Annex 4

Report of the Chair of the Scientific Committee
on the CCAMLR Scientific Committee Symposium
(Virtual Meeting, 8 and 10 February 2022)

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Abstract

The Chair's report on the Scientific Committee Symposium was developed following the meeting and submitted for comment to the intersessional working groups (WG-ASAM-2022, WG-SAM-2022 and WG-EMM-2022). Due to the time constraints of virtual meetings the comment period was extended to the Scientific Committee Symposium e-group. This report does not include comments from WG-IMAF-2022 or WG-FSA-2022 as these will be provided by those working groups directly to the Scientific Committee. The next steps identified in Section 6 were completed. Comments received are included in this revised version of the report directly and in Appendix A. We look forward to SC-CAMLR reviewing this paper and drawing from it to adopt its second 5-year strategic workplan at SC-CAMLR 41.

1. Opening of the meeting and rationale

1.1 The CCAMLR Scientific Committee Symposium met virtually using the Interprefy platform on 8 and 10 October 2022, and was chaired by Dr D. Welsford (Australia) and supported by the CCAMLR Secretariat. Scientists from 22 Members, one Acceding State, and Observers from the Association of Responsible Krill harvesting companies (ARK), the Antarctic and Southern Ocean Coalition (ASOC), the Coalition of Legal Toothfish Operators (COLTO), the International Union for the Conservation of Nature (IUCN), the Scientific Committee on Antarctic Research (SCAR), and the Scientific Committee on Oceanic Research (SCOR) attended the Symposium.

1.2 At the opening of the meeting, Dr Welsford welcomed and acknowledged more than 124 attendees and noted that this meeting was an informal meeting to discuss progress and outcomes from the first CCAMLR Scientific Committee's workplan (SC-CAMLR-XXXVI/BG/40). The meeting was also to provide an opportunity for participants to propose long-term priorities and strategies to inform the development of the next five-year strategic plan of the Scientific Committee (2023–2027). Accordingly, this report is not an adopted report, but is a summary by the Chair for the consideration of the working groups and the Scientific Committee. The intent is that the recommendations and plans outlined below will be refined during the intersessional period and agreed at SC-CAMLR-41 according to the Scientific Committee Rules of Procedure.

1.3 The Chair introduced the rationale and scope of the symposium as outlined in SC CIRC 22/13 to review and develop priority work items for the 2023–2027 period, and noted that the Symposium was arranged into the following agenda items to facilitate discussion:

(i) Review of implementation of the Scientific Committee's 2017–2021 five-year Strategic Plan
(ii) Priorities for scientific research and advice over the next five years (2023–2027)
(iii) Processes and mechanisms to deliver strategic work and advice
(iv) Next steps.

2. Review of implementation of the Scientific Committee's 2017–2021 five-year Strategic Plan

2.1 The participants considered SC-Symposium-2022/05 and welcomed this collation of the Scientific Committee's tasks over the last five years by the Secretariat, the Scientific Committee Chair and the working group conveners. It was acknowledged that a considerable body of the workplan included within SC-CAMLR-XXXVI/BG/40 has been achieved across all six themes identified in the first five-year plan. While most tasks had been completed or progressed, about 20% of these were judged by the authors to have made little to no progress. Symposium attendees identified diverse factors that contributed to hindering progress on these tasks, including:

(i) the large list of tasks

(ii) the scope required to address particular issues (e.g. some felt that the large amount of time and effort invested in the krill management procedure had come at the expense of other areas of work, such as the review of the CCAMLR Ecosystem Management Program (CEMP))

(iii) a lack of criteria for evaluating the effectiveness of the implementation tasks/topics

(iv) a lack of clear requirements for formation of tasks/topics outcomes

(v) a lack of clear identification of who was facilitating a particular work stream

(vi) the prioritisation of more time-critical topics including ad-hoc requests from the Commission

(vii) effects of the Covid-19 pandemic.

2.2 The Symposium noted that the lack of progress on some tasks may hinder the progress on others. In looking to the future, an approach that prioritised addressing tasks that had high level of interdependency with other parts of the work plan could avoid delaying progress in other areas.

