Australian Government

Australian Fisheries Management Authority

Adaptation of Commonwealth fisheries management to climate change

Heard Island and McDonald Islands Fishery Climate Adaptation Workshop

1-2 May 2023
Hobart, Australia

Contents

1 Introduction

AFMA has been working with CSIRO and FRDC over a number of years to improve our understanding of climate impacts on Commonwealth fisheries. In 2021 the FRDC 'Guidance on Adaptation of Commonwealth Fisheries management to climate change project' was completed, providing key adaptation resources including climate sensitivity analyses for all Commonwealth fisheries and species, and the 'Adaptation of fisheries management to climate change handbook'.

AFMA is working to ensure that climate impacts are routinely and explicitly incorporated into the management of Commonwealth fisheries. Foundational elements of the AFMA Climate Adaptation Program include ensuring that information on climate impacts is provided to RAGs and MACs, Climate and Ecosystem Status Report cards with readily available indicators of ecosystem status and trends are developed, and workshops are held with stakeholders in key fisheries to discuss climate impacts and adaptation options. The Adaptation of fisheries management to climate change handbook ('the Adaptation Handbook'), is being used as the framework for these discussions.

The Heard Island and McDonald Islands (HIMI) Fishery has been identified as a priority fishery for the implementation of AFMA's climate adaptation work. A workshop was held with HIMI fishery stakeholders in March 2020, to inform the development of the Adaptation Handbook. In order to progress discussions on climate impacts and potential adaptation, AFMA convened a Climate Adaptation Workshop for the HIMI fishery, in Hobart in May 2023, with the following objectives:

- Build a shared understanding of current science on existing and predicted climate impacts in the HIMI Fishery
- Progress discussions on operational and management climate adaptation options,
- Identify priority climate adaptation action for the HIMI fishery.

The workshop discussed the latest science on existing and predicted impacts of climate change on Patagonian toothfish and the HIMI ecosystem, changes being seen in the HIMI fishery, and the potential adaptation options for industry and management. This report provides a summary of the workshop discussions and outcomes, and recommends next steps in adaptation of the HIMI fishery to climate change.

2 Workshop Approach

The HIMI Climate Adaptation Workshop involved managers, industry, scientists and other stakeholders (see Appendix A for participant list). The workshop agenda included:

- An update on recent research on climate impacts on the HIMI Fishery, with presentations provided by IMAS and CSIRO,
- Observations from industry on changes in the fishery,
- Mapping of potential climate change impacts on the HIMI Fishery (including a review of outputs from the March 2020 workshop),
- Workshopping industry and management adaptation options, and
- Prioritisation of adaptation options.

The impact mapping and adaptation options sessions used methods and contents from the Adaptation of fisheries management to climate change Handbook (Fulton et al., 2020), which is designed to support stakeholders to assess the risk of climate change to species and identify adaptation actions to mitigate those risks. The Handbook was produced as part of the project Adaptation of Commonwealth fisheries management to climate change (FRDC 2016-059).

3 Workshop Summary

3.1 Update on current science on climate impacts in the HIMI Fishery

A brief overview and preliminary findings from two projects were presented to the workshop:

1. Toothfish Response to Environmental Variability: Climate Impacts Assessment, presented by Stuart Corney (IMAS/UTAS) (the TREV Project)
2. Environmental and ecosystem drivers of catch efficiency within Australia's subantarctic Patagonian Toothfish (*Dissostichus eliginoides*) fisheries, presented by Ryan Downie (CSIRO)

Key points arising from the presentations and subsequent discussion included:

- The Kerguelen Plateau region has experienced long-term warming and an increase in surface kinetic energy in the past 2 decades.
- Changes/variability? in circulation have been detected.
- There remains significant uncertainty in the relationship between Patagonian Toothfish catch (and CPUE) and water temperature.
- A sharp decline in toothfish catch in 2016 coincided with a marine sea surface temperature (SST) heatwave.
- Increased CPUE in recent years indicate that 2016 CPUE was not a decline in stock biomass, but instead reflected a decline in availability.
- Warming waters may also impact on prey availability, sea life, bycatch and depredation rates.
- Availability of prey impacts toothfish distribution and condition.
- There is some possibility that toothfish and/or their prey will benefit from warmer water.
- Initial results of the TREV Project indicate a possible decline in total biomass, catch and mean body mass under future climate scenarios.
- Influx of cold Antarctic sea water below temperatures preferred by toothfish may influence catchability of toothfish.
- While there is potential for new commercial opportunities from bycatch species, they are not currently considered economically viable.
- Climate change is not currently explicitly accounted for in stock assessments, although some influence could be captured in changes to length-weight relationships. There is some potential to incorporate environmental or climatic variables in future stock assessments.

An introduction to the 'Adaptation of fisheries management to climate change Handbook' developed by CSIRO with AFMA and FRDC support, was presented by Dr Jess Melbourne-Thomas (CSIRO). Methods and content from the Handbook were used during the 2020 and 2023 workshops to develop impact mapping and adaptation options.

3.2 Observations of on-the-water changes

Workshop participants, particularly industry representatives and skippers, discussed the changes that they have seen on the water and if/how these correlated with some of the scientific information presented. Points arising from the discussion included:

- Changes in catch rates such as the strong decline in 2016 have been observed, some of which could have been influenced by warming waters and cold water influxes.
- A general decrease in sea ice and icebergs has been observed over time through south HIMI. This could be influencing CPUE and less sea ice could also reduce buffering against winds and increase mixing. Some observations reported of more 'pancake ice'.
- Changes in currents that are influential on the Kerguelen Plateau have been observed.
- Improved seasonal outlook products for the fishery area, including predictions of sea state, would be useful.
- There has been some observed change in the behaviour of some TEP species, with some becoming hungrier and more aggressive depredation.
- Higher fishing effort in a location (e.g. multiple boats fishing consecutively on the same grounds) could also be influencing CPUE.
- Sea lice have been observed to be more abundant at all depths and more widespread.
- Icefish abundance has become more consistent, less boom and bust.

