SC-CAMLR-44

SCIENTIFIC COMMITTEE FOR THE CONSERVATION OF ANTARCTIC MARINE LIVING RESOURCES

REPORT OF THE FORTY-FOURTH MEETING OF THE SCIENTIFIC COMMITTEE

HOBART, AUSTRALIA
20 – 24 OCTOBER 2025

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Abstract

This document presents the adopted report of the Forty-fourth Meeting of the Scientific Committee for the Conservation of Antarctic Marine Living Resources held in Hobart, Australia, from 20 to 24 October 2025.

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Report of the Forty-fourth
Meeting of the Scientific Committee
(Hobart, Australia, 20 to 24 October 2025)

Opening of the meeting

1.1 The Forty-fourth meeting of the Scientific Committee was held from 20 to 24 October 2025 at the CCAMLR Headquarters in Hobart, Tasmania, Australia. The meeting was chaired by Dr C. Cárdenas (Chile). The plenary sessions of the meeting were streamed to an online audience.

1.2 Dr Cárdenas welcomed all participants, whether in-person or as an online audience (Annex 1). He anticipated his second meeting as Chair of the Scientific Committee to be a collaborative and productive meeting.

1.3 Dr Cárdenas noted the retirement of Drs G. Watters and C. Reiss (United States of America (USA)) and highlighted their invaluable contributions to the work of the Scientific Committee and the Commission over many years.

1.4 Dr Cárdenas welcomed the addition of two new Wombats (individuals who have participated in at least one official CCAMLR meeting per year in thirty different years), namely Dr V. Siegel (Germany) and the current Executive Secretary, Dr D. Agnew (paragraphs 2.4 and 15.7).

1.5 Chile drew the Scientific Committee's attention to the passing of Dr Rodrigo Wiff, a distinguished CCAMLR scientist who dedicated his life to fisheries sustainability, biodynamic modelling and Antarctic science. His generosity, compassion and friendliness will be missed.

1.6 The Scientific Committee recalled that Dr Wiff was the very first recipient of a CCAMLR Scientific Scholarship (2012) and expressed its sincere condolences to his family, friends and colleagues.

1.7 Dr Cárdenas encouraged the delegates to work together efficiently and to use the best available science to provide consensus advice to the Commission. He noted that in cases where consensus could not be reached, all views will be presented.

1.8 The List of Documents considered during the meeting is given in Annex 2. A glossary of acronyms and abbreviations used in CCAMLR reports is available online at https://www.ccamlr.org/node/78120.

1.9 While all parts of this report provide important information for the Commission, paragraphs of the report summarising the Scientific Committee's advice to the Commission have been highlighted in grey. Contributed statements are indicated in italics.

1.10 The report of the Scientific Committee was prepared in accordance with Rule 3 of the Rules of Procedure of the Scientific Committee by D. Bahlburg (Germany), M. Belchier (United Kingdom (UK)), P. Brtnik (Germany), R. Cavanagh and M. Collins (UK), A. Dunn (New Zealand), T. Earl (UK), M. Eléaume (France), Z. Filander (South Africa), S. Hill (UK),

K. Hoszek-Mandera (Poland), E. Johannessen (Norway), N. Kelly (Australia), L. Krüger (Chile), D. Maschette (Australia), E. Pardo (New Zealand), S. Parker (Secretariat), C. Péron (France), S. Rodríguez Alfaro (European Union), M. Santos (Argentina), F. Schaafsma (Kingdom of the Netherlands (Netherlands)), K. Teschke (Germany), S. Thanassekos (Secretariat), X. Wang and G. Zhu (People's Republic of China (China)).

Adoption of the agenda

1.11 The Scientific Committee considered the Provisional Agenda which had been circulated as SC CIRC 25/49 prior to the meeting consistent with Rule 7 of the Rules of Procedure of the Scientific Committee. The Agenda was adopted without change (Annex 3).

Chair's report

1.12 The Chair of the Scientific Committee noted the work undertaken this past year, which generated advice for the Scientific Committee to consider. The following meetings were held or attended by representatives of the Scientific Committee:

(i) Third Age Determination Workshop (WS-ADM3) in Cambridge, UK, 19–23 May 2025

(ii) Working Group on Acoustic Survey and Analysis Methods (WG-ASAM-2025) in Geilo, Norway, 30 June–4 July 2025

(iii) Working Group on Statistics, Assessments and Modelling (WG-SAM-2025) in Tenerife, Spain, 16–20 June 2025

(iv) Working Group on Ecosystem Monitoring and Management (WG-EMM-2025) in Geilo, Norway, 7–18 July 2025

(v) Working Group on Fish Stock Assessment (WG-FSA-2025) in Hobart, Australia, 6–16 October 2025

(vi) Workshop on developing Capacity for Data-Limited Integrated Stock Assessments in toothfish fisheries (Cap-DLISA) in Tenerife, Spain, 23–27 June 2025

(vii) FAO symposium on applying the Ecosystem Approach to Fisheries Management in ABNJ, Rome, Italy, 11–13 March 2025

(viii) Antarctic Treaty Consultative Meeting / Committee for Environmental Protection (ATCM 47 – CEP 27) meeting, Milan, Italy, 23–27 June 2025

(ix) 36th Meeting of Managers of Latin American Antarctic Programs (RAPAL), Punta Arenas, Chile, 22–25 September 2025

(x) Scientific Committee Bureau meetings for organisation and planning.

Harvested species: general issues

2.1 The WG-ASAM co-convener, Dr X. Wang (China), introduced the report of the WG-ASAM-2025 meeting held at Geilo (Norway) from 30 June to 4 July (SC-CAMLR-44/09). The meeting was attended by 16 participants from nine Members with one invited expert (ARK). The meeting discussed standardised approaches for acoustic surveys and associated biological sampling to inform the development of the krill fishery management approach (KFMA).

2.2 The WG-SAM co-convener, Dr T. Okuda (Japan), introduced the report of the WG-SAM-2025 meeting held in Tenerife (Spain) from 16 to 20 June (SC-CAMLR-44/08). The meeting was attended by 25 participants from 12 Members, and 29 papers were submitted. The meeting included discussions on data collection and models for evaluating stock status, fishing operations and on harvest control rules for toothfish and krill.

2.3 The WG-EMM convener, Dr J. Hinke (USA) introduced the report of the WG-EMM-2025 meeting held at Geilo (Norway) from 7 to 18 July (SC-CAMLR-44/10). The meeting was attended by 54 participants from 21 Members. The meeting included discussions on krill biology and ecology, krill fishery management, ecosystem monitoring and spatial management, with focus topics on the CCAMLR Ecosystem Monitoring Program (CEMP) and the progression of the revised Krill Fishery Management Approach (KFMA) and the harmonisation between KFMA and the Domain 1 Marine Protected Area (D1MPA) proposal.

2.4 The WG-FSA convener, Mr S. Somhlaba (South Africa) introduced the report of the WG-FSA-2025 meeting held in Hobart (Australia) from 6 to 16 October (SC-CAMLR-44/11). The meeting was attended by 45 participants from 14 Members and was the last Working Group meeting attended by Dr Agnew in his role as Executive Secretary of CCAMLR. WG-FSA thanked Dr Agnew for his work and contributions (paragraph 15.7).

2.5 The Scientific Committee endorsed the recommendation by WG-EMM-2025 (paragraph 2.35) requesting Members to provide information about the locations and components of scientific moorings to the Secretariat for communication to Members for both safety and enhanced collaboration on the scientific data generated by the moorings. In this context, the Scientific Committee tasked the Secretariat to identify a method for collecting information about currently deployed moorings and making it available to the fishing industry and report it to WG-FSA-2026.

2.6 The Scientific Committee endorsed the recommendation by WG-EMM-2025 (paragraph 2.210) and WG-SAM-2025 (paragraph 2.12) to revise the haul-by-haul and Catch and Effort (CE) forms to remove the ‘type of fishing’ classification field to avoid mismatches between what is reported in CE and haul-by-haul data in the different fisheries and to prevent inconsistent reporting of fishing type between both vessels and seasons in haul-by-haul data (WG-EMM-2025, paragraph 2.208).

2.7 The Scientific Committee endorsed the recommendations by WG-SAM-2025 (paragraph 3.27), WG-EMM-2025 (paragraph 3.6) and WG-FSA-2025 (paragraphs 2.12 and 2.15) to implement the proposed separation of C1 haul-by-haul forms into finfish and krill trawl-fishery specific forms (WG-FSA-2025/07), along with accompanying instructions as requested by WG-FSA-IMAF-2024 (paragraph 1.20), and including fields recommended by WG-IMAF to clarify the reporting of incidental mortalities on vessels. The Scientific

Committee also recommended that the form nomenclature be revised to avoid confusion in form names, and that any references to these forms in Conservation Measures (CMs) be identified and revised as necessary.

2.8 The Scientific Committee endorsed the recommendation by WG-FSA-2025 (paragraph 2.15) that the new separate C6 (finfish) and C1 (krill) haul-by-haul forms could be voluntarily tested in the coming season, in parallel with the current forms, as required by existing CMs and if necessary revised versions of the new C1 (krill) form and the new C6 (finfish) haul-by-haul form could be presented by the Secretariat at WG-EMM-2026 and WG-FSA-2026 respectively.

2.9 The Scientific Committee endorsed the recommendation by WG-FSA-2025 (paragraph 6.8) to adopt changes to the Warp Strike Observation worksheet and accompanying information presented by the Secretariat, considering the current CCAMLR data collection form assumes that the warp and net monitoring cables can be observed simultaneously, which is not the case for all vessels.

2.10 Dr S. Kasatkina (Russian Federation (Russia)) expressed the opinion that a coverage rate of 5% of fishing time for seabird strike observations lacked scientific justification and could result in seabird strikes being underestimated.

2.11 The Scientific Committee noted that analysis of warp strike observation requirements had taken place at WG-IMAF-2023 (paragraphs 4.12 to 4.17) and SC-CAMLR-42 (paragraph 3.35) and welcomed future research investigating the effect of different coverage rates to be brought to WG-IMAF for consideration.

2.12 SC-CAMLR-44/BG/01 presented a summary of catches of target species from directed fishing on toothfish, icefish and krill in the Convention Area in the 2023/24 and 2024/25 seasons and from research fishing under CM 24-01. The authors noted that the total catch for *Euphausia superba* has been updated to 624 918 tonnes as detailed in SC-CAMLR-44-BG/36 Rev. 2.

Krill in Statistical Area 48

2.13 The Scientific Committee noted record krill catches in Statistical Area 48 during the 2024/25 season, which exceeded the trigger level of 620 000 tonnes specified in CM 51-01 by 4 917 tonnes. More than 50 % of this catch was taken from Subarea 48.1, corresponding to a doubling of the CM 51-07 (2023) limit for that Subarea (WG-FSA-2025, paragraph 2.5).

2.14 The Scientific Committee noted the number of vessels notified for this fishery in the 2025/26 season (14 vessels) (CCAMLR-44/BG/08 Rev. 1) exceeds the number that fished in the area during 2024/2025 (12 vessels, including 6 with continuous trawling capability) (SC-CAMLR-44/BG/36 Rev.2).

2.15 The Scientific Committee recommended that the Commission note the number of vessels notified to fish for krill in Area 48, in the context that the trigger level was reached in the 2025 season (CCAMLR-44/BG/08 Rev. 1, Table 6).

2.16 SC-CAMLR-44/BG/38, authored by the Antarctic and Southern Ocean Coalition (ASOC) presented an analysis of automatic identification system (AIS) data, which revealed a strong increase in apparent fishing effort in Subarea 48.1 in the 2024/25 season following the lapse of CM 51-07, raising concerns about concentrated fishing. This increase was particularly apparent in predator-rich areas such as the Gerlache and Bransfield straits. ASOC recommended that CCAMLR consider these changes in the intensity of apparent fishing effort, reflected also by a broader spatial footprint, as it continues to assess the impacts of the krill fishery on the ecosystem and consider management implications.

2.17 The Scientific Committee thanked ASOC for this useful analysis, which will help inform further discussions of this important issue throughout the meeting.

2.18 SC-CAMLR-44/BG/36 Rev. 2 provided a summary of krill fishery operations in the 2024/25 season. Catches were taken faster than in any previous season with the result that the trigger level was reached and the fishery was closed on 1 August 2025. The total catch was 624 917 tonnes based on C1 (haul-by-haul) data. 57% of this was caught in Subarea 48.1, where the catch increased by 118 % compared to the previous season. The catch in Subarea 48.2 increased by 47%, while that in Subarea 48.3 decreased by 97%. The paper presented metrics of catch concentration including catch per square kilometre within each Subarea and polygon contours representing the area in which 50% of the catch was taken.

2.19 The Scientific Committee thanked the Secretariat for the analyses presented in SC-CAMLR-44/BG/36 Rev. 2 and recommended updating the document for submission to the Scientific Committee in future years, and that the Secretariat work with WG-EMM to refine the contents for inclusion in future Fishery Reports.

2.20 The Scientific Committee noted the value of catch concentration metrics such as those presented in SC-CAMLR-44/BG/36 Rev. 2 and encouraged further refinement of these metrics at WG-EMM. It also noted that such metrics do not provide a direct measure of ecosystem impact of fishing. It further noted that these metrics might be biased by the inclusion of research surveys which are spatially extensive and have low catch rates compared to commercial hauls. It encouraged Members that have conducted krill surveys to contact the Secretariat to help identify the corresponding C1 (haul-by-haul) records (SC-CAMLR-44/BG/36 Rev. 2, Table A1).

2.21 The Scientific Committee noted that the krill catch (359 226 tonnes) in the Subarea 48.1 in the 2024/25 fishing season is about 50% of the potential catch limit for Subarea 48.1 (SC-CAMLR-41, paragraph 3.46 and Table 2).

2.22 The Scientific Committee noted there was a substantial increase in catches in Subarea 48.1 that could not have occurred if CM 51-07 remained in place. The Scientific Committee further noted that the changes in fishing distribution during the 2024/25 fishing season may have been affected by the sea ice coverage in Subareas 48.1 and 48.2 (WG-FSA-2025, paragraph 4.13), as well as the interannual dynamics of krill stocks and patchy nature of krill distribution (SC-CAMLR-43/BG/22; WG-FSA-2021/56).

2.23 The Scientific Committee noted ongoing changes in fleet composition (continuous versus traditional trawl vessels) and recommended that WG-EMM investigate the effect of fishing method on fishery distribution.

2.24 The Scientific Committee highlighted the urgent need for spatial distribution of the krill catch. It also noted that estimates of total catch are an uncertain representation of total removals due to potential errors in estimation procedures and the exclusion of escape mortality (Krafft et. al., 2016; Krag et al., 2021).

2.25 The Scientific Committee noted that the current situation with a trigger level of 620 000 tonnes in CM 51-01 alone is not precautionary due to local concentration of the catch (WG-EMM-2025, paragraph 4.47). It further noted the effectiveness of the now lapsed CM 51-07 in spreading the trigger level across the Subareas (WG-EMM-2025, paragraph 4.13) and the urgent need to implement an interim conservation measure to distribute catches across Subareas 48.1 to 48.4 (WG-EMM-2025, paragraph 4.14).

2.26 The Scientific Committee recalled that three components of the KFMA were endorsed by the Commission (CCAMLR-38, paragraph 5.7) and noted the significant scientific progress on the revised KFMA (WG-EMM-2025/05) which distributes catch limits in time and space in Subarea 48.1.

2.27 The Scientific Committee recalled that the original distribution of catch limits in the framework of the trigger level allocation under the now-lapsed CM 51-07 was largely based on the sum of maximum historical catches (the trigger level) and the proportions of biomass in each Subarea during the first synoptic krill survey in 2000 (the allocations) (WG-EMM-2025/05).

2.28 The Scientific Committee noted the discussion in WG-EMM-2025 about using the proportions of biomass from the two broad-scale surveys (2000 and 2019) (Krafft et al., 2021) to provide an interim measure (WG-EMM-2025, paragraph 4.16), and potential catch limits in the frame of the trigger level under CM 51-01 for each Subarea (WG-EMM-2025, paragraph 4.19).

2.29 The Scientific Committee further noted that the resulting potential catch limits in the frame of the trigger level under CM 51-01 for each Subarea are as follows (WG-EMM-2025, paragraph 4.19):

(i) 48.1 248 000 tonnes

(ii) 48.2 263 500 tonnes

(iii) 48.3 201 500 tonnes

(iv) 48.4 93 000 tonnes

2.30 The Scientific Committee did not reach consensus on these catch limits

2.31 CCAMLR-44/BG/29, presented by ASOC, emphasised the need to engage in constructive discussions on the KFMA and the D1MPA proposal and find a way forward at CCAMLR-44. ASOC encouraged the Scientific Committee and Commission to consider proposals in light of previous advice and recommendations, including those from SC-CAMLR. These included: using a staged approach to increase catch limits; ensuring that any increases in the catch limit are accompanied by increased monitoring of krill and krill predators; and harmonising the KFMA and the D1MPA proposal.

2.32 The Scientific Committee discussed three papers (SC-CAMLR-44/02; SC-CAMLR-44/BG/23; SC-CAMLR-44/BG/25) commenting on and proposing ways forward for the development of interim and long-term solutions in the krill fisheries management.

2.33 SC-CAMLR-44/BG/25 commented on the current and future krill fishery management in Area 48. It argued that the options for an interim measure for spatial distribution of catches in Area 48, intended to replace the expired CM 51-07, required scientific and legal justification. The authors noted the fundamental differences in the methodology of the 2019 and 2000 surveys (CCAMLR-37/16), and the 2019 survey data were not included in the model ensembles for the values used to estimate krill in Subarea 48.1 (WG-FSA-2021/39; WG-EMM-2021, paragraphs 2.32 and 2.33). It was noted that the use of general protection zones and seasonal protection zones (GPZ and SPZ) for the KFMA in a framework of harmonisation of the KFMA and the D1MPA proposal has no legal justification under current conservation measures. The authors noted that the revision of krill fisheries management in Subarea 48.1, as well as in other Subareas 48.2–48.4, should be implemented within the framework of coordinated fisheries management in Area 48, based on patterns of krill spatial distribution and the relationships between Subareas. This coordinated krill fishery management is implemented within the framework of CM 51-01. The authors proposed that the revision of krill fisheries management in Subareas 48.1–48.4 should be carried out in a unified framework based on ecosystem-based and precautionary approaches, which include regular, standardised synoptic and regional krill surveys in summer and winter, accompanied by environmental data collection and regular observations of mammals and seabirds. The development of science-based metrics and indicators for assessing the potential ecosystem impacts of the krill fishery as a basis for a risk assessment, and a revision of the Scientific Observer Guidelines – Krill Fisheries were identified as integral parts of the krill fishery management review.

2.34 The Scientific Committee agreed that regular acoustic monitoring is essential to inform krill fisheries management. Conducting synoptic summer and winter surveys annually, however, may exceed the existing logistical and financial capacity. However, the Scientific Committee noted that this lack of capacity should not hold up progress on finding short- and long-term solutions for krill fisheries management. The Scientific Committee further noted that some of the issues raised, including the revision of the SISO guidelines, are being addressed.

2.35 SC-CAMLR-44/02 provided two options for interim conservation measures to replace the lapsed CM 51-07 and prevent excessive concentration of catches until a full implementation of a krill fisheries management approach (KFMA) harmonised with a marine protected area in the Antarctic Peninsula region, is feasible. The first option is a simple update to the Subarea catch limits, which was discussed by WG-EMM-2025 (paragraph 4.19) and could be implemented with or without GPZs and SPZs of the proposed D1MPA. The second option uses the first option as a starting point and permits an increase in the Subarea 48.1 cap to the '2max' level (395 000 tonnes – WG-EMM-2024, Table 5) over three years. This increase could be accompanied by spreading of the Subarea 48.1 catch across three groups of MUs in year two, increases in monitoring of the fishery, krill stock and krill dependent predators, implementation of GPZs and simplified SPZs (with consistent closed periods) and limitations on how much of the catch could be taken in summer.

2.36 SC-CAMLR-44/BG/23 outlined a proposal for the initial implementation of a revised Krill Fishery Management Approach (KFMA) in Subarea 48.1, marking a transition from a fixed catch limit regime to a more dynamic and ecosystem-based management framework. The proposal includes removing Subarea 48.1 from the current trigger level of 620 000 tonnes as defined in CM 51-01 and keeping the Subarea-specific trigger levels for Subareas 48.2–4. The updated total trigger level for Subareas 48.2–4 would be 500 769 tonnes following the 130% logic of the expired CM 51-07. A new CM 51-08 is proposed for Subarea 48.1, which would spread a total catch limit of 668 101 tonnes across five MUs and between summer and winter according to the SOA. The proposed CM 51-08 would further implement GPZs and SPZs and contribute to the harmonisation of KFMA and a marine protected area in the Antarctic Peninsula region. An implementation of a monitoring framework to inform the KFMA and later revisions would be developed within the initial five years of this proposal. Key tasks requiring further consideration by the Scientific Committee and the Commission, including the revision of CM 51-01 and the establishment of a new CM 51-08 to regulate krill fishing in Subarea 48.1 were identified.

2.37 The Scientific Committee thanked the authors of SC-CAMLR-44/02 and SC-CAMLR-44/BG/23 for their constructive proposals.

2.38 The Scientific Committee recalled that the current trigger level of 620 000 tonnes specified in CM 51-01 was introduced in 1991 and was based on the sum of maximum historic catches reported at the time in each Subarea. It also noted that the trigger level is not linked to the assessment of krill biomass (WG-EMM-2025/05).

2.39 Some Members noted that an initial implementation of the KFMA, as proposed in SC-CAMLR-44/BG/23, may be premature at this stage, as key elements such as a sustainable financial and logistical framework to support data collection are still lacking.

2.40 Some Members raised concerns about the high catch allocation in the Gerlache Strait included in the option presented in SC-CAMLR-44/BG/23 and suggested that limits on permissible harvest rates could be used. This issue was previously discussed in WG-EMM-2024 (paragraphs 5.36 and 5.46 to 5.48)

2.41 Dr Kasatkina noted that the proposals to amend CM 51-01 and establish new CM 51-08 did not take into account existing knowledge about the patterns of krill distribution in Area 48 under the influence of water mass dynamics and that these proposals were not accompanied by sufficient data to justify the proposed conservation measures.

2.42 The Scientific Committee noted that WG-EMM-2025 (paragraph 4.12) recognised further work is required towards the full implementation of the KFMA in Subarea 48.1 and that additional work includes inter alia:

(i) development and implementation of a monitoring program that includes CEMP monitoring and at-sea monitoring;

(ii) detailed documentation of the KFMA processes that led to the recent calculations of putative catch limits for Subarea 48.1;

(iii) urgent need to develop a sustainable funding mechanism;

(iv) a time-bound implementation plan, including periodic updates of biomass, and review of monitoring (5–7 years cycle); and

(v) a mechanism to objectively evaluate the performance of any implemented measure.

2.43 The Scientific Committee further noted the need for additional consideration of how to use data collected from monitoring programs during the implementation of KFMA to provide advice on updating catch limits.

2.44 The Scientific Committee requested that the Commission address the urgent issue of developing sustainable funding mechanisms to support enhanced management of the krill fishery, including the collection of data necessary for the KFMA, and that funding mechanisms may differ between at-sea and land-based data collection.

2.45 The Scientific Committee discussed the design of Management Units (MUs) within Subarea 48.1 over which catch limits could be spread. It recalled that it had previously endorsed a set of nine candidate MUs (SC-CAMLR-43, paragraph 2.63) but acknowledged differing opinions about the appropriate number of MUs for interim and long-term solutions. The Scientific Committee also discussed options of increasing the number of MUs over time in conjunction with increasing catch limits and monitoring.

2.46 The Scientific Committee recognised that a common understanding of what a staged approach means is required. Options under consideration include those that include increases in both catch limits and monitoring in Subarea 48.1 over time and those that extend the KFMA from Subarea 48.1 to other Subareas over time. Discussions should be clear about which form of staging is being considered.

2.47 The Scientific Committee discussed the inclusion of GPZs and SPZs in potential interim solutions, and the eventual implementation of both the KFMA and a D1MPA.

2.48 Some Members supported the inclusion of SPZs and GPZs as proposed in SC-CAMLR-44/02 and SC-CAMLR-44/BG/23. Others suggested that more work on the design and validity of such zones was necessary.

2.49 The Scientific Committee agreed that clarification of whether a clear roadmap for the full implementation of the KFMA and proposed D1MPA is needed, and what such a roadmap would look like, is necessary. Possible elements of such a roadmap include time-bound milestones, associated performance reviews and potential fallback options if milestones are not reached.

2.50 The Scientific Committee discussed the evaluation of the performance of any implemented solution. It would be necessary to identify the frequency of such evaluations, their data requirements and the specific evaluation methods.

2.51 The Scientific Committee considered an additional option which maintained the CM 51-01 trigger level in its first two years and remove the trigger level in the third year.

2.52 The Scientific Committee did not reach consensus on how to manage the krill fishery in Area 48.

2.53 SC-CAMLR-44/BG/02, authored by WG-EMM and the CCAMLR Secretariat, summarised the development of the revised KFMA up to and including developments in 2024. This is intended as a public-facing document to accompany krill Fishery Reports and to be updated annually to reflect further developments in the KFMA.

2.54 The Scientific Committee endorsed publication of SC-CAMLR-44/BG/02 as part of the Fishery Reports and encouraged ongoing review of the document by WG-EMM. It noted that future updates should include consistent language when referring to the 'Spatial Overlap Analysis/Risk Assessment Framework' and clear statements about the spatial scales at which the various KFMA components are applied.

2.55 SC-CAMLR-44/01 documented the use of the Spatial Overlap Analysis (SOA) to develop potential advice on the KFMA which has been presented in SC and WG-EMM reports (SC-CAMLR-41, Table 2; WG-EMM-2025, Table 5). The paper aimed to facilitate reproduction and validation of this potential advice and the development of future advice. The paper provided a summary of the SOA, its input data and settings and its outputs. It documented changes that have been made to these inputs and settings over time, provides links to code and input data files, and list the settings used to generate the outputs presented in the Scientific Committee and WG-EMM reports. The authors identified some changes to reported outputs that are not currently documented, and which affect the values in SC-CAMLR-41, Table 2. They also noted the conflation of SOA-derived MUs (which cover c. 56% of Subarea 48.1) and acoustic survey strata (which cover 100% of subarea 48.1) in SC-CAMLR-41, Table 3.

2.56 The Scientific Committee welcomed SC-CAMLR-44/01. It suggested that the document be further reviewed by WG-EMM-2026 and could then be considered for publication as an appendix to SC-CAMLR-44/BG/02 as part of the Fishery Reports. It also encouraged Members to develop accompanying documentation of other components of the KFMA, including precautionary yield estimates (based on the Grym) and biomass estimation (based on acoustic surveys). It encouraged the Working Groups and the authors of WG-EMM-2022/05, WG-FSA-2022/39 to add information on changes to output values documented in SC-CAMLR-44/01 (Table 1).

2.57 The Scientific Committee noted that the aspects of the original three components of the KFMA have been used to develop existing potential advice on potential spatial and seasonal catch limits (SC-CAMLR-44/BG/02; CCAMLR-38, paragraph 5.17), and that other aspects, including the krill stock hypothesis and ecosystem health checks, are intended to be used in future advice. The Scientific Committee encouraged documentation of all relevant aspects.

2.58 SC-CAMLR-44/P01 presented an article recently published in Proceedings of the National Academy of Sciences by authors affiliated with the SCAR Krill Expert Group. The authors proposed a management framework that integrates variability in krill recruitment and key pathways between spawning and nursery areas – a krill stock hypothesis – to inform decisions on catch limits and CMs. The authors highlighted that implementing this approach will require targeted data collection which can be accomplished through a multi-sector collaborative network, including partnering with industry.

2.59 The Scientific Committee endorsed the recommendation by WG-EMM (SC-CAMLR-44/10, paragraph 2.42) to incorporate a continuously updated KSH into the relevant components of the KFMA to inform the development of measures to conserve krill stocks and hence their predators.

2.60 The Scientific Committee endorsed the recommendation by WG-EMM-2025 (paragraph 2.130) to consider an enhanced CEMP as an integral part of implementing the KFMA.

2.61 SC-CAMLR-44/05 presented the main findings from the 2024 and 2025 summer surveys conducted by Chinese fishing vessels, which covered all five core candidate Management Units of the KFMA in Subarea 48.1. The surveys demonstrated a consistent pattern on the spatial separation between spawning and juvenile krill with spawning adults being mainly distributed in deep offshore waters beyond the shelf break of the South Shetland Islands and Elephant Islands, and juveniles being concentrated in the Antarctic Peninsula shelf area in the Bransfield Strait and around Joinville Island. The findings highlighted the need for considering the spatial distribution and connectivity of krill stocks as well as their association with oceanographic features across MUs.

2.62 The Scientific Committee thanked China for their efforts in conducting structured surveys in Subarea 48.1 and recognised the valuable findings on the spatial distribution and connectivity of krill stocks. It further emphasised the potential for such structured surveys to provide valuable data for the KFMA and KSH and encouraged aligning the survey transects with those suggested by WG-ASAM-2025 (paragraphs 3.5 to 3.15).

2.63 The Scientific Committee acknowledged the value of research conducted on fishing vessels in advancing Southern Ocean research and informing fisheries management. It further highlighted the importance of joint efforts between Members to implement such surveys.

2.64 The Scientific Committee noted that China had conducted similar surveys during winter (SC-CAMLR-43/BG/14) and welcomed further analysis from these surveys to be presented to the Scientific Committee and the relevant Working Groups.

2.65 The Scientific Committee noted that surveys conducted in core strata could be done annually, and that biomass estimates should not be extrapolated beyond the area surveyed (WG-ASAM-2025, paragraph 3.7).

2.66 The Scientific Committee endorsed the recommendation by WG-ASAM-2025 (paragraph 3.9) that if winter surveys were required, they could be conducted in late April/May before the development of sea-ice that will reduce survey coverage.

2.67 The Scientific Committee endorsed the recommendation by WG-ASAM-2025 (paragraph 3.11) that the distance between sampling stations for acoustic biomass surveys should be 40 nm with the goal of a least 2 sampling stations on each transect, noting exceptions as specified in WG-ASAM-2025, paragraphs 3.15 (v) and 3.13. The Scientific Committee noted that sampling station spacing required for acoustic biomass estimates may differ from those required for ecological monitoring or to inform the KSH.

2.68 The Scientific Committee noted that the SOA boundaries in the PB1 and PB2 MUs could be revised in the future, since PB2 is unlikely to be accessible in summer or winter due to persistent sea-ice conditions (WG-ASAM-2025, paragraph 3.18).

2.69 The Scientific Committee endorsed the recommendation by WG-ASAM-2025 (paragraph 3.41) to task the Secretariat with identifying the modifications needed to CM 23-06 (or other CMs) to permit fishing vessels conducting acoustic surveys to submit acoustic trawl catch data from research trawls exclusively through the acoustic survey metadata form instead of through the C1 form, and to develop a proposal for the Scientific Committee.

2.70 The Scientific Committee endorsed the recommendation by WG-EMM-2025 (paragraph 2.28) to task the Secretariat with circulating a survey form to develop practical guidelines for standardising and comparing different research trawl types to Members.

2.71 The Scientific Committee endorsed the recommendation by WG-EMM-2025 that a maximum stretched mesh size of 9 mm (paragraphs 2.29 and 2.40) be used for the sampling of post-larval krill, and a maximum mesh size of 330 micrometres (paragraph 2.40) for research trawls and acoustic surveys.

2.72 The Scientific Committee endorsed the sampling plans proposed by WG-EMM-2025 (Tables 4 to 6) to support the implementation of the revised KFMA.

2.73 The Scientific Committee further noted that these sampling protocols should be used in conjunction with existing protocols developed by WG-ASAM-2024. The Scientific Committee requested that the Secretariat coordinate with relevant Members to develop a guidance note compiling all relevant protocols, with a view to streamlining their use.

2.74 The Scientific Committee endorsed a proposed research topic to Antarctica InSync (WG-EMM-2025, paragraph 2.121) on krill fishery-ecosystem interactions in Area 48, as well as a circumpolar assessment of krill biomass, krill biology and characterisation of krill flux.

2.75 The Scientific Committee noted recommendations by WG-FSA-2025 (paragraph 6.13):

(i) to adopt the new upscaling method for future by-catch analyses;

(ii) to separate annual reports of total by-catch and fish by-catch and update Figures 6 to 9 of the fishery report using the new method; and

(iii) to highlight the usefulness of additional comments and photos in observer cruise reports to help verify large by-catch events and unusual specimens.

2.76 The Scientific Committee noted that the Fishery Reports currently provide per-haul upscaled by-catch estimates and not estimates of total extrapolated by-catch including for additional hauls that were not inspected by observers.

Krill in Statistical Area 58

2.77 The Scientific Committee noted WG-FSA-2025/P01, which provided an update of a krill stock assessment and precautionary catch rates for Divisions 58.4.1 and 58.4.2 that were previously presented in WG-FSA-2023/68. It also noted that WG-FSA-2025 (paragraph 5.5) supported the assessment of the harvest rates for *E. superba* in Divisions 58.4.1 and 58.4.2-East and recommended a total catch limit for Division 58.4.1 of 391 754 tonnes (141 970 tonnes west of 103°E, 58 256 tonnes between 103°E and 123°E, and 191 528 tonnes east of 123°E) and 2 088 872 tonnes (1.448 million tonnes west of 55°E and 640 872 tonnes east of 55°E) in Division 58.4.2. The trigger level set under CM 51-03 remains in force.

2.78 The Scientific Committee recommended further review of the input parameters of the Grym stock assessment and resulting precautionary harvest rates for these two Divisions, alongside those for the Grym stock assessment in Subarea 48.1 (WG-FSA-2022, paragraph 7.27) at WG-EMM to ensure consistent approaches and data quality standards across krill assessments.

Harvested species - finfish general issues

3.1 The Scientific Committee considered several general issues related to finfish fisheries, including the toothfish Management Strategy Evaluation (MSE) workplan, toothfish ageing, review of research proposals, Trend Analysis and developments towards integrated stock assessments in data limited fisheries for toothfish, and tagging.

3.2 Proposed precautionary finfish catch limits (tonnes) for 2025/26 are given in Table 1.

Toothfish MSE workplan

3.3 The Scientific Committee noted the progress made by WG-SAM-2025 and WG-FSA-2025 towards addressing the workplan outlined by SC-CAMLR-43, paragraph 3.8.

3.4 The Scientific Committee noted that there were likely to be significant difficulties in evaluating the current CCAMLR toothfish Decision Rules (Component 1 of Phase 1 MSE in WG-SAM-2025, paragraph 5.13). The Scientific Committee also noted that such constant catch rules were unlikely to be optimal when stocks were approaching or near target levels and were not considered best practice in most other fisheries.

3.5 The Scientific Committee also noted the difficulty with longer-term projections given the assumptions associated with using historical data for projections and the current CCAMLR toothfish Decision Rules for toothfish that require a 35-year projection, but that there were a range of alternative harvest strategies where such a long-term projection is not required.

3.6 The Scientific Committee noted that the current constant-catch-based CCAMLR toothfish Decision Rules, with a 35-year projection period, no longer constitute a best practice approach to fisheries management, and agreed that the future development of MSEs for toothfish should focus on Harvest Control Rules (HCRs) that are based on harvest rates.

3.7 The Scientific Committee noted that the objectives of the current CCAMLR toothfish Decision Rules would continue to form the basis for the development of HCRs based on harvest rates.

3.8 The Scientific Committee agreed that the work on stock-specific MSEs (Component 2 of Phase 1 MSE, WG-SAM-2025, paragraph 5.13) using HCRs based on harvest rates should be a priority. The Scientific Committee noted that while the objectives and general implementation principles would need to be consistent among stock-specific MSEs, the resulting HCRs may be different depending on the stock-specific characteristics, productivity, data collection and uncertainties.

3.9 The Scientific Committee noted that good progress had been made in the development of HCRs for toothfish and encouraged Members to continue to collaborate on the development of MSEs for toothfish.

3.10 The Scientific Committee agreed that:

(i) MSE work focus on HCRs based on harvest rate such as those recommended by WG-SAM-2024 (paragraph 6.7). The Scientific Committee also noted that other HCRs may be suitable for a particular stock, including for example HCRs that define changes in catch limits relative to current catch limits

(ii) the key uncertainties to be included in the MSE could be specific to each stock but should include plausible ranges of key uncertainties including potential changes due to climate change

(iii) the potential performance indicators proposed by WG-SAM-2024 (paragraph 6.10), average annual variability (AAV) and the preliminary performance measures proposed in WG-FSA-2025/11 and WG-FSA-2025/41 should be further considered and developed over the intersessional period when developing MSEs

(iv) a framework for the scientific and management response for when exceptional circumstances are triggered should be developed.

Ageing of toothfish

3.11 The Scientific Committee noted the value of the inter-laboratory collaboration and mentoring for toothfish ageing programmes. The Scientific Committee also recommended that the current research proposal template be expanded, so that question 3(c) specifies how readers will be trained, otoliths will be prepared, aged, and calibrations conducted, and a milestone detailing when these data will be submitted to CCAMLR.

3.12 The Scientific Committee thanked the convenors K. Owen and Dr P. Hollyman (UK), Dr J. Devine (New Zealand), Dr C. Brooks (USA) and the UK for hosting the WS-ADM3.

3.13 The Scientific Committee requested that CCAMLR Otolith Network (CON) develop a timetable for incorporating age data that could be used in assessments into the CCAMLR age database. The Scientific Committee also requested that CON develop a categorisation of age data quality to facilitate the consideration of these data into future stock assessments.

Trend analysis

3.14 The Scientific Committee requested the Secretariat publish a full time series of CPUE trends (or CPUE-derived biomass estimates) and catch limits for each Research Block, and agreed that:

(i) the trend analysis procedure did not need to be presented to future meetings of WG-SAM for methodological review, unless there were methodological changes

(ii) the influence of updates in the GEBCO bathymetry would only need to be investigated if requested

(iii) the retrospective analysis of the catch limit advice would only be calculated on request.

Review of new research proposals for *Dissostichus* spp. notified under CMs 21-02 and 24-01

3.15 The Scientific Committee recommended that the research plans for *Dissostichus* spp. notified under CMs 21-02 and 24-01 should provide information on how data collection quality is evaluated to identify any potential issues and ensure reliable data collection at sea. The Scientific Committee also noted that evaluating the likelihood of success of new and ongoing research plans would be assisted by the inclusion of a summary of the achievement of previous milestones in the research plan.

3.16 The Scientific Committee discussed that as research plans have developed, the progress of the research plans notified under CM 21-02 beyond the first year should be evaluated based on:

(i) the quality of at sea data collection

(ii) the quality of parameter estimates towards a stock assessment

(iii) progress towards developing a stock assessment, and

(iv) the progress of other milestones.

3.17 The Scientific Committee agreed that research plans should be evaluated in their first year based on the criteria summarised in Table 7 of WG-FSA-2025. The Scientific Committee requested that the Conveners of WG-SAM and WG-FSA, and the Chair of the Scientific Committee develop a paper for review by WG-SAM and WG-FSA in 2026 which outlines metrics for reviewing research plans in subsequent years. The Scientific Committee tasked WG-FSA with undertaking a preliminary assessment using the revised evaluation criteria for research plans.

3.18 The Scientific Committee noted that if there was any revision of the evaluation criteria, then this may require changes to the template format used to propose research plans (paragraph 3.11).

Tagging

3.19 The Scientific Committee welcomed the development of the tagging training video (WG-FSA-2025/53), noting that it will be a useful resource for scientific observers and crew training. The Scientific Committee requested the Secretariat translate the video into the other official CCAMLR languages (French, Spanish and Russian) as well as Bahasa Indonesian to support broader use across fishing nations.

3.20 The Scientific Committee requested the Secretariat develop a survey in 2026 to gather information from vessels which have not achieved an 80% tag overlap statistic in exploratory CCAMLR fisheries. The data from this survey could be used to educate vessel crews on practices leading to high tag overlap and also to gather information on factors that may hinder better performance (WG-FSA-2025, paragraphs 5.15 to 5.19). The Scientific Committee also requested the Secretariat survey include vessels with a high tag overlap to allow a better understanding of the procedures and strategies used on those vessels.

Progress towards assessments in data limited fisheries

3.21 The Scientific Committee welcomed the success of the first Cap-DLISA workshop (CCAMLR-44/BG/31 Rev. 1) and thanked the workshop participants for the large amount of work that substantially progressed the scientific understanding of toothfish in Subarea 48.6. The Scientific Committee agreed that a further workshop in 2026/27 would be valuable to further progress the capacity in undertaking stock assessments in data limited fisheries such as Subarea 48.6 (and other areas notified under CM 24-01, such as Subarea 88.3) so that it can be used for management advice.

3.22 The Scientific Committee noted that the workshop had been supported by contributions from the CCAMLR General Capacity Building and General Science Capacity Funds. The Scientific Committee encouraged the Cap-DLISA participants to develop a second General Capacity Building Fund application to further progress the capacity development in stock assessments for toothfish in data-limited fisheries.

3.23 The Scientific Committee noted that there was an urgent need to develop more stable funding mechanisms to help the work of the Scientific Committee and its Working Groups.

Statistical Area 48

Icefish

3.24 The Scientific Committee noted the recommendations in both WG-SAM-2025 (paragraph 3.21) and WG-FSA-2025 (paragraph 3.4) that research plans submitted under paragraph 3 of CM 24-01 which include an acoustic survey should be reviewed by WG-ASAM in the first instance and that this may require a change in the submission deadline for these research proposals.

3.25 The Scientific Committee recommended that for research plans notified under CM 24-01, paragraph 3, which include an acoustic biomass estimate as a primary objective, WG-ASAM is the relevant Working Group and such plans should be reviewed there in the first instance. The Scientific Committee suggested that these research plans should be notified by submitting documents to WG-ASAM in addition to the current research notification process submitted by June 1st..

3.26 The Scientific Committee recommended that WG-ASAM add to its workplan the development of acoustic survey protocols for finfish similar to those developed for krill.

3.27 The Scientific Committee recommended that future research proposals that include an acoustic survey for finfish should include a self-assessment table to support the development, implementation, standardisation and review of survey protocols (as requested by SC-CAMLR-39, Annex 7, paragraph 4.28 and Table 9).

Icefish (*Champsocephalus gunnari*) in Subarea 48.3

3.28 The Scientific Committee noted the discussion in WG-FSA-2025 on mackerel icefish (*Champsocephalus gunnari*) in Subarea 48.3 (paragraphs 3.5 to 3.11).

3.29 The Scientific Committee noted that the current length-based assessment is robust, highly precautionary, and a suitable basis for providing management advice, given the significant difficulty in age-reading otoliths from this species. The Scientific Committee further noted that collection of otoliths may be beneficial for potential future ageing and connectivity studies, and such data may also potentially be useful for any future age-based stock assessment.

3.30 The fishery for *C. gunnari* in Subarea 48.3 operated in accordance with CM 42-02 and associated measures. In 2024/25, the catch limit for *C. gunnari* was 1 824 tonnes and 9 tonnes were taken as of 31 July 2025. Details of this fishery and the stock assessment of *C. gunnari* are contained in the Fishery Report (https://fisheryreports.ccamlr.org).

3.31 The Scientific Committee recommended that the catch limit for mackerel icefish in Subarea 48.3 should be set at 3 430 tonnes for 2025/26 and 2 230 tonnes for 2026/27 seasons (Table 1).

Toothfish (*Dissostichus* spp.)

Toothfish (*Dissostichus* spp.) in Subarea 48.4

3.32 The Scientific Committee noted deliberations by WG-FSA-2025 on *Dissostichus* spp. in Subarea 48.4 (WG-FSA-2025, paragraphs 4.28 to 4.37), which included discussions on a tag-based population assessment (WG-FSA-2025/12) and the harvest rate applied to the result of this assessment.

3.33 The Scientific Committee endorsed the advice of WG-FSA-2025 (WG-FSA-2025, paragraph 4.34) and recommended that the catch limit for *D. mawsoni* in Subarea 48.4 be set at 32 tonnes for the 2025/26 fishing season. It further recommended that assessments for this Subarea be carried out every two years, starting in 2026 to be in line with other toothfish stock assessments.

3.34 The Scientific Committee endorsed the advice of WG-FSA-2025 (WG-FSA-2025, paragraph 4.37) and recommended that the catch limit for *D. eleginoides* in Subarea 48.4 be set at 33 tonnes for the 2025/26 and 2026/27 seasons and noted the intention for an updated stock assessment to be presented in 2026 in line with other integrated toothfish stock assessments.

Toothfish (*Dissostichus* spp.) in Subarea 48.6

3.35 The Scientific Committee noted deliberations by WG-FSA-2025 on *D. mawsoni* in Subarea 48.6 (WG-FSA-2025, paragraphs 4.87 to 4.110) which included discussions on the considerable scientific advances in this Subarea following the Cap-DLISA workshop.

3.36 The Scientific Committee endorsed the advice of WG-FSA-2025 (paragraphs 4.109 and 4.110) and recommended that the research plan specified in WG-SAM-2025/02 continue and with the catch limits for *D. mawsoni* in Subarea 48.6 as specified in Table 1.

Toothfish (*Dissostichus* spp.) in Subarea 48.2

3.37 The Scientific Committee noted the discussions and extensive review of the two research plans proposed by Chile and Ukraine, respectively, to undertake research in the Subarea 48.2, which is classified as a closed area, at WG-SAM-2025 (paragraphs 6.10 to 6.15) and WG-FSA-2025 (paragraphs 4.126 to 4.138).

3.38 The Scientific Committee noted that whilst significant development had been undertaken on the proposals between WG-SAM-2025 and WG-FSA-2025, the proponents had not been able to develop a joint proposal in that time. The Scientific Committee further noted WG-FSA-2025 advice (paragraph 4.133) that the Working Group was unable to reach consensus on both proposals being undertaken in parallel with their own catch limits as there was no basis to determine if the combined effects of these two research plans submitted under CM 24-01 were precautionary.

3.39 The Scientific Committee recalled discussions in CCAMLR-XXXI (paragraph 5.28) regarding joint research plans to be developed when several Members propose research in the same area.

3.40 The Scientific Committee noted the request from WG-FSA-2025 (paragraph 4.137) to provide guidance to the proponents of the two proposals in Subarea 48.2 under CM 24-01 for coordinating their research plans or combining into a single proposal, as encouraged by WG-SAM (WG-SAM-2025, paragraph 6.15). The Scientific Committee recommended a coordinated or joint proposal should provide justification for:

(i) conducting research fishing in the closed area,

(ii) proposing a higher catch limit than in previous research (75 tonnes), and

(iii) be restructured to align with the purpose of the research linked to Commission or Scientific Committee priorities.

3.41 The Scientific Committee recommended that when multiple Members propose research plans in the same area and the primary objectives and sampling methodology are similar, then a joint multi-member proposal should be submitted. If there are differences in the primary objectives and/or sampling methodology, then coordination of the research plans should include:

(i) coordination of the catch limits across the total area (Subarea/Division),

(ii) coordination of complementary objectives, and

(iii) coordination of complementary data collection.

3.42 In these cases, the research proponents should detail where their research plans differ and why they cannot be aligned. The relevant Working Groups should then evaluate the different research plans and provide advice if one, some, or all research plans should proceed given their objectives and sampling designs.

3.43 The Scientific Committee noted that there was no consensus on the research plans submitted under CM 24-01in Subarea 48.2 proceeding in the 2025/26 season.

3.44 The Scientific Committee requested that the Commission provide guidance on whether scientific research fishing notified under CM 24-01 mainly focusing on data collection within closed areas is a priority for the current work of the Commission.

Toothfish (*Dissostichus eleginoides*) in Subarea 48.3A

3.45 The Scientific Committee noted the discussions and extensive review of the research plan proposed by Chile to undertake research in the closed Management Area 48.3A at WG-SAM-2025 (paragraphs 6.16 to 6.20) and WG-FSA-2025 (paragraphs 4.139 to 4.148).

3.46 The Scientific Committee noted that whilst significant developments had been undertaken on the proposal between WG-SAM-2025 and WG-FSA-2025, WG-FSA-2025 had not been able to reach consensus on conducting the proposed research (WG-FSA-2025, paragraph 4.146).

3.47 The Scientific Committee noted the discussions in WG-FSA-2025 (paragraphs 4.142 and 4.144) had included that this research proposal was an unusual situation as Management Area 48.3A has previously had a catch limit of 0 tonnes but is an area that is included within the 48.3 stock assessment for *D. eleginoides*. The Scientific Committee noted that Area 48.3A has been closed to fishing for 18 years with a catch limit of 0 tonnes, with the associated benefits of undisturbed benthic habitats.

3.48 The Scientific Committee further noted that in order to achieve the intention of the Convention, some parts of the Convention Area need to be closed to fishing and those areas must include some toothfish habitat. The Scientific Committee, noting the request for advice from the Commission regarding scientific research fishing within closed areas (paragraph 3.45), recommended that a very strong justification for scientific research fishing in a closed area should be provided.

3.49 Dr Collins noted that in his view, the catch limit proposed and a marginal improvement in the stock assessment is not a strong enough justification for fishing in a closed area. Dr Collins further noted that some of the objectives covered in the proposal (e.g. size-depth patterns) are already well established.

3.50 Dr Montenegro noted that in order to determine if the proposed catch limit for the research plan is appropriate, collection of data in the area through fishing needs to be undertaken. Moreover, Dr Montenegro noted that once the data from the first season of this research plan are obtained, the catch limits can be adjusted to levels that do not endanger the conservation of the *D. eleginoides* in Management Area A.

3.51 The Scientific Committee noted that there was no consensus on the research plan proposed in Management Area 48.3A proceeding in the 2025/26 season.

Statistical Area 58

Icefish

3.52 The fishery for *C. gunnari* in Division 58.5.2 operated in accordance with CM 42-02 and associated measures. In 2024/25, the catch limit for *C. gunnari* was 1 824 tonnes and 383 tonnes was taken as of 31 July 2025. Details of this fishery and the stock assessment of *C. gunnari* are contained in the Fishery Report (https://fisheryreports.ccamlr.org).

3.53 The Scientific Committee noted that WG-FSA-2025 reviewed a preliminary assessment of *C. gunnari* in Division 58.5.2 (WG-FSA-2025/17) that was based on the results of the trawl survey described in WG-FSA-2025/18. The 2025 survey showed a large 3+ cohort in the population and high estimated biomass. The assessment projected forward the proportion of the lower one-sided 95 percentile CI of fish aged 1+ to 3+ (9 901 tonnes). The assessment resulted in yields of 1 429 tonnes in the 2025/26 season and 1 126 tonnes in the 2026/27 season following the CCAMLR decision rules for icefish.

Advice to the Commission

3.54 The Scientific Committee recommended that the catch limit for mackerel icefish in Division 58.5.2 should be set at 1 429 tonnes in the 2025/26 season and 1 126 tonnes in the 2026/27 season.

Toothfish

Dissostichus mawsoni in Divisions 58.4.1 and 58.4.2

3.55 The Scientific Committee noted the discussion at WG-SAM-2025 (paragraphs 7.4 to 7.10) and WG-FSA-2025 (paragraphs 4.111 to 4.125) regarding the research conducted in the *D. mawsoni* exploratory fishery in Divisions 58.4.1 and 58.4.2 and an updated research plan for 2025/26, the last year of the research plan, by Australia, France, Japan, Korea, and Spain under CM 21-02, paragraph 6(iii).

3.56 The Scientific Committee noted that exploratory fishing under this research plan has been conducted in Division 58.4.2 in the past season by two Members using autoline equipped vessels, but that no exploratory fishing for toothfish has been allowed in Division 58.4.1 since 2018/19.

3.57 The Scientific Committee noted that macrourid otoliths had been collected for use in ageing studies, and that the analysis of by-catch species is planned as a milestone for 2026.

3.58 The Scientific Committee noted the considerable work that had been undertaken by the proponents to modify the research plan for Division 58.4.1 to allow for an evaluation of the effects of gear type on the collected data using an experimental design which had been developed based on a recommendation by WG-SAM-2024 (paragraph 8.19). These revisions allow for the integration and calibration of different gears and modelling approaches and are essential to address one Member's concerns about meeting the reporting format of CM 24-01/A, Format 2.

3.59 Dr Kasatkina reiterated that the research plan in Division 58.4.1 does not meet the requirements of CM 21-02, paragraph 6 (iii), under which this research plan is submitted. She noted that multiple gear types should not be used for multi-vessel research proposals submitted under CM 21-02, paragraph 6(iii), as research plans should be reported in accordance with Conservation Measure 24-01, Annex 24-01/A, Format 2, which refers to calibration/ standardisation of sampling gear.

3.60 Dr Kasatkina noted that the issue of gear standardisation had been ongoing for many years but that there are no proposals to provide investigations in this aspect. She noted that in previous years several papers on the different results (abundance indices, population structure and productivity indices, distribution of toothfish and dependent species; results of tag-recapture) obtained using different gears had been presented but this data was not taken into account (WG-FSA-17/16;WG-SAM-17/23; WG-FSA-16/13 Rev. 1; SC-CAMLR-XXXVII/BG/23). Dr Kasatkina also noted that using standardised fishing gear and standard procedures for adjusting and monitoring of its parameter when conducting multi-vessel research programs is a traditional and mandatory practice in ICES areas (WG-SAM-2019/34). She noted that currently there is no scientifically based evidence adopted by the Scientific Committee that would allow proponents of the research plan in Division 58.4.1 to ignore the use of standardised fishing gear in multi-vessel research plan for toothfish in data-poor area (WG-FSA-IMAF-2024/77; SC-CAMLR-43, paragraph 3.68).

3.61 Dr Kasatkina also noted that tag recapture rates had been low in Division 58.4.1 which could be a result of the use of different gear types (WG-FSA-2025/19). Dr Kasatkina noted that the use of different types of gear should be considered as a critical factor for achieving the efficiency and reliability of research program on toothfish in Division 58.4.1. She reemphasised that the same gear type is used in the research conducted by Ukraine and Korea in Subarea 88.3.

3.62 Dr Kasatkina recalled that for period 2005–2018 number of releases was 11 235 fish and number of recaptures was 57 fish (WG-FSA-2025/19).

3.63 All other Members noted that the proposed research plan represents an appropriate scientific experiment to calibrate and test the effects of multiple gear types on the data collection in a tagging program and recommended it to go ahead. They recalled that WG-FSA-2025 had noted that there are many established methods to allow for calibration between gears and that the proposed research satisfies the requirements of CM 24-01 Annex 2, Format 2, paragraph3a. (WG-FSA-2025, paragraph 4.120). They expressed disappointment that the Scientific Committee could again not find consensus on the research plan proceeding in Division 58.4.1 and it was regrettable that the work has not proceeded for 6 years.

3.64 These Members also noted that there was no evidence that the tag recapture rates were unusually low in Division 58.4.1, that these recapture rates were consistent with independent biomass estimates from CPUE by seabed area, and that progress has been made on tagging best practices since 2018 (WS-TAG-2023, video tutorials; WG-FSA-2025/53).

3.65 The Scientific committee recalled that there had been extensive discussions over the last 6 years about the use of different gear types for conducting research to estimate toothfish biomass with no agreement reached for the research to proceed.

3.66 The Scientific Committee noted that the interpretation of CMs is a matter for the Commission and recommended that it provides advice to the Scientific Committee on the definition and interpretation of 'calibration/standardisation of sampling gear' within Annex CM 24-01/A, Format 2, paragraph 3(a).

3.67 The Scientific Committee endorsed the research plan for the exploratory fishery in Division 58.4.2 but was unable to reach consensus on how to proceed in the exploratory *D. mawsoni* fishery in Division 58.4.1.

3.68 The Scientific Committee recommended that the catch limit for *D. mawsoni* in Division 58.4.2 be based on the trend analysis shown in Table 1 for the 2025/26 fishing season.

Patagonian toothfish (*D. eleginoides*) in Division 58.5.1

3.69 The fishery for *D. eleginoides* in Division 58.5.1 is conducted in the French Exclusive Economic Zone (EEZ) of the Kerguelen Islands. Details of the fishery and the stock assessment are contained in the Fishery Report (https://fisheryreports.ccamlr.org).

3.70 No new information was available on the state of fish stocks in Division 58.5.1 outside areas of national jurisdiction. The Scientific Committee, therefore, recommended that the prohibition of directed fishing for *D. eleginoides*, described in CM 32-02, remain in force in 2025/26.

Patagonian toothfish (*D. eleginoides*) in Division 58.5.2

3.71 The fishery for *D. eleginoides* in Division 58.5.2 operated in accordance with CM 41-08 and associated measures. In 2024/25, the catch limit for *D. eleginoides* was 2 120 tonnes and 1 456 tonnes was taken as of 31 July 2025. Details of the fishery and the stock assessment are contained in the Fishery Report (https://fisheryreports.ccamlr.org/).

3.72 No new information was available on the state of fish stocks in Division 58.5.2 outside areas of national jurisdiction. Therefore, the Scientific Committee recommended that the prohibition of directed fishing for *D. eleginoides*, described in CM 32-02, remain in force in 2025/26.

Patagonian toothfish (*D. eleginoides*) in Subarea 58.6

3.73 The fishery for *D. eleginoides* at Crozet Islands is conducted within the French EEZ and includes parts of Subarea 58.6 and Area 51 outside the Convention Area. Details of this fishery and the stock assessment are contained in the Fishery Report (https://fisheryreports.ccamlr.org/).

Statistical Area 88

Toothfish

Ross Sea region (Subarea 88.1 and SSRUs 882AB)

3.74 The Scientific Committee noted that vessels entered the Convention Area into the Ross Sea region (Subarea 88.2) up to 46 days prior to the opening of the fishery. It noted that this behaviour might affect the interpretation of the catch and effort data and be a contributing factor in the short season in the N70 Management Area. The Scientific Committee noted that the lack of constraints on entering an area a long time prior to the commencement of fishing was at odds with the requirement to leave any management area as soon as that area was closed to fishing (WG-FSA-2025, paragraphs 2.2, 2.3 and 2.8).

3.75 The Scientific Committee noted that N70 Management Area was closed four days after the start of the season and had exceeded the catch limit for the Management Area by 54% (SC-CAMLR-44/BG/01, Table 3). It noted that the combination of a low catch limit and high catch rates had led to difficulties forecasting the closure date. It noted that the early arrival of vessels and the short fishery may create risks for achieving the objectives of the Convention.

3.76 The Scientific Committee recommended that further investigations into catches, catch rates, tag release, tag recapture data and tag overlap statistics from vessels which operated in the N70 Management Area be undertaken.

3.77 The Scientific Committee noted that the late retrieval of gear and departure by some vessels in the fishery may also affect the quality of data collection and recommended that the investigations also include this factor in the analysis.

3.78 The Scientific Committee noted that although the catch in the N70 Management Area had exceeded the catch limit, this was taken into account in the determination of the closure of the Ross Sea S70 region, and the overall catch limit in the Ross Sea region fishery had not been exceeded.

3.79 The Scientific Committee recommended that Commission note that the large number of vessels notified to fish in the Ross Sea region fishery may lead to further difficulties forecasting a closure date for the N70 Management Area that ensure the catch limit is not exceeded.

Ross Sea Shelf Survey

3.80 The Scientific Committee noted that WG-SAM-2025 had evaluated the proposal and the self-assessment provided in Appendix 1 of WG-SAM-2025/08 and agreed that the survey design would achieve its objectives.

3.81 The Scientific Committee noted that an updated proposal had been presented in WG-FSA-2025/43, and that WG-FSA-2025 had evaluated the proposal in the assessment table (WG-FSA-2025, Table 4) and agreed that the catch limit was appropriate for the research.

3.82 The Scientific Committee endorsed the recommendations of WG-FSA-2025, paragraph 4.155, that the research outlined in WG-FSA-2025/43 for the 2025/26–2027/28 seasons proceed, with a catch limit set at 64 tonnes for 2025/26, 85 tonnes for 2026/27 and 64 tonnes for the 2027/28 season.

Subarea 88.3

3.83 The Scientific Committee endorsed the recommendation of WG-FSA-2025 that the research outlined in WG-FSA-2025/49 Rev. 1 for Subarea 88.3 for the 2025/26 season proceed.

3.84 The Scientific Committee recommended that the catch limits for Subarea 88.3 be based on the trend analysis as shown in Table 1, with the effort-limited Research Block 2 being conducted with seven sets for each vessel and a catch limit of 20 tonnes.

3.85 The Scientific Committee recalled the discussions in the Commission (CCAMLR-XXXVI, paragraphs 5.20 to 5.24) on a proposal to establish 88.3 as an exploratory fishery. The Scientific Committee noted that the proponents have completed the research plan discussed in 2017 and another 3-year research plan since then. It further noted that research in this area has been undertaken for a long time now and is on its way to developing a stock assessment. The Scientific Committee considered whether Subarea 88.3 could move to an exploratory fishery notified under CM 21-02, paragraph 6 (iii).

3.86 The Scientific Committee noted that CM 21-02, paragraph 1 provided for new fisheries to be reclassified as exploratory fisheries, but that new fisheries were defined in CM 21-01, paragraph 1 as those where fishing had not previously occurred, which did not apply to Subarea 88.3.

3.87 The Scientific Committee noted that a directed fishing for *Dissostichus* spp. In Subarea 88.3 was currently prohibited in the area under CM 32-02, Annex A, with the exception of research under CM 24-01, until a survey of stock biomass is carried out and Commission decides to open the area based on advice from the Scientific Committee.

3.88 The Scientific Committee noted that despite proposals from some Members to develop a regulatory framework for toothfish fisheries, this had not been agreed and there was not yet an agreed mechanism for moving from one category of fishery to another.

3.89 The Scientific Committee noted that the proposed exploratory fishery would overlap with the proposed D1MPA and that the impact of any fishing activities and locations would need to be consistent with the objectives of the proposed D1MPA.

3.90 The Scientific Committee noted the challenges of establishing exploratory fisheries under the Conservation Measures in force and requested that the Commission provide guidance on the development of an exploratory fishery in this area and on the harmonisation of the proposals for an exploratory fishery with the proposed D1MPA.

3.91 ASOC made the following statement

> ‘ASOC welcomed the progress on toothfish research and management including the development of a Management Strategy Evaluation workplan. ASOC is concerned at the impact of climate change on future recruitment and looks forward to seeing further discussion over the coming year.’

Non-target catch

Fish and invertebrate by-catch

4.1 The Scientific Committee considered the discussion during WG-FSA-2025 regarding by-catch management in krill fisheries (WG-FSA-2025, paragraphs 6.27 to 6.42).

4.2 The Scientific Committee recalled that all by-catch taxa, total weight and numbers, should be reported in the C1 form from every haul (traditional) or every two hours period (continuous), and that observers are tasked (not mandatorily required) to sample 25 kg of catch on a daily basis from which they separate and identify by-catch in accordance with instructions in the Scientific Observer Logbook (2025 Observer Krill Trawl Logbook – Instructions, 2025). However, the Scientific Committee further noted the disparity between the upscaled observer by-catch estimates and that reported by the vessels, with observer data indicating that by-catch is an order of magnitude higher than that reported by vessels (WG-FSA-2025/03).

4.3 The Scientific Committee noted that clear guidance on vessel subsampling protocols was required to ensure comparability between observer and vessel derived datasets, and that this work would strengthen compliance with CM 23-06 requiring vessels to report total by-catch, while also improving the accuracy of estimates of by-catch (WG-FSA-2025, paragraph 6.35).

4.4 The Scientific Committee noted that the key distinction for data collection by vessel crew should be between krill and non-krill catch and that a trial implementation could provide useful feedback on sampling practicality and data reporting (WG-FSA-2025, paragraph 6.36).

4.5 The Scientific Committee endorsed the recommendation by WG-FSA (WG-FSA-2025, paragraph 6.38) that improvements be made to existing reporting structures and that the revised methodology (WG-FSA-2025, Figure 2) could be implemented together with an updated by-catch reporting form (WG-FSA-2025, Table 8) on a trial basis.

4.6 The Scientific Committee further endorsed the recommendation by WG-FSA (WG-FSA-2025, paragraph 6.39) that:

(i) As a trial, the proposed method would require vessels to continue to separate and report large fish by-catch in the C1 forms, but also take samples of at least 2 kg from the catch from every haul (traditional) or every two hours (continuous) and report the weight of each component of the catch (krill and non-krill, without the need to identify by-catch species)

(ii) An additional worksheet would be added to the revised C1 form, with a proposed target for introduction in 2026/27 season (Table 8).

4.7 The Scientific Committee also requested that the Secretariat analyse the by-catch sampling frequency among vessels and its effect on by-catch variability from the first year of the trial and consider additional changes to the worksheet (paragraph 4.6(ii)).

Incidental mortality of seabirds and marine mammals associated with fisheries

4.8 The Scientific Committee considered discussions held by WG-SAM regarding the development of Generalised Additive Models (GAMs) to extrapolate SISO warp strike observations to the total fishing effort in the krill fishery (WG-SAM-2025, paragraphs 2.1 to 2.4).

4.9 The Scientific Committee welcomed the work and noted that further development of this method could take into consideration the behaviour of birds around fishing vessels under different risk periods of fishing operation and environmental conditions (relating to light, wind, and the relationship between wind and vessel course) (WG-FSA-2025, paragraph 6.6). The Scientific Committee suggested continuing discussion on this method at WG-IMAF-2026.

4.10 The Scientific Committee endorsed the proposed modifications to the IMAF and warp strike worksheets for observer trawl finfish and krill fisheries logbooks (WG-EMM-2025, paragraph 3.22) and agreed to implement these in the 2026 season.

4.11 The Scientific Committee noted the discussion by WG-EMM-2025 on the methods for calculating the sampling rate for warp strike observation on trawlers towing twin nets concurrently (WG-EMM-2025, paragraph 3.24). It referred further discussion on the appropriate calculation method to WG-IMAF-2026.

4.12 The Scientific Committee noted a summary of IMAF and warp strike activities presented at WG-FSA-2025 (paragraph 6.1) and extrapolated estimates for the 2024/25 season based on data up to and including 15 September 2025, and that full analyses for the 2024/25 season will be presented at WG-IMAF-2026. The extrapolated number of seabird mortalities in the longline fisheries for the season to date was 30 individuals, which is the second lowest on record.

4.13 The Scientific Committee further noted one southern elephant seal (*Mirounga leonina*) in Subarea 48.3 was the only reported marine mammal mortality from the longline fisheries.

4.14 The Scientific Committee noted one humpback whale (*Megaptera novaeangliae*) mortality (detailed in WG-EMM-2025/27) and one unidentified Otariid seal (WG-FSA-2025/07) reported in the krill trawl fishery in the 2024/25 season (WG-EMM-2025, paragraphs 3.33 and 3.34). The Scientific Committee thanked Chile for the transparent report which provided information that WG-IMAF and the collaborative IWC Discussion group could use to further minimise the occurrence of these incidents. Noting that this is the eighth humpback mortality reported since the start of the krill fishery (all since 2021), the Scientific Committee also noted that further work is needed to minimise whale entanglements or entrapments.

4.15 Some Members recalled vessel and area limits on seabird incidental mortality (CM 42-01, paragraph 8) and noted that a similar approach could prove effective to limit cetacean incidental mortality.

4.16 The Scientific Committee noted the low estimates of seabird and mammal mortality from longline fisheries operating in the Convention Area (WG-FSA-2025, paragraph 6.2). It recalled that low mortalities in the longline fishery had not always been the case, and such continued low rates in mortalities was welcome progress.

4.17 The Scientific Committee recalled that most frequently struck birds for krill trawlers are small petrels, which are highly manoeuvrable while flying, and this characteristic may mitigate the potential injury caused by strikes (SC-CAMLR-43, paragraph 4.15). It also noted that warp strikes may cause longer term injuries to the birds that result in mortality above the level that is observed. It suggested future research to investigate the post-contact status of sea birds interacting with krill fishing gears.

4.18 SC-CAMLR-44/BG/30 presented a preliminary report on the result of the trial on net monitoring cable seabird-strike mitigation measures conducted by the Chinese continuous fishing vessels *Shen Lan*, *Fu Xing Hai* and *Fu Yuan Yu 9199* during the 2024/25 fishing season, from which detailed information will be submitted to the WG-IMAF-2026 as per the requirements of CM 25-03. The on-vessel observation coverage of the three vessels was from 5.5% to 24.0%, with 44 seabird strikes observed across all the three vessels.

4.19 The Scientific Committee commended the efforts of Members to conduct detailed trials of net monitoring cable mitigation showing progress to address this issue. It also noted differences in the observation coverage among the three vessels, and the authors clarified that the particularly high observation efforts for the new vessel *Fu Yuan Yu 9199* were conducted in order to achieve effective mitigation measures as soon as possible. It was noted that a detailed report of these trials would be presented at WG-IMAF-2026.