2.3 It was further noted that as is typical with scientific research, various items in the workplan had evolved from their original scope, with the need for new tasks and outputs being identified as work progressed. (e.g. the relatively swift progress towards using krill fishing vessels as monitoring platforms meant that some tasks identified in the 2017–2021 workplan became redundant). Given this dynamic approach, participants endorsed the need to ensure that future workplans are 'living documents' that allow for regular updating, evaluation and refinement as scientific progress and management requirements evolve. Some noted that there is still a lack of standardisation in data collection and processing, and most notably in krill surveys. It was also noted that some achievements were not utilised to progress other parts of the workplan (e.g. recommendations of the Scientific Committee on Antarctic Research (SCAR) Krill Action Group (SKAG), 2019; the Integrating Climate and Ecosystem Dynamics in the Southern Ocean (ICED) workshop April 2018).

2.4 Noting that reviewing past performance was beneficial for future planning, the Symposium considered the possibility of SC-CAMLR establishing a process to conduct more regular reviews of its strategic plan. This would allow the Scientific Committee to take the most current information into account when discussing future work.

2.5 Participants noted the invaluable role of the SC Bureau since its inception and re-endorsed the coordination process carried out by this group. They agreed that it could have a role in conducting annual progress reviews. They also noted the need to balance the frequency of reviews, which could take resources away from actually addressing priority work, and the benefits of having plans updated more regularly.

2.6 The Symposium noted that such periodic reviews were valuable for internal planning and review purposes, but also for communicating the work conducted by the Scientific Committee to the Commission and other external bodies. It was also noted that such reviews could also assist Members with explaining to research institutions and funding agencies what CCAMLR priorities were, and where and when they might best contribute, and hence increase the likelihood of Members being able to find additional resources to address these priorities.

2.7 The Symposium considered the importance of maintaining regular review and tracking on programs which contribute both to internal CCAMLR procedures (Scheme of International Scientific Observation (SISO), tagging), as well as those that also have an external focus (CEMP, marine debris).

2.8 Participants also recognised the value of contracting an external party to undertake performance reviews of SC-CAMLR (similar to the performance reviews of the CAMLR Commission, but with a focus on delivery of scientific advice) and/or programs of scientific work conducted by the Scientific Committee (particularly noted for SISO). It was noted that external reviews would foster accountability in the Scientific Committee to its agreed priorities and procedures, potentially introduce innovative approaches, and increase transparency.

3. Priorities for scientific research and advice (2023–2027)

3.1 Papers and SC CIRCs submitted to the meeting identified a number of high-priority work topics to progress as well as mechanisms to assist in the implementation of the strategic plan (SC-Symposium-2022/01, /03, /04, /06 and /08 and SC CIRCs 22/09 and 22/15). The Symposium identified strategic work topics to progress in Table 1 focusing on further development of an ecosystems approach to fisheries and themes which would improve the processes for developing the work of the Scientific Committee.

3.2 The discussion focussed on two types of needed planning. Firstly, defining detailed tasks for the working groups to prioritise in order for the Scientific Committee to provide advice that contributes towards achieving CCAMLR's objective. These items are compiled in Table 2, with the working groups involved indicated. Secondly, cross-cutting themes were identified that the Scientific Committee could implement to improve its processes and therefore speed up progress.

4. Cross-cutting themes

4.1 While considering the cross-cutting topics listed in Table 1, the Symposium discussions were along three general themes:

(a) Improving science capacity and capability

(i) *Budgeting*. The Symposium noted the need for discussions with the Commission regarding the allocation of funds to support the work of the Scientific Committee. Resources available to conduct SC-CAMLR science are limited and decreasing and were unlikely to substantially increase over the next five years unless new mechanisms to build capacity and find/fund further resources are developed. It discussed the need for a routine allocation of funds to SC-CAMLR to enable it to plan for longer-term and more strategic tasks. It noted that the current practise of annual requests for funds to the Commission, where decisions are made after the Scientific Committee has concluded it business, can lead to delays in implementing agreed initiatives. For example, after being agreed in the Scientific Committee, the Commission may request more information or discussion of alternatives, leading to at least a one-year delay.