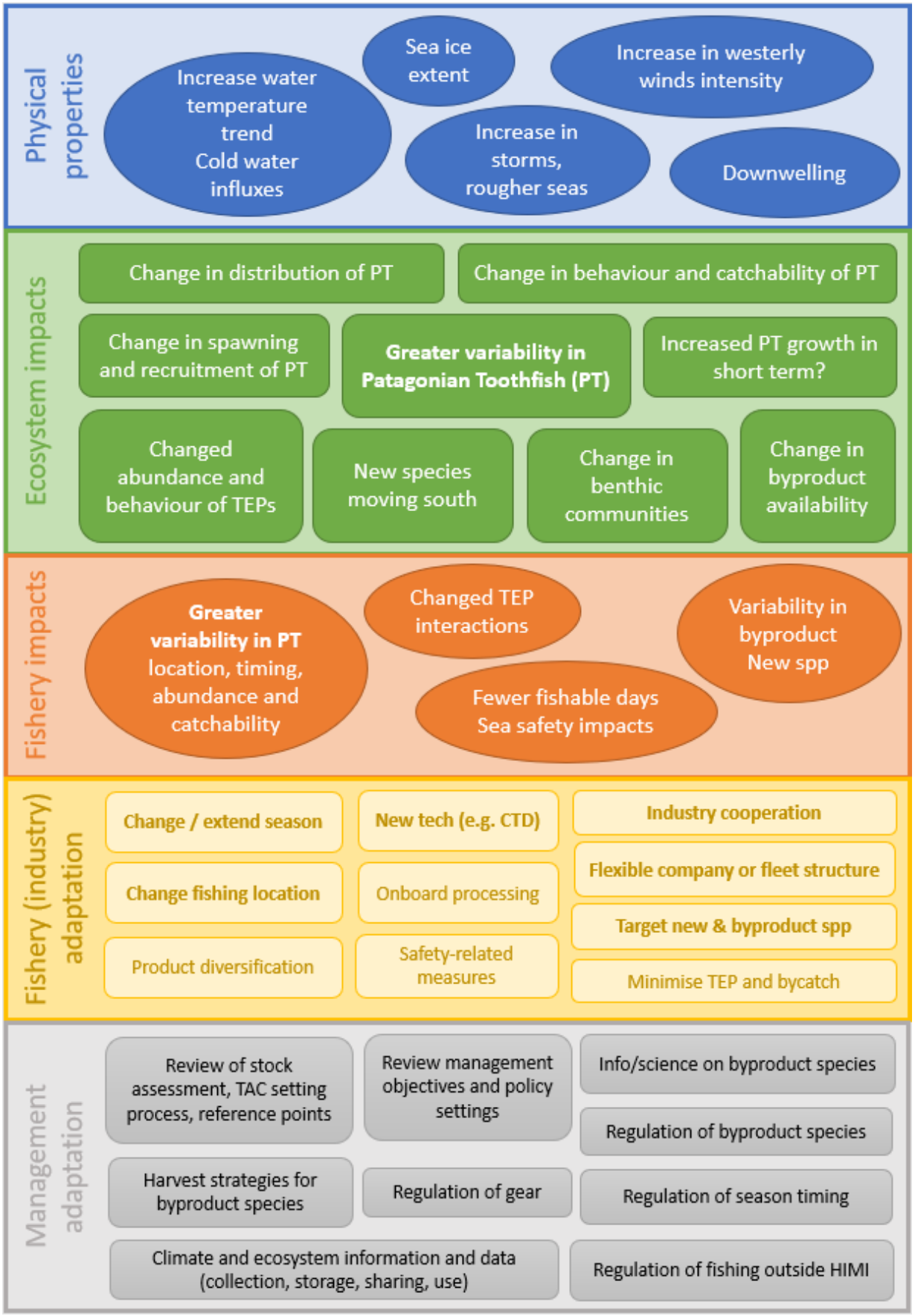
3.3 HIMI Impact Pathways

Building impact pathways is a useful way of capturing a broader understanding of how the system works. This method involves drawing pathways showing the chains of potential impacts of climate change on other parts of the system. Mayne (2015) suggests that drawing impact pathways collaboratively helps workshop participants understand: a) issues related to management and implementation (e.g. how to monitor if an intervention is successful and how to manage interventions adaptively), b) causal links and identify potential unintended links and consequences (evaluate interventions), and c) adequately scale the range of interventions. Diverse views and expertise are important to include in drawing impact pathways as they provide a rich picture of potential interventions and impacts, based on expert opinion of how changes to the environment can influence the fishery. Impact pathways are useful for understanding how changes in the environment can influence the fishery and design adequate interventions.

Impact pathways for the HIMI fishery were developed during the March 2020 workshop, and these pathways were presented to the May 2023 workshop by Dr Melbourne-Thomas.

Participants then reviewed the previously drafted impact pathways against the new information available on climate impacts in the fishery. Some new elements were added and some elements removed or revised, based on new science and information available.

The following components were identified by workshop participants as key system components for inclusion in the impact pathways for the HIMI fishery.


