



Isolating social and economic objectives within multiple stakeholder fisheries: a case study of the South Australian Marine Scalefish Fishery (MSF).

2015-220



Melissa Nursey-Bray, Nathan Bicknell, Andrew Sullivan, Anders Magnusson, Julian Morison, Meagan Magnusson

June 2017

FRDC Project No [2015-220]

© 2017 Fisheries Research and Development Corporation.
All rights reserved.

ISBN 978-1-64007-350-0

Isolating social and economic objectives within multiple stakeholder fisheries: a case study of the South Australian Marine Scale fish Fishery (MSF).

[2015-220]

2017

Ownership of Intellectual property rights

Unless otherwise noted, copyright (and any other intellectual property rights, if any) in this publication is owned by the Fisheries Research and Development Corporation and the University of Adelaide

This publication (and any information sourced from it) should be attributed to **[Nursey-Bray, M., Bicknell, N., Sullivan, A., Magnusson, A., Morison, J., and Magnusson, M. 2017 Isolating social and economic objectives within multiple stakeholder fisheries: a case study of the South Australian Marine Scale fish Fishery (MSF), FRDC, Adelaide, South Australia, April CC BY 3.0]**

Creative Commons licence

All material in this publication is licensed under a Creative Commons Attribution 3.0 Australia Licence, save for content supplied by third parties, logos and the Commonwealth Coat of Arms.



Creative Commons Attribution 3.0 Australia Licence is a standard form licence agreement that allows you to copy, distribute, transmit and adapt this publication provided you attribute the work. A summary of the licence terms is available from creativecommons.org/licenses/by/3.0/au/deed.en. The full licence terms are available from creativecommons.org/licenses/by/3.0/au/legalcode.

Inquiries regarding the licence and any use of this document should be sent to: frdc@frdc.com.au

Disclaimer

The authors do not warrant that the information in this document is free from errors or omissions. The authors do not accept any form of liability, be it contractual, tortious, or otherwise, for the contents of this document or for any consequences arising from its use or any reliance placed upon it. The information, opinions and advice contained in this document may not relate, or be relevant, to a readers particular circumstances. Opinions expressed by the authors are the individual opinions expressed by those persons and are not necessarily those of the publisher, research provider or the FRDC.

The Fisheries Research and Development Corporation plans, invests in and manages fisheries research and development throughout Australia. It is a statutory authority within the portfolio of the federal Minister for Agriculture, Fisheries and Forestry, jointly funded by the Australian Government and the fishing industry.

Researcher Contact Details

Name: Melissa Nursey-Bray
Address: GEP, F Arts, University of Adelaide
North Terrace, Adelaide, South Australia, 5005
Phone: +61 88313 3497
Email: Melissa.Nursey-Bray@adelaide.edu.au

FRDC Contact Details

Address: 25 Geils Court
Deakin ACT 2600
Phone: 02 6285 0400
Fax: 02 6285 0499
Email: frdc@frdc.com.au
Web: www.frdc.com.au

In submitting this report, the researcher has agreed to FRDC publishing this material in its edited form.

Contents

Contents	2
Abbreviations and Acronyms.....	5
Acknowledgments.....	6
Executive Summary	7
Identifying Social and Economic Indicators for the Marine Scale Fishery	7
Background.....	7
Aims/Objectives	8
Methodology	8
Key Findings	9
Implications for Relevant Stakeholders.....	10
Recommendations.....	10
Introduction.....	11
Background.....	11
The Project.....	11
The Marine Scalefish Fishery, South Australia	11
Current Management and Project Rationale.....	13
Objectives	15
Method	16
Documents and Previous work.....	16
Analytical Hierarchy Process (AHP).....	16
Establishment Phase.....	16
Data Collection Stage (Survey Implementation).....	17
Analysis Stage	17
Semi-structured Interviews	17
Development of Indicators.....	18
Triangulation	18
Research Constraints	19
Results	21
Introduction	21
The Analytic Hierarchy Process	21
AHP Analysis Results.....	30
Summary of AHP Survey	41
Summary of Interviews	42
Stock Numbers	42
Objective Prioritisation.....	42
Perceptions of Management	42
Constraints to Management	43
Unregulated Recreational Fishing a Significant Road Block to Management.....	43
Leasing issues	43
Options for Management and Reform.....	44
Discussion.....	46

Developing Indicators: A Suggested Future Process to assist meeting prioritised objectives	47
Results against the Research Aims	51
Conclusion	53
Implications	53
Recommendations	54
Further Development.....	54
Extension and Adoption.....	54
Project Materials Developed	56
Appendices	57
Appendix 1: List of Researchers and Project Staff	57
Appendix 2: Intellectual Property Declaration	58
Appendix 3: References	59
Appendix 4: Hard Copy of AHP Survey	62
Appendix 5: Hard Copy of Extension Flyer	70
.....	71

Tables

Table 1 Regional response rates from EconSearch and AHP surveys	24
Table 2 Target species distribution from AHP survey and 2014 EconSearch survey ...	24
Table 3 Low level priorities (Source AHP Survey).....	34
Table 4 Group coherence of AHP responses at each level	41
Table 5 Marine Scalefish Fishery Indicator Framework	49

Figures

Figure 1 AHP hierarchy of priorities	23
Figure 2 Respondents' years of experience in the MSF Fishery.....	25
Figure 3 Respondents' views on whether the management of fishery needs to change to have a viable future	26
Figure 4 Respondents' key concerns for the fishery's future.....	27
Figure 5 Respondents' indication of whether they would support a co-contribution (Ind/Gov) fund to adjust licence numbers	28
Figure 6 Respondents' views on whether recreational fishing impacts them more than other professional fishers	29
Figure 7 Respondents' indication of whether they would have answered the questions the same ten years ago	30
Figure 8 AHP hierarchy of priorities	32
Figure 9 High level priorities by region.....	35
Figure 10 High level priorities by target species	36
Figure 11 High level priorities by method	37
Figure 12 Middle level priorities by region	38
Figure 13 Middle level priorities by target species	39
Figure 14 Middle level priorities by method.....	40

Abbreviations and Acronyms

AHP	Analytic Hierarchy Process
EO	Executive Officer
FAO	Food and Agriculture Organisation
FRDC	Fisheries Research and Development Corporation
GSVKISE	Gulf St Vincent, Kangaroo Island and the South East
KGW	King George Whiting
MFA	Marine Fishers Association
MPA	Marine Protected Areas
MSF	Marine Scalefish Fishery
PIRSA	Primary Industries and Regions South Australia
SA	South Australia
SARDI	South Australian Research and Development Institute
SGCB	Spencer Gulf and Coffin Bay
TAC	Total Allowable Catch
WC	West Coast

Acknowledgments

We would like to acknowledge the FRDC for funding this project, the Executive Committee of the Marine Fishers Association, members of SARDI and PIRSA who gave their time to give advice and of course the members of the Marine Scalefish Fishery all across South Australia who agreed to do the survey, attend a workshop or be interviewed. The project would not have been possible without your contribution.



(Photo courtesy Nathan Bicknell 2017)

Executive Summary

Identifying Social and Economic Indicators for the Marine Scale Fishery

This report presents the initial summary of results arising from the Fisheries Research and Development Corporation (FRDC) Project aimed at identifying social economic indicators for the Marine Scalefish Fishery (MSF). It was conducted by a team which included researchers from the University of Adelaide, the Marine Fishers Association (MFA), Fish Focus and EconSearch. The project was led by Dr Nursey-Bray from the University of Adelaide. In this project we conducted (i) a survey, (ii) a number of fisher workshops and (iii) a number of interviews between May 2016 – December 2016.

We conducted the work across South Australia (SA) which included participants from the South East, Kangaroo Island, Adelaide, Yorke and Eyre Peninsula. Our rationale in doing this work was to get fisher perspectives on what types of management priorities need to be included in the ongoing reform process of the MSF. We also tried to assess whether there was any possibility of achieving consensus across the fishery on any specific management perspectives and if so, which ones mattered the most.

This report begins with a summary of the need, objectives and background to the project, and then introduces the method we used to collect data. We then present our combined findings. We conclude with some recommendations about indicators and suggestions for future reform.

Background

Like many shared inshore fisheries the MSF has sustained extensive management change over time. This has influenced its demographics, resulted in changes in the spread of fishing concentration and created stakeholder shifts in geographical location. Members within the MSF community are now widely dispersed both physically and in perspective. These factors have made it harder for the MSF to connect with and build relationships with its constituent communities. This project evolved due to an industry identified need to develop an objective method for documenting and then reconciling fisher aspirations to incorporate social and economic objectives into management of the MSF, to build a more harmonious fishery and consolidate its social license to operate with the wider community. As the project evolved it also resulted in the development of a suggested process for facilitating ongoing reform; a framework of indicators that reflect the key prioritised management objectives.

The MSF has 546 statutory stakeholders, and as a result relies heavily on its representative bodies for communication. This project was generated by the MFA Association Executive Committee (key stakeholder) as well as flagged with other related sector bodies. The project was then presented to end users and beneficiaries, and workshopped by the Executive Officer (EO) of the MSF, Nathan Bicknell. Development of the project rationale and extension involved industry engagement and this consultation with the industry resulted in a refinement of the project so that its objectives now meet end user needs as well as fishery manager expectations.

Industry has been widely engaged in all stages of the project and information outputs will be used to inform objective discussions about the strategic direction of the fishery, including into the MFA Strategic Planning Process (2015-2020) and PIRSA's Harvest Strategies (ongoing reform).

This project meets FRDC Strategic Priorities by enabling the industry to participate more 'collaboratively in fisheries and aquaculture management, including co-management', to 'develop fine-scale and spatial approaches to improve local fisheries management' and to '-improve the resilience of the fishing and aquaculture industry and the communities in which the industry operates' by 'understanding fisher perceptions'.

These insights will help improve interactions between the fishery, managers and constituent communities with respect to building community capacity and the social license to operate as well as future co-management arrangements.

Due to the dispersed context described above, this project answers the need to do research that can connect the needs of fishers and the needs of the community and integrate social and economic objectives with biological ones. It also answers identified industry need to build the fishery both internally and externally in relation to its relationships with its constituent communities.

As with many other fisheries, tensions between maintaining sustainable fisheries practice remains while biodiversity and livelihood interests compete. In order to illuminate the more ephemeral but crucial social and economic objectives, they must first be understood and agreed upon, preferably in consultation with all key stakeholders (Sloan *et al.* 2014). However, in multi-stakeholder/species fisheries with hundreds of licence holders the sheer diversity of views can confound organic development. The absence of defined social and economic objectives promotes a piecemeal approach to ongoing management, contributing to uncertainty and angst for all stakeholders (Pitcher & Cochrane 2002). Hence the key objectives of this project were as follows:

Aims/Objectives

1. To identify the common and conflicting social and economic objectives for stakeholders within the MSF
2. To inform debate and achieve agreement about a vision for the future and identity of the MSF
3. To develop the capacity of inshore fishers to participate in effective co-management
4. To provide a process/document for the ongoing monitoring and evaluation of social and economic performance within the fishery

Methodology

This project used a mixed method approach to obtain the information needed. Firstly we conducted a survey based on Analytic Hierarchy Process (AHP) principles. The AHP method is a multicriteria decision making technique developed to establish a ranking of the overall relative importance of competing priorities. The process can be applied to individuals or, through a survey, to groups. AHP was used in this project to establish a ranking, for the MSF, between social and economic objectives, and between the objectives within each defined sub-group. Overall, our aim was to use the AHP framework to explore and identify the objectives (as understood by fishers) for fisheries management performance, in order to inform how what are the priorities for reform

Secondly we conducted a series of semi-structured interviews across the State. These interviews enabled us to obtain rich, deep data that complemented the survey results and enabled us to gauge a wider appreciation of the key issues and challenges facing the fishery. Undertaking a number of interviews also enabled us to encourage further participation from fishers who did not wish to fill in the survey. We also analysed fishery documents, relevant literature and data from EconSearch.

Finally at various stages of the project we held five fisher workshops, where overall 60 surveys were taken across the State to introduce and implement the project and obtain face-to-face feedback as we progressed. We posted surveys to over 500 fishers, all 200 fishers with a listed email address and the Southern (160 members), Northern Zone Rock lobster Associations (60 members) and Lakes and Coorong (36 members) Associations were sent a link to the digital survey.

Key Findings

Our key findings were as follows:

- There is diversity amongst the fishers but overall strong agreement about the perceived state of the fishery
- That fish stocks are perceived to be low and the industry has retracted a lot in the last twenty years
- Governance reform was the highest management objective prioritised for the fishery and urgently needed
- Both economic and environmental objectives were prioritised as of key importance, but seen as equally important on the assumption that you could not have one without the other
- Social objectives were ranked below economic and environmental ones on the basis that the social was dependent on the other two priorities being met - if you had the two former, the social objectives would naturally be met
- There are variations in perspective as to whether or not there should be co-management or co-contributions, and the former was related to decision making and the latter to financial contributions and often conflated
- Almost unanimous agreement that any reform needs to adequately compensate fishers and offer entry incentives to new fishers
- Recreational fishing is unanimously seen as a major threat to current and future commercial marine scale fishers, and widely considered to be unregulated and unfair
- Management agencies are seen as a big part of the problem
- Social license (having it, or not) was not seen as a priority for fishers, and most did not know what it meant
- Management agencies are seen as contributing to management challenges by (i) being captured by their own funding regimes and thus having to cover their own costs, (seen as being offloaded to the fishery) and (ii) by not focussing on (a) environmental stock levels and then (b) governance of the MSF.

- Despite the application of the AHP Framework, we find that it was not possible to achieve consensus per se about all issues, but we argue that this is in fact, not necessary if management is diversified and geographically targeted.

Implications for Relevant Stakeholders

The implications of this project for the MSF are varied. At one level the project yielded key information about fisher perspectives and industry needs. Yet what the project really reveals is that the capacity of the fishers to adapt to current changes is limited and that they need government and other support to implement reform. While the fishing communities are also very diverse, they all agreed that reform is needed in conjunction with a reduction of licenses. For policy makers this highlights that reform is culturally palatable but that it must include forms of incentive and compensation for fishers to leave or stay in the industry. It also reflects an imperative to develop geographically located and species specific management, rather than State based regulations, and in turn this implies a need for further resources, time and money to implement effectively. These changes will also ultimately affect other stakeholders in local fishing communities or regions such as the Yorke, South East or Eyre Peninsula.

Recommendations

In light of the above we make the following recommendations: –

- That reform of the MSF include negotiated arrangements about license reduction, including ideas for compensation
- That reform of the MSF consider species and/or geographically specific options for regulation
- That ongoing reform include management options for regulation and identification of recreational effort
- Ongoing reform needs to take account of existing MSF species shares as allocated within the management plan.
- That the suggested suite of economic and social indicators be used to inform ongoing discussions about and reform of the MSF.

Introduction

Background

Worldwide, marine scalefish fisheries are facing multiple challenges including management and sustainability pressures (Jacquet & Pauly 2008). The role played by formal institutions (Dang *et al.* 2017) and the need to find coordination mechanisms between public and private sectors in fisheries governance is a dominant challenge in many fisheries (Gutiérrez & Morgan 2017) as are issues in achieving effective compliance regimes (Hauck 2008). Finding ways to integrate and understand different stakeholder perceptions about fisheries management can also be problematic as shown in recent work on fisheries in Chile (de Juan *et al.* 2017). Finally, while ecosystem based management of fisheries is still considered an important model, it can suffer from weak spatial measures and integration, and a lack of functional metrics and adaptation capacity (Rodriguez 2017). The emerging impacts of climate change are an added dilemma. In Australia, fisheries decline is occurring and diversification across and within coastal communities creating the need for different kinds of management (van Putten *et al.* 2016). In this context, understanding how fishers and management agencies prioritise social and economic objectives can provide key insights into what is needed in current and future management (Pascoe *et al.* 2014).

These considerations provide an important backdrop to this project, as we sought to understand not just the *objectives* of the fishers in the marine scale sector for management, but how they *prioritised* them. This is easier said than done; like many shared inshore fisheries the Marine Scalefish Fishery (MSF) has sustained extensive management change over time. This has influenced its demographics, resulted in changes in the spread of fishing concentration and created stakeholder shifts in geographical location. Members within the MSF community are now widely dispersed both physically and in perspective. These factors have made it harder for the MSF to connect with and build relationships with its constituent communities. This project evolved due to an industry identified need to develop an objective method for documenting and then reconciling fisher aspirations to incorporate social and-economic objectives into management of the MSF, to build a more harmonious fishery and consolidate its social license to operate with the wider community.

The Project

This section outlines the project, introduces the case study and presents our key aim and objectives.

The Marine Scalefish Fishery, South Australia

The MSF is operational across the State of South Australia (SA), and operates in all coastal waters of SA between the Western Australian and Victorian border. For some species the Offshore Constitutional Settlement extends the fishery area out 200 nautical miles to the Australian Exclusive Economic Zone miles. PIRSA Fisheries and Aquaculture describe it as follows: “There are 309 MSF licences and 6 Restricted MSF licences with State-wide access, and a further 149 Southern Rock Lobster, 61 Northern Rock Lobster and 36 Lakes and Coorong Fishery licences with commercial access to marine scalefish species”

Over 60 species are taken commercially, predominantly King George Whiting (KGW), Southern Garfish, Snapper, and Southern Calamari. Between them these species comprise 60% of the total fishery production weight and 70% of the total fishery value.

Of note is the fact that not all species taken by this fishery are scalefish but also include squid, worms and sharks. The harvest of scalefish is only permitted via license given to licenced commercial fishers in SA. A list of the full range of permitted species is located in Schedule 1 of the *Fisheries Management (Marine Scalefish Fisheries) Regulations 2006*.

There are 21 gear types able to be registered on a marine scalefish license including hook and line, longline, haul nets, mesh nets and jigs. Hand collection, handlines, and rod and lines do not need registration. However, the MSF is a limited entry fishery in that no new licenses are available and those that are current, are only issued for the term of the 10 year management plan. These licenses can be transferred but doing so is subject to the license amalgamation scheme. All licence transfers are governed by the *Fisheries Management (Marine Scalefish Fisheries) Regulations 2006*.

The idea of the amalgamation scheme is to reduce the number of licences, and hence the maximum amount of fishing effort, within the commercial fishery. At the very least, two licences have to be joined together, with one of those licences being removed from the fishery as a consequence to be eligible for the scheme. However, once a licence has amalgamated it can be freely transferred without having to be amalgamated with another licence, subject to all other conditions and regulations.

Licence holders must be registered as the master of the licence. The MSF is an owner-operator fishery. Management of the fishery is via a number of plans and these are listed in Box 1.

Box 1: Policy Framework for MSF

Legislation

The fishery is licenced under the *Fisheries Management Act 2007*.

Fishing activities (including permitted species, size limits, commercial limits, gear rules, closures, licence transfers, demerit points) are regulated under the:

- *Fisheries Management (Marine Scalefish Fisheries) Regulations 2006*
- *Fisheries Management (General) Regulations 2007*

The Commonwealth Department of the Environment requires that all commercial fisheries that export product be assessed under the *Environment Protection and Biodiversity Conservation Act 1999*. Product from the MSF is currently approved for export.

Management Plans

- *Management Plan for the South Australian Commercial Marine Scalefish Fishery (2013)*
- *Ecologically Sustainable Development Risk Assessment Report*

Stock assessment reports:

- *Garfish Fishery Stock Assessment Report 2016*
- *King George Whiting Fishery Assessment Report 2014*
- *Snapper Fishery Assessment Report 2016*

Stock status reports:

- *South Australian Marine Scalefish Fishery stock status report 2014- 15*

Current Management and Project Rationale

Like many shared inshore fisheries the MSF has sustained extensive management change over time. This has influenced its demographics, resulted in changes in the spread of fishing concentration and created stakeholder shifts in geographical location. Members within the MSF community are now widely dispersed both physically and in perspective. These factors have made it harder for the MSF to connect with and build relationships with its constituent communities

The MSF has 546 statutory stakeholders, and as a result relies heavily on its representative bodies for communication. This project was generated by the MFA's Executive Committee (key stakeholder) as well as flagged with other related sector bodies. The project was then presented to end users and beneficiaries, and workshopped by the EO of the MFA Nathan Bicknell. Development of the project rationale and extension involved industry engagement and this consultation with the industry resulted in a refinement of the project so that its objectives now meet end user needs as well as fishery manager expectations.

Industry has been widely engaged in all stages of the project and information outputs will be used to inform objective discussions about the strategic direction of the fishery, including into the MFA Strategic Planning Process (2015-2020) and Primary Industries and Regions SA's (PIRSA) Harvest Strategies (ongoing reform).

The Marine Scalefish Fishery Management Plan 2013 has Objectives linked to the Fisheries Act 2007, yet these are in many ways high level objectives which, from the perspective of the fishery need, refining so they are relevant. As noted in the MFA Strategic Plan, they have a vision to: "*Create a unified industry that is adaptable, profitable and sustainable; an industry regarded by the community as an essential provider of premium quality, sustainable seafood*". The Strategic Objectives of the fishery are summed up below. They provided the backdrop for this project and led the framing of both the questions in the survey and in the semi structured interviews.

Strategic Objectives, MSF South Australia

Access Security: Access security is fundamental to the future of the MSF. Any further loss of access will be detrimental to the livelihoods of our members and the industry as a whole.

- a) The MFA will work to protect access rights and harvest shares currently specified within the management plan.
- b) The MFA will promote the sustainable use of under-utilised species to improve profitability and increase security through diversification.

2. Co-Management: The management approach by which responsibilities are negotiated, shared and delegated between government, industry and relevant stakeholders.

- a) The MFA will actively engage and contribute to management, policy & research of the fishery in order to deliver the best outcomes for licence holders.
- b) Support and lead decision making that takes account of biological, economic and social sustainability imperatives.
- c) Promote transparency and accountability regarding co-management and management decision making.

3. Industry Promotion: Broad community support for the commercial industry is essential for the long term viability of the industry both in terms of achieving a social licence to operate and also to achieving maximum return for its product.

- a) Seek out marketing initiatives and partners at a regional and national scale to promote the fishery, its produce and the seafood sector as a whole.
- b) Support initiatives that increase consumer confidence in seafood and its origin.
- c) Support members to invest in value-adding and other initiatives that increase the value of the MSF resources.

4) Governance & Capacity Building: A strong and effective association with sound governance structures will be best placed to represent its members and deliver outcomes for the industry.

- a) The MFA will invest in its members, supporting and facilitating training to help develop leadership capacity within its membership.
- b) Ensure sound internal governance structures are in place and adhered to.
- c) Promote a culture of transparency and inclusiveness within the MFA.

This project evolved due to an industry identified need to develop an objective method for documenting and then reconciling fisher aspirations to incorporate social and economic objectives into management of the MSF, to build a more harmonious fishery and consolidate its social license to operate with the wider community.

This project meets FRDC Strategic Priorities by enabling the industry to participate more 'collaboratively in fisheries and aquaculture management, including co-management', to 'develop fine-scale and spatial approaches to improve local fisheries

management' and to -'improve the resilience of the fishing and aquaculture industry and the communities in which the industry operates' by 'understanding fisher perceptions'.