4.20 The Scientific Committee noted the level of heavy strikes on the trawl warps on the *Fu Xing Hai*, which contributed to general concerns about seabird strikes across the trawl fleet from the Scientific Committee. The Scientific Committee noted that video recordings of warp strikes would be useful for WG-IMAF-2026 to consider the classification of seabird strike severity. The Scientific Committee also noted that the video observations were conducted from different cameras during the same fishing event, and welcomed further details to be presented at WG-IMAF-2026. Further details should include clarification on the calculation on total observation time to better understand the proportion of operations that were observed and to also avoid potential non-independence issues in subsequent data analyses.

4.21 ACAP appreciated the ongoing trials by China in its continuous trawl fishery to mitigate the impacts of fishing on seabirds. ACAP remained concerned at the levels of bird strikes within CCAMLR krill trawl and continuous trawl fisheries. ACAP recommended that CCAMLR consider approaches to better reflect these interactions in the seabird mortality figures, as birds subject to ‘heavy strikes’ are more likely than not to have life-threatening injuries. ACAP advised that its next meetings, including the 13th meeting of ACAP’s Seabird By-catch Working Group (SBWG13), will be held in Namibia in mid-2026. As SBWG13 will continue to consider specific mitigation measures that may be effective for continuous trawl fisheries, ACAP encouraged any Members conducting research into mitigation of the impacts of continuous trawling on seabirds to submit their research findings to the ACAP Secretariat.

Bottom fishing and vulnerable marine ecosystems

4.22 The Scientific Committee considered discussions during WG-EMM-2025 regarding Vulnerable Marine Ecosystems (VMEs) (WG-EMM-2025, paragraphs 5.38 to 5.43). This included consideration of a proposal to list a potential VME off the east coast of Cuverville Island in the Errera Channel (Subarea 48.1). The site holds a diversity of demosponges and hard bryozoans.

4.23 The Scientific Committee recalled that benthic ecosystems have rarely been considered by CCAMLR, although they represent an important part of CCAMLR ecosystemic approach to fisheries management and conservation.

4.24 The Scientific Committee noted that the methods presented in WG-EMM-2025/68 using a quantitative approach derived from video analysis had already been presented to WG-EMM (WG-EMM-18/35; WG-EMM-2022/34 Rev. 1; WG-EMM-2022/46 Rev. 1; WG-EMM-24/48 Rev. 1) and to the Scientific Committee (SC-CAMLR-XXXVII, paragraphs 5.30 to 5.36; SC-CAMLR-41, paragraphs 5.37 and 5.38; SC-CAMLR-43, paragraphs 4.31 and 4.32) resulting in the addition of 11 VMEs to the CCAMLR VME registry.

4.25 The Scientific Committee also noted that the CCAMLR VME registry was an important tool to preserve knowledge of the position of VMEs in the Convention Area in order to potentially monitor these important components of the ecosystem often difficult to access.

4.26 The Scientific Committee further recalled that Annex 22-06/B provided clear guidelines specifying categories of information to be included in VME notification and that it was left to the Scientific Committee to provide advice to the Commission. The Scientific Committee also noted that paper WG-EMM-2025/68 had provided all required information as set out in Annex 22-06/B.

4.27 Some Members considered that a threat was necessary to grant VME status to ecosystems and that a specific threat was not demonstrated in the case presented. Most Members considered that the designation of new VME areas is not contingent on the presence of a specific threat like fishing pressure.

4.28 Some Members expressed their concern about the absence of formally consolidated Scientific Committee approved criteria for using video imagery in VME identification, and considered that further development of standardised, quantitative protocols was necessary to ensure consistency and comparability with existing criteria, especially with new technology being developed in the future.

4.29 Most Members recalled that guidelines for the preparation and submission of notifications of encounters with VME are outlined in CM 22-06 using criteria such as species composition and abundance, and that this definition was independent of the technology used for observation. The guidelines include the use of video recordings and additional ecological criteria described during the VME workshop in 2009 (paragraphs 3.1 to 3.6 and 3.11), and WG-EMM-2010 (paragraphs 3.3 and 3.46 to 3.49).

4.30 The Scientific Committee did not reach consensus on the inclusion of the site in the Errera Channel (Subarea 48.1) in the CCAMLR VME registry.

4.31 The Scientific Committee considered whether a new 'potential VME' category could be introduced to the VME registry to record the location of ecologically relevant benthic areas that did not achieve consensus for the VME registry, and whether that could include the Errera Channel (Subarea 48.1) potential VME.

4.32 The Scientific Committee considered paper SC-CAMLR-BG/27 that describes the ASOC initiative 'SOCSI' designed to identify VMEs from in situ video observations. SOCSI collaborates with the specific tourism operators that deploy submarines to observe seabed communities. Video footage recorded during dives are analysed using annotation techniques and VME indicator taxa identified. All data produced are submitted to the SCAR Antarctic Biodiversity Portal/ AntOBIS database.

4.33 The Scientific Committee welcomed the paper and noted that the collaboration with the tourism industry that regularly revisit the same sites will help monitor changes in benthic communities.

Ecosystem monitoring and management

5.1 SC-CAMLR-43/BG/19 reported that the Chilean National Oceanographic Committee (CONA) will conduct its first Antarctic expedition under the CIMAR programme (1–12 October 2025) following 30 previous cruises in Chilean fjords and oceanic islands. The cruise will implement nine projects across geology, biogeochemistry and physics, and biology.

5.2 SC-CAMLR-44/BG/20 reported British Antarctic Survey conducted aerial surveys of penguin colonies on the Antarctic Peninsula and South Shetland Islands during 2013/14, 2015/16 and 2019/20. Aerial photography can enable large-scale monitoring of various species. Survey photographs are currently being analysed, with results expected to be presented to WG-EMM in 2026. Periodic surveys (e.g. every five years) using new technology cameras could provide broad-scale penguin survey data to contribute to an integrated penguin monitoring programme in Subarea 48.1.

5.3 The Scientific Committee welcomed the work, noting that it helped close some gaps in distribution and abundance data on *Pygoscelis* species and is also of importance for SOA. The Scientific Committee further noted that Oceanites work could provide ground-truthing data to support count interpretation that might be useful in the future. The Scientific Committee also noted that aerial camera imagery collected as part of this work may capture other species, such as fur seals, providing valuable additional information.

5.4 SC-CAMLR-44/BG/22 informed CCAMLR about the current status of the Weddell Sea Observatory of Biodiversity and Ecosystem Change (WOBEC) project. In its first year, WOBEC has delivered scientific outputs supporting the development of a systematic ecosystem monitoring framework for the eastern Weddell Sea / Kong Haakon VII Sea, contributing to the research and monitoring plans of the proposed Weddell Sea MPAs (Phases 1 and 2). Key outputs include a first Data Management Plan (https://zenodo.org/records/15040396), a prototype interactive dashboard (https://wobec.shinyapps.io/data-summary/) and a factsheet (https://wobec.aq/news/). A first WOBEC sampling campaign across sea-ice, pelagic, and seafloor habitats combining biological, physical, and biogeochemical measurements will take place December 2025 – February 2026.

5.5 The Scientific Committee welcomed the WOBEC project and highlighted the importance of establishing an international research network to support research and monitoring activities in the Weddell Sea.

5.6 The Scientific Committee noted that data on *D. mawsoni* from the WOBEC *Polarstern* cruise (PS 152) could, inter alia, contribute to the stock hypothesis for Area 48 and to development of a Casal2 assessment model.

5.7 SC-CAMLR-44/BG/31 presented progress on developing a regular CCAMLR State of Antarctic Environment (SOAE) report. It aims to provide the Commission, Scientific Committee, and stakeholders with an accessible status report summarising environmental conditions and data relevant to marine living resources. WG-EMM-2025 discussions identified two levels of reporting: (i) a technical report (Level 1) for scientists, and (ii) a summarised, illustrative version for Commissioners (Level 2). These reports will synthesise multiple data streams to support an assessment of the state of the Antarctic ecosystem and management decisions. Members are invited to suggest key content and additional metrics for future iterations and contribute to the development of regional status reports.

5.8 The Scientific Committee welcomed the work on a regular SOAE report and thanked UK for initiating this project. The Scientific Committee noted that the two-level approach is helpful and looks forward to a refined draft for WG-EMM-2026.

5.9 The Scientific Committee also recognised that the topics considered (climate, ocean, and biodiversity) already have established sets of essential variables developed by international organisations, including GCOS, GOOS, and GEOBON, which could inform and strengthen the status report.

5.10 The Scientific Committee noted that SCAR research programmes, such as ANT-ICON, and expert groups, such as ANTOS, as well as SCAR web-tools and databases, and SOOS' data portal, SOOSmap, and a new project initiative (SC-CAMLR-44/BG/34) could contribute to the development of the SOAE report.

5.11 Some Members noted the potential challenge of presenting different areas, each based on varying data availability, within a single status report format. In addition, the challenge of processing data in different formats for inclusion in the report was highlighted.

5.12 The Scientific Committee acknowledged differences between regions but noted the collective expertise available to address these challenges and encouraged efforts to develop reports for regions other than Area 48.

5.13 The Scientific Committee agreed to provide an update on progress and next steps with SOAE reporting to the Commission.

5.14 SC-CAMLR-44/BG/37 reported 2024/25 surveys of *Pygoscelis* penguins on Galindez, Petermann, and Yalour. Gentoo numbers peaked at ~4 000 adults and 1 423 nests, with 1.34 chicks per nest, showing a general population increase since 2017 despite a 2024 nest decline. Time-lapse cameras lagged direct observations for egg-laying and hatching but detected crèche formation dates accurately, revealing minimal phenological change for Gentoos on Petermann, later clutch initiation and hatching dates for Adélie penguins on Yalour, and spatial variability in clutch initiation for Gentoos on Galindez. UAV surveys expanded coverage, including 4 670 penguins on Pleneau Island, demonstrating their utility for broader monitoring.

5.15 The Scientific Committee welcomed the work and noted the importance of the CEMP review given its role in monitoring the potential effects of the krill fishery and links to the proposed D1MPA. The Scientific Committee noted the CEMP review should be a focus of discussions at WG-EMM-2026.

5.16 Some members acknowledged the significant scientific contributions to CCAMLR of the Ukrainian scientist Dr Leonid Pshenichnov and expressed their regret regarding his detention by the Russian Federation.

5.17 The Coalition of Legal Toothfish Operators (COLTO) presented SC-CAMLR-44/BG/10, where several toothfish vessels are collecting high-quality oceanographic data in the CCAMLR Area using temperature-depth recorders through the Fishing vessels Ships Of Opportunity Program (FishSOOP).

5.18 The Scientific Committee noted that over 400 recordings had been undertaken to date and that additional toothfish vessels are expected to join the programme soon. The Scientific Committee thanked COLTO for presenting this report and encouraged COLTO and toothfish vessels work together continuously to collect high-quality oceanographic data.

5.19 The International Association of Antarctica Tour Operators (IAATO) presented SC-CAMLR-44/BG/12 Rev. 1 on its operational procedures to reduce risk of ship strike and further developments in its marine mammal monitoring programs. IAATO’s four mandatory Geofenced Whale Areas require a 10-knot speed restriction, and the Acoustic Awareness Zone includes further restrictions to limit acoustic disturbance. The paper highlights that the Voluntary Cetacean and Pinniped Sightings (V-CaPS) program, established in 2022/23, will collect data via the ORCA OceanWatchers app starting in the 2025/26 season. The program standardises marine mammal monitoring, integrates opportunistic data from IAATO Operators into a large dataset, and provides a source of information for ongoing cetacean population monitoring and management of IAATO vessel operations in the Antarctic Peninsula region. Over 18 700 cetacean observations have been submitted to the program to date, and these data have been valuable to the continued development of the Geofenced Whale Areas.

5.20 The Scientific Committee welcomed the report and noted that the procedure for incidental sightings implemented in the V-CaPS data could be standardised with observing protocols being developed by the CCAMLR-IWC collaboration on cetacean data to inform the KFMA/proposed D1MPA. The Scientific Committee invited IAATO to the CCAMLR Discussion group on cetacean monitoring to advance this work.

5.21 The Scientific Committee further noted that a ship strike database managed by the IWC (IWC Global Vessel Strikes Database) exists and encouraged CCAMLR Members to report incidents to this database.

5.22 SCAR presented SC-CAMLR-44/BG/29 which introduced a new plastic pollution webtool produced in collaboration with the SCAR Plastic in Polar Environments Expert Group. The paper highlighted that growing understanding of the pervasive presence of plastic pollution in the Southern Ocean necessitates assessing its distribution, intensity, and local sources, as well as combined effects with other stressors such as climate change. The paper highlights recent research by Hunter et al. (2024) which maps microplastic hotspots to identify high-risk areas for plastic-biota interactions in the Southern Ocean. To accompany this work, an online interactive web-based tool (https://southernoceanplastic.data.bas.ac.uk) has been developed to map microplastic hotspots and high-risk plastic-biota interactions, supporting coordinated monitoring and mitigation.

5.23 The Scientific Committee welcomed the paper and associated web tool, noting that the information provided is valuable. It was suggested that the spatial distribution data could be complemented by abundance information and that the inclusion of oceanic current data would further strengthen the analysis. The Scientific Committee also noted that monitoring heavy metals would be a valuable addition to the webtool.

5.24 The Scientific Committee recognised that marine plastic pollution is a major concern and that monitoring efforts are important. The Scientific Committee encouraged continued joint efforts between the CEP and CCAMLR to continue to improve plastic pollution management practices and reduce the input of plastics from the Antarctic continent into the Southern Ocean.

5.25 SC-CAMLR-44/BG/33 reported on the new SCAR Action Group on Fish, SCARFISH. SCARFISH facilitates knowledge exchange, coordinates priorities, promotes data sharing, and broadens participation. Updates include progress towards objectives, connections to CCAMLR, and new Working Groups: Horizon Scan; Biology and Life History; Biogeography, Modelling and Management; Genomics, Physiology and Pathology; Fieldwork; Data; and Outreach. The SCARFISH Horizon Scan Working Group aims to identify the major knowledge gaps and prioritise the most important scientific questions regarding Southern Ocean fish. There will be a community survey coming to CCAMLR in the near future inviting participation in this Southern Ocean fish Horizon Scan. SCARFISH encourages widespread participation from the CCAMLR community.

5.26 The Scientific Committee thanked SCAR for the update on the SCAR Action Group SCARFISH and highlighted the contribution of this group particularly to the objectives of WG-FSA, such as the investigation of biological parameters of by-catch species and identification of larval fish by-catch, as well as climate change effects, and noted that the SCARFISH efforts align well with several CCAMLR Members' national research programmes. The Scientific Committee further noted the importance of collaboration with SKEG to identify areas of overlap and encouraged participation in the joint workshop at the SCAR Open Science Conference in 2026 (paragraph 11.38).

5.27 SC-CAMLR-44/BG/39 provided an update on High Pathogenicity Avian Influenza (HPAI) H5N1 in Antarctica during 2024/25 season. Following its first detection in February 2024, the virus is established in the northern Antarctic Peninsula and has spread across sub-Antarctic islands. By September 2025, 32 sites in the Antarctic were affected, with multiple introductions via natural wildlife migration. HPAI H5N1 affects skuas, penguins, seals, and giant petrels, causing mass mortality events and asymptomatic infections. Human risk remains low, but strict biosecurity is essential. SCAR confirms that recommendations endorsed by the ATCM46 in 2024 remain relevant and additional recommendations were endorsed by the ATCM47 in 2025. IAATO and SCAR, along with other community partners including the Council of Managers of National Antarctic Programs (COMNAP) and CCAMLR, will continue to actively report on the HPAI topic in the CCAMLR Area.

5.28 The Scientific Committee thanked SCAR for the update on HPAI H5N1 and recognised the importance of the work conducted in collaboration with IAATO and COMNAP. The Scientific Committee noted particular concern regarding the situation at the Antarctic Peninsula. The Scientific Committee further noted the importance of protocols, including updated guidance for persons operating in Antarctica, monitoring of seabirds in Antarctica, and the implementation of biosecurity measures to minimise risk to Antarctic wildlife.

5.29 The Scientific Committee endorsed the recommendation of WG-EMM-2025 (paragraph 2.72) to implement revisions to CEMP data submission forms to allow reporting of HPAI presence at CEMP sites.

5.30 Dr Ghigliotti provided an update on investigations conducted in Terra Nova Bay (Subarea 88.1). The protocols followed were aligned with COMNAP, and blood samples collected from Adélie and emperor penguins tested negative.

5.31 The Scientific Committee noted discussions at WG-EMM-2025 on the utility of alternative indices for monitoring predator diet, including faecal DNA analyses. Such molecular analyses can offer higher taxonomic resolution than is often possible in standard stomach lavage samples.

5.32 The Scientific Committee endorsed the development of a standard faecal DNA metabarcoding method for diet analysis as an additional CEMP standard method to complement Standard Method A8 (WG-EMM-2025, paragraph 2.83).

5.33 The Scientific Committee considered how the incorporation of cetacean data into CCAMLR ecosystem monitoring could be supported by molecular methods. The Scientific Committee encouraged further collaboration between cetacean experts noting the possible relevance of ongoing eDNA research and welcomed the strengthening of links between SC-CAMLR and the IWC-SC (WG-EMM-2025, paragraph 2.114).

Spatial management of impacts on the Antarctic ecosystem

Existing Marine protected areas, including research and monitoring plans for MPAs

6.1 The Scientific Committee endorsed the recommendation of WG-EMM on the proposed framework timeline (WG-EMM-2025, table 9; WG-EMM-2025/36, Table 1) for the review process that will be in 2027.

6.2 The Scientific Committee noted that the research approach and the specific indicators are consistent with the requirements of CM 91-05 including priority elements and the research and monitoring plan topics. The framework is informed by baseline data contained in the CMIR database and associated indicators, and integrates suggestions from the SMART goal proposal (CCAMLR-42/44; SC-CAMLR/42/BG/08).

6.3 The Scientific Committee endorsed the recommendation of WG-EMM-2025 (paragraph 5.17) on the approach for the objective-based reporting to support the 10-year review of the RSrMPA as set out in CM 91-05.

6.4 CCAMLR-43/48 offered suggestions for the establishment of Marine Protected Areas (MPAs) within the CAMLR Convention Area specifically focusing on regulating a standardised process for the designation and management of MPAs considering current legal and scientific considerations. The authors proposed the development of a roadmap as a tool to support the achievement of MPA objectives, and a draft version of this roadmap was included in the paper. The proposal included: (i) amending CM 91-04 to introduce adequate procedural and implementation provisions for a unified process governing the establishment and management of MPAs in the Convention Area; (ii) suspending discussions on new MPA proposals until the rules for this unified process, as outlined in CM 91-04 and Annexes 1–3, have entered into force; and (iii) transitioning the South Orkney Islands Southern Shelf MPA (SOISS MPA, CM 91-03) to fall under the revised governance framework of CM 91-04, based on the submission of all necessary documentation and by consensus of both the Scientific Committee and the Commission.

6.5 The Scientific Committee recalled that CAMLR-43/48 was discussed at SC-CAMLR-43 and referred to its response to the paper at that meeting (SC-CAMLR 43, paragraph 6.7).

6.6 China expressed its support for the concerns raised in paper CCAMLR-43/48 and noted that their Working Paper (CCAMLR-44/09) proposed the RMP should identify the indicators and their parameters, identify states of ecosystem or decision triggers, and include assessment mechanisms and relevant procedures. China noted that CCAMLR-43/48 suggested who, where and how the Research and Monitoring Plan (RMP) will be conducted for each phase, and WG-EMM-2025 contains Table 9 presenting such elements. China further noted the practise could help the roadmap mentioned in their papers.

6.7 SC-CAMLR-44/BG/21 Rev. 1 presented the outcomes of the inaugural meeting of the Ross Sea region Marine Protected Area (RSrMPA) Research Coordination Network (RCN), held in June 2025 in Boulder, Colorado (USA). The meeting gathered 128 participants from 22 countries, including many CCAMLR Members, representing diverse sectors such as science, government, NGOs, industry, and Indigenous and international organisations. The RCN will advance three core components: policy engagement, community partner engagement, and integrated science which encompasses data science and cyberinfrastructure, biophysical modelling, and observation and process studies.

6.8 The Scientific Committee welcomed the establishment of the RCN, noting the potential to enhance coordination and collaboration among Members. The SC emphasised the importance of the RMP for collecting valuable data.

6.9 The Scientific Committee noted that an upcoming workshop at SCAR Open Science Conference, led by Dr C. Brooks, would provide further opportunities for engagement and encouraged participation.

6.10 Russia noted that the rationale and description of the indicators and criteria for achieving the RSrMPA's objectives remain unknown and the proposed indicative. Russia also noted that the proposed indicative species still do not correspond to the spatial structure of the MPA and the stated objectives of the MPA. Russia emphasised that the absence of a RMP for the MPA approved by the Commission makes it impossible to evaluate the effectiveness of the MPA and adopt the report for the first review period 2017–2027.

6.11 China noted that an operable and well-designed RMP should be included in MPA proposals rather than be prepared after the MPA is established.

6.12 New Zealand noted that these comments relate to policy instead of science and further discussion can take place when paper CCAMLR-44/BG/20 is presented at Commission.

6.13 SC-CAMLR-44/BG/35 updated the papers WG-EMM-2025/35 and WG-EMM-2025/36 to capture the discussions in WG-EMM-2025. The paper outlines the objective-based review framework for the 10-year review of the RSrMPA due in October 2027. CM 91-05 requires the Scientific Committee to advise the Commission on progress toward achieving the 11 objectives of the RSrMPA and the ongoing relevance of the objectives.

6.14 The Scientific Committee thanked the authors of this paper and recognised the science-based framework for the RSrMPA review. The Scientific Committee noted the progress of the work since WG-EMM-2025 and highlighted the role of the Ross Sea RCN in promoting collaborative research projects.

6.15 The Scientific Committee noted that the framework and review plan meets the requirements of CM 91-05 and includes clear and measurable indicators, which will allow for a robust and transparent evaluation. Members highlighted the importance of analysing ecological trends and climate change impacts across trophic levels.

6.16 Russia noted that there is not enough justification for the criteria used to assess whether the MPA's objectives are being met and the species indicators included in the MPA objective are not enough and make it difficult to evaluate its effectiveness.

6.17 China suggested some species such as crystal krill (*Euphausia crystallorophias*) and Antarctic silverfish (*Pleuragramma antarctica*) are still not well understood and their current baseline data are difficult to support MPA review related to the objective of protecting core distributions of dominant pelagic prey species, and these species whose data are limited and the site surveys should cover their core habitats.

6.18 Most Members considered this a significant milestone for CCAMLR, noting that the RSrMPA review could serve as a model for the assessment of other MPAs currently under discussion. Most Members expressed their continued support for the MPA network through 2027.

6.19 Dr Kasatkina noted that toothfish is a critical test species for the RMP. Regular surveys on the Ross Sea shelf are conducted by NZ within the RSrMPA. However, these surveys are insufficient by themselves to meet the stated objectives of the MPA. Furthermore, CM 91-05 lacks clarity regarding the source of resources for toothfish research, noting the need for the Scientific Committee and WG-FSA to consider the source of resources necessary to support meet the stated objectives of the MPA.

6.20 Most Members observed that there appears to be an imbalance in the level of scrutiny applied to MPAs compared to that applied to fishing activities, noting that the expectations for MPA-related science are high in comparison.

6.21 The Scientific Committee highlighted that the RSrMPA has facilitated the development of targeted scientific work, including Korea's research and monitoring plan within the MPA (WG-EMM-2025, paragraph 2.15 and paragraphs 5.23 to 5.28). The Scientific Committee also acknowledged the significant contribution of experts from SCAR to this process, as well as the involvement of the SOOS Ross Sea Regional Working Group and usefulness of SOOSmap, which further strengthens the scientific foundations of the RSrMPA review.

6.22 IUCN supported the effort to bring forth this MPA evaluation approach from the delegations of Italy, Korea, Norway and Argentina under the excellent leadership of New Zealand. IUCN sees significant value in the approach being taken for the evaluation of the RSrMPA, in particular as a positive example for other high seas protected areas in other parts of the world and for other international agreements where IUCN's efforts are also focused. IUCN looks forward to supporting the RCN and this evaluation process as it evolves through to 2027.

Review of the scientific elements of proposals for new MPAs

6.23 SC-CAMLR-44/04 presented key elements of the monitoring design behind the draft RMP to accompany the proposed D1MPA, presented in SC-CAMLR-44/BG/06, including spatial and temporal scales, baseline data, metrics, and methods, and outlines a potential framework based on a counterfactual approach to evaluate the effectiveness of the proposed D1MPA. Although not formally required for the establishment of an MPA, there are multiple benefits that can be gained from the development of an RMP.

6.24 The authors noted that as an initial step, the draft RMP focuses on penguins as a case study, providing baselines and criteria against which changes will be evaluated. The intention is to expand this approach in future iterations to other conservation objectives, namely those for krill, seals, and whales. The draft RMP is designed to enable assessments of observed changes relevant to the MPA objectives, and to provide information to support the adaptive management of the MPA. It is connected to ongoing data and information collection initiatives. The authors proposed to hold a workshop in April 2026 and invited Members to contribute to the continued development of the RMP.

6.25 The authors noted that a potential framework to evaluate the impacts of the proposed D1MPA by establishing the foundations for a robust RMP is further described in document SC-CAMLR-44/BG/06. The draft RMP takes advantage of current monitoring efforts and is able to reflect ecological outcomes aligned with the objectives of proposed D1MPA. The draft RMP aims to: (i) identify existing long-term ecological monitoring sites and propose key areas for ongoing and future in situ monitoring initiatives, (ii) list relevant ecological metrics to assess the impacts of the proposed D1MPA, (iii) present a preliminary design of a rigorous impact evaluation employing sites with and without the influence of the MPA (spatial and temporal) and (iv) ensure results feed into CCAMLR's adaptive management approach.

6.26 The authors noted that various reliable sources for *Pygoscelis adeliae*, *Pygoscelis antarcticus*, *Pygoscelis papua* and *Aptenodytes forsteri* were reviewed. Indicators were reviewed against several criteria to assess their suitability as potential candidate indicators of the proposed D1MPA ecological relevance. To evaluate prey and predator responses to the MPA implementation, a simple change-based indicator comparing pre- and post-implementation conditions will be developed. All candidate indicators will be further validated in a second expert consultation. The document describes types of comparisons that can help evaluate the effectiveness of the proposed D1MPA, including a counterfactual approach.

Control and treatment sites have to be selected for each comparison type. The authors further noted that the document provides a comprehensive review of available data and ongoing monitoring, provides suggestions of penguin colonies that can be used for the specific types of comparison, discusses metric types that can be used as ecological indicators, and identifies potential data gaps.

6.27 The Scientific Committee welcomed the document and highlighted several aspects. The experimental set-up was deemed robust and the usefulness of evaluating areas in the proximity of fishing was discussed. The Scientific Committee supported the counterfactual approach, highlighting the difficulty of finding control sites that are sufficiently similar to sites within the MPA. The Scientific Committee noted that a lot of data from, for example, CEMP, are available for assessing the effectiveness of the MPA. It further highlighted the need for increased monitoring in the proximity of Elephant Island, as a survey of research activities reported in SC-CAMLR-44/BG/06 identified only one research group working in this area. Additionally, there is a critical need to monitor trends in abundance of several small colonies of South Shetland Islands Antarctic fur seals at Elephant Island, whose regional population has declined rapidly over the last two decades (Krause et al. 2022). The Scientific Committee regarded penguins as a good indicator for a case study as they are central-place foragers, sentinel species, indicators of the status of the ecosystem and penguin monitoring is already in place. It also noted the relevance on the information collected both for the RMP of the proposed D1MPA and the KFMA.

6.28 China proposed to add more details of monitoring related to other objectives into the RMP such as monitoring fish populations in support of assessing objectives of protecting important areas for fish life-cycles.

6.29 Russia noted that the selection of penguins as the baseline and currently sole indicator for the research and monitoring plan does not meet the stated objectives of the MPA proposals, which are aimed at achieving specific objectives for the conservation of Antarctic marine living resources and biodiversity, such as pelagic, benthic, and other communities, seabirds and mammal populations. Furthermore, there is a lack of scientific evidence to justify the selection of penguins as the baseline indicator.

6.30 Some Members noted that penguin species were used as a case study and that the process will later continue with other species such as krill, seals and whales. This approach will be developed through consultations with experts following a collaborative and co-constructed approach. A fully developed RMP will be presented in 2026 and introduced at WG-EMM-2026.

6.31 The Scientific Committee supported the suggestion of a workshop and many Members expressed their willingness to contribute to the development of the proposed D1MPA RMP. The workshop can be used to define and agree on indicators.

Other spatial management issues

6.32 SC-CAMLR-44/03 proposed a workshop in 2026 to develop a harmonised marine spatial plan for Subarea 48.2. The goal is to create a science-based framework for managing the krill fishery and monitoring the ecosystem while ensuring it aligns with the conservation objectives of the proposed D1MPA. The workshop aims to address the unique challenges of this area and avoid future conflicts between separate conservation and fishing management plans.

6.33 The Scientific Committee supported the workshop and recognised the need to harmonise fishery management and conservation objectives. Several Members highlighted the importance of also addressing management in Subarea 48.1 and suggested coordination, potentially through WG-EMM, to ensure the workshops are complementary. The Scientific Committee also noted that the CCAMLR MPA Special Fund could be used to support the workshop (paragraph 13.7).

6.34 The Scientific Committee considered the possibility of discussing CM 91-03 during this workshop, though different views were expressed about the matter. Some Members understand it as a necessary discussion, while other Members expressed that it should remain in force until there is any evidence supporting the need to change it.

6.35 The Scientific Committee noted that the workshop would be coordinated by the steering committee outlined in SC-CAMLR-44/03 and convened by Mr F. Santa Cruz (Chile) and Dr A. Lowther (Norway).

6.36 SC-CAMLR-44/07 detailed the outcomes of the major international workshop held in South Africa in 2025 and the ongoing work of the PHOCIS project, which aims to use scientific data and Systematic Conservation Planning to design a representative system of MPAs in the pelagic high seas of the sub-Antarctic Indian Ocean. The project has drafted specific conservation objectives, compiling vast datasets on oceanography, biodiversity (including seabirds and mammals), and human activities. The workshop identified the strategy for applying a systematic conservation planning approach to develop priority areas for protection in 2026 to contribute to CCAMLR's goal of a representative system of MPAs.

6.37 The Scientific Committee welcomed the substantial progress and the comprehensive, methodologically structured approach of the project.

6.38 The Scientific Committee noted that a representative MPA system in CCAMLR should include the sub-Antarctic area.

6.39 The Scientific Committee noted the project request for scientific advice on its conservation objectives and strategy and looked forward to the planned meeting in Paris in 2026.

6.40 The Scientific Committee also noted the importance of integrating data from various initiatives and the challenges of data collection across such a large area, parts of which lie outside the Convention Area.

6.41 The authors welcomed the comments and highlighted that at this stage data is being processed and invited members to further engage and contribute both in the data processing and in providing new data to be incorporated into the project.

6.42 The authors highlighted that the annual meeting of PHOCIS in 2026 in Paris will provide the first results on systematic conservation planning which will be presented afterwards in WG-EMM-2026. An application to the CCAMLR MPA Special Fund will be submitted for inviting members to the Paris workshop.

6.43 Norway congratulated those leading the PHOCIS project, recalling that the MPA Special Fund supported the initial workshop in South Africa in 2019 and noted that the initial formulation of the project included discussions on including Bouvetøya. Norway highlighted that a new multidisciplinary study of the marine environment around the island would start in 2026 and looked forward to increasing its involvement in PHOCIS in the future.

6.44 ASOC thanked South Africa for this report and thanked all of the scientists from South Africa, France, Australia and others that have been involved in this work for many years. Several ASOC colleagues attended this workshop and found it to be extremely well-organised and productive. ASOC highlighted the PHOCIS project as a great contribution and complementary to the work of CCAMLR on establishing a representative system of MPAs in the Convention Area, including through its cooperation with other bodies in the service of conservation. ASOC has been pleased to support the PHOCIS project and the work of Dr Carpenter-Kling. ASOC is looking forward to seeing the results of the systematic conservation process and other work planned for 2026.

6.45 SC-CAMLR-44/BG/26 introduces two new web tools developed in relation to a NASA-funded project which sought to better understand the importance of Antarctic polynyas (areas of open water) for sustaining Antarctic marine ecosystems as biological hot-spots. The first webtool is a platform that features multi-media storytelling that uses videos, photos, and narratives to showcase results from a newly developed Antarctic Ecosystem Value Index which identifies and maps ecologically critical areas around the continent. The second web tool is an interactive index comparison tool (shiny application) that allows users to visualise and compare the Ecosystem Value Index with existing ecological indices, important biodiversity areas in the Southern Ocean and existing or proposed MPAs. The document presents these tools to help CCAMLR identify ecologically important areas for conservation and support the planning of a representative system of MPAs.

6.46 The Scientific Committee welcomed these valuable tools for supporting MPA planning, highlighting that the data, which has already been used systematically by some Members, can be incorporated into the MPA propositions.

6.47 The Scientific Committee suggested that CCAMLR consider hosting the index comparison tool (‘shiny application’) on its platform.

6.48 ASOC introduced CCAMLR-44/BG/28 which examines how the Shifting Baseline Syndrome (SBS) – the gradual acceptance of lower standards – is reflected in CCAMLR’s conservation actions. In ASOC's view, in krill fishing the lapse of CM 51-07 marked a retreat from the precautionary principle. In MPAs, momentum has stalled since the 2016 RSrMPA was adopted, with new MPA proposals and RMPs still pending despite strong scientific support. This contrasts with global progress toward the ‘30x30’ target and the BBNJ Agreement. ASOC argues these trends reflect a downward shift in CCAMLR’s conservation baseline and urges Members to restore ambition, complete the MPA representative system, and reinforce precautionary krill management. CCAMLR’s Scientific Committee has a key role in reversing this trend.

Climate change

7.1 The Scientific Committee noted that WG-FSA-2025 (paragraphs 10.1 and 10.2) reflected a summary of how climate change is being integrated into the work of WG-FSA. The Scientific Committee considered it important to highlight how the effects of climate change are an integrated into its work. The Scientific Committee further noted it could be useful for other Working Groups to do similarly with future reports.

7.2 SCAR presented SC-CAMLR-44/BG/13, noting that 2024 was likely the first year where average global temperatures exceeded 1.5°C above the pre-industrial era average, and the warmest year in the 175-year observational record. SCAR reported how abrupt changes are either already underway in the Antarctic region or are imminent. A regime shift has reduced Antarctic sea-ice extent far below its natural variability of past centuries. The tipping point for unstoppable ice loss from the West Antarctic Ice Sheet could be exceeded, potentially initiating global cascades. Regime shifts are occurring in marine systems through habitat transformation or exceeding physiological thresholds, and breeding failures of some species are increasing extinction risk. Stabilising Earth's climate with the minimal overshoot of 1.5°C will be imperative alongside global adaptation measures to minimise and prepare for the far-reaching impacts of abrupt changes in the Antarctic. The paper noted that Southern Ocean warming and acidification are already driving, and will likely continue to drive, substantial changes to ecosystems, food webs and interactions, emphasising the importance of greenhouse gas emissions reductions. SCAR noted that it is committed to providing regular scientific updates to CCAMLR on climate change and encourages CCAMLR Members to continue their efforts to implement research to understand the implications of climate change for the region.

7.3 The Scientific Committee welcomed the independent scientific updates provided by SCAR's ACCE report, which highlighted increasingly concerning environmental change in the Antarctic region. The Scientific Committee noted the growing body of evidence showing significant shifts in physical systems and ecosystems, including sea-ice loss, changes in oceanographic dynamics, and impacts on species distribution. These findings are considered central for CCAMLR work.

7.4 The Scientific Committee recognised the importance of continuing to support the integration of climate change considerations across the Scientific Committee's work programme. The Scientific Committee welcomed recent work within Working Groups to embed climate-related discussions throughout their agendas and emphasised the importance of tools such as the proposed State of Antarctic Environment (SOAE) reporting (paragraphs 5.7 to 5.13). The Scientific Committee also noted the need to ensure that relevant climate indicators inform CCAMLR's science-based precautionary management decisions.

7.5 ASOC expressed concern about the acceleration of observed and projected climate change impacts noted in the SCAR report and urged the SC-CAMLR to advise the Commission of the urgent need for management action.

7.6 Ecuador provided an update on ocean acidification research noting that the Latin American Antarctic programmes have created a dedicated Working Group on Ocean Acidification Observation focused on regional monitoring.

7.7 The Scientific Committee also supported the upcoming joint SC-CAMLR/CEP workshop on climate change and monitoring and encouraged relevant contributions to inform its agenda, including the recommendations from the CCAMLR climate change workshop (WS-CC-2023) (paragraphs 10.10 to 10.13).

Illegal, unreported and unregulated (IUU) fishing in the Convention Area

8.1 There was no discussion by the Scientific Committee under this agenda item.

CCAMLR Scheme of International Scientific Observation

9.1 SC-CAMLR-44/06 examined differences in krill length-distributions between samples collected from continuous pumping trawlers and traditional trawlers which indicate spatial heterogeneity in krill distribution in the fishing area. The authors expressed concern that the Scientific Observer requirements do not account for number of hauls per day or catch per haul and is therefore not representative of the fishery. Furthermore, the authors expressed concern that the Scientific Observers' sampling requirements have not been implemented by all observers.

9.2 The Scientific Committee welcomed the analysis. It recalled that this paper had also been discussed at WG-EMM-2025 (paragraphs 3.28 and 3.29) and noted that a longer time-series of sampling might be needed to gain a better understanding of these results. It also suggested including parameters such as codend mesh size when comparing continuous and traditional trawling systems.

9.3 SC-CAMLR-44/BG/07 details a workshop conducted in 2025 aimed at training scientific observers and inspectors to work in CCAMLR fisheries. The workshop included training aimed at observers in both krill and toothfish fisheries covering recent modifications to the CCAMLR data forms and paid particular attention to the procedures and results of tagging toothfish.

9.4 The Scientific Committee thanked Russia for presenting a description of their annual observer training workshop.

9.5 SC-CAMLR-44/BG/09 summarises the outcomes of Chile's fourth national training course for Scientific Observers. The course focused on SISO requirements, conservation measures and best practices to avoid ecosystem impacts. It included objectives to strengthen coordination among observers, industry and national authorities to support effective fisheries research and compliance and resulted in 24 newly certified scientific observers.

9.6 The Scientific Committee thanked Chile for presenting results related to conducting the workshop. The report highlights the importance of these workshops to ensure well-trained observers and high-quality data.

9.7 CCAMLR-44/BG/15 introduced a survey to assess the level of technical knowledge, skills, and experience on the use of Electronic Monitoring Systems (EMS) among CCAMLR Members. Previous work on utilising EMS suggests a reduction in discards and by-catch, improved compliance and more sustainable practices. The survey aims to collect perspectives on awareness, advantages, challenges and opportunities related to the potential implementation of EMS in CCAMLR fisheries. The authors invited CCAMLR Members, Scientific Committee participants, members of the fishing industry, and others to participate in the survey.

9.8 The Scientific Committee welcomed the survey, noting the potential value of implementing EMS on vessels participating in fisheries in the CAMLR Convention Area. It highlighted the need to exchange best practices and experiences, noting that some toothfish vessels in the Ross Sea have been using EMS for some time (WG-SAM-18/20, WG-FSA-19/13), which could offer experiences to draw from through the survey. The Scientific Committee noted that AI technology can be combined with EMS to assist observers to achieve their tasks.

9.9 The Scientific Committee endorsed the recommendation by WG-SAM-2025 (paragraph 3.24) and WG-FSA-2025 (paragraph 7.7) to implement the conversion factor sampling scheme by observers and requested that its effectiveness be assessed periodically. The Scientific Committee endorsed the changes to the forms and protocols presented by the Secretariat as in paper WG-FSA-2025/02.

9.10 The Scientific Committee endorsed the recommendations by WG-FSA-2025 (paragraphs 7.9 and 7.10) requesting Members to provide the methods used by vessels to determine the conversion factors reported in their C2 data and requested that the Commission consider including an additional requirement in fisheries operation plans within CM 21-02 paragraph 6(ii), which would specify the conversion factors used and the methods by which they are derived (WG-FSA-2025, Appendix F).

9.11 The Association of Responsible Krill harvesting companies (ARK) announced the winners of the 2025 'Krill Scientific Observer Prizes' to recognise the significant contributions made by scientific observers on behalf of CCAMLR. ARK identified three scientific observers onboard krill fishing vessels who excelled in their overall performance during the 2023/24 fishing season. First place was awarded to N. Idowu; second place was awarded to H. Poole; and third place was awarded to F. Xue. ARK congratulated the recipients and thanked the Secretariat for their help in identifying the winners. The Scientific Committee noted that scientific observers have done significant and high-quality work in the past decades and contribute valuable data to be used in CCAMLR work.

9.12 The Scientific Committee endorsed the recommendation by WG-FSA-2025 (paragraph 7.5) to acknowledge the vital role of observers, emphasising their essential contributions to data collection, including biological data collection and tagging, which support scientific assessments, and recommended maintaining the names of observers on the CCAMLR website provided that their consent is confirmed for this.

9.13 The Scientific Committee noted the recommendation by WG-FSA-2025 (paragraph 7.7) highlighting the importance of assessing various tasks conducted by scientific observers. The Scientific Committee discussed the importance of defining how collected data are to be used within the KFMA and monitoring strategy.

9.14 The Scientific Committee noted the advice from WG-FSA-2025 (paragraph 7.2) that the number of observer tasks on krill vessels continues to rise. The Scientific Committee further noted the advice from WG-FSA-2025 that two observers on a vessel may be needed to manage these tasks (WG-FSA-IMAF-2024, paragraph 5.32; WG-FSA-2025, paragraph 7.2). The

Scientific Committee also emphasised the need for balancing and prioritising of observer tasks (WG-FSA-2023, paragraphs 3.49 and 3.50).

Cooperation with other organisations

10.1 CCAMLR-44/06 presented the actions taken by the CCAMLR Secretariat in response to the Second Performance Review recommendations. The paper presents the progress achieved showing the proposed status for each recommendation.

10.2 The Scientific Committee noted the current status for the recommendations and thanked the Secretariat for its work.

10.3 The Scientific Committee considered SC-CAMLR-44/BG/18 containing the Scientific Committee on Antarctic Research (SCAR) annual report to CCAMLR 2024/25, highlighting activities of relevance to discussions within SC-CAMLR.

10.4 The SCAR annual report noted the ever-increasing pressure from global warming on the Antarctic environment and ecosystems. Many of SCAR's Scientific Research Programs, Action and Expert groups, including its new Action Group on Climate, are focused on these issues.

10.5 SCAR further noted that in 2025 there were three new SC-ATS/Ant-ICON Fellows who attended either the ATCM/CEP or the WG-EMM/SC-CAMLR meetings. The call for new fellows is now open and available on the SCAR website. SCAR encouraged early career scientists to apply. Finally, SCAR shared an invitation to join the 2026 SCAR Open Science Conference which will take place in August 2026 in Oslo, Norway.

10.6 The Scientific Committee thanked SCAR for the paper and noted the importance of facilitating the attendance of former SCAR fellow N. Friscourt as part of the French delegation and Z. Zajková as part of the Spanish delegation to WG-EMM-2025 where their work was warmly received. The Scientific Committee thanked them for their excellent work and both France and Spain for facilitating their participation.

Cooperation within the Antarctic Treaty System

10.7 The Scientific Committee considered SC-CAMLR-44/BG/05 which provided the annual report of the Committee on Environmental Protection (CEP) observer to the CCAMLR Scientific Committee. The report presented by the Chair of CEP Ms C. Poirot (New Zealand) provides information on the discussions at CEP27 on five topics of common interest between the CEP and SC-CAMLR: Climate Change, Biodiversity and Non-native Species, Species requiring Special Protection, Spatial Management and Area Protection, and Ecosystem and Environmental Monitoring. The outcomes of these discussions were:

(i) on the joint topic of 'Climate Change', the CEP noted the work continues on the status of climate-vulnerable species, enhancing coordination on climate change response in the marine realm with SC-CAMLR, decontamination of past sites of activities in the Antarctic, and assessing the risk of climate change for Antarctic infrastructure and on ‘Changing sea-ice’ as a new item on the Climate Change Response Work Program (CCRWP) during the intersessional period

(ii) on the joint topic of ‘Biodiversity and non-native species’, the CEP discussed the growing risks of HPAI in Antarctica based on a joint report by SCAR, COMNAP, IAATO and CCAMLR, noting that the virus is reaching new geographic locations in the Antarctic Treaty Area and in the sub-Antarctic region, with continuing indications that the virus was brought to the Antarctic Treaty Area through natural migration and activity of wildlife

(iii) on the joint topic of ‘Species requiring special protection’, the CEP considered a paper on emperor penguin population which indicated declines of approximately 22% in the emperor penguin populations over the period of 2009–2023. The status of the IUCN Red List risk assessment of the emperor penguin was also discussed, where a reassessment of its status would be expected early 2026

(iv) on the joint topic of ‘Spatial Management and Area Protection’, the CEP considered draft management plans for three proposed new Antarctic Specially Protected Areas (ASPA), including a draft ASPA for the wreck of *Endurance* in the Weddell Sea

(v) finally, on the joint topic of ‘Environmental Monitoring and Reporting’, the CEP discussed a proposal inviting Members to step up efforts to end plastic pollution in Antarctica and recognised plastic pollution as a global problem that required attention. The Committee also discussed the report of the ICG on the development of an international environmental monitoring framework.

10.8 The Scientific Committee thanked Ms Poirot for presenting the paper and congratulated her for the successful first meeting as Chair of CEP.

10.9 The USA also thanked New Zealand for the presentation, as Dr A. Titmus (CEP Observer to SC-CAMLR) could not attend this Scientific Committee meeting.

10.10 SC-CAMLR-44/BG/32 presented an update on the upcoming joint CEP/SC-CAMLR climate change and monitoring Workshop to be held in Hiroshima, Japan on 8–9 May 2026 in conjunction with ATCM48/CEP28. The Terms of Reference, agenda, budget considerations, and practical information including location, format, participation and outputs were presented. The workshop objective is to identify synergies and collaboration opportunities between CEP and SC-CAMLR to monitor and manage climate change effects. The workshop outputs will be a Convener’s Report focusing on the identification of common research, monitoring and information needs; prioritisation of mutually important areas of work, along with the practical steps required to advance them; and mechanisms to strengthen cooperation and coordination between CEP and SC-CAMLR on topics of mutual interest.

10.11 The Scientific Committee thanked the CEP/SC-CAMLR joint workshop steering committee for the update, Japan for hosting the workshop and the confirmed voluntary contributors.

10.12 The Scientific Committee highlighted the importance of the collaborative approach between CEP and SC-CAMLR, noting areas of mutual interest, including state of the environment reporting and environmental monitoring, and encouraged Members in-person participation in this workshop. The Scientific Committee noted the outcomes of the CCAMLR Workshop on climate change (WS-CC-2023) held in 2023 as a relevant input to be considered by the joint workshop and encouraged submission of papers to the agenda items.

10.13 As the host country, Japan encouraged SC Members timely arrangements as Japanese national holidays are celebrated in early May, and the event is organised in conjunction with the ATCM48/CEP28.

Reports of observers from other international organisations

10.14 The Scientific Committee considered SC-CAMLR-44/BG/18, submitted by the International Association of Antarctica Tour Operators (IAATO) noting IAATO's continued collaboration with the scientific community and contribution to research, management, and conservation.

10.15 IAATO reported that its membership comprised 54 operators, including provisional operators, and 74 associates. A total of 118 141 visitors travelled to Antarctica during the 2024–25 season, representing a slight decrease from the previous year. IAATO outlined its close cooperation with SCAR and COMNAP on biosecurity, wildlife health, and conservation – particularly in response to HPAI. It was noted that 92 suspected cases had been reported by operators during the 2024–25 season. IAATO also highlighted its logistical and financial support for research programmes and collaborations with Oceanites, Penguin Watch, the Antarctic Wildlife Research Fund and a range of national programmes. IAATO further noted its joint fellowship with COMNAP for early-career scientists and reaffirmed its commitment to supporting conservation objectives and research. IAATO collected more than 16 000 marine mammal observations under the Voluntary Cetacean and Pinniped Sighting Programme to inform vessel management and minimise wildlife disturbance and entered into a new partnership with ORCA for this program. IAATO additionally reiterated its support for proposed MPAs, confirmed the continued use of CCAMLR electronic forms for reporting marine debris and wildlife entanglements, and reported the approval of 19 new or updated visitor site guidelines. The organisation noted its continued collaboration with SCAR, projects funded by the Dutch Research Council and others on tourism-related research initiatives, and its continued commitment to safe and environmentally responsible travel to Antarctica.

10.16 The Scientific Committee thanked IAATO for its comprehensive report and acknowledged the continued logistical and scientific support that the tourism sector continues to provide to Antarctic research – including the facilitation of site access and data collection. The Scientific Committee noted IAATO's collaboration with the scientific community and its efforts to align tourism activities with conservation objectives, such as those relevant to the proposed D1MPA.

10.17 The Scientific Committee highlighted the increasing scale of tourism activities and emphasised the importance of assessing potential cumulative impacts in the region.

10.18 IAATO informed the Scientific Committee that it participates as an invited expert in discussions at the ATCM, including on the development of a framework for the regulation of tourism and other non-governmental activities in Antarctica. IAATO also noted that it operates within the Antarctic Treaty System to have no more than a minor or transitory impact on the Antarctic environment and supports scientific research to assess and minimise environmental impacts.

10.19 The Scientific Committee welcomed CCAMLR-44/BG/30 submitted by the Antarctic and Southern Ocean Coalition (ASOC), noting ASOC's continued efforts to advance Antarctic conservation and support policy-relevant science.

10.20 ASOC stated that during the intersessional period, ASOC and its members funded research, promoted dialogue among CCAMLR stakeholders, and participated in major international fora, including the Biodiversity COP16, Climate COP29, Our Ocean and UN Ocean Conferences, the ATCM, and the PHOCIS meeting in Cape Town. Additionally, ASOC supported projects on krill ecology, carbon sequestration, whale recovery, along with the development of an East Antarctic Marine Biodiversity Observation Network and launched the report Protecting a Changing Southern Ocean in all CCAMLR languages. ASOC also partnered with 'Outernet London' on a multimedia exhibition showcasing Southern Ocean biodiversity and received the Gulbenkian Prize for Humanity for its leadership in international cooperation and science-based advocacy.

10.21 The Scientific Committee thanked ASOC for its continued engagement and valuable contributions to the work of CCAMLR and Antarctic region at large. In addition, the efforts in supporting scientific research, outreach, and international collaborations with relevance to CCAMLR objectives was acknowledged.

10.22 The Scientific Committee expressed its support for the work of the Antarctic Wildlife Research Fund (AWR) Advisory Group and appreciation for ASOC's assistance to scientists contributing to that work.

10.23 The Scientific Committee thanked the scientists serving on the AWR Science Advisory Group for their time and expertise in evaluating projects and for their valuable contributions to the group's activities.

10.24 SC-CAMLR-44/BG/11, submitted by Oceanites, highlighted the long-term Antarctic Site Inventory (ASI) program.

10.25 Oceanites reported that the 2025/26 field season will mark its 32nd consecutive year of penguin monitoring under the ASI programme, representing its largest operation to date, with 19 teams across seven IAATO vessels and over 100 site visits. Since 1994, Oceanites has completed 2 267 census counts at 242 sites, covering more than 3.5 million penguins, with data showing continued gentoo increases, chinstrap declines, and variable Adélie trends. Expanded monitoring this season will include drone-based surveys, avian influenza surveillance, and seal and seabird counts, with results made publicly available in near real time. Oceanites also reported its ongoing relationship with ARK, contributing penguin data to assess interactions between krill fishing and predator foraging areas. The organisation continues collaborations with IAATO, SCAR's Wildlife Health Network, and research partners, maintaining the open-access MAPPPD database with 5 407 records from 725 sites in support of transparent, collaborative science consistent with Article III of the Antarctic Treaty.

10.26 The Scientific Committee acknowledged the report from Oceanites and expressed appreciation for the continuation of its long-term ASI program. It noted, furthermore, that the data generated through the ASI and MAPPPD databases provide valuable baseline information in support of CCAMLR's objectives, including MPA development, along with ecosystem monitoring, and contributes to the identification of priority areas for scientific research – particularly those relevant to the D1MPA proposal.

10.27 The Scientific Committee encouraged continued collaboration between Oceanites and CCAMLR monitoring programmes to enhance data integration and exchange.

10.28 The Scientific Committee also noted how these new technologies and innovative approaches enhance monitoring, highlighting the usefulness of data from Subarea 48.1 and Voluntary Restricted Zones (VRZs) for assessing predator population changes and environmental impacts within VRZs.

10.29 Many Members noted that VRZs provide an opportunity to assess ecological changes over time, particularly in the context of the development of the proposed D1MPA RMP.

10.30 Oceanites thanked the Scientific Committee for their support and would be happy to collaborate and contribute to the work of the Scientific Committee.

10.31 The Scientific Committee welcomed SC-CAMLR-44/BG/19, submitted by ARK, highlighting responsible krill harvesting amid environmental and management challenges.

10.32 ARK informed the Scientific Committee that the 2024/25 fishing season was constrained by extensive sea-ice around the South Orkneys, preventing early access to Subarea 48.2. ARK noted that despite the lapse of CM 51-07, ARK members voluntarily upheld previous fishing patterns and maintained precautionary VRZs, resulting in a well proportioned catch distribution between Subareas 48.1 (57.5%) and 48.2 (41.7%). Twelve vessels operated during the season, fully complying with VRZs that protected more than 74 000 km^2 of penguin foraging habitat.

10.33 The Scientific Committee noted the collaborative acoustic surveys undertaken in Subareas 48.1 and 48.2, a joint effort between the Yellow Sea Fisheries Research Institute (China) and the Institute of Marine Research (Norway), which provided valuable within-season biomass data to WG-ASAM-2025.

10.34 SC-CAMLR-44/BG/28 submitted by the Southern Ocean Observing System (SOOS) recognised ocean observing systems as essential infrastructure. The paper emphasised the importance of sustained, standardised observations as foundational infrastructure supporting both research and policymaking. SOOS noted global efforts to harmonise essential ocean variables (EOVs) and called for integration of CCAMLR's monitoring priorities into these discussions to ensure the Southern Ocean is adequately represented.

10.35 SC-CAMLR-44/BG/34, also submitted by SOOS, provided its 2024–2025 Annual Report. SOOS outlined activities undertaken through regional working groups, including multiple virtual workshops and the establishment of the SOOS/GOA-ON Southern Ocean Hub for Ocean Acidification. SOOS also highlighted ongoing work on emperor penguin monitoring and acidification impacts through collaborations with SCAR and other partners.

10.36 SOOS highlighted recent publications relevant to SC-CAMLR work, a review on the observing system in the Indian Sector of the Southern Ocean and air-sea flux observing system requirements. SC-CAMLR was also reminded of SOOS tools and networks which could assist

SC-CAMLR with its work, including SOOSmap (soosmap.aq), DueSouth (polardex.org/due-south), and SOOS' inventory of Southern Ocean long-Term monitoring programmes, which is currently being developed. SOOS presented its plans for 2026 to commence a new project developing interactive maps of observational coverage and summary visualisations for key Southern Ocean essential variables, the development of a new Science and Implementation Plan (2026–2030), and continued partnerships with 'Antarctica InSync' and the International Polar Year.

10.37 The Scientific Committee noted how SC-CAMLR-44/BG/24, SC-CAMLR-44/BG/28, and SC-CAMLR-44/BG/34 are of relevance to CCAMLR objectives. Particular interest was expressed in the studies addressing observing requirements for air–sea fluxes, the status of ocean observations in the Indian Sector, and the updated capabilities of the SOOSmap which hosts a substantial number of data layers.

10.38 The Scientific Committee further noted that SC-CAMLR-44/BG/28, which provides an important foundation for the development of ocean-related indicators and observation infrastructure, aligned with CCAMLR's ecosystem reporting and assessment needs. In this regard, the Scientific Committee recognised the critical role of SOOS in coordinating sustained ocean observations across the Southern Ocean and emphasised the importance of continued collaboration to ensure that CCAMLR's priorities, along with associated data streams, were effectively incorporated within the wider Southern Ocean observing framework.

10.39 The Scientific Committee welcomed SC-CAMLR-44/BG/41 submitted by the Food and Agriculture Organization (FAO) on Deep-sea Fisheries under the Ecosystem Approach Project (2022–2027). The paper summarised activities within the GEF-7 ABNJ Common Oceans Programme, focusing on strengthening management of deep-sea fisheries under an ecosystem approach.

10.40 SC-CAMLR-44/BG/41 noted that while CCAMLR is not a formal project partner, the expertise and experience within the CCAMLR community are highly relevant to the FAO Deep-sea Fisheries (DSF) Project's objectives. The FAO project aims to strengthen the management of deep-sea fisheries globally through improved data, science, and capacity building. Four main areas of work are outlined, including a global mapping initiative of deep-sea fishing effort designed to produce a comprehensive overview of the spatial extent and intensity of bottom-contact gear use. To support this effort, a data request to CCAMLR was included.

10.41 The paper also highlighted the project's capacity-building activities, which included a joint FAO–SEAFO observer training workshop in Namibia scheduled for January 2026. This workshop aims at strengthening observer programmes and creating synergies with global sustainable fishery frameworks, including those under CCAMLR. Finally, the paper acknowledged contributions from industry experts, including members of COLTO, in developing terms of reference for a potential global industry network to promote sustainable deep-sea fisheries.

10.42 The Scientific Committee acknowledged the forthcoming FAO–SEAFO observer training workshop to be held in Namibia (2026) and welcomed the capacity that will be developed through this initiative. The Scientific Committee further noted that the training of observers will contribute to strengthening data collection and reporting efforts across deep-sea fisheries relevant to CCAMLR and encouraged the FAO to engage with the CCAMLR Secretariat to share materials and expertise to support the workshop.

10.43 The Scientific Committee endorsed the FAO data request (SC-CAMLR-44/BG/41, Appendix 1) and encouraged continued support for participation in relevant FAO Deep-sea Fisheries Project activities that strengthen coordination and promote alignment in approaches to ecosystem-based fisheries management.

10.44 The International Union for Conservation of Nature (IUCN), Coalition of Legal Toothfish Operators (COLTO) and International Agreement on the Conservation of Albatrosses and Petrels (ACAP) are amongst the organisations that updated the Scientific Committee about their activities.

10.45 IUCN acknowledged the paper WG-FSA-2025/44, specifically the recommendation that the two icefish species, *Chaenocephalus aceratus* and *Pseudochaenichthys georgianus*, be re-assessed (WG-FSA-2025, paragraphs 6.41 and 6.42). In this regard, IUCN encouraged CCAMLR Members and experts from Antarctic-related scientific groups, such as SCARFISH, to contribute to this process to ensure that updated assessments reflect the best available scientific information. IUCN also stressed that they are organising a workshop from 16–20 March 2026 in Puerto Varas, Chile, to assess the extinction risk of about 300 marine bony fish species of the Southern Ocean and Antarctica for the IUCN Red List, fostering closer cooperation with the CCAMLR community (WG-FSA-2025, paragraph 6.42).

10.46 The Scientific Committee supported the participation in IUCN Red List processes and recommended the attendance of the CCAMLR Secretariat at relevant IUCN meetings to strengthen coordination and facilitate timely data sharing (paragraph 10.45).

10.47 The Scientific Committee also emphasised that any data requests associated with forthcoming IUCN assessments should be submitted as early as possible, recognising that sufficient lead time is required to prepare, review, and approve data in accordance with CCAMLR's established data access procedures.

10.48 COLTO thanked all crew and observers for their continued at-sea efforts. In addition, COLTO announced and congratulated the winners of the toothfish tag return lottery as follows:

(i) 1st place, *Blue Ocean* (Korea);

(ii) 2nd place, *Janas* (New Zealand); and

(iii) 3rd place, *Proa Pioneer* (Uruguay).

10.49 ACAP announced that it did not submit a report to SC-CAMLR this year, as its Advisory Committee and Working Groups did not meet in 2025; the next meetings are planned for mid-2026 in Namibia. An intersessional expert group continues to develop advice on the impacts of the HPAI H5N1 panzootic on albatrosses and petrels, including seabird handling guidelines and a global albatross and petrel case map on the ACAP website. ACAP marked the sixth World Albatross Day on 19 June 2025 under the theme Effects of Disease, highlighting the threats these species face. It welcomed eradication efforts in the sub-Antarctic—France's feral cat removal on Kerguelen Island and South Africa's progress towards eradicating house mice on Marion Island—and Australia's first research expedition in over 20 years to Heard and McDonald Islands. ACAP also expressed interest in contributing to the 2026 WG-IMAF meeting to support development of best-practice advice on bird-strike monitoring, mitigation in krill fisheries, and assessment of impacts on species such as the Cape Petrel and Snow Petrel.

Reports of representatives at meetings of other international organisations

10.50 Dr Kelly introduced paper SC-CAMLR-44/BG/14, which summarises the research activities conducted within the collaboration between the IWC-SC and SC-CAMLR in the 2024/25 intersessional period. Dr Kelly highlighted the work accomplished on the consideration of cetaceans for the ecosystem-based approach to krill fishery management, CEMP and common ecosystem modelling needs. Results of this work were presented and discussed at WG-EMM-2025 and further integrated to the WG-EMM workplan. The collaboration on minimising whale entanglements in the krill trawl fishery will have an opportunity to provide advice on the recent humpback whale entanglements during the upcoming IWC-SC meeting in April 2026.

10.51 The Scientific Committee welcomed the report, highlighting the importance of this joint work for the further development of the KFMA and CEMP, as well as for the work of WG-IMAF. It emphasised the importance of continued collaboration, which may be strengthened further if a Memorandum of Understanding between IWC and CCAMLR is agreed.

Scientific Committee activities

11.1 SC-CAMLR-44/BG/03 provided a report on the science tasks undertaken by the Secretariat during the 2024/25 intersessional period, which were mostly tasked during 2024.

11.2 The Scientific Committee thanked the Secretariat for their work on various science tasks and for the subsequent report and noted that CCAMLR's spatial data viewer has been used extensively to support the discussions of WG-EMM and WG-FSA. It also recognised the importance of celebrating long-term meeting attendance and contributions by participants through awards such as the Wombat and acknowledged that 30 years is a long time to be involved in CCAMLR. The Scientific Committee also recognised the productive relationship between CCAMLR and SIOFA and commended the collaboration.

11.3 The Scientific Committee endorsed the recommendations to:

(i) implement the protocol for sharing toothfish fishery data with SEAFO

(ii) continue development of the spatial data viewers and make them continuously available to Members with consideration of appropriate access restrictions

(iii) further develop the concept of a new category of CCAMLR participation awards, with suggestions for a name for a category to be developed, including names with a Tasmanian flavour, such as 'echidna' or 'platypus'

(iv) with the agreement of an MoU, extend an invitation to Peruvian scientists to the 2026 meetings of WG-ASAM and WG-EMM, and

(v) implement the described approach to maintain CM 91-02 and inform Members of changes in relevant ASPAs and ASMAs.

11.4 SC-CAMLR-44/BG/15 provided an update on ongoing discussions on the workflow for data requests in addition to a detailed overview of data requests received by the Secretariat between 1 September 2024 and 31 August 2025 along with their outcomes. The update also noted the issue of a continued non-response from Vanuatu regarding access to C1 krill catch data from the 2004 and 2005 seasons. If the Secretariat does not receive a reply or receives a refusal, the current procedure removes data from those data owners but releases the remaining data, which creates a biased dataset.

11.5 The Scientific Committee thanked the Secretariat for the interesting and comprehensive analysis of data requests coming into CCAMLR. It also thanked the Secretariat for its patience providing guidance on crafting data requests to ensure the correct data is provided, as well as data holders who responded to requests in a timely manner.

11.6 The Scientific Committee noted that during the 2025 reporting period, most data requests approved under paragraph 2(a) of the Rules for Access and Use of CCAMLR Data – which does not require approval from data owners as they relate to work specifically outlined and endorsed by the Commission or the Scientific Committee – were processed in less than 7 days. In comparison, requests for data to conduct work not specifically endorsed by the Commission or the Scientific Committee, approved under paragraph 2(b) were processed in an average of 29 days, and publication requests in an average of 44 days.

11.7 The Scientific Committee noted that the 2(b) requests facilitate research into emerging but important scientific questions that have not yet been reviewed or identified as priorities for the work of the Scientific Committee, and that such flexibility added significant value to the work of CCAMLR and to Antarctic science more widely. It also noted the benefit of having Scientific Committee or Commission endorsement for analyses to streamline data requests via the 2(a) request process.

11.8 The Scientific Committee confirmed that the request and publication processes as described in the process diagram are functioning satisfactorily and requested the Secretariat to make the process diagram (SC-CAMLR-44/BG-15, Figure 1) available through the CCAMLR website.

11.9 The Scientific Committee noted the importance for data holders to nominate alternative contacts to help ensure rapid responses. It also suggested that data holders could authorise a ‘perpetual’ agreement for access to data, removing the need to ask them again in the future to eliminate the risk of non-response refusals.

Science Fund reporting and the CCAMLR Scientific Scholarship Scheme

11.10 SC-CAMLR-44/BG/16 reported that the CCAMLR Scientific Scholarship Scheme received two applications in 2025 (one from South Africa and one from Argentina).

11.11 The Scientific Committee enthusiastically endorsed the recommendations to award the two scholarships to Dr T. Carpenter-Kling (South Africa), for work on identifying priority conservation areas in the Indian Ocean sub-Antarctic (Prof. P. Koubbi (France) as mentor), and to Dr D. Deregibus (Argentina), for work to develop an RMP for the proposed D1MPA (Mr Pardo as mentor).

11.12 The Scientific Committee recognised the importance of the CCAMLR Scholarship Scheme, reflecting on the considerable contributions the scholars have made to the work of CCAMLR since the scheme's inception. It also noted the importance of this scheme in bringing in early career researchers into the work of CCAMLR, highlighting that some of them have taken key roles such as conveners of the working groups, vice Chairs of the Scientific Committee, or national representatives at the Scientific Committee. The Scientific Committee also thanked the scholarship review panel for its work.

11.13 The Scientific Committee noted the projected dwindling of the General Science Capacity Fund (from which the CCAMLR Scholarship funds come from) to zero in 2027 (CCAMLR-44/04).

11.14 The Scientific Committee recommended that the Commission develop a sustainable financing plan to maintain this and other capacity development programs (e.g. Workshop support, convener travel support) which would reflect the importance of the scheme for supporting the work of CCAMLR. The Scientific Committee also recalled paper SC-CAMLR-43/BG/07 which summarised the large amount of work that scholarship recipients had undertaken over the years and suggested the Secretariat periodically provide a similar summary to support the sustainable financing plan.

11.15 SC-CAMLR-44/BG/17 presented the summary of the review of the proposal submitted to this year's round of the CEMP Special Fund. The CEMP Special Fund Management Panel reviewed the research proposal by Dr Warwick-Evans et al. (UK) on studying penguin population trends and potential impacts of the fishery at the South Orkney Islands using satellite-linked cameras, requesting A$110 054 in total over three years, with A$49 525 in the first year. The management panel recommended funding the proposal noting it was a useful pilot study that fit the CEMP Special Fund assessment criteria. Five ongoing CEMP Special Fund projects were monitored in 2025/26 and progress reports were included.

11.16 The Scientific Committee welcomed the proposal and endorsed the recommendation of the panel to fund the proposal by Dr Warwick-Evans.

11.17 The Scientific Committee endorsed the Proposal 2024/01 (on reconciling divergent population trends in gentoo penguins) for Drs Hinke and Krause (USA) to receive a no-cost one-year extension to allow a catch up in fieldwork in the 2026/27 season after logistical uncertainties in the 2025/26 field season.

Scientific Committee strategic plan and working group priorities

11.18 The Secretariat introduced and updated the format for the Scientific Committee Strategic Workplan, which combined the workplans of the Scientific Committee and its Working Groups into a single table to improve clarity and reduce duplication.

11.19 The Scientific Committee agreed on the insertion of an additional column to allow filtering of items related to climate change to better align with the CCAMLR Climate Change Workshop (WS-CC-2023) recommendations.