(ii) *Secretariat support*. The Symposium noted that to support the large and growing information and technical needs of the Scientific Committee in the coming period, the Secretariat may need to hire more staff or seek mechanisms to acquire additional capacity to support priority work such as managing acoustic datasets.

(iii) *Mentoring newcomers to CCAMLR*. The Symposium discussed the possibility of establishing a process to facilitate the introduction of new scientists to the complex CCAMLR world (e.g. goal-oriented mentoring by experienced CCAMLR scientists, assigning them as working group conveners' support, or with mentors prior to and during meetings).

(iv) *Science communication*. The Symposium identified several actions to improve communication both internally and externally, including:

(a) creation of a repository of CCAMLR scientists (a 'who's who', with names, expertise, bibliography) to facilitate communication between CCAMLR scientists and external scientists

(b) development of scientific syntheses across SC-CMALR work such as an Intergovernmental Panel on Climate Change (IPCC)-style report on the 'State of the ecosystem' in the Convention Area, which would benefit from collaboration with the International Union for the Conservation of Nature and Natural Resources (IUCN) and SCAR

(c) development of webpages for each working group on the new website to help organise and communicate their work to Members and interested public

(d) development of ways to improving science communication in general to provide transparency, attract new scientists and improve the integrity of SC-CAMLR's processes and advice.

(v) *Coordination with related organisations.* The Symposium noted the value in collaboration and targeted communication of CCAMLR science into other forums involved in ocean conservation and the Antarctic region. For example, it recalled the role played by SKAG in bringing in the expertise of krill scientists not typically engaged in SC-CAMLR in developing revised krill management approaches, and the work with the Committee for Environmental Protection (CEP) and SCAR to better understand climate change implication for the Antarctic ecosystem.

The Symposium considered SC-Symposium-2022/07, which described the importance of cetacean science to the work of CCAMLR, and the importance of CCAMLR working with the scientific expertise in the International Whaling Commission (IWC), particular to help understand the impacts of direct whale interactions with CCAMLR fisheries, as well as the implications of changing whale populations for conserving krill. It noted key topics for collaboration which applied across multiple working groups and the need to ensure the appropriate expertise was available for topics such as developing the krill management approach, minimising incidental mortality, the development of ecosystem models, and understanding the role of climate change on marine mammals.

The Symposium noted that the elements that had led to the success of previous collaborations between SC-CAMLR and the IWC could be generalised to other collaborations, including:

(a) identifying specific individuals for the task of facilitating collaboration

(b) SC-CAMLR providing clear guidance on the focus for the collaborative work.

The Symposium noted that clarity on SC-CAMLR priorities, and clear pathways for engaging with SC-CAMLR, were essential for improving coordination and integration with external organisations.

(vi) *Diversity and inclusion*. The Symposium recognised the benefits of diversity and inclusion in improving representation, perspectives, experiences and cultural contributions to the work of the Scientific Committee and encouraged Members to further support and develop this aspect of their scientific capabilities, and bring forward suggestions for improving diversity and inclusion in all aspects of SC-CAMLR work.

(vii) *Career development*. The Symposium noted the benefits of providing scholarship and integration opportunities for early- and mid-career scientists in the work of the Scientific Committee and recommended to continue developing and expanding these opportunities through internships, scholarships, funding grants for high-priority work topics, and involvement of CCAMLR scientists in communication and outreach activities.

(b) Communication with the Commission

(i) *Communicating differences in scientific opinions*. The Symposium agreed that it was an issue of great concern that was hindering scientific progress. Addressing it was of crucial importance to ensure scientific independence and effective provision of scientific advice to the Commission. It noted that 'scientific opinion' was a problematic concept, that the Scientific Committee needed to focus primarily on articulating and resolving differing 'scientific interpretations'. It was noted that this issue was not unique to SC-CAMLR, and that other forums had shown that this could be addressed through a process involving external expert review of the scientific method, data and analysis that had been undertaken to arrive at a particular scientific interpretation. The Symposium noted that devising a clear and effective process was urgently needed, as impasse in the Scientific Committee increased the risk of failure to achieve the objective of the Convention.