These insights will help improve interactions between the fishery, managers and constituent communities with respect to building community capacity and the social license to operate.

Due to the dispersed context described above, this project answers the need to do research that can connect the needs of fishers and the needs of the community so as to integrate social and economic objectives with biological ones and build the fishery both internally and externally in relation to its relationships with its constituent communities. The key objectives of this project are presented below.

Objectives

1. To identify the common and conflicting social and economic objectives for stakeholders within the MSF
2. To inform debate and achieve agreement about a vision for the future and identity of the MSF
3. To develop the capacity of inshore fishers to participate in effective co-management
4. To provide a documented process for the ongoing monitoring and evaluation of social and economic performance within the fishery.

Method

In this project we utilised three sources of information (i) documents including data from the EconSearch 2014 survey of the fishery, (ii) results from the AHP survey and (iii) interview results. The application of three techniques meant that we were able to build strong confidence in the results as there emerged a clear consistency between all data sources. This section outlines the methods we used and how we analysed the information.

Documents and Previous work

The process of gathering data began with the collection and analysis of a wide range of documents pertaining to the fishery. This included policy documents, other research projects and data on the use of social and economic indicators, amongst others (see ref list for documents used). We also obtained permission to access and analyse the MSF EconSearch Survey 2014. This data was used as a starting point to assist in identifying key issues and to confirm the representativeness of the AHP sample in this survey. The actual findings are based on the interviews and current AHP survey. Together these sources provided an opportunity to reflect on and identify the key issues facing the fishery. Use of and then analysis of the Econsearch data was also useful as it revealed strong consistency with our other data sets.

Analytical Hierarchy Process (AHP)

This project used the AHP method as a conceptual framework. The AHP method is a multi-criteria decision making technique developed to establish a ranking of the overall relative importance of competing priorities. The process can be applied to individuals or, through a survey, to groups. AHP was used in this project to establish a ranking, for the Marine Scalefish Fishery, between social and economic objectives, and between the objectives within each defined sub-group. This analytical process has been utilised in a range of fields including fisheries (FRDC; 2009-073, 2010/040, and 2011/039). It has also been used internationally as early as 1998, when Leung *et al.* (1998) used AHP to evaluate fisheries management operations in Hawaii. It has been applied in South Korea (Lee *et al.* 2012) and the Ningaloo Marine Park in Western Australia (Gao & Hailu 2013). Mardle *et al.* (2004) used AHP to look at fisheries in the UK, while Nielsen and Mathiesen (2006) used it to evaluate stakeholder preferences in relation to sand eel and trout fisheries in Norway.

In this project we implemented this survey as follows:

Establishment Phase

- Desk top research on AHP
- Industry workshop to analyse industry needs, key points to be included in final survey
- Draft survey and AHP hierarchy development based on previous work (Pascoe *et al.*, Queensland), led by Andrew Sullivan (Fish Focus) and Nathan Bicknell (MSF).
- Pilot survey workshop (Normanville) to finalise the survey and AHP hierarchy and to address problems in delivery

Data Collection Stage (Survey Implementation)

- Series of five industry workshops (Ceduna, Port Lincoln, Coorong etc.) where overall 60 surveys taken
- Posted surveys to over 500 fishers to complete
- All 200 fishers with a listed email were sent a digital survey
- Emailed link to digital survey the Southern (160 members), Northern Zone Rock lobster Associations (60 members) and Lakes and Coorong (36 members) Associations were sent a link to the digital survey.
- Follow up calls to fishers to ensure sufficient consistency in their completed surveys
- Input of surveys into master spreadsheets
- Follow up phone calls to encourage higher survey return rates

Analysis Stage

- Analysis
- Thematic summary undertaken
- Evaluation of AHP technique
- Draft report written

In summary, we sent the survey not just to the license holders but others such as the Lobster fishers and Lakes and Coorong as they also have access to the MSF. Our analysis did not reveal any differences between responses whether they were undertaken by mail, phone interview, email or workshop.

Semi-structured Interviews

The topic of marine scale fisheries is a dynamic one, yet many fishers did not want to complete the AHP survey. In order to maximise participation and to get further depth and data to complement survey data we decided to conduct a follow up round of interviews. We sent out a follow up email inviting those who wished to nominate for interviews. Follow up phone calls were then made to interested parties. Altogether 23 interviews were conducted with representatives from all parts of the State. The interviews reveal a range of other perceptions and themes surrounding the issue and provide good insights and richer data on the social and economic context of marine scale fisheries in the State.

Thematic analysis was used to code and categorise the key results from these interviews. Thematic analysis permits the identifying patterned meaning across a data set that provides an answer to the question being investigated (Denzin & Lincoln 2005). It is a flexible method that can be used across methodologies and questions as it assists in understanding people's perceptions, feelings, values and experiences. We took an inductive approach to the analysis in that we let the coding and theme development be indicated by the data, rather than assume anything before beginning.

We conducted the analysis in five stages: (i) familiarisation with the data, (ii) searching for themes, (iii) coding, (iv) reviewing and amending themes, and (v) writing up. Although we found that there were additional details gathered via the interviews, it is significant that the final analysis revealed that the dominant themes are consistent with the results of the AHP survey. In our analysis, while there were obviously variations due to data type, we were able to discern clear consistency around core themes.

Development of Indicators

Towards the end of the project we developed an indicators framework. In order to do this, we undertook an international review of all the different types of best practice indicators and frameworks we could find. We reviewed indicators for governance, environmental sustainability, fisheries, social and economic indicator sets. We then mapped the consistencies between them and chose a selection of indicators that within best practice guidelines that were relevant to the strategic objectives identified by the MFA. We then workshopped these indicators and refined them according to peer review, and fisher and MFA Board feedback.

Triangulation

Together, our results from (i) documents, (ii) the survey and (iii) interviews presented similar patterns and consistent findings. In this case, triangulation ensured validity of the data collected. Triangulation is the technique adopted within the social science domain to ensure validation of data via cross verification from two or more sources (Webb *et al.* 1966). It allows for the employment and combination of a number of research methods to investigate the same phenomenon. This creates added confidence in the results (Denzin 1970). We utilised three different forms of triangulation:

- (i) *Method triangulation* as we collected data from interviews, literature, policy documents, and the survey.
- (ii) *Investigator triangulation*, where more than one investigator collected the results. In this case, our team consisted of five people from three different institutions who collected the data and then reviewed the results and agreed on final findings as presented in this report.
- (iii) *Data triangulation* where similar messages and patterns are recorded across different data sources.

The use of multiple means of collecting information also helped offset the difficulties of trying to get people to take the survey, especially when they were busy with fishing and actually going out to work.

We continued with data collection until we achieved ‘information saturation’. This is the point at which it becomes clear that no new information will be found and the researcher can conclude with confidence that the research has achieved its goals. It is at this point that information collection can cease (Denzin & Lincoln 2005).

In our analysis we additionally ensured that our work was consistent with Lincoln and Guba (1985) evaluative criteria for establishing trustworthiness in qualitative research. These criteria are as follows:

- (i) *Credibility* - confidence in the 'truth' of the findings
- (ii) *Transferability* - showing that the findings have applicability in other contexts

- (iii) *Dependability* - showing that the findings are consistent and could be repeated
- (iv) *Confirmability* - a degree of neutrality or the extent to which the findings of a study are shaped by the respondents and not researcher bias, motivation, or interest.

Overall, the advantage of using multiple techniques meant that we could ensure we documented all the different perspectives around the development of social and economic indicators for the MSF in SA.

Research Constraints

While participation was low overall, given the range of approaches undertaken, responses were above average for the MSF. Nonetheless, some fishers were very resistant to the AHP methodology. Others expressed concern that they were not being listened to and that the issues they have raised are not being incorporated into the survey. Given the financial stress of many participants and the chequered management history of the fishery, it is not surprising that the researchers conducting the survey encountered degrees of upset, confusion and often suspicion. Some fishers felt that the opacity of the survey was a potential 'trick' leading them to say things they didn't mean. These concerns were likely due to the survey imposing a 'closed' hierarchy (as is required for the AHP method) on the concerns of a varied fishery. That is, fishers were asked to voice their concerns but became frustrated when the pre-defined hierarchy either didn't capture their concerns or forced them to change their language, sacrificing the subtlety in their views. This source of failure is an indication that a consensus approach to prioritising issues may be inappropriate for the MSF. Conducting the survey via telephone also proved very difficult as the survey mechanisms are difficult to explain verbally and without any visual aids. Fishers struggled to understand much of the terminology used in the survey.

We addressed this constraint by conducting a number of semi-structured interviews. This enabled fishers who wished to participate, and had something to say, the opportunity to make a contribution and it enabled us to build a richer and deeper data base overall.



(Beach Seine Fishing Kangaroo Island: Photo courtesy of Nathan Bicknell, 2017)

Results

Introduction

We will present the results in two sections: (i) the survey results and then the (ii) interview results. We will then collectively discuss the implications of the overall results in the discussion.

The Analytic Hierarchy Process

This section summarises the results of the AHP¹ survey conducted as part of the FRDC funded project *Isolating social and economic objectives within multiple stakeholder fisheries: a case study of the South Australian Marine Scalefish Fishery (MSF)*. The survey was designed to capture the priorities of MSF fishers in terms of fisheries management and estimate the relative importance of those priorities. The AHP method has been used for this purpose in multiple other fisheries (Himes 2007; Mardle *et al.* 2004; Pascoe *et al.* 2013; Pascoe *et al.* 2009).

Description of Survey Sample

This section describes the sample of fishers before presenting the AHP survey results on aggregate and disaggregated by primary fishing region, method and target species.

The survey collected demographic and business activity data as well as data for the AHP analysis. The AHP hierarchy used for the survey is shown in the Appendix. Data for the AHP analysis were collected by asking the respondents to make a series of pairwise comparisons between priorities by setting a ‘slider’ somewhere between the two on a paper questionnaire to indicate their relative importance. By the end of the survey, the respondents had compared every possible pair of priorities on the same branch and level of the hierarchy. The AHP analysis then incorporates all of these comparisons into a single set of weights for the entire hierarchy. This set of weights describes the relative importance of each priority in the hierarchy for each individual respondent. The average weighting for each priority across the group of respondents is reported in this section.

There were 309 licences in the MSF fishery in 2015/16². All licence holders were invited to respond to the survey. Out of a total of 78 responses, 40 responses (51 per cent) were usable. The rate of acceptable responses was low but within the range of those from similar studies³. The low rate of usable responses was due to the constraints of AHP. Specifically, each survey response must be sufficiently internally consistent⁴ in order to be allowed into the final analysis. Due to the complex structure

¹ As described in Saaty (1990) and Saaty (2003).

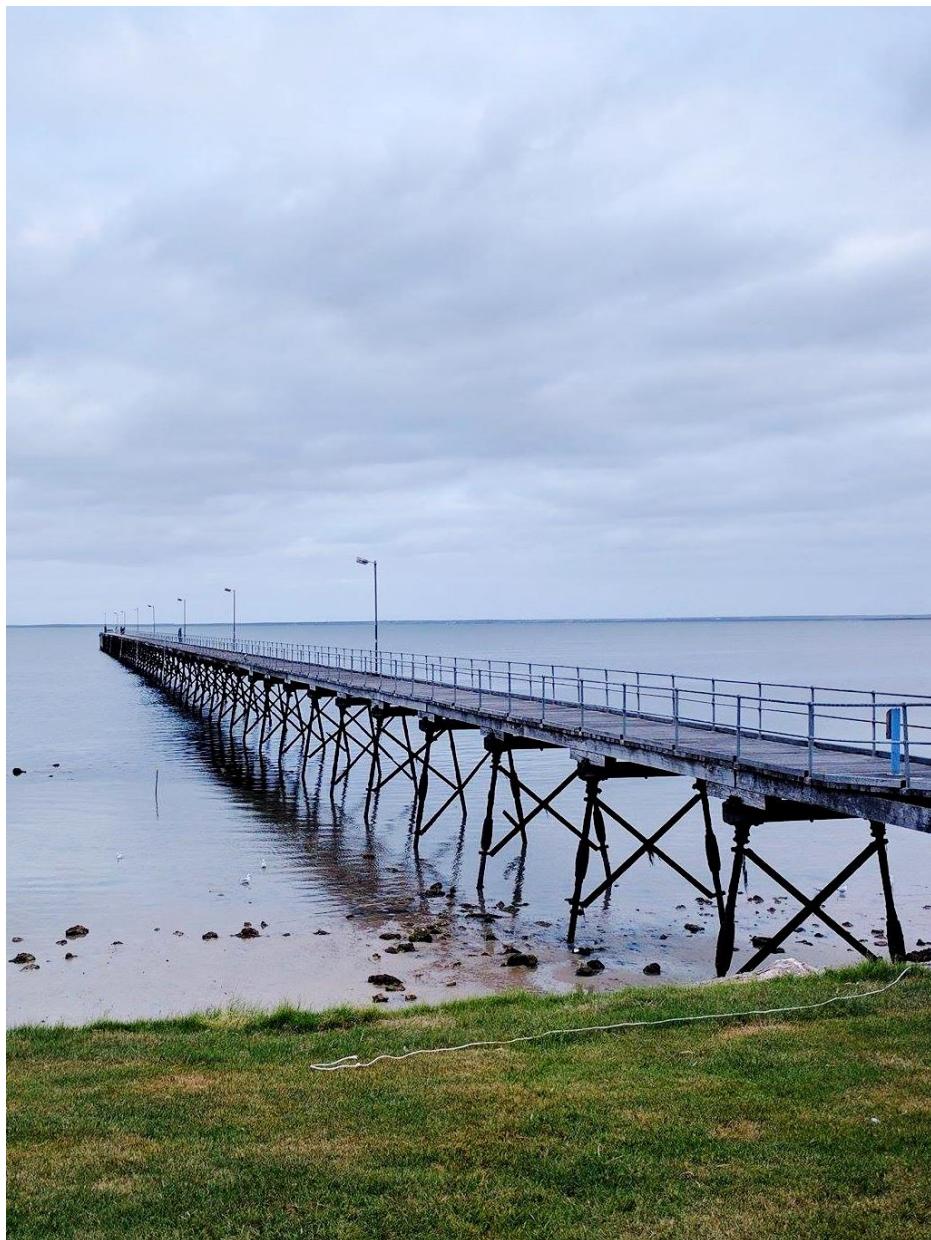
² Data used in the compilation of EconSearch (2016a).

³ 87 per cent in Pascoe *et al.* (2013), 100 per cent in Pascoe *et al.* (2009), 35 per cent in Mardle *et al.* (2004) but more were allowed through under an additional consistency rule, and 74 per cent with an inconsistency threshold of 0.2 in Himes (2007).

⁴ An inconsistency ratio of less than 0.1 for any level and branch was selected to indicate sufficient internal consistency. This is the suggested threshold from the author of the method (Saaty 1990) and has been used in multiple fisheries studies (Mardle *et al.* 2004; Pascoe *et al.* 2013; Pascoe *et al.* 2009). One study of fisheries used a threshold of 0.2 (Himes 2007) and Pascoe *et al.* (2013) allowed responses with an inconsistency between 0.1 and 0.15 through under certain circumstances. In this study however, a conservative threshold of 0.1 was chosen in favour of allowing more responses through to preserve robustness and group coherence.

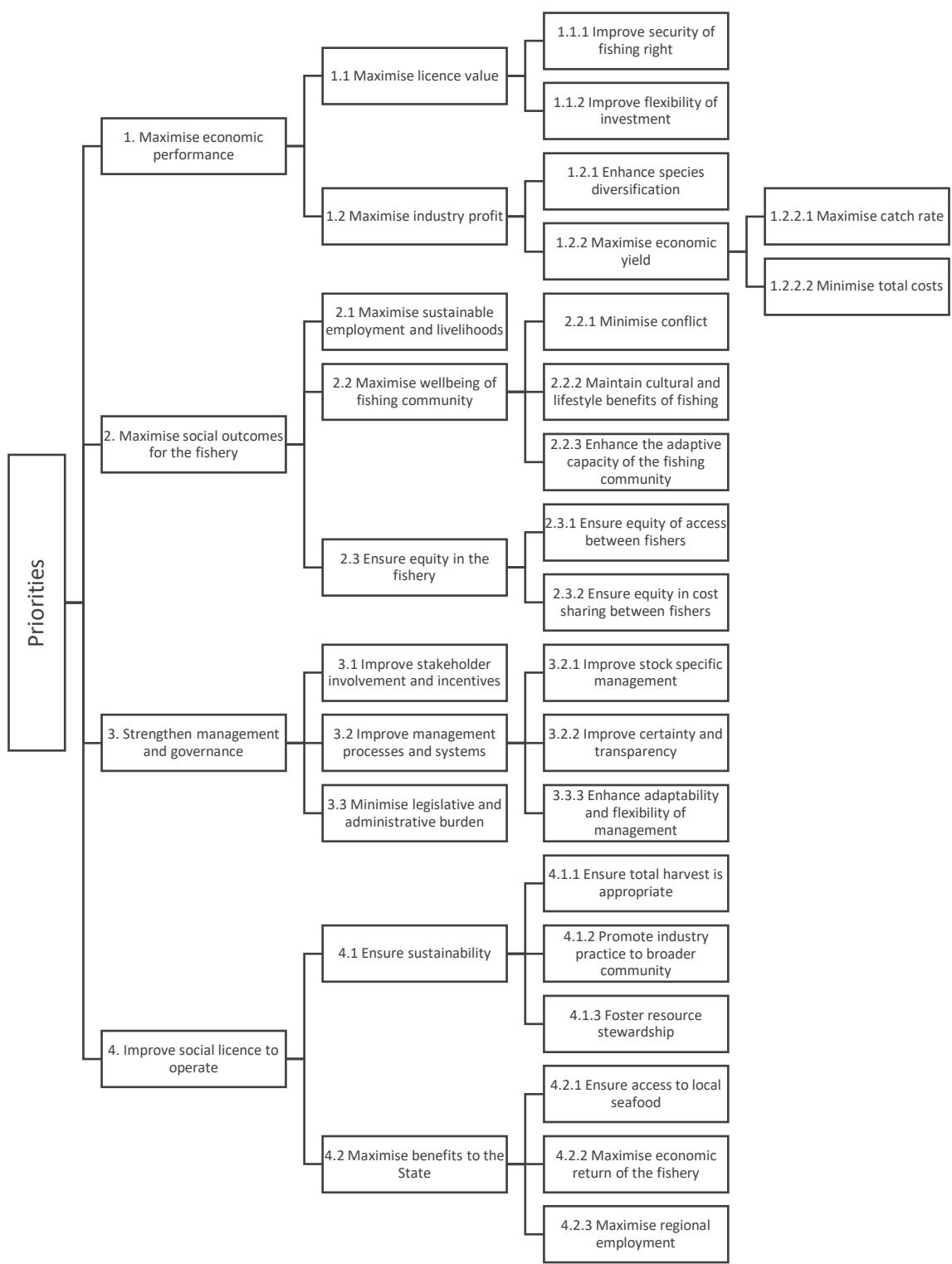
of priorities being studied and the constraints on conducting the survey face-to-face, 38 of the responses did not meet this constraint. An inconsistent response could be caused, for example, by intransitive preferences. That is, a response which suggests that the respondent prioritises **A** over **B**, **B** over **C**, and **C** over **A**.

While people may hold such preferences under rare conditions, they are not logically consistent and cannot be analysed using a logical technique such as AHP. It is more likely however, that the high rate of inconsistent responses was due to a lack of understanding by respondents of the hierarchy and the AHP method. Including the inconsistent responses would, therefore, introduce arbitrary variance to the results.



(Ceduna Jetty: Photo courtesy Meagan Magnusson 2017)

Figure 1 AHP hierarchy of priorities



Representativeness of the Survey Sample

The 40 responses were disaggregated by the primary fishing region indicated by the respondents. There were 13 responses (33 per cent) for the combined Spencer Gulf and Coffin Bay (SGCB) region, 18 (45 per cent) for the West Coast (WC) region, and 9 (22 per cent) from the rest of the state which included the Gulf St Vincent, Kangaroo Island and the South East (GSVKISE). Table 1 presents the regional distribution of responses alongside that of the 2014 MSF survey conducted by EconSearch (2016b). The EconSearch survey included 120 responses so can be assumed to better represent the fishery. Assuming that this is the case, the table shows that SGCB fishers may be overrepresented in the AHP survey and GSVKISE fishers underrepresented.

Table 1 Regional response rates from EconSearch and AHP surveys

Region	AHP	EconSearch
SGCB	33%	26%
WC	45%	42%
GSVKISE	22%	31%

Source: EconSearch (2016b)

Fishers were asked to identify which species they target. The four most commonly identified were King George Whiting (KGW), Snapper, Southern Calamari (Squid) and Garfish. Four overlapping sub-sets were formed from the whole sample based on which fishers identified each of these species. While these sub-sets are not mutually exclusive, they do give an indication of the views of fishers who target each species. Table 2 compares the distribution of responses by target species with that of the 2014 EconSearch survey. The table shows that the AHP survey captured the same ranking by group size as did the EconSearch survey and that fishers who target KGW and Garfish may be a little underrepresented in the sample.

Table 2 Target species distribution from AHP survey and 2014 EconSearch survey

Species	AHP	EconSearch
KGW	30%	38%
Snapper	16%	17%
Squid	21%	23%
Garfish	8%	17%

Source: EconSearch (2016c)

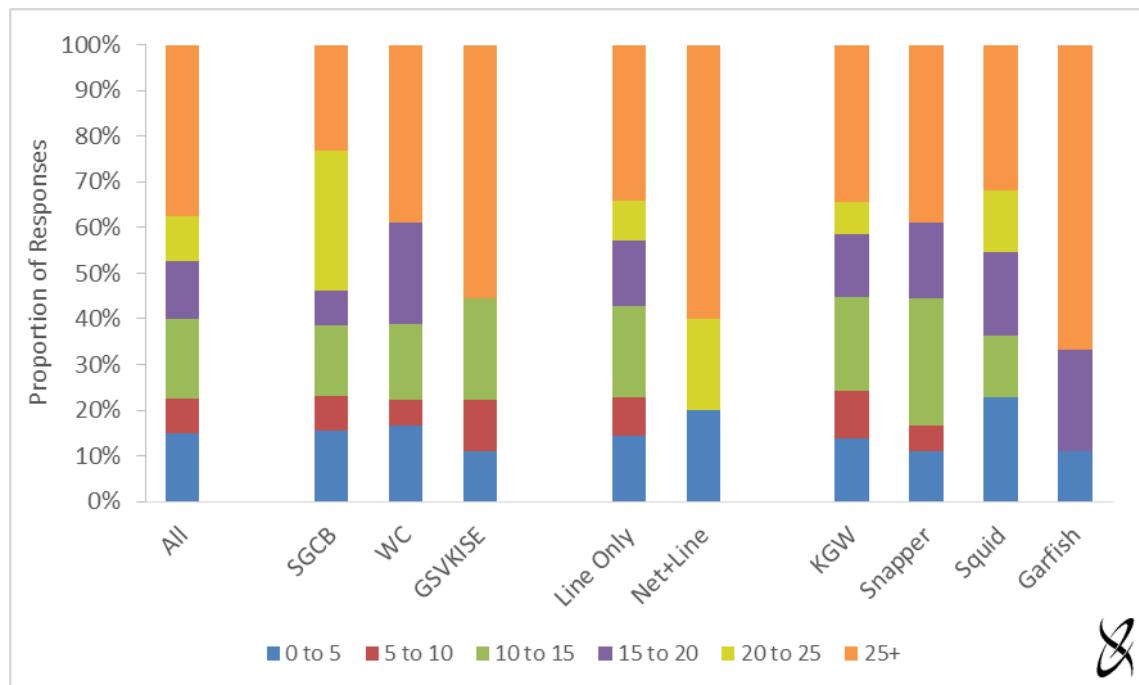
Regarding method, 5 respondents (13 per cent) to the AHP survey indicated that they owned and used a net endorsement, the remaining 35 use lines only. In 2015/16, 18 per cent of MSF Fishery licence holders owned a net endorsement. This shows that the 'net and line' fishers may be underrepresented in the AHP survey sample.