11.20 The Scientific Committee noted that some formats of the workplan table might need to be elaborated in the future, and further noted that the tasks of DSAG were completed and will be removed from the workplan table. The Scientific Committee thanked the current and previous conveners of DSAG (Drs A. Van de Putte, A. Dunn, T. Okuda, G. Walters, C. Reiss) for their contributions.

11.21 The Scientific Committee considered the WG-ASAM workplan tasks in paragraph 8.1 in WG-ASAM-2025 and noted that with the broader uses of acoustic data and analysis, the topics discussed by ASAM may exceed its Terms of Reference (WG-ASAM-2025, paragraph 9.3). It endorsed updating the ASAM Terms of Reference when revising the Scientific Committee strategic workplan during 2026.

11.22 The Scientific Committee considered the WG-SAM workplan and, noting the current task list is ambitious (WG-SAM-2025, paragraph 8.4), highlighted that with limited resources the Working Group may fail to complete some tasks (WG-SAM-2025, paragraphs 3.4 and 9.2).

11.23 The Scientific Committee considered the WG-EMM workplan and noted the fragmented handling of krill-related issues across multiple Working Groups (WG-EMM-2025, paragraphs 6.7 and 6.8) and supported the need for focus in each group. The Scientific Committee further noted the importance of integrating the work of different Working Groups and the current adjacent meetings (WG-ASAM and WG-EMM) was a very good opportunity for having experts attending both meetings discussing topics of mutual interest (WG-EMM-2025, paragraph 2.32).

11.24 The Scientific Committee noted that no meeting for WG-IMAF was scheduled during 2025 and that WG-IMAF will discuss its workplan during its next meeting in 2026.

11.25 The Scientific Committee considered the WG-FSA workplan and noted the tasks and the changes in paragraph 8.1 in WG-FSA-2025.

11.26 The Scientific Committee discussed the possibility of reconvening WG-Krill in WG-EMM this year (WG-EMM-2025, paragraph 6.7) and requested the Scientific Committee Bureau to draft its Terms of Reference for further consideration by SC-CAMLR-45 (also considering the potential implication for other Working Groups).

11.27 The Scientific Committee noted the need to expedite the work in respect of the KFMA, and that the Working Group conveners should prioritise papers and discussions that address the specific tasks on their workplans.

11.28 The Scientific Committee agreed that external experts would be invited for the WG-ASAM and WG-IMAF meetings to contribute their experience and knowledge for these Working Groups. Specifically, the Scientific Committee recommended that ACAP, IWC, COLTO and ARK be invited to send experts to contribute to discussions at WG-IMAF. The Scientific Committee also recommended that ARK experts be invited to WG-ASAM.

Election of Scientific Committee Chair, Vice-chair and next meeting

11.29 The Scientific Committee sought nominations for a new Junior Vice-Chair. Dr A. Panasiuk (Poland) was unanimously elected to the position for a term of two regular meetings (2026 and 2027). A warm welcome was extended to the incoming Junior Vice-Chair. Dr Panasiuk thanked the Scientific Committee for the opportunity to increase her contribution to CCAMLR.

11.30 The current Scientific Committee chair Dr C. Cárdenas (Chile) was unanimously elected to continue to take the chair for another two years (2026 and 2027). Dr Cárdenas thanked the Scientific Committee for its support and looked forward for this new term in order to continue progressing the work of the Scientific Committee.

11.31 The Scientific Committee thanked Dr S. Chung (Korea) for taking on the role of Junior Vice-Chair a year early and noted he would continue the role of Senior Vice-Chair in 2026.

11.32 The Scientific Committee noted Dr L. Ghigliotti (Italy) had finished her role as Senior Vice-Chair, and thanked her contribution to the Committee, including chairing the Scientific Committee when the Scientific Committee Chair was reporting to SCIC and SCAF.

11.33 The Scientific Committee noted that Dr T. Okuda (Japan) had finished his role as co-convener of WG-SAM and thanked him for his leadership that had started online in 2021 and through the COVID period along with Dr C. Péron (France) and then Dr D. Maschette. The Scientific Committee further noted that Dr Okuda accepted his nomination as the convener for WG-FSA and looked forward to his leadership of this Working Group.

11.34 The Scientific Committee noted that Mr Somhlaba had finished his role as convener of WG-FSA and thanked him for his leadership that had started in 2020.

11.35 The Scientific Committee noted that Mr N. Walker (New Zealand) had stepped down his role as co-convener of WG-IMAF and thanked him for his leadership.

11.36 The Scientific Committee noted that Dr S. Fielding (UK) had finished her role as co-convener of WG-ASAM and thanked her for her leadership that had started in 2019. The Scientific Committee further noted that Dr H. Murase (Japan) was nominated as the co-convener for WG-ASAM and looked forward to his leadership in this Working Group.

11.37 Dr A. Makhado (South Africa) informed the Scientific Committee that the upcoming CCAMLR Mid-Year meeting will be hosted in South Africa. Dr Makhado further informed that the venue of the meeting will be communicated to the CCAMLR Secretariat and the Members via circular.

SC-CAMLR supported working group meetings and workshops for 2025/2026

11.38 The Scientific Committee endorsed the following meetings and workshops in 2026:

(i) WG-ASAM in Shanghai, China (18th to 22nd May 2026)

(ii) WG-IMAF in South Africa (15th to 19th June 2026)

(iii) WG-EMM in South Africa (29th June to 10th July 2026)

(iv) WG-SAM in South Africa (13th to 17th July 2026)

(v) WG-FSA in Hobart (5th to 16th October 2026)

(vi) Scientific Committee in Hobart (19th to 23rd October 2026)

(vii) Harmonisation of Marine Spatial Planning for Subarea 48.2 Workshop in South Africa (22nd to 26th June 2026)

(viii) CEMP review/proposed D1MPA RMP Workshop (TBD)

(ix) Joint SC-CEP Climate Change (8th to9th May) and CEP (11th to15th May) in Hiroshima, Japan

(x) XII SCAR open Science Conference in Oslo, Norway (8th to 16th August).

Advice to SCIC and SCAF

12.1 The Scientific Committee collated its advice relative to funding required to support its activities in 2025/2026.

12.2 For General Science Capacity Fund expenses, the Scientific Committee noted:

(i) support for two new scholarships plus two existing scholarships totalling A$60 000 (paragraph 11.11), and

(ii) ongoing convener travel assistance for one working group convener totalling A$25 000.

12.3 The Scientific Committee reiterated the importance of a sustainable funding mechanism to support capacity building initiatives within CCAMLR to support the work of the Scientific Committee (paragraphs 3.23 and 11.14).

12.4 The Scientific Committee also noted 2026 support from the CEMP Special Fund for:

(i) a new proposal from Dr Warwick-Evans et al. for $110 054 (paragraph 11.16)

(ii) a one-year delay with the project from Drs Hinke and Krause for A$32 177 (paragraph 11.17)

(iii) a final instalment for Dr Labrousse's project for A$15 347

(iv) continuation of the CEMP Camera equipment fund.

12.5 The Scientific Committee also requested Secretariat support for the Subarea 48.2 workshop, a Subarea 48.1 workshop, participation in an IUCN Southern Ocean fish species vulnerability workshop (paragraph 10.46), and the IWC Scientific Committee in 2026 (SC-CAMLR-42, paragraph 8.4).

12.6 The Chair of the Scientific Committee provided advice to SCIC regarding the potential depth distributions of fish nests in the Convention Area, potential effects of early entry of vessels into Subareas 88.1 and 88.2, and on the utility of collecting additional information on the causes of late gear retrieval in toothfish fisheries, the effects of late gear retrieval on the quality of data collected, the tagging rate and tag overlap statistic.

12.7 The Chair of the Scientific Committee requested SCIC provide the definitions of the terms calibration and standardisation in CM 24-01, Annex 24-01/A, Format 2, which refers to calibration/standardisation of sampling gear, and clarify why vessels are requested to leave an area immediately after a season closes (CM 31-02) but are allowed to enter an area at any time prior to the start of a fishing season.

Other business

13.1 SC-CAMLR-44/BG/04, presented by Chile, summarised the Chile–Antarctic Smart Cable Project, which aims to deploy the first fibre-optic submarine cable between continental Chile and the South Shetland Islands and the northern Antarctic Peninsula, providing high-speed wired connectivity to support Earth's systems monitoring and to enhance scientific collaboration among Members.

13.2 The Scientific Committee welcomed the initiative and the potential for an increase in communications capacity for science in Antarctica and looked forward to additional updates as this project progresses.

13.3 SC-CAMLR-44/BG/40, presented by Australia on behalf of Canada, summarised the Canadian Antarctic Research Expedition (CARE) 2025, which carried out a multidisciplinary survey in the South Shetland Islands and Antarctic Peninsula to address scientific issues in marine geology and sediment sampling, oceanography, and contaminants on board the HMCS *Margaret Brooke*. The experience Canada has gained from CARE 2025 will inform future Canadian Antarctic research activities, expeditions, and collaborations and contribute to the work of the Scientific Committee.

13.4 The Scientific Committee welcomed the engagement of Canada in the Antarctic marine research community and looked forward to benefiting from its substantial experience with polar marine ecosystems and to collaborations on work with future voyages, especially in the Antarctic Peninsula area.

13.5 Australia informed the Scientific Committee it would be conducting the annual Random Stratified Trawl Survey at Heard Island and McDonald Islands in CCAMLR Division 58.5.2 in March 2026.

13.6 Australia also informed the Scientific Committee, as circulated in COMM CIRC 25/116/SC CIRC 25/87, that it plans to conduct marine science activities as part of a voyage to Heard Island during December 2025 to January 2026. The aims of marine science activities include assessments of benthic habitats and biodiversity, demersal and pelagic fish biodiversity and the importance of inshore settlement for ecologically important fish species, distribution and abundance of main phytoplankton groups, and biodiversity and spatial distribution of species occurrences through eDNA.

13.7 The Scientific Committee noted that the MPA Special Fund was seeking new management panel members to develop new terms of reference and manage the fund.

13.8 The Scientific Committee congratulated Mr Walker (New Zealand) on his appointment to the role of CCAMLR Executive Secretary, noting that although the Secretariat will gain a valuable and experienced leader, the Scientific Committee will feel the loss of his significant contributions. The Scientific Committee looked forward to future work with the Secretariat under his leadership.

Adoption of the report of the Forty-fourth meeting

14.1 The report of the meeting was adopted, requiring 7.7 hours of discussion.

Close of the meeting

15.1 The Scientific Committee noted the passing of Dr Robert Hofman. Dr Hofman was a former member of the USA delegation to CCAMLR and passed away earlier this year after declining health. He was an integral member of USA delegations to many Antarctic negotiations and assisted in developing U.S. positions for those negotiations. His career in conservation work with the U.S. Marine Mammal Commission allowed him to play an important role in the development of the ecosystem-based conservation obligations that are the hallmark of CCAMLR. Dr Hofman was also the first US Representative to the Scientific Committee of CCAMLR and to the CEP. He was always an advocate for basing management decisions on science and for carrying out the necessary research. He was a mentor to many in the USA delegation, and he would always say ‘Lead by example’. He leaves behind an impressive legacy for marine mammal science and CCAMLR and will be missed.

15.2 ASOC also noted that Dr Hofman shared his CCAMLR expertise and knowledge generously even in retirement and expressed appreciation for Dr Hofman and his commitment to CCAMLR.

15.3 Mr Walker thanked the Chair for his excellent leadership, hard work, knowledge and guidance in running the meeting. He also thanked the Secretariat Science team, interpreters, and all Secretariat support for a job well done.

15.4 Mr F. Santa Cruz (Chile) noted that he has witnessed the Chair’s impressive skills in their work together, thanked the Chair for his work, and looked forward to providing active and constructive support to the Chair during the next two years to promote Antarctic Conservation.

15.5 Dr S. Rodríguez echoed the thanks of other Members and especially appreciated the highly dynamic and well-structured sessions. In particular, he appreciated the standardisation of the use of the term ‘Romanitos’ and calibration of the timing to finish the meeting.

15.6 Dr Eléaume added his thanks to the Chair, the interpreters and translators for their support.

15.7 Mr Somhlaba thanked the Chair and also thanked Dr Agnew for his leadership for the past eight years, noting his retirement from the Executive Secretary position in the upcoming months (paragraph 2.4).

15.8 The Chair of the Scientific Committee thanked the Committee members for their good will and appreciation of his efforts. He noted that although improving their Spanish was a big achievement, the Committee sought even bigger achievements in Antarctic marine conservation and he looked forward to working together to reach those goals. He thanked the interpreters (especially those interpreting his Spanish), rapporteurs, translators, Congress for audio-visual support, and the Secretariat.

15.9 The meeting was closed.

References

Krag, L.A., A.B. Krafft, B. Herrmann and P.V. Skov. 2021. Physiological stress and recovery kinetics in trawl escapees of the Antarctic krill *Euphausia superba* Dana, 1850 (Euphausiacea), *J. Crustac. Biol.*, 41(2): ruab013. doi: https://doi.org/10.1093/jcbiol/ruab013.

Krafft, B.A., L.A. Krag, A. Engås, S. Nordrum, I. Bruheim and B. Herrmann. 2016. Quantifying the Escape Mortality of Trawl Caught Antarctic Krill (*Euphausia superba*). *PLoS One*, 11(9): e0162311. doi: https://doi.org/10.1371/journal.pone.0162311.

Krafft, B.A., G.J. Macaulay, G. Skaret, T. Knutsen, O.A. Bergstad, A. Lowther, G. Huse, S. Fielding, P. Trathan, E. Murphy, S-G. Choi, S. Chung, I. Han, K. Lee, X. Zhao, X. Wang, Y. Ying, X. Yu, K. Demianenko, V. Podhornyi, K. Vishnyakova, L. Pshenichnov, A. Chuklin, H. Shyshman, M.J. Cox, K. Reid, G.M. Watters, C.S. Reiss, J.T. Hinke, J. Arata, O.R. Godø and N. Hoem. 2021. Standing stock of Antarctic krill (*Euphausia superba* Dana, 1850) (Euphausiacea) in the Southwest Atlantic sector of the Southern Ocean, 2018–19, J. Crustac. Biol., 41(3): ruab046. doi: https://doi.org/10.1093/jcbiol/ruab046.

Krause, D.J., C.A. Bonin, M.E. Goebel, C.S. Reiss and G.M. Watters. 2022. The Rapid Population Collapse of a Key Marine Predator in the Northern Antarctic Peninsula Endangers Genetic Diversity and Resilience to Climate Change. *Front. Mar. Sci.*, 8:796488. doi: https://doi:10.3389/fmars.2021.796488.

Hunter, A., S.E. Thorpe, A.H. McCarthy and C. Manno. 2024. Microplastic hotspots mapped across the Southern Ocean reveal areas of potential ecological impact. Sci. Rep., 14: 31599. doi: https://doi.org/10.1038/s41598-024-79816-y.

Table 1: Proposed precautionary finfish catch limits (tonnes) for consideration by the Commission for 2025/26. AUS – Australia; ECU – Ecuador; CHL – Chile; ESP – Spain; FRA – France; GBR– United Kingdom; JPN – Japan; KOR – Republic of Korea; NAM – Namibia, NZL – New Zealand; RUS – Russian Federation; UKR – Ukraine; URY – Uruguay.

Subarea/ division	Fishing area	Target species	Catch limit 2024/25	Catch limit 2025/26	*Macrourus* spp.	Skates and rays	Other species	Conservation measure	Notifying Members
48.3	48.3	*C. gunnari*	3 579	3 430[4]	-	-	See CM 33-01	33-01, 42-01	Not applicable
48.3[1]	48.3A	*D. eleginoides*	-	-	-	-	See CM 33-01		Not applicable
	48.3B	*D. eleginoides*	619	619	-	-	See CM 33-01		Not applicable
	48.3C	*D. eleginoides*	1 443	1 443	-	-	See CM 33-01		Not applicable
	Total	*D. eleginoides*	2 062	2 062	103	103	See CM 33-01		Not applicable
48.4	48.4_SSI	*D. eleginoides*	19	33	10.4	3.3		41-03	Not applicable
	48.4_SSI	*D. mawsoni*	37	32	10.4	3.3		41-03	Not applicable
48.6	48.6_2	*D. mawsoni*	152	182	29	9	29	33-03, 41-04	ESP, JPN, KOR
	48.6_3	*D. mawsoni*	50	60	9	3	9	33-03, 41-04	ESP, JPN, KOR
	48.6_4	*D. mawsoni*	151	181	28	9	28	33-03, 41-04	ESP, JPN, KOR
	48.6_5	*D. mawsoni*	242	290	46	14	46	33-03, 41-04	ESP, JPN, KOR
	Total	*D. mawsoni*	595	713	-	-	-		
58.4.1	58.4.1_1[2]	*D. mawsoni*	112 (50 sets)	112 (50 sets)	17	5	17	33-03, 41-11	AUS, ESP, FRA, JPN, KOR
	58.4.1_2[2]	*D. mawsoni*	80 (50 sets)	80 (50 sets)	12	4	12	33-03, 41-11	AUS, ESP, FRA, JPN, KOR
	58.4.1_3[2]	*D. mawsoni*	79 (60 sets)	79 (60 sets)	12	3	12	33-03, 41-11	AUS, ESP, FRA, JPN, KOR
	58.4.1_4[2]	*D. mawsoni*	46 (30 sets)	46 (30 sets)	7	2	7	33-03, 41-11	AUS, ESP, FRA, JPN, KOR
	58.4.1_5[2]	*D. mawsoni*	116 (50 sets)	116 (50 sets)	18	5	18	33-03, 41-11	AUS, ESP, FRA, JPN, KOR
	58.4.1_6[2]	*D. mawsoni*	50 (50 sets)	50 (50 sets)	8	2	8	33-03, 41-11	AUS, ESP, FRA, JPN, KOR
	Total	*D. mawsoni*	483	483	-	-	-	33-03, 41-11	AUS, ESP, FRA, JPN, KOR
58.4.2	58.4.2_1	*D. mawsoni*	124	149	23	7	23	33-03, 41-05	AUS, FRA
	58.4.2_2	*D. mawsoni*	165	132	21	6	21	33-03, 41-05	AUS, FRA
	Total	*D. mawsoni*	289	281	-	-	-	33-03, 41-05	AUS, FRA

Subarea/ division	Fishing area	Target species	Catch limit		*Macrourus* spp.	Skates and rays	Other species	Conservation measure	Notifying Members
			2024/25	2025/26					
58.5.2	HIMI	*C. gunnari*	1 824	1 429[5]			See CM 33-02	33-02, 42-02	Not applicable
	HIMI	*D. eleginoides*	2 120	2 120			See CM 33-02	33-02, 41-08	Not applicable
88.1	North of 70° S	*D. mawsoni*	623	623	99	31	31	41-09	AUS, ECU, ESP, FRA, GBR, KOR, NAM, NZL, RUS, UKR
	South of 70° S	*D. mawsoni*	2 163	2163	316	108	108	41-09	AUS, ECU, ESP, FRA, GBR, KOR, NAM, NZL, RUS, UKR
	SRZ	*D. mawsoni*	393	428	72	21	21	41-09	AUS, ECU, ESP, FRA, GBR, KOR, NAM, NZL, RUS, UKR
	Shelf Survey	*D. mawsoni*	99	64	-	-	-	24-05, 41-09	NZL
	Total	*D. mawsoni*	3 278	3 278	487	160	160	41-09	
88.2	88.2_1	*D. mawsoni*	184	184	29	9	29	33-03, 41-10	AUS, ECU, ESP, FRA, GBR, KOR, NAM, NZL, RUS, UKR, URY
	88.2_2	*D. mawsoni*	378	454	72	22	72	33-03, 41-10	AUS, ECU, ESP, FRA, GBR, KOR, NAM, NZL, RUS, UKR, URY
	88.2_3	*D. mawsoni*	390	468	74	23	74	33-03, 41-10	AUS, ECU, ESP, FRA, GBR, KOR, NAM, NZL, RUS, UKR, URY
	88.2_4	*D. mawsoni*	266	319	51	15	51	33-03, 41-10	AUS, ECU, ESP, FRA, GBR, KOR, NAM, NZL, RUS, UKR, URY
	88.2H	*D. mawsoni*	166	199	31	9	31	33-03, 41-10	AUS, ECU, ESP, FRA, GBR, KOR, NAM, NZL, RUS, UKR, URY
	Total	*D. mawsoni*	1384	1624					

Subarea/ division	Fishing area	Target species	Catch limit		*Macrourus* spp.	Skates and rays	Other species	Conservation measure	Notifying Members
			2024/25	2025/26					
88.3	88.3_1	*D. mawsoni*	10	12	1	0.6	1	24-05	KOR, UKR
	88.3_2[3]	*D. mawsoni*	20	20 (14 sets)	3	1	3	24-05	KOR, UKR
	88.3_3	*D. mawsoni*	30	24	3	1	3	24-05	KOR, UKR
	88.3_4	*D. mawsoni*	30	24	3	1	3	24-05	KOR, UKR
	88.3_6	*D. mawsoni*	52	52	8	2	8	24-05	KOR, UKR
	88.3_11	*D. mawsoni*	23 (30 sets)	100	16	5	16	24-05	KOR, UKR
	88.3_12	*D. mawsoni*	23 (30 sets)	168	26	8	26	24-05	KOR, UKR
	Total	*D. mawsoni*	188	400	-	-	-		

1 Consensus could not be reached on catch limits for *D. eleginoides* in Subarea 48.3 for the 2024/2025 and the 2025/2026 seasons (SC-CAMLR-43 paragraph 3.51).
2 Catch limit for effort-limited research fishing as per WG-SAM-2025/03.
3 Catch limit for effort-limited research fishing as per WG-FSA-2025/49 Rev.1.
4 The proposed catch limit for *C. gunnari* in 48.3 for 2026/27 is 2 230 t
5 The proposed catch limit for *C. gunnari* in 58.5.2 for 2026/27 is 1 126 t

Annex 1

List of Registered Participants

List of Registered Participants

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Annex 2

List of Documents

List of Documents

SC-CAMLR-44/01	Documenting the Spatial Overlap Analyses as a contribution to documenting the krill fishery management approach Warwick-Evans, V., S. Hill and M. Collins
SC-CAMLR-44/02	Krill fishery management in Area 48 – options for spatial distribution of catches Delegation of the United Kingdom
SC-CAMLR-44/03	Proposal for a workshop to support the harmonisation of marine spatial planning for Subarea 48.2 Lowther, A.D., E.D. Johannessen, U. Lindstrøm, N. Kelly, B. Krafft., A.B. Makhado, M. Santos, F. Santa Cruz and X. Wang
SC-CAMLR-44/04	Framing the Research and Monitoring Plan of the proposed Marine Protected Area in Domain 1 (D1MPA) Delegations of Argentina and Chile
SC-CAMLR-44/05	Spatial structure of krill stock in the Antarctic Peninsula region and implication for krill fishery management Delegation of China
SC-CAMLR-44/06	Comments on efficiency of the Scientific Observer's sampling for the krill fishery Delegation of the Russian Federation
SC-CAMLR-44/07	Strategic approach to identify areas for spatial protection using pelagic ecoregionalisation in the subantarctic Indian High Seas Makhado, A.B., P. Koubbi, K.M. Swadling, T. Carpenter-Kling, A.T. Lombard, J.A. Huggett, P. Marras - Aït Razouk, M. Connan, C. Cotté and E. Goberville
SC-CAMLR-44/08	Report of the Working Group on Statistics, Assessment and Modelling (WG-SAM-2025) (Tenerife, Spain, 16 to 20 June 2025)
SC-CAMLR-44/09	Report of the Working Group on Acoustic Survey and Analysis Methods (WG-ASAM-2025) (Geilo, Norway, 30 June to 4 July 2025)

SC-CAMLR-44/10	Report of the Working Group on Ecosystem Monitoring and Management (WG-EMM-2025) (Geilo, Norway, 7 to 18 July 2025)
SC-CAMLR-44/11	Report of the Working Group on Fish Stock Assessment (WG-FSA-2025) (Hobart, Australia, 6 to 16 October 2025)
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SC-CAMLR-44/BG/01	Catches of target species in the Convention Area CCAMLR Secretariat
SC-CAMLR-44/BG/02	CCAMLR's revised Krill Fishery Management Approach (KFMA) in Subareas 48.1 to 48.4 as progressed up to 2024 Working Group on Ecosystem Monitoring and Management and CCAMLR Secretariat
SC-CAMLR-44/BG/03	Secretariat science support for the Scientific Committee in 2025 CCAMLR Secretariat
SC-CAMLR-44/BG/04	Chile–Antarctic Smart Cable Project Delegation of Chile
SC-CAMLR-44/BG/05	2025 Annual Report to the Scientific Committee of CCAMLR Delegation of the United States of America
SC-CAMLR-44/BG/06	First steps towards the development of the Research and Monitoring Plan of the proposed Marine Protected Area in Domain 1 (D1MPA) Delegations of Argentina and Chile
SC-CAMLR-44/BG/07	Information about a Workshop for Training Russian Scientific Observers and Inspectors to Work in Fisheries in the CCAMLR Convention Area (Russia, 4–8 August 2025) Delegation of the Russian Federation
SC-CAMLR-44/BG/08	CIMAR 1 Antartica: Chile's Contribution to ecosystem monitoring in subarea 48.1 Delegation of Chile
SC-CAMLR-44/BG/09	Report of the Fourth Training Course of Chilean Scientific Observers under the CCAMLR SISO Scheme Delegation of Chile

SC-CAMLR-44/BG/10	COLTO–FishSOOP Collaboration on Oceanographic Data Collection from Toothfish Vessels COLTO
SC-CAMLR-44/BG/11 Rev. 1	2025 Report by Oceanites, Inc. — Monitoring Update Oceanites
SC-CAMLR-44/BG/12 Rev. 1	Developments in cetacean monitoring and IAATO operational procedures in Antarctica 2019-2026 IAATO and ASOC
SC-CAMLR-44/BG/13	Antarctic Climate Change and the Environment: 2025 Update SCAR
SC-CAMLR-44/BG/14	Summary of research activities for the collaborations between SC-CAMLR and IWC-SC in the 2024/25 intersessional period Kelly, N.
SC-CAMLR-44/BG/15	CCAMLR data requests and the rules for Access and Use of CCAMLR Data CCAMLR Secretariat
SC-CAMLR-44/BG/16	CCAMLR Scientific Scholarship Scheme review panel recommendations in 2025 CCAMLR Scientific Scholarship Scheme review panel
SC-CAMLR-44/BG/17	CEMP Special Fund activities 2025 CEMP Special Fund Management Panel
SC-CAMLR-44/BG/18	The Scientific Committee on Antarctic Research (SCAR) Annual Report to CCAMLR 2024/25 SCAR
SC-CAMLR-44/BG/19	ARK report 2025: Responsible Krill Harvesting amid climate and management challenges ARK
SC-CAMLR-44/BG/20	Census of penguins on the Antarctic Peninsula & South Shetland Islands (Subarea 48.1) Collins, M.A., A. Bennison, N. Ratcliffe, M.L. Romero Martinez, C.M. Waluda and N. Fenney
SC-CAMLR-44/BG/21 Rev. 1	Report on the Ross Sea Region Marine Protected Area Research Coordination Network Inaugural Meeting SCAR, co-sponsored by SOOS

SC-CAMLR-44/BG/22	Establishing a Weddell Sea observatory: Advances through the WOBEC initiative for long-term biodiversity and ecosystem monitoring Teschke, K., A. Van de Putte, F. Schaafsma, T. Vandenberghe, E. Campbell, K. Campbell, Y. Ming Gan, M. van Leeuwe, M. Lenss, H. Link, F. Mark, Z. Mohamed, S. Moreau, S. Niiranen, M. Pluta, C. Papetti, R. Roura, N. Van den Steen, J. Stefels, W. Werna, M. Vortkamp, M. Wietz, J. Wiktor, A. Wold and H. Flores
SC-CAMLR-44/BG/23	From Fixed Quotas to Adaptive Management: A Proposal for Implementing KFMA in Subarea 48.1 Delegation of Norway
SC-CAMLR-44/BG/24	Inventory of Southern Ocean Long-Term Monitoring Programmes SOOS
SC-CAMLR-44/BG/25	Krill fishery management in Area 48: comments and proposals Delegation of the Russian Federation
SC-CAMLR-44/BG/26	Hot Spots in the Ice: New Tools for Exploring Ecosystem Value ASOC
SC-CAMLR-44/BG/27	Introduction to ASOC's new and novel Southern Ocean Citizen Submersible Initiative (SOCSI) ASOC
SC-CAMLR-44/BG/28	Observation systems are essential infrastructures (for CCAMLR and beyond) Delor, C.A.
SC-CAMLR-44/BG/29	Plastic Pollution Hotspots Originating from Local Sources in the Southern Ocean SCAR
SC-CAMLR-44/BG/30	Preliminary report of the trial on net monitoring cable/warp seabird-strike mitigation measures conducted by the Chinese continuous fishing vessels during the 2024/25 fishing season Delegation of China

SC-CAMLR/44/BG/31	Progress in developing CCAMLR State of Antarctic Environment (SOAE) reporting Delegations of the United Kingdom, New Zealand, France, Belgium, Chile and CCAMLR Secretariat
SC-CAMLR-44/BG/32	Progress report on the joint CEP/SC-CAMLR workshop 2026 CEP/SC-CAMLR Joint Workshop Steering Committee
SC-CAMLR-44/BG/33	SCAR Action Group on Fish (SCARFISH): Updates and Opportunities SCAR
SC-CAMLR-44/BG/34	Southern Ocean Observing System (SOOS) Annual Report (2024-2025) SOOS
SC-CAMLR-44/BG/35	The Framework and Science to support the 10-year review of the Ross Sea region MPA Delegations of Italy, New Zealand, Republic of Korea, Norway and Argentina
SC-CAMLR-44/BG/36 Rev. 2	Summary of krill fishery operations in the 2024/25 season CCAMLR Secretariat
SC-CAMLR-44/BG/37	The state of Gentoo and Adélie penguin populations at Galindez, Petermann, and Yalour islands, time-lapse camera validation, and nearby island colonies inspection Davydenko, S., E. Dykyi, P. Khoetsky, O. Savenko, G. Milinevsky, A. Simon, L. Pshenichnov, V. Tkachenko, K. Demianenko, A. Dzhulai, S. Gogol and Y. Shepeta
SC-CAMLR-44/BG/38	Changes in apparent fishing effort in Subareas 48.1 following the lapse of CM 51-07 ASOC
SC-CAMLR-44/BG/39	Update on High Pathogenicity Avian Influenza in Antarctica 2024/25 SCAR
SC-CAMLR-44/BG/40	Canadian Antarctic Research Expedition 2025 Delegation of Canada
SC-CAMLR-44/BG/41	FAO Deep-sea Fisheries Under an Ecosystem Approach Project (2022–2027) FAO Deep Sea Fisheries Project

Other

SC-CAMLR-44/P01	Adjusting the Management of the Antarctic Krill Fishery to Meet the Challenges of the 21st Century SCAR *PNAS*, 122(37): e2412624122 (2025). doi: https://doi.org/10.1073/pnas.2412624122
CCAMLR-43/48	Suggestions for establishing Marine Protected Areas in the CCAMLR Convention Area: regulation of the uniform process for establishing MPAs and the Commission's management of MPAs Delegation of the Russian Federation
CCAMLR-44/06	Performance Review 2 – summary of outcomes CCAMLR Secretariat
CCAMLR-44/BG/15	Survey for the Development of Electronic Monitoring Systems (EMS) in CCAMLR Fisheries Delegation of Chile
CCAMLR-44/BG/18	International Association of Antarctica Tour Operators 2024–2025 Report to CCAMLR-44 IAATO
CCAMLR-44/BG/28	CCAMLR and the 'shifting baseline syndrome': Issues of concern ASOC
CCAMLR-44/BG/29	Krill Fishery Management Approach and the D1MPA – Moving forward with the harmonisation process ASOC
CCAMLR-44/BG/30	ASOC Report to CCAMLR ASOC

Annex 3

Agenda for the Forty-fourth Meeting
of the Scientific Committee

Agenda for the Forty-fourth Meeting of the Scientific Committee for the Conservation of Antarctic Marine Living Resources

1. Opening of the meeting

   1.1 Adoption of the agenda
   1.2 Chair's report

2. Harvested species – General Issues

   2.1 Krill in Statistical Area 48
   2.2 Krill in Statistical Area 58

3. Harvested species – Finfish General issues

   3.1 Statistical Area 48
      3.1.1 Icefish
      3.1.2 Toothfish

   3.2 Statistical Area 58

      3.2.1 Icefish
      3.2.2 Toothfish

   3.3 Statistical Area 88

      3.3.1 Toothfish

4. Non-target catch

   4.1 Fish and invertebrate by-catch

   4.2 Incidental mortality of seabirds and marine mammals associated with fisheries

   4.3 Bottom fishing and vulnerable marine ecosystems

5. Ecosystem monitoring and management

6. Spatial management of impacts on the Antarctic ecosystem

   6.1 Existing marine protected areas, including research and monitoring plans for MPAs

   6.2 Review of the scientific elements of proposals for new MPAs

   6.3 Other spatial management issues

7. Climate change

8. Illegal, unreported and unregulated (IUU) fishing in the Convention Area

9. CCAMLR Scheme of International Scientific Observation

10. Cooperation with other organisations

    10.1 Cooperation within the Antarctic Treaty System

    10.2 Reports of observers from other international organisations

    10.3 Reports of representatives at meetings of other international organisations

11. Scientific Committee activities

    11.1 Science Fund reporting and the CCAMLR Scientific Scholarship Scheme

    11.2 Scientific Committee strategic plan and working group priorities

    11.3 Election of Scientific Committee Chair, Vice-chair and next meeting

12. Advice to SCIC and SCAF

13. Other business

14. Adoption of report of the Forty-fourth Meeting

15. Close of meeting

Annex 4

Report of the Working Group on
Acoustic Survey and Analysis Methods (WG-ASAM-2025)
(Geilo, Norway, 30 June to 4 July 2025)

Contents

Report of the Working Group on Acoustic Survey and Analysis Methods (WG-ASAM-2025)

(Geilo, Norway, 30 June to 4 July 2025)

Introduction

1.1 The 2025 meeting of the Working Group on Acoustic Survey and Analysis Methods (WG-ASAM-2025) was hosted by the Institute of Marine Research of Norway, at the Vestlia Resort in Geilo Norway, from 30 June to 4 July 2025, and organised by Ms V. Vilanger (Norway).

Opening of the meeting

1.2 The meeting co-conveners, Dr S. Fielding (United Kingdom (UK)) and Dr X. Wang (People's Republic of China (China)) welcomed participants (Appendix A) to the meeting and expressed their goals for the meeting. The participants were welcomed to the Vestlia venue and welcomed to Geilo by Dr B. Krafft (Norway). He noted that although the meeting was taking place in the mountains of Norway, the links to Antarctica were present in the climate, the surrounding glaciers, and in the marine work conducted by Norway. He looked forward to a successful meeting and synergism of ideas with WG-EMM-2025.

Adoption of the Agenda

1.3 The agenda was adopted without change (Appendix B).

1.4 Documents submitted to the meeting are listed in Appendix C. The Working Group thanked all authors of papers for their valuable contributions to the work presented to the meeting.

1.5 In this report, paragraphs that provide advice to the Scientific Committee and its other working groups have been indicated in grey. A summary of these paragraphs is provided under 'Advice to the Scientific Committee'.

1.6 The report was prepared by J. Arata (invited expert), D. Bahlburg (Germany), C. Cárdenas (Chair of the Scientific Committee), M. Cox (Australia), D. De Pooter (Secretariat), T. Dornan (UK), E. Kim (Republic of Korea (Korea)), B. Krafft (Norway), H. Sul La (Korea), H. Murase (Japan), S. Parker (Secretariat), A. Smith (Australia) and G. Zhu (China).

1.7 A glossary of acronyms and abbreviations used in CCAMLR reports is available online at https://www.ccamlr.org/node/78120.

Review terms of reference and workplan

2.1 The Working Group noted the terms of reference agreed by the Scientific Committee in 2022 and set out in SC CIRC 23/52.

2.2 The Working Group noted the workplan set out in Table 6 of SC-CAMLR-43. The Secretariat proposed options to simplify the revision of the workplan by noting revisions proposed in report text of the Working Group, and developing an online composite workplan for the Scientific Committee combining topics for all Working Groups which included specific tasks lead by Members. The Working Group agreed with this approach and to discuss additional modifications to the workplan under 'Future Work'.

Standardised procedures for the collection of acoustic data for krill fishery management

Methods for calibrating echosounders on vessels

3.1 The Working Group considered appropriate methods and procedures for calibration of echosounders on vessels used for acoustic data collection. The Working Group noted that the calibration protocol developed during WG-ASAM-2024 (WG-ASAM-2024, Appendix D) only applied to vessels with EK80 echosounders and discussed the need for advice for vessels equipped with non-EK80 echosounders. The Working Group considered the echosounders installed on krill fishing vessels notified for the 2025/26 fishing season and noted that 9 of the 14 fishing vessels are equipped with an EK80, one with an EK60, and nine of these echosounders operated with a 120 kHz transducer (Table 1). The Working Group concluded that a calibration protocol for the use of non-EK80 echosounders was not needed as a priority.

3.2 The Working Group discussed the stability of echosounder calibrations, how frequently echosounders should be calibrated and the environment the calibration was undertaken in. The Working Group noted that there was evidence in the literature that transducer Gain and S_a correction were affected by changes in temperature (Demer and Renfree, 2008). The Working Group noted that modern transducers (e.g. composite) may be more stable than older models across years and temperature gradients.

3.3 The Working Group compared Gain and S_a correction calibration results from the RRS *Sir David Attenborough* and RV *Aurora Australis*, to explore if the calibration results were stable across time. Results indicated that the modern composite transducer (120-7C) fitted to the RRS *Sir David Attenborough* was stable across 3 years and an approximately 15°C temperature difference, but that the older version of transducer (120-7) fitted to the RV *Aurora Australis* had more variability (Figure 1). The Working Group noted that more data were required to confirm these trends and invited Members to submit calibration results for comparison in the ASAM e-group https://groups.ccamlr.org/group/3/stream. The Working Group welcomed the offer by Dr Cox to conduct a temperature experiment on a 120-7C transducer and report results to WG-ASAM-2026.

3.4 The Working Group also recalled that vessels were requested to conduct impedance tests as these can provide confidence that echosounders are functioning correctly (WG-ASAM-2024, paragraph 3.8). It also recalled checking the general functionality of a split-beam transducer by observing single target distributions within the acoustic beam. The Working Group noted that vessels could conduct impedance tests at the beginning and at the end of surveys, as well as checking general functionality of the split-beam transducer by observing single target distributions throughout the survey. The Working Group recommended that the Secretariat update the calibration protocol.

Acoustic transect design and data collection

Review and recommend spacing and sampling stations for transects

3.5 The Working Group reviewed features of the acoustic survey transect and CTD and krill biological sampling station design in Subarea 48.1 developed in WG-ASAM-2024 (WG-ASAM-2024, Figure 1), noting that boundaries of some of the Management Units (MUs) for Subarea 48.1 had been revised by SC-CAMLR-43, paragraph 2.63. The Working Group considered the three survey designs for Subarea 48.1 developed during WG-ASAM-2024 (WG-ASAM 2024, Figure 1 a–c) and further discussed design rules for acoustic surveys in Subarea 48.1. The Working Group noted that these design rules (paragraph 3.15) should be applicable to other survey areas. It recalled that establishing geospatial rules had been beneficial to coordinating spatial activities within CCAMLR and their transparency (SC-CAMLR-42, paragraph 2.30; https://github.com/ccamlr/geospatial_operations).

3.6 The Working Group noted that in the WG-ASAM 2024 design, the transect spacing is closer within the core strata (GS, BS, JOIN, SSIW, EI survey strata) that cover the footprint of the fishing fleet and the Spatial Overlap Analysis (SOA) and transects further offshore are spaced further apart. The Working Group noted that the transects were designed as a parallel transect survey to allow the use of the Jolly-Hampton survey estimator. The Working Group noted that if a biomass estimate was required for the whole of Subarea 48.1 then the entire area should be surveyed.

3.7 The Working Group further noted that surveys conducted in the core strata could be surveyed annually to understand the dynamics and interannual variability of the krill stock. However, it noted that surveys used to calculate biomass estimates for the core strata should not be extrapolated beyond the area surveyed.

3.8 The Working Group re-iterated the value of continuing time-series of acoustically derived krill biomass estimates, noting the design of the WG-ASAM-2024 Subarea 48.1 survey had utilised the existing core strata transects and extended every 2nd transect further off-shore from the edge of the spatial overlap analysis boundary to the boundary of the 48.1 Subarea (WG-ASAM-2024, paragraph 3.29 (iv)).

3.9 The Working Group reviewed the spatial extent of the Subarea 48.1 survey alongside the distribution of sea-ice in winter (April–September) months and recommended that if a winter (April–September) survey was required, this could occur in late April/May before the development of sea ice which will reduce the survey coverage.

3.10 The Working Group noted that prevailing sea ice conditions meant that the Powell Basin (PB1 south and PB2) and the southern part of Drake Passage (DP2) are unlikely to be surveyable during winter. The Working Group further noted that the proposed design is focused on obtaining biomass estimates but that WG-EMM may want to survey key areas at different times for ecological monitoring.

3.11 The Working Group recommended the distance between sampling stations for acoustic biomass surveys should be 40 nm with the goal of at least 2 sampling stations on each transect with some exceptions (paragraph 3.15 (v), paragraph 3.13). The Working Group noted that sampling station spacing required to provide length frequency information for an acoustic biomass estimate may be different from those required for ecological monitoring or to inform the Krill Stock Hypothesis (KSH).

3.12 The Working Group noted that placing sampling stations at the end of transects that were at the boundaries of strata could cause challenges to fishing vessels to complete and remain in the strata. It also noted that some transects ended in shallow or unsurveyed areas that could compromise vessel safety. The Working Group agreed that sampling stations should be placed at least 10 nm in from the ends of transects. The Working Group noted that the decision on when to end a survey transect or where to conduct a trawl sample would rest with the vessel based on safety or operational considerations.

3.13 The Working Group identified that some transects in the Bransfield and Gerlache Straits were short and may only be allocated one station with the rules on spacing (paragraph 3.15(v)).

3.14 The Working Group discussed how to assess survey coverage and noted the metric devised by Aglen (1989) where survey coverage index is equal to the total transect distance divided by the square root of the area surveyed. The Working Group calculated survey coverage for the proposed transect design from WG-ASAM-2024 for each of the proposed MUs to facilitate their discussions on whether the survey design was appropriate (Table 2). The Working Group also noted that the survey coverage should be considered together with the spatial allocation of transects within survey area.

3.15 The Working Group agreed on the following design rules to revise the acoustic survey design in Subarea 48.1:

(i) The areas to be surveyed should be defined and reflect the area to which the biomass estimates apply, recognising the intent to conduct surveys both in Summer and Winter seasons. For example, survey areas within Subarea 48.3 could be defined to exclude large areas north of the Polar Front, where waters are too warm for krill and survey areas in MUs in Subarea 48.1 that have limited winter (April–May) access due to ice cover (PB2), could be excluded.

(ii) Transect orientation in each MU (or embayment within an MU) should be specified perpendicular to the bathymetric isobaths or the prevailing current in the area where possible (Rivoirard et al., 2000).

(iii) Transect lines should extend from the MU boundary to either the MU boundary or to land.

(iv) Transects should be based on the existing nominated transects (WG-ASAM-14, paragraph 2.11 and Table 2) to maintain time series of those transects. Transects could be added or removed to attain the appropriate spatial coverage to achieve preferred precision of biomass estimates.

(v) Sampling stations should be designated at 10 nm from the ends of each transects and then at 40 nm equal spacing through the rest of the transect. The goal would be to have at least 2 sampling stations on each transect, although some very short transects (such as those in GS) may only have 1 sampling station.

3.16 The Working Group noted that several exceptions to the above rules are needed to align the rules with the existing timeseries transects in Subarea 48.1:

(i) Very short transects on the edges of MUs can be removed (e.g. NE corner of SSIW MU).

(ii) Transects extended to non-SOA areas can be chosen based on the spatial coverage index, noting that the current approach in Subarea 48.1 was to extend every other transect into the outer areas.

(iii) In the NW of the SSIW MU, a N-S nominated transect was removed and replaced with parallel transects to match the rest of the SSIW nominated transects, to ensure the survey design adhered to the principles required for the Jolly and Hampton estimator.

(iv) The transect spacing in JOIN should be reviewed once the nominated transects are extended and the spatial coverage index is updated, as it currently contains the smallest spatial coverage index.

(v) Two of the nominated transects in the EI MU (T13, between Elephant and Clarence Islands; and T9, the 2nd closest to King George Island) can be removed to align the spatial coverage index with other MUs (Table 2).

3.17 The Working Group agreed that progress on the revision of the survey design using these rules should occur intersessionally through a Discussion Group in collaboration with the Secretariat. The Working Group requested the Secretariat to create an 'Acoustic Survey Design' Discussion Group.

3.18 The Working Group noted that the PB2 MU south of 63°25'S (i.e. following the southern boundary of the JOIN MU) is unlikely to be accessible in summer or winter due to persistent sea ice conditions, and therefore not surveyed. In contrast, surveys in PB1 are expected to be feasible. This suggests a future revision of the SOA boundaries to encompass all of PB1 and the portion of PB2 north of 63°25'S, extending eastward to 50°00'W.

Implementation of acoustic transect surveys

3.19 WG-ASAM-2025/21 presented preliminary results from the krill acoustic survey conducted by the Chinese fishing vessel *Long Fa*, covering five MUs (SSIW, BS, GS, JOIN, EI) in Subarea 48.1 during austral summer 2025. During the field survey, krill biological sampling was carried out at 81 stations using RMT8 trawls and CTD vertical profile sampling was deployed at 138 stations. The acoustic data were processed aboard by scientific observers using automated processing 'RapidKrill' code. The acoustic data were used to identify areas of high NASC values. Concentrations of high-density krill swarms were more frequently observed in the shelf regions to the east and south of the Elephant Island and in the coastal waters of the Gerlache Strait. Smaller krill, with a mean length less than 36 mm, were generally found in the southern shelf regions in the Bransfield Strait, Gerlache Strait and near Joinville Island.

Preliminary results from the CTD data analysis suggested that the Antarctic Coastal Current from the Weddell Sea may play a crucial role in krill flux input to the Bransfield Strait.

3.20 The Working Group thanked the authors for the quick reporting of a survey conducted this season and recognised the value of such surveys data to inform the KSH and identify locations of krill influx to the Bransfield Strait. The Working Group recognised the value of presenting data on water masses alongside NASC and krill length frequency. The Working Group discussed the value of presenting oceanographic properties alongside krill density and krill length frequency distributions. It noted that oceanographic properties could be presented in papers using Temperature-Salinity (TS) plots, velocity measurement from ADCPs, satellite remote sensing data or numerical modelling simulations. The Working Group also suggested that a heat map of krill length frequency with a corresponding heat map of krill length variance would be informative for identifying recruitment. The Working Group suggested that the modified 'RapidKrill' code be deposited in the CCAMLR GitHub repository.

Transect designs for other areas

3.21 The Working Group considered transect designs for future krill acoustic surveys in Subareas 48.2 and 48.3. The Working Group agreed that the design should follow the same rules as those for Subarea 48.1, recognising the value of existing transects and with smaller inter-transect spacing over the shelf and core fishing areas and wider spacing off-shelf for the rest of the Subarea (paragraph 3.8). The Working Group collaborated on a draft design (Figure 2) and noted that this work would be completed intersessionally and considered at WG-ASAM-2026. The Working Group recommended that following progress in the 'Acoustic Survey Design' Discussion Group, the resulting rules could be summarised and applied to Subareas 48.1, 48.2 and 48.3 by the Secretariat and submitted to WG-ASAM-2026.

Krill biological data collection protocols

3.22 WG-ASAM-2025/02 considered the benefits of the KSH within the revised krill fishery management approach (KFMA). The paper noted the revised KFMA involves improvements needed for the spatial overlap analysis, but lacks biological information of krill life history, migrations and spatial connectivity in setting catch limits. The paper recommended revisions of SISO and CEMP protocols to align with KSH data collection requirements and prioritisation of regular coordinated surveys between platforms including research vessels, fishing vessels and autonomous platforms which focus on potential recruitment source regions and population structure on broader scales.

3.23 The Working Group noted the need for clear short-term and long-term outputs from the KSH and how this would align with survey efforts to derive biomass estimates. The Working Group noted a need to use small mesh research trawls (i.e. RMT1) to sample krill early life stages (eggs and larval) and discussed the feasibility of using these gear types on research vessels compared to fishing vessels.

3.24 WG-ASAM-2025/03 presented the aims of the 'Antarctica InSync' program for circumpolar and synchronous assessment of connections between ice, ocean and ecosystems in Antarctica. The paper highlighted the important role CCAMLR could contribute to predator-prey-fishery interactions in understanding ecosystems using fishing vessels. A case study proposed in the paper suggested analysing acoustic data recorded during fishing to detect and map krill predators such as penguins and seals, which could also be paired with tagging data to identify and map predator encounters. The paper also touched on the shared benefits and opportunities for funding to support 'Antarctica InSync' projects.

3.25 The Working Group noted the priorities to be addressed by the 'Antarctica InSync' program, including key circumpolar research questions and identified topics where Members may wish to contribute to data collection and scientific collaboration. The Working Group considered alignment of topics for integration with the upcoming International Polar Year to answer research questions that would require coordinated sampling efforts. The key collaborative research efforts included:

(i) Assessment of krill biomass distribution at circumpolar scales

(ii) Identification of population structure and advective connectivity of krill stocks at scales relevant for the krill fisheries management

(iii) Assessment of ecosystem effects of the krill fishery year-round to help understand anthropogenic effects in the Southern Ocean and to advance CEMP and the Spatial Overlap Analysis

(iv) Identify potential changes in krill biomass distribution due to climate change.

3.26 The Working Group agreed that it would be useful for CCAMLR to understand predator interactions with fisheries through the use of acoustic data recorded during fishing. It considered the cost, benefit and practicality of storing these large volumes of acoustic data in a central repository with intensive remote computation capabilities, potentially hosted by the CCAMLR Secretariat. The Working Group noted that hosting these data could have infrastructure and cost implications for the Secretariat. Distributing a self-contained processing algorithm to individuals with data could be a viable alternative and was suggested if a central repository could not be arranged.

3.27 The Working Group considered that acoustic data from fishing vessels could be used to inform CEMP discussions on predator spatial distribution, making a useful contribution to the SOA and suggested the authors consider prioritising areas such as defined acoustic transects where repeated surveys may provide a time series of mammal and penguin observations.

3.28 WG-ASAM-2025/14 Rev. 1 proposed a coordinated krill fishery data collection plan in support of the revised KFMA, including the KSH. The plan builds on existing practices and ongoing discussions, aiming not to create additional sampling requirements, but to align and optimise data already being collected across platforms, including by fishing vessels. The proposed framework differentiates between two operational modes – acoustic survey mode and commercial fishing mode – with tailored data collection goals for each. It underscored the importance of representative biological sampling, and proposed standardising the trawls to RMT8+1 during the acoustic survey mode, to capture krill population structure and support the development of biomass estimates, SOA, and the KSH. Tables within the paper outlined seasonal and spatial data needs across MUs in Subareas 48.1, 48.2, and 48.3, as well as the potential contributions from different platforms such as fishing vessels, moorings, research programmes, and tourist ships.

3.29 The Working Group welcomed the comprehensive nature of the plan but raised concerns about specifying the use of only RMT8+1 trawls. The Working Group noted that there were other scientific trawl designs currently in use, and that imposing one gear type may be unnecessarily restrictive. The Working Group identified that the selectivity and avoidance of different scientific trawls on the size class of organisms caught would need to be validated. This was considered critical for enabling consistent data interpretation across vessels and years.

3.30 The Working Group encouraged the development of practical guidelines for standardising, comparing and reporting methods for different trawl types. The Working Group developed a list of variables (Table 3) to enable a consistent description of trawls used during krill acoustic surveys, which would support future inter-gear comparisons. Members were encouraged to submit descriptions of their trawl types to the CCAMLR gear library.

3.31 The Working Group noted that some additional development of the table may be required and suggested that this be considered by WG-EMM (paragraph 3.45).

3.32 The Working Group considered the feasibility of conducting intercalibration experiments of the various trawl designs, and the challenges of such an operation and ship time costs. The Working Group agreed that consulting trawl technology experts to evaluate hydrodynamic flow during trawling events and the selectivity of different trawl types would be a suitable first step.

3.33 Within the data collection plan, the Working Group noted the importance of distinguishing between data collected for routine monitoring versus targeted research. Some biological parameters – such as maturity staging or physiological traits – may not require annual updates and could be addressed through periodic studies or by research vessels. Others, such as length-frequency distributions for biomass estimation, require consistent and frequent sampling. The Working Group noted that while surveying, fishing vessels would operate similarly to research vessels, with onboard scientists conducting biological sampling using research trawls at designated stations alongside CTD casts. The Working Group further noted that during acoustic surveys, the sampling protocol targets measuring at least 100 krill per station while fishery mode protocols for SISO target at least 200 krill, and the survey protocol method for estimating maturity also differed from SISO protocols. The Working Group noted that aligning the biological sampling protocols for surveys with SISO sampling may help to avoid confusion.

3.34 WG-ASAM-2025/17 summarised the 2025 SCAR Krill Expert Group (SKEG) Symposium held online from 10–12 March 2025. The event convened approximately 90 participants from 15 countries, including representatives from industry, policy, and NGOs. The 2025 symposium marked a significant step in enhancing collaboration, supporting early-career researchers, and aligning with CCAMLR priorities. It featured two keynote presentations – one on mesopelagic ecosystems and another on krill vertical distribution – as well as a live demonstration from the RV *Nuyina*. The programme included new presentation formats such as idea pitches and speed introductions to promote engagement. Most notably, SKEG launched a new internal structure comprising four task forces focused on krill flux monitoring, database updates, fisheries indices integration into risk management, and communications/outreach. Additional task forces on carbon export and whale-related issues are under consideration, with the structure designed to be flexible and responsive to emerging priorities.

3.35 The Working Group welcomed the initiative and commended the productivity and clarity of the new format. Members highlighted the timely establishment of task forces and the quick submission of related papers to WG-ASAM as evidence of the symposium's impact. The Working Group encouraged maintaining this streamlined, research-focused format, noting that it fostered meaningful dialogue and strengthened community engagement.

Oceanographic data collection protocols

3.36 The Working Group noted that the underlying oceanographic conditions and current dynamics appeared as a regular consideration in acoustic research presented. The Working Group recommended that future surveys and papers include oceanographic and current data as context to interpret survey acoustic data, which could be sourced from oceanographic models, historical trends, or in situ oceanographic observations.

3.37 The Working Group noted the specific importance of such oceanographic data in interpretations of krill flux within regions and recommended the inclusion of temperature-salinity plots and ocean current figures in its metadata reporting requirements for krill biomass surveys. The Working Group encouraged the Secretariat to include visualisations of major ocean currents as layers in the Spatial Data Viewer.

Submission of acoustic data

3.38 WG-ASAM-2025/01 presented recent developments regarding the CCAMLR Acoustic Data Repository, including feedback from Members' testing of the Acoustic Survey Metadata Form (ASMF), along with updates to the Acoustic Data Viewer and the Krill Biomass Estimates private GitHub repository.

3.39 The Working Group thanked the Secretariat and Members involved in testing for their effort updating the ASMF. The Working Group welcomed the progress to Acoustic Data Viewer and the addition of version-controlled documentation to the Krill Biomass Estimates private GitHub repository.

3.40 The Working Group noted that the ASMF includes requests for both survey metadata and krill biological sampling information, and agreed to separate the krill biological sampling worksheet from the ASMF.

3.41 The Working Group discussed the mechanism for reporting of research trawl catch data, as fishing vessels are required by CM to submit data via the C1 and observer forms. The Working Group recommended the Secretariat identify modifications needed to CM 23-06 (or other CMs) to permit fishing vessels conducting acoustic surveys to submit acoustic trawl sample data from research trawls exclusively through the ASMF instead of through the C1 form, and develop a proposal for the Scientific Committee.

3.42 The Working Group discussed the feedback from Members' testing of the ASMF and agreed that the Vessel and Gear worksheet be reviewed intersessionally via the 'Acoustic Survey Design' Discussion group to determine whether all the variables were required, and to define what they represented.

3.43 The Working Group requested the Secretariat work with Members to draft an instruction manual to facilitate completion of the ASMF.

3.44 Noting that all of the krill fishing vessels in the fleet had fitted Simrad echosounders, the Working Group agreed to use Simrad terminology when describing echosounder settings in the ASMF.

3.45 The Working Group agreed on the addition of the *Volume of water sampled* and *Speed through the water* fields to the 'Trawl Sampling' worksheet of the ASMF (under 'Stations' tab). It noted that vessel speed could be determined as either speed through the water, or speed over ground. The Working Group noted that these fields were not compulsory but highlighted there could be value in recording vessel speed to aid acoustic data interpretation and to aid trawl intercalibration exercises to assess the impact of towing speed on selectivity (Table 3).

3.46 The Working Group identified that only the length of krill was currently used in acoustic krill biomass surveys but noted that other parts of the KFMA may require the collection of data to develop additional parameters.

3.47 The Working Group requested WG-EMM consider what parameters of krill biological sampling may be required to support the development of the KSH (WG-ASAM-2025/14 Rev. 1).

3.48 The Working group noted that factors including morphology in relation to maturity stage and lipid content may impact krill target strength estimation and would be valuable subjects of focussed research to be considered by the discussion group in the intersessional period.

Standardised procedures for analysis and development of krill biomass estimates

Survey stratification and spatial estimators

4.1 In Subarea 48.1, the boundaries of SSIW, GS, DP1 and DP2 were changed after WG-ASAM-2024 (WG-EMM-2024, Figure 11) and were subsequently agreed by the Scientific Committee (SC-CAMLR-43, paragraph 3.63).

4.2 The Working Group recalled that the biomass estimates for the stratum areas in Subarea 48.1 were based on data from multiple Members and multi-year surveys. The Working Group recognised that stratum-level krill biomass estimates have previously been modified in response to minor changes in strata boundaries and shore boundary lines and that these changes were made simply by using the existing krill biomass density (g m^{-2}) for a stratum multiplied by the revised stratum area.

4.3 The Working Group discussed the possibility of recalculating biomass estimates based on available one-nautical-mile krill biomass densities. The Working Group agreed there are some MUs, for example DP1 and PB2 where there is insufficient data to recalculate biomass estimates.

4.4 The Working Group was not in favour of extrapolating existing survey density estimates to wider areas. Furthermore, the Working Group noted that all the data being discussed are more than five years old. The Working Group considered that a recalculation would not provide meaningful improvement to existing biomass estimates.

4.5 The Working Group recognised the importance of progressing and evaluating the use of spatial (model-based) estimators for krill biomass estimation. The Working group agreed that an important aspect of model-based estimators (to be implemented in the medium term) is the incorporation of other sampling platforms such as static instruments (e.g. landers) and mobile platforms, e.g. gilders, into the estimation of biomass.

4.6 The Working Group recognised that krill biomass estimates are currently calculated using a tested, and simple to use, design-based estimator (Jolly and Hampton, 1990) and that the implementation of a model-based approach would require additional procedures and reporting.

4.7 Dr Murase made an International Whaling Commission paper (SC/68A/EM/03) available to the Working Group, which summarised the results of six models, each applied to spatial krill density modelling.

4.8 The Working Group recommended that the processed 120 kHz krill biomass density data (in one-nautical-mile integration intervals) from the 2000 synoptic survey and the 2019 large-scale surveys be used as test datasets to evaluate the performance of model-based estimators. Dr Cox agreed to lead this work intersessionally through a Discussion Group. The Working Group requested the Secretariat create a Discussion Group on 'Model-based acoustic biomass spatial estimators'.

Standardised analysis and reporting of acoustic biomass estimates

4.9 WG-ASAM-2025/13 presented an analysis of krill vertical distribution patterns using a moored echosounder. Ship-based echosounders have a surface acoustic 'blind zone' which often extends 15 m below the surface – in which no krill can be sampled – and the conical beam shape may confound analysis of diel vertical migration (DVM) patterns. The paper also examined the distribution of krill below 250 m to examine the sampling limitations of ship-based surveys. Overall, 1.5 to 3.9% of krill NASC was found shallower than the 15 m cut off and 0.4 to 40.5% of NASC was found below the 250 m cut off and this percentage was higher during the winter. These finding suggest that diel and seasonal vertical movements can lead to underestimation of krill biomass.

4.10 The Working Grouped thanked the authors and noted that in the study there was a large unsampled zone from the depth of the moored echosounder to the seafloor so the proportion of krill NASC falling outside of the 250 m lower integration interval may be higher than estimated in WG-ASAM-2025/13. The Working Group also agreed that the seasonal variation in DVM is an important consideration, and noted that for winter surveys, gliders may provide a more complete picture of DVM by sampling deeper than the moored echosounder depth. Regional (habitat) differences (e.g. on and off shelf) were also identified by the Working Group as influencing DVM patterns. The Working Group suggested that increasing the 250 m lower integration interval in response to seasonal and regional changes in krill vertical distribution should be investigated.

4.11 The Working Group noted that the different acoustic sampling characteristics of the moored echosounder (for example a Nortek Signature 100) and typical ship-based echosounders (for example a Simrad EK80s) should be assessed. The Working group agreed that inter-instrument differences be characterised using the effective observation range, i.e. the maximum range at which a given density of krill could be detected.

Krill biomass estimates

5.1 WG-ASAM-2025/06 presented an acoustic-trawl survey conducted in the Krill Research Zone (KRZ) of the Ross Sea Region Marine Protected Area. Krill were identified using a combination of the swarms-based method and the dB-difference method applied to the identified swarms. The 2-frequency and 3-frequency methods had negligible differences in both integration intervals and vertical distribution. On a transect basis, krill areal biomass density ranged from 0.02 to 15.15 gm^{-2}. Krill distribution was highly variable in the KRZ and the krill biomass was estimated as 0.59 million tonnes (CV = 63%). The highest density of krill was found in the eastern transects of the KRZ.

5.2 The Working Group thanked the authors for conducting a survey in the KRZ, where no survey has been carried out since it was designated in 2017. The Working Group suggested reviewing whether the current Jolly and Hampton statistical method is appropriate for the zig-zag survey design and recommended exploring alternative estimators. The authors confirmed that Antarctic krill maturity stages presented in the report were assessed solely based on krill length, and that ice krill (*Euphausia crystallorophias*) were not found in the trawl samples. The dB-difference method was applied to distinguish ice krill from Antarctic krill in the acoustic record, and biomass estimation was conducted accordingly.

Area 48 biomass estimates

5.3 WG-ASAM-2025/07 presented an acoustic survey conducted in the northern half of the Gerlache Strait during May 2025, which estimated a mean krill biomass density of 197.02 g m^{-2} (CI: 133.56 - 289.95) from 70 kHz acoustic data. The survey was conducted by the crew of the cargo vessel *Antarctic Provider*, without the participation of scientists onboard. The raw acoustic data (10 GB) was transferred via satellite. Transferred files were processed on land (in Bergen) using the *Krillscan* python package to calculate krill biomass density estimates.

5.4 The Working Group noted that the conversion factor in WG-ASAM-2025/07 was higher than in other studies, likely due to the use of 70 kHz instead of the typical 120 kHz, and noted the use of average krill length (35.98 mm) instead of the recommended weighted mean length. The Working Group commended the authors for their rapid processing of the data in time for this meeting. The Working Group suggested a comparison between the 70 kHz data and the 120 kHz would be constructive.

5.5 The Working Group noted that higher krill biomasses occurred in the eastern part of the Gerlache Strait, but krill fishing vessels were also fishing in other areas of the Strait. The Working Group noted that the difference between krill fishing effort (hours trawling as observed through the AIS tracking database of Global Fishing Watch) and the highest estimated krill density may result from the limited area covered by the echosounder, which only detects directly under the vessel, whereas fishing activities may occur away from the echosounder beam area.

5.6 WG-ASAM-2025/09 presented results of an Antarctic krill and ecosystem monitoring survey conducted at the South Orkney Islands in February 2025. An acoustic-trawl and visual predator surveys – observed using distance sampling methods – were presented. A key result was the estimated krill biomass of 6.16 million tons (CV = 74%). From the 28 trawl stations 38 taxonomic groups were identified with the siphonophore (*Diphyes antarctica*) found at 24 trawl stations and *E. superba* was found at 23 trawl stations (mean body length = 42.6 mm, SD = 6.6 mm; range 25.3 to 59.4 mm). Distance sampling methods were used to estimate fin whale (*Balaenoptera physalus*) and humpback whale (*Megaptera novaeangliae*) density.

5.7 The Working Group commended the authors on the rapid processing of the acoustic data to calculate krill biomass from a survey conducted in this year. The Working Group was excited to hear that the distance sampling analysis of predator sighting data is being finalised for publication in the *ICES Journal of Marine Science*. The Working Group noted that Norway is planning to host a workshop in 2026 addressing the need towards marine spatial management in Subarea 48.2 (WG-EMM-2025/58).

5.8 WG-ASAM-2025/18 presented a biomass estimate of Antarctic krill derived from an acoustic-trawl survey conducted in the Western Core Box (WCB) survey area in February 2025 to the northwest of South Georgia (in Subarea 48.3). This was the first krill acoustic-trawl survey conducted from RRS *Sir David Attenborough.* Krill echoes were identified using the three-frequency dB-difference (38, 120 and 200 kHz) method. From a survey conducted during daylight hours, mean areal biomass density was estimated (46.89 g m^{-2}) giving a biomass for the WCB survey stratum of 500 152 tonnes, with a CV of 47.9%.

5.9 The Working Group thanked the authors for the timely presentation of results from a survey conducted during the current season. The Working Group discussed how large-scale environmental processes affect krill biomass and noted that the krill biomass around South Georgia is mainly driven by the water temperature in the six months preceding the survey (Fielding et al., 2014), loosely correlated with the Southern Annular Mode (SAM). The Working Group noted that the survey date has varied throughout the survey series from early to late summer periods. Dr Fielding noted that a previous field program (2002 to 2005), where the WCB stratum was surveyed in early, middle and late periods, had shown no consistent krill biomass pattern with survey period that could be used to standardise for potential changes in krill biomass due to survey timing. The Working Group also noted that data from alternative platforms, such as moorings and gliders, could help supplement ship-based survey data and elucidate intra- and inter-annual patterns.

5.10 The Working Group encouraged further collaboration to assess krill population links between subareas of Area 48. The Working Group identified that the analysis of krill size composition would also be useful for assessing these subarea links. The Working Group acknowledged the WCB stratum as the northern edge of krill distribution and commended the authors for contributing to the long-term dataset from 1996 to 2025.

Area 58 biomass estimates

5.11 WG-ASAM-2025/08 presented a mesoscale biomass estimate of Antarctic krill in the East Antarctic derived from the ENRICH (Euphausiids and Nutrient Recycling in Cetacean Hotspots) acoustic-trawl survey conducted during January 2019. The survey carried out from the RV *Investigator* aimed to present krill biomass density to inform the SOA, to test the use of this dataset for future model-based estimates, and to promote discussion on automated standards for future surveys. The mean areal biomass density of the study areas was 18.3 g m^{-2}, yielding a total biomass of 2.32 million tonnes (CV = 11.1%). Authors noted that the survey targeted a region with high krill density, and results are not representative of the broader region.

5.12 The Working Group noted that krill swarms showed a bimodal vertical distribution, with most individuals located near the surface and a smaller mode found at greater depths (with aggregations detected even at 250 m depth).

5.13 The Working Group noted that the effective detection limit of the 120 kHz frequency was at least 350 m and that of the 70 kHz frequency was greater. The Working Group recommended further research of the swarms-based algorithm to depths below the current 250 m integration limit and how that would impact biomass estimates.

5.14 The Working Group noted that the ENRICH survey design was influenced by practical time constraints as it was part of a multidisciplinary cruise. The Working Group noted that it would be valuable to survey the same area again and that such future surveys should modify the design to improve its coverage by expanding all transects to the same northernmost latitude. However, the authors noted there are currently no plans for a new survey in the area.

5.15 The Working Group noted that while this survey did not detect a DVM signal, the 2021 survey in CCAMLR Division 58.4.2 did detect a DVM signal using a similar methodology. The Working Group reflected on potential spatial and temporal variability in krill behaviour and the importance of understanding differences in krill behaviour at a circumpolar scale. It also noted the value of autonomous sampling instruments such as moorings and the importance of finding ways of combining data from different platforms to detect this variability.