(ii) *Regulatory framework review*. The Symposium noted the need for clear descriptions of fishery classifications to initiate a framework review and considered it an urgent matter. It was noted that the Commission had tasked the Scientific Committee Chair and the Commission Chair to undertake a review, however, noted that SC-CAMLR should be focused on the scientific elements of the regulatory framework, such as what assessment methods and data are needed to determine the status and risks to fished stocks and dependant and related species.

(iii) *Climate change and spatial management*. The Symposium noted that climate change and spatial management are cross-cutting themes and considered that a joint Scientific Committee–Commission symposium may be a useful venue for discussion to progress these issues.

(c) Coordinating information from the working groups

(i) *Facilitators*. The Symposium noted the importance of assigning a facilitator to certain tasks (SC-Symposium-2022/04), noting the success of such a defined role in regard to, inter alia, the krill management approach. The default facilitator would be one of the Scientific Committee Representatives, and any such roles would need to be clearly defined and behave according to the Scientific Committee's Rules of Procedure. For long-term tasks such as reporting on CEMP, the Symposium noted that the Secretariat may be a suitable facilitator to ensure consistency through time. It also noted that tasks requiring coordination across working groups would benefit the most from a facilitator (e.g. climate change program) working together with the CCAMLR Secretariat and the SC Bureau to implement the Scientific Committee Strategic Plan.

(ii) *Terms of reference for working groups*. The Symposium noted the need to review the terms of reference of working groups (SC-Symposium-2022/06, Annex II), particularly the less recent ones as they needed updating to realign with current priorities and practices. It noted that such a task could be usefully undertaken by the working groups this year when considering the draft strategic workplan.

(iii) *Project management*. The Symposium considered the need for establishing objective criteria or metrics to measure task progression (SC-Symposium-2022/01). The Symposium noted the need to track and review progress on tasks within and between working groups, as well as within CCAMLR data collection programs, and the potential role of the SC Bureau or external reviewers in coordinating this process (see also above). The clear description of expected outcomes and tracking progress of completing tasks was also deemed important for the communication of the Scientific Committee's work.

(iv) *Performance of data collection programs*. Considering the main CCAMLR science programs (CEMP, SISO, tagging, marine debris), the Symposium noted that while progress had been made on some of these programs, more effort was required to keep the Scientific Committee informed on their current performance (in particular regarding CEMP given its potential utility in the krill management approach). Therefore, the need for a review of CEMP's standard monitoring objectives and methods was highlighted, especially given the importance of non-CEMP species such as fish and whales, in the krill management approach.

(v) *Performance review*. The Symposium noted the need to address remaining recommendations from the second performance review (CCAMLR-XXXVI/01; SC-CAMLR-XXXVII, paragraph 13.16; SC-Symposium-2022/06, Annex III), noting that some of the recommendations above would assist in this regard.

5. Rules for data access and use

5.1 The Symposium considered SC-Symposium-2022/02 and noted that while the Rules for Access and Use of CCAMLR Data (hereafter 'the Rules') apply to 'All data submitted to the CCAMLR Secretariat, and maintained by the CCAMLR Data Centre', it is unclear whether data shared between Members through the e-groups or the marine protected area (MPA) baseline data which are shared through the CCAMLR MPA Information Repository (CMIR https://cmir.ccamlr.org/) are governed by the Rules. It noted that CCAMLR's approach to data accessibility should be 'as open as possible but as closed as necessary'. It therefore noted that it may be useful to identify different categories of data held by CCAMLR, and that the rules of access could be more or less strict depending on the sensitivity of the data holding (e.g. vessel monitoring system (VMS) or fine-scale catch and effort data may need more conditions for release as opposed to other data).

5.2 The Symposium considered whether the current data request procedure in which the absence of a reply after a three-week period is taken as consent to release data is in accordance with the Rules and noted that the Rules need to be updated to allow for efficient use of data for CCAMLR purposes. It further reflected that if the length of the data request procedure would be reduced to two weeks, a system of redundancy should be established to allow an Alternative Scientific Committee Representative to approve data releases when the Scientific Committee Representative is not available.