The preceding discussion shows that the AHP survey sample, while small, aligns with the 2014 EconSearch survey of the fishery. This means that the sample can be considered representative of the population, but with the caveats mentioned above.

Descriptive Results

Figure 2 shows the distribution of years of experience in the MSF Fishery for licence holders in the whole sample, by region, by method and by target species. Net and line fishers and those who target Garfish had the most experience in the fishery, WC fishers and those who target Snapper had the least.

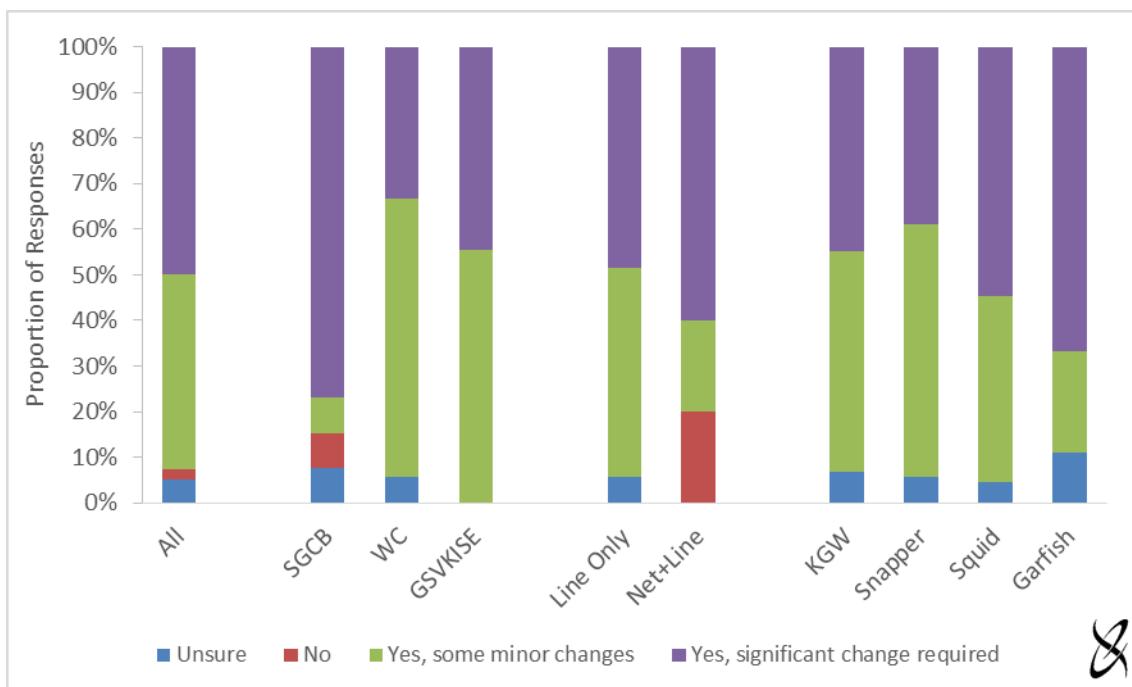
Figure 2 Respondents' years of experience in the MSF Fishery



Source: AHP survey

Figure 3 shows respondents' responses to the question '*Does the management of fishery need to change to have a viable future?*' Most fishers (93 per cent) answered 'yes'. SGCB fishers and those who target Garfish answered most strongly and WC and Snapper fishers least strongly.

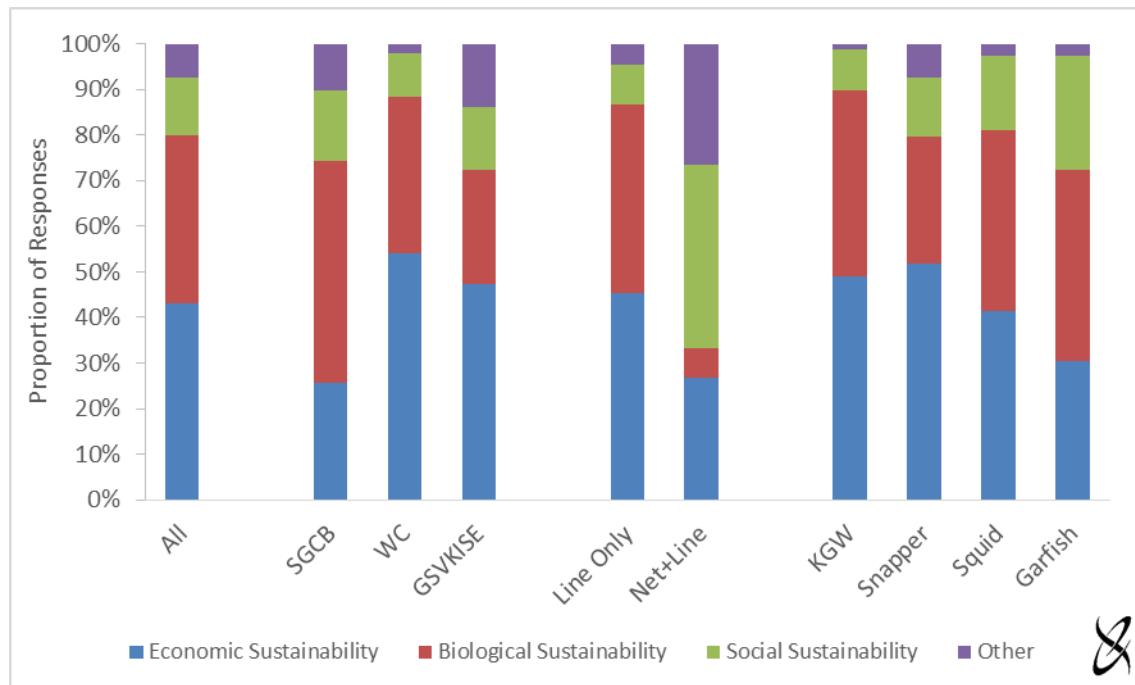
Figure 3 Respondents' views on whether the management of fishery needs to change to have a viable future



Source: AHP survey

Figure 4 presents fishers' responses to the question '*What is your key concern for the fishery's future?*' Fishers were asked to choose from the four options shown in the figure. The most commonly identified issue was *economic sustainability* (43 per cent) followed by *biological sustainability* (37 per cent), *social sustainability* (13 per cent) and *other* (7 per cent). WC fishers placed the most importance on *economic sustainability*, while SGCB fishers, net and line fishers and those who target Garfish placed the least. Net and line fishers placed the least importance on *biological sustainability* and most importance on *social sustainability* compared to the other groups.

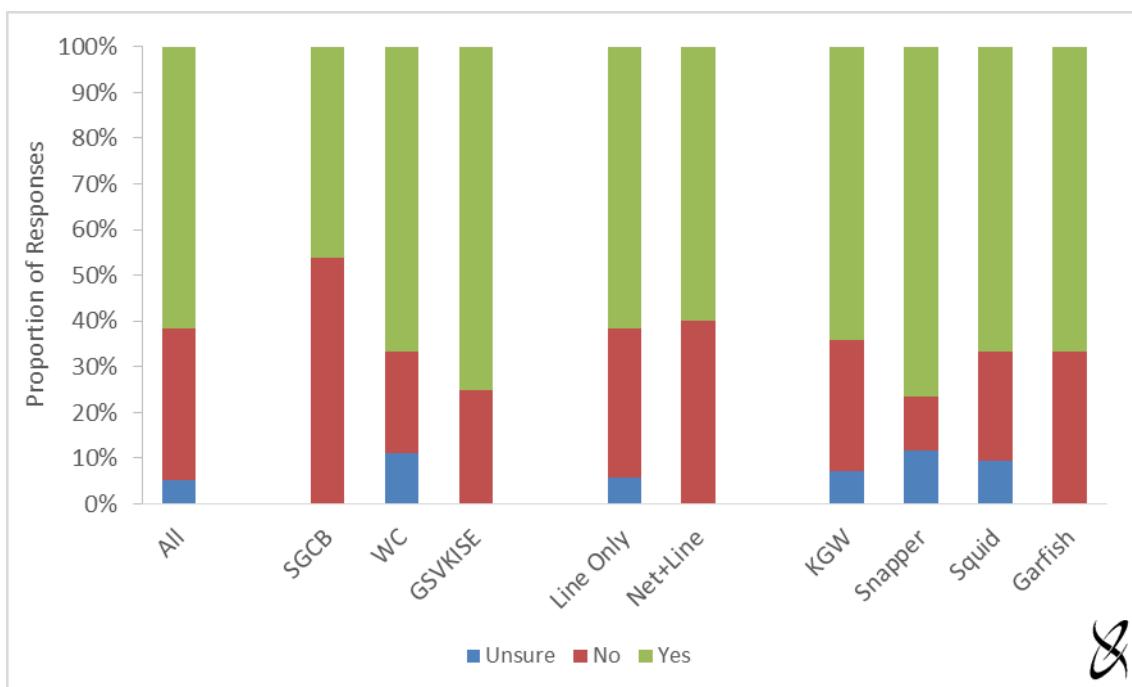
Figure 4 Respondents' key concerns for the fishery's future



Source: AHP survey

Figure 5 presents respondents' answers to the question '*Would you support a co-contribution (Ind/Gov) fund to adjust licence numbers?*' Most fishers (62 per cent) were in favour of the idea, while 33 per cent answered 'no'. Of the groups, GSVKISE fishers and those who target Snapper were the most in favour, while SGCB fishers were least in favour (54 per cent disagreed).

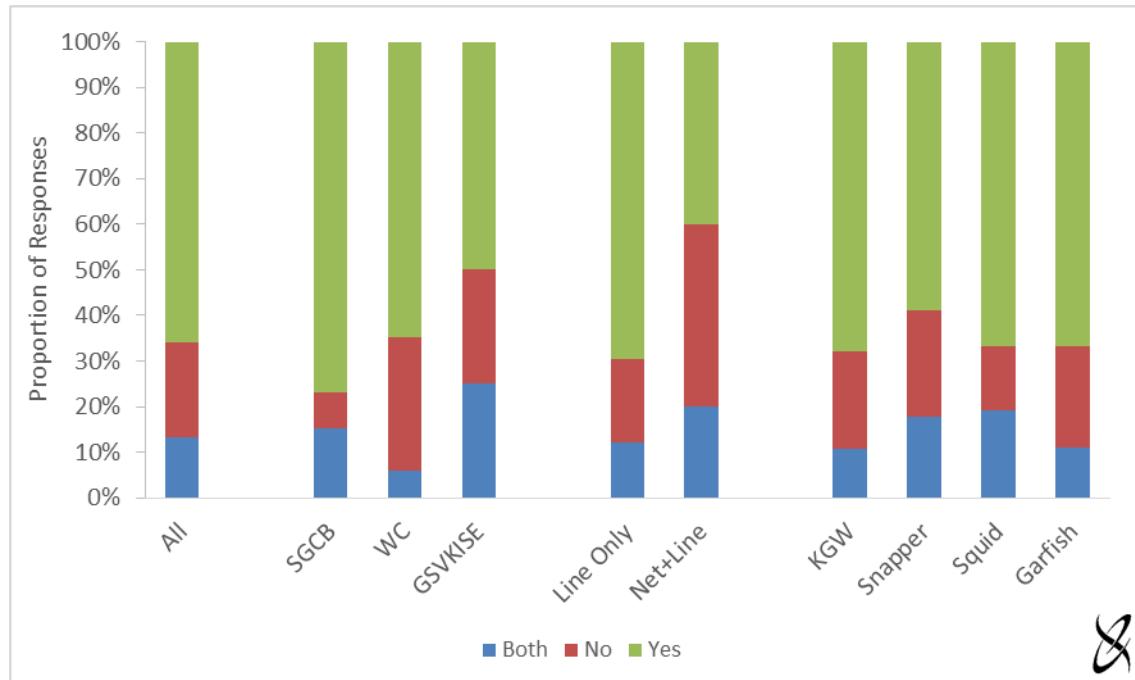
Figure 5 Respondents' indication of whether they would support a co-contribution (Ind/Gov) fund to adjust licence numbers



Source: AHP survey

Figure 6 presents respondents answers to the question '*Does recreational fishing impact you more than other professional fishers?*' Most (66 per cent) answered 'yes', 21 per cent answered 'no' and 13 per cent indicated that the impact was the same from each. SGCB fishers and line only fishers answered 'yes' more frequently, while GSVKISE and net and line fishers answered 'yes' least frequently.

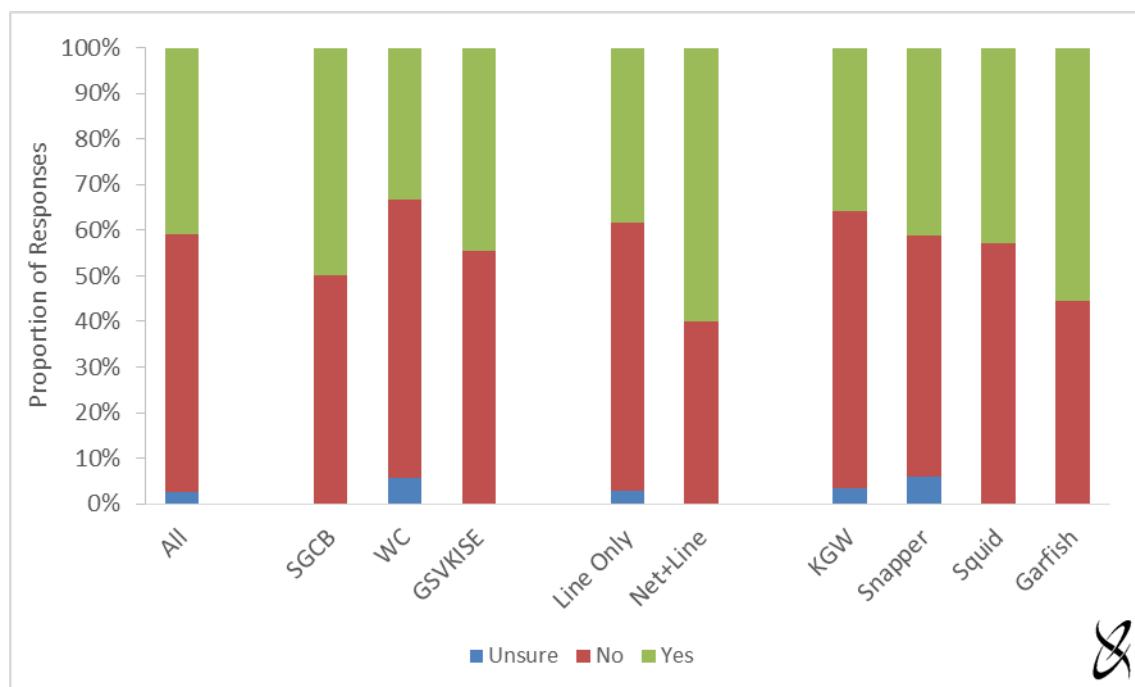
Figure 6 Respondents' views on whether recreational fishing impacts them more than other professional fishers



Source: AHP survey

Figure 7 presents respondents' answers to the question '*Would you have answered these question the same 10 years ago?*' Most (55 per cent) answered 'no' and 40 per cent answered 'yes'. SGCB fishers, net and line fishers and those who target Garfish answered 'yes' more frequently, while WC fishers, line only fishers and those who target KGW answered 'no' more frequently.

Figure 7 Respondents' indication of whether they would have answered the questions the same ten years ago



Source: AHP survey

AHP Analysis Results

This section presents the results of the AHP analysis. The results are presented for the entire hierarchy for the whole sample then for the disaggregation. The high and middle levels of the hierarchy are then compared across groups in the disaggregation to further describe the differences between the groups.

Weighted Hierarchy – Whole Sample

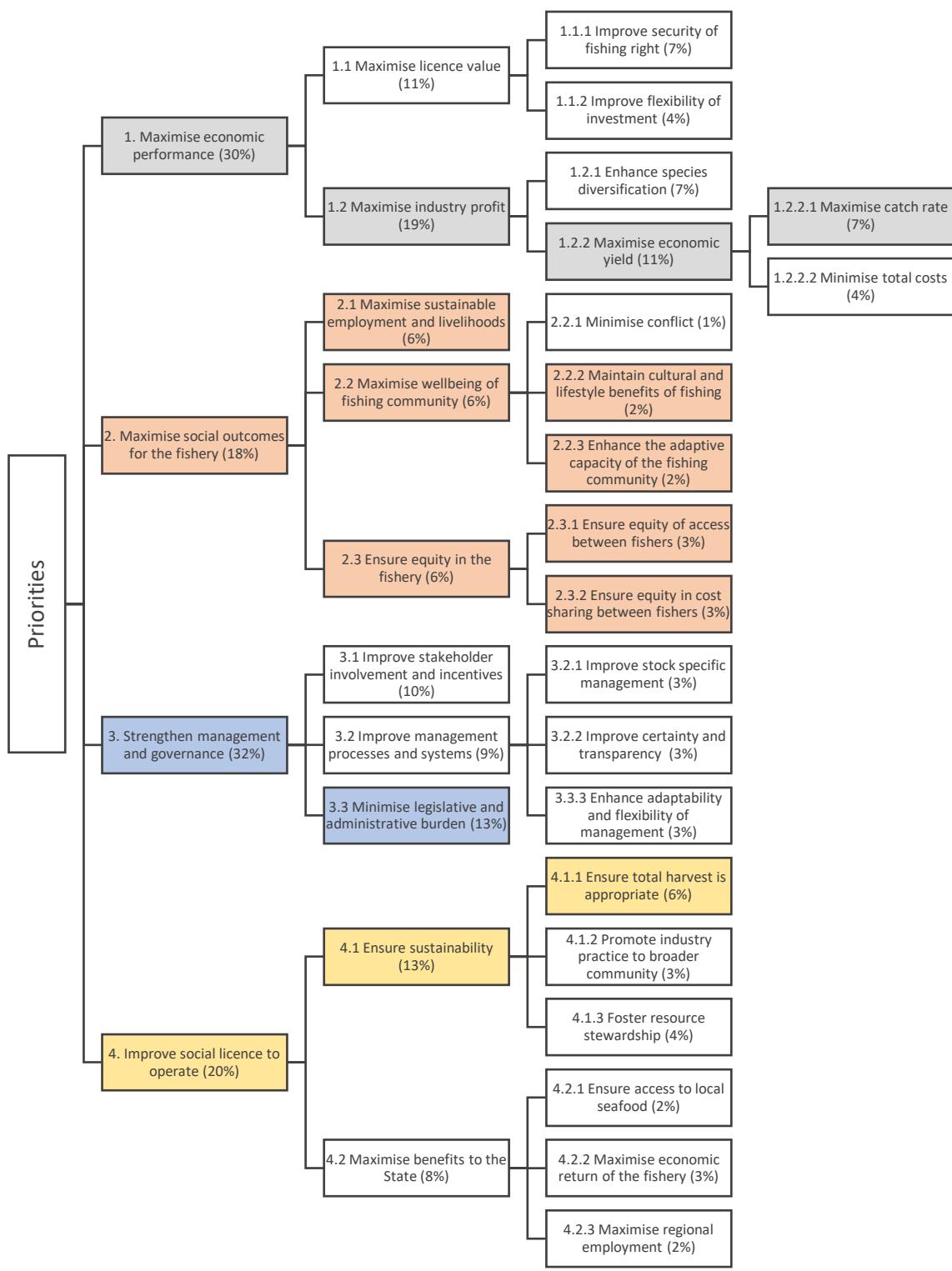
The weighted hierarchy for the whole sample is presented in Figure 8. The percentage in brackets for each priority is the average importance placed on that priority relative to the others at the same level of the hierarchy by the respondents. The weights for each level sum to 100 per cent. Comparing the weights of the group of four priorities on the left-hand side of the figure (priorities 1, 2, 3 and 4) shows that the most important high-level priority for the whole sample, on average, is '*Strengthen management and governance*' (32 per cent), followed closely by '*Maximise economic performance*' (30 per cent). The third and fourth most important priorities, '*Improve social licence to*

'operate' and *'Maximise social outcomes for the fishery'*, are close to each other in terms of relative importance (20 and 18 per cent respectively). The weights for the next level of the hierarchy show the average relative importance placed on each priority by the respondents. These can be interpreted in the same way as the high-level priorities. Interpretation on the middle-level of the hierarchy is provided in the disaggregation to come.

To tease out the issues underlying each of the high-level priorities, a series of priorities have been shaded on each branch in Figure 8 by moving from left to right and selecting the priority with the greatest weighting on each level of each branch. Different colours are used for clarity only. The issues underlying the high-level priorities can be interpreted through this lens as follows:

1. Strengthen management and governance – by minimising legislative and administrative burden
2. Maximise economic performance – by maximising catch rate and subsequently, economic yield and industry profit
3. Improve social licence to operate – by ensuring total harvest is appropriate and therefore ensuring the industry is sustainable
4. Maximise social outcomes for the fishery – through a range of priorities including sustainable employment and livelihood, community wellbeing and equity in the fishery.

Figure 8 AHP hierarchy of priorities



Weighted Hierarchy – Disaggregation

Weightings for the entire hierarchy are presented in Table 3 for each group. Each column in the table is equivalent to the weightings presented on the hierarchy in Figure 8. The left-hand column in the table (Whole Sample) shows identical weights to those in Figure 8. The columns to the right are the equivalent ratings for each group. The cells of the table have been shaded for each group using the same method as was used in Figure 8. The different colours are for clarity only. This illustrates the different issues underlying each group's weightings of high level priorities. Key observations follow.

The same issues underlie the '*Maximise economic performance*' priority for all groups other than net and line fishers and those who target Snapper. Under this priority, net and line fishers place more importance on '*maximising licence value*' through '*improving security of fishing right*' rather than '*maximising industry profit*' through the catch rate. Those who target Snapper are similar to other fishers except they also place importance on '*enhancing species diversification*' as a means to '*maximising industry profit*'.