5.16 The Working Group also discussed the analysis presented by Dr Cox, which aimed to detect the effect of sampling design by removing a number of transects on CV values. It noted the potential of this approach for analyses of area coverage to be applied in other areas such as Subarea 48.1, currently under discussions within the KFMA. In response to the comments Dr Cox agreed the analysis has good potential; however, he noted the caveats of the current analyses as permutations at some point will remove consecutive transects, heavily altering the survey area represented by the transects, rather than the survey coverage.

5.17 The Working Group recalled that a large-scale biomass survey was conducted by Japan in Division 58.4.1 during 2019 (WG-ASAM-2021/06). It noted that the biomass estimate in WG-ASAM-2025/08 was approximately half of that reported by the Japanese survey for the entire Division 58.4.1 and considered whether the data from both surveys could be combined. The Working Group noted that this would require further discussion and analyses as both surveys had different purposes and methodologies and agreed to discuss intersessionally how data from both surveys may be combined to recalculate a biomass estimate for Division 58.4.1.

5.18 The Working Group noted that version 6 of the Echoview Swarms template provided slightly different results for the Division 58.4.1 biomass survey than version 7. The Working Group agreed that changes to the template should be presented to WG-ASAM and requested the Secretariat to update the Krill-Biomass-Estimates GitHub repository to provide access to the Echoview Swarms template in a version-controlled manner.

5.19 The Working Group recalled that the swarms-based algorithm was developed primarily for fishing vessels with limited equipment capacity, as it requires only a single frequency. It noted that while large-scale surveys conducted by research vessels which frequent areas with lower krill density could use the swarms-based algorithm, comparison with the three-frequency dB difference target identification algorithm may be beneficial. The Working Group recalled that both the swarms-based and dB-difference methods are acceptable krill identification methods used for biomass estimation (SG-ASAM-2019/10; WG-ASAM 2022, paragraph 2.3 and Table 1).

5.20 The Working Group recalled its recommendation to develop test datasets to benchmark processing software and methods (WG-ASAM-2022, paragraph 2.13; WG-ASAM-2023, paragraph 4.12; WG-ASAM-2024, paragraph 3.20) and welcomed the proposal by Dr Cox to contribute the data from the 2019 ENRICH acoustic-trawl survey dataset for this purpose. Any request for these data could be made through the Secretariat.

5.21 WG-ASAM-2025/16 summarised 17 multidisciplinary studies (many studies were from the Australian 2019 ENRICH and 2021 TEMPO voyage) on Antarctic krill in the East Antarctic ecosystem, which have recently been published as a Research Topic in the peer-reviewed journal Frontiers in Marine Science. The paper highlights climate-driven habitat degradation and krill redistribution due to sea-ice dynamics, the critical role of krill swarm structure for predator foraging success and the advances in autonomous sampling which enable high-resolution monitoring of these dynamics to inform CCAMLR's ecosystem-based management.

5.22 The Working Group congratulated the authors and thanked them for the valuable work conducted by collecting this extensive dataset. The Working Group noted that combining these data with data collected from other regions could allow detection of circumpolar trends. It noted the potential of circumpolar studies such as the forthcoming 'Antarctica InSync' initiative to further improve our understanding on trends at large scale levels.

Acoustic methods for measuring biomass, flux, seasonality, and behaviour from alternative platforms

6.1 WG-ASAM-2025/12 described a method employing a single upward looking moored ADCP and echosounder data for estimating temporal variability of krill biomass densities and oceanographic current patterns in East Antarctica. Biomass densities were found to be highest in winter and lowest during summer. Integrating the acoustic signal over short distances (1 nm) based on the integrated water flow above the mooring, and converting it to biomass densities based on historical, interpolated length-frequency data from the same region led to high covariances for biomass densities. Using integration distances comparable to those from ship based transect surveys (250 nm) significantly reduced the covariance while the biomass density estimates remained robust. The study concluded that scaling mooring echosounder data to survey area biomass estimates requires an array of moorings and appropriate methods must be determined to derive spatial variance from stationary platforms. The authors noted that autonomous platforms are increasingly used to monitor Antarctic krill, and in areas and seasons inaccessible to traditional ship-based surveys this method could provide an alternative solution.

6.2 The Working Group congratulated the authors on the work and highlighted that increased use of alternative monitoring platforms can provide a deeper understanding and data to support management and conservation decisions. The Working Group noted that future work could consider the depth-stratification of currents above the mooring when integrating the acoustic signal, and that arranging moorings in arrays has great potential to track the movement of krill swarms in relation to current flow, and to advance our understanding of krill flux.

6.3 WG-ASAM-2025/15 reported from the work performed by the U.S. Antarctic Marine Living Resources (U.S. AMLR) on deploying two gliders equipped with oceanographic sensors and a wide-band echosounder to estimate krill biomass in the Bransfield Strait. Initial discrepancies in biomass density estimates between the two gliders were resolved by using a more rigorous calibration procedure. Length frequency data of krill derived from penguin diet analyses were used to convert the acoustic signal into biomass density estimates. The authors emphasised that more suitable methods for providing representative length frequency estimates are needed. Revised biomass densities based on the 120 kHz ranged from 35.67 to 37.4 g m^{-2} using the 'ALL energy' method and from 32.81 to 33.82 g m^{-2} using the swarms-based method. The authors also presented a new way of calculating variance estimates for the obtained biomass densities based on spatial gridding of the acoustic observations and random resampling. The reanalysis supports the use of autonomous gliders for acoustic surveys of krill biomass, suggesting they could be a key data source for assessing krill populations at least for some parts in the Southern Ocean. The findings highlight the effectiveness of using autonomous gliders for krill biomass estimation and the ongoing efforts to improve and expand this monitoring method.

6.4 The Working Group expressed their appreciation for the progress made in developing alternative data collection platforms. It noted the use of vertically downward-facing transducers and highlighted the potential of shadowgraph systems for measuring organisms. The Working Group was particularly impressed by the alignment of cruise tracks between the two gliders.

6.5 The Working Group emphasised the importance of considering how these measurements could be integrated into fisheries management and the broader understanding of regional ecosystems. The Working Group noted that the transects from the annual Chinese acoustic surveys (WG-ASAM-2025/21 Rev. 1) align well with the transects carried out by the glider deployments and suggested that this alignment could facilitate platform comparisons on biomass densities and other relevant metrics.

6.6 WG-ASAM-2025/20 provided an overview of the recent deployment of echosounders on autonomous platforms to enhance understanding of krill distribution and behavior across the Southern Ocean. The paper aimed to stimulate discussion and foster collaboration at WG-ASAM-2025 regarding the broader use of autonomous platforms, particularly in relation to the WG-ASAM work plan item 2 (b) (i) (1). It highlighted how autonomous platforms were being used to study krill in the Southern Ocean and the strengths and weaknesses of different platforms. The authors concluded that autonomous platforms were able to effectively study krill and ecosystems.

6.7 The Working Group acknowledged the importance of clarifying the usage and utility of each platform, identifying what each can deliver and how they can complement each other. It was noted that autonomous platforms, including moorings and gliders, can provide valuable data on krill behavior, vertical distribution, flux, and biomass estimates. As such, the Working Group considered it necessary to identify the best use of each platform to contribute to the general management of the krill fishery.

6.8 The Working Group identified that summarizing the application of each platform and which variables it could measure would be useful information to consider how autonomous vehicles may contribute to either krill biomass, distribution or behaviour studies. It noted that some technology, such as gliders, were quite advanced in the development of methods and encouraged the authors of WG-ASAM25/20 to develop guidelines for surveying krill from gliders.

6.9 WG-ASAM-2025/19 reported from a comprehensive study of krill flux and emphasises the need for consistent standardised methods for gathering and analyzing data from various survey types. Combining acoustic, oceanographic, and trawl data can provide a holistic view of krill flux. A practical implementation was carried out on the research vessel RV *Atlántida* to assess the movement and distribution of krill in relation to ocean currents and analyse how krill distribution varies spatiotemporally. The study demonstrated the practical significance of standardised data collection and integration of multiple data sources. These findings are crucial for developing effective krill fishery management schemes that are informed by ecosystem dynamics.

6.10 The Working Group noted that the paper is an updated version of a paper submitted to previous meeting WG-ASAM-21/05 and recalled the previous discussion (WG-ASAM 2021, paragraphs 4.1 to 4.5).

6.11 The Working Group noted the improvements made in the revised paper and recognised the ongoing efforts to enhance the understanding of krill biomass and distribution. The Working Group noted that integrating oceanographic data, providing standardised reporting, and focusing on numerical support for assertions, CCAMLR may be able to better manage krill populations and the Southern Ocean ecosystem.

6.12 The Working Group noted that several papers have identified the importance of integrating oceanographic data with acoustic survey data to improve krill biomass estimates and emphasised the need for standardised statistical reporting, namely the inclusion of summary statistics, to ensure consistency and comparability of data.

6.13 WG-ASAM-2025/P01 assessed the importance of seasonal variation in the diel vertical migration of krill for fecal pellet-driven particulate organic carbon export based on one year of acoustic observations from East Antarctica and a numerical model. The study demonstrated that the total POC flux from krill fecal pellets was estimated to be 9.68 milligrams of carbon per square meter per day (mg C m^{-2} day^{-1}). A maximum of 25% of krill migrated to depths greater than 200 m, and showed a strong seasonal component. This migration transported less than 10% of the total krill POC flux (1.28 mg C m^{-2} day^{-1}) to the deep ocean. The study noted that accurate estimates of seasonal carbon flux are essential for informing climate policy and mitigation strategies and concluded that models including vertical migration will overestimate active carbon export by vertical migration if they do not account for the seasonality of krill migration.

6.14 The Working Group congratulated the authors on their work and emphasised the importance of acknowledging the variability in the diel vertical migration behaviour of krill observed in many regions when estimating carbon flux, biomass and observing ecosystem processes. The Working Group also noted that the growing number of long-term krill behaviour observations from various Southern Ocean regions provides significant opportunities for collaborative research on the drivers of krill behavioural variability on a large scale.

6.15 WG-ASAM-2025/P02 presented a method for identifying krill swarms using vessel-based acoustics and U-Nets, which are convolutional neural networks originally developed for biomedical image processing. The study compared U-Nets trained on single-frequency data with those trained on two- and three-frequency data. While the three-frequency U-Net demonstrated the best performance, all U-Nets achieved high accuracies of more than 90%. The study noted that due to their computational efficiency, U-Nets could be useful tools for identifying krill swarms, particularly for processing large batches of data.

6.16 The Working Group welcomed the study and recognised the usefulness of U-Nets for analysing acoustic data. The Working Group noted that additional analyses assessing the performance of U-Nets when applied to acoustic data from different platforms would help evaluate their robustness. Additionally, the Working Group encouraged systematic comparisons of biomass densities predicted by U-Nets versus established methods, such as the dB-difference and the swarms-based identification methods. The Working Group recognised this study's contribution to the advancement of open-source acoustic data processing tools.

Develop methods to estimate biomass of finfish using acoustic techniques

7.1 WG-ASAM-2025/11 proposed to conduct an acoustic-trawl survey of mackerel icefish *Champsocephalus gunnari* in Subarea 48.2, beginning from the 2025/2026 fishing season (during three fishing seasons). The main objective of this proposal is to determine the distribution and abundance of *C. gunnari* in Subarea 48.2 and understand the stock structure. The survey also aims to estimate the catchability of fishing gear (midwater trawl) for *C. gunnari*, using available acoustic data and video data from a trawl video camera system. It will collect data on the spatial and depth distributions of by-catch species, conduct by-catch mitigation measures, and compare the main biological parameters of *C. gunnari* from catches during the survey with those obtained in previous years of research (historical scientific data). Plankton samples and oceanographic research will also be undertaken in this proposed survey.

7.2 The Working Group welcomed this updated proposal which included addressing previous suggestions including the installation and calibration of the 38 kHz echosounder. The Working Group commended the collaboration between Norway and Ukraine to produce a fast and reliable calibration method for the MV *More Sodruzhestva,* and the potential for further support when analysing the resultant survey data.

7.3 The Working Group noted that stomach content examination would be helpful to understand the trophic interaction between *C. gunnari* and krill. The Working Group encouraged examination of the target strength of *C. gunnari* using various models, to help improve the acoustic assessment of this species biomass.

7.4 The Working Group noted the addition of two transects (T8 and T9), perpendicular to the other transects. It encouraged the authors to add an additional transect to that area to create a new stratum (comprised of T8, T9 and an additional parallel transect), which would enable the use of the Jolly-Hampton survey estimator to calculate the CV of an acoustic biomass estimate.

7.5 The Working Group noted the difference between the towing duration for pre-determined stations (30 minutes) and targeted stations (60 minutes). It recommended the authors explain the reason for the different tow durations for consideration by WG-FSA-2025.

7.6 With the change to the survey design and with the considerations by WG-FSA-2025 on towing duration, the Working Group agreed that the survey design and echosounder use was appropriate for the research proposal purpose and should be considered by the Scientific Committee.

Future work

8.1 The Working Group considered revisions to its current workplan as described in SC-CAMLR-43, Table 6 and recommended the following changes:

(i) The Working Group discussed the use of contributor names in the table and recommended that names be used, but that the caption should indicate that, in the case where the named scientists were not present, the lead developer of work on the specified topic would revert to the Scientific Committee Representative of the relevant Member.

(ii) Revise the term ‘Contributor’ as a column name to ‘Lead’

(iii) Remove 1 a (i) as it is included within the scope of 1 a (ii)

(iv) Add a new Task (5): Develop spatial estimators for acoustic biomass data

(v) The Working Group noted that 1 a (iii) on the specification of sample sizes has been completed and this item can be removed.

(vi) The Working Group noted that item 1 a (iv) (6) has made significant advances in analysis of acoustic data using new technologies

(vii) Add ‘including seasonal and regional effects of developmental stage’ to Task 3 and remove 1 a (iv) (4).

(viii) The Working Group noted progress on the development of biomass estimates in 48.1 (1 b (iv) 1), for example paper WG-ASAM-2025/21 Rev. 1.

(ix) In item 1 b (v), change the word ‘species’ to ‘krill’

(x) In item 1 b (iv) 1, change ‘Movement’ to ‘Advection’, and add two additional items, ‘Vertical distribution’ and ‘Seasonal variability’

(xi) Item 1 b (iii) regarding ecosystem indicators can be removed as it applies to other working groups.

(xii) Regarding item 2 a (i), the Working Group noted that there are many products that can be derived from acoustic data that could be used by other working groups (e.g. WG-ASAM-2025/04, monitoring of krill predators from acoustic data, or environmental data recorded during acoustic surveys). Therefore, revise 2 a (i) 1 to ‘CEMP related products for use by other working groups’ and 2 a (i) 2 to ‘Fishery via SISO related products for use by other working groups’

(xiii) Revise 2 b (i) (1) to ‘moored or autonomous platforms’

(xiv) Remove the references to Annex 4, Table 2, 1.a.iv under Timeframe.

8.2 The Working Group noted that several papers submitted to this meeting were based on data collected in the current fishing season, and commended authors on the rapid analysis and provision of papers to WG-ASAM. The Working Group further noted that the ability to provide work so quickly may be a result of holding the WG-ASAM-2025 meeting a month later than typical.

Other business

9.1 The Working Group noted that WG-SAM-2025 had referred paper WG-SAM-2025/28 to WG-ASAM for review as it was mostly about acoustic survey design and analysis. However, the Working Group noted that the short period between WG-SAM and WG-ASAM did not allow enough time for review and further noted that it would be beneficial to have the author of the paper present to discuss the work. Therefore, the Working Group encouraged the author to submit the paper to WG-ASAM-2026 for review and discussion.

9.2 The Working Group noted that in recent years, acoustic surveys and analysis methods work had become even more relevant in providing advice on the management of krill and ecosystems, and that these demands required broader participation than acousticians to develop advice.

9.3 The Working Group noted that with the broader uses of acoustic data and analysis, the topics discussed may exceed the Terms of Reference for the Working Group and suggested the Scientific Committee consider revising the Terms of Reference when the strategic workplan is revised in 2026.

9.4 The Working Group noted that the number of papers and participants in WG-ASAM had increased through time, but that the number of participating Members had not increased and encouraged Members to send participants to contribute relevant expertise and new perspectives to WG-ASAM meetings.

Advice to the Scientific Committee

10.1 The Working Group's advice to the Scientific Committee is summarised below; these advice paragraphs should be considered along with the body of the report leading to the advice:

(i) Core strata acoustic surveys (paragraph 3.7)

(ii) Winter acoustic surveys (paragraph 3.9)

(iii) Spacing of survey trawl sampling (paragraph 3.11)

(iv) PB1/PB2 boundaries (paragraph 3.8)

(v) Reporting of survey trawl catch data (paragraph 3.41)

(vi) Revisions to the WG-ASAM workplan (paragraph 8.1)

(vii) Revision of the WG-ASAM Terms of Reference (paragraph 9.3).

Adoption of the report and close of the meeting

11.1 The report of the meeting was adopted, with the adoption process requiring 3.8 hours of discussion.

11.2 At the close of the meeting, Dr Fielding thanked the participants for their work and a successful meeting.

11.3 Dr X. Zhao (China) expressed his gratitude and thanks to the conveners for leading the Working Group and especially to Dr Fielding for her skilful mastery of the group and for her contributions to the work of CCAMLR in developing the KFMA. He looked forward to the growing advice from WG-ASAM.

11.4 Dr Krafft thanked the conveners and participants for coming to Geilo for a productive week and wished safe travels home to those not remaining in Geilo for WG-EMM-2025.

11.5 Dr Cárdenas thanked the conveners for their service and great work, and reflected on the experience from his second time participating in WG-ASAM, noting that the work of WG-ASAM continued to grow and provide important advice.

11.6 Dr Wang thanked the Secretariat for their support and especially Dr S. Thanassekos (Secretariat) for his expert and quick remote support in the development of the acoustic survey design framework.

References

Aglen, A. 1989. Empirical results on precision-effort relationships for acoustic surveys. *ICES CM* 1989/B:30: 28pp.

Demer, D.A. and J.S. Renfree. 2008. Variations in echosounder–transducer performance with water temperature. *ICES J. Mar. Sci.*, 65(6): 1021–1035.

Fielding, S., J.L. Watkins, P.N. Trathan, P. Enderlein, C.M. Waluda, G. Stowasser, G.A. Tarling and E.J. Murphy. 2014. Interannual variability in Antarctic krill (*Euphausia superba*) density at South Georgia, Southern Ocean: 1997–2013. *ICES J. Mar. Sci.*, 71(9): 2578–2588.

Jolly, G.M. and I. Hampton. 1990. A stratified random transect design for acoustic surveys of fish stocks. *Can. J. Fish. Aquat. Sci.*, 47: 1292–1291.

Rivoirard, J., N. Bez, P. Fernandes, K.G. Foote and E.J. Simmonds. 2000. *Geostatistics for estimating fish abundance*. Blackwell Science, Oxford, UK: 206 pp. https://doi.org/10.1002/9780470757123.

Table 1 Details of scientific echosounders installed on fishing vessels notified for the 2025/26 fishing season. 1 = present. The transducer frequencies are marked as present solely if the vessel is equipped with a scientific echosounder (either EK80 or EK60)

Vessel	Echosounder		Frequency (kHz)			
	EK80	EK60	200	120	70	38
Antarctic Endeavour	1			1	1	
Antarctic Endurance	1			1	1	1
Antarctic Navigator	1		1	1	1	1
Antarctic Sea						
Fu Xing Hai	1			1	1	1
Fu Yuan Yu 9199	1			1	1	1
Hua Xiang 9		1		1	1	1
Long Fa	1			1	1	1
More Sodruzhestva						
Sae In Leader						
Saga Sea						
Sejong	1			1	1	1
Shen Lan	1					1
Yong Li	1			1	1	
TOTAL	9	1	1	9	9	8

Table 2 Spatial coverage results for Subarea 48.1, including estimated time required to complete surveys by a single vessel assuming a station distance of 40 nm (WG-ASAM-2024 Figure 1b) no transit between transects and a station duration of 1.5 hours and a vessel speed of 10 kn. MU = Management unit. EI = Elephant Island, JOIN = Joinville Island, BS = Bransfield Strait, SSIW = South Shetland Islands West, GS = Gerlache Strait, DP = Drake Passage, PB = Powell Basin

MU	Area (km^2)	Transect length (km)	Survey coverage index ($T/\sqrt{A}$)	Transect length (nm)	No of stations	Time (hrs)	Time for stations	Total time (transects + stations) (hrs)	Total time (transects + stations) (days)
EI	51669	1311	5.78	707.88	17.70	70.79	26.55	97.33	4.06
JOIN	23033	306	2.02	165.23	4.13	16.52	6.20	22.72	0.95
BS	35208	525	2.80	283.48	7.09	28.35	10.63	38.98	1.62
SSIW	59293	1359	5.58	733.80	18.35	73.38	27.52	100.90	4.20
GS	61088	1262	5.11	681.43	17.04	68.14	25.55	93.70	3.90
DP1	41688	678	3.32	366.09	9.15	36.61	13.73	50.34	2.10
DP2	224045	2427	5.13	1310.48	32.76	131.05	49.14	180.19	7.51
PB1	45456	985	4.62	531.86	13.30	53.19	19.94	73.13	3.05
PB2	99236	1906	6.05	1029.16	25.73	102.92	38.59	141.51	5.90
Total	640716	10759		5809.40	145.23	580.94	217.85	798.79	33.28

Table 3 Variables required to describe research trawls used for krill sampling during acoustic surveys.

1) Trawl name: _________ (i.e., RMT8, Macroplankton)
2) Mesh:
   - Mesh size: bar length _______ mm ; diagonal (stretch) length ______ mm
   - Mesh design: Diamond ______; Square _______ (mark one)
   - Material: ___________; Diameter: _______mm
3) Trawl size:
   - Mouth size: horizontal _______m; vertical ________m
   - Frame type: beam trawl ________ ; rigid frame __________ ; other ______ (describe)
   - Open-closing trawl _____
   - No. warp cables: _______
   - Net length: ________m
4) Operational:
   - Towing speed: ________ knots through the water / over ground (mark one)
   - How towing speed is measured:
   - Veering (setting) speed: ________ m/s
   - Hauling speed: ________ m/s
   - Oblique or V-haul/Double oblique haul:
   - Depth range trawl was open (sampling):
     (i) Min _______ m ; Max _______m
     (ii) Min _______ m ; Max _______m
     (iii) Min _______ m ; Max _______m
5) Instrumentation:
   - Flowmeter in trawl?: ______ (yes/no); If yes: Make _________; model ________
   - TD in the trawl? ______ (yes/no); If yes: make ________ ; model _______
   - CTD in the trawl? ______ (yes/no); If yes: make ________ ; model _______

Mesh size measurement:

- Bar length or corner-to-corner length: using a calliper, measure the distance of one mesh side, from corner to corner (or knot-to-knot)
- Diagonal (or stretched) length: measure the length by stretching a mesh over a ruler or mm paper

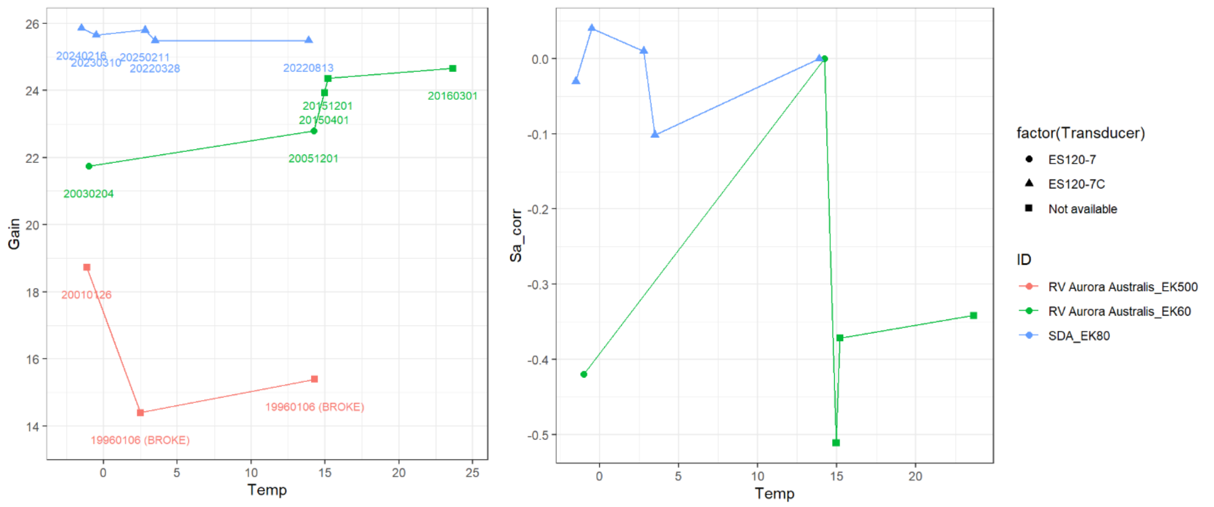

Figure 1: Results of how echosounder Gain (left) and S_a correction (right) vary with temperatures for different platforms and transducers. Labels on the Gain plot are dates of calibration. Note that ice windows on the *RV Aurora Australis* were changed between 2005 and 2015 and are the likely source of the change at this time.

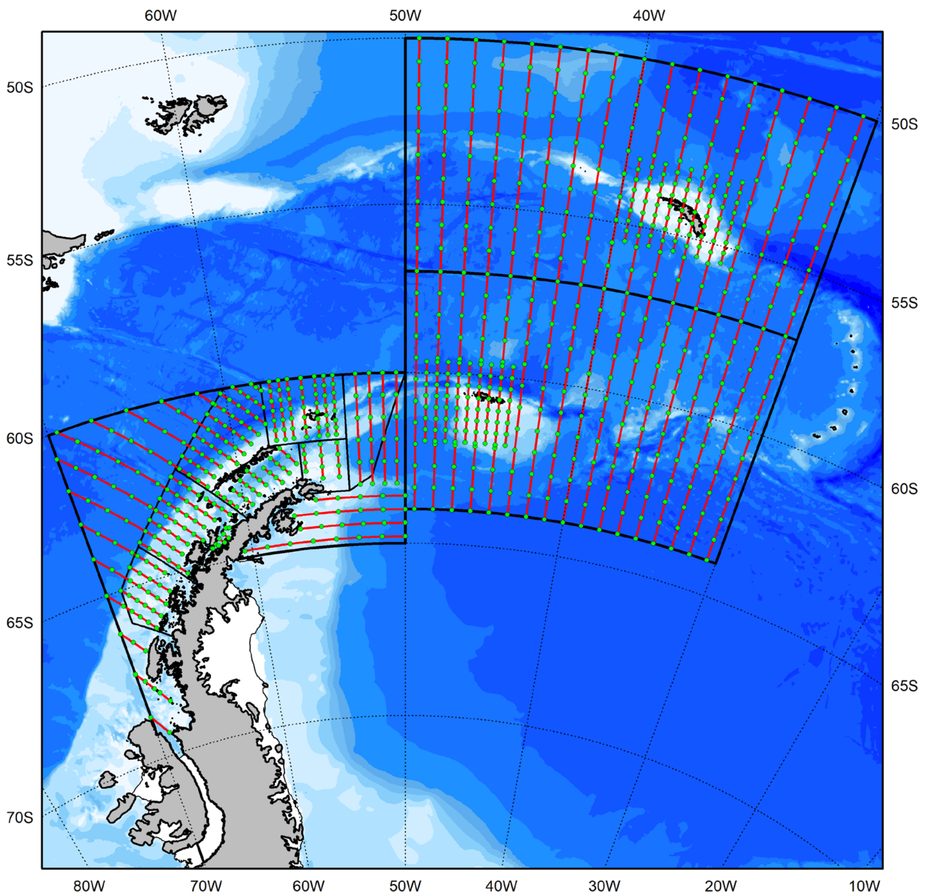

Figure 2: Draft acoustic-trawl survey design for Subareas 48.1, 48.2 and 48.3 to be further developed intersessionally and considered at WG-ASAM-2026.

Appendix A

List of Participants
Working Group on Acoustic Survey and Analysis Methods
(Geilo, Norway, 30 June to 4 July 2025)

Co-convener	Dr Sophie Fielding British Antarctic Survey
Co-convener	Dr Xinliang Wang Yellow Sea Fisheries Research Institute, Chinese Academy of Fishery Science
Invited Expert	Dr Javier Arata Association of Responsible Krill harvesting companies (ARK)
Australia	Dr Martin Cox Australian Antarctic Division, Department of Climate Change, Energy, the Environment and Water
	Dr Abigail Smith Australian Antarctic Division
Chile	Dr César Cárdenas Instituto Antártico Chileno (INACH)
China	Dr Xianyong Zhao Yellow Sea Fisheries Research Institute, Chinese Academy of Fishery Science
	Mr Shuai Li East China Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences
	Mr Ling Zhi Li East China Sea Fisheries Research Institute
	Dr Yunxia Zhao Yellow Sea Fisheries Research Institute
	Professor Guoping Zhu Shanghai Ocean University
Germany	Mr Dominik Bahlburg Alfred-Wegener-Institut

Japan	Dr Hiroto Murase Tokyo University of Marine Science and Technology
	Dr Tomohiko Matsuura Japan Fisheries Research and education agency
Korea, Republic of	Dr Eunjung Kim National Institute of Fisheries Science
	Dr Hyoung Sul La Korea Ocean Polar Research Institute (KOPRI)
Norway	Dr Bjørn Krafft Institute of Marine Research
Ukraine	Mr Viktor Podhornyi Institute of Fisheries, Marine Ecology and Oceanography (IFMEO)
United Kingdom	Dr Tracey Dornan British Antarctic Survey
CCAMLR Secretariat	Dr Steve Parker Science Manager
	Daphnis De Pooter Science Data Officer

Appendix B

Agenda
Working Group on Acoustic Survey and Analysis Methods
(Geilo, Norway, 30 June to 4 July 2025)

1. Introduction

    1.1 Opening of meeting

    1.2 Adoption of the Agenda

2. Review terms of reference and workplan

3. Standardised procedures for the collection of acoustic data for krill fishery management

    3.1 Methods for calibrating echosounders on vessels

    3.2 Acoustic transect design and data collection

        3.2.1 Review and recommend spacing and sampling stations for transects

        3.2.2 Implementation of acoustic transect surveys

        3.2.3 Transect designs for other areas

    3.3 Krill biological data collection protocols

    3.4 Oceanographic data collection protocols

    3.5 Submission of acoustic data

4. Standardised procedures for analysis and development of krill biomass estimates

    4.1 Survey stratification and spatial estimators

    4.2 Standardised analysis and reporting of acoustic biomass estimates

5. Krill biomass estimates

    5.1 Area 48 biomass estimates

    5.2 Area 58 biomass estimates

6. Acoustic methods for measuring biomass, flux, seasonality, and behaviour from alternative platforms

7. Develop methods to estimate biomass of finfish using acoustic techniques

8. Future work

9. Other business

10. Advice to the Scientific Committee

11. Adoption of the report and close of the meeting

List of Documents
Working Group on Acoustic Survey and Analysis Methods
(Geilo, Norway, 30 June to 4 July 2025)

WG-ASAM-2025/01	Updates to the CCAMLR Acoustic Data Repository CCAMLR Secretariat
WG-ASAM-2025/02	The benefits of integrating the Krill Stock Hypothesis (KSH) as an integral Part into the Revised Krill Stock Management Approach (KSMA) Meyer, B., D. Bahlburg, C.A. Cárdenas, S.L. Hill, S. Kawaguchi, B.A. Krafft, S. Labrousse, D. Maschette, Z. Sylvester, P. Ziegler and J.A. Arata
WG-ASAM-2025/03	"International Science & Infrastructure for Synchronous Observation (Antarctica InSync)" – how can CCAMLR`s needs be met? Meyer, B. and B. Krafft
WG-ASAM-2025/04	Potential topics of mutual interest to WG-ASAM and WG-EMM for joint discussion Scientific Committee Bureau
WG-ASAM-2025/05	SKEG Symposium 2025 Report Bahlburg, D., S. Kawaguchi, B. Meyer and Z. Sylvester
WG-ASAM-2025/06	Acoustic estimation of Antarctic Krill Biomass using two- and three-frequency methods in the Krill Research Zone of the Ross Sea Region Marine Protected Area Son, W., J. Kim and S. La
WG-ASAM-2025/07	Acoustic survey of Antarctic Krill abundance in Gerlache Strait in May 2025 Menze, S. B.A. Krafft, G. Zhang and J. Arata
WG-ASAM-2025/08	An estimate of mesoscale biomass of Antarctic krill (*Euphausia superba*) in the East Antarctic Cox. M., N. Kelly, S. Kawaguchi, M. Double and E. Bell
WG-ASAM-2025/09	Antarctic krill and ecosystem monitoring survey off the South Orkney Islands in 2025 Krafft, B.A., L. Krag, G. Zhang, S. Menze, G.E. Aguirre and A.F. Rasmussen
WG-ASAM-2025/11	Fishery Research Proposal: The Acoustic-Trawl Survey *Champsocephalus gunnari* in the Statistical Area 48.2 Delegation of Ukraine

WG-ASAM-2025/12	Krill biomass estimations from moored upward looking echosounders A.J.R. Smith, S. Wotherspoon, G.R. Cutter, G.J. Macaulay, M.J. Cox
WG-ASAM-2025/13	Observations of krill vertical distributions: implications for correction factors and timing of traditional acoustic surveys Zhang G. and B.A. Krafft
WG-ASAM-2025/14 Rev. 1	Proposed at-sea krill data collection plan and protocol for fishing vessels Kawaguchi, S., D. Maschette, Y. Ying, J. Arata, M. Cox, T. Ichii, N. Kelly, B. Meyer, A. Pettersen, F. Santa Cruz, A. Smith and M. Kane
WG-ASAM-2025/15	Revised biomass density estimates of Antarctic krill in Bransfield Strait during the 2023/24 austral summer from a new glider-based wideband echosounder; forthcoming biomass estimates from the 2024/25 glider deployment and mooring and glider deployment plans for 2025/26 Cossio, A.M. and C.S. Reiss
WG-ASAM-2025/16	Summary of Australia's recent research on Antarctic krill and interactions in the East Antarctic ecosystem Cox, M.J., A.J.R. Smith and S. Kawaguchi
WG-ASAM-2025/17	SKEG Symposium 2025 Report Bahlburg, D., S. Kawaguchi, B. Meyer and Z. Sylvester
WG-ASAM-2025/18	Update to the Polar Ocean Ecosystem Time-Series Western Core Box krill density Fielding, S., G Tarling, R Saunders, G Stowasser and S Thorpe
WG-ASAM-2025/19	Proposal for estimating krill flux indices Kasatkina S, and V. Shnar
WG-ASAM-2025/20	Use of autonomous platforms to study krill in the Southern Ocean Dornan, T., S. Fielding, B.A. Krafft, C. Reiss, A. Cossio and M.J. Cox
WG-ASAM-2025/21 Rev. 1	Preliminary results from the acoustic surveys of Antarctic krill conducted by the Chinese fishing vessel in Subarea 48.1 during austral summer 2025 Wang, X., Y. Zhao, J. Wang, H. Zhang, J. Zhang, Y. Ying, G. Fan, J. Zhu and Xianyong Zhao

Other

WG-ASAM-2025/P01	Antarctic krill vertical migrations modulate seasonal carbon export Smith, A.J.R., S. Wotherspoon, L. Ratnarajah, G.R. Cutter, G.J. Macaulay, B. Hutton, R. King, S. Kawaguchi and M.J. Cox *Science*, 387:6732 (2025). doi: https://doi.org/10.1126/science.adq5564.
WG-ASAM-2025/P02	Using U-Net convolutional neural network to enhance multi-frequency acoustic signal extraction of Antarctic krill (*Euphausia superba*) Zhu, G.P., Q.H. Mao, Z. Chen and Y.D. Li *Mar. Ecol. Prog. Ser.*, 760:55-69 (2025). doi: https://doi.org/10.3354/meps14842.

Annex 5

Report of the Working Group on Statistics, Assessment and Modelling (WG-SAM-2025)
(Tenerife, Spain, 16 to 20 June 2025)

Contents

Report of the Working Group on Statistics, Assessments and Modelling (WG-SAM-2025)

(Tenerife, Spain, 16 to 20 June 2025)

Introduction

1.1 The 2025 meeting of the Working Group on Statistics, Assessments and Modelling (WG-SAM-2025) was hosted by the Instituto Español de Oceanografía, Consejo Superior de Investigaciones Cientificas (IEO-CSIC) in Santa Cruz de Tenerife, Spain, from 16 to 20 June 2025, and organised by Mrs V. Rojo, Mr R. Sarralde and Dr J.M. Arrieta.

Opening of the meeting

1.2 The meeting co-conveners, Dr T. Okuda (Japan) and Mr D. Maschette (Australia) welcomed participants (Appendix A) to the meeting and expressed their goals for the meeting. The participants were then welcomed to Tenerife by Dr J.M. Arrieta, Director of the Canarias IEO-CSIC. He noted the history of the IEO and that the goals of the founder aligned well with the mandate of CCAMLR and wished participants a pleasant and productive meeting.

Adoption of the agenda

1.3 The agenda was adopted without change (Appendix B).

1.4 Documents submitted to the meeting are listed in Appendix C. The Working Group thanked all authors of papers for their valuable contributions to the work presented to the meeting.

1.5 In this report, paragraphs that provide advice to the Scientific Committee and its working groups have been indicated in grey. A summary of these paragraphs is provided under 'Advice to the Scientific Committee'.

1.6 The report was prepared by S. Alewijnse (UK), S. Chung (Korea), A. Dunn (New Zealand), T. Earl (UK), E. Kim (Korea), R. Leeger (New Zealand), M. Mardones (Chile), C. Masere (Australia), M. Mori (Japan), F. Ouzoulias (France), S. Parker (Secretariat), C. Péron (France), R. Sarralde (Spain), I. Slypko (Ukraine), S. Thanassekos (Secretariat) and P. Ziegler (Australia).

1.7 A glossary of acronyms and abbreviations used in CCAMLR reports is available online at https://www.ccamlr.org/node/78120.

1.8 The Working Group noted the terms of reference agreed by the Scientific Committee in 2022 and set out in SC CIRC 23/52.

1.9 The Working Group noted the workplan set out in SC-CAMLR-43, Table 7. The Secretariat proposed options to simplify the revision of the workplan by noting revisions proposed in report text of the Working Group and developing an online composite workplan for the Scientific Committee combining topics for all Working Groups which included specific tasks lead by Members. The Working Group agreed to discuss additional modifications to the workplan under ‘Future Work’.

Krill

Data collection

2.1 WG-SAM-2025/21 presented a draft workflow for the calibration of Generalised Additive Models (GAMs) to extrapolate SISO observations to total fishing effort, using warp strike observations in the krill fishery. The workflow informed both model parameter value choices and appropriate gridding of the input data in space and time. The CCAMLR Secretariat requested feedback from the Working Group regarding the methods, the estimation of uncertainty, and the use of additional explanatory variables.

2.2 The Working Group welcomed the analysis, which provided a clear approach to setting parameter values in the GAMs considered. It noted that the method closely predicted the sum of observed warp strikes in each season from 2015 to 2024 for Subareas 48.1, 48.2 and 48.3, but resulted in large uncertainty ranges, particularly for Subarea 48.2. The Working Group considered that the problems encountered when estimating prediction uncertainty were highly likely due to low historic sampling effort. The Working Group noted that observation rates were increasing in the coming season to 5% of total fishing time and agreed that a regular review of this analysis would be beneficial.

2.3 The Working Group also noted the similarity of median estimates between the previous bootstrap method (WG-FSA-IMAF-2024/10) and the GAM and discussed the trade-off between complexity and usability. It noted that fishing method (i.e., continuous vs traditional) was accounted for by the inclusion of random effects for vessels in the analysis. The Working Group discussed the potential inclusion of seabird species in the model and noted that this would require increased sampling effort, particularly to get reliable estimates for less common species. The Working Group also noted that the analysis provided valuable insights into potential differences between Subareas where for instance, the best model fits where obtained by pooling records at a smaller spatio-temporal scale in Subarea 48.1 than in Subarea 48.2.

2.4 The Working Group recommended the Scientific Committee consider these results and discussion, recalling that based on the analysis presented in WG-IMAF-2023/16 the Commission had agreed to increase warp strikes observation efforts (CCAMLR-42, paragraph 4.111). Further, the Working Group noted that in addition to estimating total interactions, this modelling approach had potential for the assessment of the effectiveness of mitigation measures if more data from increased observations rates were available.

2.5 WG-SAM-2025/29 presented an analysis of inter-vessel variability in the length composition of krill in commercial catches in Subarea 48.2 during March 2024 undertaken to evaluate the efficiency of the Scientific Observer Guidelines for sampling 200 krill every 3 or 5 days, regardless of the number of hauls and the catch per haul and per day (CM 51-06). The authors obtained additional evidence that the existing observation protocol tends to under-sample krill for different length groups, especially recruitment groups, by assuming homogeneity of krill length composition in the catch regardless of catch size and duration of fishing operation as well as not taking into account potential spatio-temporal heterogeneity in krill distribution patterns within fishing grounds. In general, krill samples were taken from only 10% of the catches and one sample of 200 krill is taken from a catch that varies from 121 tons to 600 tons for vessels using the traditional fishing method. The proportion of catch accompanied with krill samples undertaken by at-sea observers varied from 9% to 0.2%, the proportion of recruitment groups varied from 37% to 0% and one sample of 200 krill (weighing 120 g) accounts for a catch reaching 7 347 tons for vessels using the continuous fishing method. Statistically significant inter-vessel variability in krill length compositions in catches was found both between vessels using traditional fishing methods as well as between vessels using continuous fishing methods. The most vulnerable to the gear construction, fishing method and observer krill protocols is the retention of recruitment group and adult krill in the catches. Data collected in 2024 provide additional evidence of the need to revise the efficiency of observer sampling protocols with special attention to observer krill samples collected onboard vessels using the continuous fishing method. The current levels of krill sampling in the krill fishery, occurring in both Subarea 48.2 and Subarea 48.1, have no scientific justification. The authors pointed out the necessity of preparing unified requirements for the sample size and its design for SISO, taking into account the number of hauls per day and the amount of catch per haul, so that C1 data and samples collected by at-sea observers would provide the best information to support the strategic objectives for scientific observations of the krill fishery.

2.6 The Working Group welcomed the analysis as it fitted well within Task 1 of its workplan (SC-CAMLR-43, Table 7). Recalling past discussions on the use of krill length frequency data (WG-SAM-2024, Figure 1), it reiterated that effective sample size should be driven by the intended use of these data, and that this issue needed further research. As outlined in the analysis, estimating the length distribution of the catch for assessment purposes using ~100 individuals to represent several thousand tonnes of catch was likely insufficient. The Working Group noted that the analysis would benefit from considering a broader area and time period to help generalise its conclusions. The length frequency analysis would however need to consider fishing events that occurred in proximity to each other in space and time to avoid the potential bias introduced by krill flux.

2.7 The Working Group highlighted that concrete proposals for changes in sampling regimes were needed to progress this task. It recommended WG-EMM-2025 consider this paper, noting that EMM's interest likely lay more in the use of length frequency data for biological inferences (e.g. maturity estimation) than for stock assessment or biomass estimation purposes.

Stock assessment model

2.8 WG-SAM-2025/11 Rev. 1 presented an integrated length-to-age stock assessment model of Antarctic krill population dynamics using Stock Synthesis 3 (SS3). Focusing on Subarea 48.1, the spatially implicit model accounted for environmental forcings (e.g. satellite-derived Chlorophyll-a concentration) predator pressure (three penguin species) fishery monitoring data and survey estimations (e.g. SISO LFDs and AMLR biomass indices). Through the exploration of four scenarios, the study demonstrated the potential of integrated models within an ecosystem-based approach to support the management of the krill fishery.

2.9 The Working Group noted the large amount of work conducted and congratulated Mr Mardones, a previous CCAMLR scholarship recipient, for his continued efforts towards progressing Task 2 of its intersessional work plan (SC-CAMLR-43, Table 7). It discussed potential further areas of research, including non-linear effects of environmental processes, the use of MCMC simulations to assess parameter estimates, consideration of the contributions of different sub-processes into total RMSEs and further investigation of the estimated mortality-at-age. While welcoming the inclusion of environmental forcings, the Working Group noted that satellite-derived data corresponded to surface conditions, while the diel vertical migration of krill resulted in individuals experiencing subsurface conditions. It noted that a length-based model would better incorporate growth uncertainty, and that further consideration needed to be given to the spatial scale of the model, both due to the potential effect of flux and the uneven availability of predator data across Management Units. The Working Group noted that while accounting for the effect of environmental drivers on recruitment had potential (e.g. Crone et al., 2019; Sylvester et al., 2025), such an approach may require further development of SS3.

2.10 The Working Group further noted that other modelling approaches, such as age-structured catch-at-length models are underway (e.g. Dong et al., 2024). The Working Group encouraged the authors to continue refining their modelling work and to consider collaborating with other Members (see also WG-SAM-2024, paragraph 3.1) and stock assessors.

Finfish data collection

Ageing

3.1 WG-SAM-2025/22 presented the results of a calibration exercise between Japanese and Spanish laboratories on toothfish age determination using otolith samples prepared with different methods to compare ageing and readability between the two laboratories. The main objective was to determine whether the age data provided by the Spanish laboratory in 2023 were suitable as input data for the 48.6 stock assessment model. Japan applied the thin section method, while Spain used the bake and embed method. For thin section samples, the results showed good consistency of readers within the Japanese laboratory, but high variability in ages between the Japanese and Spanish laboratories (16.63% average percent error (APE) and 31.73% CV). The inter-lab discrepancy was moderately lower for the bake and embed method. Some of the differences in interpretation of otolith ages appeared to stem from unfamiliarity with otolith image characteristics resulting from the different preparation procedures.

3.2 The Working Group noted that the current Spanish age data were likely to be biased and recommended that the Spanish laboratory re-read otoliths following calibrations with Japanese or other laboratories.

3.3 The Working Group acknowledged the complexity of this type of analysis and recommended using the CV as the primary metric for comparison. The exercise was considered highly productive, and the Working Group emphasised the importance of future collaboration and the ongoing comparisons between ageing laboratories.

3.4 The Working Group noted that finalising the reference sets for each species and method should be a priority. The Working Group noted that a manual with clear instructions on how to read otoliths had been used in the past to improve consistency among readers in the Japanese laboratory, and that during the most recent workshop, growth curves were estimated and compared to identify differences in age interpretation.

3.5 WG-SAM-2025/23 presented the Conveners Report of the 3rd Workshop on Age Determination Methods (WS-ADM3) which had been held at the British Antarctic Survey, Cambridge, UK from 19 to 23 May 2025. The Workshop was organised, developed, and convened by K. Owen (UK), Dr P. Hollyman (UK), Dr J. Devine (NZ) and Dr C. Brooks (USA) and supported by the CCAMLR Secretariat. Scientists and technical experts from 7 Members attended the Workshop. The workshop aimed to progress inter reader comparisons among laboratories using different preparation methods, and to progress the development of otolith reference sets for each toothfish species and preparation method as both training and reader calibration tools.

3.6 The Working Group noted that the WS-ADM3 had identified that a key issue was the involvement of many new readers, which may have contributed to the inconsistencies. Therefore, the Working Group agreed that a formal calibration process among readers is essential moving forward.

3.7 The Working Group noted the importance of the work undertaken at WS-ADM3, particularly in facilitating inter-laboratory reading and comparison. While otolith readers are well-practiced at reading images from their own laboratories, they are typically less familiar with reading otoliths prepared in other laboratories using different otolith preparation procedures. WS-ADM3 facilitated improving their experience reading otoliths prepared by different laboratories and methods.

3.8 The WS-ADM3 made two requests of WG-SAM:

(i) advise on which precision threshold method and level is most appropriate for use in age-based stock assessments; and

(ii) recommend a mechanism for CCAMLR to support mentoring and the development of ageing programs.

3.9 The Working Group encouraged a mechanism for CCAMLR to support mentoring and the development of ageing programs. In particular, the mentoring of otolith readers which is facilitated via CCAMLR is valuable and should continue to be supported. The Working Group further noted the need for significant investment in otolith reader training and time, as well as capital investment required for purchasing thin sectioning equipment. However, the Working Group also noted that Members putting forward Research Proposals under CM 24-01 and CM 21-02 have committed to analysing the samples they are collecting, which includes ageing. The Working Group noted question 3(c) in the Format for submitting finfish research proposals in accordance with paragraph 3 of CM 24-01 and paragraph 6(iii) of CM 21-02, which asks about methods for data analysis (paragraph 8.4).

3.10 The Working Group recommended the Scientific Committee continue to support inter-laboratory collaboration and mentoring for ageing programmes. The Working Group further recommended that the current Research Proposal template be expanded, so that question 3(c) specifies how readers will be trained, otoliths will be prepared, aged, and calibrations conducted, and a milestone detailing when these data will be submitted to CCAMLR (paragraphs 6.11 and 7.23).

3.11 The Working Group noted that any of the methods defining a precision threshold used to determine when otoliths should be re-read are useable within stock assessment models, but that the method used must be specified and consistent among the ageing data sources pooled for a stock assessment.

3.12 The Working Group recalled discussion by WG-SAM-2024 (paragraph 5.33) which noted that a binary classification indicating whether an otolith reading was suitable for inclusion in an assessment was preferable to a 1–5 readability score. The Working Group noted that having at least two readers was advantageous in determining the uncertainty in the age of a given otolith.

3.13 The Working Group noted that currently, practitioners of integrated stock assessments treat age data differently before inclusion in stock assessment models. The Working Group recommended that the authors of integrated stock assessments conduct a joint survey to summarise how ageing data are incorporated into their assessments.

3.14 The Working Group noted that using age-length keys from nearby areas could be applied to data poor areas where ageing data are unavailable, although this would require a strong assumption that both growth and year class strengths were identical between the two areas. The Working Group recommended that spatio-temporal or hierarchical modelling of the length-age relationship may offer a better approach, but that these methods were technically challenging. The Working Group suggested that Members develop methods, where resources allowed, for such approaches.

Tagging and survey design

3.15 WG-SAM 2025/24 presented the summary of the result of the POKER (‘POissons de KERguelen’) V survey, which was carried out around the Kerguelen Islands in CCAMLR Division 58.5.1 in October 2024. The sampling design was modified compared to previous POKER surveys (2006, 2010, 2013 and 2017) to focus on Patagonian toothfish recruitment. A total of more than 25 fish species was recorded along with biological data. Three dominant species in biomass were marbled rockcod (*Notothenia rossi*), unicorn icefish (*Channichthys rhinoceratus*) and Patagonian toothfish (*D. eleginoides*). While there were no changes in the composition of the benthic fish community through time, these species showed significant changes in distribution and biomass compared to previous surveys. Despite an increase in Patagonian toothfish biomass compared to 2017, it remained below the long-term average. Strong cohorts of both 2- and 3-year-old fish suggest strong toothfish recruitment in recent years (2021 and 2022), especially on the northern shelf. Work is ongoing to estimate biomass by age class using spatially explicit models. In addition, a series of annual recruitment surveys are planned for the next three years to track 2024 cohorts and understand factors influencing recruitment.

3.16 The Working Group welcomed the new POKER survey results and thanked the authors. It encouraged the authors to tabulate all the operational factors and their changes (e.g. gear, vessel and sampling design) for all five surveys which could influence biomass estimates and present those results to WG-FSA.

3.17 The Working Group noted that the survey included day and night hauls, and that these could be used to investigate different behaviours of icefish between day and night.

3.18 The Working Group noted the *N. rossi* catch was at its highest recorded level since the population of this species collapsed in the 1970s and shows recovery in the last 15 years. It also highlighted that the authors could potentially investigate the movement and connectivity between the Kerguelen Islands, Crozet Island, and adjacent areas through collaboration among Members. The Working Group also discussed priority for otolith readings of POKER samples.

3.19 The Working Group encouraged the continuation of these surveys in future years to explore the effect of environmental factors and climate change on recruitment variability.

3.20 WG-SAM-2025/28 presented the requirements for a standardised acoustic survey methodology for finfish in the CCAMLR Convention Area. The authors pointed out that in terms of the requirements of Article II of CCAMLR, species such as icefish are both a 'harvested' and a 'dependent' species, and icefish acoustic surveys in the CCAMLR Convention Area should provide the following three items: (i) an estimate of the biomass and distribution of icefish in the pelagic zone, (ii) an estimate of the biomass and distribution of krill and other finfish species (e.g., myctophids) in the pelagic zone, and (iii) an analysis of the interactions between the spatial distribution of krill and icefish, as well as the interactions between the spatial distribution of icefish and other finfish as a source of potential alternative food webs between icefish and krill. The paper discussed methodical aspects of data collection and processing, including echosounders and their calibration, survey design, target backscattering identification (krill, icefish and other fish), fish target strength, and estimating fish biomass by length groups. The effect of various sources of uncertainty was simulated using the example of an icefish survey that was implemented in Subarea 48.3 in 2002.

3.21 The Working Group recommended that WG-ASAM rather than WG-SAM review this document, as it primarily focuses on the methodology of an acoustic survey. The Working Group also noted that WG-ASAM has developed surveys for protocols for krill and could do the same for finfish.

3.22 The Working Group recalled that the advantage of acoustic surveys is that they sample the entire water column and can identify diurnal vertical movements and that the author's recommendation to use only daytime hauls may not apply to all acoustic surveys, depending on the target species and research aims.

Data collection: SISO and vessels

3.23 Following a request by WG-SAM (WG-SAM-2024, paragraph 4.2), WG-SAM-2025/01 presented a power analysis to estimate the number of longline sets and fish sampled from each set to reach an 80% power in detecting a 3% change in conversion factor values over a month using Convention Area-wide data. The paper determined minimum sample sizes using subsets of SISO data as well as simulated data. Based on the results, the authors proposed sampling at least 20 fish from a haul when (or soon after) entering an area, and at least once a week if remaining in that area. Regular review of the effectiveness of the sampling regime could be conducted in the future.

3.24 The Working Group recommended the Scientific Committee endorse the proposed sampling regime and requested that its effectiveness be assessed regularly. It further recommended fish be sampled individually rather than in batch due to the documented sources of variability in conversion factors (see WG-FSA-2022/12). The Working Group recommended the Scientific Committee task the Secretariat with updating the forms and protocols to reflect this change.

3.25 WG-SAM-2025/07 presented a revised C1 trawl fine scale catch and effort form, separated into individual forms for finfish and krill trawl fisheries following a request from WG-FSA-IMAF-2024 (paragraph 1.20). The paper noted that additional revisions are expected as the revision of the krill fishery management approach progresses (e.g. SC-CAMLR-41, paragraph 3.51; WG-EMM-2023, paragraph 5.58; WG-FSA-2023, paragraph 2.37). Updates included detailed gear configuration reporting and linking to individual fishing events, improved description of marine mammal exclusion devices, and identification of the personnel reporting IMAF.

3.26 The Working Group thanked the Secretariat for the revised C1 forms. It encouraged the Secretariat to propose specific names for each form type to WG-FSA-2025 to avoid confusion between multiple types of C1 forms and identify where Conservation Measures may need to be updated to accommodate this change.

3.27 The Working Group recommended the new forms replace the current C1 forms and further noted that the new forms will assist the Secretariat in developing more efficient automated data loading procedures.

Develop stock assessments to implement decision rules for finfish

Ageing

4.1 The Working Group succinctly discussed cross-cutting issues related to ageing, including the crucial importance of age data for stock assessments, the outcomes of the WS-ADM3 (WG-SAM-2025/23) and the need to add clearly identified ageing milestones in research plans (paragraph 3.10). Regarding the ageing workshop, the Working Group noted that advances in ageing methods could inform the frequency of these workshops.

4.2 Regarding the unevenness of ageing efforts across fisheries, the Working Group recalled the need for increased efforts in Subarea 88.2, as highlighted in the past (e.g. SC-CAMLR-XXXII, paragraph 3.169; WG-FSA-16, paragraph 3.129; WG-FSA-17, paragraph 3.122; WG-FSA-18, paragraph 4.173). While it noted the importance of solving this issue in Subarea 88.2, the Working Group discussed the development of ageing effort metrics to help track progress across research proposals and plans (paragraph 6.2).

Tagging performance

4.3 The Working Group discussed inter-vessel variability in tagging survival and/or detection rates and encouraged Members to conduct descriptive analyses of their tagging data to document potential issues and help solve them. It further noted that such descriptive analyses could help document residence time variability in space and according to sex, which would help better understand stock structure.

Stock assessment developments

4.4 WG-SAM-2025/17 presented an overview of assumptions made when using mark-recapture (M-R) models, with focus on the use of tag release and recapture data in CCAMLR integrated stock assessments. Violations of assumptions were identified as potential sources of bias. Guidance was provided to qualitatively and quantitatively evaluate adherence to M-R model assumptions, and for situations where assumptions were strongly inconsistent and could not be met that it may be useful to consider implementing alternative M-R models.

4.5 The Working Group noted the importance of ensuring that tagging data are assessed for adherence to the assumptions of given M-R models and welcomed the guidance for how to undertake this process. The Working Group noted the importance of evaluating the characteristics of the given tagging dataset for elements such as the number of multiple recaptures to ensure they aligned with requirements for alternative M-R models also.

4.6 The Working Group noted that there has been some development of the Chapman estimator within Casal2 compared to the classical Chapman estimation of abundance, to account for issues such as tag loss, tag-related mortality and tag detection rates. It further noted the importance of examining raw data directly as a regular quality control check. The Working Group recommended that R code to test M-R models and standardised diagnostics should be developed and shared amongst those researchers using M-R data in their analyses (paragraph 8.2).

4.7 The Working Group noted that CCAMLR relied on a number of model frameworks to develop fishery stock assessments, notably Casal2 for toothfish and the Grym for krill. These model frameworks have been largely developed by individual CCAMLR members. The Working Group encouraged Members who use the software or participate in fisheries that were assessed by Casal2 to contribute to the development of the underlying code, supplementary code, and user manuals and guides for Casal2 to help ensure it remains up-to-date and relevant to the work of CCAMLR (WG-SAM-2024, paragraph 11.4). The Working Group also highlighted the value of developing standardised diagnostics across assessments to support comparability and transparency.

4.8 WG-SAM-2025/14 presented a conceptual model to inform the spatial structure of Patagonian toothfish in Division 58.5.2. It reviewed key factors such as depth, genetics, fishing footprint, tagging density, and movement patterns. Seven candidate spatial area scenarios were proposed to support future development of a spatially structured stock assessment. The paper highlighted the need for evaluating movement between areas, identifying metrics for comparing scenarios, and selecting appropriate methods for delineation.

4.9 The Working Group welcomed the approach proposed to inform spatial structuring of Patagonian toothfish. The Working Group also suggested that the review of observations such as age frequencies and sex ratio and seasonal variation therein, and residence time within areas may also be helpful to better inform spatial delineation.

4.10 The Working Group noted that using objective methods, such as clustering or regression trees, to define depth strata, rather than arbitrary depth bins, could be useful. It also emphasised that analyses should focus more on data and observations rather than outputs from stock assessment models.

4.11 WG-SAM-2025/26 estimated sex-specific biological parameters (length–weight relationships, maturity-at-age, and growth curves) for Patagonian toothfish in Subarea 48.3. Results confirmed that females grow larger, mature later, and are heavier at length than males. The combined-sex biological parameters used in the current Casal2 model were more closely aligned to those for females than for males, since more female toothfish are caught and sampled in the fishery. The authors recommended that these parameter estimates provided a foundation for developing a sex-disaggregated Casal2 model to better reflect population structure in future assessments.

4.12 The Working Group noted males were estimated to mature at young ages and recommended accounting for potential misidentification of maturity stage 2 from macroscopic staging, and suggested the authors consider methods that adjust for spatial bias in maturity estimates (e.g. Cousido-Rocha et al., 2024).

4.13 The Working Group recalled the relevance of the work by Marsh et al. (WG-SAM-2023/15) on environmental effects on growth and noted the importance of continuing to investigate trends in biological parameters of all toothfish stocks over time.

4.14 Dr Kasatkina noted that the data from groundfish trawl surveys used as a source of data on toothfish recruitment groups and data on localised fisheries are insufficient to assess the biological parameters of toothfish in Subarea 48.3. Dr Kasatkina referred to the recommendations of Independent Reviews (2018, 2023) and pointed out the need to assess the spatial structure of toothfish biological parameters across the entire distribution area of its population in Subarea 48.3 and noted the need to improve data collection to better account for this spatial structure, which requires data from longline survey across the entire distribution area of toothfish population. Dr Kasatkina noted that it is necessary to comprehensively use data from such longline survey and groundfish trawl surveys to assess toothfish biological parameters across the Subarea 48.3 and the Casal2 parameterisation.

4.15 The Working Group discussed the value of estimating biological parameters from a dedicated longline survey only. Most participants considered that the combined data from the groundfish survey and the commercial fishery in Subarea 48.3 covered a large range of the species distribution and provided more statistical power for the analysis of biological parameters than data from longline surveys alone.

4.16 The Working Group noted that including the diagnostic plots to evaluate the fit of biological models was valuable and should be included in all such analyses. The Working Group recommended that R code for the analysis of biological parameters and simulated datasets should be shared via a GitHub repository and welcomed the offer from the Secretariat to facilitate this (paragraph 8.2).

4.17 WG-SAM-2025/16 compared a sex-disaggregated stock assessment with the current single-sex model for Patagonian toothfish in Division 58.5.2. The largest impact on biomass estimates was found when introducing sex-specific growth, but with poorer model fits linked to high values of length-at-age variance estimated for females. A sensitivity run with reduced variance resulted in improved fits.

4.18 The Working Group welcomed the development of a sex-disaggregated stock assessment model in Division 58.5.2 and its comparison to the current single-sex model. It noted that the estimated CV for female growth was unusually high and recommended exploring alternative approaches to estimate female growth more robustly.

4.19 The Working Group noted that a sex-disaggregated model in Division 58.5.2 could be developed that used combined sex parameters where the sex-specific parameters were uncertain. Further work was recommended before adopting a fully sex-disaggregated model for management advice.

4.20 The Working Group discussed the specifications of selectivity in the assessment model and encouraged further investigation using transformation of some of the selectivity parameters (e.g. transformation of the declining left- or right-hand limb parameters to log or inverse space).

Developments in diagnostics and trends

4.21 The Working Group noted ongoing efforts to improve diagnostic tools and their standardisation across assessments and recalled its discussions on stock assessment diagnostics at WG-SAM-2023 (paragraphs 6.33 and 6.34). It highlighted the value of compiling a list of diagnostic plots, building on the framework proposed by Ziegler et al. (WG-SAM-15/26) to support transparency and comparability of model outputs (paragraph 8.1).

4.22 The Working Group recommended that stock assessment diagnostics should generally present observed and expected values, model fits, residuals, and residual patterns appropriate to the item being assessed. The Working Group also noted that suitable diagnostics include, inter alia, standardised Kobe plots and retrospective plots. The Working Group noted that current stock assessments provide Pearson residuals, but alternative methods such as ‘one step ahead’ residual plots could be used instead for compositional observations. However, further development work is needed, as there may be challenges in implementing and interpreting these alternatives. The Working Group also noted that Probability Integral Transform (PIT) residuals could be considered.

4.23 The Working Group recommended that integrated toothfish stock assessments should include posterior predictive plots, and likelihood distributions of parameters from the MCMC.

4.24 The Working Group agreed that when an assumption is made, a diagnostic plot should be shown, or relevant tests should be conducted to evaluate how this assumption is being met if possible (e.g. WG-SAM-2025/17, Table 2).

4.25 The Working Group suggested that a list of diagnostic plots be compiled and brought to WG-SAM-2026 to develop a standard reference set for future assessments. It encouraged Members to collaborate on this issue (paragraph 8.1 (xvii)). The list should include the rationale for each diagnostic, and a guide on their interpretation. The Working Group acknowledged the utility of such objective criteria in facilitating the evaluation of model performance and in supporting management advice.

Management strategy evaluations for target species

5.1 WG-SAM-2025/10 discussed current approaches for forecasting recruitment in fisheries stock assessment models with a focus on medium- to long-lived species such as toothfish. The paper recommended using average recent recruitment for short-term projections (1–5 years). For longer-term projections (30+ years) the author suggested incorporating environmental covariates into stock recruitment models and employing ensemble modelling approaches that may better capture potential trends and variability under changing climate conditions. The author noted a number of key challenges including the breakdown of historical climate-recruitment relationships under climate change, the assumption of stationarity in traditional approaches, and the need to balance biological realism with practical management requirements. The author recommended a multi-faceted approach that explicitly acknowledges uncertainty through stochastic simulations, is regularly updated as new data becomes available, and employs Management Strategy Evaluation (MSE) frameworks to test robustness under various recruitment scenarios.

5.2 WG-SAM-2025/27 explored the recruitment assumptions used in integrated assessments of toothfish stocks within the CAMLR Convention Area. The review found areas of both similarity and differences between the four stocks. General areas of agreement included: (1) assumptions about future recruitment levels and variability should be informed by past estimates; (2) where available, time series of standardised surveys provide valuable fishery-independent indices of recruitment trends; and (3) where there is evidence of a change in recruitment which was not modelled, a more recent time period should be used to forward project recruitment.

5.3 The paper made the following recommendations for the four integrated stock assessments: (1) projections using the entire assessment time series are presented in all assessments as a baseline; (2) where there is evidence of a change in recruitment, either positive or negative, a recent time period (~10 years) should be used to project future recruitment; and (3) where fishery-independent surveys are available, these should be used to compare indices of recruitment to those in the model.

5.4 The Working Group noted that fishery-independent data on recruitment and young age classes such as from research surveys was useful to review. However, differences between the survey designs may mean that the calculation of recruitment indices would be undertaken in different ways. The Working Group noted that using the trend from the survey index to project future recruitment would not replace the need to investigate and, where possible, resolve discrepancies between the estimates of recruitment trends from the assessment and the survey.

5.5 The Working Group discussed the difficulty of longer-term projections given the assumptions associated with using historical data for projections. The appropriate time frame for drawing historical recruitments to use, potential non-stationarity of year class strength values, as well as the lack of strong environmental correlates with recruitment were all discussed as issues to consider. The Working Group noted that the current CCAMLR Decision Rules for toothfish require a 35-year projection, but that there were a range of alternative harvest strategies where such a long-term projection is not required. The Working Group recommended that a harvest rule that was not dependent on these long-term recruitment projections should be evaluated within the ongoing MSE work.

5.6 The Working Group agreed that a pragmatic way forward was required as stock assessments will be presented to the Scientific Committee in 2026. It agreed that there may be slightly different implementation of forward projections, yet the principles should be consistent between assessments.

Evaluation of the CCAMLR Decision Rules for toothfish and
potential alternative harvest control rules for assessed fisheries

5.7 WG-SAM-2025/12, WG-SAM-2025/19 and WG-SAM-2025/25 presented work addressing the Scientific Committee's workplan for MSEs as set out in SC-CAMLR-43, paragraph 3.14. The tasks identified for WG-SAM-2025 were to provide advice to the Scientific Committee in 2025 on the range of uncertainties to which the management strategy should be robust (WG-FSA-IMAF-2024, paragraph 4.48(i)(a-d)) and suitable operating models for consideration in the MSE (WG-FSA-IMAF-2024, paragraph 4.48(ii)).

5.8 WG-SAM-2025/12 presented a range of uncertainties for each of the key input parameters used in the toothfish stock assessments. The author proposed following the recommendation of Rademeyer et al. (2007) and Punt et al. (2016) to split the uncertainties into a reference scenario that should be used to evaluate the success of the Management Strategy, and a range of robustness trials, under which the Management Strategy should still perform acceptably. The paper proposed to simulate a generic toothfish population and fishery so that the results of the MSE could be applied to any toothfish population and fisheries, including for both Antarctic and Patagonian toothfish species and across all fished CCAMLR areas. In addition to Management Strategies based on an integrated assessment, the paper proposed that the MSE should also investigate alternative approaches where the estimation of stock abundance is based on relatively simple methods such as spatial or non-spatial tag-based estimators rather than integrated stock assessments to set catch limits.

5.9 WG-SAM-2025/19 presented key parameters and their uncertainty ranges for MSEs for Antarctic toothfish in the Ross Sea region. It focused on the parameters that influenced assessment outcomes and hence management advice. This identified critical parameters requiring initial evaluation, including natural mortality, recruitment patterns, growth parameters, tagging-related parameters, maturity, selectivity patterns, and bias in tag-related abundance estimates. For each parameter, the authors provide plausible ranges derived from previous assessments, and meta-analyses that could be used to test the robustness of alternative harvest control rules. The authors recommended developing the MSE process in stages, initially prioritising work on parameters that are likely to be the most influential, and noted that recruitment assumptions would be a high priority.

