Possible	Moderate	Pests and diseases Recreational fishing is an activity which has the potentially to inadvertently introduce pests or infectious diseases into the marine environment through the use of bait and the movement of contaminated fishing gear. Recreational fishing activity may lead to the transfer of an aquatic pest or disease with major consequences for the individual enjoyment value (consumer surplus) estate due to substantial measurable and ongoing negative impacts evident at a regional scale on others in the marine estate. The extent of pleasure and relaxation experienced by users can be reduced due to areas compromised by pest or disease. With white spot the possible impacts would be on the production of prawn farms and on wild prawn and other crustacean fisheries. Thus, consumers could have a significant reduction in their consumer surplus, if locally grown or produced prawns are not available due to disease incursion. An example would be consumers having to pay higher prices for prawns due to the Queensland white spot outbreak, representing a loss in consumer surplus. Pests/diseases will impact on recreational fishers where impacts on habitats and marine life are significant. Impact dependent on the scale and impact of the pest/diseases. Other enjoyment use benefits likely limited as enjoyment values are independent of this threat, and therefore the community wide consequence level is likely only minor (<i>Statewide TARA 104</i>). Additional consequences that are not listed in the Statewide TARA include: The importation of prawns to Australia has been the subject several national biosecurity import risk assessments (Biosecurity Australia 2009, DAWE 2020). These have identified the “Use of imported prawns as bait or berley for recreational fishing” as a major import risk pathway, “substantially contributing to the total risk” (DAWE 2020 page 62). (See cell 88). (<i>Commonwealth Government reports, Expert advice</i>)	Limited-Inferred	Regional	10 years	Stable

				The likelihood of this consequence being the result of recreational fishing activity is <i>possible</i> as recreational fishers have been identified as vectors for pests and disease in a number of cases. Overall risk rating: Moderate				
92	Major	Unlikely	Low	Climate change (20 year timeframe) Recreational fishing takes place in a global environment when the impacts of Climate Change from industrial emissions are being recognised. Reduction of carbon emissions are required globally and recreational fishing sector is expected to limit its carbon emissions as part of its public responsibility. The consequences of this stressor on health, safety and wellbeing are not directly related to the contribution of recreational fishers, but rather the wider global phenomenon of climate change and represent <i>major</i> consequence due to measurable and ongoing negative impacts will likely be evident at a regional scale. The Statewide TARA lists a range of impacts from climate change on safety health and wellbeing and classifies them as major consequences, and likely. (<i>Statewide TARA 121b</i>). The consequences of climate change remain unchanged when thinking about the specific role of recreational fishing. However, the likelihood of this consequence being the result of recreational fishing activity is proportional. Recreational fishing activity indirectly contributes to this threat. Like the general public and tourists, recreational fishers contribute to CO₂ level through travel by car and boat use generating a carbon footprint. Additional consequences that are not listed in the Statewide TARA include: There have been no specific studies of the carbon footprint of recreational fishing activity in NSW. Using available information for NSW in 2020 there were 4,348,429 passenger vehicles and 19,601 campervans total 4,368,030. (ABS 2020a). Average kilometres (kms) per vehicle were 12,000 in 2020, a year impacted by Covid, the average 2012-2020 being 13,300 km per vehicle (ABSb). The total kms by passenger vehicles in 2020 were 44,868 million (ABSb-Tab7), a probable underestimate on previous years due to COVID-19. McIlgorm and Pepperell (2013) estimated the Recreational fishers expended \$277m on 554million kms in 2012-2013. The travel by recreational fish trips as a proportion of statewide annual travel is $(554m/44,868m \times 100)$ 1.23% of total passenger vehicle travel in kms. This fully attributes all trip mileage to recreational fishing activity, whereas trips have many purposes, such a family and annual holidays and recreational fishing is a marginal activity for many trippers – for example 79% of recreational fishers fished less 5 days or less a year (West et al. 2015 – page 21) and may typically have annual leave of two weeks. (<i>Literature, ABS data, NSW DPI research, expert opinion</i>). According to the Transport for NSW licence data base, 145,138 recreational fishing vessels were registered out of a total of 240,040 (Transport for NSW). Thus 60.5 % of licensee's have indicated that they will use their newly registered vessel for recreational fishing. The carbon footprint of this vessel activity has not been estimated. (<i>Advice -Transport for NSW, Expert opinion</i>).	Inferred	Regional	10 years	Increasing

				We estimate that the contribution to carbon footprint of NSW passenger vehicles by recreational fishing is less than 1% of all passenger vehicle kms annually, with 0.5% being a reasonable adjusted figure (40% of recreational trips kms, 60% other leisure, touring and marine recreation). In the absence of recreational fishing, other activities would be substituted. The emerging national trend towards less carbon emitting vehicles, electric cars and outboards, should reduce the carbon emissions from vehicles in NSW in the coming decades with benefits to the environment accruing at a future date. We consider the likelihood of recreational fishing activity as a climate change stressor as <i>unlikely</i>, and note that like all marine estate users, recreational fishing may be impacted by climate change. Overall risk rating: Low				
93	Major	Unlikely	Low	Climate change (20 year timeframe) Recreational fishing takes place in a global environment when the impacts of Climate Change from industrial emissions are being recognised. Reduction of carbon emissions are required globally and recreational fishing sector is expected to limit its carbon emissions as part of its public responsibility. The consequences of this stressor on socialising and sense of community are not directly related to the contribution of recreational fishers, but rather the wider global phenomenon of climate change and represent <i>major</i> consequences due to measurable and ongoing negative impacts will likely be evident at a regional scale. The Statewide TARA lists a range of impacts from climate change on socialising and sense of community, particularly in relation to beach amenity and foreshore use, and classifies them as major consequences, and likely (<i>Statewide TARA 122b</i>). However, the likelihood of this consequence being the result of recreational fishing activity is related to its carbon footprint as a stressor. Recreational fishers, like all members of the community, contribute to climate change through their carbon emissions. For example, recreational fishers contribute to CO₂ level through travel by car and boat. The extent of CO₂ are likely to be less than 0.5% of total annual car travel in NSW (See 92). We consider the likelihood as <i>unlikely</i>, and note that like all marine estate users, recreational fishing may be impacted by climate change. Overall risk rating: Low	Inferred	Regional	20 years	Increasing

94	Major	Unlikely	Low	Climate change (20 year timeframe) Recreational fishing takes place in a global environment when the impacts of Climate Change from industrial emissions are being recognised. Reduction of carbon emissions are required globally and recreational fishing sector is expected to limit its carbon emissions as part of its public responsibility. The consequences of this stressor on enjoying the biodiversity & beauty of Marine estate (social intrinsic value) are <i>major</i> and not directly related to the contribution of recreational fishers, but rather the wider global phenomenon of climate change and represent a major consequence due to measurable and ongoing negative impacts will likely be evident at a regional scale. The Statewide TARA lists a range of impacts from climate change on biodiversity values, particularly in relation to impacts on fishing and tourism industries. It lists these as major consequences, and almost certain (<i>Statewide TARA 124b</i>). However, the likelihood of this consequence being the result of recreational fishing activity is proportional to its carbon footprint. Recreational fishers, like all members of the community, contribute to climate change through their carbon emissions. For example, recreational fishers contribute to CO₂ level through travel by car and boat. 0.5% of total annual car travel in NSW (See cell 92). We therefore consider the likelihood as <i>unlikely</i>, and note that like all marine estate users, recreational fishing may be impacted by climate change Overall risk rating: Low	Inferred	Regional	20 years	Increasing
95	Major	Unlikely	Low	Climate change (20 year timeframe) Recreational fishing takes place in a global environment when the impacts of Climate Change from industrial emissions are being recognised. Reduction of carbon emissions are required globally, and recreational fishing sector is expected to limit its carbon emissions as part of its public responsibility. The consequences of this stressor on consumptive use (extracting) are not directly related to the contribution of recreational fishers, but rather the wider global phenomenon of climate change and represent a <i>major</i> consequence due to substantial measurable and ongoing negative impacts will likely be evident at a regional scale. The Statewide TARA lists a range of impacts from climate change on in relation to loss of natural foreshores and biodiversity declines in MPAs and other areas. It lists these as major consequences, and almost certain (<i>Statewide TARA 123b</i>). However, the likelihood of this consequence being the result of recreational fishing activity is proportional to its carbon footprint. Recreational fishers, like all members of the community, contribute to climate change through their carbon emissions. For example, recreational fishers contribute to CO₂ level through travel by car and boat. 0.5% of total annual car travel in NSW (See cell 92). We therefore consider the likelihood as <i>unlikely</i>, and note that like all marine estate users, recreational fishing may be impacted by climate change. Overall risk rating: Low	Inferred	Regional	20 years	Increasing

96	Moderate	Unlikely	Minimal	Climate change (20 year timeframe) Recreational fishing takes place in a global environment when the impacts of Climate Change from industrial emissions are being recognised. Reduction of carbon emissions are required globally and recreational fishing sector is expected to limit its carbon emissions as part of its public responsibility. The consequences of this stressor on intrinsic and bequest values (economic intrinsic value) are not directly related to the contribution of recreational fishers, but rather the wider global phenomenon of climate change and represent a <i>moderate</i> consequences due to substantial measurable and ongoing negative impacts will likely be evident at a regional scale. The Statewide TARA indicates a range of impacts from climate change on the intrinsic values of users of the Marine Estate and lists these as <i>Minor (Statewide TARA 126a)</i>. However, the likelihood of this consequence being the result of recreational fishing activity is proportional to its carbon footprint. Recreational fishers, like all members of the community, contribute to climate change through their carbon emissions. For example, recreational fishers contribute to CO₂ level through travel by car and boat, 0.5% of total annual car travel in NSW (See cell 92). We consider the likelihood as <i>unlikely</i>, and note that like all marine estate users, recreational fishing may be impacted by climate change. Overall risk rating: Minimal	Limited	All regions	20 years	Increasing
97	Major	Unlikely	Low	Climate change (20 year timeframe) Recreational fishing takes place in a global environment when the impacts of Climate Change from industrial emissions are being recognised. Reduction of carbon emissions are required globally and recreational fishing sector is expected to limit its carbon emissions as part of its public responsibility. The consequences of this stressor on employment and value of production are not directly related to the contribution of recreational fishers, but rather the wider global phenomenon of climate change and represent <i>major</i> consequences due to substantial measurable and ongoing negative impacts may be evident at a regional scale. The Statewide TARA indicates a range of impacts from climate change on businesses such as oyster farming in the Marine Estate with <i>moderate</i> consequences (<i>Statewide TARA 127a</i>). However, the likelihood of this consequence being the result of recreational fishing activity is proportional to its carbon footprint. Recreational fishers, like all members of the community, contribute to climate change through their carbon emissions. For example, recreational fishers contribute to CO₂ level through travel by car and boat. 0.5% of total annual car travel in NSW (See cell 92). We consider the likelihood as <i>unlikely</i>, and note that like all marine estate users, recreational fishing may be impacted by climate change.	Limited	All regions	20 years	Increasing

				Overall risk rating: Low				
98	Major	Unlikely	Low	Climate change (20 year timeframe) Recreational fishing takes place in a global environment when the impacts of Climate Change from industrial emissions are being recognised. Reduction of carbon emissions are required globally and recreational fishing sector is expected to limit its carbon emissions as part of its public responsibility. The consequences of this stressor on individual enjoyment value (consumer surplus) are not directly related to the contribution of recreational fishers, but rather the wider global phenomenon of climate change and represent a <i>major</i> consequences due to substantial measurable and ongoing negative impacts will likely be evident at a regional scale. The Statewide TARA indicates a range of impacts from climate change on the enjoyment values of users of the Marine Estate with <i>Moderate</i> consequences (<i>Statewide TARA 127a</i>). Flood incidents are expected to increasing impact marine estate users such as tourists. The consequences of climate change are less when thinking about the specific carbon footprint of recreational fishing. However, the likelihood of this consequence being the result of recreational fishing activity is proportional to its carbon footprint. Recreational fishers, like all members of the community, contribute to climate change through their carbon emissions. For example, recreational fishers contribute to CO₂ level through travel by car and boat. 0.5% of total annual car travel in NSW (See cell 92). We consider the likelihood as <i>unlikely</i>, and note that like all marine estate users, recreational fishing may be impacted by climate change. Overall risk rating: Low	Limited	All regions	20 years	Increasing
99	Minor	Possible	Minimal	Inadequate regulation of recreational fishing Marine fish resources held in common require regulation to maintain their sustainability. The type and degree of regulation needs to be adequate to facilitate all users enjoying the marine estate. The consequences of inadequate regulation, on safety, health and well-being of marine estate users are <i>minor</i> given the limited contribution of recreational fishing to this stressor. Consequences listed in the Statewide TARA (129) which are relevant to recreational fishing include the loss of social benefits accruing to recreational fishers associated with restrictions from MPAs, the cost of gathering knowledge of MPA boundaries, decreased fishing frequency and success associated with MPAs and increased crowding in areas available to fishing. Consequences not considered in the Statewide TARA include the loss of enjoyment from other users associated with inadequate regulation around biodiversity protection as a result of recreational fisher campaigns to reduce MPA	Inferred	Regional	10 years	Stable

				boundaries (and so increase fishing zones, frequency etc.). This may have an impact on the safety, health and wellbeing of other marine estate users through the stress associated with conflicting values (noting that there is the converse position within the community also with parts of the community lobbying for increased marine protected areas). There have also been representations made to the government from members of the public (mostly recreational fishers) who are concerned that restrictions on recreational fishing effort are insufficient to allay the risk of excessive catch, examined earlier (in consideration of excessive and illegal catch see cells 50-57) (<i>Departmental reports, social media reports, expert advice</i>). The likelihood of this consequence is <i>Possible</i>. Overall risk rating: Minimal				
100	Minor	Possible	Minimal	Inadequate regulation of recreational fishing Marine fish resources held in common require regulation to maintain their sustainability. The type and degree of regulation needs to be adequate to facilitate all users enjoying the marine estate. The consequences of inadequate regulation on socialising and sense of community are <i>minor</i> given a limited contribution of recreational fishing to this stressor. Consequences listed in the Statewide TARA (129) which are relevant to recreational fishing include the loss of social benefits accruing to recreational fishers associated with restrictions from MPAs, the cost of gathering knowledge of MPA boundaries, decreased fishing frequency and success associated with MPAs and increased crowding in areas available to fishing. Consequences not considered in the Statewide TARA include the loss of enjoyment from other users associated with inadequate regulation around biodiversity protection as a result of recreational fisher campaigns to reduce MPA boundaries (and so increase fishing zones, frequency etc.). This may have an impact on the socialising and sense of community of other marine estate users through the stress associated with conflicting values. The risk of excessive and illegal catch, was examined earlier (see cells 50-57) The likelihood of this consequence is <i>possible</i>. Overall risk rating: Minimal	Inferred	Regional	10 years	Stable