A wide range of issues underlie the '*Maximising social outcomes for the fishery*' priority for the whole sample but the disaggregation shows that different issues underlie this priority for different groups. WC fishers place more importance on '*sustainable employment and livelihoods*', while GSVKISE fishers and those who target Snapper or Squid place more importance on '*ensuring equity in the fishery*'. Net and line fishers place more importance on the '*wellbeing of the fishing community*'.

The issues underlying the '*Strengthen management and governance*' and '*Improve social licence to operate*' priorities are consistent across the groups. The only exception is that, for GSVKISE fishers, '*strengthening management and governance*' means '*improving stakeholder involvement and incentives*' rather than '*minimising legislative and administrative burden*', as it does for other fishers.

Table 3 Low level priorities (Source AHP Survey)

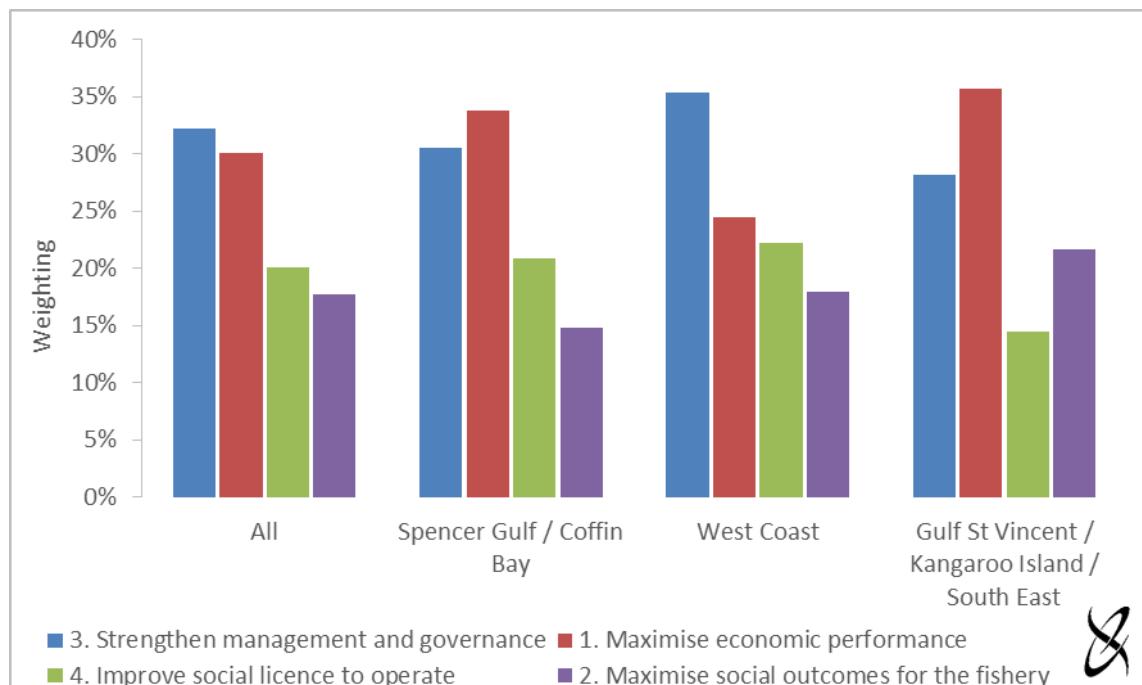
	Whole Sample	Region			Method		Target Species			
		SGCB	WC	GSKVISE	Line Only	Net+Line	KGW	Snapper	Squid	Garfish
1. Maximise economic performance	30%	34%	24%	36%	29%	38%	28%	27%	28%	33%
1.1 Maximise licence value	11%	14%	7%	17%	10%	22%	10%	11%	9%	11%
1.1.1 Improve security of fishing right	7%	9%	4%	12%	6%	19%	5%	6%	5%	8%
1.1.2 Improve flexibility of investment	4%	5%	3%	5%	4%	2%	5%	5%	4%	4%
1.2 Maximise industry profit	19%	20%	17%	19%	19%	17%	19%	16%	19%	22%
1.2.1 Enhance species diversification	7%	7%	8%	7%	7%	7%	8%	8%	8%	10%
1.2.2 Maximise economic yield	11%	13%	10%	12%	11%	10%	11%	8%	11%	12%
1.2.2.1 Maximise catch rate	7%	7%	6%	9%	7%	7%	6%	4%	6%	8%
1.2.2.2 Minimise total costs	4%	7%	4%	3%	4%	3%	5%	4%	5%	4%
2. Maximise social outcomes for the fishery	18%	15%	18%	22%	18%	17%	18%	17%	16%	15%
2.1 Maximise sustainable employment and livelihoods	6%	4%	7%	7%	6%	5%	6%	6%	4%	5%
2.2 Maximise well-being of fishing community	6%	5%	6%	7%	6%	8%	6%	4%	5%	5%
2.2.1 Minimise conflict	1%	1%	1%	2%	1%	3%	1%	1%	1%	1%
2.2.2 Maintain cultural and lifestyle benefits of fishing	2%	3%	2%	2%	2%	2%	2%	1%	2%	1%
2.2.3 Enhance the adaptive capacity of the fishing community	2%	2%	3%	3%	2%	3%	2%	2%	2%	3%
2.3 Ensure equity in the fishery	6%	5%	5%	8%	6%	4%	6%	7%	6%	4%
2.3.1 Ensure equity of access between fishers	3%	3%	3%	4%	3%	2%	3%	3%	3%	2%
2.3.2 Ensure equity in cost sharing between fishers	3%	2%	2%	4%	3%	2%	3%	3%	3%	2%
3. Strengthen management and governance	32%	31%	35%	28%	34%	23%	34%	35%	32%	32%
3.1 Improve stakeholder involvement and incentives	10%	9%	11%	11%	11%	7%	10%	9%	10%	11%
3.2 Improve management processes and systems	9%	8%	9%	10%	9%	7%	9%	9%	11%	10%
3.2.1 Improve stock specific management	3%	3%	3%	3%	3%	2%	3%	3%	3%	3%
3.2.2 Improve certainty and transparency	3%	3%	3%	4%	3%	2%	3%	3%	4%	4%
3.3.3 Enhance adaptability and flexibility of management	3%	2%	3%	3%	3%	3%	3%	3%	3%	3%
3.3 Minimise legislative and administrative burden	13%	14%	15%	7%	14%	9%	14%	17%	12%	12%
4. Improve social licence to operate	20%	21%	22%	14%	20%	22%	20%	20%	24%	20%
4.1 Ensure sustainability	13%	15%	13%	9%	12%	13%	12%	12%	14%	13%
4.1.1 Ensure total harvest is appropriate	6%	8%	6%	5%	6%	7%	7%	6%	7%	7%
4.1.2 Promote industry practice to broader community	3%	4%	2%	2%	3%	3%	2%	2%	3%	2%
4.1.3 Foster resource stewardship	4%	3%	5%	2%	4%	3%	4%	3%	4%	3%
4.2 Maximise benefits to the State	8%	6%	10%	5%	7%	9%	8%	8%	9%	7%
4.2.1 Ensure access to local seafood	2%	2%	2%	2%	2%	3%	2%	2%	3%	2%
4.2.2 Maximise economic return of the fishery	3%	2%	4%	2%	3%	3%	3%	3%	4%	3%
4.2.3 Maximise regional employment	2%	2%	3%	2%	2%	3%	2%	3%	3%	2%

High Level Priorities

The ranking of high level priorities for the whole sample are presented in the left-hand cluster (labelled 'All') of Figure 9. The column heights of the 'All' cluster show the average weighting placed on each priority by the AHP analysis of the whole sample of fishers, they show the same data as the high-level priority weightings in Figure 8. The heights therefore represent the relative importance of each priority. The three right-hand clusters in Figure 9 show the relative importance placed on each of the high level priorities, on average, by fishers in each region. Comparing these clusters to the 'All' cluster shows three key differences:

1. Fishers in the SGCB and GSVKISE regions prioritise '*maximising economic performance*' more highly than '*strengthening management and governance*'.
2. In the WC region, fishers ranked the priorities in the same order as the state but put relatively less importance on '*maximising economic performance*'.
3. '*Maximising social outcomes*' was given a higher priority by fishers in the GSVKISE region.

Figure 9 High level priorities by region



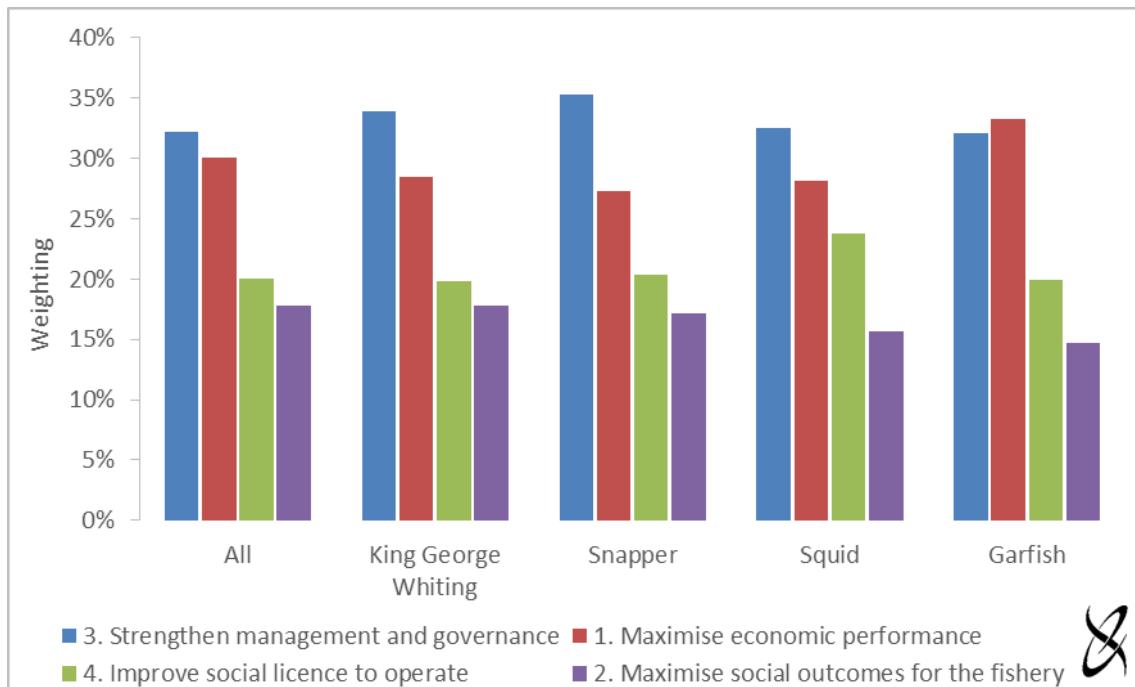
Source: AHP survey

The four right-hand clusters in Figure 10 show the relative importance placed on each of the high level priorities, on average, by fishers who target each of the four species: KGW, Snapper, Squid and Garfish. Comparing these clusters to the 'All' cluster shows three key differences:

1. Fishers who target KGW or Snapper ranked the priorities in the same order as the whole sample but placed relatively more importance on '*strengthening management and governance*' and relatively less on '*maximising economic priorities*'.
2. Fishers who target Squid also ranked the priorities in the same order as the whole sample but placed more importance on '*improving social licence to operate*' and less on '*maximising social outcomes*' for the fishery.

3. Fishers who target Garfish placed more importance on '*maximising economic performance*' than '*strengthening management and governance*'. They also placed less importance on '*maximising social outcomes*' compared to the whole sample.

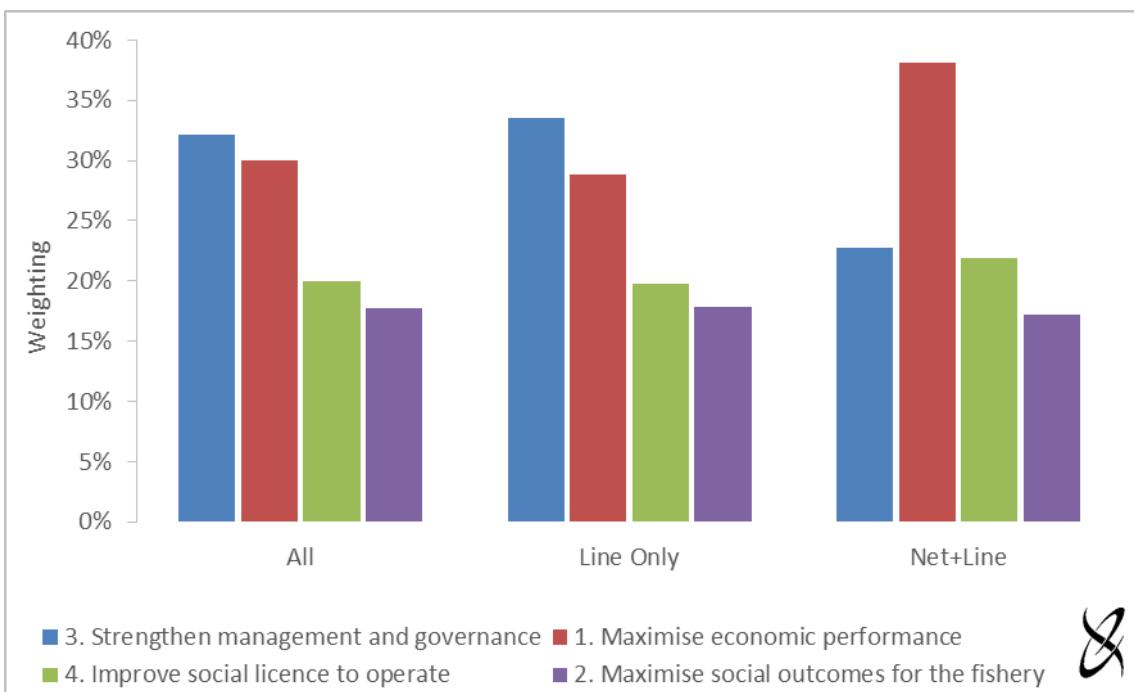
Figure 10 High level priorities by target species



Source: AHP survey

The two right-hand clusters in Figure 11 show the relative importance placed on each of the high level priorities, on average, by fishers who fish by line only and those who fish by net and line. Comparing these columns directly to each other shows that net fishers placed much more importance on '*maximising economic performance*' and much less importance on '*strengthening management and governance*'.

Figure 11 High level priorities by method

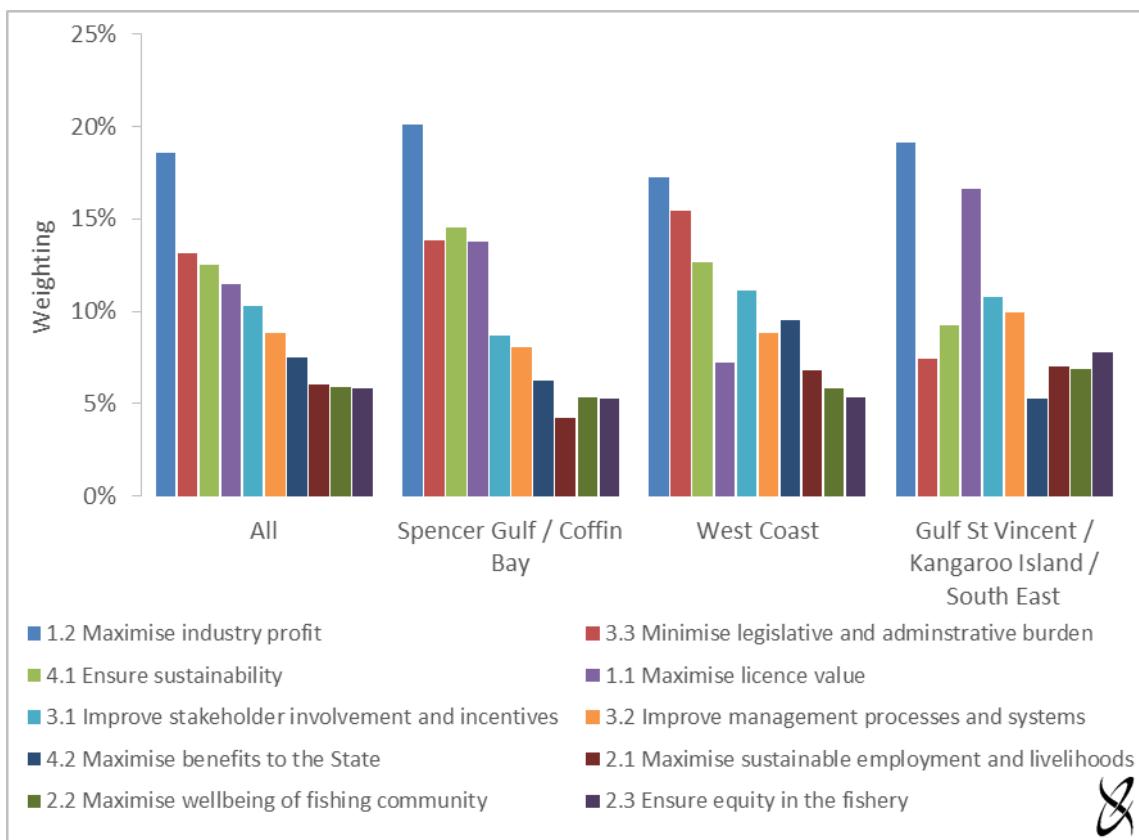


Source: AHP survey

Middle Level Priorities

The ranking of middle level priorities for the whole sample is presented in the left-hand cluster (labelled 'All') of Figure 12. The column heights of the 'All' cluster show the average weighting placed on each priority by the AHP analysis of the whole sample of fishers, they sum to 100 per cent. The heights therefore represent the relative importance of each priority. The numbering of the priorities show which high-level priority each comes under in the hierarchy. For example, '1.2 Maximise industry profit' and '1.1 Maximise licence value' are middle level priorities which come underneath '1. Maximise economic performance' in the hierarchy. The 'All' cluster shows that the greatest middle-level priority for the whole sample, on average, is 'Maximise industry profit' by a significant margin, followed by 'Minimise legislative and administrative burden', then 'Ensure sustainability' and so on, moving from left to right as the column heights decrease.

Figure 12 Middle level priorities by region



Source: AHP survey

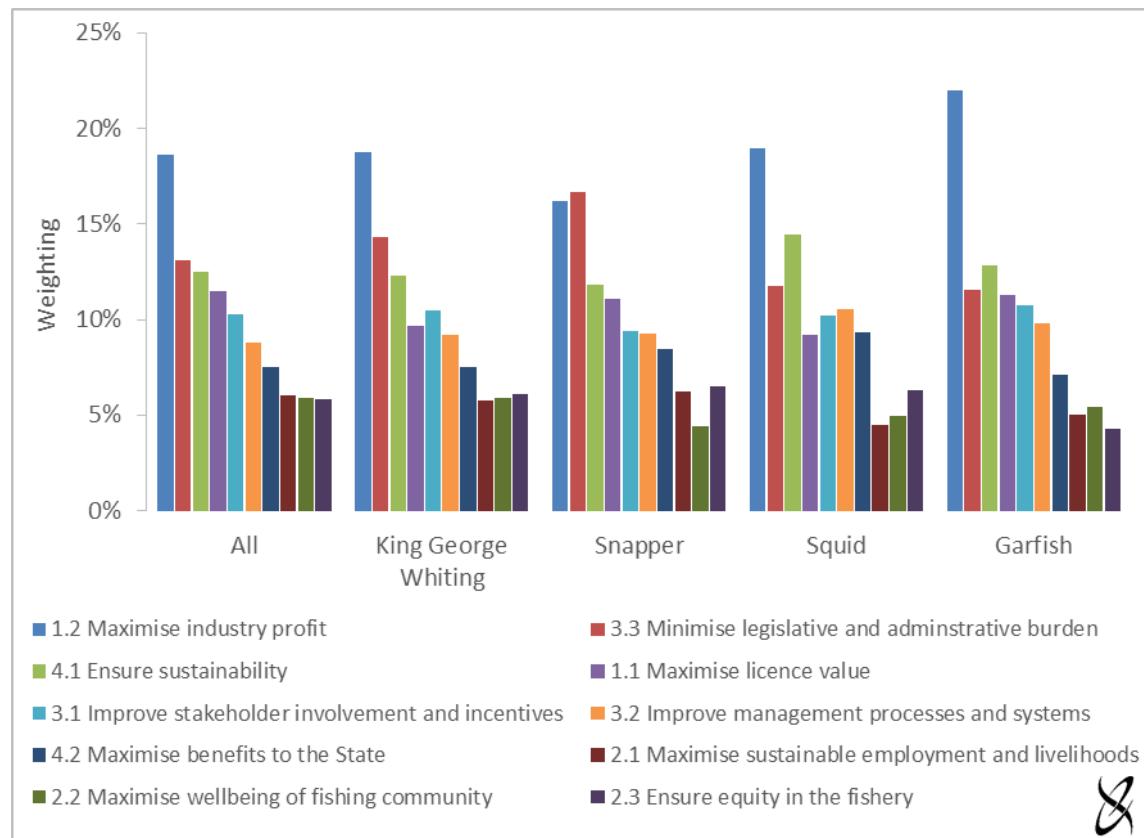
The three right-hand clusters in Figure 12 show the relative importance placed on each of the middle level priorities, on average, by fishers in each region. Comparing these clusters to the 'All' cluster shows some key differences for each region:

1. The highest priority in each region is '*Maximise industry profit*'. The second most important priority is different for each region.
2. In the SGCB region there is no clear second most important priority. These fishers placed around the same amount of importance on each of three priorities which all take this 'second place', they are: '*Minimise legislative and administrative burden*', '*Ensure sustainability*' and '*maximise licence value*'.
3. The second most important priority in the WC region is '*Minimise legislative and administrative burden*'. These fishers placed the highest importance on this priority compared to the other regions.
4. The second most important priority in the GSVKISE region is '*Maximise licence value*' which is quite close in importance to the first priority in the region. These fishers placed the highest importance on this priority compared to the other regions.

The four right-hand clusters in Figure 13 show the relative importance placed on each of the middle level priorities, on average, by fishers who target each of the four species: KGW, Snapper, Squid and Garfish. Comparing these clusters to the 'All' cluster shows three key differences:

1. Fishers who target Snapper tend to place a higher importance on '*minimising legislative and administrative burden*' than on '*maximising industry profit*'.
2. Fishers who target Squid or Garfish tend to place more importance on '*ensuring sustainability*' than on '*minimising legislative and administrative burden*'.
3. Fishers who target KGW or Squid tend to place more importance on '*improving stakeholder involvement and incentives*' than on '*maximising licence value*'.