5.10 WG-SAM-2025/25 presented the outputs of a two-day informal workshop held at the Centre for Environment, Fisheries and Aquaculture Science (UK) to bring together stock assessors and MSE experts to identify approaches to addressing the CCAMLR Scientific Committee’s Workplan. The authors presented approaches to choosing a range of uncertainties for assessment input parameters and proposed that for the Subarea 48.3 toothfish assessment, the highest priorities to investigate within the MSE framework would be mis-estimation of natural mortality and trends in recruitment. The authors considered the use of Casal2 or FLR (Fisheries Library in R) as the basis for suitable operating models and identified approaches to approximating the Casal2 assessment and 35 years forecasts that may be helpful to evaluate the current for CCAMLR Decision Rules for toothfish efficiently.

5.11 The Working Group noted that the three papers shared many common conclusions in their approaches to selecting plausible range of parameters and the identification of high priority assumptions. The Working Group recommended that scientists working on these MSEs should collaborate to share resources and ensure that the results were presented in a consistent way as much as possible in order to assist the Scientific Committee and Commission in interpreting the outputs.

5.12 The Working Group recalled that the Commission, as the main stakeholder of the MSE, would need to be kept informed about the progress of the process.

5.13 The Working Group proposed two components to Phase 1 of the Management Strategy Evaluation (Phase 1, MSE). As the first component, a generic toothfish operating model with a relatively simple fishery and data generation would be used to compare the current constant catch CCAMLR Decision Rules for toothfish to alternative harvest rules such as those identified in WG-SAM-2024 paragraph 6.10. The Working Group noted that the 35-year projection period of the current CCAMLR Decision Rules for toothfish could be approximated with faster approaches than MCMC sampling (such as multivariate normal sampling or a harvest rate simulated under equilibrium age conditions). For the second component of Phase 1, harvest control rule(s) that were identified by the first component as being promising should be evaluated in stock- specific simulations to ensure that the harvest strategy is robust for that particular fishery.

5.14 The Working Group noted that key uncertainties to be evaluated in Phase 1, MSE should include those relating to estimates of natural mortality, growth and maturity, bias in abundance estimates, and recruitment patterns such as stock-recruitment steepness, recruitment variability, autocorrelation and trends (Table 5.1). For the stock-specific MSE, any other key stock-specific uncertainties and parameter values should be evaluated.

5.15 The Working Group recommended the MSE simulate the fish populations over at least a 200-year time period and to evaluate the performance of the harvest control rules at time steps of 5 years, 10 years, 20 years, 40 years and 200 years.

5.16 The Working Group noted that results of the Phase 1, MSE should be presented in 2026 with the aim that the Scientific Committee will have sufficient information to make a recommendation on the choice of a harvest control rule for each toothfish stock. During the subsequent Phase 2, the MSE could be extended to evaluate other uncertainties of relevance that were not listed as the highest priority and included in Phase 1, MSE, and any other emerging issues.

5.17 The Working Group recommended that the need for further evaluations of harvest control rules be reviewed every 6 years.

5.18 The Working Group noted that the evaluation of the MSE would use the same reference points as specified in the current CCAMLR Decision Rules for toothfish, i.e. maintaining the stock at 50% of SSB_0 and having a low probability of being below 20% of SSB_0.

Development and testing of data-limited fishery decision rules

5.19 WG-SAM-2025/06 presented the preliminary trend analysis for research blocks in data-limited toothfish fisheries and requested feedback from the Working Group. The document included summaries of fish releases and recaptures within and between research blocks, annual biomass estimates and updated trends, the decision tree of the trend analysis, preliminary catch limits and retrospective analyses. The General Bathymetric Chart of the Oceans (GEBCO) dataset was used to estimate fishable areas and associated CPUE-by-seabed area biomass estimates and preliminary catch limits.

5.20 The Working Group recommended that:

(i) the trend analysis procedure was now mature and did not need to be presented to future meetings of WG-SAM for methodological review, unless there were methodological changes

(ii) the influence of updates in the GEBCO bathymetry would only need to be investigated if requested

(iii) the retrospective analysis of the catch limit advice would only be calculated on request

(iv) the Secretariat should publish a full time series of CPUE trends (or CPUE-derived biomass estimates) and catch limits for each Research Block, either in future iterations of this document, or through the fishery reports.

Review of new research proposals

6.1 Five new proposals were submitted and reviewed by the Working Group.

6.2 The Working Group recommended that the Scientific Committee note that evaluating the likelihood of success of new and ongoing research plans would be assisted by a broader review of the research plan review tables which includes a summary of the achievement of previous milestones (paragraph 4.2).

New proposals under CM 21-02

6.3 There were no new research proposals under CM 21-02.

New proposals under CM 24-01

6.4 WG-SAM-2025/08 presented a proposal by New-Zealand to continue the time series of longline research surveys to monitor abundance of Antarctic toothfish (*Dissostichus mawsoni*) in the southern Ross Sea for the next three years (2025/26 to 2027/28). The objectives are to (1) monitor Antarctic toothfish recruitment, (2) monitor trends in abundance of the larger (sub-adult and adult) toothfish in regions where predators of toothfish are abundant (McMurdo

Sound and Terra Nova Bay), and (3) collect and analyse a wide range of data and samples from these areas including benthic invertebrates, fish stomach and tissue samples, and associated environmental and acoustic data. Objectives (2) and (3) are specified as high priority research topics in the research and monitoring plan for the Ross Sea region Marine Protected Area (RSRMPA).

6.5 The Working Group noted that the proposal was using the same methods and design as in previous surveys. The Ross Sea Shelf Survey was an important time series for informing the Ross Sea region stock assessment and delivered a long-term time series of recruitment and provided the ability to track age and length cohorts as they move from the shelf to deeper areas where the exploratory fishery occurs.

6.6 The Working Group noted the trend in toothfish abundance in Terra Nova Bay since 2015 and suggested that the proposal be updated with any available details on research programs conducted on toothfish predators in that region, and the specific contribution of the survey to the RSRMPA research and monitoring plan.

6.7 The Working Group also requested further information on how collected by-catch data from the survey was being used.

6.8 The Working Group noted the change in the sampling rates with all toothfish measured for length, weight, sex and maturity stage data being proposed to be measured up to a maximum of 120 individuals. The Working Group requested that a summary of the number of toothfish caught on each set, and the proportion of times this had exceeded 120, be presented to WG-FSA to allow it to evaluate the effect of this maximum.

6.9 The Working Group evaluated the proposal and the self-assessment provided in Appendix 1 of WG-SAM-2025/08, and agreed that the survey design would achieve its objectives. The Working Group recommended that Scientific Committee approve the research proposal.

6.10 WG-SAM-2025/04 presented a proposal by Chile to conduct a longline survey in Subarea 48.2 from 2025/26 to 2027/28. The main objectives are to (1) obtain relative abundance estimates for toothfish by depth strata using CPUE indices, (2) investigate the toothfish population structure (ratio between Antarctic and Patagonian toothfish, size and age structure, mean length), (3) continue the tagging and recapture program, (4) characterise by-catch species and (5) characterise the interactions of seabirds and marine mammals with fishing operation.

6.11 The Working Group noted that the randomised stratified survey design of the proposed survey was appropriate to estimate abundance, however it recommended the proponents address the following for submission to WG-FSA-2025:

(i) provide additional information on how this survey will complement previous studies conducted in this subarea by Ukraine and UK in previous years and how it will fill gaps in the knowledge on the stock hypothesis of Area 48 (for example, the connectivity and movement of toothfish across this area)

(ii) clarify how the relative abundance estimates will be used to derive an estimate of absolute abundance that can be used by CCAMLR to manage toothfish stocks

(iii) clarify how the objectives would apply to each of the two toothfish species (*D. eleginoides* and *D. mawsoni*)

(iv) modify the sampling regime for toothfish and by-catch species to (a) meet the minimum sampling requirements as used in other CCAMLR fisheries, and (b) collect data on gonad weight and undertake gonad histological analyses to improve knowledge on key life history traits of toothfish in this area

(v) provide more details on the number of otoliths that would be aged and how the age data would be analysed and used, as well as describe the ageing protocols. The Working Group recommended the proponents also consider joining the CCAMLR expert group on toothfish age reading.

(vi) include additional information in the proposal, such as the name of the lead researcher conducting the analysis, sampling protocols, and the tagging procedure form developed by CCAMLR for all research plans

(vii) include a table which summarises the scientific results obtained on previous surveys conducted in Subarea 48.2, including referencing the documents that had been previously submitted to CCAMLR Working Groups where these results were presented

(viii) include the self-assessment table as recommended by WG-FSA (WG-FSA-2019, paragraph 4.28).

6.12 The Working Group noted that the trend analysis cannot be used to calculate catch limits for this survey as there had not been any research fishing in this area over the last 5 years (WG-SAM-2025/06). The Working Group noted that the survey would have to be effort limited, with a catch limit appropriate for the level of effort proposed.

6.13 WG-SAM-2025/18 presented a proposal by Ukraine to conduct a longline survey in Subarea 48.2 from 2025/26 to 2027/28. The main objectives are to (1) obtain a relative abundance of the adult population of *Dissostichus* spp. and determine their biological parameters, (2) determine the spatial distribution of two toothfish species in the study area, (3) assess the impact of fishing operations of different types of bottom longlines on vulnerable marine bottom ecosystems, by-catch, and the environment in general using underwater video systems, (4) carry out electronic monitoring of the processes of setting and hauling longlines, and tagging procedures, (5) undertake plankton and oceanographic research, (6) obtain biological and other observational data in order to evaluate the achievement of the objectives of the South Orkney Islands Southern Shelf Marine Protected Area, and (7) collect biological data for toothfish and by-catch species.

6.14 The Working Group recommended the proponents address the following for submission to WG-FSA-2025:

(i) provide additional information on how this survey will complement previous studies conducted in Subarea 48.2 by Ukraine and UK in previous years and how it will fill gaps in the knowledge on stock hypothesis of Area 48 (for example, the connectivity and movement of toothfish across this area)

(ii) clarify how the relative abundance estimates will be used to derive an estimate of absolute abundance that can be used by CCAMLR to manage toothfish stocks

(iii) undertake a power analysis to help determine the proposed catch limits, and sampling rates for the survey

(iv) clarify how the electronic monitoring data would be analysed and subsequently used

(v) include a table which summarises the scientific results obtained on previous surveys conducted in Subarea 48.2, including referencing the documents that had been previously submitted to CCAMLR Working Groups where these results were presented.

6.15 The Working Group encouraged the proponents of the research proposals in WG-SAM-2025/04 and WG-SAM-2025/18 submit a joint proposal that combined the two research proposals into an integrated proposal to WG-FSA. The Working Group encouraged the proponents to include in this proposal further justification on the need for research in what is a closed area if the intention is not to reach a stock assessment and subsequent fishery.

6.16 WG-SAM-2025/05 presented a proposal by Chile to conduct a longline survey in Subarea 48.3A from 2025/26 to 2027/28. The main objectives are (1) to obtain relative abundance estimates for toothfish by depth stratum, (2) investigate the toothfish population structure (including the relative proportions of Antarctic and Patagonian toothfish, and their size and age structure), (3) continue the tag release and recapture program, (4) characterise bycatch species, and (5) characterise interactions of seabirds and marine mammals with fishing operation.

6.17 The Working Group noted that most of the current information for the fish in this area was from Management Areas 48.3B-C, where an established fishery operates, and Management Area 48.3A may be connected to stocks in both Management area 48.3B-C as well as FAO Area 41. The Working Group also noted that this area may be an important habitat for juvenile Patagonian toothfish and is likely to have a significant occurrence of VME indicator taxa.

6.18 The Working Group requested the proponents address the same comments as were provided for their research proposal presented in WG-SAM-2025/04 where they are applicable (paragraph 6.9 (ii to vi), and (viii)). The Working Group also recommended the proponents address the following for submission to WG-FSA-2025:

(i) consider how the survey will investigate stock structure, given that the randomised stratified random survey had only one station in depths less than 1000m

(ii) consider revising the by-catch limits to be appropriate for the survey area given current limits are calculated for Management Areas 48.3B-C

(iii) consider revising the toothfish tagging rate from 1 fish per tonne to 5 fish per tonne, consistent with the tagging rate proposed in WG-SAM-2025/04 for Subarea 48.2

(iv) review the timing of milestones to ensure that the reporting to CCAMLR is achievable

(v) ensure that the correct vessel is referred to throughout the research plan.

6.19 Dr Kasatkina noted that the proposed research plan is localised and does not cover the distribution area of the toothfish population in Subarea 48.3 and there is no clarity how the data from this plan meets the goals of enhancing the understanding of toothfish population dynamics and inform conservation measures stock assessments. Dr Kasatkina noted that research plan does not respond to recommendations of the Independent Review on biological parameters used in assessment (SC-CAMLR-42/02 Rev. 2).

6.20 Dr Kasatkina noted the position of Russia, repeatedly indicated at the Scientific Committee and the Commission on the need to conduct an international longline survey in Subarea 48.3 to assess the status of the toothfish population. Dr Kasatkina emphasised that, given the above, she does not support the proposed research plan.

6.21 WG-SAM-2025/15 presented a proposal by Ukraine to conduct a trawl and acoustic survey in Subarea 48.2 from 2025/26 to 2027/28. The main objective of the research is to determine the distribution and the abundance of *Champsocephalus gunnari* in the Subarea 48.2.

6.22 The Working Group noted that the research proposal would be supported by acoustic expertise from Norway, who have provided calibration of the onboard 38, 120, and 200 kHz echosounders.

6.23 Dr Kasatkina noted that the first stage of the icefish trawl - acoustic survey was completed in 2022. However, there is still no clarity on the results of this program and recalled that the external expert did not provide any analysis of the acoustic data or its quality (WG-FSA-2022, paragraph 5.45). Dr Kasatkina noted that the proposal required clarity for fundamental aspects such as the acoustic trawl survey methodology, acoustic data collection and processing procedures, expected survey results and survey catchability estimates. The proposal states that data collection and processing will be performed at three frequencies: 38, 120, and 200 kHz. However, the vessel's notification does not specify the installation of a 38 kHz echosounder. Therefore, there is still no clarity regarding the survey acoustic equipment and the proposed use of the multi-frequency data collection and processing method. The proposal specifies estimating the midwater trawl catchability, however, there is still no clarity regarding estimation of catchability and the method of assessment. Dr Kasatkina noted the proposal requires revision, taking into account the above comments.

6.24 The Working Group noted that the acoustic component of this survey will be presented to WG-ASAM-2025 for its review due to the technical expertise required.

6.25 The Working Group requested that a revised proposal be submitted to WG-FSA-2025 that addressed the following issues:

(i) the relevance of the work to CCAMLR, specifically how would the information from the survey be used by CCAMLR

(ii) clarification of trawling operations, and specifically that the trawling will take place at night during the survey

(iii) clarification of the survey data collection and processing.

Review of ongoing research plan results and proposals

Research results and proposals from Area 48

7.1 WG-SAM-2025/02 presented a revised multi-Member research proposal by Japan, Korea, South Africa, and Spain for the continuation of the exploratory fishery for *D. mawsoni* in Subarea 48.6 from 2024/25 to 2027/28. The proposal maintains the spatial design of four research blocks and includes Korea's participation from 2024/25 to enhance research capacity. The three main objectives are: (i) to provide an assessment of stock status including size/age structure of *D. mawsoni*, (ii) to investigate ecological traits of *D. mawsoni* (e.g. growth, movement and reproduction), and (iii) to improve knowledge of Antarctic marine ecosystems including by-catch composition, predator interactions, and oceanographic conditions.

7.2 The Working Group noted that this proposal was endorsed in 2024 and is currently in its first year of implementation. As there were no substantial changes to the research plan, the proposal was introduced and no issues were raised.

7.3 The proponent noted that the identified icefish nest site in Subarea 48.6 (CCAMLR-43/02. Annex 91-XX/A, paragraph 4(ii), Site 2), is located in Research Block 486_5 but at depths shallower than 550 m, where toothfish fishing is prohibited under CM 22-08, and therefore will not be impacted by fishing operations.

Research results and proposals from Area 58

7.4 WG-SAM-2025/03 presented an update of the research plan for continuing research in the *D. mawsoni* exploratory fishery in Divisions 58.4.1 and 58.4.2 from 2022/23 to 2025/26 under CM 21-02, paragraph 6(iii) for the last year of the 4-year research plan. Compared to the research plan that was presented in WG-FSA-IMAF-2024/25, there was one vessel replacement. The plan retained a proposal for structured fishing in Division 58.4.1 to allow for an evaluation of the effects of gear type on the collected data which had been developed based on a recommendation by WG-SAM-2024 (paragraph 8.19).

7.5 The Working Group noted that exploratory fishing under this research plan has been conducted in Division 58.4.2 in the past season by two Members using autoline, but that no exploratory fishing for toothfish has been allowed in Division 58.4.1 since 2018/19.

7.6 The Working Group noted that the exploratory fishery and associated research in Division 58.4.1 are important for achieving the robust assessment of *D. mawsoni* and that the research proposal has an appropriate design to meet objectives.

7.7 Dr Kasatkina noted that multiple gear types should not be used for research proposals submitted under CM 21-02 paragraph 6(iii) as research plans should be reported in accordance with the Conservation Measure 24-01, Annex 24-01/A, Format 2 which refers to standardised gear. Dr Kasatkina pointed out that there are no provisions in the rules of procedure of the Scientific Committee and the Commission for partial implementation of CCAMLR Conservation Measures.

7.8 Dr Kasatkina noted that currently, there is no scientifically based evidence adopted by the Scientific Committee that allows proponents of the program to ignore the international practice of using standardised fishing gears in multivessel resource programs. Therefore, the use of standardised fishing gear as proposed will not meet the objectives of the research plan for data-limited fisheries and comply with current Conservation Measures.

7.9 The other participants of the Working Group noted that the specially designed experiment presented in the research plan to assess the impact the different gear types on research fishing would be valuable. These participants noted that standardised gear type is not a requirement for research proposals submitted under CM 21-02 paragraph 6(iii), and recalled extensive discussion on this issue (WG-SAM-2019/25; WG-SAM-2019, paragraphs 6.1 to 6.7 and 6.54 to 6.72; WG-FSA-2019, paragraphs 4.89 to 4.114; SC-CAMLR-38, paragraphs 3.102 to 3.123; SC-CAMLR-39, paragraphs 4.10 to 4.13; WG-SAM-2021, paragraphs 8.8 to 8.14; WG-FSA-2021, paragraphs 4.17 to 4.28; SC-CAMLR-40, paragraphs 3.100 to 3.104; WG-SAM-2022, paragraphs 5.8 to 8.20; WG-FSA-2022, paragraphs 5.21 to 5.39; SC-CAMLR-41, paragraphs 3.125 to 3.136; WG-SAM-2023, paragraphs 9.12 to 9.19; WG-FSA-2023, paragraphs 4.168 to 4.174; SC-CAMLR-42, paragraphs 2.192 to 2.195; WG-SAM-2024, paragraphs 8.7 to 8.18; WG-FSA-IMAF-2024, paragraphs 4.3 to 4.10; SC-CAMLR-43, paragraph 3.67 to 3.70).

7.10 The Working Group recommended that the research proposal as detailed in WG-SAM-2025/03 proceed for Division 58.4.2, but did not reach consensus on this research plan for Division 58.4.1.

Research results and proposals from Area 88

7.11 WG-SAM-2025/09 provided a report on the results of the 2025 Ross Sea Shelf Survey – the 14th in the time series including a summary of the survey series to date. The 2025 survey was successfully conducted and confirmed strong recent recruitment of Antarctic toothfish, with smaller individuals observed across all strata. Standardised indices, including those for fish under 90 cm, showed a notable increase in abundance compared to 2023. A total of 30.1 tonnes of toothfish were caught, and two previously tagged fish were recaptured – after 5 and 10 years at liberty. Tagging efforts over the years have resulted in 2 405 tagged individuals, with a 96% tagging overlap statistic in 2025.

7.12 The survey continues to provide essential input to stock assessments and addresses 17 of the 22 research priorities under the RSRMPA research and monitoring plan. By-catch was mainly composed of *Trematomus loennbergii* and *Pogonophryne* spp, and small amounts of VME indicator taxa were recorded on most lines. The Working Group recognised its scientific value and the effective use of fishing vessels as research platforms.

7.13 Mr Dunn (New Zealand) thanked Dr Mori (Japan) for her participation on the survey and noted that she had provided a valuable contribution to the survey. Dr Mori thanked New Zealand for allowing her participation in the survey, which she found to be very constructive.

7.14 The Working Group discussed the top predator monitoring conducted onboard and agreed that more detailed information of the time series/strata will be of interest.

7.15 The Working Group noted that different variables could affect the catch rates, such as environmental factors, limited period of the year and migrations, but these did not significantly alter the standardisation of the catch rates.

7.16 The Working Group noted that scavenging amphipods could have an impact on the catch rates by, for example, consuming bait. The Working Group recommended consideration of how their presence may have affected catch rates to be provided in future analyses.

7.17 The Working Group noted that Figures 6 and 7 of WG-SAM-2025/09 had used different scales in the plots for the toothfish catch per set and requested that the scales be standardised in future reports.

7.18 The Working Group noted that a time series of the abundance of small fish as well as all fish was presented, and that the development of age-specific abundance indices was planned to be evaluated within the Ross Sea region toothfish stock assessment.

7.19 WG-SAM-2025/13 provided a notification for a research plan targeting Antarctic toothfish in the Bellingshausen Sea (Subarea 88.3) by Korea and Ukraine. This is the first year of the three-year research plan under CM 24-01 (2024/25–2026/27) endorsed in 2024 and WG-SAM-2025/20 provided a progress report on the joint research for *Dissostichus* spp. in Subarea 88.3 by Korea and Ukraine during the 2024/25 fishing season.

7.20 Research fishing was conducted by two vessels following the survey design described in WG-FSA-IMAF-2024/52 Rev. 1. Two new research blocks have been visited along with three of the existing research blocks. Two of the existing research blocks were not accessible due to sea ice. Two toothfish recaptures were reported and CPUE values were variable across blocks, with notably high catch rates in the newly incorporated research blocks 883_11 and 883_12, supporting hypotheses on westward movement and connectivity with Subarea 88.2.

7.21 Proponents noted that the two research blocks that have not been fished this season will be a priority in the next season.

7.22 The Working Group noted that although the sampling design is randomised across the research blocks, research block 883 4 showed activity exclusively in the western part of the research block and that this was due to bad weather conditions experienced by one of the vessels.

7.23 The Working group noted that ageing work on toothfish is an essential step for the development of a stock assessment. Korea informed the Working Group that they have started to progress otolith ageing over recent years (WG-FSA-IMAF-2024/62 Rev. 1, pages 13 to 15) and participated in the last two CCAMLR ageing workshops, supporting ageing work particularly in Subarea 88.3. It also noted Ukraine has already collaborated with Chinese scientists to contribute to the ageing work.

7.24 The Working Group noted the low number of tag recaptures. The Working Group noted the importance of tracking tagging performance to understand the likelihood of collecting enough tagging data to support a stock assessment. The Working Group requested the proponents consider this issue for their revision and submission to WG-FSA-2025. In research blocks 883 1, 883 3 and 883 4 the bad weather together with the planned location of the sets have prevented the return year after year to the same locations.

7.25 The Working Group requested the proponents provide a map to WG-FSA-2025 of the proposed locations of the stations along with the actual fishing locations to help to understand ability of the vessels to implement the agreed research plan.

Future work

8.1 The Working Group considered revisions to its current task list as described in SC-CAMLR-43, Table 7 and recommended the following changes:

(i) remove the 'years' columns when the table is updated but retain the timeframe

(ii) significant progress has been made in progressing Task 2 on developing an integrated stock assessment for krill. However, the Working group noted that Dr Watters has retired. The Working Group thanked him for his invaluable contributions and noted that he will be missed.

(iii) revise Task 3 to read: Evaluate tagging performance using different gear types

(iv) Dr Hoyle can be removed as a contributor to Task 4

(v) task 5 has been completed and can be removed

(vi) should the conversion factor recommendations made by WG-SAM-2025 be adopted by the Scientific Committee, Task 6 can be removed

(vii) revise Task 7 to read: Evaluate bias in tagging data in abundance estimation

(viii) revise Task 9 to read: Estimation of sample size requirements per age class for an ageing reference set

(ix) task 10 is considered to be a low priority and can be removed

(x) in addition to the tasks identified in the Terms of Reference for WG-SAM, additional tasks are prioritised within this workplan, and therefore Task 11 can be removed.

(xi) in the row labelled '1, d, ii, 1)', the rows for 'T17-6 and 7', can be removed from SAM topic lists as remaining aspects of this topic are covered by WG-FSA

(xii) add Ms Ouzoulias as a contributor to Task 12

(xiii) revise 1, d, iii) to begin with 'CCAMLR Decision Rules for finfish…'

(xiv) move rows 1, d, iii) 'T17-8, 22, and 18-10' to be included under Task 12 with other aspects of that row to be covered by WG-FSA

(xv) revise Task 14 to read: Effective sample size estimation for monitoring fish by-catch in the krill fishery

(xvi) considerable progress has been made on Task 15, and with additional work next year the Diagnostic and stock status graphs task can be removed

(xvii) add a new task to: Develop a repository of code with examples of standardised diagnostics. This should have a time frame of 'Short' and include Secretariat support with contributions by WG-SAM

(xviii) add a new task to: Develop a repository for code to estimate biological parameters, including worked examples. This should have a time frame of 'Short' and include Secretariat support with contributions by WG-SAM

(xix) add a new task to: Develop code for stock assessment diagnostics and stock status. This should have a time frame of 'Short' and include Secretariat support with contributions by WG-SAM.

8.2 The Working Group noted requests to the Secretariat for developing code repositories in 8.1 (xvii) and (xviii), and requested that the Secretariat develop a structure for these Github repositories and assist contributors to ensure that contributed code and simulated data were organised in a consistent manner.

8.3 The Working Group noted that it was given and has addressed tasks associated with improving tag bias in stock assessments and developing an MSE framework last year (SC-CAMLR-43 and 3.8 and 3.15). It noted that additional tasks from SC-CAMLR-43, paragraph 3.8 should be added to the workplan.

8.4 The Working Group noted that the current task list is ambitious and highlighted that with limited resources WG-SAM may fail to complete some tasks (paragraphs 3.4 and 9.3).

Other business

9.1 The Working Group noted that most items from the toolbox for research plan design (SC-CAMLR-38, paragraph 4.17) had been completed in the past five years due to contributions from the Secretariat and Members. These tools included: (i) mapping tools or tutorials; (ii) scripts for statistical power analysis; (iii) scripts for the random selection of stations; (iv) indications on the definition and delimitation of sampling strata; (v) diagnostic methods for sea-ice conditions; and (vi) scripts for comparative analysis of vessel tagging performance.

9.2 The Working Group noted further tool development by the Secretariat such as research planning tools within the spatial data viewer, or particle tracking tools to study stock connectivity would be useful. The Working Group recommended the Scientific Committee consider the extent to which these tools be made available for Member use throughout the year.

9.3 The Working Group also noted that additional capacity development support, being piloted as the CAP-D-LISA workshop to be held in Tenerife, Spain in the following week (23 to 27 June) also contributes to tool development for research plans.

9.4 The Working Group noted that the proposed review template for the evaluation of research plan and proposal results is likely to identify further useful analytical tools.

Advice to the Scientific Committee

10.1 The Working Group's advice to the Scientific Committee is summarised below; these advice paragraphs should be considered along with the body of the report leading to the advice:

(i) Estimating warp strikes in the krill fishery (paragraph 2.4)

(ii) Toothfish ageing programs (paragraph 3.10)

(iii) Conversion factor sampling (paragraph 3.24)

(iv) C1 form revision (paragraph 3.27)

(v) Stock assessment status projections (paragraph 5.5)

(vi) Development of MSEs (paragraph 5.12 to 5.18)

(vii) Toothfish trend analysis (paragraph 5.20)

(viii) Research plan review and proposals (paragraphs 6.2, 6.9 and 7.10)

(ix) Future work (paragraphs 8.1 and 8.4)

(x) Development of research planning tool (paragraph 9.2).

Adoption of report and close of meeting

11.1 The report of the meeting was adopted, with the adoption process requiring 2.6 hours of discussion.

11.2 Dr Okuda, noting that this was his last meeting as a convener of WG-SAM, thanked the participants for their support, and the Secretariat for their assistance. He thanked the IEO and the hosts for organising a successful meeting in a beautiful city on the beach. He noted that the short adoption process seemed to be a miracle, but that it was a result of good discussions and clear text. He confidently welcomed Mr Maschette to take over the role of convener.

11.3 Mr Dunn (New Zealand) thanked to co-conveners for their leadership and organisation, and especially Dr Okuda for his years of service, noting he should be back in a leadership role in the near future. He also congratulated Mr Maschette for the great work in his first meeting as a convener, and looked forward to the coming years of WG-SAM meetings.

11.4 Mr Maschette thanked the participants and the Secretariat for their support, and their forbearance with his rapid speaking. He looked forward to progressing the many issues within WG-SAM's workplan.

References

Cousido-Rocha M., F. Izquierdo, J. Martínez-Minaya, M. Grazia Pennino, M. Mendes, C. Silva, A.V. Silva, M. Saínza and S. Cerviño. 2024. A novel statistical approach to deal with spatial bias in maturity ogive estimation. *Can. J. Fish. Aquat. Sci.*, 81(4): 497–507. https://doi.org/10.1139/cjfas-2023-0219.

Crone P.R., M.N. Maunder, H. Lee and K.R. Piner. 2019. Good practices for including environmental data to inform spawner-recruit dynamics in integrated stock assessments: Small pelagic species case study. *Fish. Res.*, 217: 122–132. https://doi.org/10.1016/j.fishres.2018.12.026.

Dong S.S., F. Zhang and G.P. Zhu. 2024. Temporal variability in mortality and recruitment jointly influence the periodic fluctuations in Antarctic krill populations. *Mar. Environ. Res.,* 204: 106923. https://doi.org/10.1016/j.marenvres.2024.106923.

Sylvester Z. T. et al., 2025. Untangling the complexities of larval Antarctic krill overwintering success under climate change. *ICES J. Mar. Sci.*, 82(4). https://doi.org/10.1093/icesjms/fsaf049.

Table 1: Specification of the Phase 1 Management Strategy Evaluation (Phase 1, MSE) for component 1 (Generic MSE) and component 2 (Stock-specific MSE), and key parameters that the MSE should include, and harvest rules to be evaluated.

Issue	Parameters	Generic MSE (component 1)	Stock specific MSE (component 2)
Uncertainties to be evaluated	Natural mortality	X	X
	Maturity	X	X
	Growth	X	X
	Bias in abundance estimates	X	X
	Recruitment patterns	X	X
	Steepness	X	X
	Recruitment variability	X	X
	Recruitment autocorrelation	X	X
	Recruitment trend	X	X
	Stock-specific uncertainties and parameter values		X
Harvest control rules to be evaluated	Current CCAMLR decision rules for toothfish	X	
	Constant harvest rate (rule 1 in WG-SAM-2024, paragraph 6.10)	X	X
	Alternative ramp rule (e.g. rules 3 and 6, WG-SAM-2024, paragraph 6.10)	X	X

Appendix A

List of Participants
Working Group on Statistics, Assessments and Modelling
(Tenerife, Spain, 16 to 20 June 2025)

Co-convener	Mr Dale Maschette Institute for Marine and Antarctic Studies (IMAS), University of Tasmania
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CCAMLR Secretariat	Dr Steve Parker Science Manager
	Dr Stéphane Thanassekos Fisheries and Ecosystems Analyst

Appendix B

Agenda
Working Group on Statistics, Assessments and Modelling
(Tenerife, Spain, 16 to 20 June 2025)

1. Introduction
   1.1. Opening of the meeting
   1.2. Adoption of the Agenda
2. Krill
   2.1. Data collection
   2.2. Stock assessment model
3. Finfish data collection
   3.1. Ageing
   3.2. Develop methods to estimate biomass for finfish
4. Develop stock assessments to implement decision rules for finfish
   4.1 Ageing
   4.2 Tagging performance
   4.3 Stock assessment developments
   4.4. Developments in diagnostics and trends
5. Management strategy evaluations for target species
   5.1 Evaluation of the CCAMLR decision rules and potential alternative harvest control rules for assessed fisheries
   5.2 Development and testing of data-limited fishery decision rules
6. Review of new research proposals
   6.1 New proposals under CM 21-02
   6.2 New proposals under CM 24-01
7. Review of ongoing research plan results and proposals
   7.1 Research results and proposals from Area 48
   7.2 Research results and proposals from Area 58

7.3 Research results and proposals from Area 88

8. Future work

9. Other business

10. Advice to the Scientific Committee

11. Adoption of report and close of meeting

Appendix C

List of Documents
Working Group on Statistics, Assessments and Modelling
(Tenerife, Spain, 16 to 20 June 2025)

WG-SAM-2025/01	Power analysis to assist in establishing a sampling regime for Conversion Factors in CCAMLR toothfish fisheries CAMLR Secretariat
WG-SAM-2025/02	Continuation of Research on Antarctic toothfish (*Dissostichus mawsoni*) exploratory fishery in Statistical Subarea 48.6 from 2024/25-2027/28): Research Plan under CM 21-02, paragraph 6(iii) Delegations of Japan, Korea, South Africa and Spain
WG-SAM-2025/03	Continuing research in the *Dissostichus mawsoni* exploratory fishery in East Antarctica (Divisions 58.4.1 and 58.4.2) from 2022/23 to 2025/26; Research plan under CM 21-02, paragraph 6(iii) Delegations of Australia, France, Japan, Korea and Spain
WG-SAM-2025/04	New Research Plan for Toothfish (*Dissostichus* spp.) under CM 24-01, paragraph 3 in Subarea 48.2, conducted by Chile from season 2025/26 to 2027/28 Delegation of Chile
WG-SAM-2025/05	New Research Plan for Toothfish (*Dissostichus* spp.) under CM 24-01, paragraph 3 in Subarea 48.3A, conducted by Chile from season 2025/26 to 2027/28 Delegation of Chile
WG-SAM-2025/06	2025 provisional trend analysis: preliminary estimates of toothfish biomass in Research Blocks. CCAMLR Secretariat
WG-SAM-2025/07	Proposed new separate C1 trawl haul by haul forms for krill and finfish fisheries CCAMLR Secretariat
WG-SAM-2025/08	Proposal to continue the time series of research surveys to monitor abundance of Antarctic toothfish (*Dissostichus mawsoni*) in the southern Ross Sea, 2025/26–2027/28: Research Plan under CM 24-01 Delegation of New Zealand

WG-SAM-2025/09	Results of the 2025 Ross Sea Shelf Survey and summary of the survey series to date Mormede, S., M. Mori and W. Lyon
WG-SAM-2025/10	Approaches to forecasting recruitment in age-structured stock assessment modelling Dunn, A.
WG-SAM-2025/11 Rev. 1	Assessing environmental and predator impacts on Antarctic Krill (*Euphausia superba*) population dynamics from an integrated length-to-age assessment model perspective Mardones, M., E.J. Mason, A. Pinones, L. Krüger, F. Santa Cruz, C. Cárdenas and R. Methot
WG-SAM-2025/12	Considerations about the specification of a management strategy evaluation (MSE) for CCAMLR toothfish fisheries Ziegler, P.
WG-SAM-2025/13	Continuing research plan for Antarctic toothfish (*Dissostichus mawsoni*) under CM 24-01, paragraph 3 in Subarea 88.3 by Korea and Ukraine from 2024/25 to 2026/27 Delegations of Korea and Ukraine
WG-SAM-2025/14	Developing robust approaches to define areas to represent spatial structure of Patagonian toothfish in Heard Island and McDonald Islands (HIMI) Masere, C., A. Coghlan, D. Maschette and P. Ziegler
WG-SAM-2025/15	Fishery research proposal – The acoustic-trawl survey *Champsocephalus gunnari* in the Statistical Subarea 48.2 Delegation of Ukraine
WG-SAM-2025/16	Initial investigations of a sex-specific stock assessment model for *Dissostichus eleginoides* in Division 58.5.2 Maschette, D., S. Wotherspoon, C. Masere and P. Ziegler
WG-SAM-2025/17	Investigating the adherence of fisheries' tagging data-sets to mark-recapture assumptions Masere, C., A. Coghlan, D. Maschette and P. Ziegler
WG-SAM-2025/18	New Fishery Research Proposal Plan Under CM 24-01 Paragraph 3 to Conduct the Survey *Dissostichus* spp. in the Statistical Subarea 48.2 during seasons 2025/2026, 2026/2027, 2027/2028 Delegation of Ukraine
WG-SAM-2025/19	Parameters for Management Strategy Evaluation for toothfish using integrated age-structured models Dunn, A.

WG-SAM-2025/20	Progress report on the joint research for *Dissostichus* spp. in Subarea 88.3 by Republic of Korea and Ukraine in 2025 Delegations of Korea and Ukraine
WG-SAM-2025/21	Draft workflow for the calibration of Generalized Additive Models to extrapolate warp strikes observations in the krill fishery CCAMLR Secretariat
WG-SAM-2025/22	The calibration exercise of age determination of Antarctic Toothfish from Subarea 48.6 by Japanese and Spanish aging laboratories Mori, M., T, Okuda, R. Sarralde Vizuete and N.D. Gonzalez-Fernandez
WG-SAM-2025/23	Conveners Report of the 3rd Workshop on Age Determination (WS-ADM3) Owen, K., P. Hollyman, J. Devine and C. Brooks
WG-SAM-2025/24	Results from the 2024 Kerguelen shelf survey (POKER V) in Division 58.5.1 Péron, C., M. Kauffmann, N. Gasco, F. Massiot-Granier, F. Ouzoulias, C. Chazeau and A. Martin
WG-SAM-2025/25	Steps towards the development of a CCAMLR Management Strategy Evaluation Earl, T., S.R. Alewijnse and L. Readdy
WG-SAM-2025/26	Sex-disaggregated biological parameters for Patagonian toothfish (*Dissostichus eleginoides*) in Subarea 48.3 Alewijnse, S.R. and T. Earl
WG-SAM-2025/27	Recruitment assumptions in integrated assessments of toothfish Alewijnse, S.R., L. Readdy and T. Earl
WG-SAM-2025/28	Acoustic assessments of fish pelagic resources in the CCAMLR area: Some proposals on methodological aspects for fish acoustic survey Kasatkina, S.
WG-SAM-2025/29	Comments on the krill samples undertaken by observers to evaluate efficiency of SISO sampling protocols in the krill fishery Sergeev, S. and S. Kasatkina

Report of the Working Group on Ecosystem Monitoring and Management (WG-EMM-2025)

(Geilo, Norway, 7 to 18 July 2025)

Contents

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Introduction

1.1 The 2025 meeting of the Working Group on Ecosystem Monitoring and Management (WG-EMM-2025) was hosted by the Institute of Marine Research of Norway, at the Vestlia Resort in Geilo Norway, from 7 to 18 July 2025, and organised by Ms V. Vilanger (Norway).

Opening of the meeting

1.2 The meeting convener, Dr J. Hinke (United States of America (USA)) welcomed participants (Appendix A) to the meeting and noted the presence of both familiar and new participants. The participants were welcomed to the Vestlia venue, which was humbled by the extensive international involvement to a venue more typical for local people. The participants were also welcomed to Geilo by Dr B. Krafft (Norway). He noted that it was a thrill to have scientists and experts from all over the world in Geilo and pointed them to the reminders of Antarctica present, such as mountains, glaciers, and even reindeer (which until recently could be found within Subarea 48.3). He also noted the ancient cultures and history of the region and encouraged participants to explore the local nature and use the inspiration in their science to provide advice on the sustainable management of Antarctic marine living resources.

Adoption of the agenda, rapporteurs and proposed schedule

1.3 The agenda was adopted without change (Appendix B), noting a request to bring paper WG-ASAM-2025/16 forward to WG-EMM under agenda Item 4.5.

1.4 The Working Group noted that it may be desirable to incorporate direct reporting on WG-EMM work relative to the Terms of Reference (https://www.ccamlr.org/en/science/working-goup-ecosystem-monitoring-and-management-wg-emm) by providing summary text within the report that links the terms of reference to individual paragraphs.

1.5 The Secretariat provided a summary of the improvements made to the Spatial Data Viewer (https://ccamlrgis.shinyapps.io/public/), including several versions that make data available to either public, working groups, or specifically for acoustic survey work.

1.6 The Working Group thanked the Secretariat for the further development of this useful tool, which has provided an intuitive mechanism to bring all participants to the same understanding of the spatial relationships in CCAMLR data. For example, WG-ASAM-2025 found the tool useful for planning acoustic survey design relative to sea ice distribution and polar front features (WG-ASAM-2025). The Working Group encouraged further development of the tool and continuous access for Members to conduct research and support the provision of science to CCAMLR.

1.7 Documents submitted to the meeting are listed in Appendix C. The Working Group thanked all authors of papers for their valuable contributions to the meeting.

1.8 In this report, paragraphs that provide advice to the Scientific Committee and its other working groups have been indicated in grey. A summary of these paragraphs is provided under item 8 'Advice to the Scientific Committee'.

1.9 The report was prepared by P. Brtnik, D. Bahlburg and F. Bellotto Trigo (Germany), C. Cárdenas (Chair of the Scientific Committee), M. Collins (United Kingdom (UK)), M. Eléaume (France), L. Emmerson (Australia), L. Eon (France), S. Fielding (UK), N. Friscourt (France), S. Hill (UK), K. Hoszek-Mandera (Poland), E. Deehr Johannessen (Norway), S. Kawaguchi and N. Kelly (Australia), E. Kim (Republic of Korea (Korea)), B. Krafft (Norway), D. Krause (USA), L. Krüger (Chile), S. Labrousse (France), A. Lowther (Norway), A. Makhado (South Africa), M. Mori, H. Murase and T. Okuda (Japan), A. Panasiuk (Poland), E. Pardo (New Zealand), S. Parker (Secretariat), F. Santa Cruz (Chile), M. Santos (Argentina), F. Schaafsma (Netherlands), Z. Sylvester (Belgium), C. Waluda (UK), X. Wang (People's Republic of China (China)), V. Warwick-Evans (UK), C. van Werven (Secretariat), Y. Zhao and G. Zhu (China).

1.10 A glossary of acronyms and abbreviations used in CCAMLR reports is available online at https://www.ccamlr.org/node/78120.

1.11 The Working Group noted the terms of reference agreed by the Scientific Committee in 2022 and set out in SC CIRC 23/52.

1.12 The Working Group noted the workplan set out in Table 8 of SC-CAMLR-43. The Secretariat proposed options to simplify the revision of the workplan by noting revisions proposed in report text of the Working Group and developing an online composite workplan for the Scientific Committee combining topics for all Working Groups which included specific tasks lead by Members. The Working Group agreed with this approach, and to discuss additional modifications to the workplan under 'Future Work'.

1.13 The Working Group noted that scheduling WG-ASAM-2025 adjacent to WG-EMM-2025 provided an opportunity for scientists to participate in both meetings and bringing together the different but related scientific expertise in CCAMLR relative to management and understanding the ecology of krill.

1.14 The Working Group also noted that WG-ASAM-2025/04 was submitted by the Scientific Committee Bureau to identify topics about which WG-EMM sought advice from the expertise within WG-ASAM. The WG-ASAM co-conveners were present at WG-EMM-2025 to bring these considerations and feedback to WG-EMM.

Ecosystem monitoring

2.1 WG-EMM-2025/24 presented the progress towards defining high-level strategic objectives for ecosystem modelling to deliver on the Terms of References (ToRs) of the IWC Intersessional Correspondence Group (ICG) on the provision of advice on cetacean science to inform CCAMLR's revised krill fishery management approach (KFMA), CEMP, and ecosystem modelling. The document outlined a proposed paper to be presented at the IWC

Scientific Committee meeting in April 2026 that will address the high-level strategic objectives, relevant modelling efforts and guidance for modellers. The authors will work with relevant experts from both organisations.

2.2 The Working Group welcomed the paper recognising the value of the work for EMM on krill-whale interactions, including in the Krill Fishery Management Approach (KFMA).

2.3 The Working Group noted the modelling components needed to inform management discussions for both CCAMLR and IWC, pointing out that for this specific task the focus was on whales and krill, while recognising that for future work on food webs, other existing ecosystem models, including those with a broader range of components, could be considered.

2.4 WG-EMM-2025/29 summarised the voyage ACTUATE (AntarCTic soUthern oceAn scientific rEsearch) onboard the RV *Tangaroa* conducted in 2025. The voyage objectives were aligned to the specific objectives and the RMP of the Ross Sea Region Marine Protected Area (RSrMPA). Sampling effort was designed to address a wide range of areas and ecosystems, and the voyage objectives included hydrography, benthic ecology, fish eDNA, oxygen budgets and zooplankton. The main survey area was the Western Ross Sea from Iselin Bank to Cape Adare and as far south as the Ross Ice Shelf front. The paper highlighted the importance and benefits of autonomous monitoring such as ocean gliders and Argo profiling floats.

2.5 The Working Group recognised the success of the voyage, the international collaborations and the value of the data collected in the framework of the research and monitoring plan of the RSrMPA, particularly for its specific objectives and review. The Working Group noted the importance of standardising data collection procedures and protocols for eDNA, inclusion of acoustic data collection as well as predators and bird observations. The authors welcomed further collaboration with other CCAMLR scientists for the next survey planned in 2027.

2.6 WG-EMM-2025/40 presented the current status and advances of the WOBEC (Weddell Sea Observatory of Biodiversity and Ecosystem Change) project, a three-year EU funded research program that started in April 2024. WOBEC project outcomes support the development of a systematic ecosystem monitoring framework for the eastern Weddell Sea / Kong Haakon VII Sea. The paper highlighted the activities and outcomes of the first year, including a first version of a data management plan and a first draft of a catalogue of standard operating procedures to prevent loss of methodological expertise over time. The paper also provided an outlook of upcoming activities such as a second stakeholder workshop in November 2025 and the expedition with RV *Polarstern* (PS152), from December 2025 to February 2026 in the WOBEC study area.

2.7 The Working Group congratulated the authors on the project and the work done so far, in particular the open and transparent data management plan. The authors encouraged CCAMLR scientists to join the project.

Krill biology and ecology

2.8 WG-EMM-2025/48 Rev. 1 presented the preliminary results of a multidisciplinary krill survey covering five core candidate management units (MU) of the revised KFMA in Subarea 48.1 in February 2024. Analyses were focused on potential linkages between krill distribution, stock structure and water masses. Preliminary results indicated distinctive geographic distribution patterns between spawning and juvenile krill. Spawning krill was mainly distributed in offshore waters beyond the shelf break dominated by the Transitional Bellingshausen Water (TBW) and the modified Circumpolar Deep Water (mCDW), while juveniles were mostly observed in the Antarctic Peninsula shelf water within the Bransfield Strait and Joinville Islands waters dominated by the Transitional Weddell Water (TWW) and mCDW. These findings suggested that oceanographic processes may play a critical role on shaping krill stock structure distribution. The authors highlighted the importance of stage-specific distribution information for the development of the Krill Stock Hypothesis (KSH) and the improvement of the KFMA.

2.9 The Working Group congratulated the authors on the amount of valuable data collected, stressing the importance of these datasets to improve KFMA in relation to the KSH and knowledge about stock structure in the region. The Working Group noted that the distribution pattern of the spawning and juvenile kill observed from this survey is consistent with previous findings (Siegel, 1988) and noted that spatial distribution and seasonality of krill stock structure are important for future krill fishery management. The Working Group noted that for biomass estimation purposes, day and night size sampling needs to be analysed separately. The Working Group further noted that such datasets are useful for predator modelling in the Bransfield Strait and encouraged further collaboration on progressing this work.

2.10 The Working Group noted that further analyses are needed to investigate the sex difference in length at 50% maturity observed during this survey, which appears larger than previous estimates from samples collected in early spawning season.

2.11 The Working Group noted that while the Grym assumes equal fishing mortality across age classes, the spatial stage segregation implies that this assumption might not always apply. The Working Group encouraged analysis of the sensitivity of Grym predictions to other assumptions about life stage-specific fishing mortality to be assessed in the future.

2.12 The Working Group further noted that the CMIX method was used for krill cohort analysis based on krill length distribution from this survey and encouraged further development of such method on krill age class identification.

2.13 WG-ASAM-2025/21 Rev. 1 presented the preliminary results from the krill acoustic surveys conducted by the Chinese fishing vessel *Long Fa* in Subarea 48.1 during the austral summer of 2025. Results covered the five MUs in Subarea 48.1 (GS, JOIN, BS, EI and SSIW) of the KFMA and included krill acoustic density, length-frequency distribution and water mass analysis.

2.14 The Working Group congratulated the authors for their comprehensive work that included oceanographic, biological, and acoustic data collection delivered in a short time. The Working Group noted the difference of spatial distribution results between February 2024 and January 2025, probably due to reduced reproductive activity in February, and suggested further work is needed to understand these differences. The authors noted that further surveys are planned for the next seasons provided funding is available. The Working Group noted that the survey was conducted during both daytime and night-time, suggesting that there is variation in the diurnal behaviour of krill and a potential underestimation of the krill biomass distributed near the surface at night.

2.15 WG-EMM-2025/56 presented results from the multidisciplinary oceanographic research voyage onboard IBRV *Araon* in March 2024. The paper reported on the first acoustic survey of Antarctic krill (*Euphausia superba*) density distribution in the Krill Research Zone (KRZ) of the RSrMPA. The results showed that horizontal and vertical distributions of Antarctic krill reveal a pronounced ontogenetic segregation across the Ross Sea survey area, where juveniles were primarily concentrated near the seasonal ice-edge at high-latitude while sub-adult and adult krill are predominantly found at lower latitudes and deeper depths. The results further showed developmental stages differed in swarm depth and packing concentration and showed significant negative correlations with water temperature and distance from the ice edge. The authors highlighted the importance of stage-specific monitoring of krill populations and biomass estimates for management approaches.

2.16 The Working Group welcomed this first krill density and biomass estimation survey in the RSrMPA KRZ especially in regard to the contribution towards the objectives (vi) and (xi) of the RSrMPA and its upcoming review. The Working Group noted that while the area is likely an important foraging area for Antarctic blue whales, the KRZ is a data deficient area for krill. The Working Group acknowledged the new methods used to assess age classes using acoustic data, and noted the possible application of this approach to study interactions of predators with different age classes of krill.

2.17 The Working Group noted that there are regional differences between the Ross Sea and the Antarctic Peninsula with regard to the distribution of spawning krill during autumn, but similarities in age class distribution, and encouraged further investigation of the differences.

2.18 The Working Group recommended work to clarify the nomenclature of age classes and maturity stages and encouraged observations of predators during future surveys.

2.19 WG-EMM-2025/69 presented a study on the physical drivers of larval krill transport into the Bransfield Strait nursery area using a circumpolar regional ocean model system (ROMS) with embedded Lagrangian drifters. Results showed that, along with a combination of bathymetric constraints and development of vertical migration behaviour, summer wind regimes were highly influential on larval transport and also highlighted the importance of capturing interannual variability in environmental forcing and larval behaviour in connectivity models. The findings supported the development of the KSH by identifying key source-sink relationships and suggest the northwestern Weddell Sea to be a spawning or nursery area.

2.20 The Working Group congratulated the authors and recognised the value of their work. The Working Group noted the importance of including multiple years and interannual variability in the model and to independently ground truth assumptions on mortality of embryos based on embryo size and sinking trajectories. The Working Group noted that additional environmental parameters such as sea ice concentration and water temperature were tested but showed no significant relationship and that tidal currents will be addressed by a higher resolution version of the model. The authors shared that the data could be analysed to answer a number of questions and are publicly available from the Biological and Chemical Oceanography Data Management Office (BCO-DMO https://www.bco-dmo.org/dataset/964861). The Working Group noted previous work existed on water transport (WG-EMM-2024/55) and tidal current models (Zhou et al., 2020) that can be used to test theories generated by the model analysis. The Working Group noted the use of models may improve the understanding of the larval krill transport in this region and support the information for the KSH.

2.21 WG-EMM-2025/P06 presented a study on the interannual variability in fatty acids in Antarctic krill based on data collected by krill fishing vessels *Long Teng* and *Fu Rong Hai* in the Bransfield Strait (BS) during five consecutive autumns from 2015 to 2019, revealing seasonal food availability for krill. The results showed that krill were generally in good feeding condition in the BS in autumn, suggesting that BS could be considered an important foraging ground as well as an area that supports overwintering. It further indicated that krill fatty acid content displayed substantial inter-annual variation, which was potentially driven by phytoplankton productivity. The results further showed that krill exhibited differentiated feeding abilities and lipid retention based on their size, with the length-weight relationships and lipids of krill varying interannually. The authors highlighted the need for consideration of the effects of lipid retention when performing a stock assessment.

2.22 WG-EMM-2025/P08 presented a study on diet composition and trophic ecological niches of Antarctic krill and the pelagic tunicate (*Salpa thompsoni*) in the BS during autumn in 2022 using fatty acids, stable isotopes and stomach content analysis. The results showed a low overlap of the trophic niches, while the differentiated feeding pattern occupied by the two species promoted their coexistence.

2.23 WG-EMM-2025/P09 presented a study on the diet variability of Antarctic kill by using fatty acid profiles of the krill-dependent predator mackerel icefish (*Champsocephalus gunnari*) from South Georgia during winter and South Orkney Islands during summer. Results show that fatty acid patterns of *C. gunnari* closely reflected those of krill, indicating that prey diet composition drove predator fatty acid variations rather than dietary diversity of the predator. The authors highlighted the possibility of this novel approach to infer krill feeding ecology and trophic interactions during periods of limited direct sampling.

2.24 The Working Group thanked the authors and welcomed this valuable dataset coming as added value from fisheries activities. The Working Group cautioned using *C. gunnari* collected from krill trawlers alone to describe diet for the species, as they may not represent the feeding ecology of the species as a whole. Some individuals may feed on other sources, for example, from benthic and myctophid species and sampling from fishing vessels may select for those who feed mainly on krill. The Working Group recalled the existence of an alternative food chain for icefish in relation to krill, which is important to consider for using fatty acid profiles of mackerel icefish. The Working Group further noted the ongoing collaboration between the teams from China and the UK may provide an opportunity to address this.

2.25 The Working Group highlighted that additional oceanographic or environmental data are needed to complement fisheries datasets. The Working Group noted that such datasets are welcome to be added into SO DIET, a SCAR database for isotopic datasets. The Working Group recognised that the biomarker approach is a useful tool and could be included in the data collection plans but needed further improvements. The Working Group further noted that biomarkers may be useful to estimate length-weight relationship used for the krill stock assessments.

2.26 The Working Group noted that krill present a flexible strategy in response to co-existence competition for space and resource use, and this provides an insight for the future modelling of krill habitat, as indicated in WG-EMM-2025/P08.

Advice from WG-ASAM

2.27 The co-convener of WG-ASAM (Dr Fielding) presented a summary of the discussions on specific items of mutual interest between WG-ASAM and WG-EMM, which included:

(i) Acoustic survey design for Subarea 48.1 and future application on Subareas 48.2 and 48.3

(ii) Inter-transect and inter-station distance in areas with higher footprint of the fishery (core areas) compared with the open ocean

(iii) Transect extent in relation to areas with limited accessibility (due to sea ice extent in winter) or absence of krill (e.g. areas north of the Polar front)

(iv) Biological sampling requirements (krill length frequency) for acoustic surveys versus other sampling for other biological parameters that might be required for population dynamics or the KSH. This included the review of the biological sampling to be used for the acoustic biomass estimate surveys

(v) Standardisation or comparison of selectivity of different research trawl types

(vi) Noting that after the modifications of the candidate Management units (MUs) boundaries conducted after WG-ASAM-2024, some MUs (such as DP1 and PB2) may not have sufficient data to recalculate biomass estimates

(vii) Development of analyses comparing model-based estimates versus Jolly-Hampton (or design)-based estimates (intersessionally via a Discussion Group).

2.28 The Working Group noted WG-ASAM discussions on the use of several scientific research trawls that are currently used to collect krill length information for acoustic biomass surveys, and the need for identifying the selectivity and avoidance of different research nets. The Working Group discussed and revised some practical guidelines developed by WG-ASAM for standardising and comparing different research trawl types (Table 1). The Working Group requested the Scientific Committee task the Secretariat to circulate the survey form to Members and compile the responses to WG-ASAM-2026 and WG-EMM-2026.

2.29 The Working Group also discussed differences in mesh size for post-larval krill sampling and recommended the use of research trawls for acoustic surveys with a stretched mesh size of 9 mm or less.

2.30 The Working Group noted that biological variables required to be sampled during acoustic surveys may not necessarily be the same as those required for other purposes, such as krill biological parameters to support the development of the KSH. Hence it was noted that discussions among experts from WG-ASAM and WG-EMM during this meeting would be very beneficial to advance on the design of surveys that will inform different purposes. It also noted the importance of discussions among experts of both groups at this stage where there is a need to operationalise the development of acoustic surveys and the collection of other biological parameters.

2.31 The Working Group, in response to WG-ASAM discussions, highlighted the importance of further work on the development of model-based estimators and the integration of different data sources generated from new platforms other than vessels (e.g. gliders, mooring, etc). It also noted the importance of spatial scale and timing required of surveys that will be developed for different purposes.

2.32 The Working Group highlighted the importance of integrating the work of both groups and noted the current adjacent meetings (WG-ASAM and WG-EMM) was a very good opportunity for having experts attending both meetings discussing topics of mutual interest.

Population status and dynamics

2.33 WG-ASAM-2025/15 presented updated Antarctic krill biomass densities in Bransfield Strait using two Teledyne Webb Research Slocum G3 gliders (AMLR03 and AMLR04) during 2023/24 to correct the results presented in WG-EMM-2024/53 using the same datasets. The authors conducted a recalibration procedure using a new method because they hypothesised that error was induced by the original calibration. Their results suggested that this revised calibration procedure corrected previously reported differences. In addition to this, the U.S. AMLR 2025/26 plan includes the deployment of two gliders and up to 12 moorings in collaboration with partners operating in Subarea 48.1. One glider has an echosounder to estimate krill biomass and the other has a shadowgraph camera to capture images of small zooplankton and krill larvae. U.S. AMLR plans to deploy nine moorings, and collaboration is sought to deploy the remaining three in the Bransfield Strait. The moorings are equipped with ADCP, echosounder, and CTD sensors and will form an approximate ring around a historically high krill density area to investigate krill flux.

2.34 The Working Group noted that the U.S. AMLR program has made significant progress with developing autonomous technology to study krill biomass and population structure. It noted that the glider tracks closely followed the planned routes, demonstrating excellent navigation abilities. Nonetheless, the use of such technology requires continued refinement, e.g. additional comparisons of krill length frequencies derived from predator diets versus traditional trawl samples. The Working Group noted some of the challenges and benefits associated with autonomous monitoring and pointed out the benefit of collaboration with other programs particularly around deployment and retrieval.

2.35 The Working Group noted that moorings could be damaged by other operations including fishing and requested Members to provide information about the locations and components of moorings to the Secretariat for communication to Members for both safety and to enhance collaboration on the scientific data generated by the moorings and suggested that the Scientific Committee request mooring locations that may interfere with the fishery be notified to the fishery via the Secretariat.

Krill stock hypothesis and life history parameters

2.36 WG-ASAM-2025/02 presented ideas for integrating the Krill Stock Hypothesis into the revised Krill Fishery Management Approach to (i) ensure that management measures align with the most current and reliable ecological knowledge; (ii) establish a comprehensive framework for assessing catch limits in the face of uncertainties, including those related to climate change, and (iii) support the development of adaptive management strategies that evolve through the continuous collection of data on key ecological factors regarding krill and their primary predators. Implementing this approach will require targeted and collaborative data collection and a centralised data sharing network. The paper presented case studies to demonstrate how fisheries can contribute to data collection while promoting sustainable management. A major challenge in this effort is securing long-term funding for data collection.

2.37 The Working Group welcomed further elaboration of ideas about the development and use of the KSH and noted that the structure and connectivity of the stock should be accounted for in long term management of the fishery. The Working Group noted that the KSH can be used to test assumptions embedded in the KFMA, such as self-sustaining stocks at the subarea scale. The Working Group noted the need for clear language to distinguish between fishable krill stocks and the wider krill population. It discussed the conservation of different krill life stages.

2.38 The Working Group reviewed the trawl gear information survey form that have been developed by WG-ASAM-2025 (WG-ASAM-2025, Table 3). The form was updated by the Working Group to ensure all information required by WG-EMM will be collected, including for the purpose of informing the KSH.

2.39 The Working Group requested the Secretariat to finalise the form and circulate it to all Members to collect information on the sampling nets that are being used for surveys.

2.40 The Working Group recognised the variation between research groups in the design and mesh size of nets that are currently used to sample krill. The Working Group recommended that to ensure the retention of post larval krill the stretched mesh size should be 9 mm or less (paragraph 2.29), and a mesh size of up to 330 micrometres be used for the sampling of the larval stages of Antarctic krill.

2.41 The Working Group developed a plan for the collection of biological information of krill, such as the distribution of larval and post-larval stages, which specifies the frequency and timings of sampling, the spacing between stations, measurements that need to be undertaken, and the timeframe for sample processing (Table 5).

2.42 The Working Group recommended that the Scientific Committee endorse the objective of incorporating a continuously updated KSH into the relevant components of the KFMA to inform the development of measures to conserve krill stocks and hence their predators.

2.43 WG-EMM-2025/P03 presented the results of the investigation of Antarctic krill distribution and biomass using eDNA collected from surface and seafloor in East Antarctica during the 2021 RV *Investigator* TEMPO survey by the development of a set of species-specific genetic markers to quantify Antarctic krill eDNA. Additionally, the eDNA age was estimated based on the level of eDNA fragmentation detected in each sample. This research revealed the following four points: (i) at the surface, there was a higher probability of detecting krill swarms acoustically near newer eDNA than near older eDNA; (ii) at the seafloor, recent eDNA was detected on the continental slope, which was consistent with visual detections; (iii) newer eDNA likely indicated the presence of live krill in the vicinity of the sample; and (iv) eDNA abundance decreased with the increase in the distance to swarms. The authors concluded that this new method helps investigate the distribution and habitat of krill and associated species, especially in hard-to-access areas.

2.44 The Working Group welcomed this interesting result using a new method and discussed the adaptation of this method to other species. The Working Group noted that eDNA could be advected away from the site where it was shed and that the age of the eDNA might help to identify advected distance.

Krill predator biology and ecology

2.45 The WG-EMM-2025/53 reported on the sixth research cruise of the JASS-A (Japanese Abundance and Stock structure Surveys in the Antarctic). The plan for JASS-A program was to cover two-thirds of the circumpolar Antarctic Ocean from 0° to 120°W longitude (IWC Management Areas III–VI and CCAMLR Areas 48, 58 and 88) over an eight-year period from 2019/20 to 2026/27. The research followed IWC's sighting survey guidelines. The 2024/25 survey was conducted during the austral summer of January–February 2025 over a period of 41 days using the research vessels *Yushin Maru No. 2* and *Yushin Maru No. 3*. During the survey, various whale species were observed, including Antarctic blue whales, fin whales, Antarctic minke whales, humpback whales, southern right whales, southern bottlenose whales, and killer whales.

2.46 Research activities involved photo-identification, biopsy sampling, and the deployment of satellite tags. Satellite tags were deployed on 25 Antarctic minke whales, 10 fin whales, and two humpback whales. The survey area was divided into two strata – northern and southern – and followed a zigzag track line design with randomised starting points. The most abundant species was a humpback whale, while the second most frequently sighted species was the Antarctic minke whale, particularly in the southern stratum. The collected data and samples will be analysed and presented to CCAMLR in future reports.

2.47 The Working Group expressed appreciation for the results and noted the research was conducted in line with IWC guidelines using a distance sampling method and zigzag track line design aimed at covering the survey area efficiently in a statistically robust design.

2.48 The Working Group noted that the humpback whale populations in the survey area appear to be recovering, in line with observations in the Antarctic Peninsula area.

2.49 The Working Group noted it would be useful to analyse species distribution or potential overlaps relevant to MPA proposals. The authors further suggested the data may be used for a Spatial Overlap Analysis (SOA) once abundance estimates are derived.

2.50 The Working Group highlighted the large number of satellite tag deployments and inquired as to whether the movement of tagged animals was monitored in the days after a tag is implanted. The authors responded that unusual movement patterns were sometimes observed during this time, and this aspect is worth further investigation.

2.51 WG-EMM-2025/57 provided the first description of the spatial scale of pelagic krill predators and fisheries overlap in Subarea 48.1. The largest overlap between whales and fishery areas was observed with humpback whales in the areas of Gerlache and Bransfield straits.

2.52 The Working Group underlined that given increasing populations of whales and increasing catch in the krill fishery, multidisciplinary research (e.g. acoustic surveys, satellite tagging) is crucial for informing spatial management that could help minimise interactions between whales and fisheries.

2.53 The Working Group noted that some of the spatial overlap may be the result of the number or starting locations of individuals tagged, and that this needed to be accounted for in the analysis.

2.54 The Working Group noted issues in WG-EMM-2025/57, namely that the errors remaining in post-modelled whale location data were of the same scale that overlap was considered to occur, meaning overlap at the scale of 66 sq km / 0.1 degree x 0.1 degree grid cell (as suggested by the authors) could not be assumed. Additional concerns regarding the utility of First Passage Time (FPT) as a metric of search radius were raised, given that the greater accuracy of AIS information from fishing vessels implied a better estimate of search radius for fishing trawlers could be modelled. Similarly, the use of FTP as a metric for search radius of whales was questioned, given that the whale location data were treated by a model which can simultaneously estimate when whales were entering (and exiting) Area Restricted Searching.

2.55 Finally, some participants recognised that the co-location of whales and fishing trawlers at such coarse scales do not necessarily translate into a functional interaction between the two.

2.56 Some participants recognised that despite the methodological issues pointed out, the document is useful for guiding management advice.

2.57 Despite the uncertainties and issues raised regarding WG-EMM 2025/57, the Working Group further noted that understanding the nature of any overlap would require estimating the abundance of cetaceans and their potential krill consumption, as well as the krill biomass variability in the study area by conducting acoustic surveys there. The Working Group also noted that it is necessary to consider the krill flux through the study area and its effect on the krill biomass and distribution in the area.

2.58 The Working Group noted that a shared understanding of terms such as ‘competition’, ‘overlap’, ‘spatial overlap’, ‘functional overlap’ and ‘interaction’ is necessary.

2.59 The Working Group distinguished between the provision of uncertainty around a numerical analysis and the lack of evidence supporting an outcome. It noted that the former should be presented as a range of uncertainty around a parameter estimate, whereas the latter implies that management actions cannot be based on scientific certainty and should proceed under the precautionary approach.

2.60 Some participants of the Working Group recalled the importance of applying the precautionary approach when scientific evidence is uncertain. In particular, an absence of evidence of competition between the fishery and krill predators should not be regarded as evidence of absence of competition.

2.61 The Working Group recognised that estimating status of ecosystem interaction for precautionary krill fishery management would benefit from the development of a standardised approach to data collection and processing; development of scientifically based criteria and diagnostics to assess the possible ecosystem impact of the fishery, taking into account the mixed effects of fishing, environmental variability (or climatic changes), and the competitive relationship between predator species.

Population status and dynamics

2.62 WG-EMM-2025/15 reported on the U.S. Antarctic Marine Living Resources Program (U.S. AMLR) annual field study for 2024/25 assessing the status and trends of CCAMLR Ecosystem Monitoring Program (CEMP) penguin and seal indicator taxa in the South Shetland Islands, Antarctica (Subarea 48.1). Notable results from 2024/25 included the 4th highest krill recruitment event observed in predator diets since the early 1990s and continued, rapid growth in gentoo chick production. The paper also reported on the first census since 1980/81 of a large colony of chinstrap penguins at False Round Point, King George Island. This report updates results first presented in WG-EMM-2024/18 Rev. 1.

2.63 The Working Group recognised that the krill length-frequency distributions from penguin diets presented in WG-EMM-2025/15 demonstrated similar patterns across several species and sites, and these patterns could be used to provide information on krill recruitment cycles.

2.64 The Working Group recognised the value of long-term monitoring datasets and updating historical population counts, in particular updating of information for the False Round Point chinstrap colony, to improve consumption estimates used in the Spatial Overlap Analysis. In this context, the Working Group noted work currently underway at the British Antarctic Survey to analyse 2013–14 surveys of penguin colonies in the South Shetland Islands.