101	Low (N) Moderate (C&S)	Possible (N) Likely (C&S)	Low (N) Moderate (C&S)	Inadequate regulation of recreational fishing Marine fish resources held in common require regulation to maintain their sustainability. The type and degree of regulation needs to be adequate to facilitate all users enjoying the marine estate. The consequences of inadequate regulation on enjoying biodiversity and beauty of the marine estate are <i>moderate</i> due to potential measurable and on-going negative impacts that will be evident at a regional scale. Under-regulation can also have significant impacts on community enjoyment of beauty or biodiversity values, particularly if the community believes these values are not being adequately protected. For example high levels of support for MPAs are demonstrated through numerous studies including Sweeney report. MPAs, particularly no take zones, provide dedicated opportunities for enjoyment and appreciation of nature by separating passive and consumptive users. Given the high level of community support for MPAs the absence of these protection measures can be considered to have moderate consequences. (Statewide TARA 129). The likelihood of these consequences is <i>possible</i> in the North region where MPAs are already established. But, an increased likelihood where recreational fishers are leading campaigns to have these protections overturned. They are <i>likely</i> in Central region where limited MPA protection exists at present and recent attempts to establish MPAs have failed with considerable lobbying from recreational fishers occurring. In the South, some adjustments were recently made to Batemans Marine Park after lobbying. Overall risk rating: Low (N) and Moderate (C&S).	Inferred	Regional	10 years	Stable
102	Moderate	Possible	Low	Inadequate regulation of recreational fishing Marine fish resources held in common require regulation to maintain their sustainability. The type and degree of regulation needs to be adequate to facilitate all users enjoying the marine estate. The consequences of inadequate regulation (agencies) on consumptive use (extracting) to be <i>moderate</i> given the creation of recreational fishing havens (RFHs) in 2002 resulted in the exclusion of commercial fishers from some sections of the coast and estuaries. This would likely have resulted in major impacts at a local scale for the fishers affected. The likelihood of this consequence of recreational fishing to this stressor is <i>possible</i>. However, it is noted that since the creation of RFHs, governments have been supportive of viable commercial fisheries and promoting quality recreational fishing with no major resource re-allocation considerations without consensus from both sectors. See cell 4 for detail on increased security provided the NSW commercial fishing sector – including the introduction share management fisheries and the 2017 BAP process to provide greater certainty and ensure the long-term viability and sustainability of the NSW commercial fishing industry. Overall risk rating: Low	Inferred	Regional	10 years	Stable

103	Minor	Unlikely	Minimal	Inadequate regulation of recreational fishing Marine fish resources held in common require regulation to maintain their sustainability. The type and degree of regulation needs to be adequate to facilitate all users enjoying the marine estate. The consequences of inadequate regulation of recreational fishers on intrinsic and bequest values to be <i>minor</i> given the impacts of over regulation and inefficient regulation are not expected to impact the intrinsic value of the marine estate (Statewide TARA 133) and the contribution of recreational fishing to this stressor is unknown. The likelihood of the contribution of recreational fishing to this stressor is <i>unlikely</i> given the impacts of over regulation and inefficient regulation are not expected to impact the intrinsic value of the marine estate (Statewide TARA 133) Overall risk rating: Minimal	Inferred	Regional	10 years	Stable
104	Minor	Unlikely	Minimal	Inadequate regulation of recreational fishing Marine fish resources held in common require regulation to maintain their sustainability. The type and degree of regulation needs to be adequate to facilitate all users enjoying the marine estate. The consequences of inadequate regulation on employment and value of production to be <i>minor</i> given the current management controls and regulations in place with high compliance rates (see cell 121). The likelihood of the contribution of recreational fishing to this stressor is <i>unlikely</i> given the impacts of over regulation and inefficient regulation are not expected to impact the production values or employment values of the marine estate (Statewide TARA 133). See cell 4 for detail on increased security provided the NSW commercial fishing sector – including the introduction share management fisheries and the 2017 BAP process to provide greater certainty and ensure the long-term viability and sustainability of the NSW commercial fishing industry. Overall risk rating: Minimal	Inferred	Regional	10 years	Stable
105	Minor	Unlikely	Minimal	Inadequate regulation of recreational fishing Marine fish resources held in common require regulation to maintain their sustainability. The type and degree of regulation needs to be adequate to facilitate all users enjoying the marine estate. The consequences of inadequate regulation on individual enjoyment value (consumer surplus) would be <i>minor</i> given current management controls and regulations in place with high compliance rates (see cell 121).	Inferred	Regional	10 years	Stable

				The likelihood of the contribution of recreational fishing to this stressor is <i>unlikely</i> given the impacts of over regulation and inefficient regulation are not expected to impact the individual enjoyment values of users of the marine estate (Statewide TARA 133). Overall risk rating: Minimal				
106	Minor	Likely	Low	Lack of or ineffective community engagement Recreational fishers rely on the social licence of the public and other marine estate users and so communication and engagement with other Marine Estate users is important. It is also important that the recreational fishing sector have appropriate engagement with others in the community, and the community engages with recreational fishers (Granek et al., 2008; Pomeroy and Douvere, 2008; Thurstan et al., 2017). The consequences of lack of or ineffective community engagement on safety, health and wellbeing to be <i>minor</i> given the limited contribution of recreational fishing to this stressor. Governance processes that are seen to be unfair or inequitable, or ‘imposed’ on communities without adequate consultation can have highly deleterious impacts on the mental health of individual stakeholders. It may also impact broader community wide feelings of trust in government (Statewide TARA 138). A component of the recreational fishing sector may impact this stressor through acts of intimidation and bullying as part of lobbying campaigns, which may prevent other marine users from engaging effectively with governance processes and institutions. For example, the proposed Hawkesbury Shelf Marine Park proposal involved incidences of online abuse of people supporting the proposed MPAs and there were also some reports of recreational fishers intimidating other users at the public events associated with this proposal. (<i>Departmental reports, social media reports, expert advice</i>). The likelihood of the contribution of recreational fishing to this stressor is <i>likely</i> given the community engagement issues identified above. Overall risk rating: Low	Limited	Regional	10 years	Stable
107	Minor	Likely	Low	Lack of or ineffective community engagement Recreational fishers rely on the social licence of the public and other marine estate users and so communication and engagement with other Marine Estate users is important. It is important that the recreational fishing sector have appropriate engagement with others in the community. The consequences of lack of or ineffective community engagement on socialising and sense of community to be <i>minor</i> given the impacts being specific around fishing rules and temporary in nature.	Limited	Regional	10 years	Stable

				Effective participation and engagement of communities is fundamental to achieving socially and economically equitable outcomes for communities. The risk of ineffective or inadequate engagement is that vested interested or noisy minorities can influence outcomes that are against the interest or wishes of the wider community. Community engagement, if not carefully managed, can also exacerbate or create division within the community rather than encouraging deliberation and negotiation (Statewide TARA 139). For example, the proposed Hawkesbury Shelf Marine Park proposal involved incidences of online abuse of people supporting the proposed MPAs and there were also some reports of recreational fishers intimidating other users at some public community consultation events associated with this proposal. (<i>Departmental reports, social media reports, expert advice</i>). The likelihood of the contribution of recreational fishing to this stressor is <i>likely</i> given the community engagement issues identified above. Overall risk rating: Low				
108	Minor	Unlikely	Minimal	Lack of or ineffective community engagement Recreational fishers rely on the social licence of the public and other marine estate users and so communication and engagement with other Marine Estate users is important. It is important that the recreational fishing sector have appropriate engagement with other marine estate users and the community. The consequences of lack of or ineffective community engagement on enjoying the biodiversity and beauty of the marine estate to be <i>minor</i> given the limited contribution of recreational fishing to this stressor. The likelihood of the contribution of recreational fishing to this stressor is <i>unlikely</i> as the community engagement issues do not directly impact biodiversity. Overall risk rating: Minimal	Inferred	Regional	10 years	Stable
109	Minor	Unlikely	Minimal	Lack of or ineffective community engagement Recreational fishers rely on the social licence of the public and other marine estate users and so communication and engagement with other Marine Estate users is important. It is important that the recreational fishing sector have appropriate engagement with others in the community. The consequences of lack of or ineffective community engagement on consumptive use (extraction) to be <i>minor</i> given the limited contribution of recreational fishing to this stressor. The likelihood of the contribution of recreational fishing to this stressor is <i>unlikely</i> as the community engagement issues do not directly impact consumptive use. Overall risk rating: Minimal	Inferred	Regional	10 years	Stable

110	Minor	Possible	Minimal	Lack of or ineffective community engagement Recreational fishers rely on the social licence of the public and other marine estate users and so communication and engagement with other Marine Estate users is important. It is important that the recreational fishing sector have appropriate engagement with others in the community. The consequences of lack of or ineffective community engagement on intrinsic and bequest values to be <i>minor</i> given the limited contribution of recreational fishing to this stressor. Effective participation and engagement of communities is fundamental to achieving socially and economically equitable outcomes for communities. The risk of ineffective or inadequate engagement is that vested interested or noisy minorities can influence outcomes that are against the interest or wishes of the wider community. Community engagement, if not carefully managed, can also exacerbate or create division within the community rather than encouraging deliberation and negotiation (Statewide TARA 135). For example, the proposed Hawkesbury Shelf Marine Park proposal involved incidences of online abuse of people supporting the proposed MPAs and there were also some reports of recreational fishers intimidating other users at some public community consultation events associated with this proposal. (<i>Departmental reports, social media reports, expert advice</i>). The likelihood of the contribution of recreational fishing to this stressor is <i>possible</i> depending on the extent of any community engagement issues. Overall risk rating: Low	Limited	Regional	10 years	Stable
111	Minor	Possible	Minimal	Lack of or ineffective community engagement Recreational fishers rely on the social licence of the public and other marine estate users and so communication and engagement with other Marine Estate users is important. In the absence of a formal mechanism between all Marine Estate stakeholders, it is important that the recreational fishing sector has appropriate processes in place for wider engagement with the community. The consequences of lack of or ineffective community engagement on employment and value of production to be <i>minor</i> given the limited contribution of recreational fishing to this stressor. (See cell 110 for additional evidence) The likelihood of the contribution of recreational fishing to this stressor is <i>possible</i> depending on the extent of any community engagement issues that may impact commercial activities. Overall risk rating: Minimal	Inferred	Regional	10 years	Stable
112	Min	Pos	Min	Lack of or ineffective community engagement	Lim	Reg	10 y	Stab

				Recreational fishers rely on the social licence of the public and other marine estate users and so communication and engagement with other Marine Estate users is important. It is important that the recreational fishing sector have appropriate engagement with others in the community. The consequences of lack of or ineffective community engagement on individual enjoyment value (consumer surplus) to be <i>minor</i> given the limited contribution of recreational fishing to this stressor. (See cell 110 above for additional evidence. The likelihood of the contribution of recreational fishing to this stressor is <i>possible</i> depending on the extent of any community engagement issues and its impact on the enjoyment of marine estate users. Overall risk rating: Minimal				
113	Minor	Possible	Minimal	Lack of recreational fisher awareness of the marine estate The activity of recreational fishing takes place amongst the natural processes of the marine environment and fits in amid many different activities and uses under a statewide approach to manage the NSW marine estate. Recreational fishers risk being deficient in their awareness of knowledge of the marine environment, the use and expectations of other active and passive users of the marine estate and of the marine estate management arrangements, as they may only have experience of fisheries regulations through, for example, the NSW fishing rules and the recreational fishing licence. The consequences of this stressor on Safety health and wellbeing (including relaxation) on those using the marine estate from recreational fishing are <i>minor</i> at the statewide scale. The Statewide TARA study indicated: “While a lack of awareness or knowledge of the marine estate is unlikely to have significant impacts on community safety health and wellbeing it should be noted that encouraging greater knowledge and understanding may also encourage greater use of the marine estate. This may, in turn, have substantial community health benefits, particularly in relation to mental health and relaxation. One of the themes that came out of the Marine Estate Community Survey was a general lack of awareness or opinion on current management and threats of the marine estate (Statewide TARA 145). Consequences not considered in the Statewide TARA include: • “<i>Lack of community awareness of the marine estate & associated threats & benefits</i>” among all users, is identified by the Marine Estate Management Strategy (2018-2028) as a moderate risk to “Enjoyment, Biodiversity and Beauty of the marine estate” (DPI 2018 page 21) (<i>Department report</i>). The likelihood of the contribution of recreational fishing to this stressor is <i>possible</i> as awareness among recreational fishers of the marine estate may be slightly greater than the general population due to their engagement and involvement with the marine estate.	Limited	All regions	10 years	Stable
					Li			