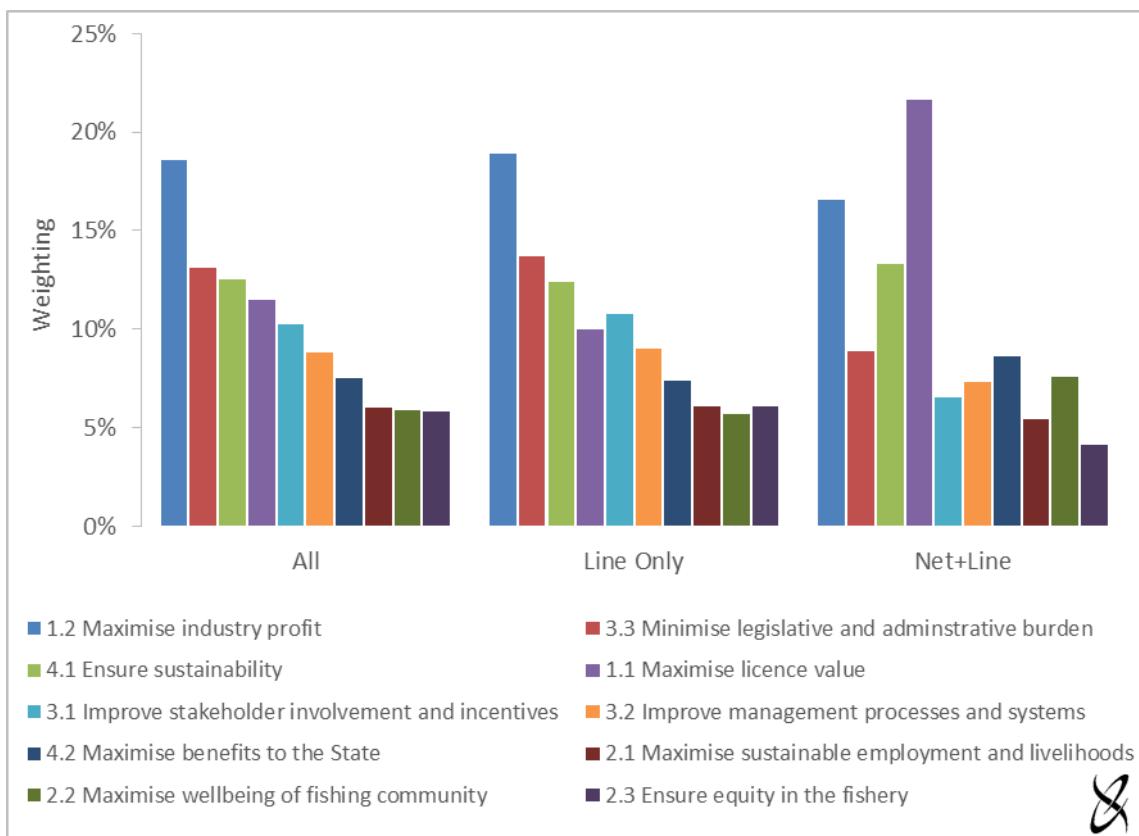
Figure 13 Middle level priorities by target species



Source: AHP survey

The two right-hand clusters in Figure 14 show the relative importance placed on each of the middle level priorities, on average, by fishers who fish by line only and those who fish by net and line. Comparing these columns directly to each other shows that net and line fishers place less importance on '*maximising industry profit*', '*minimising legislative and administrative burden*' and '*improving stakeholder involvement and incentives*' compared to line only fishers. Net and line fishers place much more importance on '*maximising licence value*' and a little more importance on '*maximising benefits to the state*' and '*maximising wellbeing of the fishing community*' compared to line only fishers.

Figure 14 Middle level priorities by method



Source: AHP survey

Group Coherence

The level of coherence⁵ for each group gives an indication of how closely aligned each respondent's responses are to the other respondents' in the same group. A coherence value of 1 (the maximum value) shows perfect coherence, this would occur if each respondent gave an identical response. The lower a coherence value, the less alike the responses within the group are. Table 4 shows the coherence value for each group and level of the hierarchy. As expected, the coherence value decreases moving down the priority levels as the comparisons become more complex. The whole sample has a coherence value of 0.90 at the highest level, 0.84 at the middle level and 0.80 at the lowest level.

⁵ Coherence is calculated using the method described by Zahir (1999a, 1999b) and used for fisheries analysis by Pascoe *et al.* (2013).

Table 4 Group coherence of AHP responses at each level

	Priority level		
	High	Middle	Low
Whole sample	0.90	0.84	0.80
Region			
SGCB	0.89	0.83	0.79
WC	0.93	0.87	0.86
GSVKISE	0.86	0.76	0.71
Method			
Line only	0.90	0.84	0.81
Net+line	0.88	0.82	0.78
Target species			
KGW	0.90	0.84	0.81
Snapper	0.90	0.83	0.81
Squid	0.89	0.83	0.80
Garfish	0.74	0.81	0.78

Source: AHP survey

Summary of AHP Survey

This section has shown that overall, whether it is across region, species or method that by and large respondents prioritised governance as an ongoing issue, with economic performance close behind across all levels of priority.

These findings are consistent with the EconSearch Survey of 2014 and overall highlight that reform needs to explore how to create governance and administrative reform, while maximising economic performance, license value and/or reduction. Of note is that net /line fishers as a group had different priorities and issues and were very focussed on maximising economic performance.

Summary of Interviews

As noted in the method section we also undertook a series of semi-structured interviews, with 23 fishers willing to participate. The interview questions were in line with the AHP survey and asked participants about how they prioritised issues in the fishery, what the key issues of concern were, their views on co-management and management generally and documented information about species or geographical differences. Analysis of the interviews revealed a number of key themes, but also synergy with survey results. A synopsis of them follows.

Stock Numbers

When asked about what the key issues confronting the fishery are and to define them in line with economic, environmental and social categories, fishers consistently reiterated an overriding concern is stock numbers:

“Well it’s the stock. So much less now than there was. That’s the real problem right there, no point talking about money if there’s no fish to sell. What we need is regulations to build the stocks” (MSF 21).

In relation to this theme, was the repeated assertion that part of the problem was referred effort – that regulations, when they occurred for one species meant another would be fished out, as this typical quote shows:

“It has to be integrated, no point telling us, forcing us to restrict effort for one species and then puts pressure on another one, false logic” (MSF 20).

Objective Prioritisation

Overall, fishers consistently indicated that if they had to choose between social and economic objectives that economic objectives would be their greatest concern. Being able to make enough money, being able to sell at a good price, and being able to cover costs are the bottom line.

Following on from this, fishers stated that the social dimensions were really important in that not only being part of a community was important, but that they played a crucial role in *making* a community, particularly in small regional areas. A number of fishers reflected on how their towns and regions had contracted and lost social capital once fishers left the area. One fisher detailed the decline in small towns in the Yorke Peninsula based on a reduction of numbers or migration of fishers.

“Look, without these guys, these fishing families, there would be no schools, no footie clubs, no shops...lose the fishers, lose the town...” (MSF 17).

“Open your ears and listen to the guys who have seen the catches fall to a stage where it will not return unless someone makes hard decisions on the future. A good lifestyle say the new fishers but lifestyle is no good when you are broke. Won’t affect me, as I have seen the good days (MSF 7).

Perceptions of Management

Fishers did not think PIRSA was doing a good job and stated that this was because of the belief that it needed to maintain fisher fees in order to maintain their own structures;

“No political will to improve fishery and listen to industry (us/me). E.g., rationalise com, marine scale numbers by way of the amalgamation scheme (introduced in

1994). This fishery is toxic and dysfunctional by government not acting on transient stock levels and proper governance" (MSF 5).

"We need responsible government and PIRSA and SARDI to have a part in management. But they need to listen to industry a lot more" (MSF 7).

"I truly believe the fishery has been significantly mismanaged for several years now. It has been allowed to deplete to concerning levels through both ignorance, communication failures and not taking note of serious matters raised by fishers for many years. For example, we have been pleading to implement a quota on snapper but was continually rejected. Now in only recent times they are addressing the problem. I hope it is not too late (MSF 23).

Constraints to Management

Fishers discussed a number of historical impediments that in their view had caused current management issues and were likely to impinge on future management. One of these, asserted as a key block was the establishment of Marine Protected Areas (MPA), which were perceived to inhibit access and capacity for stock replenishment. One example given often was the fact that four commercial fishers near Port Wakefield have stopped operating due to the nearby MPA:

"Look, since the marine parks have been in, seriously, we have lost a lot, access, stock, money. It's a joke" (MSF 22).

"Marine Protected Areas, now that's an example of a big big mistake" (MSF 15).

Unregulated Recreational Fishing a Significant Road Block to Management

Recreational activity and take was unanimously perceived as the key road block to management as shown by the quotes below:

"Recreational fisher's impact business more than professional fishers, sometimes on grounds outnumbered 30 to 1" (MSF 1).

"The recreational were not as big a problem as they are now. And with closure areas it's pushing other pros into smaller areas making it very difficult" (MSF 2).

"2015 and 2016, the recreational sector is a greater risk to effecting our future fishing, trying to ban long lining. Also part time commercial fishermen that come running when they hear the fish are thick. My main concerns are poachers (reco's selling fish) and commercial fishermen exceeding limits and doing illegal things" (MSF 5).

"Reco fishers push me off fish more and more every year. This means I lose money! 10 years ago it was rare to see reco boats. Today everywhere!" (MSF 21).

Leasing issues

A number of fishers raised leasing issues and felt that the shift to leasing licenses had meant that non fishers, with little experience, were beginning to get control of the industry in ways that were disadvantageous to its long term future:

"I have been a commercial fisherman for nearly 30 years now. In that time I have seen a huge change in the MSF and unfortunately not for the better. Ten to fifteen years ago it was a great industry to work in, even though there were more fishermen. Most people were prepared to work made a reasonable living. Fish stocks seemed to be better and it was not uncommon to work a patch to yourself. Fast forward to today,

now everywhere I go I see other commercial fishermen. Everyone who is licenced has the right to fish where ever that they choose but some of these so-called fishermen have no scruples or manners and that has diminished fish stocks are causing huge angst in our industry. I believe to sort this mess out is quite a simple matter. This is meant to be an owner/operator licence but due to a loophole, this is not the case at present. There are approx. 100+ licenses being leased out. These people have to catch about \$450 of fish a week before they can even put petrol in their tank. This practice must be stopped. We all know we need to reduce licenses. Simple plan, buy out all licenses being leased that will reduce pressure on stocks of fish [and] add value to licenses to the people who actually own them. It will also relieve the pressure on most areas and stop all the aggressive attitudes that have come about. For these and other reasons, I am unable to fill out your survey. We have had a lot of surveys, meetings and other forums in the past and not a thing has changed except more pressure on the fish" (MSF 20).

These concerns were echoed across the board and generated some pessimism in relation to the future of the industry:

"I can tell you now, in 5 years you guys will not have a job because you won't have anyone bar people leasing and pro AM fishers who are only dodging taxes through other businesses with fishing" (MSF 6).

Options for Management and Reform

The reduction of licenses or quota was advanced most commonly as the key management idea, but zoning, charging recreational fishers fees, and the introduction of Total Allowable Catch (TAC) were other ideas:

"Introduce zoning (Eg. Like abalone, rock lobster), introduce TAC and individual (transferable) quota, scrap antiquated amalgamation scheme (has passed it's used by date)" (MSF 5).

"Just charge recreational's \$100 a year. Our fees would be about a quarter of now" (MSF 19).

Co-management was in general rejected as the way forward in relation to above based on two reasons: (i) most fishers, although agreeing to the need for management, did not agree they should have to make the decisions about how to do that and (ii) most felt that PIRSA should make those decisions. Further, there was variability of opinion as to whether fishers should make a co-contribution, which was understood as a slightly different process than co-management. Co-management was understood as a joint management or decision making process, whereas co-contributions were discussed in financial terms only: -

"Would you support a co-contribution (Ind/Gov) fund to adjust licence numbers? No!!! We already pay too much already, government should pay more, how much more money can we shell out?" (MSF Int 5).

"No not at the moment. Why should I put money into reducing licenses when I have no security? e.g. Marine closures, parks, more and more cuts. The MSF are not breaking their share of allocation. Give me security, quota etc., I'd be more than happy!" (MSF 3).

Respondents also made a number of suggestions for what they thought would constitute some effective options for structural reform. These included:

- Imposing greater regulation on the recreational sector, and a cap on effort

- Reducing the number of licenses – the figure most commonly suggested was 50 across the state
- Implement scale based, or geographically tailored fish management
- Establish zoning arrangements such as in abalone and rock lobster
- License buy back – but at reasonable levels of compensation



(Coffins Bay: Photo courtesy Meagan Magnusson 2017)

Discussion

In this section we will present the following: (i) a summary of the key findings (ii) a suggested process and indicators for future inclusion into management of the fishery, and (iii) a summation of how the project met the aims and objectives of the project. We conclude with discussion on the implications of the project findings for stakeholders and some recommendations for management.

As discussed in earlier sections, we found that there is consistency across the fishery and across three data sources in relation to: (i) priorities for management, (ii) perception of ways forward and (iii) key management issues. Our key findings were as follows:

- There is diversity amongst the fishers but overall strong agreement about the perceived state of the fishery
- That fish stocks are perceived to be low and the industry has retracted a lot in the last twenty years
- Governance reform was the highest management objective prioritised for the fishery and urgently needed
- Both economic and environmental objectives were prioritised as of key importance, but seen as equally important on the assumption that you could not have one without the other
- Social objectives were ranked below economic and environmental ones on the basis that the social was dependent on the other two priorities being met - if you had the two former, the social objectives would naturally be met
- There are variations in perspective as to whether or not there should be co-management or co-contributions, and the former was related to decision making and the latter to financial contributions and often conflated
- Almost unanimous agreement that any reform needs to adequately compensate fishers and offer entry incentives to new fishers
- Recreational fishing is unanimously seen as a major threat to current and future commercial marine scale fishers, and widely considered to be unregulated and unfair
- Management agencies are seen as a big part of the problem
- Social license (having it, or not) was not seen as a priority for fishers, and most did not know what it meant
- Management agencies are seen as contributing to management challenges by (i) being captured by their own funding regimes and thus having to cover their own costs, (seen as being offloaded to the fishery) and (ii) by not focussing on (a) environmental stock levels and then (b) governance of the MSF.
- Despite the application of the AHP Framework, we find that it was not possible to achieve consensus per se about all issues, but we argue that this is in fact, not necessary if management is diversified and geographically targeted.

Developing Indicators: A Suggested Future Process to assist meeting prioritised objectives

While the original intent of the project was to identify how the fishery prioritised objectives for management, we then also considered how achieving those objectives may occur. Discussion within the fishery led to a preference for indicators that would provide a means by which to measure and account for whether or not management objectives and priorities were being met.

There is a substantive amount of international work on the development of appropriate indicators. A review of these indicator systems reveals a focus on social, economic and sustainability indicators. They are also defined in many different ways; Potts (2006) for example argues that sustainability indicators are defined as follows:

“A structured system that is used to define, measure and implement information that directly relate to effective decision making regarding sustainability or its primary dimensions” (Potts 2006, p. 267).

Garcia *et al.* (2000) define them as variables, pointers of indicators of a phenomenon and Jennings (2005) notes they are useful for environmental reporting, research and management support. The Food and Agriculture Organisation (FAO) also has guidelines for the development and use of sustainable development of marine capture fisheries, some of which have been applied in Australia (Garcia *et al.* 2000). The purpose of such indicators is to enhance communication, transparency, effusiveness and accountability for management of what is a very complex natural system (Garcia *et al.* 2000, p. 539).

However, part of the challenge is working out how to develop schemata of indicators that cover all areas; environmental, social and economic, as each category constitutes a means by which to measure achievement within each area (Bonzon 2000). As such, successful indicators, when applied in management, will reduce the number of measures usually required to understand the status quo of the fishery and to simplify the process of communication of key priorities to managers, stakeholders and communities (Bowen & Riley 2003).

In this context, social and economic indicators are key to building understanding of the links between social systems and the environment which are ultimately vital to ensuing effective decision making. Social and economic indicators can also help give insights into community or artisanal fisheries, enhance ongoing management (Kronen *et al.* 2010) or can be used to help build management in small-scale fisheries as has occurred in Turkey (Ünal & Franquesa 2010) and the Adriatic (Accadria & Spagnolo 2006). In Newfoundland, the use of social indicators helped identify issues with employment, population decline and increased outmigration, while also building capacity for responses and adaptation to its cod crisis via the development of incentives for economic diversification (Hamilton & Butler 2001).

The use of sustainability frameworks is one common application to manage fisheries, but so is the Driver – Pressure – State – Impact – Response (DPSIR) model. This approach has been used in Kenya for example to embed indicators across multiple contexts to manage their fisheries (Mangi *et al.* 2007). The application of social and economic indicators such as landings, traditional use, access, effort, subsidies and employment have helped to build a picture of the challenges and viability of the Yukon Salmon Fishery (Kruse *et al.* 2012). Another model using a multi-fleet analysis has proved useful in documenting social and economic indicators for fishery management in Brazil (Gasalla *et al.* 2010) and Alaska, where application of this technique has identified key industry sensitivities (Seung & Zhang 2011).

These studies provided good information from which we based the development of our own suite of indicators as presented below. We have drawn on an array of indicators currently used across the world, from local to international best standard indicator sets, which we then mapped against the core management priorities asserted by our respondents.

These indicators sum up the key points of concern under each identified domain in this project: (i) governance, (ii) economic, (iii) social and, (iv) environmental. We have included governance as an indicator stream given the high priority it was given in this project. Please note, that we have deliberately kept these indicators broad in nature and as free of 'jargon' as possible. For example, we do not over complicate our economic indicators by specifying specific and complicated economic indices such as 'gross regional product'. Rather, we define indicators that are more easily interpreted while covering the necessary scope such as 'regional economic contribution'. If we had defined more specific indicators the table would have been multiple pages long and we wanted to provide a direct and vivid summary of the key objectives within the fishery. As part of the extension process, these indicators were sent via a flyer and a web site to all members of the fishery, and presented to the MFA Board of Directors for feedback. The final framework reflects feedback from this extension work.

Management of this fishery is fraught with internal conflict and ongoing struggle to catch enough fish to maintain livelihoods. There are multiple versions of the 'story' as to what the issue is and what the solutions are. However, there is overall consensus within the fishery at both scale and species level in relation to objectives to indicate that there is common agreement on what key indicators could be used to indicate how these objectives may be met to reflect an economically productive, socially diverse and environmentally healthy industry.

As a process we suggest that the focus on trying to achieve consensus across the fishery is unrealistic and may undermine its diversity (and hence inherent dynamism). Instead, we recommend that a broad suite of indicators (such as suggested below) are used as *the starting point* to signify key aspirations for and by the fishery and that they are used to workshop more tailored and specific indicators within geographical, method or species categories. We suggest that these indicators be incorporated within and considered in MSF reform processes as they reflect the key and overriding concerns and aspirations of the fishery both present and into the future. The indicators we have chosen are mapped against the key priorities and also the identified objectives from the MFA Strategic Plan which included: i) access security, (ii) co-management, (iii) industry promotion and (iv) governance and capacity building.

We suggest that further work needs to be done on these indicators – they are at this point, a suggested process only. The aim of the research and work we did was primarily aimed at trying to understand what objectives are in common and then secondarily how their implementation might be measured: their fine tuning would need to occur at a later stage as part of ongoing reform processes. Table 5 presents a Fishery Indicator Framework and they relate to the MSF Strategic Objectives.

Table 5 Marine Scalefish Fishery Indicator Framework

Governance	Environmental	Social	Economic
MFA has its feedback demonstrably incorporated into ongoing management policy/documents/reform	Fishery management based on ecosystem based management principles	Number of fisher families resident in local towns	Increasing/declining catch of each species
Numbers of representatives of all sectors of MSF, including location and species type in governance institutions and arrangements	Habitat damage resulting from fishing practices	Number of fishers employed full time/part time	Regional upstream employment (input suppliers such as fuel, repairs, ice, business services) and downstream employment (such as fish transport, processing and retail)
Extent of resourcing of ongoing governance for fishery	Classification of fish stocks (stock status)	Number of fishers involved in other roles in their local communities	Levels of debt/disposable income
Number of fishery stakeholders resourced to participate	Diversity of species caught	Number of children from fisher families in local schools	Increase/decrease in fisher numbers
Extent of regular communications about management	Size of stock caught within regulated limits	Number of new entrants to the fishery	Market price of species
Equitable distribution in decision making		Existence of cultural fishing practice	Regional economic contribution

No evidence of conflict of interest		Capacity to have recreational time/participate in social/cultural/recreational activities	Net profit (such as profit at full equity for individual businesses and economic rent for the fishery as a whole)
Number of quotas and allocations within sustainable limits		Extent of personal disruption	Ratio of catch per trip/time taken out fishing (known as 'catch per unit effort')
		Extent of conflict in fishery and between fishers and regulators	Operating costs (including fuel)
			Infrastructure/ maintenance costs

Results against the Research Aims

1. To identify the common and conflicting social and economic objectives for stakeholders within the Marine Scalefish Fishery

Comment: Overall we find that it is possible to identify common economic and social objectives amongst the fishery. Despite its diversity, and indeed occasional division and conflict we found substantial agreement amongst the MSF that (i) governance reform is needed and urgent, (ii) that economic objectives mattered most, (iii) that sustainable economies had to be underpinned by environmental condition (as in sufficient stock) and (iv) that if these two objectives were met, that the social dimensions would follow. Where there is disagreement within the fishery it pertains to what each group/individual believes is the best and most efficient management strategy.

2. To inform debate and achieve agreement about a vision for the future and identity of the MSF fishery

Comment: This project certainly raised debate within the MSF about the future and identity of the fishery. All those who participated, and our results, whether looking at species, method or location, found a consistent agreement that governance and management reform was the most important objective for the future of the fishery.

Future visions of the fishery rotated around a vision of better stocks, both in terms of fish quantity and quality. Interestingly, participants did not feel that the MSF needed to achieve consensus or integration as a whole; instead, they asserted a vision of future management and identity of the fishery as a differentiated and demarcated management domain, split or allocated by species and/or location. Future identity of the fishery was thus conceived of as being ideally, a set of tailored management options for specific fisheries or locations. Future visions of the fishery were also constructed via the application of an indicator framework which was asserted as one mechanism by which the fishery could measure the extent to which their management objectives were being achieved.

3 To develop the capacity of inshore fishers to participate in effective co-management

Comment: In the end it was beyond the capacity of this project to develop the capacity of inshore fishers to participate in effective co-management. In fact, co-management was not constructed or perceived in a positive light, more as an experiment that to date had not yielded much. Many interpreted it as a co-contribution exercise rather than a collaborative decision making enterprise. Most fishers felt that it was not resourced properly, and that in reality the important decision making was one way and top down and hence not worth pursuing.

However, we note from the MFA's point of view, defining the common and conflicting objectives across the fishery, as has been achieved in this project, will enable it to engage more meaningfully with fishers, regulators and the community, in effect contributing to co-management anyway.

4 To provide a process and document for the ongoing monitoring and evaluation of social and economic performance within the fishery

Comment: As described in the previous section, we provide a suggested typology of indicators and process for implementation and we provide indicators for governance as well as for the economic, environmental and social objectives that were our initial concern.

The key point in developing these indicators is not that one set or another set of indicators is prioritised but rather that they help embed a management approach that is more interrelated and addresses multiple factors simultaneously. It is unrealistic to expect consensus across what is a very diverse fishery and equally unrealistic to expect fishers or governments to prioritise one factor over another when they are important and relate to each other in specific ways. Hence we suggest that these indicators may be useful in multiple contexts and can be applied as appropriate to the different scale, species, method and location of the different fishing groups.