2.65 WG-EMM 2025/32 presented the results of the first synoptic census across the entire range of the South Shetland Islands Antarctic fur seal (SSAFS) population since 2008 conducted by the U.S. Antarctic Marine Living Resources Program. The survey was completed in January 2025, along with collaborators from the Chilean Antarctic Institute (INACH) and the University of Chile. The paper summarised the SSI survey to census SSAFS and collect samples to monitor high pathogenicity avian influenza (HPAI). The paper reported no evidence for HPAI infection in seabird or pinniped colonies. Furthermore, the paper noted that the SSAFS subpopulation has decreased by over 88% since 2008 surpassing the IUCN criteria for a critically endangered subpopulation.

2.66 The Working Group acknowledged that the survey represented in WG-EMM-2025/32 is a valuable update to the status of SSAFS, and noted that the recent increase in pup survival rates had not yet translated into increased recruitment back into the population.

2.67 The Working Group noted that the updated survey data presented in both WG-EMM-2025/15 and WG-EMM-2025/32 incorporated data on different species that exhibit contrasting population trajectories, potentially representing the degree of complexity of the ecosystem. The Working Group further noted the presence of five king penguins at False Round Point, potentially representing how animals are trying to adapt to climate change, and agreed that further monitoring was worthwhile.

2.68 The Working Group noted that a submission to the IUCN Species Survival Group Pinniped Specialist Group to assess Antarctic fur seal population status against the criteria for listing as Critically Endangered may strengthen a case for classifying Antarctic fur seals as a Specially Protected Species. The authors agreed and clarified that an assessment of the whole species is currently under review by the IUCN.

2.69 The Working Group recalled that, in the context of the differing population trajectories presented in WG-EMM-2025/32, gentoos exhibit greater dietary and life history plasticity than other penguin species which may translate into an ability to adapt to ecosystem change. The Working Group discussed the recent increase in SSAFS pup survival in the context of leopard seal predation, noting that the historical declines in pup density may have resulted in leopard seals switching to a different prey source. The Working Group noted that the vulnerable status of the SSAFS population needs to be taken into account while considering future management plans.

2.70 The Working Group noted that although no widespread HPAI infection was detected during the survey (paragraph 2.65), influenza had been observed in Subarea 48.3 (WG-EMM-2025/21), emphasising the importance of continued HPAI surveillance.

CEMP and other ecosystem monitoring needs

2.71 WG-EMM-2025/06 provided an update of data submitted to the Secretariat from nine Members for 20 CEMP sites during the 2024–25 monitoring season. The suspected presence of HPAI was reported to have prevented data collection at several sites. The paper also provided visual summaries of data types and time series, including maps of the spatial overlap between krill fishing effort and catch and current CEMP sites in Area 48 over the past decade. The paper noted that the distribution of distances between CEMP sites and fishing events in the 2024/25 fishing season were significant and may be due to the expiration of Conservation Measure 51-07. The paper also highlighted the utility of the CCAMLR Spatial Viewer tool as a valuable resource for accessing and displaying environmental and fishery spatial data which may aid in the development of an enhanced CEMP approach.

2.72 The Working Group recommended that the Scientific Committee implement revisions to update CEMP data submission forms to allow reporting of HPAI presence at CEMP sites. It reiterated the importance of monitoring the impacts of HPAI and other potential viruses and recognised the need to establish or maintain baseline data. The Working Group clarified that it is the responsibility of each national program to report evidence of HPAI to the SCAR Antarctic Wildlife Health Network (AWHN).

2.73 The Working Group noted the importance of distinguishing between null and zero values in CEMP data submissions, particularly in the context of ongoing efforts to improve data quality and enable further analysis, and tasked the Secretariat with updating the forms to support this distinction.

2.74 The Working Group recognised that some Members are unable to process and submit all recent field season data in time for the annual update to WG-EMM. It tasked the Secretariat with including a summary of previous season submissions in future iterations to ensure the updates remain comprehensive.

2.75 The Working Group recalled WG-EMM-2025/60 (paragraph 2.89), which highlighted the importance of establishing CEMP sites both near to and distant from fishing activity to better distinguish fishery impacts from environmental variation. It noted that while some sites may be ideal for monitoring due to their ecological relevance, practical constraints such as access may limit the establishment of long-term infrastructure. In such cases, these sites could still contribute through less frequent monitoring and integration with existing long-term sites, following the hierarchical approach applied by Australia in WG-EMM-2023/45. The Working Group noted that CEMP data can be submitted to the Secretariat from non-CEMP sites, provided the surveys are conducted using standard CEMP methods and reported through the standard CEMP data submission form, and that such submissions are encouraged. The Working Group recognised that the current CEMP forms would require modification to clearly distinguish between data from established CEMP sites and those from non-CEMP sites. The Working Group tasked the Secretariat with facilitating the necessary updates to the forms.

2.76 The Working Group sought to identify additional spatial data that would assist CEMP review teams and tasked the Secretariat with separating the fishing distance distribution plots into summer and winter to identify when the fishing events were occurring. The Working Group noted that this distinction is important as seasonal differences may impact distances to fishing effort and catch. The Working Group also requested that the overlap maps be seasonal. It was noted that these visuals can be created using the new Spatial Data Viewer, with options to select individual months and species, and requested these standardised views be provided in future iterations of the Secretariat's report.

2.77 WG-EMM-2025/17 identified gaps in data available from ecosystem monitoring in Subarea 48.1 to inform and facilitate enhanced monitoring. The authors identified four key data streams: land-based monitoring, at-sea predator monitoring, krill-related data, and the proposed D1MPA. They highlighted the need to improve spatial and temporal coverage, and better integrate at-sea predator data for effective monitoring in Subarea 48.1. The paper also outlined requirements for an enhanced CEMP, including establishing a minimum monitoring level per management area, setting a timeframe for implementation, and ensuring a functional link between monitoring data and management actions.

2.78 The Working Group welcomed the paper and acknowledged the need to define the specific monitoring questions for potential effect to guide survey methodology (paragraphs 2.133 to 2.144).

2.79 WG-EMM-2025/22 presented a comparison of the performance of three mesozooplankton sampling techniques as to identify the most effective tools for monitoring lower trophic levels. The authors compared in situ imagery using an Underwater Vertical Profiler with benchtop scanning of net samples using Zooscan, and microscopy of net samples. While microscopy was the best for taxonomic identification, it was resource intensive. Benchtop imaging allowed for high-throughput processing, and in situ imagery, and although less destructive for identification of fragile organisms, had very low detection rates. The authors concluded that a combination of these methods would be the most effective.

2.80 The Working Group welcomed the paper and recognised the value of comparing sampling methods, particularly in understanding mesozooplankton like copepods, which are important in krill diets. The Working Group inquired about the difference in depths at which the two net types were sampled, which affected the comparability of the samples collected. The authors noted that logistical problems with net deployments had been resolved.

2.81 WG-EMM-2025/50 provided an update on an eight-year comparative study of DNA metabarcoding from guano samples and stomach lavage for describing the composition of Adélie penguin diets at Signy Island (Subarea 48.2). The paper compared the two approaches and made recommendations for developing a faecal DNA metabarcoding method for diet analysis as an additional method for CEMP Standard Method A8. The authors suggested that they are prepared to develop a protocol and standard method if that would be of use to WG-EMM.

2.82 The Working Group welcomed the study and recognised that DNA metabarcoding is a valuable approach for the analysis of diet data. The Working Group noted that the metabarcoding approach resulted in a higher proportion of fish in the diet than the lavage method in some years and suggested that this may be due to larval fish which are detected in DNA but are not easy to identify in lavage samples. The authors clarified that the weeks '1–5' presented in comparisons were based on a biological cue rather than a calendar date, so they may shift slightly between years but that aligning the time of year would be possible with these data.

2.83 The Working Group recommended the Scientific Committee support the development of a standard faecal DNA metabarcoding method for diet analysis, as an additional CEMP standard method to complement Standard Method A8.

2.84 The Working Group encouraged the authors to coordinate the development of this form with interested researchers and the Secretariat. The Working Group recognised that this method could be updated in the future to incorporate additional genetic markers as needed, and that iterative updates would be required to update taxonomic identifications as new reference DNA sequences become available.

2.85 The Working Group suggested that lavage samples or the collection of stomach contents when the penguins regurgitate can provide a measure of krill length frequency data, and this could be linked with local fishery data. The authors clarified that experiments conducted on captive penguins suggested that the relative abundance reported in DNA samples was similar to the proportion of prey items in their controlled diet. The Working Group also noted that combining tracking and diet data to identify geographic areas of particular prey types (e.g. larval fish), would be valuable in areas where predators and the fishery overlap.

2.86 WG-EMM-2025/59 described the first year of CEMP monitoring of Adélie penguins at Seaview Bay, Inexpressible Island (Ross Sea region) in 2024/25, undertaken by China and Korea. The site hosts a breeding population of approximately 30 000 pairs. High-resolution drone counts and ground observations were applied twice to obtain updated population counts and the body mass of twenty-five individuals was also obtained. South Polar skuas in the same region were also monitored. As this colony is close to the new Qinling research station, this CEMP monitoring program will be further developed in the future.

2.87 The Working Group welcomed the study, field effort and, in particular, the collaboration between several national programs to continue the time series of population counts and establish additional CEMP monitoring in the Ross Sea. The Working Group suggested that traditional ground-based and drone-based census methods be conducted concurrently to validate their methods. It also suggested the use of time-lapse cameras as a monitoring tool for this site given the difficulty of accessing it. The Working Group encouraged the authors explore ways to coordinate efforts from interested Members to contribute to this monitoring program.

2.88 The Secretariat clarified that the new site is in the process of being added to the official CEMP site list.

2.89 WG-EMM-2025/60 presented a spatial modelling approach to identify additional krill predator monitoring sites in Subarea 48.1 with the aim of expanding data collection to facilitate CEMP monitoring. The authors emphasised the importance of matching the spatial scale of data collection relative to a focal management area to allow for meaningful detection of trends amongst the variability of the environment and anthropogenic effects. The paper qualitatively defined potential management areas based on known oceanographic boundaries and focused on penguin breeding colonies as a target monitored species. Using available CEMP data and penguin colonies from Mapping Application for Penguin Populations and Projected Dynamics (MAPPPD), combined with accessibility based on Council of Managers of National Antarctic Programs (COMNAP) station locations and International Association of Antarctic Tour Operators (IAATO) site visitations, they presented two sets of potential monitoring sites; one based on maximising spatial coverage by foraging penguins, and another based on prioritising accessibility.

2.90 The Working Group welcomed the results of the modelling exercise and noted the importance of developing a systematic approach to prioritising potential future monitoring sites for CEMP, and for the KFMA in general.

2.91 Some concerns were made stating that introducing a new set of proposed management boundaries may be counterproductive at this stage and the use of tourist visitation sites may impact future analysis due to known behavioural impacts on predator colonies due to tourism.

2.92 The Working Group commended the approach of WG-EMM-2025/60 for identifying spatially relevant sites. The Working Group noted that adjustments could be made to modelling parameters to prioritise large infrequently surveyed colonies, revise site selection based on the practicality of visitation or establishing monitoring infrastructure, verify the accuracy of input data, and the need to address that circular distance buffers do not describe the actual distribution of foraging effort. The authors welcomed the feedback, noting that the boundaries defined are not intended to be used as management units, but as a framework to identify spatial monitoring needs. The authors also noted that these models are starting points to guide the future development of revised CEMP, with the next steps including predator tracking data, tourist visitation rates, and assessing the accessibility of each site on an individual scale.

2.93 The Working Group noted that the proposed sampling locations are meant to increase the signal-to-noise ratio from specific drivers for addressing CEMP objectives and agreed that further analysis would be needed to understand the effectiveness of any given spatial sampling plan. The Working Group noted that the spatial analysis used MAPPPD data and that any related data (e.g. IAATO visitation rates) could be integrated in future analyses. The Working Group noted the importance of further collaboration with other organisations such as IAATO and MAPPPD for the implementation of the enhanced monitoring plan to ensure the best spatial coverage that will allow detection of potential impacts or trends along such a wide area around the Antarctic Peninsula.

2.94 WG-EMM-2025/64 presented results from a study measuring population dynamics and breeding phenology of a gentoo penguin (*Pygoscelis papua*) colony on Galindez Island (Subarea 48.1), near Akademik Vernadsky Ukrainian Antarctic Station between 2018 and 2025. The authors also reported on CEMP monitoring parameters obtained from time-lapse cameras during the 2023, 2024 and 2025 seasons and compared validation metrics with earlier results. The visual-observer-photo validation revealed more variance in phenological parameters in recent years compared to 2018 and 2019. They provided suggestions for potentially improving the performance of camera-based observations in the future.

2.95 The Working Group thanked the authors for presenting several years of valuable CEMP data, especially from the southernmost CEMP site in the Antarctic Peninsula region. It noted that observations of egg laying and hatch dates for a given nest can be hampered if the angle of the camera prevents visibility of the egg, suggesting that it might be possible to adjust for such issues in the future. The Working Group also emphasised that the authors had contributed to a successful implementation of data collection instruments sponsored through a CEMP Special Fund project. The Working Group further recognised the success and benefits of using the CEMP Special Fund for data collection instruments and encouraged others to take advantage of this funding opportunity.

2.96 The Working Group recalled that several teams were requested (SC-CAMLR-42, paragraph 2.74) to review the monitoring of current and potential sentinel species, and also initiated several teams to progress enhancing CEMP to meet KFMA and ecosystem monitoring goals (paragraphs 2.122 to 2.130).

Analysis of existing monitoring data

2.97 WG-EMM-2025/10 reported on field studies on the diet and habitat use of chinstrap (*Pygoscelis antarcticus*) and gentoo (*Pygoscelis papua*) breeding penguins from two colonies near recent fishing activity in Gerlache Strait during 2024–25. They presented the habitat use of 14 gentoo and 16 chinstrap penguins using GPS biologgers. Utilisation distributions illustrated that gentoo penguins foraged much further from the colony and used a broader area than chinstrap penguins. The diet of both species was dominated by krill, and length frequency distributions of those krill showed that gentoos were on average eating slightly larger krill.

2.98 The Working Group welcomed this predator study and noted the value of this CEMP site because it is located close to an area with increasing fishing activity. It highlighted the value of these data for continued monitoring in the KFMA and the proposed D1MPA areas. It also noted that it would be valuable to deploy position tracking instruments on penguins from this colony during fishing and non-fishing periods to test for differences in foraging behaviour.

2.99 The Working Group discussed the best metrics to assess interactions between foraging penguins and the fishery including overlap in space, time, and depth. The Working Group encouraged the authors to participate in sharing their tracking data with the WG-EMM community and noted their value in developing standard methods to improve inter-site comparisons of behaviour and functional overlap with the fishery.

2.100 The Working Group discussed the scientific value of comparing the penguin-diet-derived krill length frequency distributions with those derived from the fishery that was operating nearby during the same period. It also noted that initial review indicated a shift in size of prey, but the same foraging distribution pattern. The Working Group inquired if krill life stages can be assigned to krill recovered from penguin diet samples and asked if it was unusual to see a gentoo diet that was 100% krill. The authors clarified that identifying life stages can be difficult from diet samples because they are often partially digested, and confirmed that it is common for gentoo diets to be comprised entirely of krill.

2.101 WG-EMM-2025/13 presented an analysis of the foraging behaviour of Adélie penguins (*Pygoscelis adeliae*) using GPS, dive depth, and accelerometer data from penguins breeding at Esperanza/Hope Bay during the 2022/23 and 2023/24 breeding seasons. The spatial extent of foraging varied substantially between seasons, but the majority of foraging activity took place within 30 km of the colony. Accelerometer data revealed that approximately 21% of all dives included active foraging. The authors presented foraging maps generated from data collected in 2013/14 and noted the similarity in foraging patterns.

2.102 The Working Group thanked the authors for sharing valuable krill-predator foraging data which is essential for informing spatiotemporal management under the KFMA and the proposed D1MPA. It further emphasised the value of accelerometry data which supports a higher resolution understanding of behaviour and potential interactions with fishing. The Working Group suggested specific data analysis techniques (e.g. supervised machine learning accelerometry analysis) could allow for comparison of behaviour between species and sites.

2.103 WG-EMM-2025/28 presented a progress report of the ‘CEMP – Analysis of Existing Data’ team during the 2024/25 intersessional period. Progress included the development of code to clean and merge CEMP data with the aim of analysing temporal and spatial variability in A3 data in Subareas 48.1–48.4. The paper also included a plan to progress the analysis, in collaboration with data holders, before WG-EMM-2026.

2.104 The Working Group thanked the CEMP data team and emphasised the importance of engaging A3 data holders. The Working Group noted that species specific analysis may help to review any potential differences in adaptive strategies of different species to climate change and anthropogenic activities. It further noted that information on extreme events may also be useful in this regard.

2.105 The ‘CEMP – Analysis of Existing Data’ team refined the plan presented in WG-EMM-2025/28 to engage with data holders to clean and merge data, analyse time series and formulate testable hypotheses. The team will progress their work plan during the intersessional period.

Monitoring of current and potential sentinel species

2.106 WG-EMM-2025/19 presented a study on the trophic ecology of adult female Antarctic fur seals (AFS) at Bird Island (Subarea 48.3), Cape Shirreff (Subarea 48.1), and Marion Island (Subarea 58.7) using stable isotope analysis on blood sampled in winter and summer. The paper provided the first cross-basin and seasonal comparison of the trophic ecology of this species accounting for food web baselines. Female AFS at Marion Island consistently fed on higher trophic level prey year-round, and at Bird Island they fed predominantly on krill during summer. While krill is important prey during summer for Cape Shirreff AFS, they had a mixed diet that included higher trophic level prey items. It was not clear whether AFS from Bird Island and Cape Shirreff shifted to higher trophic level prey such as squid and fish during winter or whether the result reflected the consumption of krill which tend to have higher nitrogen isotopic values in winter. The authors propose that an index of AFS diet through these biomolecular approaches could serve as an indicator of Southern Ocean change and be of value for CEMP.

2.107 The Working Group welcomed insights into AFS trophic ecology across the large spatial scales presented in the paper and discussed the potential to integrate dietary information from scat analyses. The Working Group noted that whiskers collected at Bouvet Island (Subarea 48.6) on female AFS and blood samples for HPAI surveillance at Subarea 48.3 have been collected and may provide an opportunity for analysis to investigate broader geographical comparisons.

2.108 WG-EMM-2025/63 provided an investigation of the diet of non-breeding male AFS at four localities in the South Shetland Islands through the analysis of 1254 scats collected between 1995 and 2004. The main prey items included Antarctic krill, fish and penguins. Antarctic krill was the main prey item by mass at Potter Peninsula and Deception Island (Subarea 48.1), while fish and penguins dominated the diets of AFS at Duthoit Point (except in 2000) and Harmony Point. Myctophid fish, mainly *Gymnoscopelus nicholsi* and *Electrona antarctica*, contributed most by mass to the diet of the AFS at all localities. Although *Pleuragramma antarcticum* was previously an important fish prey for AFS at the South Shetland Islands, it was absent or scarcely represented in the diet of the fur seals in this study. The authors propose using the diet of AFS to monitor the distribution and abundance of myctophid fish and *P. antarcticum*.

2.109 The Working Group recognised the significant effort involved in collecting samples for this study and suggested valuable insights into long-term trends and potential shifts in AFS diet would result from the continuation of this work. The Working Group discussed the observed decline in *P. antarcticum* in AFS diet, noting it could reflect changes in the availability of this prey species or shifts in prey preference by AFS. The Working Group noted South Polar skua diet also showed a reduction in *P. antarcticum* from 2000 onwards in Potter Cove (SSI) despite the species remaining present in skua diet at Cierva Cove. The Working Group encouraged the authors to combine a molecular approach with visual diet component identification to improve the accuracy of diet composition analysis.

2.110 WG-EMM-2025/21 provided an overview of ecosystem monitoring and research activities in Area 48 undertaken by the British Antarctic Survey (BAS) during 2024/25. The study includes monitoring environmental conditions, CEMP (including HPAI surveillance), pelagic survey work, marine debris surveys, and other associated projects and papers of interest to WG-EMM. The paper reported unusual winter sea ice extent in Area 48, with ice approaching South Georgia for the first time since the 1980s, and a strong phytoplankton bloom at South Georgia, particularly in January. The giant iceberg A-23A became grounded on the southwestern shelf of South Georgia in March 2025, shedding multiple smaller icebergs. CEMP monitoring was conducted at Bird Island and Maiviken (Subarea 48.3), Signy Island (Subarea 48.2) and Goudier Island (Subarea 48.1) on penguins (macaroni, gentoo, chinstraps, Adélie), Antarctic fur seals, and black-browed albatrosses. Monitoring revealed that AFS pup production at Bird Island continued to increase following the record low in 2021/22. New outbreaks of HPAI H5N1 were reported near King Edward Point particularly affecting Antarctic fur seals and Southern elephant seals. Pelagic survey work including moorings, acoustic surveys and the Groundfish Survey in Subarea 48.3, along with a cruise onboard the RRS *Sir David Attenborough* focused on ocean circulation, nutrient tracing, and carbon flux in the Scotia and Weddell Seas. Finally, entanglements in marine debris involving AFS (16), and wandering albatrosses (2) were recorded at South Georgia, with the first record of an entangled gentoo penguin recorded at Goudier Island.

2.111 The Working Group welcomed the extensive monitoring effort and noted the importance of these activities for assessing ecosystem variability and responses to environmental change. The Working Group discussed the potential for compiling a catalogue of key or extreme environmental events to complement existing databases, noting that BAS has ongoing research to assess impacts of extreme events on Southern Ocean ecosystems. The Working Group noted that toothfish collected during the surveys in shallow areas were in the 40–55 cm size range. The Working Group discussed the observed krill biomass in the Western Core Box survey area, suggesting that higher primary production compared to previous years could potentially explain the observed distribution, but recognised the challenges in interpreting intra-annual variation and variability in the timing of surveys. Mooring data were presented as a possible option to further resolve these patterns.

2.112 WG-EMM-2025/43 presented a review and recommendations regarding how to incorporate cetacean species into CEMP and the KFMA, with guidance from the IWC-SC and other cetacean experts. The authors provided an overview of population status of species relevant to Area 48, especially humpback, fin and Antarctic minke whales, highlighting their potential as environmental indicators in a region of significant krill fishing activity. The document identified key knowledge gaps in abundance, distribution, krill consumption, impact of climate change and fisheries (entanglement and competition for resource), as well as interactions with other krill-dependant predators. The report highlighted limited winter data for cetaceans in Area 48 and outlined monitoring methods and technology for estimating abundance, distribution, foraging behaviour, population health (i.e. contaminants, body condition, pregnancy rates, and population changes) and krill consumption rates incorporating IWC's 'Requirements and guidelines for conducting surveys and analysing data within the Revised Management Scheme' (IWC, 2012). The authors recommend prioritising collection of data to estimate cetacean abundance, spatial distribution, and seasonal presence (including winter) for humpback, fin and minke whales to assist in development of data layers for the KFMA via the Spatial Overlap Analysis, including into the winter months in Subarea 48.1. The authors recommended considering IWC abundance estimate classifications and identifying those most relevant for different uses in CCAMLR. The paper encouraged continued collaboration between SC-CAMLR and the IWC-SC and invited feedback from the Working Group to refine this ongoing work.

2.113 The Working Group welcomed the review and recommendations presented in WG-EMM-2025/43. The Working Group noted the need to develop appropriate survey designs and clear, transparent definitions of ecological indicators. The Working Group discussed the IWC's abundance classifications and noted the importance of deciding the most useful categories for CEMP monitoring and the KFMA. The Working Group noted that multiple models exist to estimate cetacean prey consumption but highlighted that further work is needed to identify the most appropriate approaches for CCAMLR purposes.

2.114 The Working Group encouraged further collaboration between cetacean experts noting the possible relevance of ongoing eDNA research and welcomed the strengthening of links between SC-CAMLR and the IWC-SC.

2.115 WG-EMM-2025/65 reported an update of ongoing research on the impact of illegal, unregulated, and unreported fishing (IUU) on the efficacy of by-catch mitigation measures for the wandering albatross population at Bird Island. The study compiled diverse data streams to simulate population growth rates under various management scenarios to assess whether improvements in by-catch mitigation in regulated fisheries could enable population recovery, or if IUU fishing was a dominant effect. Preliminary results showed that the baseline demographic model indicated a 2.5% annual population decline (growth rate of 0.975); the population distribution was highly constrained for successful breeders around South Georgia, while juveniles and non-breeders had more widespread distributions in the region. Juveniles and non-breeders exhibited wide-ranging circumpolar distributions, particularly between 40°–60°S, notably around South America; fisheries effort data showed the highest pelagic longline effort in the South Pacific and Indian Oceans, and demersal longline effort concentrated in Chile and Namibia EEZs.

2.116 The Working Group welcomed this work and emphasised the challenges and importance of applying seabird conservation measures at large spatial scales across multiple jurisdictions to improve conservation outcomes. The Working Group noted that the paper focused on longline fisheries and highlighted the need to also consider trawl fisheries. New Zealand has engaged with the authors to discuss this suggestion and facilitate additional data that could be included in this research. The Working Group recommended that the final version of this research is submitted to the next WG-IMAF meeting.

2.117 WG-EMM-2025/66 examined the distribution of baleen whales in Antarctic marine ecosystems and assessed the overlap between species occurrence and existing and proposed MPAs. Using multi-year sighting data (2010–2024) from research cruises and kernel density estimation, the authors analysed the distribution of fin (*Balaenoptera physalus*), humpback (*Megaptera novaeangliae*), blue (*Balaenoptera musculus*), and Antarctic minke whales (*Balaenoptera bonaerensis*). Results revealed a latitudinal gradient in species distributions, with fin whales occurring primarily in the northern regions (55°–65°S), while blue and minke whales (largest range) were mostly found south of the Antarctic Circle (55°–77°S and 60°–70°S, respectively). Humpback whales showed a wide latitudinal range (55°–70°S). Higher overlap between the total species distribution and the spatial distribution of krill exists between 55°S and 65°S. The analysis showed that the current South Orkney Islands Southern Shelf (SOISS) MPA offers limited protection for these species. In contrast, overlap with the proposed Antarctic Peninsula and Southern Scotia Arc MPA (D1MPA) and Weddell Sea MPA (WSMPA) Phase 1 would substantially increase protection (*B. physalus* 49.7%, *M. novaeangliae* 62.7%, *B. musculus* 39.3%, and *B. bonaerensis* 59.3%). The authors concluded that updating cetacean distribution data and expanding conservation areas could improve protection of critical habitats and support adaptive management by international bodies.

2.118 The Working Group recognised the effort to model whale distribution in Area 48. The Working Group noted that because distance sampling methodologies were not used, the analysis does not account for survey effort variability, weather conditions, or the detection range from different observation platforms, which could influence the interpretation of the results. The Working Group suggested that breaking down the analysis by management zones within the proposed D1MPA could provide further insights. The Working Group noted that integrating tracking results from other datasets could be useful.

2.119 WG-ASAM-2025/03 presented an overview of the relevance of the Antarctica InSync initiative for CCAMLR to open the discussion on how the CCAMLR scientific community can contribute. Antarctica InSync provides a framework for international collaboration to implement sustainable ocean science as addressed by the UN Ocean Decade and by SCAR, and to provide a milestone towards the International Polar Year 2032/2033 (SCAR/IASC). It aims to strengthen and create partnerships to synchronise and coordinate circumpolar data collection, and to better understand and sustainably manage these regions. The paper described the biological component of InSync, which focuses on interspecific relationships, connective processes and their significance for the recruitment and distribution of species, particularly in relation to the impacts of anthropogenic stressors. The paper highlighted the importance of synchronised, standardised data collection across multiple platforms (research vessels, commercial vessels, autonomous platforms, and biologging). The authors noted the relevance of this initiative to CCAMLR's work, particularly for understanding the effects of krill fisheries at larger spatial and temporal scales than previously studied. The authors invited CCAMLR's scientific community to initiate discussion regarding priority topics in relation to upcoming krill surveys and bringing together tracking studies and how CCAMLR can contribute to the initiative.

2.120 The Working Group discussed potential funding sources to support contributions to InSync, noting that the initiative itself does not provide funding. Possible funding opportunities may arise from the Horizon Europe infrastructure funding call in 2026 and the AWR Fund. It was also noted that the CCAMLR CEMP Special Fund and PolarIN could help support fieldwork activities. The Working Group noted that commercial fisheries remain a key platform for scientific observations, underscoring the importance of aligning scientific activities with operational opportunities. The Working Group highlighted the potential to expand InSync's scope to include krill biology and potentially circumpolar assessments of toothfish fisheries. The Working Group also discussed whether this initiative could serve as a deadline to consolidate and advance discussions held over the last two years and provide a model for the future International Polar Year.

2.121 The Working Group recommended that the Scientific Committee endorse a proposed research topic to InSync including krill fishery-ecosystem interactions in Area 48, as well as a circumpolar assessment of krill biomass, krill biology and characterising krill flux during the InSync timeframe (2026-2030) (Table 2).

Progress from CEMP review teams: updates, work plans and objectives

2.122 The Working Group recalled that four temporary teams were tasked in 2023 (SC-CAMLR-42, paragraph 2.74) to advance work on (i) analysis of existing CEMP monitoring data (CEMP – Analysis of Existing Data team), (ii) monitoring of current and potential sentinel species (CEMP – Sentinel Species Monitoring team), (iii) krill fishery and at-sea monitoring, and (iv) environmental and non-biological parameters of relevance to wider ecosystem monitoring (CEMP – External Data of Relevance to CCAMLR team).

2.123 In 2024, the Working Group also tasked a team ((v) CEMP – Analysis of Tracking Data team) to focus on assessing the utility of tracking data to determine essential habitats, and along with a team to collate existing external datasets, contribute to the spatial overlap analysis (SOA), provide baseline data for the marine protected areas (MPAs) proposals, ecosystem monitoring under the Ecosystem Health Check concept, and for other CCAMLR purposes (WG-EMM-2024, paragraphs 6.50 and 6.26).

2.124 WG-EMM-2024 also created a team to discuss the potential inclusion of cetaceans in CEMP, the (vi) CEMP – Cetaceans Monitoring team.

2.125 The Working Group recalled the objectives of CEMP and noted that whilst ecosystem change could be indexed by monitoring individual species, disentangling the effects of fisheries from climate will be aided by information about environmental variability, ecosystem changes (such as the recovery of previously over-exploited species), enhancing CEMP, and the functional relationship between CEMP indicator species.

2.126 The Working Group recalled that the enhancement of CEMP as outlined in WG-EMM-2024/08 and WG-EMM-2024 (Figure 12), was to strategically expand the capabilities of CEMP to address three core purposes: (1) the KFMA through data input to SOA, (2) monitoring to detect drivers of change of krill-dependent predators and assess ecosystem status and health including the effects of climate change or 'health check', and (3) MPA Research and Monitoring Plans.

2.127 The Working Group recalled that the review of the CEMP program is expected to take several years to allow an assessment of the current monitoring program, future monitoring needs, the CEMP Standard Methods and protocols, and the incorporation of new information or approaches while still meeting CCAMLR data standards (WG-EMM-2024, paragraph 6.45). It further noted that progress towards an enhanced CEMP requires immediate and longer-term time frames and funding mechanisms and that addressing these should be incorporated into task team work plans.

2.128 The Working Group noted that distinguishing fishing impacts from ecosystem changes may be aided by ecosystem models (WG-EMM-2025/24). Such models require data on distribution and abundance, prey consumption, and interactions between key taxa.

2.129 The Working Group further recalled that WG-EMM-2023 suggested that a health check, or ecosystem status report, like that envisioned in WG-EMM-2023/45, could become a fourth leg of the KFMA.

2.130 The Working Group agreed that ecosystem monitoring delivered through CEMP was created as an integral part of krill fisheries management. It recommended that Scientific Committee consider an enhanced CEMP as an integral part of implementing the KFMA.

2.131 The following sections detail reports on the current CEMP teams.

CEMP – Analysis of Existing Data team (i)

2.132 The report from the CEMP – Analysis of Existing Data team is presented in paragraphs 2.103 to 2.105.

CEMP – Sentinel Species Monitoring team (ii)

2.133 The Working Group recalled the following tasks outlined for 'CEMP Sentinel Species Monitoring team' during WG-EMM-2024 aimed to:

(i) Identify data needs and indicators to monitor the krill fishery and krill-dependent predators, including the connectivity between Subareas 48.1, 48.2, and 48.3, and identify a coordinator to lead this task in Subarea 48.1.

(ii) Identify data or data collection methods to enhance existing CEMP to deliver to the spatial overlap analyses or ecosystem health checks and develop protocols and indicators for integration into CEMP.

(iii) Provide an overview of current data collection and monitoring programs (circumpolar) to identify future monitoring priorities or data needs.

(iv) Consider how tracking data can be incorporated into CEMP to address CCAMLR's data needs, and progress defining an index derived from tracking data for this purpose, noting that considerable work has been conducted under external groups that may expedite this process.

(v) Consider priority areas in which to establish CEMP sites or collect CEMP-like parameters, including areas where change is likely rapidly occurring (e.g. sub-Antarctic islands), sites that are not affected by the fishery, and monitoring of non-krill-dependent species to aid in disentangling fishery from climate change impacts.

2.134 The Working Group noted that identifying data needs and enhancing monitoring in Subarea 48.1 remained a priority (WG-EMM-2024, paragraph 6.53) and identified that the CEMP – Sentinel Species team would work together to review the existing monitoring program (WG-EMM-2025/17) to identify gaps in monitoring and explore potential solutions.

2.135 The Working Group recognised progress to examine the spatial extent of data collection and the location of CEMP monitoring sites in relation to fisheries activities and sentinel species foraging ranges (WG-EMM-2025/06 and WG-EMM-2025/60), and encouraged further work using the approach outlined in WG-EMM-2025/60 with additional data from Members working in this area to identify spatial gaps in monitoring coverage in Subarea 48.1.

2.136 The Working Group recalled that the hierarchical approach to monitoring from combining periodic broad-scale census of sentinel species, underpinned by detailed demographic data at CEMP sites would provide a useful framework for enhancing CEMP monitoring (WG-EMM-2023/45; WG-EMM-2024/31).

2.137 The Working Group acknowledged that different subareas may require different approaches for ecosystem monitoring to achieve CCAMLR's monitoring objectives, and that this may include monitoring of different species, time scales, parameters and the use of various monitoring platforms.

2.138 The Working Group recognised the importance of identifying CEMP parameters that are particularly informative in detecting change or the potential effects of fishing on predators and noted the work from long-term data derived from existing CEMP measures of penguin breeding performance in earlier studies by Krüger et al. (2021) and Watters et al. (2020).

2.139 The Working Group recognised that additional species including whales, crabeater seals, flying seabirds and additional penguin species could enhance CEMP, but that an assessment of their utility and relevance for assessing ecosystem change, ecosystem status reporting, or for fisheries impacts would be important prior to those species being adopted as part of CEMP.

2.140 The Working Group considered additional response parameters that could enhance CEMP and noted that these were being considered in relation to foraging ecology through the work of the CEMP – Analysis of Tracking Data team. The Working Group further noted that the use of molecular techniques for assessing diet as outlined in WG-EMM-2025/50, and a proposed review on the use of biomarkers, including stable isotopes, lipids and fatty acids, genetic analysis of scats, and contaminants for monitoring predator diet and contaminants exposure and changes in food web structure, should be considered.

2.141 The Working Group discussed the importance of understanding the spatial and temporal scales that are integrated in different response parameters. For example, the Working Group noted that potential effects from fisheries may impact some measured parameters immediately while other effects may have a lag. In addition, some effects may span through multiple seasons.

2.142 The Working Group agreed the following tasks for this team, to be reported upon at WG-EMM-2026:

(i) The development of an expanded CEMP monitoring strategy for Subarea 48.1, including the revision of WG-EMM-2025/60 using additional data to identify gaps in current CEMP site, and an assessment of the feasibility and practicality of monitoring suggested additional sites in this high priority area. To be progressed by Dr Collins, Dr Krause, Dr Santos and Dr Johannessen.

(ii) An overview of current monitoring efforts of subantarctic species within the CCAMLR Area, and an outline of a potential plan for enhanced monitoring of subantarctic species. To be led by Dr Makhado.

(iii) An assessment of the methods and feasibility to research and survey populations of Antarctic phocids to better understand their abundance and consumption needs. To be led by Dr Krause and Dr Waluda.

(iv) The identification and assessment of the efficacy of potential additional Antarctic land-based seabird species by region. To be progressed by Dr Kim, Dr Lin and Dr Waluda.

(v) A progress report outlining methods for surveying the distribution and abundance of cetaceans for input for the SOA, noting the CEMP – Cetacean Monitoring team is progressing and developing plans for monitoring cetaceans and have separate work plans (SC-CAMLR-43, Table 8). To be led by Dr Kelly.

(vi) A progress report on the utility of tracking data for CEMP and the development of protocols and indicators to deliver to the spatial overlap analyses and ecosystem health checks, noting the CEMP – Analysis of Tracking Data team will progress this work and have separate work plans (SC-CAMLR-43, Table 8). To be led by Dr Krüger.

(vii) A review of biomarker techniques (including stable isotopes, lipids/fatty acids, and DNA metabarcoding) either to provide new methodology for existing CEMP parameters or for developing new response parameters and approaches for monitoring contaminants relevant for CEMP. To be led by Dr Friscourt, K. Hoszek-Mandera and Professor G. Zhu.

2.143 The Working Group recalled that when CEMP was established, the decisions on species, response parameters and the location of monitoring sites balanced questions of practicality and utility, and that this is important to consider as CEMP is enhanced.

2.144 The Working Group acknowledged as a high priority the importance of not only developing CEMP but also ensuring that the interpretation of the data it generates is directly linked to informed management decisions, and that this may form part of the future analyses for the CEMP – Analysis of Existing Data team.

CEMP – External Data of Relevance to CCAMLR team (iv)

2.145 The Working Group discussed the task teams formed in 2023 (WG-EMM-2023, paragraph 5.65; WG-EMM-2023, paragraph 6.64) and 2024 (WG-EMM-2024, paragraph 6.26). It noted that both tasks had considerable overlap in scope and were both led by Dr Anton Van de Putte. As a result, the working group proposed to merge the two groups into the existing 'CEMP – External Data of Relevance to CCAMLR team'.

2.146 The CEMP – External Data of Relevance to CCAMLR team will receive input from the 'CEMP – Sentinel Species Monitoring team' and the 'State of Environment' Discussion Group on environmental/non-biological parameters of relevance to wider ecosystem monitoring. For these data, the 'CEMP - External Data of Relevance to CCAMLR team' will continue to develop and support access to these types of data through the Geospatial Toolbox maintained by the Secretariat (see WG-EMM-2024, paragraph 6.26), using the overview table in Table 3.

2.147 Intersessionally, the team will further refine the information to be provided within the overview table; it will populate the table based on input received from the 'CEMP – Sentinel Species Monitoring', the 'State of Environment' Discussion Groups, and responses to the circulated survey presented in WG-EMM-2025/42, and collaborate with the Secretariat to determine the most effective mechanism for sharing this table and any supplementary information.

CEMP – Analysis of Tracking data team (v)

2.148 The Working Group noted that priorities for the CEMP – Analysis of Tracking data included the following objectives of WG-EMM-2024 (paragraph 6.54): (ii) to identify data or data collection methods to enhance existing CEMP to deliver to the spatial overlap analyses or ecosystem health checks, and develop protocols and indicators for integration into CEMP, (iv) on how tracking data can be incorporated into CEMP to address CCAMLR's data needs and progress defining an index derived from tracking data, and (v) to identify priority sites for collecting CEMP data.

2.149 The Working Group noted that predator tracking data are an important input to the spatial overlap analysis for the KFMA, that parameters derived from tracking data could be included as response parameters currently monitored in CEMP, and that additional response parameters could be derived from data obtained from telemetry devices to enhance CEMP data collection.

2.150 The Working Group noted that some existing parameters in the CEMP Standard Methods could be derived from tracking data including for penguins: A2 – Duration of the First incubation shift, and Method A5 – Duration of foraging trips, and for seals: Method C1 – Duration of foraging/attendance cycles.

2.151 The Working Group noted that no parameters for flying seabirds in the CEMP Standard Methods could be derived from tracking data, and that although whales are not currently a CEMP species, consideration of what response parameters could be derived from tracking data for other species would form part of this team's work.

2.152 The Working Group decided that an initial table should be developed for different species, life history stage, device type (e.g. GPS location, time-depth recorder, or accelerometer) and potential response parameters that could be derived from that data. The table could be updated to incorporate additional parameters associated with the development of CEMP as advised by the 'CEMP Sentinel Species' Monitoring team.

2.153 The Working Group remembered that protocols have already been developed that could be used as a frame of reference (e.g. Bird Life International, SCAR Retrospective Analysis of Antarctic Tracking Data (RAATD) project) for this team.

2.154 The Working Group noted that intersessional discussions would occur in the online Discussion Group 'CEMP – Analysis of Tracking Data team'. The first task of the team will be to develop an inventory of available tracking data in Subarea 48.1 to enable the identification of sites that should be considered priority for future tracking studies in coming years.

CEMP – Cetacean Monitoring team (vi)

2.155 There is a recognition that considering cetaceans is increasingly important in CCAMLR's ecosystem-based approach to management which includes ecosystem monitoring, management of the Antarctic krill fishery and developing the circumpolar network of MPAs. Following guidance outlined in WG-EMM-2025/43, the Working Group considered recommendations for priority data collection to inform CCAMLR management discussions requiring information about cetaceans. The priority cetacean data collection and analyses were considered to be: (i) population abundance by subarea; (ii) seasonal presence (using methodologies beyond those associated with abundance i.e. PAM, eDNA); and (iii) spatial distribution (via habitat models, passive acoustic monitoring and telemetry). The need to review methods and data to derive krill consumption estimates for baleen whale was also identified as a separate priority research item. Finally, the Working Group noted the need to have an overarching synthesis of cetacean data and methods to inform CCAMLR discussions on the CEMP review and ecosystem-based approaches to management of the krill fishery (including WG-IMAF).

2.156 The Working Group agreed on the work plan to develop guidelines on each of the priority data collection and analyses items, with the following leaders nominated for each item:

(i) Population abundance by subarea (Mr Johannessen and Dr Murase)

(ii) Seasonal presence (IWC-SORP Acoustic Trends Project representative, cetacean eDNA expert)

(iii) Spatial distribution (Dr Lowther and others TBD)

(iv) An overarching/synthesis of cetacean research/data to inform CCAMLR discussions (Dr Kelly and Dr Lowther)

(v) Methods and data for estimating krill consumption by baleen whales (Dr Kelly and whale physiology experts).

2.157 The Working Group noted that development of these data collection and analysis protocols, and methods reviews, will also involve assistance from the IWC collaboration on providing advice on cetaceans for CCAMLR's KFMA, CEMP and ecosystem modelling, the terms of reference for which were endorsed by SC-CAMLR in 2024 (SC-CAMLR-43, paragraphs 2.77 and 2.78).

2.158 The Working Group noted the opportunity to present these guidelines and methods reviews to the next IWC-SC meeting in April 2026 (with an approximate paper due date of mid-April 2026), but that this would require substantial progress before mid-December 2025, prior to the Antarctic fieldwork season. After IWC-Scientific Committee review, these guidelines and methods reviews can be revised and submitted to WG-EMM-2026, and subsequent recommendations made to SC-CAMLR-45.

2.159 The Working Group noted that intersessional discussions would occur through the CEMP – Cetacean Monitoring Discussion Group.

Krill fishery and at-sea data collection plan team (iii)

2.160 The Working Group noted that the 'Krill fishery and at-sea data collection team (iii)' reported under the fishery dependent data collection plan (paragraphs 2.199 to 2.207).

Environmental/non-biological parameters relevant to wider ecosystem monitoring

2.161 WG-EMM-2025/03 summarised ongoing work conducted by the CCAMLR Secretariat on developing standard operations for Geographic Information Systems (GIS) in support of the work of the Scientific Committee and its Working Groups, updating WG-ASAM-2024/01. Following a recommendation by WG-EMM-2024 (WG-EMM-2024, paragraph 6.27), a preliminary analysis of publicly available satellite data was presented as an example. The Secretariat requested collaboration with Members to identify and develop additional satellite-derived summary indices to assist Members in accessing and utilising these types of data for the Convention Area.

2.162 The Working Group welcomed the progress of updating and developing the GIS toolbox and thanked the Secretariat for its work. It noted that all the Scientific Committee's Working Groups have uses for these spatial and requested the Secretariat to create a 'Geospatial toolbox' Discussion Group. The Working Group noted that communication of the availability of the toolbox to the Scientific Committee such as through SC Circs may be considered, or for Scientific Committee Representatives to ensure relevant members of their delegations have joined the Discussion Group.

2.163 The Working Group noted the usefulness of developing a Geospatial Toolbox for common spatial data processing tasks, particularly with regard to the types of data that should be incorporated.

2.164 WG-EMM-2025/42 reported on the initial steps taken to address the need for better documentation of environmental data sources and their access and analysis. The report provided an overview of many external environmental data sources that are valuable to the CCAMLR research community.

2.165 WG-EMM-2025/55 presented a selection of databases and tools related to the work of various CCAMLR-relevant SCAR groups. These groups include the SCAR Krill Expert Group (SKEG), the SCAR Action Group on Fish (SCARFISH), the Expert Group on Birds and Marine Mammals (EG-BAMM), and the Expert Group on Antarctic Biodiversity Informatics (EG-ABI). The authors noted that making these resources available to the CCAMLR community would maximise the use of existing datasets, reduce duplication of effort, and enhance these products by demonstrating how data can be contributed to existing databases.

2.166 The Working Group thanked the authors and SCAR for providing a useful overview of relevant databases. The Working Group recommended integrating links to these databases into the CCAMLR website to make them more visible and accessible. They also suggested adding particularly relevant data layers to the Spatial Data Viewer as they become identified by the Working Groups.

2.167 The Secretariat noted that it is developing scripts in the Geospatial toolbox for handling these data types (paragraph 2.162; WG-EMM-2025/03). The code is available via GitHub.

Communicating results (e.g. ecosystem status reports)

2.168 WG-EMM-2025/16 proposed a collaborative framework for developing ecosystem monitoring in East Antarctica based on datasets generated by existing long-term monitoring programs and using analysis workflows designed using the Galaxy platform, paired with Essential Biodiversity Variables (EBV) used as a common referential to classify the output variables of the workflows. The proposed collaborative framework aims to improve the concordance of ecosystem monitoring analysis processes to the FAIR principles. The Galaxy platform effectively aggregates different data collections while allowing for the inclusion of datasets with varying accessibility status. The atomisation-generalisation approach put forward by the authors shows how the Galaxy platform enables to design modular and interoperable tools, underlining the interest of the platform and its adherence to the FAIR principles. The Galaxy platform allows for the development of automated, transparent, and reproducible workflows that can be used to translate primary data into indicators. These indicators represent a relevant output to communicate results to policymakers. The authors suggested that Research Monitoring Plans (RMP) for existing and potential future Marine Protected Areas (MPAs) could use the Galaxy platform and its workflow design tool to produce the indicators needed within each RMP.

2.169 The Working Group commended the authors on their work and highlighted the usefulness of this approach. The Working Group suggested that workshops be organised in the future to familiarise more participants with the Galaxy platform to enhance CCAMLR scientific works, for example MPA research and monitoring plans. The Working Group further suggested contacting the GOOS BioEco panel to coordinate the concurrent development of essential ocean and biodiversity variables suggested by the authors.

2.170 WG-EMM-2025/38 presented a solution for automating the creation of the State of the Environment Report using the Galaxy platform. This solution addresses the Scientific Committee's request for the report to be easily replicable in other areas of the Convention Area. The proposed automation process enables users to produce graphical illustrations of selected variables and to choose the temporal and spatial extent of the figures produced. These figures are subsequently embedded into a report document via reproducible and transparent workflows for the selected region and year.

2.171 The Working Group welcomed the proposed solution which provides flexibility and improves the efficiency of creating State of the Environment Reports in the future. The Working Group discussed whether structural changes in data used for the State of the Environment Report (such as data from fisheries or changes to environmental variables) may impact the automation of the report generation, as those changes might require regular adjustments of the data processing workflows and may therefore require additional staff time to maintain.

2.172 WG-EMM-2025/25 presented the progress made on developing a regular 'State of the Environment and Antarctic Marine Living Resources' report for CCAMLR, following discussions held during WG-EMM-2023, the 2023 CCAMLR Climate Change Workshop, WG-EMM-2024 and SC-CAMLR-43. The report aims to synthesise the various data sets necessary for an integrated regional understanding of the ecosystem and to provide relevant context for management decisions. The authors requested feedback from the Working Group on which variables should be included in such reports and how the information should be presented. They also asked for input on how to develop indices that effectively communicate the state of the environment and ecosystem to the CCAMLR Commission.

2.173 The Working Group recognised the progress made on the State of the Environment Report and encouraged the authors to continue their work. The Working Group noted that identifying the report's intended audience(s) is important for deciding the best way to present the data. The Working Group also discussed including a circumpolar perspective in addition to regional assessments and emphasised the importance of including additional context, such as the occurrence of extreme events, into the report to support data interpretation and management decisions. The Working Group further suggested that the group for environmental status reporting coordinates with other groups (e.g. the group for external existing data relevant to CCAMLR) to define common key variables and to reduce duplication in reports. The Working Group also noted that this work is essential for meeting the WG-EMM Terms of Reference, parts B and C.

2.174 To progress the State of the Environment Report the Working Group noted that two types of reports should be generated: (i) a technical report (level 1 reporting), and (ii) a summarised, illustrative version of the technical report for presentation to the Commissioners (level 2 reporting). The Working Group identified Climate and Oceanography, Biodiversity/Biology, Fisheries, and Current and Emerging Threats as the four core topics to be addressed in the reports. The Working Group noted that once the content of a report was agreed that the Secretariat would be an appropriate mechanism to update and distribute the reports.

2.175 WG-EMM-2025/51 presented a new framework combining Earth System Models and ecological models to project the current state of the Southern Ocean ecosystem and its future state under climate change scenarios. Within this framework, an Antarctic Ecosystem Value index (AEV) was derived based on the projected abundance and growth potential of krill, two species of penguins, fish, and primary producers. This metric was used to identify potential changes in ecological hotspots, with the aim of informing conservation efforts and future monitoring.

2.176 The Working Group congratulated the authors on their work and acknowledged the framework's potential to predict future ecosystem changes. The Working Group encouraged the authors to include additional trophic levels to improve the AEV's representativeness of the ecosystem, and suggested including uncertainty estimates of model projections to address the specificity of the biological models used in the study and potential mismatches between the spatial scales for which some of the models were originally calibrated and later applied in this study. The Working Group suggested using toothfish fisheries data to evaluate how fishing may affect the AEV index.

Other impacts (e.g. HPAI, toxins)

2.177 WG-EMM-2025/44 Rev. 1 presented work on the presence of endocrine-disrupting phenolic compounds from anthropogenic sources in Antarctic krill samples. The paper emphasised that continued monitoring, broader spatial sampling and further research on the transport and accumulation mechanisms of pollutants in Antarctic marine ecosystems are needed to better assess and manage the risks to the region's living resources.

2.178 The Working Group welcomed the paper and noted the valuable addition to their knowledge and understanding. The Working Group discussed the lipophilic nature of phenolic compounds which are likely to originate from plastics, resins, paints, rubber and industrial cleaning products and noted that krill may ingest phenolic compounds accumulated in predator excrement or those compounds may be absorbed onto krill carapaces. The Working Group discussed the possibility of studying microplastics as a vector for contaminants, noting that there are studies showing that phenolic compounds can be absorbed onto the surface of microplastics.

2.179 WG-EMM-2025/70 proposed a framework for expanded contaminant monitoring under CEMP, highlighting the need for a more systematic and standardised approach to track pollutants in Subarea 48.1. The study recognises that improving contaminant monitoring is crucial to better understand ecosystem responses to the combined pressures of pollution and climate change. The paper further noted that incorporating a harmonised, non-invasive contaminant module would strengthen the objectives of CEMP, as this approach would create a cost-effective extension to current monitoring protocols.

2.180 The Working Group congratulated the authors for their work and highlighted that this study, along with the previous paper (WG-EMM-2025/44 Rev. 1), were both led by a current CCAMLR scholarship recipient, K. Hoszek-Mandera (Poland). The Working Group noted that Dr X. Mu (China), a fellow 2024–2025 CCAMLR Scholar, was unable to attend WG-EMM-2025. The Working Group wished Dr Mu well with her ongoing research work and look forward to welcoming her in future years.

2.181 The Working Group discussed the value of testing samples and comparing results from areas of lower anthropogenic input than Subarea 48.1 and highlighted the longevity of these less well understood contaminants, which can bioaccumulate in animals' internal organs like the liver or brain.

2.182 The Working Group noted the potential transport of contaminants into the Southern Ocean via ocean circulation or atmospheric transfer, noting that some contaminants were banned from use globally many years ago. The Working Group highlighted the potential for future collaborative work such as the analysis of microplastics from penguin guano, comparative studies with stable isotope analyses, and noted the value of this important work to inform the ongoing CEMP review.

2.183 WG-EMM-2025/P05 highlighted the urgent need for coordinated surveillance, response, and policy action to address the spread of HPAI H5 in the Southern Ocean region. The paper also underscores the risk of ecosystem-level impacts and long-term population declines. The authors also made recommendations to help strengthen CCAMLR's capacity to respond to emerging wildlife disease threats, such as supporting ecological assessments of species or colonies most at risk, including disease dynamics and outbreak scenarios into ecosystem models and spatial decision-making processes and minimising non-essential human activity at or near affected wildlife colonies.

2.184 The Working Group welcomed the paper and emphasised the importance of maintaining attention on avian influenza in Antarctic wildlife, noting that the situation can change during a season as demonstrated in other regions (WG-EMM-2025/21).

2.185 The Working Group noted that work undertaken on HPAI in other regions, for example a recent survey around New Zealand and sub-Antarctic Islands, found no cases of HPAI in the region (Waller et al., 2025), whereas high mortalities of skuas have been reported from the South Shetland Islands during surveillance work conducted by Chile (Bennet-Laso et al., 2024; Léon et al., 2025) and mortality of wandering albatrosses, king penguins, giant petrels and skuas and mass mortality of macaroni penguins just after moulting reported from Prince Edward Island due to suspected HPAI.

2.186 The Working Group discussed integrating HPAI monitoring into the CEMP structure and noted the Secretariat has been leading work on current status and species affected submitted to the CEMP (paragraph 2.72; WG-EMM-2025/06).

2.187 The Working Group welcomed suggestions to make on-site PCR testing available and to provide training for interested parties, as well as developing cooperation with partners having infrastructure to test samples. It was proposed that the CEMP Special Fund could help support these efforts. The Working Group noted the value of undertaking additional genomic/molecular studies to understand virus variability and mutations in order to examine potential further spread, connectivity and identify potential source areas of the disease.

Climate change and associated ecosystem research and monitoring

2.188 WG-EMM-2025/P01 outlined New Zealand's historic and recent advances in Antarctic oceanographic research in the Ross Sea region, highlighting emerging systematic observations, ocean modelling, and international collaborations to address climate-driven changes in the region. The paper identified challenges, such as logistical constraints and funding, and emphasised the importance of continued and expanded research to support CCAMLR objectives and the Ross Sea region Marine Protected Area (RSrMPA).

2.189 The Working Group thanked the authors for the comprehensive review and noted that summarising and sharing these findings is highly valuable. Participants suggested that sharing information on future survey plans would increase opportunities for collaboration.

Marine debris

2.190 WG-EMM-2025/52 presented work on broad scale beached debris surveys undertaken near Mawson and Davis stations along with longitudinal beached debris surveys at Bechervaise Island (Division 58.4.1). Debris recovered comprised machined wood, plastic and metal items. The majority of debris recovered were legacy items most likely of base origin, with very little originating from marine sources.

2.191 The Working Group welcomed the paper and noted similarities with the results of marine debris monitoring in other Antarctic regions where machined wood items and plastic also dominate (e.g. WG-EMM-2025/21). The Working Group noted the absence of fishing related debris at the survey sites, recalled that a higher proportion of fishing-related debris has historically been reported from the sub-Antarctic region (e.g. WG-EMM-2025/21), and highlighted the need to provide management advice in the event of increases in fisheries debris. The Working Group noted the presence of a disused research station embedded in iceberg A23-A, the remains of which may be seen in future debris surveys, particularly in Subarea 48.3.

2.192 The Working Group encouraged ongoing monitoring of marine debris whether it be beached or oceanic, and the reporting of lost fishing gear to assess the efficacy of waste management practices. It further highlighted the importance of monitoring to allow Antarctic operators and managers early detection of marine debris arriving from elsewhere and an understanding of its sources.

2.193 The Working Group discussed the value of comparing data from across regions, with the caveat that effort needs to be standardised across sites, and that consideration needs to be given to including null values from surveys which were undertaken but no debris items were observed. The authors noted the importance of removing debris prior to it breaking up into microplastics and the improvements made to waste management at Antarctic research stations in recent decades. The authors noted that data from the report presented will be submitted to CCAMLR and associated with publication as a scientific paper.

Fishery-independent data collection plan

2.194 WG-ASAM-2025/17 presented the outcomes of the SCAR Krill Expert Group (SKEG) Symposium, which was held online from 10 to 12 March 2025. The event convened approximately 90 participants from 15 countries, including representatives from industry, policy, and NGOs. The paper documented the progress of SKEG, including the creation of four task-force groups to address the following subjects: (i) krill flux; (ii) fishery indices; (iii) KRILLBASE; and (iv) communications and outreach. Reports from three of the tasks (krill flux, fishery indices and communications) were presented at WG-ASAM (WG-ASAM-2025/02; WG-ASAM-2025/14; WG-ASAM-2025/17, respectively).

2.195 The Working Group noted that the other SKEG task force focused on the further development of KRILLBASE was developing a data paper on the larval krill data and encouraged participants to submit relevant data through the SKEG website.

2.196 The Working Group noted that the krill flux task force is developing a mooring array to better understand flux in Subarea 48.1. The Working Group noted the SKEG plan to send a questionnaire to fishing companies to seek views on the best locations for moorings.

2.197 Dr S. Kasatkina expressed concern about the use of moorings to investigate flux and emphasised the value of multi-frequency acoustic surveys to determine biomass, such as that conducted on *Atlantida*.

2.198 The Working Group thanked SKEG for their ongoing work on the krill stock hypothesis and noted that SKEG continues to make important contributions to the work of WG-EMM.

Fishery-dependent data collection plan

2.199 WG-ASAM-2025/14 Rev. 1 proposed an at-sea data collection plan for the revised KFMA, including the KSH, noting that much of the requisite data can be collected through existing CMs and SISO. The paper made a series of recommendations for WG-EMM to consider:

(i) CCAMLR to ensure the collection of all krill data required for the implementation of the revised KFMA

(ii) use of RMT 8+1 net (mesh sizes of 4.5 mm and 330 μm for RMT 8 and RMT 1, respectively) for trawling during acoustic transect mode, and biological sampling

(iii) biological sampling be conducted during acoustic transect mode

(iv) increase frequency of krill biological sampling by the SISO observers to one sampling per day throughout the commercial fishing operation

(v) SISO Observer logbook for krill trawl needs to be revised to allow entry of detailed maturity stages and standardised trainings for maturity staging for observers to be conducted

(vi) use Table 1 in WG-ASAM-2025/14 Rev. 1 as a starting point at WG-EMM-2025 to further populate the table and use as guiding tables for the planning of strategic data collection for the long-term monitoring to support the revised KFMA

(vii) key to the integration of data from alternative platforms is the development of krill biomass estimation techniques (i.e. model-based estimators) that can incorporate data from instruments that collect point samples (i.e. sub-surface moorings, landers), or non-random data collection, such as autonomous surface and underwater vehicles (gliders and sail drones).

2.200 The Working Group noted the discussion of the paper at WG-ASAM-2025 (paragraphs 3.28 to 3.33) and agreed that rather than specify the trawl type, the most important information was the size of the mesh and the net mouth opening area.

2.201 The Working Group discussed the frequency and detail of biological sampling in the krill fishery. It was noted that the krill fleet often operated in close association, making daily sampling from all vessels potentially unnecessary, however, this is not always the case, as there are times when vessels are distributed across different subareas.

2.202 The Working Group noted that fishing depth and location can change from hour to hour, and that sampling every three days would not capture this variability. It emphasised the importance of understanding the structure of catch, including size and maturity composition through daily sampling. The Working Group also noted that it is important to prioritise tasks to ensure that the most critical information is collected.

2.203 The Working Group noted that maturity staging is a time-consuming process and suggested that, where onboard capacity is limited, preserving samples for subsequent analysis may be a suitable alternative.

2.204 The Working Group developed a krill data collection plan for krill fishing vessels during routine fishing operations (Table 4). The plan clarifies the role and objectives of sampling activities to be undertaken by the SISO observers and provides examples of additional biological sampling that may be conducted by science programs to progress the understanding of krill biology.

2.205 The Working Group also developed a krill biological sampling plan for vessels undertaking acoustic surveys (Tables 5 and 6). Table 5 focuses on data collection for the KSH, whilst Table 6 focuses on data collection for acoustic transects. It also outlined key components of sampling design, including types of nets to be used, spacing between sampling stations, and the measurements to be taken during acoustic transects.

2.206 The Working Group noted that the sampling plan could be conducted during acoustic surveys or during other type of research surveys.

2.207 The Working Group recommended that the Scientific Committee endorse the sampling plans outlined in Tables 4 to 6 to support the implementation of the revised KFMA. It further noted the relevance of existing protocols, such as krill biology sampling protocol developed by WG-ASAM-2024, which should be used in conjunction with the proposed new data collection plan. The Working Group requested that the Secretariat coordinate with relevant Members to develop a guidance note compiling all relevant protocols, with a view to streamlining the use of these protocols.

2.208 WG-EMM-2025/01 presented an overview of the current classification of fishing events in CCAMLR data reporting and highlighted inconsistencies in the use of fishing type codes (Commercial, Research, and Survey) across different reporting forms and gear types. The current implementation has resulted in a mismatch between what is reported in CE and haul-by-haul data in the different fisheries (i.e. C1, C2) and additionally has resulted in inconsistent reporting of fishing type between both vessels and seasons in haul-by-haul data. For example, catches during fishing on acoustic transects are reported in the same category as commercial fishing, and fishing under CM 24-01 paragraph 3 are reported as ‘Research’ instead of ‘Survey’.

The Secretariat requested that the Working Group assess the purpose and analytical value of fishing event classification data and provide feedback on whether these classifications should continue to be used.

2.209 The Working Group supported the recommendation to remove the field as reporting of acoustic survey trawling events could be recorded in the Acoustic Survey Metadata Form (ASMF), noting that it would simplify fisheries data collection and that C4 data could be collected through haul-by-haul data.

2.210 The Working Group recommended the Scientific Committee consider revising the haul-by-haul and CE forms to remove the 'type of fishing' classification field.

Krill Fishery

3.1 WG-EMM-2025/30 described the introduction of two new krill products by the Chinese fishing vessel *Fu Yuan Yu 9199*: Frozen Wet Meal and a mixture of protein extracts derived from stick water. These products are not currently listed in the fishery notifications conservation measure (CM 21-03) and the C1 data forms. To facilitate better understanding of the products, the paper provided brief descriptions and proposed product codes for implementation. It is suggested that the WG-EMM recommend the adoption of the code 'FWM' for Frozen Wet Meal in the future.

3.2 The Working Group thanked the authors for reporting this interesting development of krill products and supported the recommendation on using 'FWM' as the product code for Frozen Wet Meal.

3.3 The Working Group noted that stick water has been discussed in WG-IMAF meetings, particularly regarding the potential to attract seabirds. The Working Group noted that protein recovery may reduce the attraction of seabirds. The Working Group suggested that the paper may be interesting to WG-IMAF-2026.

3.4 The Working Group noted that stick water could be a useful sample for chemical analyses and encouraged further analysis of the contents and properties of stick water.

3.5 WG-SAM-2025/07 described the separation of C1 haul-by-haul forms into finfish- and krill trawl-fishery specific forms, along with accompanying instructions as requested by WG-FSA-IMAF-2024. These forms include fields recommended by WG-IMAF to clarify the reporting of incidental mortalities on vessels.

3.6 The Working Group thanked the Secretariat for this work and recommended that the Scientific Committee implement these new forms. The Working Group also endorsed the recommendations in the paper that the form nomenclature be revised to avoid confusion in form names, and that any references to conservation measures be identified and revised as necessary.

3.7 The Working Group requested the Secretariat ensure the forms and accompanying instructions were specific to each form type (e.g. not including generic terms such as 'EEZ' in the glossary).

3.8 WG-EMM-2025/07 further discussed the development of new haul-by-haul (C1) forms for CCAMLR trawl fisheries, which have been identified as a priority for several years. The paper highlighted limitations in the current C1 form, which only records codend mesh size per haul and lacks clarity on measurement methods. It notes the absence of key haul-level data such as net dimensions and marine mammal excluder configurations, which restricts analysis of swept area and catchability. The proposed C1 form contains haul-specific fields for net mouth width, height, and mesh size, and the ability to link multiple nets to trawl type codes. Linking this gear data to individual fishing events would enhance spatial and ecological analyses.

3.9 The Working Group expressed their gratitude to the Secretariat for their efforts in making the forms more efficient, reducing redundancy, and enhancing future data use. The Working Group noted that the trawl gear definition should include the area of the fishing circle to avoid confusion with the mouth area of the trawl wings. In addition, the form should specify the mesh sizes of the codend outer mesh and inner mesh liner to prevent confusion in reporting for selectivity studies.

3.10 The Working Group recognised, at present, it is not possible to link the net configuration used for a fishing event to the fine-scale catch and effort data, as the C1 form does not record such detail on a haul-by-haul basis and recommended that the Scientific Committee implement the revised trawl forms and instructions documented in WG-SAM-2025/07.

3.11 The Working Group further noted that linking fishing gear configuration with individual fishing events would permit additional needed analysis of gear selectivity, swept area calculations and gear performance studies, and tasked the Secretariat with updating the historical trawl gear configuration table on the fishing gear library webpage.

Fishing activities

3.12 WG-EMM-2025/09 summarised the fishing activities of the Chilean trawler, *Antarctic Endeavour,* carried out in the Antarctic krill fishery between January and October 2024, capturing 21 872 tonnes (4.39% of the total catches in that fishing season). The paper provided details on catch, CPUE, depth of hauls, and length-frequency distributions of captured krill per trip and across Subareas 48.1, 48.2, and 48.3, along with by-catch estimates, which included some invertebrates and fish. No bird strikes were observed, and one humpback whale mortality occurred on 1 February 2024. Comparisons were drawn across all seven years of operations of this vessel within the subareas, with a focus on catch performance, fishmeal production and conversion factors. The authors encouraged similar periodic reporting from other CCAMLR vessels participating in the krill fishery.

3.13 The Working Group welcomed the paper and congratulated Chile for submitting a summary of the fishing activities regularly. The Working Group noted the value of these data to better understand the population structure and indicated that an aggregation of the data from other CCAMLR krill vessels would provide a more accurate assessment of the overall fishery.

3.14 The Working Group recommended that the Secretariat produce a report summarising the fisheries operations of krill vessels in more detail than in the Fishery Report as a separate monitoring paper submitted to WG-EMM with the intent to identify improved summaries to be included in the Fishery Report.

3.15 WG-EMM-2025/11 analysed krill fishing logbook data (2017–2024) from the Chilean trawler *Antarctic Endeavour* targeting Antarctic krill to identify spatial patterns in fishing activity across Subareas 48.1 to 48.3. The study used a hierarchical agglomerative clustering technique to compare the positions of each fishing haul (Euclidean distance) to explore and identify 'fishing opportunities' (areas with discrete groups of fishing events by that vessel). The paper evaluated three types of fishing opportunities, which included unusual, sporadic and recurrent events. Twenty-seven fishing opportunities were recorded in Bransfield Strait (48.1) and the South Orkney Island (48.2), which were classified as unusual (<10 hauls, <3 years); sporadic (11 < 48 hauls, comprising half of the time series); or recurrent (>50 hauls, covering the most years). Multivariate analysis linked fishing activity to by-catch, water temperature, krill population structure, and CPUE. Results highlighted key breeding and recruitment areas, and indicated potential local depletion in two recurrent fishing grounds based on declining CPUE. Fishing opportunities showed higher performance than other fishing events, illustrating spatial variability in krill productivity at the local scale. While the proportion of gravid females and juveniles indicates areas of importance for krill reproduction and recruitment, the CPUE trend enabled characterisation of fishing opportunities and identification of local depletion. The proportion of gravid females and juveniles indicated potential breeding and recruitment regions (South Orkney Islands and Bransfield Strait, respectively), while the catch per unit effort trend identified local depletion in two recurring fishing opportunities.