				Overall risk rating: Low				
114	Minor	Possible	Minimal	Lack of recreational fisher awareness of the marine estate The activity of recreational fishing takes place amongst the natural processes of the marine environment and fits in amid many different activities and uses under a statewide approach to manage the NSW marine estate. Recreational fishers risk being deficient in their awareness of knowledge of the marine environment, the use and expectations of other active and passive users of the marine estate and of the marine estate management arrangements, as they may only have experience of fisheries regulations through, for example, the NSW fishing rules and the recreational fishing licence. The consequences of this stressor on Socialising and sense of community are thought to be <i>minor</i> at the statewide scale as recreational fishers are only one part of the users in the marine estate. The Statewide TARA (146) gives justifications as per cell 113 above. The likelihood of the contribution of recreational fishing to this stressor is <i>possible</i> as participants are a key contributor to the marine estate user community and their engagement and involvement with the marine estate requires further investigation. Overall risk rating: Minimal	Limited	All regions	10 years	Stable
115	Moderate	Possible	Low	Lack of recreational fisher awareness of the marine estate The activity of recreational fishing takes place amongst the natural processes of the marine environment and fits in amid many different activities and uses under a statewide approach to manage the NSW marine estate. Recreational fishers risk being deficient in their awareness of knowledge of the marine environment, the use and expectations of other active and passive users of the marine estate and of the marine estate management arrangements, as they may only have experience of fisheries regulations through, for example, the NSW fishing rules and the recreational fishing licence. The consequences of recreational fishing on enjoying the biodiversity & beauty of Marine estate (social intrinsic value) are thought to be <i>moderate</i> at the statewide scale. The Statewide TARA report indicated that: “A lack of knowledge and awareness of the marine estate may detract from the full extent to which people can appreciate and enjoy the benefits it provides. It may also influence the extent to which the community supports difficult management decisions considered necessary for environmental protection. Finally, it may also impact the behaviour of marine estate users – those with a greater knowledge and awareness of the benefits provided by the marine estate may be more likely to act in ways that support and sustain it “(Statewide TARA 147). Consequences not considered in the Statewide TARA include:	Limited	All regions	10 years	Stable

				- Reports of recreational fishing taking place in areas designated as “scientific reference sites” with the potential to impact research and monitoring of biodiversity (<i>Marine Estate advice, Departmental reports, expert advice</i>). “Lack of community awareness of the marine estate & associated threats & benefits” among all users, is identified by the Marine Estate Management Strategy (2018-2028) as a moderate risk to “Enjoyment, Biodiversity and Beauty of the marine estate”(DPI 2018 page 21) (<i>Departmental report</i>). The likelihood of the contribution of recreational fishing to this stressor is <i>possible</i> as many recreational fishers may be poorly informed or be insufficiently aware of their impacts on the marine estate’s biodiversity. The extent of their awareness is unknown. Overall risk rating: Low				
116	Minor	Possible	Minimal	Lack of recreational fisher awareness of the marine estate The activity of recreational fishing takes place amongst the natural processes of the marine environment and fits in amid many different activities and uses under a statewide approach to manage the NSW marine estate. Recreational fishers risk being deficient in their awareness of knowledge of the marine environment, the use and expectations of other active and passive users of the marine estate and of the marine estate management arrangements, as they may only have experience of fisheries regulations through, for example, the NSW fishing rules and the recreational fishing licence. The consequences of this stressor on consumptive use are <i>minor</i> at the statewide scale as recreational fishing is one of several stressors on the marine estate. The statewide TARA noted a lack of knowledge and understanding of the marine estate may influence fishing behaviour and compliance with regulations, which may in turn impact the health of local fisheries and the enjoyment of the experience of other users (Statewide TARA 148). The likelihood of the contribution of recreational fishing to this stressor is <i>possible</i> though with few consequences on consumptive use of other marine estate users. Overall risk rating: Minimal	Limited	All regions	10 years	Stable
117	Minor	Possible	Minimal	Lack of recreational fisher awareness of the marine estate The activity of recreational fishing takes place amongst the natural processes of the marine environment and fits in amid many different activities and uses under a statewide approach to manage the NSW marine estate. Recreational fishers risk being deficient in their awareness of knowledge of the marine environment, the use and expectations of other active and passive users of the marine estate and of the marine estate management arrangements, as they may only have experience of fisheries regulations through, for example, the NSW fishing rules and the recreational fishing licence. The consequences on intrinsic and bequest values to considered to be <i>minor</i> at the statewide scale.	Limited	All regions	10 years	Stable

				The Statewide TARA: One of the themes that came out of the Marine Estate Community Survey was a general lack of awareness or opinion on current management and threats of the marine estate. The Hawkesbury assessment has demonstrated that information failure can lead to a range of environmental, social and economic threats; these may in turn, impact upon intrinsic values. (Statewide TARA 150). Consequences not considered in the Statewide TARA include: • “<i>Lack of community awareness of the marine estate & associated threats & benefits</i>” among all users, is identified by the Marine Estate Management Strategy (2018-2028) as a moderate risk to “Enjoyment, Biodiversity and Beauty of the marine estate“(DPI 2018 page 21) (<i>Department report</i>). The likelihood of the contribution of recreational fishing to this stressor is <i>possible</i> as it may impact intrinsic and bequest values. Overall risk rating: Minimal				
118	Minor	Likely	Low	Lack of recreational fisher awareness of the marine estate The activity of recreational fishing takes place amongst the natural processes of the marine environment and fits in amid many different activities and uses under a statewide approach to manage the NSW marine estate. Recreational fishers risk being deficient in their awareness of knowledge of the marine environment, the use and expectations of other active and passive users of the marine estate and of the marine estate management arrangements, as they may only have experience of fisheries regulations through, for example, the NSW fishing rules and the recreational fishing licence. The consequences of poor information on recreational fishing activity can impact the employment and value of production on the marine estate with <i>minor</i> impacts on other industries and users of the marine estate. “One of the themes that came out of the Marine Estate Community Survey was a general lack of awareness or opinion on current management and threats of the marine estate. This risk is assumed to be low. The Hawkesbury assessment has demonstrated that information failure can lead to a range of environmental, social and economic threats; these may in turn, impact upon production” (Statewide TARA 151). Consequences not considered in the Statewide TARA include: “<i>Lack of community awareness of the marine estate & associated threats & benefits</i>” among all users, is identified by the Marine Estate Management Strategy (2018-2028) as a moderate risk to “Enjoyment, Biodiversity and Beauty of the marine estate” (DPI 2018 page 21) (<i>Department report</i>). The likelihood of the contribution of recreational fishing to this stressor is <i>likely</i> if the marine estate is under appreciated for its broader economic potential.	Limited	All regions	10 years	Stable

				Overall risk rating: Low				
119	Minor	Likely	Low	Lack of recreational fisher awareness of the marine estate The activity of recreational fishing takes place amongst the natural processes of the marine environment and fits in amid many different activities and uses under a statewide approach to manage the NSW marine estate. Recreational fishers risk being deficient in their awareness of knowledge of the marine environment, the use and expectations of other active and passive users of the marine estate and of the marine estate management arrangements, as they may only have experience of fisheries regulations through, for example, the NSW fishing rules and the recreational fishing licence. The consequences of lack of information on recreational fishing on individual enjoyment value (consumer surplus) of those using the marine estate is <i>minor</i>. “One of the themes that came out of the Marine Estate Community Survey was a general lack of awareness or opinion on current management and threats of the marine estate. This risk is assumed to be low. The Hawkesbury assessment has demonstrated that information failure can lead to a range of environmental, social and economic threats; these may in turn, impact upon individual enjoyment value.” (Statewide TARA 152). Consequences not considered in the Statewide TARA include: • “<i>Lack of community awareness of the marine estate & associated threats & benefits</i>” among all users, is identified by the Marine Estate Management Strategy (2018-2028) as a moderate risk to “Enjoyment, Biodiversity and Beauty of the marine estate’ (DPI 2018 page 21) (<i>Department report</i>). The likelihood of the contribution of recreational fishing to lack of awareness of the marine estate is <i>Likely</i> if the enjoyment of other marine estate users is impacted. Overall risk rating: Low	Limited	All regions	10 years	Stable
120	Moderate	Likely	Moderate	Lack of compliance with regulations by users Effective management of the fishery requires effective compliance with the rules and regulations. This requires the managing agency to undertake compliance checks on fishers. The government have comprehensive fishing rules and restrictions in place and approximately 100 fishery officers checking compliance by users.	Adequate	Regional	10 years	Stable

			The consequences of lack of compliance with regulations by users on safety, health and well-being to be <i>moderate</i> given there may be measurable and on-going negative impacts evident at a regional scale. There are a number of well-documented concerns regarding lack of compliance with regulations on the part of recreational fishers. The impact of this stressor on safety, health and wellbeing present primarily though impacts on individual stress levels and associated compromised relaxation. Consequences listed in the Statewide TARA (153) which are relevant to recreational fishing include a high degree of concern from marine estate users about equity and justice, meaning illegal activity can cause anger, resentment, frustration and stress. Illegal behaviour can be used to make generalisations about particular sections of the community, leading to conflict between different cultural groups. Lack of compliance may impact social intrinsic, consumptive business and employment values, when habitats and fish stocks are impacted by illegal and unsustainable behaviour. Recreational fishing is likely to contribute to the risk of non-compliance with regulations through a minority of participants illegally fishing and littering, resulting in conflict with others. Compliant recreational fishers will also be impacted by this threat causing social impacts on participation and enjoyment. Consequences not considered in the Statewide TARA include: - DPI have provided anecdotal reports that there have been incidences of tension and disharmony in the community associated with perceptions of overfishing of shellfish or taking of undersized fish in various parts of the state, such as cockle collecting at on Lake Illawarra, ghost nippers at certain locations on the Tweed River (Terranora), Maianbar in Port Hacking, and invertebrate collection from rock platforms around Sydney and Coffs Harbour. This tension is often exacerbated by cultural and language differences. - There are 100 fisheries officer roles across the state in 17 coastal and 9 inland locations. In the years 2012-2021, out of 45,000 to 49,000 total contacts per annum made by fisheries officers the rates of compliance were between 89.4% and 90.6% (NSW DPI Compliance data 2021). - A summary of the types of fishery offences (marine and inland) for 2019-20 indicated the following categories of offences (NSW DPI Compliance data). Some 38% of offences are to do with the licence fee and access, 18% fish sizes and 13% method offences and 12% excess fish and 11% area based offences. <table><tr><th>Offence</th><th>Numbers</th><th>Percentages</th></tr><tr><td>Fee related</td><td>2,593</td><td>38.1%</td></tr><tr><td>Fish size</td><td>1,238</td><td>18.2%</td></tr><tr><td>Method offence</td><td>886</td><td>13.0%</td></tr><tr><td>Excess fish</td><td>809</td><td>11.9%</td></tr><tr><td>Area offences</td><td>753</td><td>11.1%</td></tr><tr><td>Other offences -various</td><td>523</td><td>7.7%</td></tr><tr><td>Grand Total</td><td>6,802</td><td>100.0%</td></tr></table>	Offence	Numbers	Percentages	Fee related	2,593	38.1%	Fish size	1,238	18.2%	Method offence	886	13.0%	Excess fish	809	11.9%	Area offences	753	11.1%	Other offences -various	523	7.7%	Grand Total	6,802	100.0%				
Offence	Numbers	Percentages																													
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Grand Total	6,802	100.0%																													

				Compliance with fisheries legislation by recreational fishers is relatively high and remains relatively stable year on year (Fisheries statistic report 2014-2015 DPI) and helps to demonstrate that although some fishers do break the rules, the majority of recreational fishers follow the rules. https://www.dpi.nsw.gov.au/_data/assets/pdf_file/0003/599421/Fisheries-statistics-report-2014-15.pdf The current levels of compliance reflects substantial efforts by the regulator to communicate, inform and educate recreational fishers with an enforcement presence to support the regulations. The likelihood of this consequence is <i>likely</i> as there is evidence of various offences committed by recreational fishers, though this is stable and is part of any recreational fishery management regime (FAO 2012). Overall risk rating: Moderate				
121	Moderate	Likely	Moderate	Lack of compliance with regulations by users Effective management of the fishery requires effective compliance with the rules and regulations. This requires the managing agency to undertake compliance checks on fishers. The consequences of lack of compliance with regulations by users on socialising and sense of community to be <i>moderate</i> given there may be measurable and on-going negative impacts evident at a regional scale. There are a number of well-documented concerns regarding lack of compliance with regulations on the part of recreational fishers. The impact of this stressor on present primarily though impacts on individual stress levels and associated compromised relaxation. Consequences listed in the Statewide TARA (154) which are relevant to recreational fishing include a high degree of concern from marine estate users about equity and justice, meaning illegal activity can cause anger, resentment, frustration and stress. Illegal behaviour can be used to make generalisations about particular sections of the community, leading to conflict between different cultural groups. Lack of compliance may impact social intrinsic, consumptive business and employment values, when habitats and fish stocks are impacted by illegal and unsustainable behaviour. Recreational fishing is likely to contribute to the risk of non-compliance with regulations through a minority of participants illegally fishing and littering, resulting in conflict with others. Compliant recreational fishers will also be impacted by this threat causing social impacts on participation and enjoyment. Consequences not considered in the Statewide TARA include: The DPI have provided anecdotal reports that there have been incidences of tension and disharmony in the community associated with perceptions of overfishing of shellfish or taking of undersized fish in various parts of the state, such as cockle collecting at on Lake Illawarra, ghost nippers at certain locations on the Tweed	Adequate	Regional	10 years	Stable