(Photo courtesy of Nathan Bicknell 2017)

Conclusion

This project started out with the aim of identifying how fishers within the MSF prioritise economic and social objectives. It was based on the founding assumption that achieving consensus across the fishery would be a good idea and that to date management had been based on environmental imperatives. We used a mixed methods approach which included documentary analysis, a survey and semi-structured interviews.

Results highlight that in fact overall fishers do rank economic priorities very highly but that they also rank as equally important the ecological status of the fisheries. Without one, it is perceived, you do not have the other. Fishers believe that while social objectives are important, they are not the priority considering that once you achieve your economic and environmental objectives that the social naturally follows. Ultimately, and this was the surprising result, all fishers asserted better management and governance as the biggest priority and most important objective.

In light of this we have developed a suite of indicators that could be used and applied in ongoing management of the MSF.

Implications

The implications of this project for the MSF are varied. At one level the project yielded key information about fisher perspectives and industry needs. Yet, what the project really reveals is that the capacity of the fishers to adapt to current changes is limited and that they need government and other support to implement reform. While the fishing communities are also very diverse, they all agreed that reform is needed and specifically a reduction of licenses.

For policy makers, this highlights that reform is culturally palatable but that it must include appropriate forms of incentive and compensation for fishers to leave or stay in the industry. It also reflects an imperative to develop geographically located and species specific management, rather than State based regulations, and in turn this implies a need for further resources, time and money for effective implementation.

These changes will also ultimately affect other stakeholders in local fishing communities or regions such as the Yorke Peninsula, South East or Eyre Peninsula.

Recommendations

In light of the above we make the following recommendations: –

- That reform of the MSF include negotiated arrangements about license reduction, including ideas for compensation
- That reform of the MSF consider species and/or geographically specific options for regulation
- That ongoing reform include management options for regulation and identification of recreational effort
- Ongoing reform needs to take account of existing MSF species shares as allocated within the management plan.
- That the suggested suite of economic and social indicators be used to inform ongoing discussions about and reform of the MSF.

Further Development

While this project suggests some indicators for inclusion into management, there is still much social research that could be undertaken to further build the industry.

This work could include:

1. Trial and then evaluation of application of the indicator set we have developed
2. Identification of and then feasibility studies into what species specific or geographically specific management options would look like
3. Development of appropriate communication strategies and products about the MSF and its management to achieve greater clarity and transparency across whole fishery as to ongoing status of MSF
4. Research into what and how to manage/regulate recreational effort
5. Research into models that may be applicable or transferable into the MSF.

Extension and Adoption

This project had three stages of extension, and we feel that given the diverse nature of the fishery and members' views that we have been able to access and inform a wide range of fishers, across scale and species about this project.

In the first phase we consulted with industry stakeholders and committees to identify project needs, key questions and the methodology. The second phase of the extension was to hold workshops and inform people about the survey and assist them in undertaking it.

The final phase of the extension process has begun but is ongoing. In order to find a way to maximise exposure of the results to all the fishers in the industry we developed a project based web site which summarises the results. We then sent a covering letter with a flyer and a link to the web site so all industry members could participate in giving final feedback to us about the project but also in a transparent manner be aware of its outcomes.

The link to the web site can be found here: www.msfobjectivesproject.info

The feedback process is ongoing and we plan to hold a few information workshops where we will travel to designated areas and regions and present the results face-to-face.

In these ways, the results will gain enough exposure to be considered, and part of ongoing discussions, within the current MFA reform process.

We presented the results of the project to the MFA Board in Port Adelaide at their June meeting 2017. The project was endorsed and favourably received with one member commenting the project offered a once in a generation opportunity to inform the fishery to achieve reform. The Chairman of the Board was keen to send the report to the Minister.



(Clean-up Australia Day Port Adelaide: Photo courtesy Nathan Bicknell 2017)

Project Materials Developed

This project developed the following materials:

- The survey instrument – attached as Appendix 4
- A website - see the link here: www.msfobjectivesproject.info
- A flyer – see it attached overleaf in Appendix 5

It is likely there will be at least one scientific paper published from this project but it will be developed in conjunction with FRDC staff, and the MFA before submission.



(Photo courtesy of Nathan Bicknell, 2017)

Appendices

Appendix 1: List of Researchers and Project Staff

The team is one of high level expertise and has included senior staff from EconSearch, the EO of the MSA Fishery Nathan Bicknell, Associate Professor Melissa Nursey-Bray and researcher Meg Magnusson (University of Adelaide). Andrew Sullivan from Fish Focus also assisted in collecting data and running workshops and auconsulting, a science communications company developed the website and flyer.

The team was as follows:

Associate Professor Melissa Nursey-Bray: Melissa is Head of Department and researcher at the Department of Geography, Environment and Population. She has extensive experience working in fisheries across Australia, in India, Cambodia and Vietnam. Melissa led the project and conducted the semi-structured interviews. For details of her work see this link: <http://researchers.adelaide.edu.au/profile/melissa.nursey-bray>

Meg Magnusson: Meg was the research officer for the project and has extensive experience conducting interviews in various fisheries projects over the last 3 years. She is also working on her PhD and is located within the Department of Geography, Environment and Population, University of Adelaide.

Nathan Bicknell: Is EO of the MFA. He has extensive networks within, and has worked for the MSF for over 5 years.

Anders Magnusson and Julian Morison, EconSearch: Based in Adelaide, EconSearch provides independent economic analysis and policy advice to firms, industry associations, research & development corporations, regional development boards, government agencies and other organisations. EconSearch has conducted assignments throughout Australia and works in collaboration with a range of other consulting companies and research institutions (engineering, horticultural, accounting, farm management, etc) and is well placed to contribute to multi-consultant and multi-disciplinary studies. Led by Julian, EconSearch has carried out an SA fisheries economic research project over the past 18 years, preparing economic indicators for the commercial fisheries in South Australia. Please see the following link: <http://www.econsearch.com.au/>

Andrew Sullivan, Fish Focus Consulting: Andrew has many years' experience working in fisheries across Australia and in Ireland. Andrew has a strong connection with the South Australian MSF having held the position of fishery manager, 2006-2008. In addition, he returned to work with PIRSA to lead the development of the current management plan in 2011. He is the Director of Fish Focus Consulting, a fisheries consulting company. Andrew led the first round of fisher workshops with Nathan and collected a number of the surveys. He also helped develop and refine the pilot surveys.

AuConsulting: AuConsulting is an integrated marketing and communications company that was sub-contracted to develop the web site and associated extension work. Please see the following link: <http://www.auconsulting.com.au/>

Appendix 2: Intellectual Property Declaration

The information contained in this report is the intellectual property of the FRDC and the University of Adelaide but it is acknowledged that it would not have been possible without the contributions of local knowledge within the MSF. We also note that EconSearch has been very generous in sharing its intellectual property relating to previous work they have done on the MSF.

Appendix 3: References

- Accadia, P & Spagnolo, M 2006, 'Socio-economic indicators for the Adriatic Sea demersal fisheries', in Thirteenth Biennial Conference of the International Institute of Fisheries Economics & Trade, Portsmouth, UK, pp. 1-9.
- Bonzon, A 2000, 'Development of economic and social indicators for the management of Mediterranean fisheries', *Marine and Freshwater Research*, vol. 51, no. 5, pp. 493-500.
- Bowen, RE & Riley, C 2003, 'Socio-economic indicators and integrated coastal management', *Ocean & Coastal Management*, vol. 46, no. 3–4, pp. 299-312.
- Dang, NB, Momtaz, S, Zimmerman, K & Hong Nhung, PT 2017, 'Effectiveness of formal institutions in managing marine fisheries for sustainable fisheries development: A case study of a coastal commune in Vietnam', *Ocean & Coastal Management*, vol. 137, pp. 175-84.
- de Juan, S, Gelcich, S & Fernandez, M 2017, 'Integrating stakeholder perceptions and preferences on ecosystem services in the management of coastal areas', *Ocean and Coastal Management*, vol. 136, pp. 38-48.
- Denzin, NK 1970, *The research act in sociology: A theoretical introduction to sociological method*, McGraw-Hill, New York, NY.
- Denzin, NK & Lincoln, YS 2005, *Handbook of qualitative research*, vol. 3, SAGE publications.
- EconSearch 2016a, Economic Indicators for the South Australian Marine Scalefish Fishery 2014/15, report prepared for PIRSA Fisheries and Aquaculture, Adelaide.
- EconSearch 2016b, Extended Analysis of SA Marine Scalefish Social Indicators, report prepared for FRDC, Adelaide.
- EconSearch 2016c, SA Marine Scalefish Fishery Economic Analysis of Core Species 2013/14, report prepared for PIRSA Fisheries and Aquaculture, Adelaide.
- Gao, L & Hailu, A 2013, 'Identifying preferred management options: An integrated agent-based recreational fishing simulation model with an AHP-TOPSIS evaluation method', *Ecological Modelling*, vol. 249, pp. 75-83.
- Garcia, SM, Staples, DJ & Chesson, J 2000, 'The FAO guidelines for the development and use of indicators for sustainable development of marine capture fisheries and an Australian example of their application', *Ocean & Coastal Management*, vol. 43, no. 7, pp. 537-56.
- Gasalla, MA, Rodrigues, AR, Duarte, LFA & Rashid Sumaila, U 2010, 'A comparative multi-fleet analysis of socio-economic indicators for fishery management in SE Brazil', *Progress in Oceanography*, vol. 87, no. 1-4, pp. 304-19.
- Gutiérrez, AT & Morgan, S 2017, 'Impediments to fisheries sustainability – Coordination between public and private fisheries governance systems', *Ocean & Coastal Management*, vol. 135, pp. 79-92.
- Hamilton, LC & Butler, MJ 2001, 'Outport adaptations: Social indicators through Newfoundland's Cod crisis', *Human Ecology Review*, vol. 8, no. 2, pp. 1-11.
- Hauck, M 2008, 'Rethinking small-scale fisheries compliance', *Marine Policy*, vol. 32, no. 4, pp. 635-42.

Himes, AH 2007, 'Performance indicator importance in MPA management using a multi-criteria approach', *Coastal Management*, vol. 35, no. 5, pp. 601-18.

Jacquet, J & Pauly, D 2008, 'Funding Priorities: Big Barriers to Small-Scale Fisheries', *Conservation Biology*, vol. 22, no. 4, pp. 832-5.

Jennings, S 2005, 'Indicators to support an ecosystem approach to fisheries', *Fish and Fisheries*, vol. 6, no. 3, pp. 212-32.

Kronen, M, Vunisea, A, Magron, F & McArdle, B 2010, 'Socio-economic drivers and indicators for artisanal coastal fisheries in Pacific island countries and territories and their use for fisheries management strategies', *Marine Policy*, vol. 34, no. 6, pp. 1135-43.

Kruse, G, Browman, H, Cochrane, K, Evans, D, Jamieson, G, Livingston, P, Woodby, D & Zhang, C 2012, Global progress in ecosystem-based fisheries management, *Alaska Sea Grant*, University of Alaska Fairbanks.

Lee, S, Kim, W, Kim, YM & Oh, KJ 2012, 'Using AHP to determine intangible priority factors for technology transfer adoption', *Expert Systems with Applications*, vol. 39, no. 7, pp. 6388-95.

Leung, P, Muraoka, J, Nakamoto, ST & Pooley, S 1998, 'Evaluating fisheries management options in Hawaii using analytic hierarchy process (AHP)1', *Fisheries Research*, vol. 36, no. 2-3, pp. 171-83.

Lincoln, YS & Guba, EG 1985, *Naturalistic inquiry*, Sage Publications, Newbury Park, CA.

Mangi, SC, Roberts, CM & Rodwell, LD 2007, 'Reef fisheries management in Kenya: Preliminary approach using the driver-pressure-state-impacts-response (DPSIR) scheme of indicators', *Ocean and Coastal Management*, vol. 50, no. 5-6, pp. 463-80.

Mardle, S, Pascoe, S & Herrero, I 2004, 'Management Objective Importance in Fisheries: An Evaluation Using the Analytic Hierarchy Process (AHP)', *Environmental Management*, vol. 33, no. 1, pp. 1-11.

Nielsen, JR & Mathiesen, C 2006, 'Stakeholder preferences for Danish fisheries management of sand eel and Norway pout', *Fisheries Research*, vol. 77, no. 1, pp. 92-101.

Pascoe, S, Brooks, K, Cannard, T, Dichmont, CM, Jebreen, E, Schirmer, J & Triantafylllos, L 2014, 'Social objectives of fisheries management: What are managers' priorities?', *Ocean & Coastal Management*, vol. 98, pp. 1-10.

Pascoe, S, Dichmont, C, Brooks, K, Pears, R & Jebreen, E 2013, 'Management objectives of Queensland fisheries: Putting the horse before the cart', *Marine Policy*, vol. 37, no. 1, pp. 115-22.

Pascoe, S, Proctor, W, Wilcox, C, Innes, J, Rochester, W & Dowling, N 2009, 'Stakeholder objective preferences in Australian Commonwealth managed fisheries', *Marine Policy*, vol. 33, no. 5, pp. 750-8.

Pitcher, T & Cochrane, K 2002, 'The use of ecosystem models to investigate multispecies management strategies for capture fisheries', *Fisheries Centre Research Reports*, vol. 10, no. 2.

Potts, T 2006, 'A framework for the analysis of sustainability indicator systems in fisheries', *Ocean & Coastal Management*, vol. 49, no. 5-6, pp. 259-80.

Rodriguez, NJI 2017, 'A comparative analysis of holistic marine management regimes and ecosystem approach in marine spatial planning in developed countries', *Ocean & Coastal Management*, vol. 137, pp. 185-97.

Saaty, TL 1990, 'How to make a decision: The analytic hierarchy process', *European Journal of Operational Research*, vol. 48, no. 1, pp. 9-26.

Saaty, TL 2003, 'Decision-making with the AHP: Why is the principal eigenvector necessary', *European Journal of Operational Research*, vol. 145, no. 1, pp. 85-91.

Seung, C & Zhang, CI 2011, 'Developing socioeconomic indicators for fisheries off Alaska: A multi-attribute utility function approach', *Fisheries Research*, vol. 112, no. 3, pp. 117-26.

Sloan, S, Smith, T, Gardner, C, Crosthwaite, K, Triantafilos, L, Jeffriess, B & Kimber, N 2014, National guidelines to develop fishery harvest strategies, *Fisheries Research & Development Corporation*, Adelaide, South Australia.

Ünal, V & Franquesa, R 2010, 'A comparative study on socio-economic indicators and viability in small-scale fisheries of six districts along the Turkish coast: Technical note', *Journal of Applied Ichthyology*, vol. 26, no. 1, pp. 26-34.

van Putten, I, Cvitanovic, C & Fulton, EA 2016, 'A changing marine sector in Australian coastal communities: An analysis of inter and intra sectoral industry connections and employment', *Ocean & Coastal Management*, vol. 131, pp. 1-12.

Webb, EJ, Campbell, DT, Schwartz, RD & Sechrest, L 1966, *Unobtrusive measures: Nonreactive research in the social sciences*, Rand McNally Chicago.

Zahir, S 1999a, 'Clusters in a group: Decision making in the vector space formulation of the analytic hierarchy process', *European Journal of Operational Research*, vol. 112, no. 3, pp. 620-34.

Zahir, S 1999b, 'Geometry of decision making and the vector space formulation of the analytic hierarchy process', *European Journal of Operational Research*, vol. 112, no. 2, pp. 373-96.

Appendix 4: Hard Copy of AHP Survey

To begin the survey, click on "High Level Objectives"

(Note, you can view definitions of objectives by placing the cursor on the objective name.)

Participation and confidentiality

Participation in this study is voluntary. You are free to withdraw from this study at any time (i.e. just do not return the survey). Only completed surveys will be used in the analysis. Individual data will not be identifiable, and all information collected in this study will be confidential. Information on your identity is only collected in case there is a need to get back to you to seek clarification about your responses. The data will only be seen by members of our research team and will be stored in a secure area that is not accessible to any individuals other than the research team. Your information will only be used for research purposes.

Note that returning the completed survey indicates your consent to participate.

Contacts

For further information about the project please contact:

Project leader: Dr Melissa Nursey-Bray

University of Adelaide

Phone: 08 83133497

Mobile: 0437 738 635

Email: melissa.nursey-bray@adelaide.edu.au

Thank you for your valuable input to this important project.

A note on the inconsistency index

The inconsistency index measures how consistent the choices are as a set (rather than each individual pairwise comparison). If your inconsistency level is greater than 10%, then there are some problems with consistency that need to be addressed.

Example: if we say that both 1.0 and 2.0 are both "more important" than 3.0, then we are also implying that 1.0 and 2.0 are equal. If we think that 1.0 is "more important" than 2.0, then we have inconsistency. In this case, we would either adjust 1.0 and 2.0 to be equal, **OR** reduce the importance of 2.0 against 3.0 **OR** increase the importance of 1.0 against 3.0 **OR** a combination of these. There are many possible ways of reconciling this to give a consistent response - the choice is yours.

Summary of Objectives

1 Maximise economic performance

1.1 Maximise licence value

1.1.1 Improve security of fishing right

1.1.2 Improve flexibility of investment

1.2 Maximise industry profit

1.2.1 Enhance species diversification

1.2.2 Maximise economic yield

1.2.2.1 Maximise catch rates

1.2.2.2 Minimise total annual costs

2 Maximise social outcomes for the fishery

2.1 Maximise sustainable employment and livelihoods

2.2 Maximise wellbeing of fishing community

2.2.1 Minimise conflict

2.2.2 Maintain the cultural and lifestyle benefits of fishing

2.2.3 Enhance the adaptive capacity of the fishing community

2.3 Ensure equity in the fishery

2.3.1 Ensure equity of access between fishers

2.3.2 Ensure equity in cost sharing between fishers

3 Strengthen management and governance

3.1 Improve stakeholder involvement and incentives

3.2 Improve management processes and systems

3.2.1 Improve stock specific management

3.2.2 Improve certainty and transparency

3.3.3 Enhance adaptability and flexibility of management

3.3 Minimise legislative and administrative burden

4 Improve social licence to operate

4.1 Ensure sustainability

4.1.1 Ensure total harvest is appropriate

4.1.2 Promote industry practice to broader community

4.1.3 Foster resource stewardship

4.2 Maximise benefits to the State

4.2.1 Ensure access to local seafood

Personal Details

Name _____

Age

Address

Licence Number

Licence Class (circle one)

Interest

Main gear type used

Fishing operations

Primary Fishing Region

Primary port/town

Secondary Fishing Region

Years MSF Fishing

Nights away from home fishing

Current Target Species

Future Target Species

Future

What is your key concern for the fisheries future?

Does the management of fishery need to change to have a viable future?

Would you encourage your children or young people to invest in the fishery?

What is the ideal number of licence in your region?

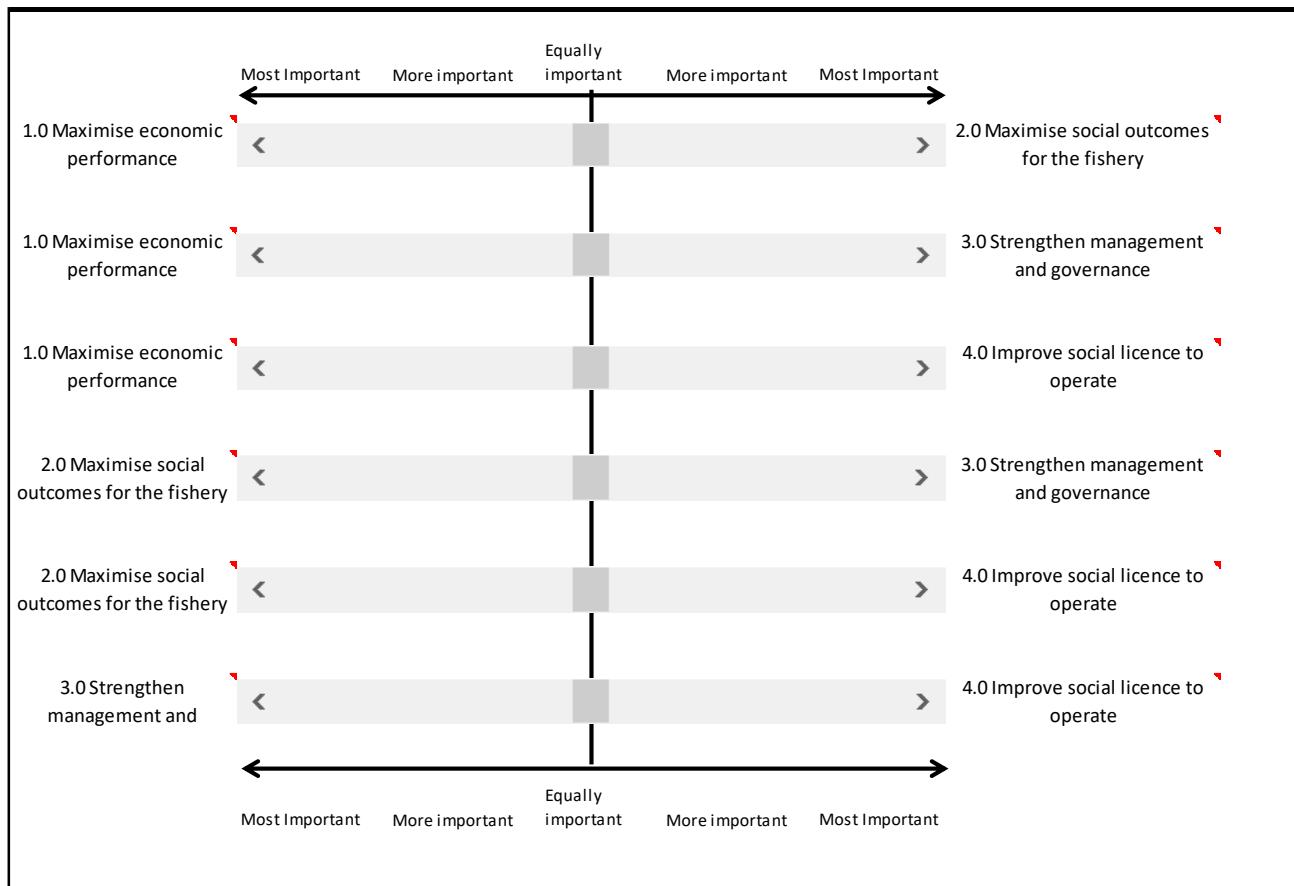
What is the ideal number of licences across the State?

Would you support a co-contribution (Ind/Gov) fund to adjust licence numbers?

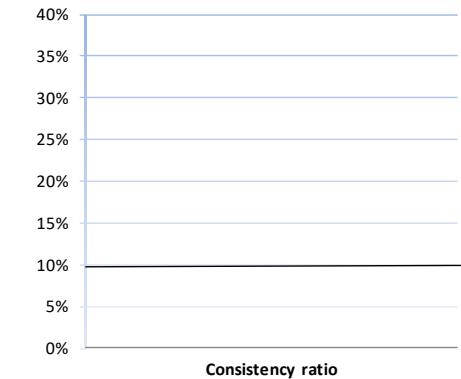
Does recreational fishing impact you more than other professionals fishers?