5.3 The Symposium noted that it could be beneficial for CCAMLR to establish a metadata catalogue to help researchers understand the types of data held or used by CCAMLR. This would aim to document all datasets maintained by the CCAMLR Secretariat as well additional datasets which may be useful for CCAMLR work, but are not maintained by the Secretariat. Datasets in this catalogue could be identified with a DOI and the catalogue could specify for each dataset how they can be accessed, and which rules apply to them. The Symposium considered whether the level of access and the expected use of data should be specified at a record level inside the CCAMLR database and welcomed collaboration with Members on how this could be developed.

5.4 The Symposium reflected that while there are good reasons that recent data and papers should be confidential, those reasons may no longer apply after a certain number of years. Noting that CCAMLR is now 40 years old, in many cases longer than the careers of CCAMLR scientists, there was considerable merit in developing a rule to release papers that are older than, say, 25 years.

5.5 The Symposium reflected on whether CCAMLR data should be made available solely for work conducted by the working groups and the Scientific Committee and noted the increasing number of requests to use CCAMLR data for analyses to be published in peer-reviewed journals, without being presented to the working groups. The Symposium noted that the Rules allow the data owners and requesters to agree conditions under which data would be released and for the data owner to refuse publication in the public domain if they feel those conditions have not been adhered to. The Symposium considered whether it should instate a procedure to detect and address lack of compliance with the Rules.

5.6 The Symposium noted that Observers attending e-groups and potentially other forums have access to some confidential data and papers during meetings and considered options to address this in the Rules.

5.7 The Symposium noted that the Rules should be reviewed by the working groups, the Scientific Committee and the Commission. It requested the Data Services Advisory Group (DSAG) to prepare a revised version of paper SC-Symposium-2022/02 for consideration during 2022.

6. Next steps

6.1 This summary document provides potential tasks for working group efforts and actions the Scientific Committee could progress during the next five years. Each working group is invited to:

(i) review their terms of reference as provided in Annex III of SC-Symposium-2022/06 and suggest revisions to simplify and streamline their work

(ii) comment on the report and cross-cutting themes

(iii) identify the tasks within their remit from Annex II of SC-Symposium-2022/06 and develop a sequence for addressing the topics, facilitators for the major topics and mechanisms to track progress on tasks.

6.2 The Scientific Committee Chair will collate comments from Members and the working groups and present a revised Draft Strategic Plan of the Scientific Committee, 2023–2027 to the 2022 meeting of the Scientific Committee for consideration.

6.3 The Symposium noted that tracking and review was critical in implementing the strategic plan. The Scientific Committee Chair recommends that in addition to annual reporting through the working group conveners on progress on the identified topics, the Scientific Committee should look forward to another Symposium in the 2026/27 season to allow a new strategic plan to be developed for agreement during the 2027 Scientific Committee meeting.

6.4 The Scientific Committee Chair thanked all participants for their contributions and the Secretariat, interpreters, stenographer, and Interprefy staff for their support of the Scientific Committee Symposium. Many participants noted the lack of formality had contributed to a very open and honest dialogue and thanked the Scientific Committee Chair for guiding the Symposium.

Table 1: High-priority scientific issues for the Scientific Committee to progress 2023–2027.

Providing the scientific advice that underpins an integrated, ecosystem-based approach to fisheries	1.	Develop the new krill management approach for all subareas in Area 48
	2.	Review krill and finfish management approaches and decision rules to ensure they are consistent with Article II
	3.	Develop data collection plans to inform and support refined management approaches
	4.	Develop research to inform and support more robust assessment approaches for lower information fisheries
	5.	Develop methods to detect ecosystem changes and provide advice on adaptive management (e.g. through CEMP and WG-IMAF)
	6.	Develop scientific approaches for conservation of Antarctic marine ecosystems, including spatial management
	7.	Ensure the effects of fishing on by-catch, dependent, or related species are consistent with Article II
	8.	Provide scientific advice on CCAMLR's regulatory framework for fisheries.
Addressing cross-cutting scientific topics	1.	Develop a process to objectively address differences in scientific interpretation
	2.	Improve integrated approaches to fund and build science capacity within CCAMLR, including linkages with external organisations
	3.	Develop policies to communicate the science generated by CCAMLR to the wider scientific community
	4.	Review performance of CEMP and SISO data collection programs relative to the strategic plan
	5.	Collaborate with other organisations (e.g. CEP, SCAR) to provide a synthesis of the state and trajectory of Antarctic marine living resources.