				River (Terranora), Maianbar in Port Hacking, and invertebrate collection from rock platforms around Sydney and Coffs Harbour. This tension is often exacerbated by cultural and language differences. - There are 100 fisheries officer roles across the state in 17 coastal and 9 inland locations. In the years 2012-2021, out of 45,000 to 49,000 total contacts per annum made by fisheries officers the rates of compliance were between 89.4% and 90.6% (NSW DPI Compliance data). - An overview of recreational fisher offences in 2019-20 is given in cell 120 (NSW DPI Compliance data). Compliance with fisheries legislation by recreational fishers is relatively high and this rate has remained relatively stable and helps to demonstrate that although some fishers do break the rules, the majority of recreational fishers follow the rules (see cell 120). The likelihood of this consequence is <i>Likely</i> as there is evidence of various types of social incidents as described above involving recreational fishing and raising compliance issues. Overall risk rating: Moderate				
122	Minor	Likely	Low	Lack of compliance with regulations by users Effective management of the fishery requires effective compliance with the rules and regulations. This requires the managing agency to undertake compliance checks on fishers. The consequences of lack of compliance with regulations by users on enjoying the biodiversity & beauty of marine estate (social intrinsic value) are <i>minor</i> given there may be measurable and on-going negative impacts evident at a local scale. There are a number of well-documented concerns regarding lack of compliance with regulations on the part of recreational fishers around the state. Lack of compliance with regulations put in place to manage, protect and enhance biodiversity values or maintain the aesthetic beauty of the coast would be <i>likely</i> to have discernible impacts (<i>minor</i>) on the enjoyment and appreciation of these values (Statewide TARA 154). There is no consequence listed in the <i>Statewide TARA</i> which are relevant to recreational fishing. While there is evidence of some non compliance by some recreational fishers, the likelihood of this consequence impacting users enjoying the biodiversity & beauty of marine estate is <i>possible</i>. Overall risk rating: Low	Limited	Regional	10 years	Stable
123	Mod	Like	Mod	Lack of compliance with regulations by users	Ade	Reg	10 y	Stab

				Effective management of the fishery requires effective compliance with the rules and regulations. This requires the managing agency to undertake compliance checks on fishers. The government have comprehensive rules and restrictions in place and approximately 100 fishery officers checking compliance by users. The consequences of lack of compliance with regulations by users on consumptive use (extracting) to be <i>moderate</i> as there may be measurable and on-going negative impacts evident at a regional scale with substantial ongoing impacts at a local scale. There are well-documented concerns regarding lack of compliance with regulations on the part of recreational fishers, and this will have impacts on the fisheries resources used by other commercial users in the marine estate (e.g. commercial fisheries and diving etc.) “Lack of compliance with regulations that are put in place to manage, protect and enhance fisheries or other forms of consumptive use (e.g. controls on visitor numbers/vessel anchoring or mooring areas) is likely to have ongoing impacts on the ongoing success of these management arrangements with flow on impacts on the viability of these activities” (Statewide TARA 156). However, there is no consequence listed in the <i>Statewide TARA</i> which are relevant to recreational fishing. Consequences not considered in the Statewide TARA include: • There are 100 fisheries officer roles across the state in 17 coastal and nine inland locations. In the years 2012-2021, out of 45,000 to 49,000 total contacts per annum made by fisheries officers the rates of compliance were between 89.4% and 90.6% (NSW DPI Compliance data). • An overview of recreational fisher offences in 2019-20 is given in cell 120 (NSW DPI Compliance data). • Details of the commercial fishing industry catches and of shared fish resources were previously presented (cell 4). • Compliance with fisheries legislation by recreational fishers is relatively high (89.5 % in 2020-2021 and this rate remains relatively stable) (DPI pers. comm.) and helps to demonstrate that although some fishers do break the rules, the majority of recreational fishers follow the rules (reference in 120). As there is evidence of some non compliance by recreational fishers the likelihood of this consequence impacting the consumptive use of other users of the marine estate is <i>likely</i>. Overall risk rating: Moderate				
124	Moderate	Likely	Moderate	Lack of compliance with regulations by users Effective management of the fishery requires effective compliance with the rules and regulations. This requires the managing agency to undertake compliance checks on fishers. The consequences of lack of compliance with regulations by users on intrinsic and bequest values (economic intrinsic value) are <i>moderate</i> as there may be measurable and on-going negative impacts evident at a regional scale.	Limited	Regional	10 years	Stable

				Recreational fishing is likely to contribute to the risk of noncompliance with regulations, with a minority of participants illegally fishing resulting in conflict with others. Illegal recreational fishing is outside of the management framework and thus imposes unmeasured losses on the intrinsic and bequest values of the marine estate. These include illegal catch in this time period reducing future fish stocks and catch available in the future. “Illegal activities are likely to impact perceptions of the marine estate, thereby negatively impacting on intrinsic and bequest values. However, at a community wide scale the consequence is likely to be <i>moderate</i> and the overall risk low (<i>Statewide TARA 158</i>). Consequences not considered in the Statewide TARA include: - There are 100 fisheries officer roles across the state in 17 coastal and nine inland locations. In the years 2012-2021, out of 45,000 to 49,000 total contacts per annum made by fisheries officers the rates of compliance were between 89.4% and 90.6% (NSW DPI Compliance data). - An overview of recreational fisher’s offences in 2018-19 is given in cell 120 (NSW DPI Compliance data). The likelihood of this consequence impacting intrinsic values of the marine estate is likely, as recreational fishing takes place in a range of different coastal habitats and non compliance may impact the intrinsic values of the marine estate held by other marine estate users. Overall risk rating: Moderate				
125	Moderate	Likely	Moderate	Lack of compliance with regulations by users Effective management of the fishery requires effective compliance with the rules and regulations. This requires the managing agency to undertake compliance checks on fishers. The consequences of lack of compliance with regulations by users on employment and value of production to considered to be <i>moderate</i> given they may be measurable and on-going negative impacts evident at a regional scale. Recreational fishing is likely to contribute to the risk of noncompliance with regulations through a minority of participants illegally fishing resulting in conflict with others. The illegal catch is unmeasured and interferes with the reliability of the data used by management to indicate fishery production and reduces legitimate employment from the extractive industries in the marine estate. “Commercial fishers may be significantly impacted where their livelihoods are under threat from overfishing and habitat destruction related to illegal activities” (<i>Statewide TARA 159</i>). Consequences not considered in the Statewide TARA include:	Adequate	Regional	10 years	Stable

				- There are 100 fisheries officer roles across the state in 17 coastal and nine inland locations. In the years 2012-2021, out of 45,000 to 49,000 total contacts per annum made by fisheries officers the rates of compliance were between 89.4% and 90.6% (NSW DPI Compliance data). - An overview of recreational fisher's offences in 2018-19 is given in cell 120 (NSW DPI Compliance data). The likelihood of recreational fishing leading to this consequence is <i>likely</i>, as compliance data suggests that while most recreational fishers abide by the law, non compliance may have commercial and employment consequences for other users of the marine estate. Overall risk rating: Moderate				
126	Moderate	Likely	Moderate	Lack of compliance with regulations by users Effective management of the fishery requires effective compliance with the rules and regulations. This requires the managing agency to undertake compliance checks on fishers. The consequences of lack of compliance with regulations by users on individual enjoyment values to be <i>moderate</i> given there may be measurable and on-going negative impacts evident at a regional scale. Recreational fishing is likely to contribute to the risk of noncompliance with regulations through a minority of participants illegally fishing resulting in conflict with others. "A lack of compliance with regulations can negatively impact on enjoyment value. In particular, when illegal activities deter people from visiting or enjoying the marine estate, their use values are lost. Although this may be an issue in some localities, the community-wide impacts are relatively moderate as illegal activities are generally isolated incidents". (<i>Statewide TARA 160</i>) Consequences not considered in the Statewide TARA include: - There are 100 fisheries officer roles across the state in 17 coastal and 9 inland locations. In the years 2012-2021, out of 45,000 to 49,000 total contacts per annum made by fisheries officers the rates of compliance were between 89.4% and 90.6% (NSW DPI Compliance data). - An overview of recreational fisher's offences in 2018-19 is given in cell 120 (NSW DPI Compliance data). The likelihood of this consequence is <i>likely</i>, as non compliance by recreational fishers may reduce fish available for other users of the marine estate with loss of consumer surplus and enjoyment. Overall risk rating: Moderate	Adequate	All regions	10 years	Stable

127	Moderate	Possible	Low	Wildlife interactions (e.g. shark bite, jellyfish, boat striking a whale) Recreational fishing activity takes place among other marine life and there are potential interactions with other aquatic wildlife that may have safety implications. The consequences of this stressor on Safety health and wellbeing (including relaxation) relates to recreational fishers contributing to increased incidences of negative wildlife interaction through their fishing practices (e.g. use of burley or discarded fishing waste in public areas), or increased public concern around wildlife interactions generated through public reports by fishers of shark interactions. These consequences are considered are <i>moderate</i> given they are major impacts at a local scale and generally temporary (e.g. following an interaction). Consequences listed in the Statewide TARA were not specific to recreational fishing but noted: Information is needed to ascertain whether risks to personal safety (real or perceived) operate as a threat or deterrent to beach users. Risk to personal safety may have a high consequence either moderate or major over short temporal intervals, such as following shark sightings or attacks. (<i>Statewide TARA</i> 161). The likelihood of this consequence being the result of recreational fishing activity is <i>possible</i> as recreational fishers do engage in activities that might influence wildlife behaviour and movements. Overall risk rating: Low	Inferred	Regional	10 years	Stable
128	Minor	Possible	Minimal	Wildlife interactions (e.g. shark bite, jellyfish, boat striking a whale) Recreational fishing activity takes place among other marine life and there are potential interactions with other aquatic wildlife that may have safety implications. The consequences of this stressor on Socialising and sense of community relates to recreational fishers contributing to increased incidences of negative wildlife interaction through their fishing practices (e.g. use of burley or discarded fishing waste in public areas), or increased public concern around wildlife interactions generated through public reports by fishers of shark interactions. These consequences are considered are <i>minor</i> given they are short term and at a local scale and generally temporary (e.g. following an interaction). Consequences listed in the Statewide TARA were not specific to recreational fishing but noted: Impact associated with decreased community use of the coast for socialisation associated with shark interactions and jellyfish etc. are likely to be short term and localised. (<i>Statewide TARA</i> 162). The likelihood of this consequence being the result of recreational fishing activity is <i>possible</i> as recreational fishers do engage in activities that might influence wildlife behaviour and movements. Overall risk rating: Minimal	Inferred	Regional	10 years	Stable

129	Minor	Possible	Minimal	Wildlife interactions Recreational fishing activity takes place among other marine life and there are potential interactions with other aquatic wildlife that may have safety implications. The consequences of this stressor on enjoying the biodiversity & beauty of Marine estate (social intrinsic value) relates to recreational fishers contributing to increased negative incidences of wildlife interaction through their fishing practices (e.g. use of burley or discarded fishing waste in public areas), or increased public concern around wildlife interactions generated through public reports by fishers of shark interactions. These consequences are considered are <i>minor</i> given they are short term and at a local scale and generally temporary (e.g. following an interaction). Consequences listed in the Statewide TARA were not specific to recreational fishing but noted: Impacts associated with decreased enjoyment of the beauty and biodiversity of the coast associated with shark interactions and jellyfish etc. are likely to be short term, localised and concentrated on user groups such as snorkelers, divers, swimmers and surfers. (<i>Statewide TARA</i> 163). The likelihood of this consequence being the result of recreational fishing activity is <i>possible</i> as recreational fishers do engage in activities that might influence wildlife behaviour and movements in areas where snorkelers, divers swimmers and surfers are active. Overall risk rating: Minimal	Inferred	Regional	10 years	Stable
130	Minor	Possible	Minimal	Wildlife interactions Recreational fishing activity takes place among other marine life and there are potential interactions with other aquatic wildlife that may have safety implications. The consequences of this stressor on consumptive use relates to recreational fishers contributing to increased incidences of negative wildlife interactions through their fishing practices (e.g. use of burley or discarded fishing waste in public areas) or increased public concern around wildlife interactions generated through public reports by fishers of shark interactions. These consequences are considered are <i>minor</i> given they are short term and at a local scale and generally temporary (e.g. following an interaction). Consequences listed in the Statewide TARA were not specific to recreational fishing but noted they would be most likely concentrated on tourism operators (<i>Statewide TARA</i> 164). The likelihood of this consequence being the result of recreational fishing activity is <i>unlikely</i> as recreational fishers do engage in activities that might influence wildlife behaviour and movements in areas where snorkelers, divers swimmers and surfers are active. Overall risk rating: Minimal	Inferred	Regional	10 years	Stable