Would you have answered these questions the same 10 years ago?

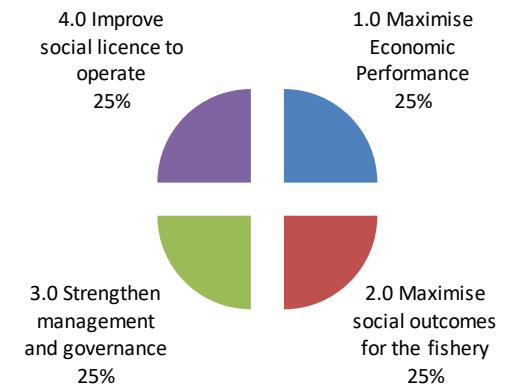
High Level Objectives



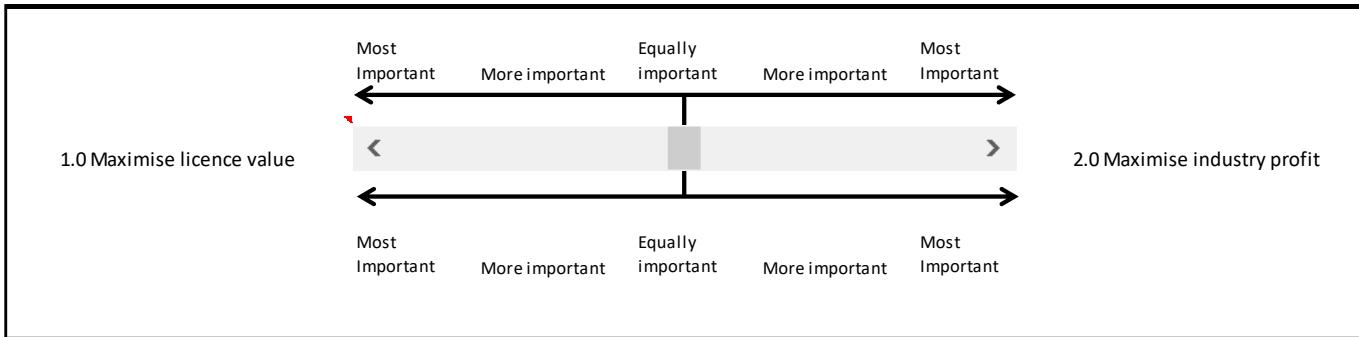
Inconsistency level
(should be less than 10%)



Relative Importance



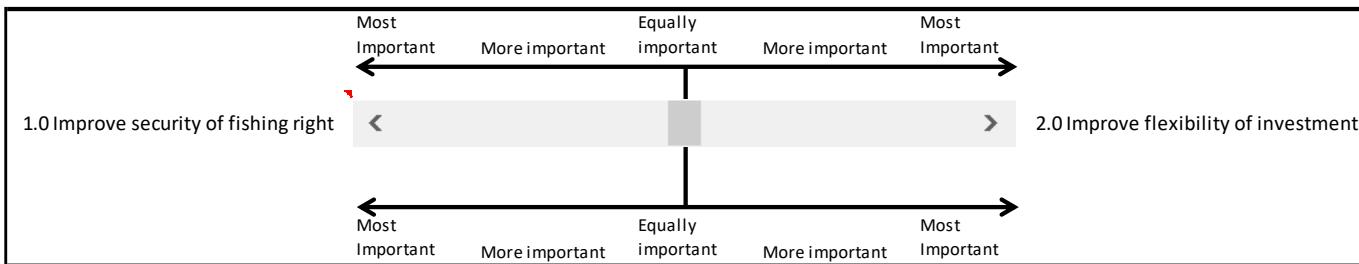
Maximising the Economic Performance



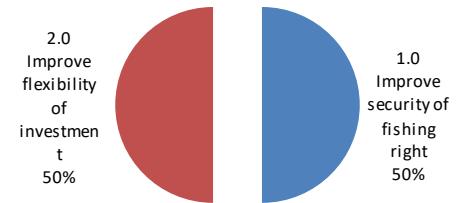
Relative Importance



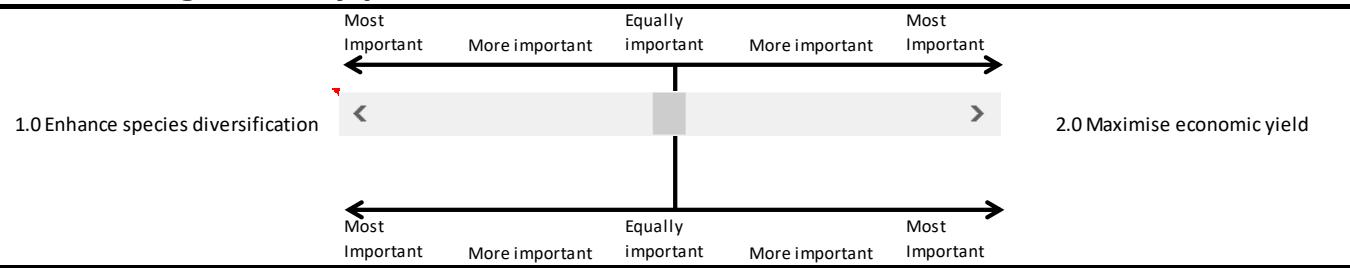
Maximising Licence Value



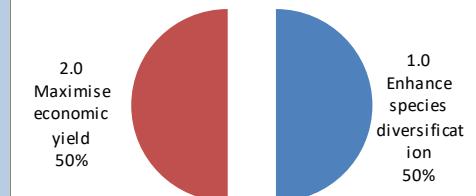
Relative Importance



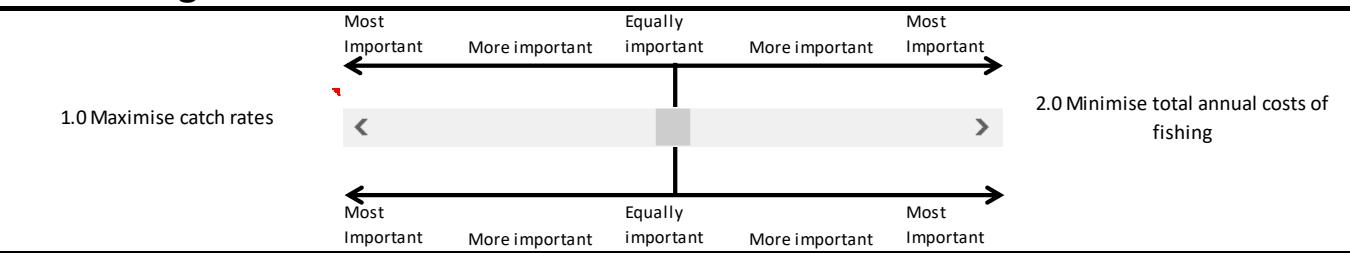
Maximising industry profit



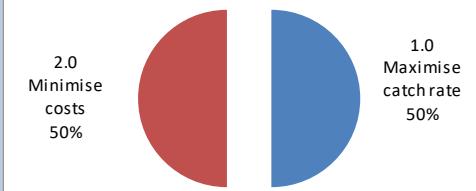
Relative Importance



Maximising Economic Yield

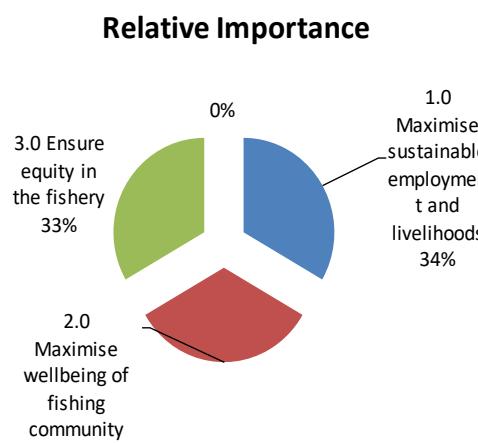
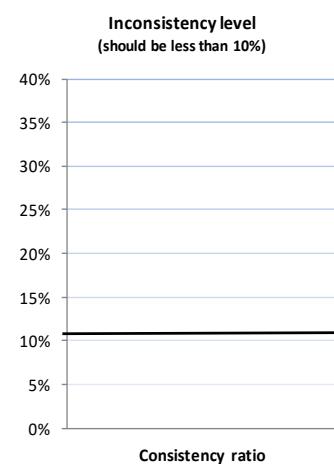
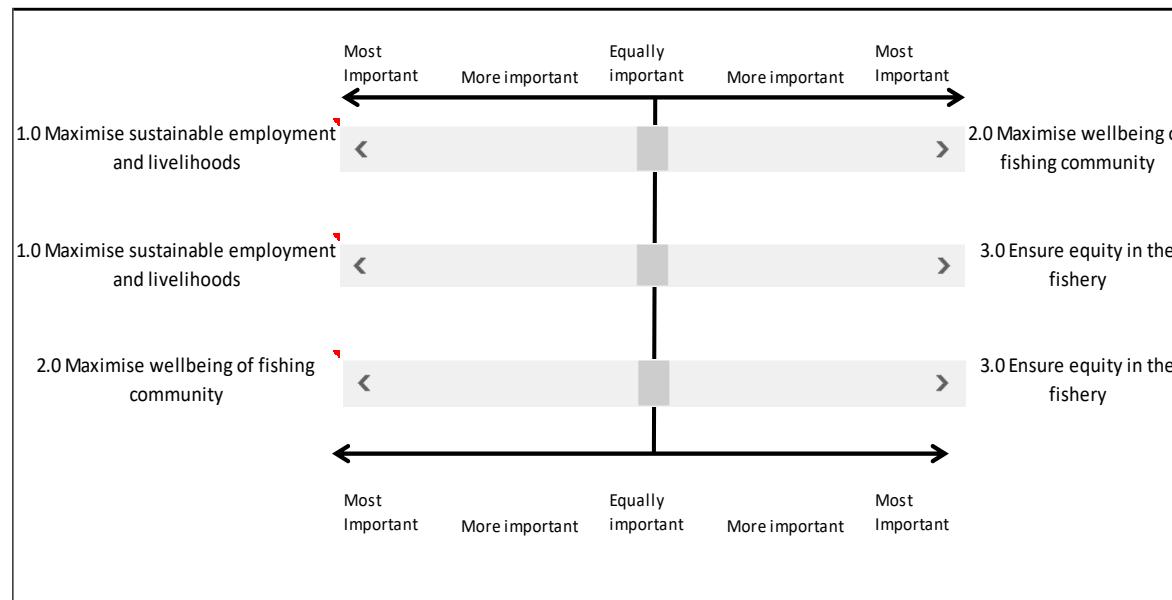


Relative Importance

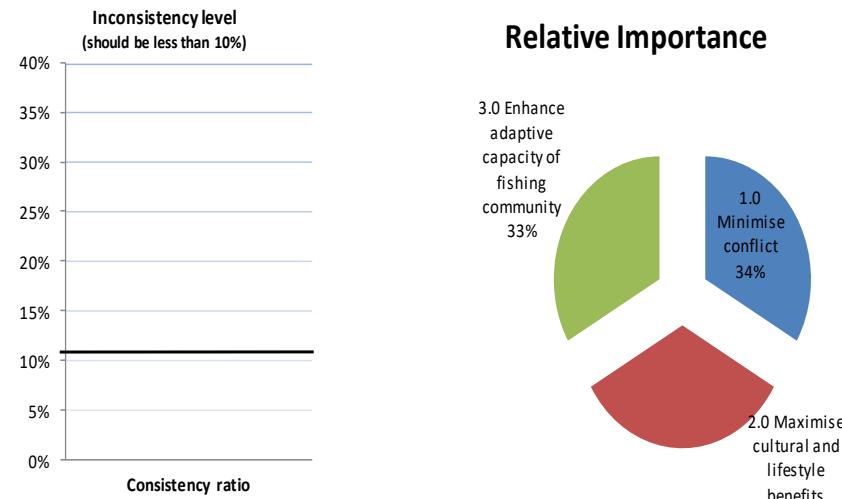
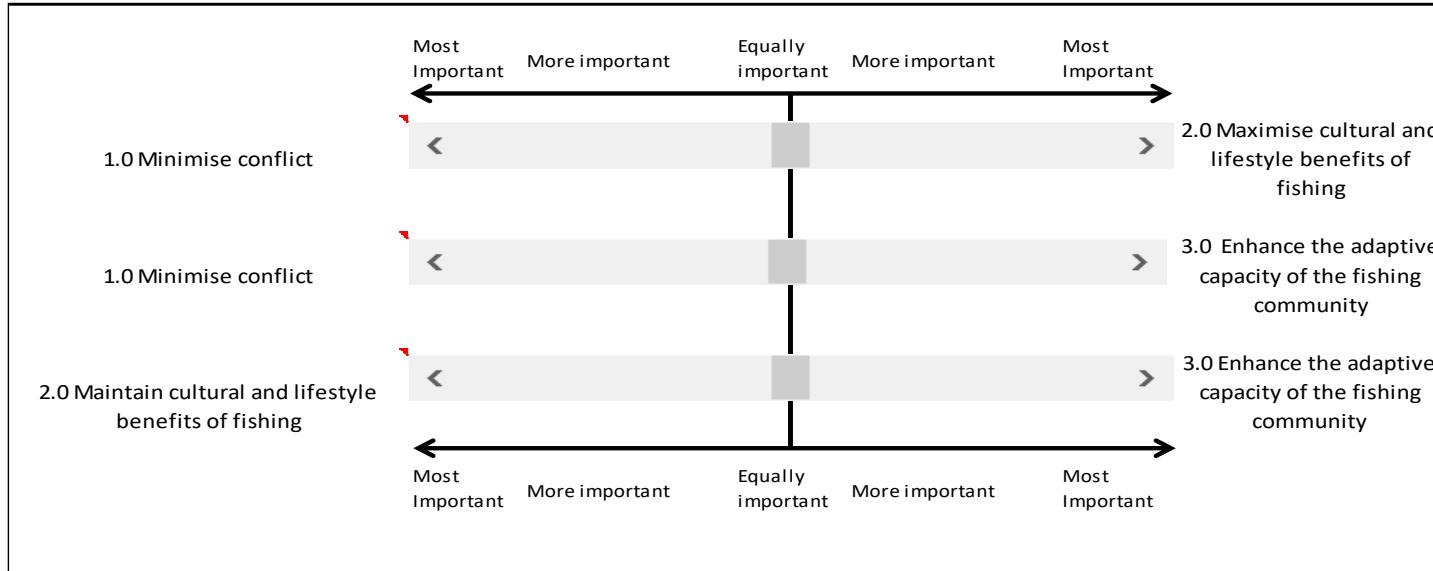


When you have completed this task, please go on the "Max social outcomes" page.

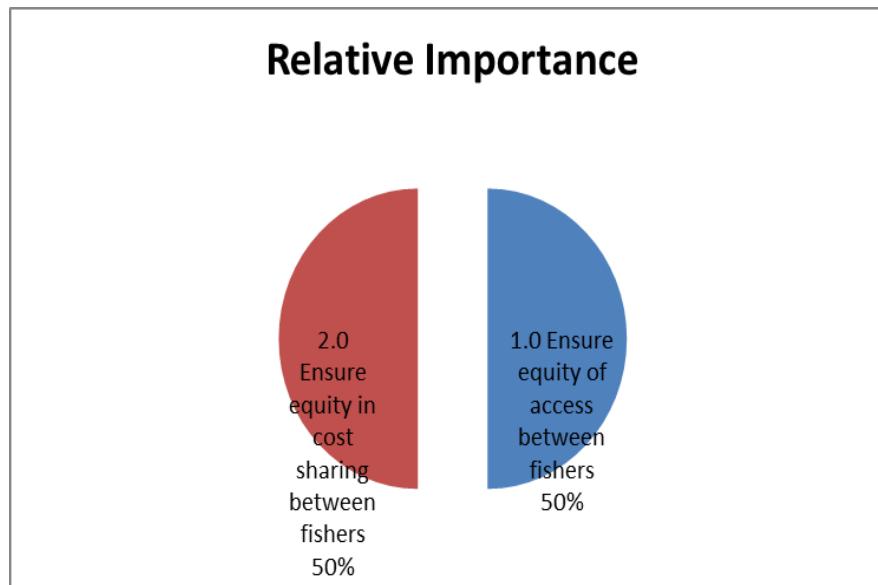
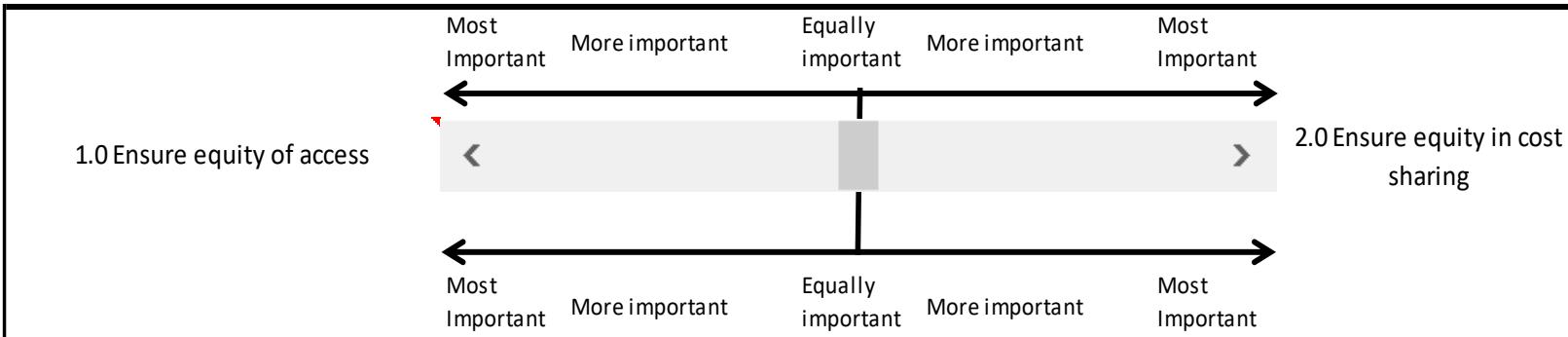
Maximising Social Outcomes



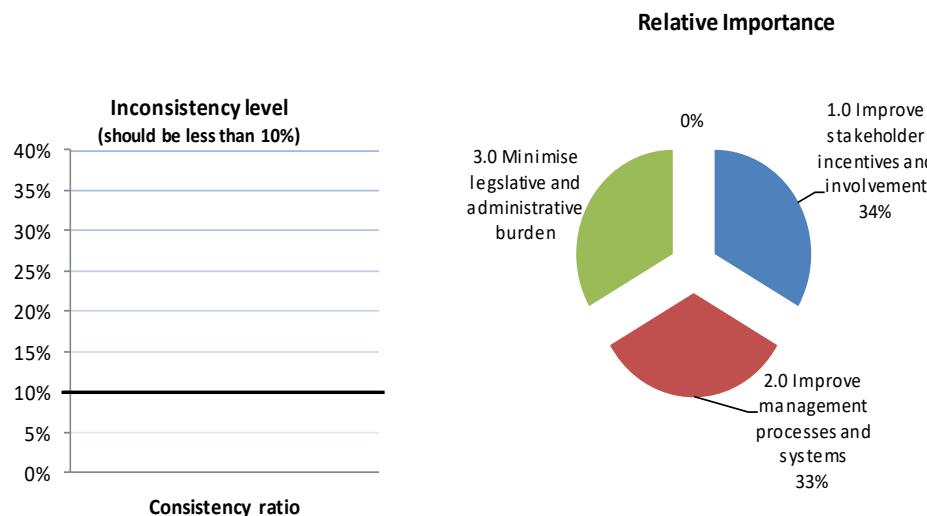
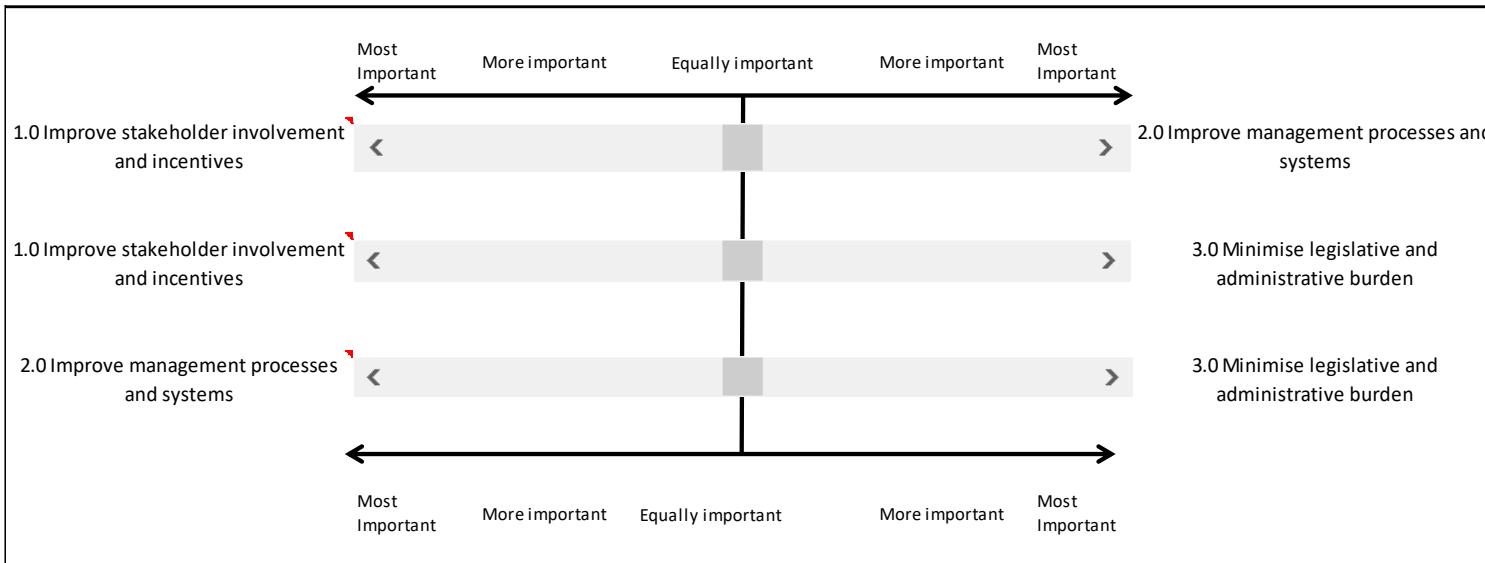
Maximising wellbeing of fishing community