3.16 The Working Group thanked Chile for the valuable data presented. The Working Group also noted the recommendations for future work in extending the approaches to the entire fleet data and across a longer period.

3.17 WG-EMM-2025/33 presented an analysis of the spatiotemporal variability of catch per unit effort (CPUE) in areas with recurring fishing effort assessed using data from a single commercial vessel (*Antarctic Endeavour*) operating between 2017 and 2024 in Subareas 48.1 and 48.2. Individual hauls and CPUE data were modelled using hierarchical Bayesian spatiotemporal models fitted with the Integrated Nested Laplace Approximation (INLA), fixed effects of environmental (temperature, wind speed) and operational (fishing depth, course) variables were included. In Subarea 48.1, CPUE was consistently higher and exhibited lower interannual variability than in Subarea 48.2. Conversely, Subarea 48.2 exhibited the lowest CPUE values, consistent with the estimated spatial patterns. Spatial field analysis revealed differences in spatial autocorrelation between subareas. In both subareas, there was no strong evidence of spatiotemporal dependence.

3.18 The Working Group thanked the Chilean delegation for presenting the paper and congratulated the authors on their research. The Working Group discussed potential differences in fishing opportunities across areas and suggested that additional analyses comparing recurrent and sporadic fishing locations could help refine the classification of these areas. The Working Group noted that possible inaccuracies in species identification within the reported by-catch composition reported by vessels may have influenced the analysis (paragraph 3.32; WG-EMM-2025/49; WG-FSA-IMAF-2024, paragraph 5.20). The Working Group noted that environmental variables may be influencing the observed patterns in the presence of female and juvenile krill.

3.19 WG-EMM-2025/62 summarises krill fishing activities conducted by Korean-flagged vessels within the CCAMLR Convention Area from 2020 to 2024, with a particular focus on fishing effort, spatial and temporal patterns, catch per unit effort (CPUE), and the composition of non-target species (by-catch). A total of 14 460 hauls were recorded during this period, yielding annual krill catches ranging from 15 091 to 44 567 tonnes. Monthly catch and CPUE trends exhibited substantial interannual variation, influenced by fleet size, operational strategies, and environmental conditions. Fishing activities were concentrated in Subareas 48.1 and 48.2, particularly in the Bransfield Strait and South Orkney Island sectors, while limited operations occurred in Subarea 48.3. Korean operations complied with voluntary conservation measures, avoiding hauls in ARK's Voluntary Restricted Zones (VRZs) in accordance with their seasonal closure periods. Between 2022 and 2024, a total of 36 finfish species were identified across six taxonomic orders and eight families, with dominant representation from Nototheniidae, Channichthyidae, Myctophidae, and Bathydraconidae. A focused examination of Channichthyidae (icefishes) resulted in descriptions of eight species across developmental stages, documented in WG-EMM-2025/49.

3.20 The Working Group thanked the authors for the information on how the Korean krill vessels have been operating as well as the development of an identification (ID) guide for fishing observers. The Working Group requested that the guide be made available on the CCAMLR website and that it would be very useful to Members if it was translated into English and other languages in use by fishers and observers. It was also noted that the WOBEC program (WG-EMM-2025/40) is in the process of developing ID guides and invited Members to share any known resources, acknowledging that some of the guides may be specifically tailored for fisheries observers.

Scientific observation

3.21 WG-EMM-2025/02 presented proposed modifications to the IMAF and warp strike worksheets for observer trawl finfish and krill fisheries logbooks. These include simplifying the data recording process, the addition of the ability to record whether a warp strike was conducted from a video recording or visual observation data, and whether a mortality was observed. The paper requests WG-EMM approve the proposed additions for inclusion in the 2026 season.

3.22 The Working Group thanked the Secretariat and endorsed the proposed additions on the modifications to the IMAF and warp strike worksheets for observer trawl finfish and krill fisheries logbooks and recommended that the Scientific Committee implement these in the 2026 season.

3.23 WG-EMM-2025/04 presented an annual update of observer sampling rates for each vessel that fished for krill in the last five complete seasons (2020–2024) in Subareas 48.1 – 48.3. The paper summarised the current sampling rate requirements for observers, noting that observer coverage and sampling requirements have evolved over time. It concluded that in general minimum sampling rates (of either once every 3 or 5 days, depending on season) are generally met or close to being met. At a fleet-wide level the requirement to undertake warp observations for 2.5% of the total fishing time was generally met, although several individual vessels did not reach this requirement. The paper suggested that the requirement to meet the new 5% target will require increased duration or frequency of observation and appropriate guidance is requested.

3.24 The Working Group thanked the Secretariat for this analysis and discussed the calculation methods for presenting the sampling rate for warp-strike observation on trawlers with towing twin nets concurrently and referred this topic to the Scientific Committee for clarification. The Working Group requested that future versions of this report include a footnote to the figures to indicate that although the vessel name was reported for understanding the context of the plots, the sampling rates reported were observer duties.

Krill biological sampling

3.25 WG-EMM-2025/P02 presented an automated method for estimating krill body length data employing an in-trawl stereo camera system and custom-trained machine learning model for processing. Results from the automated detection are compared with manually measured krill lengths subsampled from corresponding trawls. It demonstrated the ability to extract krill lengths from underwater images, although mismatches were observed. The authors propose to address these uncertainties by using more advanced camera technology and optimising the observation section of the small-meshed two-layer krill trawl.

3.26 The Working Group thanked the authors and noted this method may be potentially used for estimating krill body length, identifying sex and maturity stages while acknowledging the technology needed to improve in some aspects, including the method for identifying large krill, lighting and camera setup, battery duration, and the calibration. The Working Group further noted these camera data may be used for calibration of microsonar seal-borne derived krill length data collection and encouraged the authors to collaborate with the interested parties.

3.27 Some participants noted that the biological data should include both krill length and weight, sex, and maturity stage in an integrated manner. All of these biological data should be collected in an integrated manner. Furthermore, it is necessary to provide additional data on the comparability of the proposed method for measuring krill length with measurements made by scientific observers. It was further noted that the proposed method may be considered as a complementary method for collecting data on the method by at-sea observer.

3.28 WG-SAM-2025/29 presented an inter-vessel comparison in krill length composition from commercial fishing vessels operating in Subarea 48.2 during March 2024. The paper noted discrepancies in number of samplings undertaken by the vessels. Statistically significant differences in krill length distribution were observed between different vessels and Members. The authors suggested that these differences could be due to both heterogeneity in krill distribution patterns and the catch value, and duration of trawling. The analysis suggested that sampling of 200 krill every 3 to 5 days, regardless of catch per haul or day, under-sampled krill from different length groups and particularly recruitment groups. It was further noted that the SISO manual was not provided to some of the observers on board vessels operated in Subarea 48.2 during March 2024. The authors noted that it is necessary to revise Scientific Observer protocols taking into account the number of hauls per day and the catch value per haul, so that C1 data and samples collected by at-sea observers would provide the best information to support the strategic objectives for scientific observations of the krill fishery.

3.29 The Working Group thanked the authors and noted the comparison of krill length distribution may be biased due to the difference in the nature of the fishing methods and mesh size, limited spatial and temporal scales, inter-swarm variability and the seasonally-differentiated requirements of the SISO manual for observers. It further noted the low number of observations made on some vessels and noted the importance of using data from broad enough period for such analysis in order to avoid any misleading results.

3.30 The Working Group recalled the discussions in the WG-SAM-2025 (paragraphs 2.5 to 2.7) and noted that effective sample size to characterise length frequency distribution should be driven by the intended use of these data. The Working Group noted small krill sampling could be undertaken through structured acoustic surveys or national programs rather than the commercial fishery.

By-catch sampling

3.31 WG-EMM-2025/49 introduced preliminary observations on morphological distinctions among eight species of the family Channichthyidae (icefishes) collected as by-catch during commercial Korean krill trawl operations in Subareas 48.1 and 48.2 in 2023 and 2024. The molecular phylogeny of these eight icefish species was compared with the morphological differences. External features of pelvic fin length and coloration, lateral line patterns, gill pigmentation and body proportions were used to distinguish between species, and these morphological diagnostic characters could be used to improve by-catch species identification protocols and therefore enhance understanding of the spatial distribution and developmental stages of icefish.

3.32 The Working Group welcomed this analysis and noted the work may be used for improving the identification performance of the icefishes by observers, especially the inclusion of the different life history stages. It further noted the juvenile fish identification is an area of improvement for the at-sea observers and encouraged the authors to collaborate with interested parties to enhance this work using the combination of molecular approach and morphological approaches. The Working Group noted the methods like maximum likelihood or Bayesian inference may help improve the robustness of nodes in the phylogenetic tree.

IMAF data collection and sampling

3.33 WG-EMM-2025/27 reported the incidental capture of a humpback whale by the Chilean traditional krill trawler in CCAMLR Subarea 48.2 during the 2024/25 fishing season. The authors noted that this is the second incident reported in the same area involving the same vessel. A high abundance of humpback whales was observed in the days leading up to the incident. On 25 March 2025, a 10-metre-long humpback whale was recovered in the trawl with its head toward the codend. The vessel was operating at the time with no cetacean exclusion device (CED), only a seal net excluder device. The vessel acquired a CED later in the season and used it for the remainder of the current fishing season. The incident was recorded in the vessel's C1 form and in the SISO scientific observer report and logbook, as well as this report to WG-EMM.

3.34 The Working Group thanked the authors for this analysis and welcomed the transparent reporting of this incidental mortality. It noted that design and implementation of marine mammal exclusion devices may be improved through considering whale behaviour and gear technology and suggested this paper should be presented to the WG-IMAF-2026 for discussion. The Working Group noted electronic monitoring may help improve the observation, and the

WG-IMAF should include gear technologies to consult on gear design and performance issues. The Working Group further noted that ongoing investigations including the research project presented in WG-FSA-IMAF-2024/04 may help improve the understanding of potential causal factors that may have contributed to whale mortalities in krill fisheries, and encouraged the authors to collaborate with interested parties. The Working Group recalled this is the eighth humpback whale mortality associated with krill trawling since 2021, and that the collaboration with the International Whaling Commission's experts on whale entanglements is available to provide advice to CCAMLR on how to minimise whale interaction with krill fishery.

Krill Fishery Management

Summary documentation of KFMA

4.1 WG-EMM-2025/05 summarised the ongoing development of the revised krill fishery management approach (KFMA). This is a public facing document that is being developed by the Secretariat and WG-EMM, and previous versions have been reviewed by the Scientific Committee. The Secretariat has provided the updated document to WG-EMM for its review and comment before it is submitted to the Scientific Committee for its endorsement.

4.2 The Working Group thanked the Secretariat for developing such a useful document. It noted that a version authored by the 'Working Group on Ecosystem Monitoring and Management and CCAMLR Secretariat' will be submitted to the Scientific Committee with no further changes, and recommended the Scientific Committee endorse its publication as part of the Fishery Reports documents.

4.3 The Working Group discussed documenting the processes used for the derivation of spatially and temporally resolved catch limits from identified input datasets. This approach could be used to validate existing advice and update advice in the future. The Working Group recommended that the Working Group conveners with assistance from Members, review the sections in WG-EMM-2025/05 to identify process gaps with the aim to document sufficient detail to replicate advice that has been agreed (e.g. SC-CAMLR-41, Table 2). These resulting explanations could be added as an appendix to future revisions of the KFMA summary document.

4.4 The Working Group noted that the KFMA also includes additional elements such as the KSH, ecosystem monitoring, and harmonisation between the KFMA and the proposal Domain 1 MPA which were not included amongst the original three elements of the KFMA (viz., biomass estimates, precautionary yield and spatio-temporal distribution) and that as these components develop, the process for developing advice could be documented and included. The Working Group suggested the Scientific Committee consider including these components in the next version of WG-EMM-2025/05.

Way forward for the revised KFMA

4.5 WG-EMM-2025/23 provided a summary of the current situation surrounding krill fishery management and harmonisation in Area 48, including the issue of the lapse of CM 51-07 in 2024. It further described the status of the D1MPA proposal and the recommendations on catch limits from the Harmonisation Symposium in 2024. With the expiry of CM 51-07, theoretically the fishery is able to fish without any spatial constraint in Subarea 48.1, exacerbating the potential of local concentration of catch. The paper recommends developing an interim Conservation Measure to support orderly development of the krill fishery in Subarea 48.1 in the short term, while allowing time to agree a feedback management approach and the D1MPA proposal. The paper offers some potential ways forward to progress the KFMA.

4.6 WG-EMM-2025/39 summarised the current status of the KFMA and identified some outstanding issues to progress. It described the challenges in the development of scientific methodologies for its successful implementation. The paper suggests a key opportunity lies in harmonising the KFMA with the D1MPA proposal, leveraging their spatial and temporal protection elements, and describes a need for clear delineation of responsibilities, costs, and additional requirements to implement the KFMA in Subarea 48.1. The paper states that significant issues will require decisions by the Commission, including modification of existing CM 51-01 and establishing a Conservation Measure tailored to Subarea 48.1.

4.7 WG-EMM-2025/26 outlined the harmonisation process (SC-CAMLR-2024/29) which aims to achieve compatibility between krill fishery management approach (KFMA) and marine spatial protection in the Antarctic Peninsula and Scotia Arc region (D1MPA proposal). The paper highlights the value of this process as a means of fostering long-term sustainability, reducing potential Members' conflicts, and strengthening the effectiveness of CCAMLR's governance in the area. The paper concluded that, although some relevant issues remain unresolved, CCAMLR is making significant progress to accommodate the diversity of approaches supporting a harmonized approach which may include an increase in PCLs allocated among MUs through summer/winter periods, along with the implementation of GPZ and SPZs, and a holistic KFMA - D1MPA monitoring and data-collection plan.

4.8 The Working Group thanked the authors of the three documents and noted that the three papers collectively provided a list of issues that need to be addressed, including, distribution of precautionary catch limits, trigger level, harmonisation between KFMA and D1MPA proposal, a staged approach, determination of biomass estimates, predator monitoring requirements, Spatial Overlap Analysis, and resource needs for sustainable implementation, to progress the revised KFMA as well as potential solutions for these issues.

4.9 The Working Group noted all three papers shared common views on the needs for an increase in data collection and monitoring (on krill-dependent predators through CEMP and on krill biomass and distribution data from research vessels and structured acoustic surveys using fishing vessels), and that progressing the KFMA, and the harmonisation of KFMA and the D1MPA proposal in Subarea 48.1 is a matter of priority. The three papers also shared the view that while scientific tasks can be addressed at the Working Group level, there may be issues beyond the remit of the Working Group or the Scientific Committee.

4.10 The Working Group recalled the significant progress made in recent years in developing the KFMA, including biomass estimates, harvest rates (Grym) and the spatial overlap analysis.

4.11 The Working Group noted that the Scientific Committee had endorsed biomass estimates, harvest rates, and MUs for Subarea 48.1, and agreed that these should form the basis for the further development and implementation of the KFMA. The Working Group also noted that whilst catch limits for each MU had been recognized as best available science by the

Scientific Committee in 2022 (SC-CAMLR-41, paragraph 3.46), the Scientific Committee could not reach consensus on the implementation of those catch limits (SC-CAMLR-41, paragraph 3.67).

4.12 The Working Group recognised that further work is required towards the full implementation of the KFMA in Subarea 48.1 and that additional work includes inter alia:

(i) development and implementation of a monitoring program that includes CEMP monitoring and at-sea monitoring

(ii) detailed documentation of the KFMA processes that led to the recent calculations of putative catch limits for Subarea 48.1 (paragraph 4.3)

(iii) urgent need to develop a sustainable funding mechanism

(iv) a time-bound implementation plan, including periodic updates of biomass, and review of monitoring (5–7 yr cycle).

(v) a mechanism to objectively evaluate the performance of any implemented measure.

4.13 The Working Group noted the effectiveness of the now lapsed CM 51-07 in spreading the catch limit across Subareas 48.1, 48.2, and 48.3 in the frame of the trigger level allocation. It noted changes in krill fishery dynamics including a significant increase in catch and catch concentration in Subarea 48.1 during the 2024/25 fishing season. It also noted that changes in fishing distribution may have been affected by the heavy sea ice coverage in Subarea 48.2 in the early part of the season.

4.14 Following the expiration of CM 51-07 and in the absence of a fully mature KFMA, the Working Group agreed there is an urgent need to implement an interim conservation measure to distribute catches across the four subareas (48.1 to 48.4).

4.15 The Working Group recognised that whilst CM 51-01 remained in force, an interim measure similar to the lapsed CM 51-07 would be a simple and effective mechanism for distributing catches between the four subareas.

4.16 The Working Group recalled that the original distribution of catches in the frame of trigger level allocation under the now lapsed CM 51-07 was largely based on the sum of maximum historical catches (the trigger level) and the proportions of biomass in each subarea during the first synoptic krill survey in 2000 (the allocations) (WG-EMM-2025/05), and that it would be possible to use the proportions of biomass from the two broad-scale surveys (2000 and 2019; see Krafft et al., 2021) to provide an interim measure.

4.17 The Working Group noted the difference in methodologies between the two surveys to assess krill biomass and its distribution.

4.18 Some participants noted that Krafft et al. (2021) detected no significant difference between the two methods.

4.19 The Working Group thanked Dr Hill (UK) for undertaking the calculations (Appendix D) of potential catch limits in the frame of the trigger level under CM 51-01 for each subarea as follows:

(i) 48.1 248 000 tonnes

(ii) 48.2 263 500 tonnes

(iii) 48.3 201 500 tonnes

(iv) 48.4 93 000 tonnes

4.20 The Working Group noted that this arrangement would reduce fishery concentration and that the catch limits could be implemented with or without the SPZs and GPZs identified during the Harmonisation Workshop.

4.21 With the understanding that there was no consensus view to modify or adjust CM 51-01, another option was presented for an alternative interim measure which would require adjustment of CM 51-01 (Appendix E). This option, based on elements of an option presented in WG-EMM-2025/39, and on the basis of the scientific progress achieved by the Scientific Committee (paragraphs 4.10 and 4.11), was proposed by proponents as an interim solution while we continue to progress implementation of the KFMA and other spatial management initiatives. This option includes the following:

(i) To ensure precautionary catch distribution amongst subareas, the Interim Measure follows the same logic as the lapsed CM 51-07 contained a total 130% distribution of catch, in order to provide flexibility in the location of fishing (in order to (i) allow for interannual variation in the distribution of krill aggregations, and (ii) alleviate the potential for adverse impacts of the fishery in coastal areas on land-based predators). The new suggested Interim Measure removes Subarea 48.1 and keeps the same catch levels for Subareas 48.2 – 48.4 as in the lapsed CM 51-07, leaving a realised trigger of 500 769 tonnes distributed as follows: Subarea 48.2 – 279 000 tonnes; Subarea 48.3 – 279 000 tonnes; Subarea 48.4 – 93 000 tonnes. This approach could offer continuity of trigger limits in 48.2 – 48.4 while further work progresses.

(ii) Simultaneously, a new interim Conservation Measure will be established for Subarea 48.1 consisting of five management units with the proposed GPZs and SPZs from the harmonisation process (Figure 1). The Subarea catch limit of 668 000 tonnes from SC-CAMLR-41 (Table 3) would be divided between the five management units from the options presented during WG-EMM-2025 (Figure 1) and the catch limits would be introduced through a stepwise approach scaling up to 668 000 tonnes.

4.22 Some participants emphasised that the scenario in (i) and (ii) in the preceding paragraph can also be implemented without GPZs and SPZs (Figure 2).

4.23 Some participants noted that the scaling up to 668 000 tonnes should be determined in accordance with the concerns presented in WG-EMM-2024, paragraphs. 4.13 and 5.42, and SC-CAMLR-43, paragraphs 2.71 to 2.73.

4.24 Some participants noted that other key elements included in WG-EMM-2025/39, such as a monitoring program, regular biomass estimates and krill biological sampling, are not included in the options in paragraphs 4.21 and 4.22.

4.25 Dr Kasatkina noted that the revision of the KFMA in Subarea 48.1, as well as in 48.2 to 48.4, should only be undertaken as part of a coordinated management of the krill fishery in Area 48, taking into account the variability in the spatial distribution of krill and the interrelationships between subareas. CM 51-01 establishes such coordinated management of krill resources in Area 48, ensuring compliance with Article II of the Convention (CCAMLR-41/37). There is currently no scientific basis for revising or adjusting CM 51-01. It was noted that any proposals for subareas catch allocations should be provided in the frame of the trigger level in CM 51-01 (620 000 tonnes). Substantive issues regarding the scientific justification of harmonisation of the KFMA and proposed D1MPA in Subarea 48.1 are not legally justified under existing CMs, for example, establishing the General Protection Zones (GPZ) and the Seasonal Protection Zones (SPZ). Dr Kasatkina noted that the proposals indicated in paragraph 4.19 are not legally justified under existing conservation measures and require additional scientific justification (CCAMLR-43/22). Dr Kasatkina expressed that the Working Group could not reach consensus on the proposal for an alternative interim measure which would require adjustment of CM 51-01 (paragraph. 4.21).

4.26 Some participants noted that the option with GPZs and SPZs (paragraph 4.21) is consistent with the harmonisation process between the KFMA and the D1MPA proposal developed in 2024 (CCAMLR-43/29). They also noted that the modification of MUs into larger units to allow greater flexibility for fishery operations, will be accompanied by an increase in catch limits. For this reason, they noted the inclusion of General Protection Zones (GPZ) and Seasonal Protection Zones (SPZ) is considered essential to safeguard important areas for krill life stages and their predators, especially in light of existing uncertainties and the need for further work (paragraph 4.12)

4.27 The Working Group noted that if this option (paragraph 4.21) with GPZs and SPZs was chosen, it would represent a step towards the implementation of the KFMA. Some participants noted the option still lacked key elements for its full implementation, including the items identified above (paragraph 4.8), and elements of the D1MPA proposal, and that increase of catch limits within each MUs would occur in a stepwise manner, commensurate with an increase in data collection and predator monitoring.

4.28 The Working Group suggested that the implementation of any interim measure should be time limited (e.g. 2–3 yrs), and priority should be given to progress with the development and implementation of the various components of the KFMA and for the further work required for the KFMA, to be completed before the expiry of any interim measure.

4.29 The Working Group noted that including a fallback option for catch limits in Subarea 48.1 in a potential, time-limited new measure is essential. Otherwise, when a temporary measure expires and no agreement on a new measure can be reached, there will be no catch limit regulation in place for Subarea 48.1.

4.30 The Working Group noted the need to evaluate the efficacy of any management scenario but recognised the limitation of current ecosystem monitoring to detect change. The group noted that a metric of catch concentration or realised harvest rate may be informative but accepted that such a metric may not indicate impact.

4.31 The Working Group noted that it is important to progress in developing metrics to assess impact. It further recalled that it is necessary to prevent the risk of changes in the ecosystem.

Krill biomass estimation

4.32 WG-ASAM-2025/P02 described a deep learning approach based on the U-net convolutional neural network to recognise and segment krill swarms using different combinations of acoustic data collected using a Simrad EK60 scientific echosounder. The model which used triple frequencies (38 kHz, 70kHz, and 120kHz) performed best. The model using only 120kHz yielded the highest individual accuracy in krill recognition, which is also the standard frequency recommended for krill biomass estimates. Compared to traditional methods, this approach is more automated, available, and maintains high recognition accuracy in complex marine environments. In addition, deep learning methods can also be applied to define krill swarm characteristics, highlighting its utility in ecological studies and their incorporation into existing acoustic systems or mobile devices. Future work could be expanded to include a broader range of marine environments and krill growth stages, enabling optimization in terms of seasonal and annual variations in krill lipid storage and distribution.

4.33 The Working Group noted that WG-ASAM reviewed this paper and noted the utility of machine learning methods in quick processing of acoustic data, specifically in relation to the detection of the presence of predators in krill swarms (WG-ASAM-2025; WG-EMM-2024/21) and other relevant applications. They further recalled that WG-ASAM-2024/12 used a machine learning approach to determine maturity stages and krill length which showed promising potential for future development.

4.34 The Working Group noted the potential application of machine learning methods on processing data from mobile platforms such as gliders as well as their utility in species differentiation compared to traditional methods, and the ease of application to other vessels. The Working Group suggested that the biomass estimates derived from machine learning approaches need to be compared with existing agreed methods.

4.35 Dr Kasatkina noted the value of standardised data collection and recalled the validity of the three frequencies approach to delineating krill in acoustic signals. Dr Kasatkina further noted that the focus of acoustic data processing on registering krill swarms is unjustified, since it does not take into account the different forms of krill distribution, which will lead to a potential underestimation of krill biomass.

Harvest rate estimation and MSE

4.36 WG-EMM-2025/P04 builds on previous work (WG-EMM-2014/14) and established a description of distinct morphological characteristics in all twelve maturity stages of male and female Antarctic krill, from juveniles to sexually mature adults. The analysis used a model-based approach to assess individual selectivity in various mesh sizes and openings relevant to the krill fishery. The authors found that selectivity varied significantly between maturity stages and sex, where juveniles and males were more likely to escape through smaller mesh sizes compared to mature females. The authors highlighted that mesh sizes could be optimised to minimise by-catch and ensure sustainable harvest levels, emphasising the need for regulations based on scientific findings. Further studies are needed to examine potential long-term population effects of such demographic selectivity.

4.37 The Working Group welcomed these results, noting that WG-EMM encouraged further work (WG-EMM-2014, paragraph 2.24) regarding size selectivity of krill in trawl to inform the effect of fishing on krill populations, as well as to increase the understanding of the ecological effects of fishing on population structure. It was also noted that these results could have implications for the krill fishery management approach, specifically in developing sustainable harvest rates using the Grym, which requires information on size selectivity.

Spatial overlap analysis

4.38 WG-EMM-2025/12 presented an approach to consider consumption of krill by baleen whales during winter in Subarea 48.1 in the Spatial Overlap Analysis (SOA). A key limitation was the lack of winter abundance data for cetaceans, particularly baleen whales, which prevented their winter krill consumption from being fully represented in the SOA. Researchers used tracking data from humpback whales in the Gerlache Strait to estimate their winter presence and modelled different abundance scenarios from April to July. Results showed that including winter krill consumption by whales had only a marginal effect on the spatial and temporal distribution of krill catch, although baseline risk increased. However, the winter krill distribution and density layer significantly impacted SOA outcomes. The authors recommended that both the summer and the winter krill layers are updated to include data collected across a larger proportion of the study area. They noted that SOA can be useful in its ability to subdivide the krill catch limit, but many caveats remain in its structure and implementation. The authors also indicated that consumption rates within the GPZ/SPZ boundaries were not considered.

4.39 The Working Group welcomed the paper and thanked the authors for the large amount of work conducted over several years that has progressed this useful framework.

4.40 The Working Group discussed the spatial layers included in the models. Some participants raised concerns regarding currently lacking or missing data layers, recommending the inclusion of updated krill consumption from predators, more robust cetacean layers, krill advection and flux, updated distributions of krill for winter and summer seasons, and including an updated fish layer, potentially drawing data from fisheries by-catch data. The authors noted that WG-EMM-2025/12 includes a sensitivity analysis and that uncertainties and sensitivities have been documented in previous SOA papers. The authors proposed to document the details of SOA to date to allow the results to be reproduced as part of the effort to document the KFMA process (paragraph 4.3).

4.41 The Working Group recommended that the IWC-CCAMLR collaborative group works to review methods for estimating krill consumption, particularly for humpback, fin, and Antarctic minke whales.

4.42 Dr Kasatkina noted that predator consumption would be dependent on the number of whales and the dynamics of krill biomass under the influence of krill flux in Subarea 48.1. Dr Kasatkina also recalled results from RV *Atlantida* survey in 2020 (WG-ASAM-2021/04 Rev. 1; SC-CAMLR-42/07) which showed fewer predators compared to findings in Warwick-Evans et al. (2021) during February–March and questioned the ecosystem impact of krill fishing during the summer. Dr Kasatkina further noted that shallow coastal waters may be more important for predators, warranting further discussion in the context of summer and winter catch limits for krill (Watters and Hinke, 2022).

4.43 Some participants noted that the MUs agreed at SC-CAMLR-43 (SC-CAMLR-43, paragraph 2.63) and used in the SOA may not align with ecological structures that dictate the spatial distribution of krill and krill-dependent predators in Subarea 48.1. They noted that the scale of this stratification may not be sufficient to account for the advection of krill, potentially increasing up- and downstream effects of fishing. Implications of the spatial boundaries used in Subarea 48.1 for various management initiatives are discussed in detail in WG-EMM-2025/37. They noted that in the absence of uncertainty layers in the SOA, the spatial scale of MUs should be increased as a mechanism to buffer spatial uncertainty into the analysis, noting that the SOA has a metric to measure risk but not uncertainty (WG-EMM-2021/27). Some other participants noted that there was no evidence to support that such a mechanism would decrease the uncertainty and that there is an increase in the SOA risk metric with management unit size (WG-EMM-2021/27).

4.44 The Working Group recalled that the management units used in WG-EMM-2025/12 were based on U.S. AMLR biomass surveys that already considered ecological structure, and which have already been endorsed by the Scientific Committee (SC-CAMLR-43, paragraph 2.63). The Working Group noted that the spatial overlap analysis is a tool with uncertainties and could be used in the absence of complete data. Furthermore, it was noted that the current iteration of the SOA is the result of several years of work which has evolved over time, integrating regular feedback from CCAMLR Working Groups. The Working Group emphasised the need to update data layers as more robust data become available in future to periodically inform the KFMA. Most participants agreed that the SOA presented in WG-EMM-2025/12 for Subarea 48.1 constituted the best available science and should be applied to spread catch limits. The Working Group noted the balance between using smaller management units to avoid the concentration of catch and using larger management units to mitigate the effects of uncertainty in underlying data layers or from advection of krill.

4.45 The Working Group agreed that the SOA is an appropriate tool for providing advice on the spatial and temporal division of catch limits and identified the following options for using it to spatially and temporally divide catch in Subarea 48.1 based on the SOA (Table 7):

(i) use the alphas from 2022

(ii) use the alphas from WG-EMM-2025/12

(iii) recalculate alphas from WG-EMM-2025/12 without including the proposed GPZs and SPZs in the analysis

(iv) use the data layers from 2025, but with different management units.

4.46 The catch allocations (alphas) associated with options (i) to (iii) are given in Table 8.

4.47 The Working Group recalled its previous advice to the Scientific Committee on the lapsed CM 51-07 that the proportion of the trigger level distributed to Subarea 48.1 provides an appropriate balance between fishery desirability and reducing the risk for local krill-dependent predators (WG-EMM-2021, paragraph 2.63). The Working Group agreed that the current situation of trigger level of 620 000 tonnes in CM 51-01 alone is not precautionary due to local concentration of the catch, and stressed the need to re-instate smaller spatial management similar to the lapsed CM 51-07 to minimise the ecological risk of catch concentration until a longer-term measure is agreed. The Working Group recalled the significant scientific progress on the revised KFMA (WG-EMM-2025/05) which distributes catch limits in time and space at the Subarea scale.

4.48 WG-EMM-2025/34 outlined progress on implementing the SOA in Subarea 48.3. The paper described the source data and subsequent species distribution analyses and consumption estimates for krill and various predators, including cetaceans, penguins, demersal and mesopelagic fish, and Antarctic fur seals. Furthermore, the document described missing layers, including seabird and winter krill layers, and concludes by aiming towards having filled these knowledge gaps before WG-EMM-2026.

4.49 The Working Group welcomed the paper, recognising the value of the work. The Working Group noted that acoustic surveys conducted in May, July, September will be used to create a data layer of krill distribution during winter.

4.50 Dr Kasatkina noted that krill biomass in Subarea 48.3 is highly variable, with low values of krill biomass even in the absence of krill fishing, for example as observed in 2009 (WG-EMM-2009/23). The Working Group noted that biological responses had been observed in years of high and low krill biomass, including in 2009.

4.51 WG-EMM-2025/47 presented a proposal to update the Spatial Overlap Assessment (SOA) in Divisions 58.4.1 and 58.4.2-East using new survey and predator data, and invited the WG-EMM to provide feedback or contribute additional data. The SOA was initially applied in Divisions 58.4.1 and 58.4.2 in 2018 (WG-EMM-2018/37). Japan and Australia have recently conducted broad ecological surveys in the Indian Sector. These surveys included data on Antarctic krill, oceanography, primary production, zooplankton, and top predators. Ongoing data collection on land-based predators like penguins and pinnipeds has also contributed valuable information from French, Japanese and Australian research stations in the region.

4.52 The Working Group welcomed the paper recognising the value of the work and commended the structure of the timeline for the proposed SOA.

4.53 The Working Group discussed parameter weighting in future SOAs, when a more comprehensive ecological understanding is established. It noted that the exact mechanism as to how weighting could be prioritised is currently unclear. The Working Group recalled that tracking data from crabeater seals in East Antarctica were available, and crabeater seals were a desirable species to include in the SOA as a krill-dependent species (WG-EMM-2024/35).

4.54 Some participants noted the differences in applying the SOA in Area 48 and Area 58, where the fishery footprint in the latter is based on historical catch data, and that a potential contemporary fishery might use different areas and be influenced by sea ice and wind conditions.

4.55 WG-EMM-2025/P07 presented an overview of results from a large-scale multidisciplinary ecosystem survey conducted by the Japanese research vessel *Kaiyo-maru* in the Indian sector of the Southern Ocean in 2019. The survey covered physical and chemical oceanography, primary producers, meso- and macrozooplankton, Antarctic krill, flying seabirds and cetaceans. Subsequent work resulted in a collection of peer-reviewed articles in a special issue of *Progress in Oceanography*, as well as several articles in other journals, producing biomass estimates of Antarctic krill, a precautionary catch limit for Division 58.4.1, and baseline data to initiate the Spatial Overlap Analysis development in Area 58.

4.56 The Working Group congratulated Japan on their successful survey and the extraordinary amount of work which resulted in fourteen publications in a special issue, and more than twelve in other journals. The Working Group noted the high relevance to CCAMLR science, providing results across a range of disciplines, as well as a contribution to baseline data for the development of the KFMA in Area 58. The Working Group further noted the high utility of collecting the resulting publications in one issue.

Coordination of the KFMA and D1MPA planning

4.57 CCAMLR-43/22 presented comments on the Harmonisation process between the KFMA and the establishment of the proposed D1MPA in Subarea 48.1. The document noted that the scientific based evidence for the urgent establishment of the proposed D1MPA as a tool to protect against threats from anthropogenic and climatic impacts is not provided. The document further noted that the KFMA and the proposed D1MPA in Subarea 48.1 assumes that current fisheries impact on krill resources and their dependent predators, stressing that such assumption requires scientific justification based on the development of evidence-based criteria and diagnostics for assessing the possible ecosystem impact of fishery. This should take into account the mixed effects of fishing, environmental variability and competitive relationship between predator species. The document emphasised that the KFMA in Subarea 48.1 should be implemented within the framework of the coordinated management of the krill fishery in Area 48 in accordance with CM 51-01, ensuring compliance with Article II of the Convention.

4.58 CCAMLR-43/22 noted that the substantive issues regarding the scientific and legal justification of the Harmonised scenario between the D1MPA and the KFMA remain unresolved, including the D1MPA (objectives, boundaries, indicators and performance evaluation metrics, Research and Monitoring Plan); the boundaries of the General Protection Zones (GPZ) and the Seasonal Protection Zones (SPZ); indicators for assessing the effectiveness of the KFMA and DIMPA harmonisation; and violation of the coordinated and rational management of krill fisheries in Area 48 established by CM 51-01. The document further noted that the proposals to establish the D1MPA and harmonise the KFMA and D1MPA in Subarea 48.1 are not legally justified under existing conservation measures. The document emphasised that implementing harmonisation scenarios between KFMA and D1MPA would only be possible within the framework of a conservation measure establishing the D1MPA in the CCAMLR area.

4.59 The Working Group noted that this paper is a resubmission (WG-EMM-2024, paragraphs 5.14, 5.15 and 5.20).

4.60 The Working Group noted that CM 51-07 had lapsed in 2024, allowing concentration of harvesting (paragraph 4.13). The Working Group recalled the significant progress made on KFMA since 2019 and welcomed new data to be included in analyses for future catch limit deliberations, as well as the development of a more standardised methodology for management, and this is currently being considered in the discussions regarding 'Spatial Overlap Analyses' and different scales of MUs, for example.

4.61 Some participants highlighted the availability of evidence to suggest fishing is having an impact on predator populations, and that such studies can be found in peer-reviewed research published in high impact-factor scientific journals, in addition to other long-term monitoring programs of top predators in the region. All of these resources should allow for the Working Group to discuss and decide on advice for the Scientific Committee based on Article IX of the Convention. This article indicated that CCAMLR formulates, adopts and revises conservation measures on the basis of the best scientific evidence available.

4.62 WG-EMM-2025/37 highlighted three components of the D1MPA proposal and KFMA marine spatial planning processes that remained unlinked until July 2024 (i.e. Management units, Spatial Overlap Analysis, and the outstanding issues related to the finite-time trial of the harmonised D1MPA/KFMA). The paper attempted to identify redundancies and the remaining hurdles in the integration of krill fishery management and marine protected area planning. It proposed pathways for science-based advice, and a monitoring program to assess the efficacy of the harmonised D1MPA and KFMA in Subarea 48.1.

4.63 The Working Group agreed that many points relevant to WG-EMM-2025/37 have been discussed along with the spatial overlap analysis (paragraphs 4.38 to 4.56).

4.64 WG-EMM-2025/58 proposed a workshop to be held in 2026 to progress development of an adaptive marine spatial planning framework for Subarea 48.2 entitled 'Workshop on development a revised krill fishery management approach harmonised with the D1MPA proposal in the South Orkney Islands (Subarea 48.2)'. The terms of reference for the workshop will centre on data assimilation and the development of an agreed, sufficiently resolved work plan to achieve the combined goals of developing an adaptive marine spatial planning framework for Subarea 48.2 that includes the management of fishing and monitoring of the ecosystem. It is intended that the workshop will focus on scientific discussion and will be 3–4 days in length. A steering committee will be formed to coordinate and plan the workshop, and authors extended an invitation those with active research activities and interests in the area to join. Funding to host the workshop has been secured, and the authors propose the workshop is in-person and takes place in connection with one of the 2026 intersessional Working Group meetings. It is proposed that the terms of reference will be developed and presented to the Scientific Committee in 2025, and that the outcome of the Workshop will be a report to be presented to the Scientific Committee in Hobart 2026.

4.65 The Working Group thanked the authors for presenting the workshop proposal, noting it was a promising start to progressing KFMA in Subarea 48.2, in particular to make sure the different initiatives develop in a complementary way. The Working Group suggested a minor workshop title change to reflect the initiatives should be harmonised together and not that the krill fishery should be specifically harmonised with the D1MPA proposal.

4.66 The Working Group noted that the workshop would be a good forum within which to synthesise the range of fishery and predator data that is collected in Subarea 48.2 by several Members. The Working Group also identified the importance of the workshop considering the proposed acoustic transects across Subareas 48.1 and 48.2, which are currently being developed by WG-ASAM (WG-ASAM-2025, paragraph 3.21 and Figure 1).

4.67 The Working Group agreed that having the Subarea 48.2 workshop adjacent to a working group like WG-EMM would be both productive and more cost-effective for participants. Finally, the Working Group requested further information on workshop requirements, including the potential need for Secretariat support, extra travel assistance funding or invited experts.

4.68 The Working Group formed a steering committee to guide further development of terms of reference for the workshop, and to begin to collate information on what datasets would be available to support discussions on spatial management, fishery activities and ecosystem function in Subarea 48.2. Thus far, nominations for participation in the steering committee include Dr Wang, Dr Santa Cruz, Dr Santos, Dr Kelly, Dr Waluda and the CCAMLR Secretariat.

4.69 The Working Group requested that the Secretariat set up a CCAMLR Discussions group titled 'Workshop to support harmonisation in Subarea 48.2' to support the work of the steering committee in developing a proposal document for Scientific Committee.

4.70 The Working Group also noted that planning for the workshop, including development of an agenda and consideration of what the Secretariat might be asked to assist with, would only occur in the event that the Scientific Committee endorsed the proposal as a CCAMLR supported meeting. The Working Group also noted the potential for applying to the MPA Special Fund to assist with having external subject matter experts participate in the workshop.

Krill Fishery Management in Area 58

4.71 WG-ASAM-2025/16 summarised 17 multidisciplinary studies (many studies were from the Australian ENRICH voyage in 2019 and the TEMPO voyage in 2021) on Antarctic krill in the East Antarctic ecosystem, which have recently been published as a Research Topic in the peer-reviewed journal *Frontiers in Marine Science*. The paper highlights climate-driven habitat degradation and krill redistribution due to sea-ice dynamics, the critical role of krill swarm structure for predator foraging success and the advances in autonomous sampling which enable high-resolution monitoring of these dynamics to inform CCAMLR's ecosystem-based management.

4.72 The Working Group thanked the authors of WG-ASAM-2025/16 for presenting an overview of the special volume on Antarctic krill-centred ecosystem in East Antarctica and congratulated all authors who contributed. The Working Group suggested the information reported in the special volume could contribute to a comparative analysis of the Indian and Atlantic sectors, noting that the Indian sector has not been the focus of a krill fishery for several decades. The authors agreed and proposed that the information presented in the special volume, in addition to ongoing CEMP monitoring in the region, would represent baseline data in the event a krill fishery recommenced in East Antarctica. The Working Group also noted that other data gaps in East Antarctica have recently been filled, such as research in the Krill Research Zone in the Ross Sea (WG-EMM-2025/56), which would assist in future spatial management.

Spatial management

5.1 WG-EMM-2025/46 reported on a study on the distribution of fish communities under the fast ice of the Ross Sea shelf. Shelf habitats are under-sampled zones due to logistical constraints but are important to the research and monitoring programmes in the Ross Sea region

MPA. This seasonally ice-covered area spans depths, from tens to a few hundred meters. As part of the RESTORE project, under the Italian National Antarctic Research Program (PNRA), an Unmanned Underwater Vehicle (UUV) was used to visually survey shelf areas in Tethys Bay, along the coast of Terra Nova Bay, during the late austral spring of 2022. Preliminary results showed the presence of 15 demersal fish species from four families (within the suborder Notothenioidei) and two more pelagic species. Species appeared to segregate depending on substrate type and macrobenthos distribution. Settlement of early-life stages of certain species was observed.

5.2 The Working Group welcomed the paper and noted the knowledge gap that this study fills which was an important contribution to the RSrMPA review. The Working Group highlighted the use of a non-invasive method to study fish and the usefulness of the environmental sensors on the ROV, that help to better understand the ecosystem dynamics in this area, for example, the relation between juvenile fishes and other species with different benthic habitats. It was noted that earlier studies conducted in the Dumont-d'Urville region yielded similar results in terms of species richness. The authors acknowledged the extensive training by Marino Vacchi in identifying Antarctic fish species, a difficulty that was emphasised by the Working Group. The ROV survey was suggested to be suited for use in InSync studies. The importance of standardising survey methods and drawing from existing ROV operational protocols to ensure data comparability across studies and timeframes was noted. The Working Group highlighted that the paper was authored by two former CCAMLR scholarship recipients (Dr Di Blasi and Dr Carlig), again stressing the importance of the scholarship program.

5.3 WG-EMM-2025/54 describes a study on the non-breeding distribution and space use of Adélie penguins, by tracking 61 individuals from Terre Adélie over five years using geolocators. Moulting occurred in areas of low sea ice concentration (SIC), whereas during winter, penguins migrated on average 1 550 km westward from the colony to areas along the sea ice edge with high SIC (75%). The inter-annual overlap of wintering grounds revealed high spatio-temporal consistency, indicating productive regions. Despite variability across years, tracked individuals moulted predominantly outside the proposed EAMPA. As the boundaries of the proposed EAMPA are largely based on species' breeding distributions, the study highlighted a relevant gap in spatial coverage of critical moulting and wintering areas of this highly mobile species in the current proposal.

5.4 The Working Group welcomed the contribution and noted its relevance to the broader design and evaluation of MPAs in the Convention Area. The study was seen as a valuable addition to the body of knowledge informing the EAMPA proposal, especially considering recent discussions on refining spatial coverage to better align with biodiversity objectives. as the Working Group encouraged integrating tracking datasets across other taxon including seabirds and marine mammals, to support holistic ecosystem-based MPA planning. The Working Group also noted the habitat use of Adélie penguins varied interannually and suggested the authors investigate the potential drivers that resulted in such variability. Furthermore, the Working Group highlighted the importance of considering both large-scale migratory connectivity and fine-scale habitat protection in MPA planning. The Working Group also noted that the geolocator tracking could expand the understanding of the location of Adélie penguins during the pre-moult hyperphagia which has been identified as a critical period of peak prey consumption, and concurs with the large winter migratory pathway of penguin populations along the east Antarctic coastline. The Working Group acknowledged the Ant-ICON scholarship program as instrumental to bringing this research to WG-EMM and in enabling new voices and advancing collaborative science within the WG-EMM community.

Data analysis supporting spatial management approaches in CCAMLR

5.5 WG-EMM-2025/45 provided an extensive summary of the relevant research and monitoring activities for the RSrMPA undertaken by New Zealand between 2023 and 2025 and demonstrated a vast amount of national and international collaboration in the research efforts. The authors emphasised the work has been done in direct relevance to evaluating the effectiveness and conservation value of the RSrMPA. The paper shows how the RSrMPA has become a focal point for coordinated international science, acting as a driver for ecosystem-scale research aimed at understanding the impacts and value of large-scale spatial protection in the Southern Ocean. Lastly, the authors invited members with contributions to refer to the spreadsheet accompanying the paper, listing all projects, datasets, and points of contact. This spreadsheet will be submitted to the Secretariat and made available at the CCAMLR MPA Information Repository (CMIR) database.

5.6 The Working Group thanked the authors for the report and acknowledged the significant scale and collaborative nature of the research. Participants noted that the paper demonstrates how the RSrMPA is catalysing scientific inquiry and international coordination, and commended New Zealand for their leadership in fostering open data sharing and international engagement. The Working Group expressed appreciation for the scope of the work and its contribution to RSrMPA evaluation efforts. Participants noted that the acoustic datasets collected using echosounders aboard research vessels may be valuable for submission to WG-ASAM, particularly for ecosystem monitoring applications.

Research and monitoring plans for CCAMLR MPAs

5.7 WG-EMM-2025/31 introduced the outcomes of the Ross Sea Research Coordination Network (RCN) inaugural meeting formally launched in June 2025, in Boulder, Colorado, (USA) at the National Center for Atmospheric Research. A total of 128 individuals registered to participate in the meeting (43 in-person and 85 online) from 22 countries. Participants included scientists from a wide range of career stages, disciplines and institutions, as well as individuals from governmental, inter-governmental and non-government organisations, fishing and tourism industries along with representatives from other international organisations, including CCAMLR members. The goal of the RCN is to formalise connections between policy, research, and other communities focused specifically on research and monitoring of the Ross Sea region MPA. To support research and monitoring in the Ross Sea Region Marine Protected Area (RSRMPA), the RCN includes three key components: (i) policy engagement, (ii) community partner engagement, and (iii) integrated science comprising three themes: data science and cyberinfrastructure; biophysical modeling; and observations, which includes monitoring and process studies. During the 4 days, the different groups RCN actively worked to design plans for the RCN to continue work throughout the coming months and years. Specific Working Groups will continue meeting and progressing their planned activities with a focus on key activities in 2025 and 2026, looking to the 2027 RSrMPA review.

5.8 The Working Group welcomed the output of the inaugural RCN meeting, noting the large number of participants, including external scientists from different countries and expertise.

5.9 The Working Group noted that this document allows to set the scene for the RSrMPA review process and that it can be a useful guideline for other MPA proposals. It further encourages the engagement of other Members.

5.10 WG-EMM-2025/36 presented a framework to support the first 10-year review of the Ross Sea region Marine Protected Area (CM 91-05). The authors provided a detailed schedule of the RSrMPA science and review process, including deliverables and timeframes. The schedule includes a proposed workshop in August 2025 to share feedback on the proposed framework from WG-EMM. An updated paper will be submitted to SC-CAMLR and Commission in 2025 (Table 8, derived from WG-EMM-2025/36, Table 1).

5.11 The Working Group welcomed the detailed framework and schedule to follow for the RSrMPA review. The Working Group noted the role of the Secretariat in supporting this process defined by CM 91-05 by compiling and distributing the information.

5.12 Dr Kasatkina noted that the number of publications indicated in the framework is not enough to present as results and indicated that indicators and criteria to achieve objectives and assesses the effectiveness of the MPA performance and undertake the RSrMPA review. It further noted that the Research and Monitoring Plan for RSrMPA was not endorsed by the Commission and recalled that rationale and description of the indicators and criteria for achieving the objectives of the RSrMPA remain unknown, making it difficult to evaluate the MPA effectiveness. Dr Kasatkina emphasised that the absence of the MPA Research and Monitoring Plan approved by the Commission, in principle, makes it impossible to assess the effectiveness of the MPA's performance and to adopt the Report for the first review period 2017–2027. Dr Kasatkina also suggested to segment the Research and Monitoring Plan for the RSrMPA into distinct phases and specifying for each phase the research to be carried out and the data to be reported.

5.13 The Working Group noted the CMIR database maintained by CCAMLR includes all the baseline data for the RSrMPA and several hundred references to research projects had been added since the MPA was created. It was further noted that the RSrMPA RMP was endorsed by SC-CAMLR in 2017 (SC-CAMLR-XXXVI, paragraph 5.45). The Working Group also noted that the proposed research priorities follow the RMP structure and the latest CCAMLR scientific information to address the requirements in CM 91-05 and will advise the Commission in 2027 on progress made in the 11 objectives of the RSrMPA.

5.14 The Working Group noted that CM 91-05, Table 1 specifies the relevance of each objective to the geographical area of each RSrMPA area and that paper WG-EMM-2025/35 includes a summary table with this information.

5.15 The Working group endorsed the table (Table 9; WG-EMM-2025/36, Table 1 – the schedule) for the review process that will be in 2027.

5.16 WG-EMM-2025/35 presented a proposed research approach for the objective-based reporting to support the 10-year review of the RSrMPA review as set forth in CM 91-05. The authors summarised the science requirements to be included in objective-based reports of science activities to support the 10-year review of the RSrMPA and RMP, detailing specific ecological, biological, and conservation objectives across different zones of the MPA. The paper proposes indicators and research approaches for each objective, aiming to assess the effectiveness of the MPA in conserving biodiversity, supporting scientific research and monitoring climate and fishing impact. A revised framework and research approach to support the RSRMPA review will be submitted to the Scientific Committee (SC-CAMLR-44) for its consideration with the feedback incorporated.

5.17 The Working Group welcomed the paper and thanked the authors for the integration of a range of information into a proposed research approach. The Working Group endorsed the proposed approach, after some clarifications. It was noted that the research approach and the specific indicators have been built from the requirements from CM 91-05, including the priority elements for research, protection targets (described in SC-CCAMLR-XXXIII/BG/23 Rev.1, Table 1), the SMART goals paper (CCAMLR-42/44; SCCAMLR-42/BG/08) and guidance form the RMP.

5.18 WG-EMM 2025/41 reviewed of ecological data on Elephant Island, emphasising its ecological significance. The area's high productivity is likely due to the unique hydrological conditions resulting from the influence of specific water masses, but also the seafloor topography, particularly submarine canyons that promote transport of krill onto the shelf area from the open oceanic waters, including the juvenile krill which tend to distribute around the island. Long-term studies on krill abundance variability in the island area have shown clear interannual fluctuations. Although high krill recruitment years have been observed since the beginning of the 20th century, no subsequent high abundances have been recorded in the region after 2000, suggesting high juvenile mortality. The island hosts major chinstrap penguin colonies, most of which have declined since 2000. Macaroni penguins and fur seals are also present, though data are outdated. The island is an important feeding area for fin whales, raising concern about whale by-catch in krill fisheries and suggesting the need for precautionary area closures. The authors highlighted that long-term data was provided by the AMLR program.

5.19 The Working Group welcomed the document noting that it is very timely. The Working Group highlighted the long-term data set considered in the document and agreed that this is a hotspot for krill and dependant predators, and the information presented may be useful for KSH, KFMA and predator conservation needs.

5.20 The Working Group highlighted the importance of contextualising the data on zooplankton. It also emphasised the uniqueness of the island, which hosts colonies of macaroni penguins and where fur seal populations are declining at a slower rate compared to other locations.

5.21 The Working Group noted that there may be a possibility of a geographical gradient in abundance changes that should be explored further. Most colonies have declined by more than 50% in recent years compared to the period prior to the year 2000. However, the local population dynamics remain poorly understood due to the sparse and fragmented nature of the available data.

5.22 The Working Group also emphasised the need for caution when interpreting the results in relation to water masses. It was suggested that incorporating recent studies on krill distribution and abundance could improve the understanding of krill-predator interactions and strengthen the review.

5.23 WG-EMM-2025/20 presented the results of aerial surveys of 12 Adélie penguin breeding colonies along the Northern Victoria Land coast conducted from 2021 to 2024 focusing on areas with previously limited baseline data. The total number of breeding pairs

(223 990 breeding pairs) across 12 colonies increased by 3.9% compared to the baseline and by 48.4% compared to the SMART criteria, although substantial variation was observed among sites. Additionally, the authors analysed temporal changes in the number of breeding pairs and breeding success at two key colonies, Cape Hallett and Inexpressible Island (Subarea 88.1), spanning the 2017/18 to 2024/25 breeding seasons. While Cape Hallett exhibited a long-term decline in breeding pair numbers from the 2017/18 to 2023/24 breeding seasons, with partial recovery in 2024/25, Inexpressible Island maintained stable numbers of breeding pairs. This study addresses key data gaps in the assessment of Adélie penguin population dynamics and contributes to the scientific basis for the upcoming 10-year review of the Ross Sea MPA. The authors further noted that to assess the status of the Adélie penguin population within the RSrMPA it will be necessary to compile data from different countries with help to fill data gaps.

5.24 The authors explained that the first phase of the project took place from 2017 to 2021, and that the second phase, which began in 2022, will conclude next year. The third phase is planned to run from 2027 for 2032, with field activities scheduled to start in 2027. The project will focus on three main topics: (i) distribution and diversity of marine organisms; (ii) ecological response of indicator species; and (iii) changes in marine and ecological environment. The authors expressed their openness to feedback and support from the community for the new phase of the project.

5.25 The Working Group welcomed the paper and noted the relevance of conducting large-scale censuses. It highlighted the importance of a collaborative approach among members to extend data collection and address existing data gaps.

5.26 The Working Group noted that some populations were declining while others remained stable and offered the suggestion to combine data from different sites to understand overall population dynamics. The Working Group welcomed the plan for the upcoming season where information about penguin diet composition, foraging range and oceanographic data will be collected.

5.27 The Working Group recommended the new phase of research project in support of the RSRMPA. The Working Group also highlighted that this was a valuable exercise in demonstrating how to apply SMART criteria in the context of the Ross Sea region MPA review. The Working Group further noted that the value of the collected data is well aligned with the objectives of the MPA review and offers a strong foundation for linking this information to the RMP.

5.28 The Working Group recalled the efforts being conducted toward standardising methods and enhancing data collection to assess ecosystem effects. These efforts aim to ensure that data collected now can be used in the future for more informative and integrated analyses. In this context, the Working Group expressed its support for the new phase of the project. The Working Group noted that penguin populations across different regions of Antarctica exhibit varying ecological dynamics. In the Antarctic Peninsula, krill is the dominant prey species in most cases, while in the Ross Sea, fish play a more significant role. The Working Group highlighted the importance of extending this study as a good example of continuous data collection and emphasised the relevance of using this information to support the enhanced CEMP, particularly in distinguishing the effects of climate change from those of fisheries.

ASPA/ASMA/VME and other spatial management issues

5.29 WG-EMM-2025/08 presents an overview of the progress made by the 2025 CCAMLR Scholarship recipient, Dr Filander, on mapping Vulnerable Marine Ecosystems (VME) in the Weddell Sea. The work involved integrating deep learning image analysis and multivariate modelling techniques applied to still and video imagery from 16 research cruises between 1985 and 2021 with use of photo sleds, towed camera systems (e.g., OFOBS) and remotely operated vehicles (ROVs). The data covered depths ranging from shallow depths as 23 m to nearly 1800 m, thus capturing a wide range of environmental conditions. Differences in data acquisition, processing methodologies, imaging availability and varying levels of benthic annotation that were not specifically designed to match VME taxa identifications defined by CCAMLR, and the authors propose the project undergoes a revision towards producing a presence–absence matrix of VME indicator taxa, maximising use of data to produce a broader spatial coverage.

5.30 The Working Group congratulated Dr Filander and recognised the presentation as an ambitious and valuable contribution to Antarctic marine research. The Working Group highlighted the integration of diverse data sources and noted the potential to support the identification of Vulnerable Marine Ecosystems (VMEs) in the Weddell Sea.

5.31 The Working Group noted the level of taxonomic identification, with experts advising the use of higher-level categories when species-level identification is not possible, particularly for organisms like sponges. The Working Group noted that the long-term dataset was promising for future climate change analysis, though potential biases should be considered.

5.32 The WG noted that this kind of data set and machine learning approach to identifying VMEs could be in the future implemented in the fisheries electronic monitoring.

5.33 The Working group emphasised the importance of coordinating benthic data across the Southern Ocean and encouraged collaboration with existing initiatives in New Zealand, Tasmania and BAS. The work was acknowledged as a good example of capacity building through the CCAMLR Scientific Scholarship Scheme, with appreciation expressed for the mentoring and international cooperation involved.

5.34 WG-EMM-2025/61 presented a summary of the VME dataset currently available at the Secretariat, which includes data collected for the past 15 years through commercial fisheries records of VME indicator taxa by-catch (CM 22-07) within the Convention area. Comparisons between observers and vessels data showed mismatches in the number of records, likely a result of recording or data quality issues.

5.35 The Working Group thanked the Secretariat and noted that the project was undertaken through the CCAMLR international internship programme with support provided by China Fund. The Working Group noted that there are various ways errors could be incorporated into the data, including individual variability from observers. It was noted that since the CM 22-07 entered in force, observers needed training in the identification of taxonomic groups, therefore, time was necessary for the CM to be effective. Some discrepancies between observers and vessel reporting could be traced back to this initial period after the CM 22-07 entered in force in 2014. It reinforced the need to improve the data loading procedures to include rules to check for inconsistencies while data is being loaded, and the need to develop a way to correct those errors once identified.

5.36 The Working Group highlighted the importance of CM 22-07 as a source of data but called attention to the need for looking more carefully at the approach to use VME organisms as indicators, as addressed in the VME workplan developed at WG-FSA-2019 (WG-FSA-2019, Table 12).

5.37 The Working Group noted that this information could be made publicly available through the CCAMLR Spatial Data Viewer, recognising that VME data may inform ecosystem health checks. The Working Group noted that careful checks for data quality would be required, and the data should be anonymised before being made available to the public.

5.38 WG-EMM-2025/68 presented imagery data from Remotely Operated Vehicle deployed by the *M/Y Legend* off the east coast of the Cuverville Island in the Errera Channel (Subarea 48.1) to calculate relative percent cover of Vulnerable Marine Ecosystem (VME) taxa indicator species. The site corresponds to a wall with rock and rubble substrate leading down to a steep rocky slope. Analysed imagery had VME percent coverage above 50%, with the majority of imagery with VME coverage between 70% and 80%. The site holds a high diversity of demosponge species, hard bryozoans that form extremely fragile reef-like structures and kelp forests at the shallow depths of the wall. The authors propose the inclusion of this site in the VME site list. Data on this VME can be found in SCAR/AntObis/ GBIF database ((https://ipt-obis.gbif.us/resource?r=vme_rov_cuverville_2025).

5.39 The Working Group acknowledged the study for its transparency, data accessibility and the use of non-destructive ROV techniques, which are becoming a widely accepted method for assessing deep benthic habitats.

5.40 The Working Group noted that the inclusion of the VME in the VME register would assist in ensuring ecological information is preserved and available and suggested that retrospective revisions could be made if needed, noting that the proposal methodology used aligns with protocols accepted by the Scientific Committee since 2010 (WG-EMM-10). The Working Group noted precedents where VMEs were registered based on video-derived quantitative criteria, such as percent cover and taxon density.

5.41 Some participants expressed concern about the absence of formally consolidated and Scientific Committee-approved criteria for using video/imagery in VME identification, and noted that further development of standardised, quantitative protocols to ensure consistency and comparability with existing (e.g. fishing-based) criteria, including the need for defining existing fishing-derived metrics in Annex 22-06/B.

5.42 The Working Group recalled that the first VMEs were identified in areas that were closed for fishing, and noted that several VME sites have been designated in recent years using similar survey approaches.

5.43 Some participants recalled that the existing VME notification process does not require the identification of current threats. They noted that the inclusion of this site will provide information to reduce risk to VMEs in the future. They also recalled that the notification process contributes in generating a database for future comparisons and to test whether VMEs change in time.

5.44 WG-EMM-2025/67 presents updates on the changes of the ice coastline and surface area of the Pine Island Glacier (Subarea 88.3), which is a dynamic glacier that have undergone rapid changes. Pine Island Glacier sea ice coastline retreated substantially from its 2017 baseline, reaching its lowest area in 2021, then expanding and increasing area until 2025. While the glacier's area in 2025 is still significantly lower than the 2017 baseline, it no longer meets the criteria for Special Area for Scientific Studies (SASS) designation set out in CM 24-04. Authors will not seek re-notification of Stage 1 designation, but do not exclude potential future notification due the highly dynamic nature of the glacier. The authors highlighted the importance of regular monitoring of updated satellite image of ice shelves, glaciers and ice tongues in Subareas 48.1, 48.5 and 88.3 to identify other areas that may meet the criteria for SASS designation under CM 24-04.

5.45 The Working Group noted that understanding the history of seafloor exposure is critical to interpreting ecological dynamics, particularly the process of ecosystem colonisation and succession following ice retreat. Temporarily exposed areas can provide valuable insights into early colonisation stages, especially when comparing previously exposed sites with newly revealed ones. This could support future studies of ecosystem resilience and adaptation studies.

5.46 The Working Group emphasised the importance of minimising human activity in newly exposed areas to allow for unbiased scientific observation and data collection. The Working Group noted that while the site does not currently meet the SASS criteria, the dynamic nature suggests that future calving or collapse events could expose new areas that might qualify. The Working Group encouraged Members to maintain close satellite monitoring of Pine Island Glacier and other key glacial fronts in designated subareas to detect future changes.

Other business

Joint SC-CAMLR – CEP Workshop 2026

6.1 The Working Group noted the proposed Joint SC-CAMLR – CEP Workshop scheduled for May 2026 in Hiroshima, Japan, as outlined in paper WP37 submitted to the ATCM. The paper described the intended format and organisational approach for the workshop, which has been under development for several years and now includes a timeline and terms of reference, although a formal agenda is yet to be developed. Participants of WG-EMM were invited to provide suggestions for additional discussion topics to be considered by the Workshop Steering Committee. It was emphasised that this is an opportune time to contribute ideas before the joint draft agenda is presented to the Scientific Committee.

6.2 The Scientific Committee Chair provided an update on recent CEP discussions in Milan and identified ballast water management, bio-fouling, and invasive species range shift/expansion in response to climate change as examples of relevant joint topics.

6.3 The Working Group noted that based on precedents, the outcomes of the Workshop will be submitted to WG-EMM and Scientific Committee and could be made publicly available. The Working Group further noted that formal Scientific Committee-endorsed workshops are included on the CCAMLR website, while informal workshops or those with no formal adopted reports are not.

6.4 The Working Group noted that if the workshop accepts papers, Members may consider submitting papers to the Workshop. The Working Group recalled the value of previous joint workshops between the Scientific Committee and CEP, and highlighted the importance of maintaining progress on topics of common interest.

6.5 The Working Group recalled the six joint priority areas of common interest to the CEP and SC-CAMLR (as listed below), and noted their relevance to the remit of WG-EMM:

(i) climate change and the Antarctic marine environment

(ii) biodiversity and non-native species in the Antarctic Marine environment

(iii) Antarctic species requiring special protection

(iv) spatial marine management and protected areas

(v) ecosystem and environmental monitoring

(vi) marine debris.

Workplan and krill

6.6 The Working Group recalled previous discussions at SC-CAMLR-43 (paragraph 11.22) regarding the responsibilities of different working groups in developing advice related to krill fisheries management. It noted that working group participants often possess different areas of expertise, and that topics are frequently referred between Working Groups to develop comprehensive advice.

6.7 The Working Group highlighted the fragmented handling of krill-related issues across multiple working groups and supported the consolidation of such work. The Working Group noted that a dedicated meeting or the re-establishment of WG-Krill could be considered to bring together relevant expertise from WG-EMM, WG-SAM and WG-ASAM.

6.8 However, the Working Group emphasised the importance of maintaining an integrated ecosystem perspective within WG-EMM to ensure relevant expertise informs the work.

6.9 The Working Group agreed that further discussion by the Scientific Committee would be beneficial to explore options for improving coordination of krill-related work across working groups. The Working Group noted that the WG-EMM terms of reference had been formulated prior to the currently urgent needs to develop the KFMA. It further noted that a holistic approach to reviewing the terms of reference for all CCAMLR working groups, perhaps during the 2027 review of the strategic workplan by the Scientific Committee, was a desirable approach as the Scientific Committee is ultimately responsible for tasking the working groups to manage crosscutting issues.

Status of commercial fisheries in the Convention Area

6.10 The Working Group recalled that WG-FSA-2024 developed three CCAMLR fisheries status assessment categories for commercial fisheries in the Convention Area:

(i) Category 1: Integrated stock assessments (e.g. *Dissostichus spp.*) or 2-year projections based on recent trawl surveys (e.g. *Champsocephalus gunnari*)

(ii) Category 2: 20-year projections based on hydroacoustic survey results conducted more than five years ago (e.g. *Euphausia superba*)

(iii) Category 3: Trend analyses of catch per unit effort or mark-recapture estimates of vulnerable biomass with target harvest rates (e.g. 4% for *Dissostichus spp.*).

6.11 The Working Group noted that SC-CAMLR-43 assigned Category 2 assessments to krill fisheries in Subareas 48.1, 48.2, 48.3, 48.4 and Divisions 58.4.1 and 58.4.2, and that no assessment category was assigned for other areas. SC-CAMLR-43 further noted (SC-CAMLR-43, Table 1, footnote 4) that that the krill assessment categories would be refined during 2025.

6.12 The Working Group agreed that the category 2 description should read: "Precautionary harvest rate that achieves 75% escapement derived from 20-year projections based on population parameters".

Future work

Review of workplan

7.1 The Working Group considered revisions to its current workplan as described in SC-CAMLR-43, Table 8 and recommended the following changes:

(i) revise the term 'Contributor' as a column name to 'Lead'

(ii) remove Dr Labrousse from item 2 a i 2.

(iii) add the CEMP review teams to 2 a (i) 1 and add team leaders (paragraph 2.96).

(iv) add 'Urgency: High to 2 a (i) 1 (i).

(v) remove names for 2 a (ii) Ecosystem modelling.

(vi) noting their recent retirements, remove Dr Watters and Dr Reiss throughout

(vii) remove Dr Lowther and Mr Johannessen from 1 a (v) 1.

(viii) add 'RSRMPA review in 2027' to 2 b (ii).

(ix) remove Dr Hill from 1 b (v) (vii) and Dr Makhado from 2 a (ii)

(x) add 'Ecoregionalisation of Subantarctic Indian Ocean' to 2 b (i) 2 with Dr Makhado and Dr Koubbi as lead

(xi) revise 1 b (v) to read 'Develop the Revised Krill Fishery Management Approach (KFMA)'

(xii) add Dr Panasiuk to 1 a (vi)

(xiii) remove Dr Meyer from 1 a (iv).