131	Minor	Unlikely (C&S), Possible (N)	Minimal (C&S), Minimal (N)	Wildlife interactions Recreational fishing activity takes place among other marine life and there are potential interactions with other aquatic wildlife that may have safety implications. The consequences of wildlife interactions on intrinsic and bequest values to <i>minor</i> given the impacts on intrinsic and bequest values can be significant in the short term but minimal in the long term (Statewide TARA For example, a Four Corners episode ('Shark Alarm' broadcast 8/2/2016) highlighted contemporary fears in the community of shark attacks and represented negative impacts on the intrinsic values the community places on the marine estate. Fear of unprovoked shark bite is identified as an anxiety order for which treatments are emerging (Malbos et al., 2020). Depending upon the frequency of attacks, these fears are not likely to persist through multiple years, nor have a large community-wide impact. In the northern region where shark attacks have been more frequent in recent years and concerns already exist within the tourism sector the consequence is assumed to be higher (<i>Statewide TARA 166</i>). There is no contribution of recreational fishing to this stressor discussed in the Statewide TARA. The likelihood of this consequence is <i>unlikely</i> (C&S) and <i>likely</i> (N) as recreational fishing takes place in a range of different coastal habitats and may result in interactions with wildlife. Based on the documented evidence of shark attacks above, these interactions are considered Likely in the North and Unlikely in the Central and South. Overall risk rating: Minimal (C&S), Minimal (N)	Adequate	All regions	10 years	Stable
132	Insignificant	Unlikely (C&S), Possible(N)	Minimal (C&S), Minimal (N)	Wildlife interactions Recreational fishing activity takes place among other marine life and there are potential interactions with other aquatic wildlife that may have safety implications. The consequences of wildlife interactions on employment and value of production to be <i>insignificant</i> in the given any impacts on businesses (tourism, café owners etc.) can be significant in the short term but minimal in the long term (Statewide TARA 166). Depending upon the frequency of attacks, these fears are not likely to persist through multiple years, nor have a large community-wide impact. In the northern region where shark attacks have been more frequent in recent years and concerns already exist within the tourism sector the consequence is assumed to be higher (<i>Statewide TARA 166</i>). There is no contribution of recreational fishing to this stressor discussed in the Statewide TARA. The likelihood of this consequence is <i>unlikely</i> (C&S) and <i>possible</i> (N) as recreational fishing takes place in a range of different coastal habitats and may result in interactions with wildlife. Based on the documented evidence of shark attacks above, these interactions are considered possible in the North and Unlikely in the Central and South. Overall risk rating: Minimal (C&S), Minimal (N)	Adequate	All regions	10 years	Stable

133	Minor	Unlikely (C&S), Possible (N)	Minimal (C&S), Minimal (N)	Wildlife interactions Recreational fishing activity takes place among other marine life and there are potential interactions with other aquatic wildlife that may have safety implications. The consequences of wildlife interactions on individual enjoyment value (consumer surplus) to be given any impact on enjoyment values (beach closures etc.) can be significant in the short term but minimal in the long term (Statewide TARA). The TARA report indicates less incidents in Central and Southern regions and more in the North Depending upon the frequency of attacks, these fears are not likely to persist through multiple years, nor have a large community-wide impact. In the northern region where shark attacks have been more frequent in recent years and concerns already exist within the tourism sector the consequence is assumed to be higher. (<i>Statewide TARA 166</i>). There is no contribution of recreational fishing to this stressor discussed in the Statewide TARA. The likelihood of this consequence is <i>unlikely (C&S)</i> and <i>possible (N)</i>, as recreational fishing takes place in a range of different coastal habitats and may result in interactions with wildlife. Based on the documented evidence of shark attacks above, these interactions are considered Likely in the North and Unlikely in the Central and South. Overall risk rating: Minimal (C&S), Minimal (N)	Adequate	All regions	10 years	Stable
134	Minor	Likely	Low	Inadequate social and economic information There are significant gaps in knowledge of the social and economic impacts of recreational fishing activity on the benefits of marine estate users. The consequences of this stressor on Safety health and wellbeing (including relaxation) on those using the marine estate from recreational fishing are <i>minor</i> with some information available. The Statewide TARA report noted: “Key knowledge gaps exist around the different ways in which coastal users value the coast and how particular activities and management changes are likely to impact these values. In particular the cumulative impacts of socio economic threats is an area that has received limited research attention to date and this is recognised as a current data gap in the TARA process. It is understood that different communities are likely to respond in different ways to the identified threats and associated management changes. It is difficult, however, to determine the complex interactions of socio-economic, demographic, political and environmental factors which influence these differences. Cumulative impacts associated with the socio-economic threats considered in the TARA can be thought about in two main ways. Firstly the cumulative impacts of multiple stressors, or the increasing likelihood of a single stressor over time, may influence the resilience of a community to additional threats. Secondly, the cumulative impact of external factors associated with demographics, socio-economics and historical or legacy issues may also influence the vulnerability of a population to particular stressors. A lack of understanding of the resilience levels of different communities is likely to inhibit the development of appropriate management strategies. Moderate community wide consequences on human health and wellbeing are therefore considered likely as a result of inadequate information to guide decision making. (<i>Statewide TARA 185</i>).	Limited	All regions	10 years	Stable

				Consequences not considered in the Statewide TARA include: There is a limited amount of specific documentation on the social and economic aspects of recreational fishing in NSW and of recreational fishing activity as a stressor on the social and economic benefits that come from the NSW marine estate. The NSW Recreational Fishing Trust funds many projects that benefit recreational fishing as well as numerous projects that enhance the environment. It has also supports ongoing projects that mitigate the impacts of recreational fishing practices such as citizen science programs and various responsible fishing programs. (<i>Expert advice</i>) The NSW Marine Estate Management Strategy (2018-2028) identifies “<i>Critical Knowledge Gaps</i>” and proposes to address “<i>Inadequate social, cultural and economic information that limits the ability to address identified threats</i>” through a management action to “<i>Establish and deliver the Marine Integrated Monitoring Programs social, cultural and economic components</i>” (DPI 2018 Page 70). (<i>Departmental reports</i>). The likelihood of the contribution of recreational fishing to this stressor is <i>likely</i> as additional literature and reports on the social and economic contributions to the marine estate would address an identified knowledge gap (DPI 2018). Overall risk rating: Low				
135	Minor	Likely	Low	Inadequate social and economic information There are significant gaps in knowledge of the social and economic impacts of recreational fishing activity on the benefits of marine estate users. The consequences of this stressor on Socialising and sense of community are thought to be <i>minor</i> as recreational fishers are only one part of the users in the marine estate. “A lack of understanding of the way the marine estate facilitates and builds community cohesion and division may limit the ability of management responses to be sensitive to protecting or enhancing social relationships. Moderate community wide consequences on socialisation and sense of community are therefore considered likely as a result of inadequate information to guide decision making”. (Statewide TARA 186). For additional evidence since completion of the Statewide TARA - See cell 134 The likelihood of the contribution of recreational fishing to this stressor is <i>likely</i> as participants are a key contributor to the marine estate user community and requires further investigation. Overall risk rating: Low	Limited	All regions	10 years	Stable

136	Minor	Likely	Low	Inadequate social and economic information There are significant gaps in knowledge of the social and economic impacts of recreational fishing activity on the benefits of marine estate users. The consequences of recreational fishing on enjoying the biodiversity & beauty of Marine estate (social intrinsic value) are thought to be <i>minor</i>. The Statewide TARA noted: Different community perceptions of ‘beauty’ and ‘biodiversity’ are likely to be key drivers in their attitudes towards management responses and the extent to which they feel impacted by environmental changes. These need to be better understood in the development of management responses. This is especially important in understanding how environmental change associated with climate change, extractive use and other stressors may interact with community values to determine how communities will respond and react to these changes. Moderate community wide consequences on enjoyment of biodiversity values and beauty are therefore considered likely as a result of inadequate information to guide decision-making (Statewide TARA 187). Consequences not considered in the Statewide TARA include: • Reports of recreational fishing taking place in areas designated as “scientific reference sites” with the potential to impact research and monitoring of biodiversity (<i>Marine Estate advice, Departmental reports, expert advice</i>). • See cell 134 for additional evidence The likelihood of the contribution of recreational fishing to this stressor is <i>likely</i> as many fishers may be poorly informed or be insufficiently aware of their impacts on the marine estate’s biodiversity. Overall risk rating: Low	Limited	All regions	10 years	Stable
137	Minor	Likely	Low	Inadequate social and economic information There are significant gaps in knowledge of the social and economic impacts of recreational fishing activity on the benefits of marine estate users. The consequences of this stressor on consumptive use are thought to be <i>minor</i> with impacts on other industries and users of the marine estate from lack of information. The Statewide TARA noted: The social and economic aspects of fisheries management in NSW is understudied, although there is increasing work being done in this area around the world. These works point to the importance of studying social, economic and environmental drivers which influence the success of management strategies in an integrated manner. Without doing so there is a risk that fisheries will be managed in ways that may be environmentally sustainable but result in social and economic failures (or vice versa). Moderate community wide consequences on consumptive use are therefore considered likely as a result of inadequate information to guide decision making (Statewide TARA 188).	Limited	All regions	10 years	Stable

				For evidence since completion of the Statewide TARA – See cell 134 The likelihood of the contribution of recreational fishing to this stressor is <i>likely</i> as additional literature and reports on the social and economic contributions to the marine estate would help address the knowledge gap identified by the Marine Estate Strategic Plan (2018-2028 see DPI 2018). Overall risk rating: Low				
138	Minor	Possible	Minimal	Inadequate social and economic information There are significant gaps in knowledge of the social and economic impacts of recreational fishing activity on the benefits of marine estate users. The consequences on intrinsic and bequest values to <i>minor</i> and require further research. The Statewide TARA: Key knowledge gaps and inadequate scientific information have been identified through the marine estate management process, although their impacts on intrinsic benefits are difficult to quantify. Given that the Hawkesbury assessment has demonstrated that information failure can lead to a range of environmental, social and economic threats; these may in turn, impact upon intrinsic values.(Statewide TARA 189). For evidence since completion of the Statewide TARA – See cell 134 The likelihood of the contribution of recreational fishing to this stressor is <i>possible</i> with improved social and economic information increasing opinions on the intrinsic value of the marine estate. Overall risk rating: Minimal	Limited	All regions	10 years	Stable

139	Minor	Likely	Low	Inadequate social and economic information There are significant gaps in knowledge of the social and economic impacts of recreational fishing activity on the benefits of marine estate users. The consequences of poor information on recreational fishing activity can impact the employment and value of production on the marine estate with <i>minor</i> impacts on other industries and users of the marine estate. “The Hawkesbury assessment has demonstrated that information failure can lead to a range of environmental, social and economic threats; these may in turn, impact upon production and employment” (Statewide TARA 139). For evidence since completion of the Statewide TARA - See cell 134 The likelihood of the contribution of recreational fishing to this stressor is <i>likely</i> as having information on the social and economic benefits from the marine estate can support production and employment opportunities Overall risk rating: Low	Limited	All regions	10 years	Stable
140	Minor	Likely	Low	Inadequate social and economic information There are significant gaps in knowledge of the social and economic impacts of recreational fishing activity on the benefits of marine estate users. The consequences of lack of information on recreational fishing on individual enjoyment value (consumer surplus) of those using the marine estate is <i>minor</i>. “The Hawkesbury assessment has demonstrated that information failure can lead to a range of environmental, social and economic threats; these may in turn, impact upon individual enjoyment value.” (Statewide TARA 139). For evidence since completion of the Statewide TARA - See cell 134 The likelihood of the contribution of recreational fishing to this stressor is <i>likely</i> as lack of information may reduce the enjoyment of the marine estate Overall risk rating: Low	Limited	All regions	10 years	Stable

References

- AAS, Ø., THAILING, C. E., & DITTON, R. B. (2002). Controversy over catch-and-release recreational fishing in Europe. *Recreational fisheries: Ecological, economic and social evaluation*, 95-106.
- ABS (2020a). Motor Vehicle Census, Australia, 2020 (93090DO001_2020).
- ABS (2020b). Survey of Motor Vehicle Use, Australia, 12 months ended 30 June 2020(92080DO001_202006).
- ARLINGHAUS, R. (2007). Voluntary catch-and-release can generate conflict within the recreational angling community: a qualitative case study of specialised carp, *Cyprinus carpio*, angling in Germany. *Fisheries Management and Ecology*, 14(2), 161-171.
- ARLINGHAUS, R., COOKE, S. J., SCHWAB, A., & COWX, I. G. (2007). Fish welfare: a challenge to the feelings-based approach, with implications for recreational fishing. *Fish and Fisheries*, 8(1), 57-71.
- ARLINGHAUS, R., SCHWAB, A., RIEPE, C., & TEEL, T. (2012). A primer on anti-angling philosophy and its relevance for recreational fisheries in urbanized societies. *Fisheries*, 37(4), 153-164.
- ARLINGHAUS, R. (2006). On the Apparently Striking Disconnect between Motivation and Satisfaction in Recreational Fishing: The Case of Catch Orientation of German Anglers. *North American Journal of Fisheries Management*, 26, 592-605.
- ADVS (1999). Consultancy on routes for exposure of aquatic animals to aquatic animal products intended for human consumption. Aquaculture Development and Veterinary Services Pty Ltd, Allens Rivulet, Tasmania, Australia.
- ÁVILA-FOUCAT, V. S., VARGAS, A. S., JORDAN, A. F., & FLORES, O. R. (2013). The impact of vessel crowding on the probability of tourists returning to whale watching in Banderas Bay, Mexico. *Ocean & coastal management*, 78, 12-17.
- BAIL, C. A., ARGYLE, L. P., BROWN, T. W., BUMPUS, J. P., CHEN, H., HUNZAKER, M. B. F., LEE, J., MANN, M., MERHOUT, F. & VOLFOVSKY, A. (2018). Exposure to opposing views on social media can increase political polarization. 115, 9216-9221.
- BARCLAY, K., McILGORM, A., MAZUR, N., VOYER, M., SCHNIERER, S., PAYNE, A.M. (2016). Social and Economic Evaluation of NSW Coastal Aquaculture, Fisheries Research and Development Corporation (FRDC 2015/302) and University of Technology Sydney, Sydney (216 pp).
<https://www.uts.edu.au/about/faculty-arts-and-social-sciences/research/fass-research-projects/social-science-fisheries/social-and-economic-evaluation-nsw-coastal-aquaculture>
- BEARDMORE, B., HAIDER, W., HUNT, L. M., & ARLINGHAUS, R. (2013). Evaluating the ability of specialization indicators to explain fishing preferences. *Leisure Sciences*, 35(3), 273-292.
- BEARDMORE, B., HAIDER, W., HUNT, L. M. & ARLINGHAUS, R. (2011). The Importance of Trip Context for Determining Primary Angler Motivations: Are More Specialized Anglers More Catch-Oriented than Previously Believed? *North American Journal of Fisheries Management*, 31, 861-879.
- BERTHE, F. C., LE ROUX, F., ADLARD, R. D., & FIGUERAS, A. (2004). Marteilirosis in molluscs: a review. *Aquatic Living Resources*, 17(4), 433-448.