Table 2: Priority research topics for the working groups and the Scientific Committee arranged by relationship to Article II of the Convention and the working group(s) charged with leading the work. Urgency is coded as High, Medium, or Low. ASAM – Working Group on Acoustic Survey and Analysis Methods; SAM – Working Group on Statistics, Assessments and Modelling; EMM – Working Group on Ecosystem Monitoring and Management; IMAF – Working Group on Incidental Mortality Associated with Fishing; FSA – Working Group on Fish Stock Assessment; SISO – Scheme of International Scientific Observation; CEMP – CCAMLR Ecosystem Monitoring Program; MPA – marine protected area; DSAG – Data Services Advisory Group. X indicates annual work on this topic. Number indicates the year of focussed work. Hyphens indicates additional work in the following year. Sec – Secretariat; AUS – Australia.

	Urgency	ASAM	SAM	EMM	IMAF	FSA	Workshop	e-group	Facilitator
1. Target species									
(a) Develop methods to estimate biomass for **krill**									
(i) Survey design standards for regional and synoptic surveys	H	X	23						
(ii) Develop methods to use fishing fleets as monitoring platforms	H	X							
(iii) Data collection – SISO and vessels and CEMP	H	X		X		X	X	X	Sec
(1) Implement standardised surveys		X							
(2) Develop diagnostic approaches for data quality	H		23–	X	X				
(iv) Acoustic data storage and processing	H	X							
(1) Automated data processing of acoustic data from fishing vessels, including frequency of updates to biomass estimates	L	23							
(2) Standardised procedures to check and verify acoustic data	M	23							Sec
(3) Develop the use of krill length frequency data in the estimation of target strength, and krill weight for biomass estimates	H	23		X				X	AUS
(4) Submission of acoustic data and the inclusion of metadata by Members in the repository held by the Secretariat	L	22							Sec
(5) Develop statistical approaches to acoustic data emerging from new acoustic observation platforms	L								
(v) Biomass estimation methods	H	X							
(1) Establish Grym parameters for krill stock assessments in Areas 48 and 58	H			X					
(2) Krill age interlaboratory comparisons	L						22		
(3) Grym Training	L						22		

(continued)

Table 2 (continued)

	Urgency	ASAM	SAM	EMM	IMAF	FSA	Workshop	e-group	Facilitator
(4) Krill biomass estimate in Division 58.4.1	L	X							
(5) Krill biomass estimate in Division 58.4.2	L	X							
(vi) Account for spatial structure of krill	M	X		X					
(b) Develop stock assessments to implement decision rules for **krill**									
(i) Krill management approach (synthesis of krill recruitment, spatial scale, biomass estimates, predator risk)	H	X	X	X	X	X	X	X	
(1) Subarea 48.1 (2022)	H	X		X		X			
(2) Subareas 48.2, etc… (2023/24)	L	X		X		X			
(ii) Develop diagnostic tools	L	X	24–	X					
(iii) Develop ecosystem indicators to inform risk assessment framework	L	X		X					
(iv) Methods to account for uncertainty in stock status	L	X	24–	X		X			
(1) Movement of krill (flux)	L	X							
(2) Spatial structure within subareas	H	X		X	X				
(3) Interannual variability	L	X		X					
(v) Develop krill management approach as a multiannual cycle	H		25–	X		X			
(vi) Generate precautionary spatial catch limits for krill	H						X		
(vii) Krill management strategies that are robust to climate change	L		25–	X		X			
(c) Develop methods to estimate biomass for **finfish**									
(i) Survey design	H		23						
(ii) Data collection – SISO and vessels	H		23			X		X	Sec
(1) Conversion factors	H					X	22		Sec
(2) Tagging protocols	L					X	22		Sec
(3) Ross Sea data collection program	L					X	22		
(iii) Improve biomass estimation methods	M		23–						Sec
(iv) Gear standardisation analyses	H		X						