Physical properties
Increase water temperature trend
Cold water influxes
Sea ice extent
Increase in westerly winds intensity
Increase in storms, rougher seas
Downwelling
Ecosystem impacts
Change in distribution of PT
Change in behaviour and catchability of PT
Change in spawning and recruitment of PT
Greater variability in Patagonian Toothfish (PT)
Increased PT growth in short term?
Changed abundance and behaviour of TEPs
New species moving south
Change in benthic communities
Change in byproduct availability
Fishery impacts
Greater variability in PT location, timing, abundance and catchability
Changed TEP interactions
Variability in byproduct
New spp
Fewer fishable days
Sea safety impacts
Fishery (industry) adaptation
Change / extend season
New tech (e.g. CTD)
Industry cooperation
Flexible company or fleet structure
Change fishing location
Onboard processing
Target new & byproduct spp
Product diversification
Safety-related measures
Minimise TEP and bycatch
Management adaptation
Review of stock assessment, TAC setting process, reference points
Review management objectives and policy settings
Info/science on byproduct species
Regulation of byproduct species
Harvest strategies for byproduct species
Regulation of gear
Regulation of season timing
Climate and ecosystem information and data (collection, storage, sharing, use)
Regulation of fishing outside HIMI

3.4 Industry adaptation options

The workshop identified a number of adaptation options available to industry (as listed in 3.2). The workshop discussed a limited number of options in further detail, including the likelihood of implementation of the option (if it were available to industry).

The potential industry adaptation responses identified and discussed by workshop participants included:

- Change / adjust fishing season:

  A later start to the season with a December extension was considered to be easily implementable by industry, if the option were available. However, such a change of season also requires changes to CCAMLR management measures.

- Change fishing location:

  Fishing beyond the current fishery boundary was also considered to be easily implementable by industry if allowed, however again requires changes to CCAMLR management measures.

- Switching species:

  Greater utilisation of byproduct species is possible. Possible options include krill, Antarctic toothfish, icefish, grenadier and skates. Grenadier and Antarctic toothfish are considered the most likely candidates, however quota limits are constraints.

- Investing in new technology:

  The deployment of CTD (conductivity, temperature, depth devices) to collect real time data is already being explored and could lead to increased efficiency as well as data and science improvements. Data confidentiality agreements, storage needs and costs will need to be considered further.

- Fleet structure flexibility:

  Positive collaboration in the fishery already exists, supporting operational efficiency. Additional flexibility could be provided by enabling multi-gear vessels, introduction of new gear and targeting new species. This may require changes to CCAMLR management measures.

Participants identified their individual priorities for operational adaptation, and the timeframe for implementation. This suggested that cumulatively the workshop participants considered the priorities for operational adaptation action were:

Operational adaptation action	**Priority (% of votes)**	**Timeframe for implementation***		
		Short (1 year)	**Medium (2-5 years)**	**Long (>5 years)**
Increase biological sample collection	**1** (35%)			
Invest in new technology (e.g. CTD, Argo etc)	**2** (24%)			

Explore potential later season start (season extension)	**3** (18%)			
Increase fleet structure flexibility / company cooperation	**4** (8%)			
Information dispersal (beyond industry)	**4** (8%)			
Switch / change use of species (e.g. grenadier)	**6** (4%)			
Accessing / sharing climate change information (within industry)	**7** (2%)			
Change location of fishery	**8** (0%)			

** Note: Timeframe for implementation was not identified for all actions or by all participants.*

3.5 Management adaptation options

The workshop identified and discussed a number of potential management adaptation options:

- Investment in innovative research to better understand climate change impacts on diet, trophic relationships and the fishery, including:
  - Climate and ecosystem information and data (collection, storage, sharing, use),
  - Information/science on other species (including stock assessments),
  - Reviewing the sensitivity of stock assessments to climate change,
  - Collaborating with other like-minded fishing nations on science, and
  - Understanding potential shifts in the population and spawning location.
- Review management objectives and policy settings.