BIOSECURITY AUSTRALIA (2009). Generic Import Risk Analysis Report for Prawns and Prawn Products. Biosecurity Australia, Canberra, Australia.

BOUCQUEY, N. (2017). 'That's my livelihood, it's your fun': The conflicting moral economies of commercial and recreational fishing. *Journal of Rural Studies*, 54, 138-150.

BROAD, A. M.J REES, AND A.R. DAVIS (2020). Anchor and chain scour as disturbance agents in benthic environments: trends in the literature and charting a course to more sustainable boating and shipping. *Marine Pollution Bulletin*, Volume 161, Part A, 111683, ISSN 0025-326X, <https://doi.org/10.1016/j.marpolbul.2020.111683>.

BROUWER, R., TURNER, R. K., & VOISEY, H. (2001). Public perception of overcrowding and management alternatives in a multi-purpose open access resource. *Journal of Sustainable Tourism*, 9(6), 471-490.

BROWN, C. J. (2016). Social, economic and environmental effects of closing commercial fisheries to enhance recreational fishing. *Marine policy*, 73, 204-209.

BRYAN, H. (2000). Recreation specialization revisited. *Journal of Leisure Research*, 32(1), 18-21.

BUDRUK, M., STANIS, S. A. W., SCHNEIDER, I. E., & HEISEY, J. J. (2008). Crowding and experience-use history: A study of the moderating effect of place attachment among water-based recreationists. *Environmental Management*, 41(4), 528-537.

CARVALHO, R. C., KENNEDY, D. M., & WOODROFFE, C. D. (2019). A morphology-based drowning risk index for rock platform fishing: a case study from southeastern Australia. *Natural Hazards*, 96(2), 837-856.

CECCARELLI, D. M. (2009). Impacts of plastic debris on Australian marine wildlife. Report by C&R Consulting for the Department of the Environment, Water, Heritage and the Arts.

CHEN, C. L., & TENG, N. (2016). Management priorities and carrying capacity at a high-use beach from tourists' perspectives: A way towards sustainable beach tourism. *Marine Policy*, 74, 213-219.

CINELLI, M., DE FRANCISCI MORALES, G., GALEAZZI, A., QUATTROCIOCCHI, W. & STARNINI, M. (2021). The echo chamber effect on social media. 118, e2023301118.

CLEAN4 SHORE (2019) "Communities Protecting Local Waterways", ANNUAL REPORT 2019., Clean4shore. <https://www.stedwards.nsw.edu.au/wp-content/uploads/2020/05/Clean4ShoreAnnualReport0705v7reducepdfprint.pdf>

COOKE, S.J., VENTURELLI, P., TWARDK, W.M. et al.(2021) Technological innovations in the recreational fishing sector: implications for fisheries management and policy. *Rev Fish Biol Fisheries* 31, 253–288. <https://doi.org/10.1007/s11160-021-09643-1>

DAVIS, D., & TISDELL, C. (1996). Economic management of recreational scuba diving and the environment. *Journal of environmental management*, 48(3), 229-248.

DAVIS, D., & TISDELL, C. (1995). Recreational scuba-diving and carrying capacity in marine protected areas. *Ocean & Coastal Management*, 26(1), 19-40.

DAWE (2020). Import risk review for prawns imported from all countries for human consumption, Department of Agriculture, Water and the Environment, Canberra, September 2020. CC BY 4.0.

DAWR (2017). Report into the cause of white spot syndrome virus outbreak in the Logan River area of Queensland – December 2016, Canberra.

DIGGLES, B. (2020). Submission by DigsFish Services to DAWE on the revised Prawn Risk Analysis “Draft Risk Review”. (www.digsfish.com) 16 December 2020.

DITTON, R. B. & SUTTON, S. G. 2004. Substitutability in Recreational Fishing. *Human Dimensions of Wildlife*, 9, 87-102.

DPI (2016). NSW Marine Estate Threat and Risk Assessment – background environmental information, NSW Marine Estate Management Authority
November 2016 (Second edition: September 2017) Published by NSW Department of Primary Industries
ISBN 978-1-74256-983-3
https://www.marine.nsw.gov.au/__data/assets/pdf_file/0006/672198/NSW-Marine-Estate-Threat-and-Risk-Assessment-background-environmental-information-TARA-report.PDF

DPI (2018). NSW Marine Estate Management Strategy (2018-2028), The NSW Marine Estate Management Authority. ISBN: 978-1-76058-221-0
https://www.marine.nsw.gov.au/__data/assets/pdf_file/0007/815596/Marine-Estate-Management-Strategy-2018-2028.pdf

DPI (2019). Abalone Fishery, NSW Total Allowable Fishing Committee Report and Determination. Report to the DPI, 19th November.

DPI (2020). Rock Lobster Fishery, NSW Total Allowable Fishing Committee Report and Determination 2020–21, DPI, 13th June.

DPIE (2020). NSW Wildlife Rehabilitation Annual Report 2018–19, Department of Planning, Industry and Environment, NSW Government. ISSN 2652-6451 EES 2020/0460, November.
<https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Native-animals/wildlife-rehabilitation-annual-report-201819-200460.pdf>

DPIE (2020b). NSW debris threat and risk assessment. Stage 3- Expert elicitation background document for SOCIAL VALUES, (Internal document), NSW Department of Planning, Industry and Environment, November.

FAO (2012). Recreational fisheries. FAO Technical Guidelines for Responsible Fisheries. No. 13. Rome, FAO. 2012. 176p.

FONTAINE, C. (2017). *Asian Australian Cultures of Recreational Fishing*. Honours Honours, University of Wollongong.

FRDC (2019) New South Wales Fisheries and Aquaculture Industry 2017/18: Economic Contributions Summary. FRDC project 2017-210, UTASD, IMAS and BDO, ISBN 978-1-922352-00-2.

HUNT, L. M., SUTTON, S. G. & ARLINGHAUS, R. (2013). Illustrating the critical role of human dimensions research for understanding and managing recreational fisheries within a social-ecological system framework. *Fisheries Management and Ecology*, 20, 111-124.

GESAMP (2016). Sources, fate and effects of microplastics in the marine environment: part 2 of a global assessment. (Kershaw, P.J., and Rochman, C.M., eds). (IMO/FAO/UNESCO-

IOC/UNIDO/WMO/IAEA/UN/ UNEP/UNDP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection). Rep. Stud. GESAMP No. 93, 220 p.

GRAEFE, A. R., & FEDLER, A. J. (1986). Situational and subjective determinants of satisfaction in marine recreational fishing. *Leisure Sciences*, 8(3), 275-295

GRAMANN, J. H. (1982). Toward a behavioral theory of crowding in outdoor recreation: An evaluation and synthesis of research. *Leisure sciences*, 5(2), 109-126.

GRANEK, E. F., MADIN, E. M., BROWN, M. A., FIGUEIRA, W., CAMERON, D. S., HOGAN, Z., ... & ARLINGHAUS, R. (2008). Engaging recreational fishers in management and conservation: global case studies. *Conservation Biology*, 22(5), 1125-1134.

GRIFFIN, K. J., HEDGE, L. H., WARTON, D. I., ASTLES, K. L., & JOHNSTON, E. L. (2021). Modeling recreational fishing intensity in a complex urbanised estuary. *Journal of Environmental Management*, 279, 111529.

HARASTI D, DAVIS T.R., JORDAN A, ERSKINE L, MOLTSCHANIWSKY, J. N. (2019). Illegal recreational fishing causes a decline in a fishery targeted species (Snapper: *Chrysophrys auratus*) within a remote no-take marine protected area. *PLoS ONE* 14(1): e0209926. <https://doi.org/10.1371/journal.pone.0209926>

HENRY G. AND J. LYLE (2003) The National Recreational and Indigenous Fishing Survey July . Australian Government Department of Agriculture, Fisheries and Forestry, Canberra.

HUNT, L. M., BANNISTER, A. E., DRAKE, D. A. R., FERA, S. A., & JOHNSON, T. B. (2017). Do fish drive recreational fishing license sales? *North American Journal of Fisheries Management*, 37(1), 122-132.

HUNT, W., & MCMANUS, A. (2016). Recreational fishing supports health and wellbeing in Western Australia. *Australian and New Zealand journal of public health*, 40(3), 292-292.

INSPECTOR-GENERAL OF BIOSECURITY (2017). Uncooked prawn imports: effectiveness of biosecurity controls, Department of Agriculture and Water Resources, Canberra. https://www.igb.gov.au/sites/default/files/documents/final-uncooked-prawn-imports_0.pdf

JAKUS, P., & SHAW, W. D. (1997). Congestion at recreation areas: empirical evidence on perceptions, mitigating behaviour and management preferences. *Journal of Environmental Management*, 50(4), 389-401.

JAMIESON, E., BELLEHUMEUR, K., ARLINGHAUS, R., & COOKE, S. J. (2011). Opinions of fisheries researchers, managers, and anglers towards recreational fishing issues: an exploratory analysis for North America. In *American Fisheries Society Symposium* (Vol. 7551, p. 74).

KEARNEY, R. E. (2002). Recreational fishing: value is in the eye of the beholder. *Recreational fisheries: ecological, economic and social evaluation*, 2, 17-33.

KEWAGAMA RESEARCH (2002). National survey of bait and berley use by recreational fishers, Kewagama Research, Noosa Valley, available at http://www.daff.gov.au/__data/assets/pdf_file/0016/13561/2003-11.pdf.

- KEWAGAMA RESEARCH (2007). National survey of bait and berley use by recreational fishers: a follow-up survey focusing on prawns/shrimp, Kewagama Research, Noosaville, available at http://www.agriculture.gov.au/SiteCollectionDocuments/ba/memos/2007/animal/2007_13c.pdf
- KING, T., KILPATRICK, S., WILLIS, K. & SPELDEWINDE, C. (2015). "A Different Kettle of Fish": Mental health strategies for Australian fishers, and farmers. *Marine Policy*, 60, 134-140.
- KING, T. J., TURNER, R., VERSACE, V., ABERNETHY, K., KILPATRICK, S., & BRUMBY, S. (2021). Mental health in the commercial fishing industry: Modern uncertainties and traditional risks. *Fish and Fisheries*, 00:1-14.
- KNIBB, W., LE, C., KATOULI, M., BAR, I., & LLOYD, C. (2018). Assessment of the origin of white spot syndrome virus DNA sequences in farmed *Penaeus monodon* in Australia. *Aquaculture*, 494, 26-29.
- LEADBITTER, D. (2018). Proposed Hawkesbury Shelf Marine Park: Submission, September, 2018. (with authors permission).
- LEADBITTER, D. and D. POLLARD (1983). Fishing and Diving Activities in Jervis Bay: Past and present Usages. NSW Fisheries Research Institute, Cronulla.
- LI, O., SUTTON, S. G. & TYNAN, L. (2010). Communicating Scientific Information to Recreational Fishers. *Human Dimensions of Wildlife*, 15, 106-118.
- LI, O., T. LIN, Y. LIU, A. MCILGORM, M.A. VOYER & ZHANG, D. 2019. Communicating more effectively with recreational fishers from Chinese speaking backgrounds. . *Report to the NSW Recreational Fishing Trust, Project LS012*. Wollongong: ANCORS.
- LYNCH, T. P., WILKINSON, E., MELLING, L., HAMILTON, R., MACREADY, A., & FEARY, S. (2004). Conflict and impacts of divers and anglers in a marine park. *Environmental Management*, 33(2), 196-211.
- MAGEE, C., VOYER, M., McILGORM, A. & LI, O. (2018). Chasing the thrill or just passing the time? Trialing a new mixed methods approach to understanding heterogeneity amongst recreational fishers based on motivations. *Fisheries Research*, 199, 107-118.
- MALBOS, E., BURGESS, G. H., & LANÇON, C. (2020). Virtual reality and fear of shark attack: a case study for the treatment of squalophobia. *Clinical Case Studies*, 19(5), 339-354.
- MANNING, R., VALLIERE, W., MINTEER, B., WANG, B. AND JACOBI, C., (2000). Crowding in Parks and Outdoor Recreation: A Theoretical, Empirical, and Managerial Analysis. *Journal of Park & Recreation Administration*, 18(4).
- MAZUR, K. and R. CURTOTTI (2016). A theoretical framework for resource sharing between commercial and recreational fishers. Research by the Australian Bureau of Agricultural and Resource Economics and Sciences, Conference paper, February 2016.
- McILGORM, A. and J. PEPPERELL (2013). Developing a cost effective state wide expenditure survey method to measure the economic contribution of the recreational fishing sector in NSW in 2012. A report to the NSW Recreational Fishing Trust, NSW Department of Primary Industries, November 2013. Produced by the Australian National Centre for Ocean Resources and Security (ANCORS), University of Wollongong.