(continued)

Table 2 (continued)

	Urgency	ASAM	SAM	EMM	IMAF	FSA	Workshop	e-group	Facilitator
(v) Modelling of spatial population structure	L		24–			X			
(vi) Review regulatory framework	L							X	
(d) Develop stock assessments to implement decision rules for **finfish**									
(i) Research to develop new assessments	M		X			X			
(1) Research plan evaluations	L		X			X			
(2) Subarea 88.2 fishery structure	L		23			X		22	
(3) Stock structure and connectivity	L		23–			X			
(ii) Develop new assessment tools	M		23–					X	
(1) Casal2 development	L		22			X			
(2) Toothfish age interlaboratory comparisons	L		23–				22		
(iii) Provide precautionary catch limits	H					X			Sec
(e) Management strategy evaluations for target species (Second Performance Review, Recommendation 8)									
(i) Evaluation of the CCAMLR decision rules and potential alternative harvest control rules for assessed fisheries	H		23–						
(ii) Development and testing of data-limited fishery decision rules	M		23–			X			
(iii) Finfish management strategies that are robust to climate change	L		24–	X		X			
2. Ecosystem impacts									
(a) Ecosystem monitoring (Second Performance Review, Recommendation 5)				X					
(i) Structured ecosystem monitoring programs (CEMP, fishery)	H			X					
(1) CEMP	H			X					Sec
(2) Fishery via SISO	M	X		X	X	X			Sec
(3) Research surveys	L	X			X	X			
(ii) Ecosystem modelling	L		25–	X			X		
(iii) Invasive species	L			X		X			Sec

(continued)

Table 2 (continued)

	Urgency	ASAM	SAM	EMM	IMAF	FSA	Workshop	e-group	Facilitator
(iv) Marine debris monitoring	L			X					Sec
(b) Spatial management				X			X	X	
(i) Science advice on proposals for a Representative System of MPAs	H			X				X	
(1) Current proposals	H			X			X	X	
(2) Future proposals	L			X			X	X	
(ii) Research and monitoring plans	H			X					Sec
(c) By-catch risk assessment for krill and finfish fisheries									
(i) Monitoring status and trends	H			X	X	X			Sec
(1) Implement whale sighting protocols	H				X				
(ii) By-catch species catch limits	H			X		X			
(iii) By-catch mitigation methods	L				X	X			
(iv) Incidental mortality	L				X				Sec
(d) Habitat protection from fishing impacts									
(i) Habitat classification, bioregionalisation and monitoring	L			X		X			
(ii) VME identification and management	L			X		X			
(iii) Protection of biodiversity and ecosystems (Second Performance Review, Recommendation 7)	H			X					
(1) Ecosystem impacts from krill and finfish fishing, including analyses whether research and sampling design is able to detect such impacts	H			X		X			
(2) Physical disturbance of longline fishing on benthic ecosystems	L			X		X			
(3) Suitability of reference areas for comparison between fished and unfished areas	M			X		X			
(e) Monitoring and adaptation to effects of climate change, including acidification									
(i) Develop methods to detect change in ecosystems given variability and uncertainty (Second Performance Review, Recommendation 6)	M	X	26–	X	X	X			

(continued)

Table 2 (continued)

	Urgency	ASAM	SAM	EMM	IMAF	FSA	Workshop	e-group	Facilitator
Administrative topics									
(a) Advise on database facilities required through DSAG	H	X	X	X	X	X		X	Sec
(b) Advise on quality control and assurance processes for data provided to and supplied by the Secretariat	H	X	X	X	X	X		X	Sec
(c) Refine the scheme of international scientific observation (SISO) across all fisheries	M	X	X	X	X	X		X	Sec
(d) Further develop data management systems	M	X	X	X	X	X		X	
(1) Quality assurance	H	X	X	X	X	X		X	Sec
(2) DOI	M	X	X	X	X	X		X	Sec
(3) Data access	L	X	X	X	X	X		X	Sec
(e) Communication of progress, internal and external	M	X	X	X	X	X			Sec
(f) Working group terms of reference	L	X	X	X	X	X			
(g) Scientific Committee Symposium in 2027	H	27	27	27	27	27	27	27	

Appendix A

Additional comments from working group review

Comments on Table 1 and Table 2 were incorporated directly into the tables.