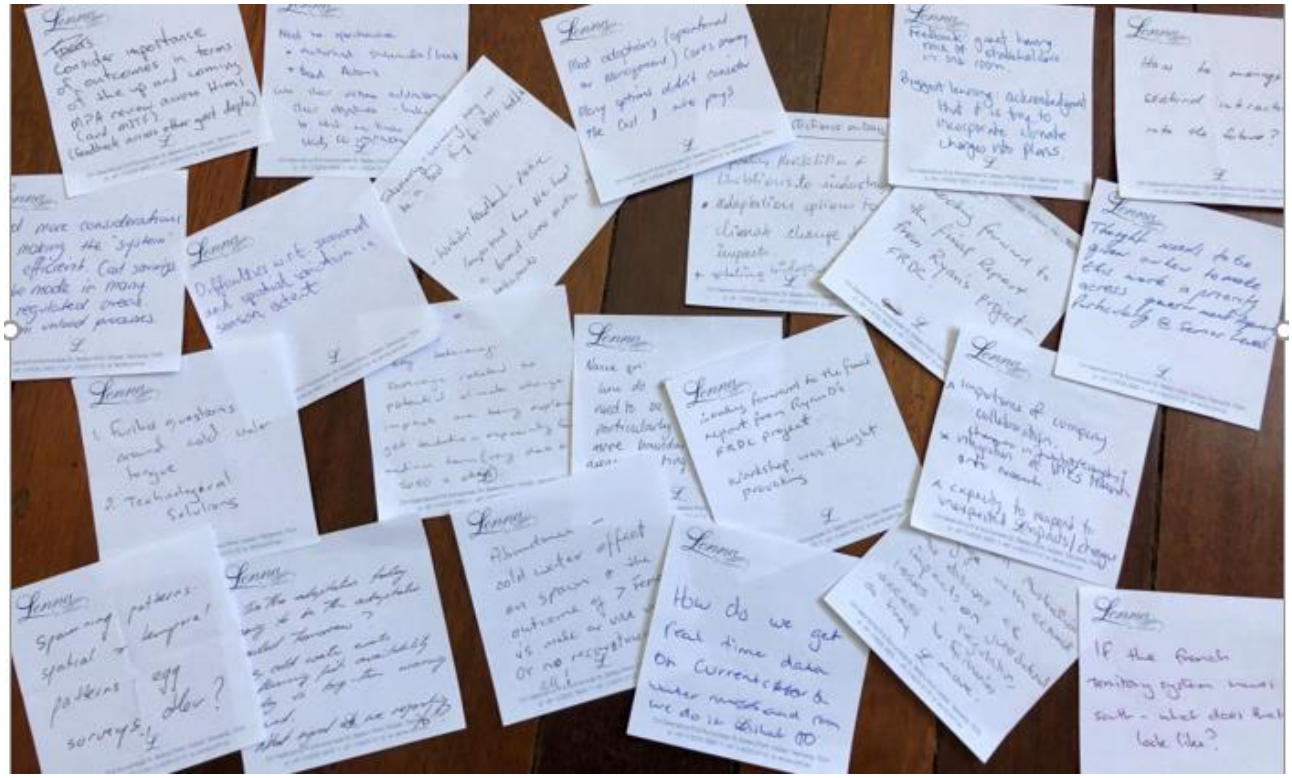
- Reviewing, revising and developing management arrangements to account for climate related shifts, including:
  - Inclusion of climate impacts in all decisions,
  - Improved review and response to climate risk,
  - Development of appropriate regulation of new target species (e.g. grenadier),
  - Review the sensitivity and appropriateness of the harvest strategy and reference points to ensure climate change impacts are accounted for, and develop harvest strategies for other species,
  - Reviewing the regulation of season timing,
  - Regulation of gear to enable greater flexibility, and
  - Reviewing the TAC setting process to ensure climate impacts are accounted for.
- Consider future strategic approach to CCAMLR for the HIMI fishery in light of predicted climate impacts.
- Reviewing domestic and international (IUU) compliance risks.
- Capacity building and information sharing on climate impacts and adaptation across fisheries, regions and RFMOs.