- McILGORM, A., C, M., VOYER, M., PEPPERELL, J., O'TOOLE, E. & LI, O. (2016a). Improving our understanding of the values, beliefs, motivations and attitudes of recreational fishers in NSW. Report to New South Wales Department of Primary Industry Recreational Fishing Trusts. Wollongong.
- McILGORM, A., VOYER, M., MAGEE, C. A., PEPPERELL, J., O'TOOLE, E. & LI, O. (2016b). Improving our understanding of the motivations and attitudes towards fisheries management of recreational fishers in NSW. *Report to New South Wales Department of Primary Industry Recreational Fishing Trusts*. Wollongong: Australian National Centre for Ocean Resources and Security (ANCORS).
- MCMANUS, A., NEWTON, W., STOREY, J., & WHITE, J. (2011). Identifying the health and well-being benefits of recreational fishing. FRDC 2011/217: A report by Curtin University to the Fisheries Research and Development Corporation., Canberra. November.
- MCPHEE, D. P. (2017). Urban recreational fisheries in the Australian coastal zone: the sustainability challenge. *Sustainability*, 9(3), 422.
- MCPHEE, D, D. LEADBITTER and G.A. SKILLETER (2002). Swallowing the bait: Is recreational fishing in Australia ecologically sustainable? *Pacific Conservation Biology*, 8(1), 40-51.
<https://doi.org/10.1071/PC020040>
- MITCHELL, R. J., WARE, L., & BAMBACH, M. R. (2014). The role of evidence, standards and education in rock fishing safety in New South Wales, Australia. *Australian and New Zealand journal of public health*, 38(6), 579-584.
- MOMTAZ, S., & GLADSTONE, W. (2008). Ban on commercial fishing in the estuarine waters of New South Wales, Australia: community consultation and social impacts. *Environmental Impact Assessment Review*, 28(2-3), 214-225.
- MOSS, D., & MCPHEE, D. P. (2006). The impacts of recreational four-wheel driving on the abundance of the ghost crab (*Ocypode cordimanus*) on a subtropical sandy beach in SE Queensland. *Coastal management*, 34(1), 133-140.
- MURPHY, J. J., OCHWADA-DOYLE, F. A., WEST, L. D., STARK, K. E. and HUGHES, J. M. (2021). Survey of recreational fishing in NSW, 2017/18. Fisheries Final Report Series | No. 158, April.
- NSW DEPARTMENT OF PRIMARY INDUSTRIES (2018). A submission to Biosecurity advice No 2018/06: Request for scientific submissions on specific issues with Australia's current prawn import policy, Department of Agriculture & Water Resources, Canberra, available at <http://www.agriculture.gov.au/SiteCollectionDocuments/biosecurity/risk-analysis/ira/nsw-dpi.pdf> (PDF 152 KB) accessed 24 June 2019. (Cited in DAWE 2020).
- OCEANWATCH (2013). Tangle Bin Overview. <https://www.oceanwatch.org.au/wp-content/uploads/2016/04/TAngler-Bin-Program-Overview.pdf>
- OH, C.-O. & DITTON, R. B. (2008). Using Recreation Specialization to Understand Conservation Support. *Journal of Leisure Research*, 40, 556-573.
- PEPIN-NEFF, C. L., & WYNTER, T. (2018). Reducing fear to influence policy preferences: an experiment with sharks and beach safety policy options. *Marine Policy*, 88, 222-229.

- PASCOE, S. (2019). Recreational beach use values with multiple activities, *Ecological Economics*, Volume 160, Pages 137-144, ISSN 0921-8009, <https://doi.org/10.1016/j.ecolecon.2019.02.018>.
- PASCOE, S., SCHROBBACK, P., HOSHINO, E. AND CURTOTTI, R. (2021). Demand Conditions and Dynamics in the SESSF: An Empirical Investigation. FRDC Project No 2018-017, FRDC, Canberra, March 2021. CC BY 3.0
- POMEROY, R., & DOUVERE, F. (2008). The engagement of stakeholders in the marine spatial planning process. *Marine policy*, 32(5), 816-822.
- PRODUCTIVITY COMMISSION (2016). Marine Fisheries and Aquaculture, Final Report. Productivity Commission, Canberra.
- QUEENSLAND GOVERNMENT (2021). White spot restrictions. <https://www.qld.gov.au/recreation/activities/boating-fishing/rec-fishing/white-spot-disease-restrictions/white-spot-disease>
- ROBBINS, W., V.M. PEDDEMORS, M.K. BROADHURST, CHARLES, A J. (2013). Hooked on fishing? Recreational angling interactions with the Critically Endangered grey nurse shark *Carcharias taurus* in eastern Australia. *Endang. Species Res.* Vol. 21: 161–170, August. doi: 10.3354/esr00520
- SCHLACHER, T. A., THOMPSON, L., & PRICE, S. (2007). Vehicles versus conservation of invertebrates on sandy beaches: mortalities inflicted by off-road vehicles on ghost crabs. *Marine Ecology*, 28(3), 354-367.
- SCHLACHER, T. A., & LUCREZI, S. (2010). Compression of home ranges in ghost crabs on sandy beaches impacted by vehicle traffic. *Marine biology*, 157(11), 2467-2474.
- SCHLACHER, T. A., THOMPSON, L. M., & WALKER, S. J. (2008). Mortalities caused by off-road vehicles (ORVs) to a key member of sandy beach assemblages, the surf clam *Donax deltoides*. *Hydrobiologia*, 610(1), 345-350.
- SHARPLESS, A. and S. EVANS (2013). The Perfect protein: A fish lovers guide to saving the oceans and feeding the world. Rodale Incorporated, Pennsylvania, US. ISBN10 1609614992.
- SKILLETER, G. A., ZHARIKOV, Y., CAMERON, B., & MCPHEE, D. P. (2005). Effects of harvesting callinassid (ghost) shrimps on subtropical benthic communities. *Journal of Experimental Marine Biology and Ecology*, 320(2), 133-158.
- STEFFE, A. S., & MURPHY, J. J. (2011). *Recreational fishing surveys in the Greater Sydney Region* (p. 122). NSW Department of Primary Industries.
- STEVEN, AH, MOBSBY, D AND CURTOTTI, R (2020). Australian fisheries and aquaculture statistics 2018, Fisheries Research and Development Corporation project 2019-093, ABARES, Canberra, April. CC BY 4.0. <https://doi.org/10.25814/5de0959d55bab>.
- SUTTON, S. G. (2006). An assessment of the social characteristics of Queensland's recreational fishers. *CRC Reef Research Centre Technical Report*, 65, 149.
- SUTTON, S.G. AND BUSHNELL, S.L.,(2007). Socio-economic aspects of artificial reefs: Considerations for the Great Barrier Reef Marine Park, *Ocean & Coastal Management*, vol. 50, no. 10, pp.829-846.

SWEENEY RESEARCH (2014). Marine Estate Community Survey - Final report. Report for the NSW Marine Estate Management Authority.

THURSTAN, R. H., GAME, E., & PANDOLFI, J. M. (2017). Popular media records reveal multi-decadal trends in recreational fishing catch rates. *PloS one*, 12(8), e0182345.

TOTTERMAN, S. (2021). Vehicle-based recreation and compliance for three beaches in northern New South Wales. Note. This paper is a preprint.

TRACEY, S., BUXTON, C., GARDNER, C., GREEN, B., HARTMANN, K., HAWARD, M., JABOUR, J., LYLE, J. & MCDONALD, J. (2013). Super Trawler Scuppered in Australian Fisheries Management Reform. *Fisheries*, 38, 345-350.

VANDERKOOI (2015). Social and Economic background information report on the NSW Marine Estate. Document produced for the Marine Estate Management Authority (MEMA) By Vanderkooi Consulting, NSW, August.

VOYER, M. (2014). *Assessing the social acceptability of Marine Protected Areas (MPAs): A comparison between Port Stephens-Great Lakes Marine Park (PGSLMP) and Batemans Marine Park (BMP) in NSW*. PhD, University of Technology Sydney.

VOYER, M., A. McILGORM and K. BARCLAY (2016) "Fishing is worth more than jobs and profits to Australia's coastal towns". *The Conversation*, October 19.

VOYER, M., BARCLAY, K., McILGORM, A. & MAZUR, N. (2016). *Social and Economic Evaluation of NSW Coastal Professional Wild-Catch Fisheries: Valuing Coastal Fisheries (FRDC 2014-301)*, Canberra, Australia, Fisheries Research and Development Corporation (FRDC) and University of Technology Sydney.

VOYER, M. K. BARCLAY, A. McILGORM, N. MAZUR (2017). Connections or conflict? A social and economic analysis of the interconnections between the professional fishing industry, recreational fishing and marine tourism in coastal communities in NSW, Australia, *Marine Policy*, Volume 76, February 2017, Pages 114-121, ISSN 0308-597X, <http://dx.doi.org/10.1016/j.marpol.2016.11.029>.

VOYER, M., GLADSTONE, W. & GOODALL, H. (2013). 'It's part of me'; The social values of NSW beaches and headlands. Report to the NSW DPI..

VOYER, M., GLADSTONE, W. & GOODALL, H. 2015. Obtaining a social licence for MPAs – influences on social acceptability. *Marine Policy*, 51, 260-266.

WADIWEL, D. (2019). 'Fishing for Fun': The Politics of Recreational Fishing. *Animal Studies Journal*, 8(2), 202-228.

WATSON, A. R. , C. BLOUNT, D. P. MCPHEE, D. ZHANG, M. P. LINCOLN SMITH, K. REEDS AND J. E. WILLIAMSON (In submission). Recreational fishing marine debris: is it a problem and how should we manage it? Article submitted to journal.

WEST, L. D., K. E. STARK, J. J. MURPHY, LYLE, J. M. & OCHWADA-DOYLE, F. A. (2015). Survey of Recreational Fishing in New South Wales and the ACT, 2013/14. Wollongong.

WEST, R. J., & GORDON, G. N. G. (1994). Commercial and recreational harvest of fish from two Australian coastal rivers. *Marine and Freshwater Research*, 45(7), 1259-1279.

WESTON, M. A., SCHLACHER, T. A., & LYNN, D. (2014). Pro-environmental beach driving is uncommon and ineffective in reducing disturbance to beach-dwelling birds. *Environmental Management*, 53(5), 999-1004.

WHITTINGTON, R., HICK, P., EVANS, O., RUBIO, A., DHAND, N., & PAUL-PONT, I. (2016). Pacific oyster mortality syndrome: a marine herpesvirus active in Australia. *Microbiology Australia*, 37(3), 126-128.

WISE, A. (2017). The long reach of the riots: Denying racism, forgetting Cronulla. *Journal of Intercultural Studies*, 38(3), 255-270.

Appendix C A Review of the Key Social and Economic Impacts of Recreational Fishing on the NSW Marine Estate

A Review of the Key Social and Economic Impacts of Recreational Fishing on the NSW Marine Estate

The social and economic impacts of recreational fishing on other user groups of the marine estate are complex and varied, as are the impacts on the marine estate itself. This document summarises the key findings from the detailed assessment of the social and economic impacts of recreational fishing on other user groups.

Threats to the social and economic benefits of the marine estate

Marine users derive social and economic benefits from the marine estate, which have the following aspects:

Social benefit	Type of benefit
Safety, health and well being	<i>Tangible</i>
Socialising and sense of community	<i>Relational</i>
Enjoying the biodiversity & beauty of the marine estate	<i>Subjective (social intrinsic value)</i>
Consumptive use (extracting)	<i>Material /Use</i>
Economic benefit	Type of benefit
Intrinsic & bequest value (economic intrinsic value)	<i>A 'natural asset' concept</i>
Employment & value of production	<i>A flow concept</i>
Individual enjoyment value (Consumer surplus)	<i>A measure of appreciation</i>

These benefits may be negatively impacted by 'threats/ stressors' coming from a variety of sources, including conflict over use, the environment, governance activities and public safety. For the purposes of this report, we limit our examination of these key threats and component stressors to the contribution of recreational fishing to each stressor.

The first category of threat called 'Resource Use Conflict' and includes the following stressors: 1) conflicts over access and use between recreational fishers and commercial fishers, between recreational fishing and other marine estate users and within the recreational fishing sector itself. Other sources of conflict include 2) anti-social behaviour 3) unsafe practices 4) over-crowding/congestion 5) loss or decline of marine industries and 6) excessive or illegal extraction.

The second category of threat called 'Environmental' includes the following stressors: 1) water pollution (specifically marine litter, solid waste, marine debris and micro-plastics) 2) wildlife disturbance and interactions 3) habitat disturbance 4) reductions in abundance of species and trophic levels 5) pests and diseases and 6) climate change stressors.

Many marine estate users (and non-marine estate users) contribute to these stressors, and so identifying the contribution of recreational fishing to these stressors is a difficult task. Ways in which recreational fishing may contribute to these environmental stressors includes discarding fishing related litter, overharvesting, using illegal fishing methods and using imported seafood as bait. Also using a four-wheel drive or a boat to access fishing locations and using fuel in boats and cars.