WG-EMM-2022 noted that it would be beneficial to cycle through the topics listed in its terms of reference to ensure that discussion time was balanced between the management of krill resources and the status of ecosystems (WG-EMM-2022, paragraph 2.18)

WG-EMMM-2022 also noted that WG-EMM would benefit from developing integrated ecosystem reporting to ensure a more comprehensive view of monitored ecosystems (WG-EMM-2022, paragraph 2.18).

WG-EMM-2022 recommended that the Scientific Committee allocate topics to specific working groups to aid Members in scheduling work and making sure scientists with appropriate expertise are available at the appropriate working groups.

The Working Groups WG-ASAM, WG-SAM and WG-EMM reviewed and commented on their Terms of Reference. WG-FSA and WG-IMAF had not met when this paper was drafted and so are not included. Current versions of the Terms of Reference, including recommended updates in track changes are provided below:

WG-ASAM Terms of Reference were set in 2019 (SC-CAMLR-38 Annex 8) and so were not reviewed.

The Working Group on Acoustics, Survey and Analysis Methods (WG-ASAM) was established by the Scientific Committee as an expert group to examine issues related to the research on Antarctic Marine living Resources using hydro-acoustic technologies. The general terms of reference of the working group includes, but not limited to:

(i) identify new and develop standard acoustic methodology and protocols for the research and monitoring of Antarctic marine living resources, including survey design

(ii) conduct regular assessment and provide advice on area-scale or subarea-scale or division-scale acoustic survey estimates of Antarctic krill to the Scientific Committee and its relevant subsidiary bodies where appropriate

(iii) provide technical advice to scientific observers and the fishing industry for acoustic data collection on board fishing vessels

(iv) conduct annual analysis of the acoustic data collected from CCAMLR-nominated transects and submitted to the Secretariat.

WG-SAM suggested minor changes to its Terms of Reference:

To provide advice to the Scientific Committee and its working groups on:

(i) quantitative assessment methods (including stock assessment methods and management strategy methods), statistical procedures, and modelling approaches for the conservation of Antarctic marine living resources,

(ii) the implementation of and data requirements for such methods, procedures and approaches;

(iii) review of research plans and proposals;

(iv) research fishing and survey design standards.

WG-EMM, originating in 1994 (SC-CAMLR-XIII, paragraph 7.41) suggested:

Recalling that Article II of the Convention requires the conservation of harvested populations, the maintenance of ecological relationships between harvested, dependent and related populations, the restoration of depleted populations and the minimisation of the risk of irreversible changes in the Antarctic marine ecosystem, the Scientific Committee agreed that the terms of reference for WG-EMM are to:

(i) undertake assessments of the status of krill;

(ii) undertake assessments of the status and trends of dependent and related populations including the identification of information required to evaluate predator/prey/fisheries interactions and their relationships to environmental features and including the role of fish in the ecosystem;

(iii) undertake assessments of environmental features and trends which may influence the abundance and distribution of harvested, dependent, related and/or depleted populations;

(iv) identify, recommend and coordinate research necessary to obtain information on predator/prey/fisheries interactions, particularly those involving harvested, dependent, related and/or depleted populations;

(v) liaise with other working groups on matters where their expertise is related to ecosystem monitoring and management;

(vi) develop further, coordinate the implementation of, and ensure continuity in the CCAMLR Ecosystem Monitoring Program (CEMP);

(vii) Incorporate spatial ecology into the management of Antarctic marine living resources;

(viii) taking into account the assessments and research carried out under the terms of reference (i) to (v) above, to develop management advice on the status of the Antarctic marine ecosystem and for the management of krill fisheries in full accordance with Convention Article II.