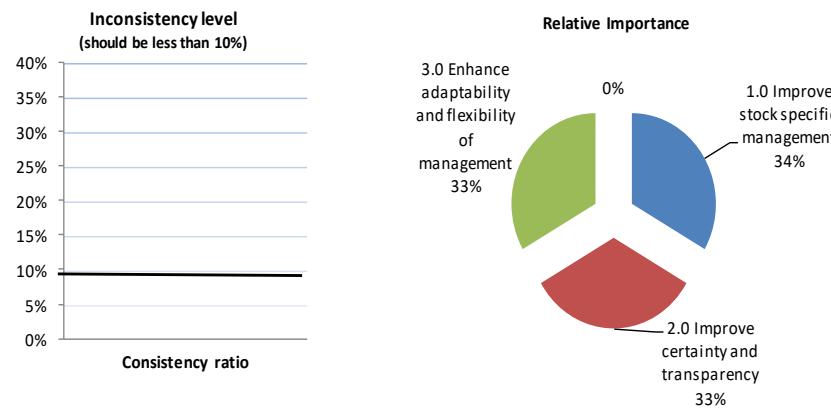
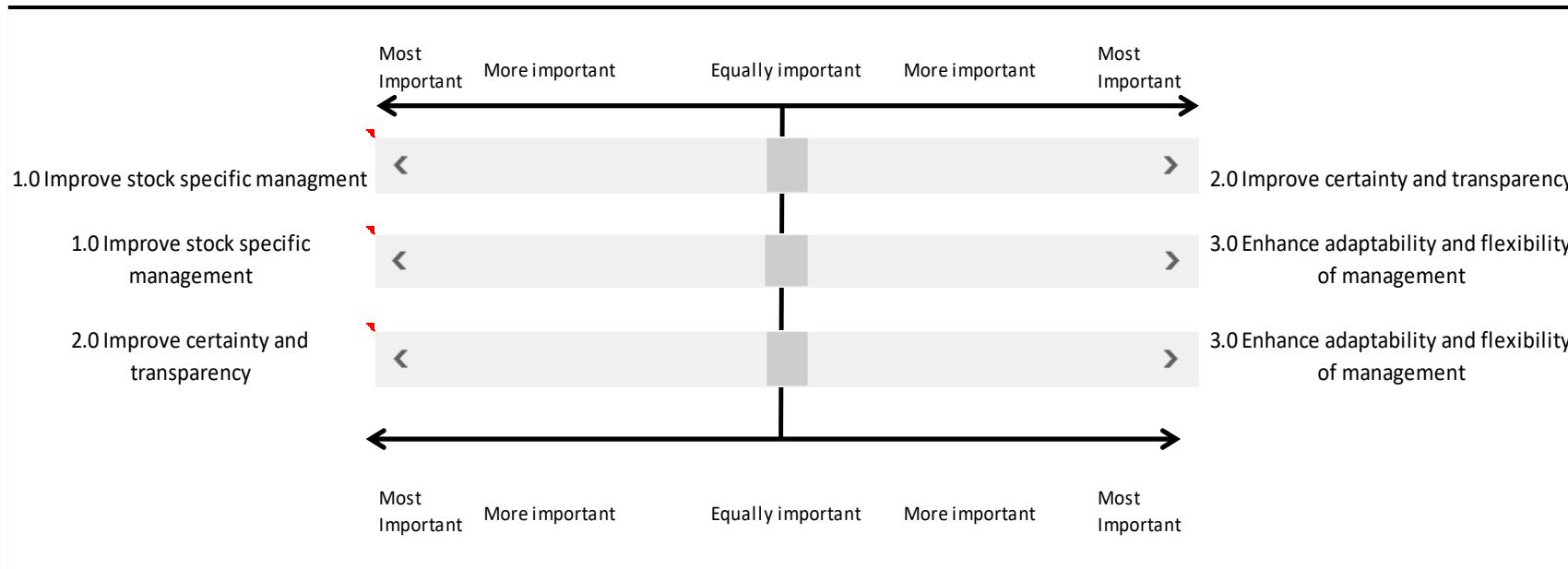
Ensure equity in the fishery



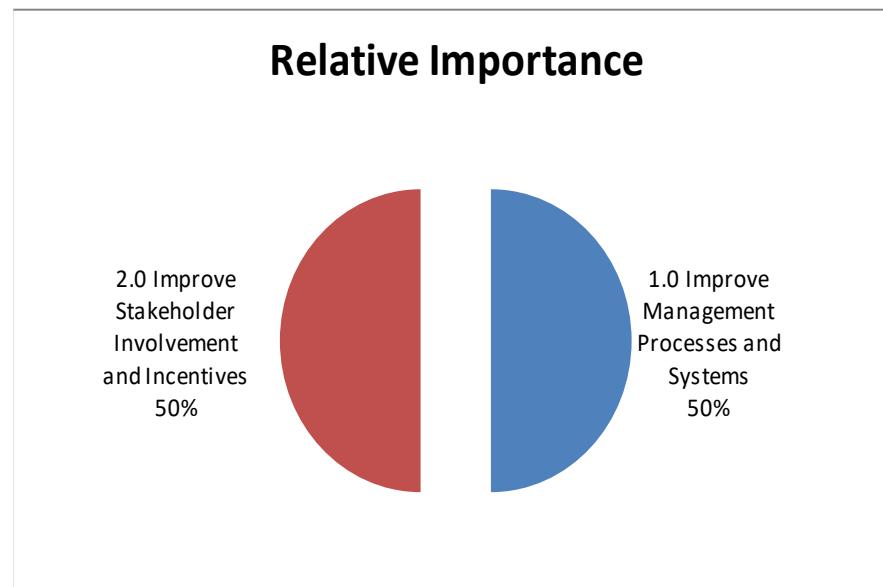
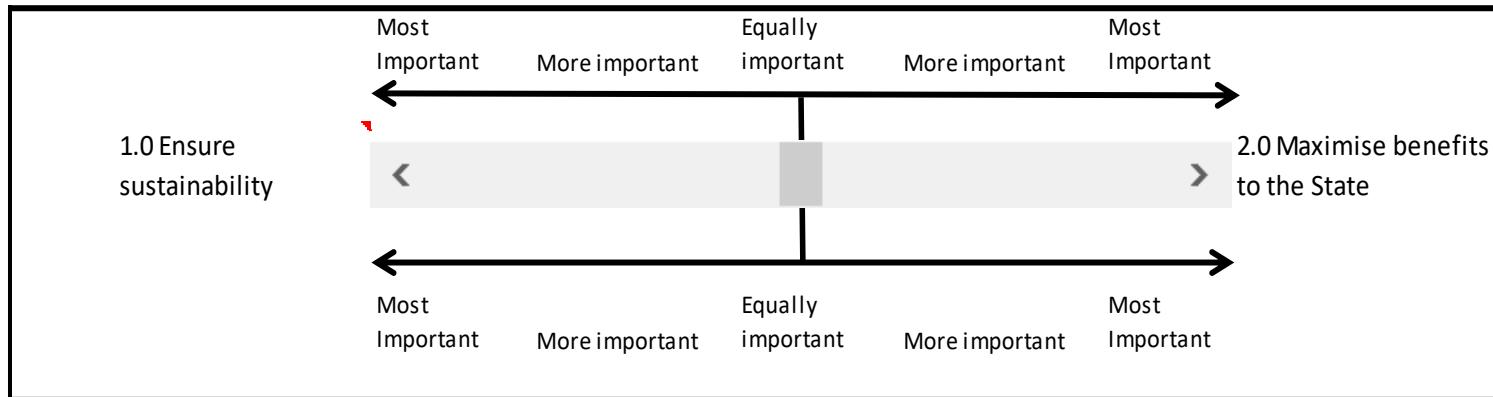
Strengthen Management and Governance



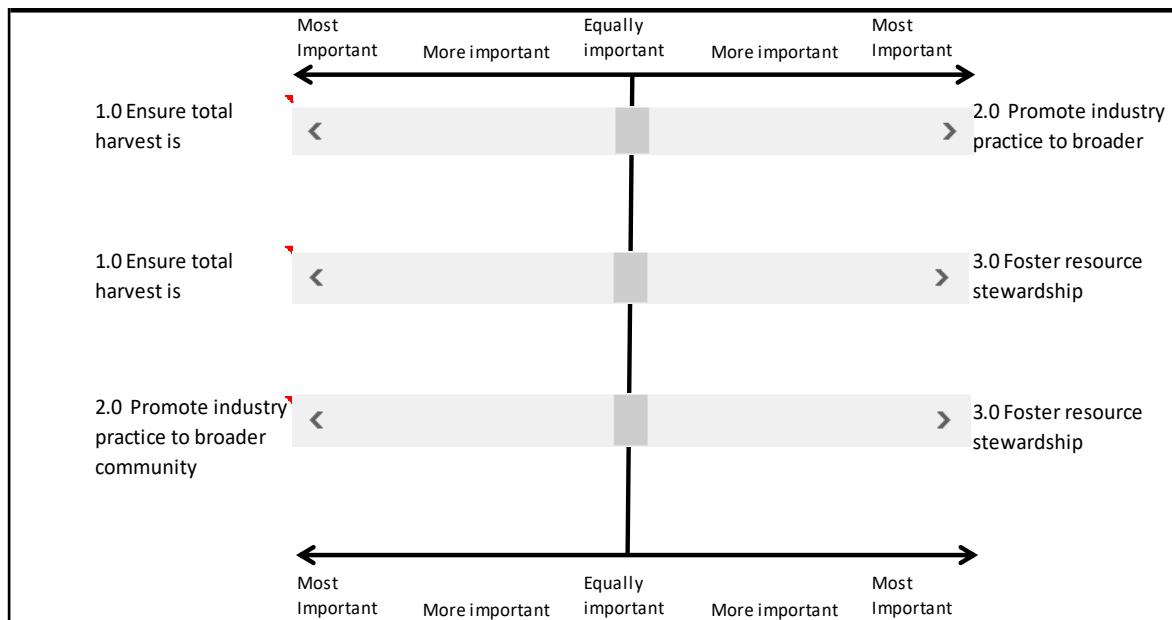
Improve Management Processes and Systems



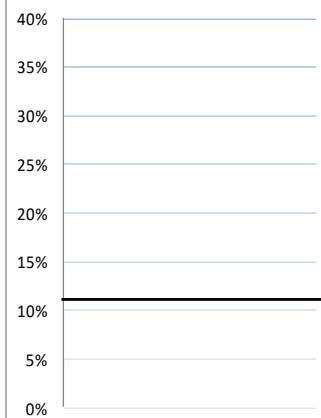
Improve social licence to operate



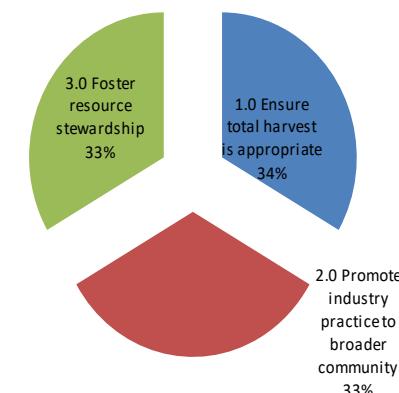
Ensure sustainability



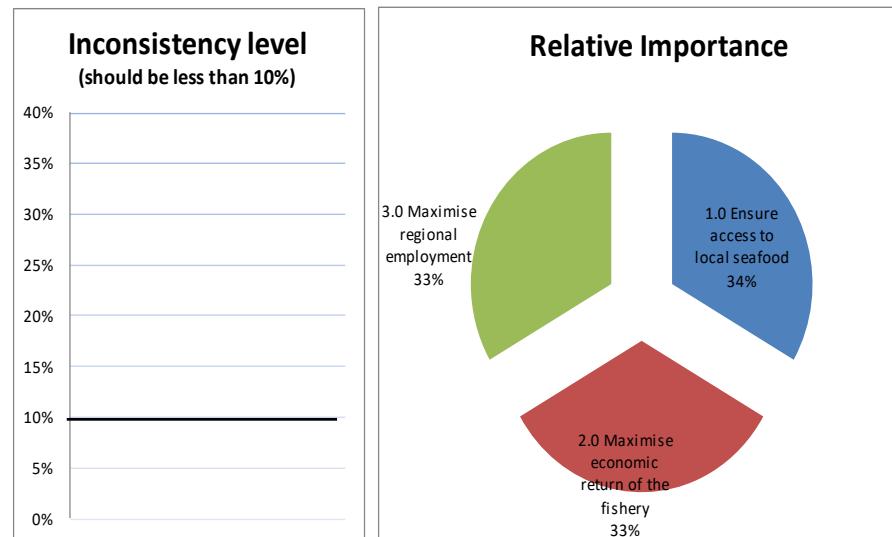
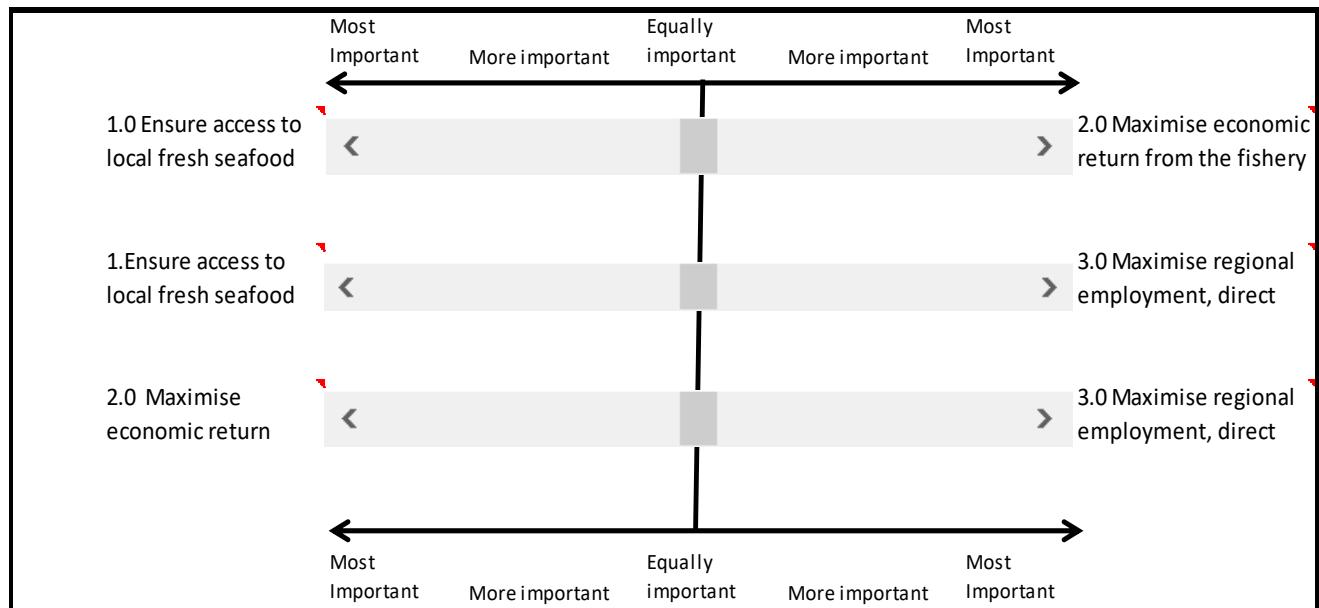
Inconsistency level
(should be less than 10%)

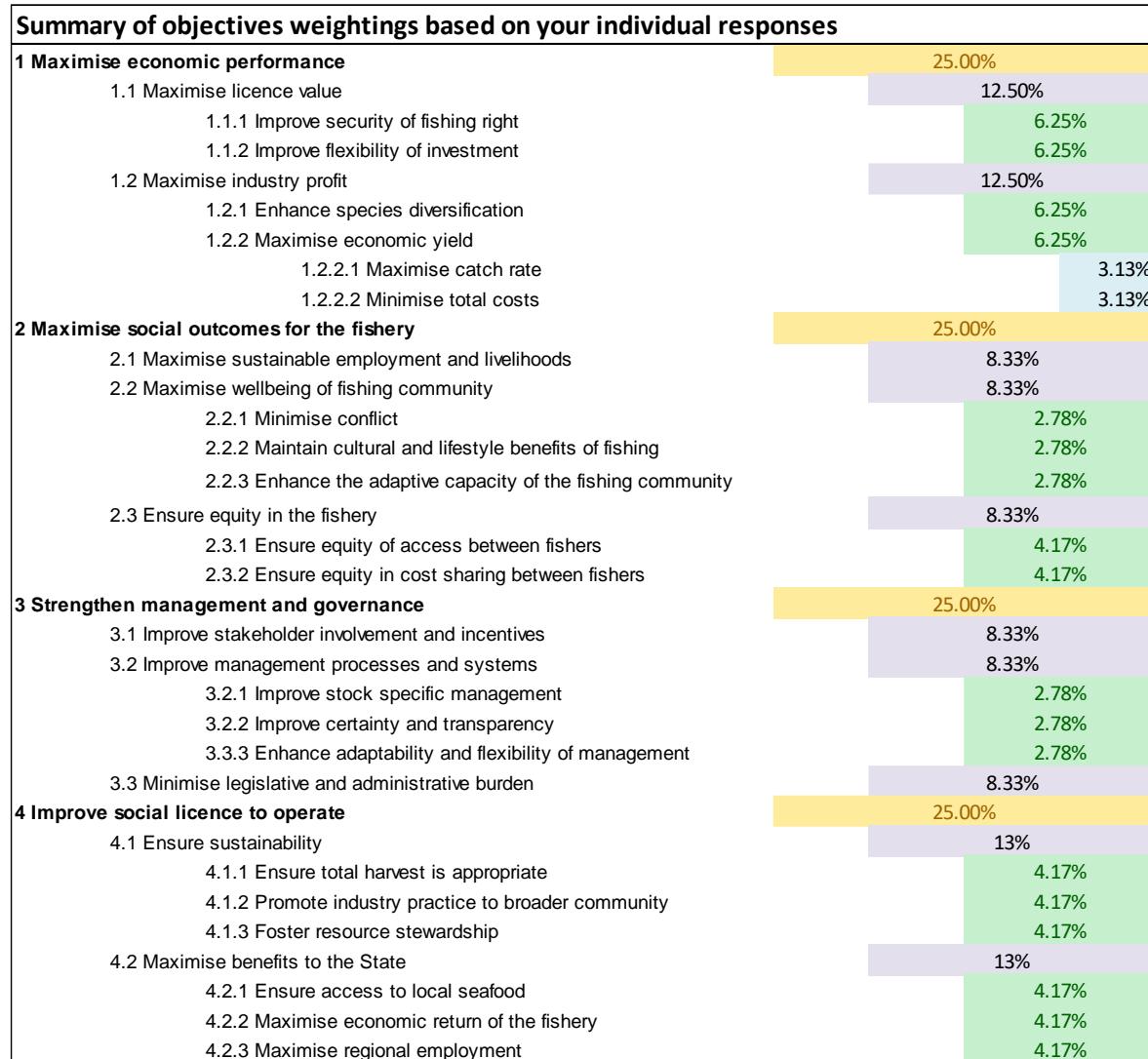


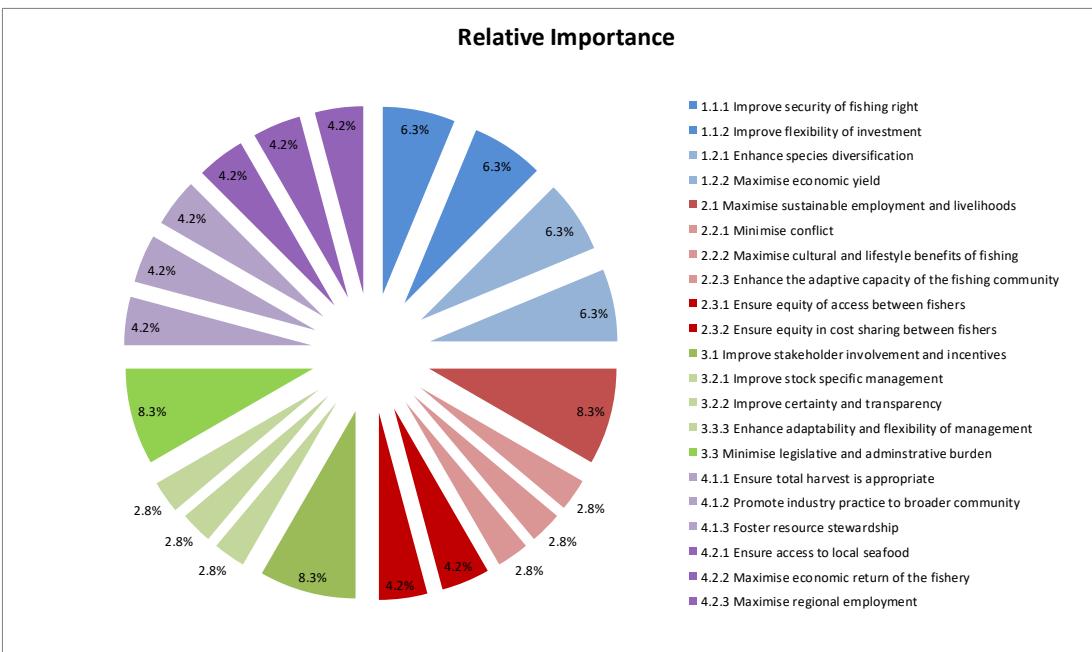
Relative Importance



Maximise benefits to the State







Appendix 5: Hard Copy of Extension Flyer



Your management objectives...

On behalf of the project team, we present to you the outcomes of a FRDC funded project that identified management objectives that integrate socio-economic issues with biological ones for the MFA. This leaflet presents a brief summary of the findings. To download the full report, visit the web site www.msfobjectivesproject.info

*Melissa Nursey-Bray
University of Adelaide
April, 2017*

Background: The MSF has sustained extensive management change over time. Through industry engagement, the MFA found that members wanted the organisation to find better ways to:

1. Incorporate socio-economic objectives into management of the MSF;
2. Help build a more harmonious fishery;
3. Consolidate its social license to operate with the wider community.

We conducted a study to respond to these issues.

How the study was conducted: All MFA members were posted a survey. Members who have an email address were also sent a digital copy. The digital survey was sent to members of the Southern and Northern Rocklobster and Lakes and Coorong Associations. Five regional workshops were conducted and one-on-one interviews were conducted with fishers across the state.

Visit www.msfobjectivesproject.info

The findings: We found substantial agreement that:

1. Governance reform is urgently needed;
2. Economic objectives matter most;
3. Sustainable economies need to be underpinned by environmental condition (as in sufficient stock);
4. That if economic and governance objectives are met, that the social dimensions would follow.

Where there is disagreement within the fishery it pertains to what each group/individual believes is the best and most efficient management strategy.

Based on the thoughts of members, management indicators have been suggested to help the MFA integrate socioeconomic issues with biological ones. A summary is presented below, the full indicator set is presented in the final report that can be downloaded from www.msfobjectivesproject.info.

Governance	Environmental	Social	Economic
Governance is accountable and transparent	Management reflects ecosystem based management principles	Number of fisher families resident in local towns	Increasing/declining catch of each species
Governance involves representatives of all sectors of MSF, including location and species type	Extent of habitat damage resulting from fishing practices	Number of fishers employed full time/part time	Extent of upstream employment (fuel, repairs, business services) and downstream employment (transport, processing and retail)
Governance is resourced	Classification of fish stocks (stock status)	Number of fishers involved in other roles in their local communities	Levels of debt/disposable income
Fishery stakeholders are resourced to participate	Size of stock caught within regulated limits	Number of children from fisher families in local schools	Increase/decrease in fisher numbers of time

Visit WWW.msfobjectivesproject.info