The third category of threat called 'Governance of the Marine Estate' includes the following stressors: 1) the adequacy of fisheries regulations 2) lack of or ineffective community engagement 3) lack of

recreational fisher awareness of the marine estate and 4) lack of compliance with regulations. The recreational fishing sector contributes to this stressor through lobbying activities, undertaking activities which dissuade other marine users from engaging in the marine estate and by not following the regulations.

The fourth category of threat called 'Public Safety' includes the stressor, wildlife interactions, the most common example of which is potential interactions with sharks. This may occur by recreational fishers increasing the risk of interactions by their behaviour. Or, they may increase stress/concern in the local community around interactions with dangerous wildlife, by reporting their own interactions, leading to reduced participation and engagement with the marine estate due to safety concerns amongst the public.

The final category of threat is 'Critical Knowledge Gaps' that covers the following stressor; inadequate social and economic information about how recreational fishing (as one of many activities in the marine estate) may impact the benefits enjoyed by all users. The NSW Government has identified the need for more information on all activities and use values as a priority within the Marine Estate Strategy (2018-2028).

Assigning Risk Ratings

The process of assigning a risk rating for individual stressors was conducted using a consequence/likelihood approach in accordance with AS ISO 31000:2018 to align with the NSW Statewide Threat and Risk Assessment (BMT WBM, 2017). A given stressor was assigned a 'consequence' level, a 'likelihood' level and an overall risk rating using the scales shown in Table 1. The overall risk rating is a combination of the consequence and likelihood levels (see Table 2 below). The overall derived risk ratings are ranked as follows: Minimal (green), Low (yellow), Moderate (orange) or High (red).

Table 1: Likelihood and Consequence Tables used in the Assessment

Likelihood level	Likelihood of impacts in the bioregion
Rare	Never reported in this situation, but still plausible within the timeframe (< 5%)
Unlikely	Uncommon, but has been known to occur elsewhere. Expected to occur in the bioregion only in specific circumstances within the timeframe (5-30%)
Possible	Some clear evidence exists to suggest this is possible in this situation within the timeframe (30-50%)
Likely	Expected to occur in this situation within the timeframe (50-90%)
Almost certain	A very large certainty that this will occur in this situation within the timeframe (>90%)

Level	Consequence of impacts on flow of social and economic benefits
Insignificant	No or barely discernible negative impacts on social/economic benefits evident at a regional scale, or else minor impacts at a local scale on: - the social/economic benefits derived in one or several localities within a region; and/or - one (or more) defined sectors or user groups
Minor	Discernible and/or temporary negative impacts on social/economic benefits are or will be evident at a regional scale, or moderate impacts at a local scale on: - The social/economic benefits derived in one or several localities within a region; and/or - one (or more) defined sectors or user groups
Moderate	Measurable and on-going negative impacts on social/economic benefits are or will be evident at a regional scale, or major impacts at a local scale on: - the social/economic benefits derived in one or several localities within a region; and/or - across one (or more) defined sectors or user groups
Major	Substantial measurable and ongoing negative impacts on social/economic benefits are or will be evident at a regional scale, or catastrophic impacts at a local scale on: - the social/economic benefits derived in one or several localities within a region; and/or - across one (or more) defined sectors or user groups
Catastrophic	Significant on-going and/or permanent negative impacts are, or are almost certain to occur at a regional scale that would terminate delivery of the majority of economic and social benefits expected to be derived from the NSW Marine Estate either permanently or irreversibly

Table 2: Risk matrix table used in assessment – consequence and likelihood of threat occurring = risk level (Statewide TARA p8).

LIKELIHOOD	LEVEL OF RISK				
ALMOST CERTAIN	MINIMAL	LOW	MODERATE	HIGH	HIGH
LIKELY	MINIMAL	LOW	MODERATE	HIGH	HIGH
POSSIBLE	MINIMAL	MINIMAL	LOW	MODERATE	HIGH
UNLIKELY	MINIMAL	MINIMAL	MINIMAL	LOW	MODERATE
RARE	MINIMAL	MINIMAL	MINIMAL	MINIMAL	LOW
CONSEQUENCE LEVEL	INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC

Key stressors impacting benefits derived from the marine estate

The risk assessment evidence tables (contained at Appendix B of the overall report) comprise over one hundred and thirty pages of evidence detailing the contribution of recreational fishing on the above stressors and the impact for the social and economic benefits derived from the marine estate. This section summarises the key finding of the assessment with a particular focus on those stressors found to be having an overall risk ranking of moderate or high.

Conflict over access and use

Conflict between the commercial and recreational fishing sectors has been a widely recognised longstanding issue for many years. Conflict over access and resource use occurs as recreational fishers often pursue fish species that are also sought by commercial fishers. Both sectors are limited in the capacity to harvest fish by regulations with temporal and spatial closures in place as well as bag and size limits for the recreational fishery whilst the commercial fishery has limits on fishing effort and catch limits in the form of quota for a number of species. Other conflict examples include direct on-water conflict with fishers arguing over fishing access, through to regular conflict over fishing related issues on social media channels.

This conflict between recreational fishing and commercial fishing sectors was determined to be of a moderate risk for consumptive users, specifically commercial fisheries. The main way in which this impact is being felt is through campaigns by recreational fishers to have areas closed to commercial fishing. This impact is largely concentrated on inshore, estuary general fishers in popular waterways along the NSW coast. These can have significant impacts on the wellbeing and mental health of the commercial fishers affected. This conflict was therefore also considered and found to be a moderate risk to the 'safety, health and wellbeing' and 'socialising and sense of community benefits' for commercial fishers and of moderate risk to the economic benefits – 'employment and value of production' and 'individual enjoyment value (consumer surplus)'.

In addition to conflict with commercial fishers, conflict with other passive recreational users was also determined to be a moderate risk to 'socialising and sense of community', 'enjoying the biodiversity of the marine estate' and 'employment and value of production'. The nature of this conflict largely related to campaigns by recreational fishers lobbying against Marine Protected Areas (MPAs). These campaigns can impact on the values of other users who prioritise no take models of protection, or who benefit from no take zones, such as divers and snorkelers. Finally, conflict exists within recreational fishing itself between different subgroups of fishers. This was considered to be most problematic for the benefits of socialising and sense of community and related largely to tensions around different community perceptions of appropriate fishing practices. In many cases this was linked to ethnicity, with evidence that fishers from particular backgrounds are experiencing often unfair and unwarranted marginalisation and victimisation due to racial profiling and discrimination. This has impacts on broader community cohesion and was hence determined to be of a moderate risk for 'socialising and sense of community'.

Unsafe practices

Unsafe practices are those actions which may cause harm to yourself or other people. Unsafe practices in the context of the activity of recreational fishing will include fishing in unsafe locations (either from land or by boat) and handling or using fishing gear such as spearguns inappropriately. Unsafe practices by recreational fishers can impact other marine users directly, either through the perceived or real risk of harm due to interactions with fishing gear, or indirectly, through diversion of resources and stress to emergency responders as they come to the aid of a fisher in distress.

A number of public safety issues are linked to recreational fishing. Rock fishing from the shore often takes fishers to dangerous rocky areas which have significant safety risks for anglers and also for potential rescuers in exposed and dangerous locations. Unlike high risk boating (such as bar crossings or using small vessels in oceanic waters), life vests have not been made mandatory for rockfishing throughout NSW (only certain council areas). Injuries and deaths when fishing from rocks has high impacts on families and local communities. There have also been instances of unsafe practices by spear fishers entering and exiting the water in crowded areas including Bondi Beach and Little Bay without properly stowing spears first, there have also been reports of spearfishers fishing amongst swimmers in these areas.

These unsafe practices were determined to be high risk for reducing the social benefits of the marine estate for 'safety, health and wellbeing'. This social benefit was impacted by both the immediate physical harm and long lasting mental impacts on those involved in these events, including fishers, their families, first responders and emergency services. The expected impact on the economic benefits from the marine estate were minimal.

Water pollution

Water pollution in the form of marine debris and litter, solid waste and microplastics comes from a variety of sources (including land-based run-off, consumer products) and from both users and non-users of the marine estate. This multi-source nature of water pollution makes identifying the marginal consequences of the recreational fishing contribution to the water pollution problem difficult.

The recreational fishing sector contributes to water pollution through the discarding of fishing based litter and accidental loss of fishing gear – including hooks, line, sinkers and lures. This marine debris poses a threat to aquatic wildlife including turtles, seals and sea birds through ingestion and entanglement. Visible fishing-based debris in recreational fishing hotspots contributes to declines in the health and cleanliness of the marine estate, and soft plastic lures, as well as other forms of plastic, may be ingested by aquatic animals.

This stressor was determined to be of moderate risk to all social and economic benefits with the exception of consumptive use, where it was deemed low risk. Impacts include distress caused by injuries occurring to iconic wildlife species and also direct impacts due to physical interactions with discarded fishing gear, and potential discord within the community as other marine users perceive the recreational fishing sector to be littering and causing harm to the marine estate.

Reduction in abundance of species and trophic levels

A trophic level indicates the position a species occupies in a food web, while abundance of species refers to the number of individuals per species. Excessive extraction of a species contributes to reduction in abundance. If this excessive extraction is particularly severe, there may be a 'trophic cascade' event, where the removal of species at particular positions in the food web causes wider ecosystem impacts. Recreational fishing can contribute to this stressor by contributing to overfishing or taking too many large fish (spawning stock).

Examples of the contribution of recreational fishing to this stressor are primarily related to reductions in abundance. Examples include contributing to overfishing of popular consumption species resulting in less availability of locally caught seafood; this excessive fishing pressure likely includes 'technology creep', where more efficient fishing gear enables a higher catch for the same amount of effort. For some species, the recreational catch is estimated to exceed the commercial catch which, coupled with technology improvements, requires careful monitoring. Other examples include

potential localised depletions due to concentrated fishing activities such as invertebrate harvesting in particularly popular fishing areas and some large-scale 'catch and keep' fishing competitions.

This stressor was determined to be of moderate risk to all the economic benefits from the marine estate, and moderate risk for the social benefits – “enjoying the biodiversity and beauty of the marine estate” and ‘consumptive use (extracting)’. The ‘employment and value of production’ economic benefit was considered particularly vulnerable to this stressor due to the impacts of reductions in abundance on local businesses (i.e. commercial fishers, scuba and snorkelling businesses). The intrinsic and bequest values of the marine estate are also vulnerable to this stressor due to the consequences to the wider ecosystem of reductions in abundance.

Pests and diseases

Recreational fishing is an activity which has the potential to inadvertently introduce pests or infectious diseases into the marine environment through the use of bait and the movement of contaminated fishing gear.

The primary example of recreational fishing contributions to this stressor is the use of imported prawns as bait, which may potentially be carrying “white spot disease” which, if it enters the aquatic environment can have major ecosystem impacts, although has no known impacts on human health. Other examples may include facilitating transfer of aquatic pests and diseases via contaminated fishing gear or vessels.

This stressor was determined to have at least a moderate risk rating for all the economic benefits, with a high risk rating for the ‘employment and value of production’ and a high risk rating for the ‘consumptive use’ social benefit. This was attributed to the potential ecosystem impacts from an infectious disease causing agent (such as white spot disease or another exotic infectious disease) could cause widespread declines in valuable commercial species, with resulting impacts on other marine businesses such as tourism operators, as well as contribute to increases in government ‘clean-up’ costs.

Lack of compliance with regulations (by users)

The governance arrangements in place for recreational fishers require adequate regulation and compliance. Impacts from inadequate regulation of recreational is a moderate risk to ‘safety, health and wellbeing’ and ‘socialising and sense of community’. This largely relates to tensions, stress and anger that often results from real or perceived non-compliance by individuals or groups of fishers. Also lack of compliance was determined to have a moderate risk to ‘consumptive use (extracting)’ whereby the illegal take of fish represents a risk to others that harvest the same resource. Non-compliance is also a moderate economic risk to all benefits as it undermines fishery management and efforts to share the catch fairly and ensure sustainability of stocks.

Other risks

Overcrowding due to recreational fishing in the highly populated central NSW area was determined to have a moderate risk of causing a reduction in the ‘individual enjoyment value (consumer surplus)’ of other marine estate users. Recreational fishing also was determined to have a moderate risk to ‘employment and value of production’ for the stressor ‘loss or decline of marine industries’. Moderate risk ratings were also determined for impacts to ‘enjoying the biodiversity and the beauty of the marine estate’ for the stressors of wildlife disturbance and interactions and inadequate regulation of recreational fishing.

Summary of benefits most impacted

While all the social and economic benefits derived from the marine estate are susceptible to some degree by the impacts of stressors, some benefits are more vulnerable than others. We identified that the social benefit of 'socialising and sense of community' is particularly at risk, as is the economic benefit of 'employment and value of production'. The socialising benefit is impacted predominantly through the disharmony within the community which results from the recreational fishing contribution to stressors, particularly the 'conflict over access and use' and 'water pollution' stressors. The employment benefit is mainly impacted through recreational fishing contributions to the environmental stressors, specifically the water pollution, reductions in abundance of species and pests and diseases stressors. These stressors can have a significant impact on commercial fishers and other commercial operators in the marine estate, which is reflected through reductions in this benefit. There are also a range of minor anti-social behaviour and social media related conflict issues created by a small component of the recreational fishing sector. These may encroach on the perceptions of good management of recreational fishing as part of the broader marine estate use. The assessment exercise indicated the need to keep educating recreational fishers about the benefits of the marine estate to all of the community and the need to have better information on social and economic aspects of all marine estate users.



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