Participants identified what they, individually, thought the priorities for management adaptation were and identified a timeframe for implementation. This activity suggested the following order of prioritisation for management adaptation actions:

Management adaptation action	**Priority (% of votes)**	**Suggested timeframe for implementation***		
		Short (1 year)	**Medium (2-5 years)**	**Long (>5 years)**
Climate and ecosystem reports / forecasts / seasonal outlooks	**1** (27%)			
Data and information in response to climate change, including better real time effort data for management	**1** (27%)			
Review of management including long term management, policy and strategy	**3** (15%)			
Research coordination	**4** (13%)			
Incorporating climate change and uncertainty into stock assessments	**5** (8%)			
Regulation of season timing	**5** (8%)			
Fishing outside HIMI	**7** (2%)	*not identified*		
Grenadier management (science, stock assessment, regulation, harvest strategy)	**8** (0%)	*not identified*		
Gear regulation	**8** (0%)	*not identified*		

** Note: Timeframe for implementation was not identified for all actions or by all participants.*

3.6 Final thoughts, feedback and lingering questions



Workshop participants provided written feedback on the workshop and identified key outstanding questions. The following comments and questions should be considered by scientists and managers for further research and discussion:

- Need to update data and information on biological and life history characteristics.
- What is the effect of colder water (i.e. cold water influxes) and warmer water (i.e. general heating trend) on spawning, recruitment and sex?
- Climate driven changes need to be incorporated into MPA reviews and other regulatory processes.
- Improved understanding of seasonal, spatial and temporal variability needed, including for spawning.
- How to improve real time data on currents and water masses?
- What does the Kerguelen ecosystem look like in the future?
- How will adaptation needs change over time?
- How will climate change be integrated into Australia's engagement in CCAMLR?
- Will seabird interaction management need to change?

4 Next steps for HIMI climate adaptation

The HIMI Climate Adaptation Workshop provided an opportunity for important discussions between industry, scientists, managers and others, on the existing and potential impacts of climate change and what adaptation in the HIMI fisheries might look like. The informal environment enabled the linking up of ideas, observations and research, bringing together knowledge from across different stakeholders.

Importantly ideas to refine, advance and align research were presented, operational adaptation options were aired and management adaptation actions were identified.

Workshop participants highlighted the following:

- The need to move from motherhood statements on climate adaptation to tangible operational action,
- The importance of incorporating climate change into management and regulatory frameworks, as well as stock assessments,
- The need to expand collection of biological samples and environmental data to inform research and improved understanding of climate influences and future impacts, and
- The benefit to operations and management of improved environmental monitoring and forecasts in the area of the fishery.

Next steps for implementation of climate adaptation action in the HIMI fishery could include:

- Communication of existing and predicted climate impacts on the HIMI fishery by workshop participants and associated organisations,
- Consideration of the workshop outcomes by SARAG,
- RAG and MAC integration of workshop considerations and outputs into research prioritisation and management decisions,
- Clarification of the cost of adaptation options, and
- Identification of agencies and organisations responsible for implementation of priority management adaptation options, and integration of those adaptation options into organisational priorities and planning processes.

Appendix A - Workshop participants

Alice McDonald (facilitator)	AFMA
Brad Milic	Australian Longline Fishing
Bruce Wallner	SARAG Chair
Cara Masere	AAD
Claire Wallis	AFMA
Dale Maschette	IMAS
Danait Ghebrezgabhier	AFMA
Heather Johnston	DAFF
Heather Patterson	ABARES
Jess Melbourne-Thomas	CSIRO
Lyn Goldsworthy	SouthMAC Member
Malcolm McNeill	Australian Longline Fishing
Marty Johnson	Australian Longline Fishing
Michael	Australian Longline Fishing
Noel	Australian Longline Fishing
Peter Oke	CSIRO
Phil Ziegler	AAD
Pia Bessell-Browne	CSIRO
Rachel Baird	SouthMAC Chair
Rhys Arangio	Austral Fisheries
Rich Hillary	CSIRO
Ryan Downie	CSIRO
Sally Carney	AAD
Selina Stoute	AFMA
Stuart Corney	IMAS
Tim Ward	SARAG Member