Advice to the Scientific Committee and its working groups

8.1 The Working Group's advice to the Scientific Committee is summarised below. These advice paragraphs should be considered along with the body of the report leading to the advice:

(i) WG-ASAM-2025 Research trawl questionnaire (paragraph 2.28)

(ii) research trawl minimum mesh size (paragraphs 2.29 and 2.40)

(iii) utility of adjacent WG-EMM / WG-ASAM meetings (paragraph 2.32)

(iv) reporting of moorings affecting fisheries (paragraph 2.35)

(v) incorporating KSH into KFMA (paragraph 2.42)

(vi) update CEMP forms to note disease (e.g. HPAI) (paragraph 2.72)

(vii) add faecal DNA metabarcoding to CEMP (paragraph 2.83)

(viii) strengthening ties between SC-CAMLR and IWC-SC (paragraph 2.114)

(ix) proposed topics for Antarctica InSync (paragraph 2.121)

(x) CEMP as part of the KFMA (paragraph 2.130)

(xi) krill data collection plan (paragraph 2.207)

(xii) fishing event classification codes (paragraph 2.210)

(xiii) krill product reporting codes (paragraph 3.2)

(xiv) fishery-specific trawl haul-by-haul data forms (paragraph 3.6)

(xv) linking trawl gear configuration to individual hauls (paragraph 3.10)

(xvi) modify IMAF reporting form (paragraph 3.22)

(xvii) calculation of warp-strike reporting rate (paragraph 3.24)

(xviii) KFMA summary document (paragraphs 4.2 to 4.4)

(xix) needs to implement the KFMA (paragraph 4.12)

(xx) krill fishery distribution in 2024/25 season (paragraph 4.13 and 4.14)

(xxi) trigger level catch allocations among subareas (paragraph 4.19, 4.29 and 4.47)

(xxii) SOA alphas for spatial and temporal allocation of catch limits (paragraph 4.45)

(xxiii) RSRMPA review timetable and framework (paragraphs 5.15 and 5.17)

(xxiv) WG-EMM scope of work (paragraphs 6.7 and 6.8)

(xxv) CCAMLR stock status classification (paragraph 6.12)

(xxvi) review of WG-EMM workplan (paragraph 7.1).

Adoption of the report and close of the meeting

9.1 The report of the meeting was adopted requiring 10.9h of discussion.

9.2 At the close of the meeting Dr Collins expressed his gratitude to the convener for his expertise in guiding the sometimes tricky discussions with humour and skill.

9.3 Dr X. Zhao (China) thanked the convener, the host and ARK for a fantastic venue for the meeting.

9.4 Dr Krause thanked the Secretariat for their expert support in preparing the meeting and for their assistance during the meeting.

9.5 Dr Krafft noted the impressive papers, high quality presentations brought to the meeting and welcomed the presence of the diverse next generation of CCAMLR scientists who bring expertise and perspectives from work across the Southern Ocean. He noted that the work of WG-EMM is challenging but constructive and thanked the convener, participants, the Secretariat for their dedication to achieving the big picture of the meeting. He wished all participants safe travels home.

9.6 The Working Group acknowledged Dr George Watters for his invaluable contributions to the group over the years. His work has been central to discussions on key topics such as the Krill Fishery Management Area and the development of the Ross Sea Marine Protected Area. Beyond his role as an outstanding scientist, Dr Watters has been especially appreciated for his ability to guide complex discussions toward common ground, always with wisdom and a sense of humour. His leadership and collegiality have greatly contributed to the group's progress, even in the most challenging debates. With sincere appreciation (and some regret), the Working Group wished 'The Wombat' a happy and well-deserved retirement.

9.7 The Working Group also acknowledged the retirement of Dr Christian Reiss, who brought a wealth of expertise, innovative solutions, and entertainment to the discussions of acoustics and krill as a participant in several working groups and in his role as co-convener for SG-ASAM. The Working Group wished him well in his retirement.

References

Bennett-Laso, B, B. Berazay, G. Muñoz, N. Ariyama, N. Enciso, C. Braun, L. Krüger, M. Barták, M. González-Aravena and V. Neira. 2024. Confirmation of highly pathogenic avian influenza H5N1 in skuas, Antarctica 2024. *Front. Vet. Sci.*, 11:1423404. https://doi.org/10.3389/fvets.2024.1423404.

IWC. 2012. Requirements and guidelines for conducting surveys and analysing data within the revised management scheme. *J. Cetacean Res. Manage.*, 13: 509–516.

Krüger, L., M.F. Huerta, F. Santa Cruz and C.A. Cárdenas. 2021. Antarctic krill fishery effects over penguin populations under adverse climate conditions: Implications for the management of fishing practices. *Ambio*, 50: 560–571. https://doi.org/10.1007/s13280-020-01386-w.

Léon, F. et al. 2025. Skuas mortalities linked to positives HPAIV/H5 beyond Polar Antarctic Circle. bioRxiv, 2025.03.02.640960. https://doi.org/10.1101/2025.03.02.640960.

Siegel, V. 1988. A concept of seasonal variation of krill (*Euphausia superba*) distribution and abundance west of the Antarctic Peninsula. In: Sahrhage, D. (Ed.). *Antarctic Ocean and Resources Variability*. Springer-Verlag, Berlin Heidelberg: 219–230.

Waller, S.J., J.R. Wierenga, L. Heremia, J.A. Darnley, I. de Vries, J. Dubrulle, Z. Robinson, A.K. Miller, C.N. Niebuhr, D.S. Melville, R. Schuckard, P.F. Battley, M. Wille, B. Alai, R. Cole, J. Cooper, U. Ellenberg, G. Elliott, J. Faulkner, J.H. Fischer, J. Fyfe, L. Hay, D. Houston, B.C. Keys, J. Long, R. Long, T. Mattern, H. McGovern, L. McNutt, P. Moore, O. Neil, J. Osborne, A.S. Pagé, K.A. Parker, M. Perry, B. Philp, J. Reid, K. Rexer-Huber, J.C. Russell, R. Sagar, T.T. Ruru, T. Thompson, L. Thomson, J. Tinnemans, L. Uddstrom , T.A. Waipoua, K. Walker, E. Whitehead, C. Wickes, M.J. Young, K. McInnes, D. Winter and J.L. Geoghegan. 2025. Avian Influenza Virus Surveillance Across New Zealand and Its Subantarctic Islands Detects H1N9 in Migratory Shorebirds, but Not 2.3.4.4b HPAI H5N1. *Influenza Other Respir Viruses*, 19(4): e70099. https://doi.org/10.1111/irv.70099.

Watters, G.M., J.T. Hinke and C.S. Reiss. 2020. Long-term observations from Antarctica demonstrate that mismatched scales of fisheries management and predator-prey interaction lead to erroneous conclusions about precaution. *Sci. Rep.,* 10: 2314. https://doi.org/10.1038/s41598-020-59223-9.

Zhou, X.Q., G.P. Zhu and S. Hu. 2020. Influence of tides on mass transport in the Bransfield Strait and the adjacent areas, Antarctic. *Polar Science*, 23: 100506.

Table 1: Variables required to describe research nets used for krill sampling during acoustic surveys.

1) Net name: _________

2) Mesh:

- Mesh size: stretched inside mesh size _______ mm ;
- Mesh design: Diamond ______; Square _______ (mark one)
- Material: ___________; Diameter: _______mm
- Twine type (twisted/braided)

3) Net size:

- Mouth size: horizontal opening _______m; vertical opening________m
- Frame type: beam trawl ________ ; rigid frame __________ ; top and bottom cross bars with vertical wires; other ______ (describe)
- No. towing wires:______; no. warps attached to the frame

Open-closing net _____

- Net length: ________m

4) Operational:

Towing speed: ________ knots through the water

How towing speed is measured:

Hauling speed: ________ m/s

Oblique or V-haul/Double oblique haul:

Depth range net was open (sampling):

(i) Min _______ m ; Max _______m

(ii) Min _______ m ; Max _______m

(iii) Min _______ m ; Max _______m

5) Instrumentation:

Flowmeter in trawl?: ______ (yes/no); If yes: Make _________; Model ________

TD in the trawl? ______ (yes/no); If yes: make ________ ; model _______

CTD in the trawl? ______ (yes/no); If yes: make ________ ; model _______

Mesh size measurement:

- Stretched inside mesh size: using a calliper, measure the distance of one mesh side, from corner to corner (or knot-to-knot)

Table 2: Overview of the proposed schedule for CCAMLR InSync activities.

Aims and timeline for CCAMLR's InSync activities

- 2024–2026 – Preparatory Phase
- 2027–2029 – Implementation Phase
- 2029–2030 – Completion and Reporting Phase

Proposed CCAMLR WG-EMM subtopics to be included within the InSync initiative

1. Ecosystem effects of the krill fishery in Area 48
2. Circumpolar biological krill surveys
3. Characterising krill flux

Research questions identified by the WG-EMM to be addressed within the proposed subtopics (see above)

At this stage, the specific research questions and required data products will serve as references for coordinating the planned data collections and surveys during the InSync Implementation Phase. Therefore, the list of research questions will be further developed in a CCAMLR Discussion Group with CCAMLR members and external experts throughout the InSync Preparatory Phase as field campaigns are organised and feasibility checks are conducted.

Subtopic 1: Ecosystem effects of the krill fishery in Area 48:

Topic	Research Question	Proposed data product requirements
Spatiotemporal overlap of fisheries and krill predators and associated functional responses	*Quantify the degree of horizontal and vertical overlap of fishing and predator foraging events, and does this translate into a functional response by predators to fisheries-induced changes in krill availability?*	Fisheries acoustics Fishing net depth Vertical dive profiles of predators based on animal-borne logging data (e.g. time and depth recorders) Predators foraging areas (horizontal telemetry data) Envelopes of several krill-dependant predator distributions based on

		animal-borne data (from the number of locations or the number of dives or the sum of dive duration) Depth and frequency of prey capture attempts (accelerometer-based estimates) Variability in predator foraging behaviour (trips duration, energy expenditure, successful capture attempts, prey intake) in response to krill availability or proximity of fishing activity during key stages of the breeding cycle Data on diet of predators in fishing areas and non-fishing areas (scats and biomarkers) and data on available prey in the regions Data on diet of predators before and after fishing events Krill catches Krill biomass estimates Horizontal and vertical prey field structure Changes in temporal availability of krill during key stages of the breeding season Deployment-associated diet studies (biogeochemistry, molecular genetics, direct sampling) Energetic cost of foraging
Spatiotemporal overlap of fisheries and krill predators and associated functional responses	*What is the seasonality and magnitude of krill flux at local and subarea scales (spatiotemporal patterns of advection-driven krill stock replenishment)*	Continuous echosounder data of the upper 300 m either from gliders, repeat boat/ship based tracks, or an array of bottom-mounted acoustic buoys – all would need to be sampled densely enough to characterise flux over a time and spatial scale relevant to foraging behaviour
Numerical / demographic responses to fishing pressure	*Are functional responses to human-driven changes in krill availability (through fishing) translated into population abundance changes of predators?*	Aerial surveys of land-based predator colonies (UAV, piloted aircraft, ground counts)
Behavioural interactions between the krill fishery and krill-dependent predators	*Does nearby fishing change the foraging behaviour of krill predators?*	Fisheries acoustics Fishing net depth Vertical dive profiles of predators based on animal-borne data Predator-specific prey capture rates Change in foraging tactics (shape of dives, changes in pattern of acceleration…) Change in predator body condition from accelerometry data Fishing fleet position data

Behavioural interactions between the krill fishery and krill-dependent predators	*Can nearby (or remote) fishing activity alter the spatial movements of krill predators?*	Fishing fleet position data Fishing effort data Predator telemetric data
Behavioural interactions between the krill fishery and krill-dependent predators	*What is the impact of fishing activity on the temporal depletion of krill in the upper layers of the water column and/or on the structure of krill swarms near central-place foragers colonies?*	Individuals' physiological condition and breeding output under different scenarios of krill availability in the surroundings of breeding colonies Krill fisheries acoustic data An array of acoustic buoys that is placed densely enough to characterise the flux through an area relevant to the scale of potential fishery depletion.
Behavioural interactions between the krill fishery and krill-dependent predators	*How does the spatial distribution of different krill-dependent predators relate to documented direct interactions with fishing vessels?*	Predator survey data Predator telemetric data Fisheries acoustics Fishing fleet position data

Subtopic 2: Circumpolar biological krill survey

Topic	Research Question	Proposed data product requirements
Large scale krill biomass estimates	*Can a synoptic or semi-synoptic krill acoustic survey be completed across Subareas or at circumpolar scales?*	Calibrated acoustic data from vessels following systematic survey grids Acoustic glider data (if a suitable biomass model can be designed)
Large scale krill population structure	*Can we identify source and sink regions as well as potential advective connectivity between different krill populations at large scales based on population structure?*	Krill length frequency distribution Krill sex/maturity stage composition
Large scale dynamics in krill vertical distribution	*Can we identify general mechanisms and drivers of the vertical distribution of krill swarms?*	Fisheries acoustics Glider acoustics Mooring/lander acoustics Acoustic data from research surveys (conducted by fishing and research vessels)

Subtopic 3: Characterising krill flux

Topic	Research Question	Proposed data product requirements
Area or management unit scale estimates of krill flux at a seasonal scale	*Can we estimate krill density and movement (flux) into and out of a biologically or ecologically relevant area (e.g. Bransfield Strait)*	A large array of acoustic buoys with ADCP and echosounder sensors

Table 3: Initial table outlining essential variables and indices identified by the CEMP Monitoring Plan and Ecosystem Status Reporting teams, including methods for accessing raw data, scripts used for data reformatting, and locations of processed output files.

		Data scope		Data Source			Workflow	Output
Essential Variable	CCAMLR Index	Relevant CEMP site(s)	Relevant region	DOI/API	Resource contact	National program (if applicable)		

Table 4: Krill biological data collection plan on the krill fishing vessels during commercial operation.

Krill biological sampling by SISO Observers during fishing operations (CM 51-06)

Sampling frequency and sample size	Measurements	Objectives
Every 3 days or every 5 days, random 200 individuals SISO Protocol for details	Krill length (in mm)	Operational: Size composition of catch in space and time, and in relation to gear selectivity. Stock assessment parameters: Spawning season parameters for Grym. Inform future integrated stock assessment for krill. KSH: Spatial krill length frequency distribution (LFD) and life stage distribution patterns (such as in relation to topography or Management Units).

Krill biological sampling for Science Programs (Note: Sampling during acoustic transects are detailed in Table 5)

Sampling frequency and sample size	Measurements	Objectives
Project dependent	Detailed LFD and maturity stages, and weights.	Stock assessment parameters: Length-weight relationship Maturity parameters to determine recruitment KSH: LFD and maturity distribution pattern (such as in relation to topography) of post-larval krill (juveniles, subadults, and adults) within fishing grounds and hotspots.
	Environmental data (e.g. SST, salinity, sea ice, wind, chl-a, eDNA,	Ancillary environmental parameters to support taken by vessels to understand habitat condition and its relation to krill life stage distribution throughout the period.
	Genetics)	Development of molecular markers for analysing subarea level population. Molecular analysis of microbiome assembly that are geographically structured. Understand connectivity and retention.

Table 5: Biological sampling plan for KSH during acoustic transects

Trawl type	Measurement	Data to be used for	Number of individuals to be measured	Net Towing method	Spacing between sampling stations	Season	Processing
Post-larval krill sampling net	Essential Length Basic staging (Juveniles, Adult Males, Adult Females, Gravid females) Determined by scientists or image-based methods Optional Detailed maturity staging using Makarov and Denys (1981 staging key)	Recruitment index for Grym Maturation parameter for Grym Detailed maturity information of post-larval krill to advance KSH	100-150 (randomly grabbed and all individuals to be measured	Double oblique 0-200 m (the depth of towing net depends on the weather)	During acoustic transects station spacing 20-40nm	Summer (Jan) and Winter (May)	On board Post processing (within 1 year after survey)
Larval krill sampling net	Antarctic krill larvae	Identification of nursery ground for KSH	1. Using splitter to subsample. 2. Record split factor and 3. Mark Furcilia numbers in subsample as follows: 1-10: + 10-20: ++ >20: +++	Double oblique 0-200 m	During acoustic transects station spacing 20-40nm	Only winter	Post processing (within 1 year after survey)

Table 6: Biological sampling plan for acoustic biomass

Trawl type	Measurement	Data to be used for	Number of individuals to be measured	Net Towing method	Spacing between sampling stations	Season	Processing
Post-larval krill sampling net	Length	Acoustic biomass estimate	100	Target trawl/oblique tows	Directed tows on acoustic marks	Summer and Winter	On board

Table 7: Options for spatial and temporal catch allocations (alphas) in Subarea 48.1 based on the Spatial Overlap Analysis. These options were proposed by participants and none of them represent the consensus view of WG-EMM. The statements in the 'Justification' column are the views of proponents and do not represent the consensus view of WG-EMM. The 'decreasing humpbacks' scenarios in WG-EMM-2025/12 refers to the gradual seasonal migration of humpback whales out of Subarea 48.1.

Option	Alphas	Management units	Justification	Additional work required to develop advice and indicative timescale
1 (2022 alphas)	SC-CAMLR-41, Table 2 (2022)	SC-CAMLR-41, Figure 1 (2022)	Based on best available science in 2022 (SC-CAMLR-41, paragraph 3.46).	NA (alphas in Table 8)
2 (2025 alphas-harmonised)	WG-EMM-2025/12 Table 2 ('Decreasing humpbacks' scenario)	WG-EMM-2025/12, Figure 1	Uses management units endorsed by SC-CAMLR-43 (paragraph 2.63) adapted to include the SPZs and GPZs proposed by HS (2024), and includes updated whale layer compared to option 1.	NA (alphas in Table 8)
3 (2025 alphas-KFMA)	As above but updated to remove SPZs and GPZs from management unit structure	SC-CAMLR-43, Figure 1 (2024) Original version in WG-EMM-2024/25, Figure 1 (scenario 2)	Uses management units endorsed by SC-CAMLR-43 (paragraph 2.63) and includes updated whale layer compared to option 1.	NA (alphas in Table 8)
4 to 8 (Revised management units)	Alphas to be calculated. Data layers from 2025 WG-EMM-2025/12	Five configurations of management units including management units endorsed by SC-CAMLR-43 (paragraph 2.63) Configurations to be considered with and without SPZs and GPZs	Allocations are potentially not robust to the effects of uncertainties in the SOA, including krill flux (WG-EMM-2024/27). Managing at progressively larger scales may integrate out the noise of flux. Multiple options required to allow managers to make a choice based on the trade-off between risk and uncertainties.	MU configurations provided during WG-EMM-2025. Shapefiles to be clipped to fit SOA footprint. Run SOA with proposed MU configurations in advance of SC-CAMLR-45.

Table 8: Spatial and seasonal catch allocations (alphas) for three options detailed in Table 7 ('Options for spatial and temporal distribution of catches'). Note that the shapes of the management units vary between options, and that each set of alphas sums to slightly more than one due to rounding.

Option name	2022 alphas		2025 alphas harmonised		2025 alphas KFMA	
Source	SC-CAMLR-41, Table 2 (2022)		WG-EMM2025/12, Table 2 'decreasing humpbacks' scenario		New analysis, as '2025 alphas harmonised' but without GPZs and SPZs	
Management unit	alpha summer	alpha winter	alpha summer	alpha winter	alpha summer	alpha winter
Joinville	0.0008	0.0178	0.006	0.022	0	0.018
Elephant Island	0.0662	0.1097	0.075	0.068	0.081	0.091
Bransfield Strait	0.0061	0.1094	0.007	0.12	0.007	0.096
South Shetlands Islands West	0.0549	0.0731	0.05	0.037	0.069	0.064
Gerlache Strait	0.0238	0.2116	0.055	0.245	0.051	0.220
Powel Basin and Drake Passage	0.045	0.2815				
Powell Basin 1			0.051	0.078	0.043	0.062
Drake Passage 1			0.036	0.155	0.025	0.174
Total	0.1968	0.8032	0.28	0.725	0.276	0.725

Table 9: Proposed timeline for development of the 10 year review for the RSRMPA to be completed in 2027.

	When	What	How	Description	Who
2025: scoping	July 2025	Proposal for Review Framework	WG-EMM paper	A draft RSrMPA review Framework is submitted for discussion (this paper).	Members and science community.
	August 2025	Workshop on the RSrMPA review	Online meeting	Workshop to agree on approach and timeline.	SC Reps, Commissioner, policy and science leads.
	October 2025	RSrMPA Framework proposal	SC-CAMLR and CCAMLR-44 papers	MPA review requirements paper. Proposed Framework approach paper. Workshop report paper. Open collaboration for the review.	Members and science community.
2026: Research delivery	February 2026	(tentative) RSrMPA Science Workshop	Online	MPA review workshops –science approach and delivery.	Science community.
	July 2026	RSrMPA, including SRZ, review scientific papers	WG-EMM papers	Initial reporting on progress and/or key science papers. Scientific papers submitted to support SRZ review.	Members, science leads and science community.
	October 2026	SRZ review papers RSrMPA science progress	WG-FSA SC-CAMLR Commission	SRZ review papers. Science progress papers for the RSrMPA review.	NZ (paper on SRZ) & Members.
	December 2026	Finalise compilation of 5 - year reports	Online coordination	Members to coordinate intersessional compilation of research projects for the 5-year RSrMPA report.	Members and science community.
		Submission of report on activities for 5 - year review	Online to Secretariat	Members' five-year reports on their activities against objectives.	Members.
2027: Presenting review outcomes	March 2027	Compilation of 5 - year reports on activities	Online, WG-EMM, SC	Secretariat to compile 5-year reports.	Secretariat.
	July 2027	Delivery of RSrMPA analysis reports, including 5-year review reports	WG-EMM	Science papers in support of RSrMPA review. RSrMPA report assessing objectives and research and monitoring, including management recommendations and 5-year review reports.	Members and Secretariat.
	August 2027	WG-EMM feedback addressed	Online	Members address WG-EMM feedback into a final summary and proposal for SC-CCAMLR.	Members and Secretariat.
	October 2027	RSrMPA final deliverables and science products	SC-CAMLR and Commission	RSrMPA assessment paper and management recommendations.	Members and Secretariat.

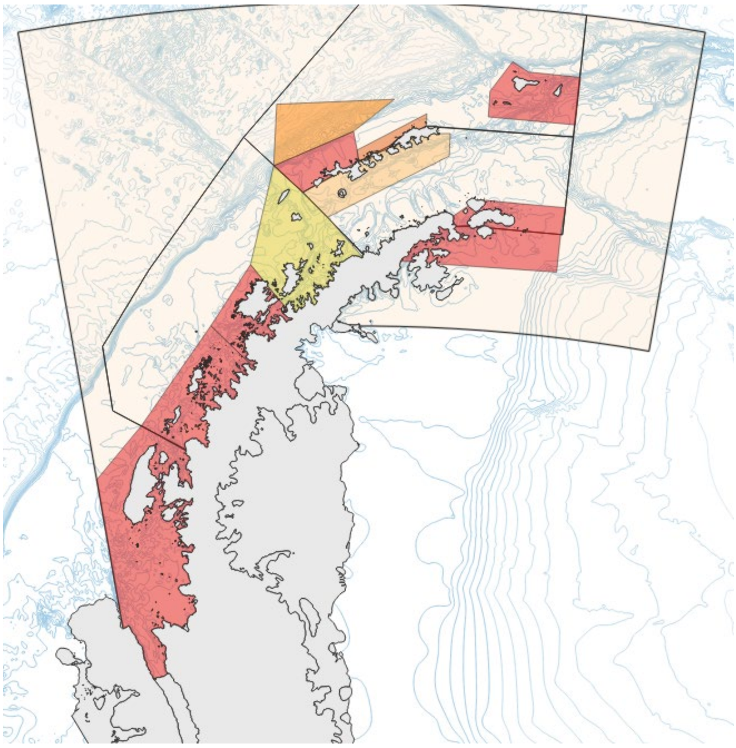

Figure 1: Subarea 48.1 with five candidate management units proposed in paragraph 4.21 and the proposed D1MPA (GPZs and SPZs as presented in CCAMLR-43/37).

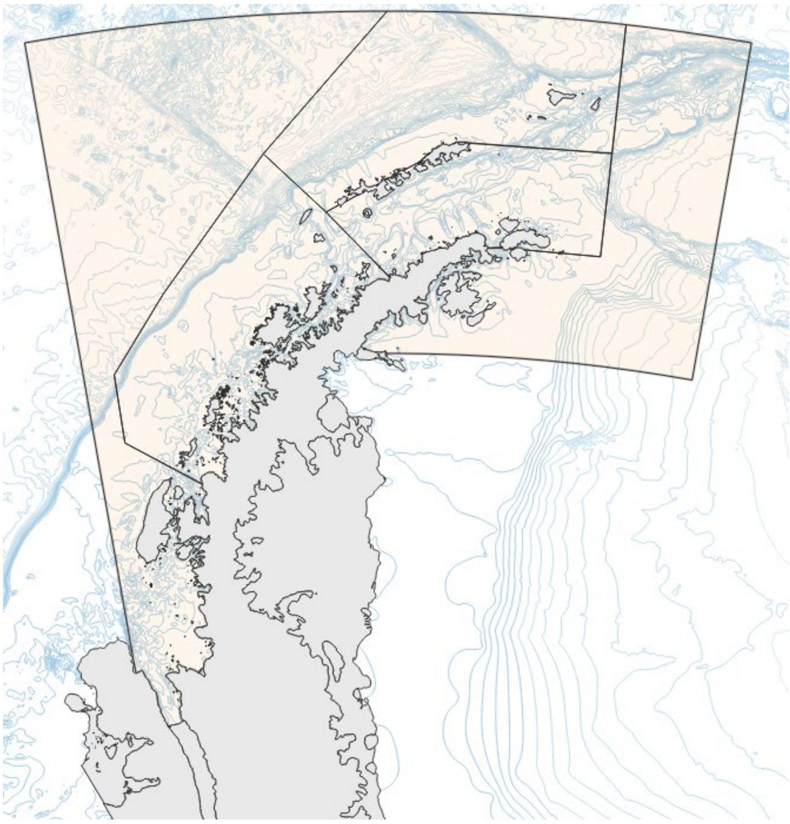

Figure 2: Subarea 48.1 with five candidate management units proposed in paragraph 4.21.

Appendix A

List of Participants
Working Group on Ecosystem Monitoring and Management
(Geilo, Norway, 7 to 18 July 2025)

Chair	Dr Jefferson Hinke National Marine Fisheries Service, Southwest Fisheries Science Center
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	Dr Jeong-Hoon Kim Korea Ocean Polar Research Institute (KOPRI)
	Dr Hyoung Sul La Korea Ocean Polar Research Institute (KOPRI)
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New Zealand	Mr Enrique Pardo Department of Conservation
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	Dr Andrew Lowther Norwegian Polar Institute
	Mr Elling Deehr Johannessen Norwegian Polar Institute
	Dr Ulf Lindstrøm Institute of Marine Research
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	Dr Zoleka Filander Department of Forestry, Fisheries and the Environment
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	Dr Sophie Fielding British Antarctic Survey
	Dr Simeon Hill British Antarctic Survey
	Dr Claire Waluda British Antarctic Survey
	Dr Vicky Warwick-Evans British Antarctic Survey
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Secretariat	Dr Steve Parker Science Manager
	Claire van Werven Research, Monitoring and Compliance Analyst

Appendix B

Agenda
Working Group on Ecosystem Monitoring and Management
(Geilo, Norway, 7–18 July 2025)

1. Introduction
   1.1 Opening of meeting
   1.2 Adoption of the Agenda
2. Ecosystem monitoring
   2.1 Krill biology and ecology
      2.1.1 Advice from WG-ASAM
      2.1.2 Population status and dynamics
      2.1.3 Krill stock hypothesis and life history parameters
   2.2 Krill predator biology and ecology
      2.2.1 Population status and dynamics
      2.2.2 CEMP and other ecosystem monitoring needs
         2.2.2.1 Analysis of existing monitoring data
         2.2.2.2 Monitoring of current and potential sentinel species
         2.2.2.3 Environmental/non-biological parameters relevant to wider ecosystem monitoring
         2.2.2.4 Communicating results (e.g. ecosystem status reports)
   2.3 Other impacts (e.g., HPAI, toxins)
   2.4 Climate change and associated ecosystem research and monitoring
   2.5 Marine debris
   2.6 Fishery-independent data collection plan
   2.7 Fishery-dependent data collection plan
3. Krill Fishery
   3.1 Fishing activities
   3.2 Scientific observation
      3.1.1 Krill biological sampling
      3.1.2 By-catch sampling
      3.1.3 IMAF data collection and sampling

4. Krill Fishery Management

    4.1 Advice from the Commission

    4.2 Advice from other Working Groups

    4.3 Implementation of the revised krill fishery management approach

        4.3.1 Krill biomass estimation

        4.3.2 Harvest rate estimation and MSE

        4.3.3 Spatial overlap analysis

    4.4 Coordination of the KFMA and D1MPA planning

    4.5 Krill Fishery Management in Area 58

5. Spatial management

    5.1. Data analysis supporting spatial management approaches in CCAMLR

    5.2. Research and monitoring plans for CCAMLR MPAs

    5.3. ASPA/ASMA/VME and other spatial management issues

6. Other business

7. Future work

    7.1. Review of workplan

8. Advice to the Scientific Committee and its working groups

9. Adoption of the report and close of the meeting

Appendix C

List of Documents
Working Group on Ecosystem Monitoring and Management
(Geilo, Norway, 7–18 July 2025)

WG-EMM-2025/01	Classification of fishing events in CCAMLR reporting forms CCAMLR Secretariat
WG- EMM-2025/02	Modification of IMAF data collection forms for Observer Trawl Finfish and Krill Fisheries CCAMLR Secretariat
WG-EMM-2025/03	2025 GIS projects update. CCAMLR Secretariat
WG-EMM-2025/04	Observer sampling rates in the krill fishery - 2025 update. CCAMLR Secretariat
WG-EMM-2025/05	CCAMLR's revised Krill Fishery Management Approach (KFMA) in Subareas 48.1 to 48.4 as progressed up to 2024. CCAMLR Secretariat
WG-EMM-2025/06	Summary of the CCAMLR Ecosystem Monitoring Program (CEMP) data holdings through the 2024/25 monitoring season CCAMLR Secretariat
WG-EMM-2025/07	Trawl gear configuration reporting and linking to individual fishing events CCAMLR Secretariat
WG-EMM-2025/08	Advancing Vulnerable Marine Ecosystems (VMEs) research in the greater Weddell Sea: 2025 scholarship progress overview Filander, Z., K. Teschke, and A. Makhado
WG-EMM-2025/09	Chilean operation in the Antarctic krill fishery, 2023-2024 season Arana, P.M. and R. Rolleri
WG-EMM-2025/10	Habitat use by chinstrap and gentoo penguins from two Gerlache Strait colonies during the 2024/25 breeding season Rozas Sia, M.G., A. Soutullo, M.A. Juáres, J. Negrete and M. Santos
WG-EMM-2025/11	Identification and Assessment of Fishing Grounds Based on Fishing Opportunity in the Antarctic Krill Fishery (*Euphausia superba* Dana, 1850) Torretti, G. and L. Cubillos

WG-EMM-2025/12	Including krill consumption by humpback whales in winter in the Spatial Overlap Analysis in Subarea 48.1 Warwick-Evans, V., M.A. Collins, A. Friedlaender, S., Hill, T. Jones, T. Joyce and N. Kelly
WG-EMM-2025/13	Key foraging areas for Adélie Penguins at Esperanza/Hope Bay, Antarctic Peninsula Santos, M. A. Silvestro, M.A. Juáres and A. Soutullo
WG-EMM-2025/14 Rev. 1	Monitoring Antarctic krill (*Euphausia superba*) distribution in the Southern Ocean: environmental DNA (eDNA) adds to the toolbox Suter, L. A. Burns, S. Bestley, J. Bird, M. J. Brasier, M. Cox, D. Hamer, O. J. Johnson, S. Kawaguchi, R. King, A. Klocker, J. Melvin, C. K. Weldrick, S. Wothersoon and B. Raymond
WG-EMM-2025/15	2025 update on the status and trends of CEMP indicator species in U.S. AMLR Program studies Hinke, J.T., S.M. Woodman and D.J. Krause
WG-EMM-2025/16	A proposed collaborative framework to develop ecosystem monitoring in East Antarctica Eon, L. Y. Ankerl, A. Barreau, A. Kondratyeva, Y. Le Bras, J. Le Cras, E. Le Mestric, C. Royaux, P. Seguineau, P. Ziegler, C. Masere and M. Eléaume
WG-EMM-2025/17	A review of ecosystem monitoring in Subarea 48.1 to identify gaps and inform future enhanced monitoring programmes in support of CCAMLRs conservation objectives Waluda, C.M., D. Bahlburg, M.A. Collins, L. Emmerson, N. Fenney, T. Hart, G. Humphries, E.D. Johannessen, S. Kawaguchi, N. Kelly, L. Kruger, B. Meyer, F. Santa Cruz, M. Santos and the CCAMLR Secretariat
WG-EMM-2025/19	Antarctic fur seals as bioindicators of seasonal and ocean basin scale variation in the Southern Ocean food web Friscourt, N., A. Walters and M.-A. Lea
WG-EMM-2025/20 Rev. 1	Breeding Population Survey of Adélie Penguins along the Northern Victoria Land Coast, Ross Sea, Antarctica Kim, J.-H., Y. Kim, J.-U. Kim, Y. Oh, Y. Jeong and H.-C. Kim
WG-EMM-2025/21 Rev. 1	British Antarctic Survey: Ecosystem Monitoring in Area 48 (2024/25) Waluda, C.M., S.E. Thorpe, A. Bennison, J.B. Cleeland, M.J. Dunn, K.A. Owen, S. Fielding, A.H. Fleming, R.A. Saunders, G.Stowasser, G.A. Tarling and M.A. Collins

WG-EMM-2025/22	Comparative evaluation of mesozooplankton sampling techniques around South Georgia: traditional and imaging approaches Dewar-Fowler, V., G. A. Tarling, M. Wootton and C. M. Liszka
WG-EMM-2025/23	Krill fishery management in Area 48 – potential ways forward Collins, M.A., S.L. Hill, S. Fielding, V. Warwick Evans, S.E. Thorpe and C.M. Waluda
WG-EMM-2025/24	Progress on defining high-level strategic objectives for ecosystem modelling Hill, S. and N. Kelly
WG-EMM-2025/25	Progress, options, and next steps for developing CCAMLR State of the Environment and Antarctic Marine Living Resources reports Waluda, C.M., S. Grant, S.E. Thorpe, R.D. Cavanagh, A.H. Fleming, S.L. Hill, A. Barreau A.L. Eon, Y. Le Bras, C. Royaux, P. Seguineau, M. Eléaume, E. Pardo, S. Parker, A.P. Van de Putte and M.A. Collins
WG-EMM-2025/26	Re-emphasising harmonisation as a relevant tool for precautionary, ecosystem-based and adaptive fisheries management and spatial protection along the Antarctic Peninsula and the Scotia Arc region Santa Cruz, F., M. Santos, D. Deregibus, L. Krüger and L. Rebolledo
WG-EMM-2025/27	Report of incidental capture of a humpback whale by the traditional Chilean krill trawler in CCAMLR Subarea 48.2 during the 2024/25 fishing season Delegation of Chile
WG-EMM-2025/28	Report of the Analysis of Existing CEMP data team to WG-EMM 2025 Hill, S., S. Labrousse, S. Parker, S. Thanassekos and C. Van Werven
WG-EMM-2025/29	Research Vessel Tangaroa 2025 Ross Sea Antarctic “ACTUATE” Voyage, 15 January - 23 February 2025 Stevens, C., D. Fernandez and M. Pinkerton
WG-EMM-2025/30	Introduction of two new types of krill products from the Chinese krill fishing vessel FU YUAN YU 9199 Zhu, J., G. Fan, J. Luo, X. Zhao, X. Wang, Y. Ying and J. Miao

WG-EMM-2025/31	Ross Sea Region Marine Protected Area Research Coordination Network Inaugural Meeting Brooks. C. S. Stammerjohn, G. Ballard, C. Christian, L. Ghigliotti, E. Hofmann, J-H. Kim, M. LaRue, C. Nissen9, A.J. Orona, B. J. Pan, J. Park, S. Parker, N. Walker and J. Weller
WG-EMM-2025/32	South Shetland Island archipelago krill-predator survey 2025: region-wide census of imperiled fur seals and HPAI testing results Krause, D.J., S.M. Woodman, J.L. Leslie, K.F. Alvstad and J.T. Hinke
WG-EMM-2025/33	Spatial and temporal analysis of the Antarctic krill (*Euphausia superba*) CPUE in recurring fishing opportunities in subareas 48.1 and 48.2 Torretti, G. and L. Cubillos
WG-EMM-2025/34	Spatial overlap analysis in Subarea 48.3: Progress update Jones, T. V. Warwick-Evans, S. Hill and M. A. Collins
WG-EMM-2025/35	2027 Ross Sea region MPA review - Requirements and science needed for objective-based reporting Pardo, E., N. Walker, S. Lamping, L. Ghigliotti, J-H. Kim, C. von Quillfeldt, C. Brooks, M. Santos, M. Pinkerton, H. Weiskel, J. Fenaughty, S. Parker, P. Castillo-Briceno and M. Anderson
WG-EMM-2025/36	A proposed framework to support the Ross Sea region MPA review Lamping, S., L. Ghigliotti, E. Pardo, N. Walker, J-H. Kim, M. Santos, C. von Quillfeldt, C. Brooks, H. Weiskel, J. Fenaughty, S. Parker, P. Castillo-Briceno and M. Anderson
WG-EMM-2025/37	Advancing harmonisation of marine spatial planning in Domain 1: identifying duplication, redundancy and gaps Lowther, A. Johannessen, E., Lindstrøm, U. and Krafft, B.
WG-EMM-2025/38	Automating the State of the Environment Report: A reproducible workflow with Galaxy Barreau, A., L. Eon, Y. Le Bras, C. Royaux, P. Seguineau, A. Van de Putte, C.M. Waluda, S. Grant, S.E. Thorpe, R.D. Cavanagh, A.H. Fleming, S.L. Hill, M.A. Collins, L. Emerson, C. Masere, P. Ziegler and M. Eléaume
WG-EMM-2025/39	Establishing a Framework for a Revised Krill Fishery Management Approach in Subarea 48.1 Krafft, B.A., A.-L. Agnalt, U. Lindstrøm, A. Lowther, E. Johannessen, T. Knutsen, J. Arata, F. Santa Cruz, D. Bahlburg and B. Meyer

WG-EMM-2025/40	Establishing a Weddell Sea observatory: Advances through the WOBEC initiative for long-term biodiversity and ecosystem monitoring Teschke, K., A.P. Van de Putte, T. Vandenberghe, E. Campbell, K. Campbell, M. van Leeuwe, M. Lenss, H. Link, F. Mark, Z. Mohamed, S. Moreau, S. Niiranen, M. Różańska-Pluta, C. Papetti, R. Roura, F. Schaafsma, N. Van den Steen, J. Stefels, W. Werna, M. Vortkamp, M. Wietz1, J. Wiktor, A. Wold and H. Flores
WG-EMM-2025/41	Hydrological and ecological uniqueness of Elephant Island (Western Maritime Antarctic Peninsula) – case study in the context of planning MPAs Panasiuk, A., H. Herr, K. Hoszek-Mandera and L. Krüger
WG-EMM-2025/42	Initial Overview of External Environmental Data Sources Relevant for CCAMLR Deschepper P., C. Plasman and A. Van de Putte
WG-EMM-2025/43	Integrating cetacean research into the CCAMLR Ecosystem Monitoring Program and the revised Krill Fishery Management Approach: Review and recommendations Johannessen, E.D., R. Reisinger, H. Murase, M. Biuw, E. Seyboth, E. Vermeulen, S. Bengtson Nash, B. Miller, A. Henderson, C. Waluda, J. Jackson, B. Krafft, F. Santa Cruz, F. Castro and N. Kelly
WG-EMM-2025/44	Monitoring of phenolic compounds in Antarctic Krill – a warning signal for the Southern Ocean food web Hoszek-Mandera, K., J.T. Hinke, M. Staniszewska, M. Bełdowska, K. Fudala, R. Bialik and A. Panasiuk
WG-EMM-2025/45	New Zealand research and monitoring in support of the Ross Sea region Marine Protected Area: 2023-2025 update Pinkerton, M., J. Devine, I. Hawes, E. Pardo, E. Robinson and C. Stevens
WG-EMM-2025/46	On the use of ROV for fish communities research and monitoring under sea ice at Terra Nova Bay (RSRMPA) Di Blasi, D., E. Carlig, A. Odetti, S. Aracri, G. Bruzzone, R. Ferretti, L. Ghigliotti, E. Spirandelli and G. Bruzzone
WG-EMM-2025/47	Planning for an upcoming update of the Spatial Overlap Analysis in CCAMLR Divisions 58.4.1 and 58.4.2 Kelly, N., H. Murase, L. Emmerson, N. Kokubun, M. Mori, F. Schaafsma, C. Southwell, M. Eléaume and S. Kawaguchi

WG-EMM-2025/48 Rev. 1	Preliminary analysis on the stock structure and biological characteristics of the Antarctic Krill in the Antarctic Peninsula region Ying, Y., Y. Zhao, P. Luo, W. Li, X. Zhao, X. Wang, G. Fan, J. Wang, C. Sun, X. Mu and J. Zhu
WG-EMM-2025/49	Preliminary Observations on Morphological Distinctions Among Eight Crocodile Icefishes (family Channichthyidae) Collected in the Antarctic Krill Fishery Lee, Y.-J., E. Kim, and J.-L. Kim
WG-EMM-2025/50	A comparative multi-year study of Adélie penguin diet using stomach lavage and scat DNA metabarcoding MacDonald, A.J., A. Polanowski, J. McInnes, B. Deagle, M. Dunn, L. Emmerson, B. Raymond, L. Suter and C.M. Waluda
WG-EMM-2025/51	Quantifying the present and future value for Antarctic ecosystems from phytoplankton to penguins DuVivier, A.K., K. M. Krumhardt, L. L. Landrum, Z. Sylvester, B. Şen, S. Labrousse, C. Che-Castaldo, A. Eparvier, M. M. Holland,M. A. LaRue, C. Nissen, M.N. Levy, S. Jenouvrier and C. Brooks
WG-EMM-2025/52	Results from beached debris surveys near Australian operated research stations in East Antarctica Emmerson, L., S. Donoghue and C. Southwell
WG-EMM-2025/53	Results of the Japanese Abundance and Stock structure Survey in the Antarctic (JASS-A) during the 2024/2025 austral summer season Katsumata, T., M. Kawasaki, C. Ohmukai, M. Yamazaki, H, Kasai, N. Abe, H. Murase and T. Isoda
WG-EMM-2025/54	Revisiting the East Antarctic Marine Protected Area proposal: Insights from long-term wintering distribution of Adélie penguins Zajková, Z., A. Kato, T. Raclot, F. Angelier, J.B. Thiebot, A. Takahashi and Y. Ropert-Coudert
WG-EMM-2025/55	SCAR Databases and Tools of Relevance to CCAMLR Van de Putte A.P., D. Maschette, B. Raymond, M. Sumner and C. Plasman
WG-EMM-2025/56	Spatial distribution of Antarctic krill (*Euphausia superba*) density in the Krill Research Zone of the Ross Sea Region Marine Protected Area, Antarctica La, H.S., W. Son and J.-H. Kim

WG-EMM-2025/57	Spatiotemporal overlap of minke and humpback whales with krill fishing vessels in the Western Antarctic Peninsula Mestre, J., P.N. Trathan, J.W. Durban, A.S. Friedlaender, A. Hutchinson, T.W. Joyce, A. Rogers and R.R. Reisinger
WG-EMM-2025/58	Starting the development of science-based management advice for Subarea 48.2 Lowther, A., E. Johannessen, U. Lindstrøm and B.A. Krafft
WG-EMM-2025/59	A preliminary report on the 2024-25 season field survey of the CCAMLR Ecosystem Monitoring Program in Seaview Bay of Inexpressible Island, Ross Sea Region Delegations of China and Korea
WG-EMM-2025/60	Strategic spatial selection of marine ecosystem indicator sites to monitor a complex coastal environment Johannessen, E.D., F. Santa Cruz, C. von Quillfeldt, B.A. Krafft and A. Lowther
WG-EMM-2025/61	Structure and summary of vulnerable marine ecosystem data collection in CCAMLR Aerts, D., A. Van de Putte and the CCAMLR Secretariat
WG-EMM-2025/62	Summary of Korean Krill Fishing Activities and Bycatch Observations in recent 5 years (2020–2024) Kim, E., J. Park, S. Chung, Y.-J. Lee and J.-K. Kim
WG-EMM-2025/63	The diet of non-breeding male Antarctic fur seals in the South Shetland Islands Casaux, R., J. Negrete , A. Corbalán, A. Farace Rey, M. Juáres and A. Carlini
WG-EMM-2025/64	The Galindez Island Gentoo penguin (*Pygoscelis papua*) population during 2024/2025 season and time-lapse camera data validation results Davydenko, S., E. Dykyi, P. Khoetsky, O. Savenko, G. Milinevsky, A. Simon, L. Pshenichnov, V. Tkachenko, K. Demianenko, A. Dzhulai and S. Gogol
WG-EMM-2025/65	The impact of illegal fishing on efficacy of bycatch mitigation for wandering albatrosses Becker, S.L. D.F. Doak, T. Clay, C. Brooks and R.A. Phillips
WG-EMM-2025/66	The proposed Marine Protected Areas could make a difference for baleen whales in Antarctica Vitale, A.S., J.L. Orgeira, P. Benedetti and F. Alvarez
WG-EMM-2025/67	Update on the Stage 1 Special Area for Scientific Study at Pine Island Glacier Grant, S.M. and A. Skachkova

WG-EMM-2025/68	Vulnerable Marine Ecosystem detected via ROV at Cuverville Island, Western Antarctic Peninsula (Subarea 48.1) Lockhart, S.J., E. Darani, A. Kuhn and R.C. Izendooren
WG-EMM-2025/69	Wind-Driven Variability in Larval Krill Connectivity: Implications for Spawning and Nursery Ground Linkages along the Western Antarctic Peninsula Sylvester, Z., M. S. Dinniman, S. Thorpe, K. Bernard and C. M. Brooks
WG-EMM-2025/70	Preliminary framework of pollutants non-invasive monitoring approach Hoszek-Mandera, K., M. Bełdowska, D. Saniewska and A. Panasiuk

Other

CCAMLR-43/22	Comments on the harmonization of the implementation of the revised krill fishery (KFMA) and the establishment of Doman 1 MPA in Subarea 48.1 Russian Federation
WG-ASAM-2025/02	The benefits of integrating the Krill Stock Hypothesis (KSH) as an integral Part into the Revised Krill Stock Management Approach (KSMA) Meyer, B., D. Bahlburg, C.A. Cárdenas, S.L. Hill, S. Kawaguchi, B.A. Krafft, S. Labrousse, D. Maschette, Z. Sylvester, P. Ziegler and J.A. Arata
WG-ASAM-2025/03	"International Science & Infrastructure for Synchronous Observation (Antarctica InSync)" - how can CCAMLR`s needs be met? Meyer, B. and B. Krafft
WG-ASAM-2025/15	Revised biomass density estimates of Antarctic krill in Bransfield Strait during the 2023/24 austral summer from a new glider-based wideband echosounder; forthcoming biomass estimates from the 2024/25 glider deployment and mooring and glider deployment plans for 2025/26 Cossio, A.M. and C.S. Reiss
WG-ASAM-2025/17	SKEG Symposium 2025 Report Bahlburg, D., S. Kawaguchi, B. Meyer and Z. Sylvester
WG-SAM-2025/07	Proposed new separate C1 trawl haul by haul forms for krill and finfish fisheries CCAMLR Secretariat

WG-EMM-2025/P01	Aotearoa New Zealand Developments in Ocean Science in the Ross Sea – from the Southern Ocean to the Ice Shelf Grounding Line Stevens, C. and D. Fernandez *CLIVAR Exchanges*, Special Issue: Advances in Emerging Antarctic Research Programs, 83: 30–35 (2024). doi: https://doi.org/10.36071/clivar.83.2024
WG-EMM-2025/P02	Automated krill body length estimation based on stereo camera images Svantemann, M.M.., B.A. Krafft, F.F.Thompson, G. Zhang and L.A. Krag *ICES J. Mar. Sci.*, 82(5): fsaf058 (2025). doi: https://doi.org/10.1093/icesjms/fsaf058
WG-EMM-2025/P03	Monitoring Antarctic krill (*Euphausia superba*) distribution in the Southern Ocean: environmental DNA (eDNA) adds to the toolbox Suter, L. A. Burns, S. Bestley, J. Bird, M. J. Brasier, M. Cox, D. Hamer, O. J. Johnson, S. Kawaguchi, R. King, A. Klocker, J. Melvin, C. K. Weldrick, S. Wothersoon and B. Raymond *Front. Mar. Sci.*, 12 (2025). doi: https://doi.org/10.3389/fmars.2025.1502498
WG-EMM-2025/P04	Assessing trawls size selectivity in Antarctic krill: The role of sex and maturity stages Krag, L.A., J. Brcicb, B. Herrmann, M. Nalon and B.A. Krafft *Reg. Stud. Mar. Sci.*, 87: 104223 (2025). doi: https://doi.org/10.1016/j.rsma.2025.104223
WG-EMM-2025/P05	Emergence, spread, and impact of high-pathogenicity avian influenza H5 in wild birds and mammals of South America and Antarctica Kuiken, R., R.E.T. Vanstreels, A. Banyard, L. Begeman, A. Breed, M. Dewar, R. Fijn, P.P. Serafini, M. Uhart and M. Wille *Conserv. Biol.*, e70052 (2025). doi: https://doi.org/10.1111/cobi.70052
WG-EMM-2025/P06	Interannual variability in fatty acids revealing autumn food availability for Antarctic krill (*Euphausia superba*) in Bransfield Strait Zhang H.T., G.P. Zhu, H. Liu and K.M. Swadling *Mar. Ecol. Prog. Ser.*, 730: 31–42 (2024). doi: https://doi.org/10.3354/meps14517

WG-EMM-2025/P07	Overview of the multidisciplinary ecosystem survey in the eastern Indian sector of the Southern Ocean (80–150◦E) by the Japanese research vessel Kaiyo-maru in the 2018–19 austral summer (KY1804 survey) Murase, H, K. Abe, F. L. Schaafsma and K. Katsumata *Prog. Oceanogr.*, 233: 103456 (2025). doi: https://doi.org/10.1016/j.pocean.2025.103456
WG-EMM-2025/P08	Shifts in food composition of Antarctic krill (*Euphausia superba*) enhance coexistence with the pelagic tunicate (*Salpa thompsoni*) Zhu G.P. and F. Xue *Mar. Biol.*, 172:1 (2024). doi: https://doi.org/10.1007/s00227-024-04553-9
WG-EMM-2025/P09	Using fatty acid profiles of krill-dependent predator to reveal variability in the diet of Antarctic krill (*Euphausia superba*): a case study of mackerel icefish (*Champsocephalus gunnari*) Zhu G.P., J.Y. Zhu, Q.Y. Xue, M. Xue and C.B. Yan *Mar. Ecol. Prog. Ser.*, 27: 145–160 (2025). doi: https://doi.org/10.3354/meps14816

Appendix D

Recalculating interim subarea area catch allocations using data from two large scale surveys

Simeon Hill

Introduction

This document explains the calculation of subarea allocations of the CM 51-01 trigger level using the average distribution of biomass observed in the 2000 and 2019 large scale surveys, and the approach employed to calculate the subarea allocations in CM 51-07. The allocations calculated in the current document improve on those in CM 51-07 in three ways. Firstly, they use the most up-to-date analysis of biomass from the 2000 survey (Fielding *et al*. 2011). Secondly, they incorporate results from a second large-scale survey conducted in 2019 (Krafft *et al*., 2021). Thirdly, a consistent method was used to allocate catch to each of the four subareas, in contrast to the separate treatment of Subarea 48.4 in CM 51-07.

Derivation of Subarea allocations in CM 51-07

The process for deriving the subarea allocations in CM 51-07 is not clearly documented, but it can be reconstructed from SC-CAMLR and CCAMLR reports.

SC-CAMLR-28 (2009) (Table 1) proposed five "models" for distributing the CM 51-01 trigger level between subareas using:

(i) Biomass observed in the FIBEX survey.
(ii) Survey area in the CCAMLR 2000 synoptic survey.
(iii) Biomass observed in the CCAMLR 2000 synoptic survey.
(iv) Biomass observed in the CCAMLR 2000 synoptic survey, with a further allocation between coastal and pelagic areas in each subarea using the ratio 27:73, and with an additional 20% added to each allocation.
(v) 40% of the trigger level in each subarea.

CAMLR-28 (2009) (Table 1) shows the allocations chosen by the Commission. These appear to be a hybrid of options (iii) and (iv) – i.e. 120% of the option (iii) allocations – albeit with an additional allocation to subarea 48.4. Thus the proportional allocation is calculated as:

$$A_s = \frac{B_s}{\sum B_s} \times 1.2 \qquad [1]$$

for subareas 48.1 to 48.3, and

$$A_s = \frac{B_s}{\sum B_s} \times 1.2 + X \quad [2]$$

for subarea 48.4, where A_s is the proportional allocation to subarea s, B_s is the estimated biomass in subarea s and X is an additional proportional allocation to Subarea 48.4. The proportional allocations are then rounded to the nearest 5%.

Table 1 shows the 120% of option (iii) proportional allocations calculated from SC-CAMLR-28 (2009) (Table 1), compared to the proportional allocations in CM 51-07. For Subareas 48.1 to 48.3 the CM 51-07 proportional allocation is 1% above the 120% of option (iii) proportional allocation, consistent with equation 1. For Subarea 48.4, the CM 51-07 proportional allocation is 8% more than the 120% of option (iii) proportional allocation, indicating that the value of X in equation 2 is 8%. Consequently the CM 51-07 proportional allocation for Subarea 48.4 is approximately double the 120% of option (iii) proportional allocation (7%)

Table 1. Subarea catch allocations in CM 51-07 compared with option (iii) in Table 1 of SC-CAMLR-28 (2009) (also included in CCAMLR-28 (2009) as Table 1).

Subarea	% Allocation	Tonnes	Option iii	120% of Option iii
48.1	25%	155,000	20%	24%
48.2	45%	279,000	37%	44%
48.3	45%	279,000	37%	44%
48.4	15%	93,000	6%	7%
Sum	130%	806,000	100%	120%

Biomass estimates

The source of the subarea biomass estimates used in option (iii) is of SC-CAMLR-28 (2009) is cited as SC-CAMLR-19 (2000). The biomass estimates form the 2000 synoptic survey that were available in 2000 are now obsolete following the reanalysis by Fielding *et al*. (2011). Hill *et al*. (2016) estimated subarea biomass using this reanalysis. They assigned biomass from the survey strata to the subareas according to the distribution of stratum survey effort amongst subareas (**Table 2**).

Table 2: Distribution of stratum survey effort among subareas in the CCAMLR 2000 synoptic survey.

	% of stratum effort in subarea			
Survey stratum/Subarea	48.1	48.2	48.3	48.4
Antarctic Peninsula	100%			
Scotia Sea		48%	47%	5%
Eastern Scotia Sea				100%
South Shetland Islands	100%			
South Orkney Islands		100%		
South Georgia			100%	
South Sandwich Islands				100%

The resulting subarea biomass estimates assign a greater proportion of the biomass to Subarea 48.1, implying that Subarea 48.1 would have been allocated a higher catch if the allocations in CM 51-07 were recalculated using the Fielding *et al*. (2011) analysis of the 2000 synoptic survey (Table 3).

Table 3. Effect of updated analysis of **CCAMLR 2000 synoptic survey biomass** (Fielding et al 2011) on the calculations used to set subarea allocations in CM 51-07. The allocation was calculated using equations 1 and 2. The value of *X* used in equation 2 was set to 11% to achieve a total % allocation of 130% as in CM 51-07.

Subarea	Biomass	% Biomass	% Allocation	Tonnes
48.1	15,892,735	26%	32%	196,101
48.2	24,638,790	41%	49%	304,019
48.3	17,211,300	29%	34%	212,371
48.4	2,553,600	4%	15%	93,509
Sum	60,296,425	100%	130%	806,000

A second large scale survey was conducted in 2019 (Krafft *et al*., 2021). This survey has not produced estimates of biomass at the subarea scale, nor was information on the allocation of stratum survey effort to individual subareas available to WG-EMM-2025. Nonetheless six of the seven survey strata were wholly contained within one of the subareas allowing confident allocation of stratum biomass to the relevant subarea. For the remaining stratum, an approximation of the allocation of stratum biomass to the relevant subareas can be calculated using the 2000 survey effort, as shown in Table 2. The resulting subarea biomass estimates are given in Table 4.

Table 4. Subarea biomass estimates calculated using the results of the 2019 large scale survey (Krafft *et al.*, 2021).

Subarea	Biomass	% Biomass
48.1	22,453,000	36%
48.2	15,759,374	25%
48.3	13,694,128	22%
48.4	10,708,498	17%
Sum	62,615,000	100%

It is pragmatic to assume that the average of the 2000 and 2019 surveys provides a better indication of biomass distribution than either individual survey. There were methodological difference between the two surveys and the resulting biomass estimates are not directly comparable. Nonetheless the average of these two surveys provides the best currently available representation of long-term biomass distribution calculated from acoustic data.

The proportion of estimated biomass in 48.4 was much higher in 2019 (**Table 4**) than it was in 2000 (**Table 3**). Given the lack of fishery interest in this subarea it seems inappropriate to inflate the allocation to this subarea using equation 2. Instead, the allocation to each subarea could be calculated using a single equation:

$$A_s = \frac{B_s}{\sum B_s} \times 1.3 \qquad [3]$$

The average biomass distribution and its implications for subarea allocations are shown in **Table 5**. As with CM 51-07, the allocations sum to 130% of the trigger level to allow flexibility for the fishery. Rounding all subarea allocations to the nearest 5% would result in a total allocation greater than 130% of the trigger level, so an alternative rounding is suggested for 48.2 and 48.3.

Table 5. Calculation of subarea allocations of the CM 51-01 trigger level using the **average biomass distribution from the 2000 and 2019 surveys.** The allocation was calculated using equation 3.

Subarea	% Biomass	% Allocation	Tonnes	Possible rounding	Tonnes
48.1	31%	40%	250,732	40%	248,000
48.2	33%	43%	266,107	42.5%	263,500
48.3	25%	33%	203,172	32.5%	201,500
48.4	11%	14%	85,989	15%	93,000
Sum	100%	130%	806,000	130%	806,000

References

Fielding, S., J. Watkins and ASAM participants: A. Cossio, C. Reiss, G. Watters, L. Calise, G. Skaret, Y. Takao, X. Zhao, D. Agnew, D. Ramm and K. Reid. (2011). The ASAM 2010 assessment of krill biomass for Area 48 from the Scotia Sea CCAMLR 2000 Synoptic Survey. Document WG-EMM-11/20. CCAMLR, Hobart, Australia: 10 pp

Hill, S.L., Atkinson, A., Darby, C., Fielding, S., Krafft, B.A., Godø, O.R., Skaret, G., Trathan, P. and Watkins, J. (2016). Is current management of the Antarctic krill fishery in the Atlantic sector of the Southern Ocean precautionary? CCAMLR Science 23, 31-51.

Krafft, B.A., Macaulay, G.J., Skaret, G., Knutsen, T., Bergstad, O.A., Lowther, A., Huse, G., Fielding, S., Trathan, P., Murphy, E. and Choi, S.G. (2021). Standing stock of Antarctic krill (*Euphausia superba* Dana, 1850) (Euphausiacea) in the Southwest Atlantic sector of the Southern Ocean, 2018–19. *Journal of Crustacean Biology*, *41*(3), p.ruab046.

Appendix E

Appendix to Option 2 for an Interim solution to catch distribution prior to the full implementation of KFMA

Bjørn Krafft

Scenario #2: Modify existing Conservation Measure 51-01 and establishing a distinct Conservation Measure tailored to Subarea 48.1, simultaneously.

-CM 51-01 includes the old 51-07 except the trigger for subarea 48.1. This means to retain the current distribution of catch limits—45%, 45%, and 15% of the established trigger level for Subareas 48.2, 48.3, and 48.4, respectively (but deducting the 25% (155,000 tonnes) allocated to Subarea 48.1.)

To ensure precautionary catch distribution amongst subareas, the Interim Measure follows the same logic as the original CM51-07 contained a total 130% distribution of catch, in order to provide flexibility in the location of fishing (in order to (i) allow for interannual variation in the distribution of krill aggregations, and (ii) alleviate the potential for adverse impacts of the fishery in coastal areas on land-based predators), resulting in a theoretical catch limit of 806,000tonnes or 23% more than the trigger level of 620,000tonnes in CM51-01. The new suggested Interim Measure removes Subarea 48.1 and keeps the same catch levels for Subareas 48.2 – 48.4 as in the original CM51-07, totalling a theoretical trigger level for the three subareas of 651,000tonnes. A reduction in this theoretical trigger level of 23% (or the same reduction in the original CM51-07) leaves a realised trigger of 500,769 tonnes distributed as follows: Subarea 48.2 – 279,000tonnes, Subarea 48.3 – 279,000tonnes, Subarea 48.4 – 93,000tonnes.

This approach could offer continuity and precaution in 48.2-4 while further work progresses.

-Simultaneously, a new Conservation Measure is established for Subarea 48.1. This represents an interim solution [2-3years] on the path toward full implementation of the KFMA. Full implementation would entail comprehensive monitoring, an operational three-legged stool approach, fully dynamic quotas updated every five years across all designated management units, and a D1MPA solution.

The interim solution involves merging some of the original seven management units, (which were endorsed by the Scientific Committee last year with the possibility of future adjustments X-REF SC-43 para 2.63). Smaller management units reduce the risk of negative impacts on predators from fishing activities. However, there is uncertainty associated with the SOA method and the data layers within, as well as the assumption that the Subarea 48.1 scale the ecosystem can be considered as a closed system, but at smaller scales flux increases the uncertainty around biomass and distribution (and therefore quota) stability.

To compensate for this uncertainty, the size of the management units can be increased (Figure 1). These units can then be reduced in size as more knowledge becomes available about krill advection. Such knowledge has already been accumulated from recent findings on potential linkage between krill stock distribution and typical water masses in Subarea 48.1 (e.g., WG-EMM-2025/21 Rev.1).

It also includes implementing the quota proposed in Table 10 of the FSA (X-REF FSA-2022 Table 10)), but redistributed according to the design in Figure 1 (proposed MU catch limits presented in Table 1). The precautionary catch limits in Table 1 may also be introduced through a step-wise approach.

Table 1Within-Subarea 48.1 catch limits based on reconfigured MU as presented in Figure 1.

Scenario 4

Management Unit	Summer	Winter	Total
BS + JI	4,600	84,972	89,572
EI + SSIW	80,947	122,155	203,103
Gerlache Strait (GS)	15,921	141,378	157,300
Powell Basin (PB) + Drake passage (DP)	30,046	188,079	218,125
Total	131,515	536,585	668,101

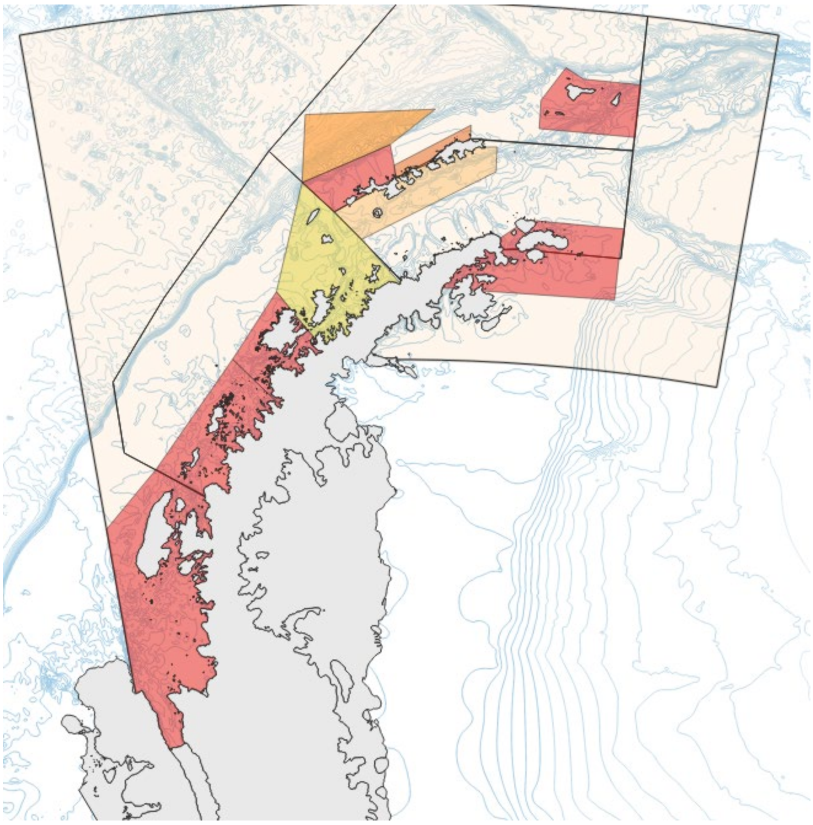

Figure 1: Alternate configurations of Scenario 4, with GPZ and SPZ configurations included.

Report of the Working Group on
Fish Stock Assessment (WG-FSA-2025)
(Hobart, Australia, 6 to 16 October 2025)

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Report of the Working Group on
Fish Stock Assessment (WG-FSA-2025)
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Opening of the meeting

1.1 The 2025 meeting of the Working Group on Fish Stock Assessment (WG-FSA-2025) was held in Hobart, Australia, from 6 to 16 October 2025. While registered participants were able to follow the webinar through Zoom, only participants who were present in the room were able to directly contribute to the meeting and comment on the report text.

Introduction

1.2 The Convener, Mr S. Somhlaba (South Africa) welcomed the participants to Hobart (Appendix A).

1.3 Dr D. Agnew (Executive Secretary) welcomed all participants to the CCAMLR Secretariat, looking forward to the exciting discussions on fish and Antarctica. He noted that as this was his last WG-FSA meeting as Executive Secretary, he looked forward to future interactions in a different capacity and wished the meeting success.

1.4 The Working Group thanked Dr Agnew for his leadership in directing the Secretariat for the past eight years and wished him all the best, while hoping he would remain engaged in CCAMLR activities in the future.

Adoption of the agenda

1.5 The Working Group reviewed the agenda and agreed that discussions relevant to the impacts of climate change (WG-FSA-IMAF-2024, paragraph 1.5) could be summarised under the 'Advice to the Scientific Committee' agenda item.

1.6 The Working Group adopted the agenda (Appendix B).

1.7 Documents submitted to the meeting are listed in Appendix C. The Working Group thanked all authors for their valuable contributions. A glossary of acronyms and abbreviations used in CCAMLR reports is available online at https://www.ccamlr.org/node/78120.

1.8 In this report, paragraphs dealing with advice to the Scientific Committee have been highlighted. These paragraphs are listed under 'Advice to the Scientific Committee'.

1.9 The report was prepared by S. Alewijnse (United Kingdom (UK)), C. Cárdenas (Chair of the Scientific Committee), J. Cleeland and M. Collins (UK), A. Dunn (New Zealand), T. Earl (UK), J. Fenaughty (New Zealand), I. Forster (Secretariat), M. Eléaume (France), Z. Filander (South Africa), S. Kawaguchi (Australia), E. Kim (Republic of Korea (Korea)), R. Leeger (New Zealand), D. Maschette (Australia), C. Montenegro (Chile), M. Mori (Japan), S. Mormede (New Zealand), T. Okuda (Japan), S. Parker (Secretariat), C. Péron (France),

S. Thanassekos (Secretariat), M. Williamson (South Africa), G. Zhu (People's Republic of China (China)) and P. Ziegler (Australia).

Review of the workplan

1.10 The Working Group noted the Terms of Reference available on the CCAMLR website.

1.11 The Working Group recalled the revised workplans for all the working groups (SC-CAMLR-43, Tables 6 to 10), have now been compiled into a composite workplan for the Scientific Committee and made available on the CCAMLR Meetings website for review. It agreed to revisit it under 'Future work' to identify WG-FSA tasks that have been completed and new tasks that may arise during the meeting. The Working Group noted that the revised workplan would then be presented to the Scientific Committee and could be made public on the Meetings website.

1.12 The Working Group noted that the table of proposed catch limits in the report (Table 1) contains only those related to the trend analysis paper outputs and that the Secretariat will compile recommended catch and by-catch limits for other fisheries into a table that would then be included with any relevant revisions as part of the report of the Scientific Committee. The Working Group encouraged participants to work with the Secretariat to review and ensure the values in the table are correct.

Review of CCAMLR fisheries in 2024/2025, notifications for 2025/2026 and data collection priorities

2.1 SC-CAMLR-44/BG/01 presented a summary of catches of target species in the Convention Area during the 2024 and 2025 fishing seasons.

2.2 The Working Group noted the *Dissostichus mawsoni* catch limit overrun in Ross Sea Region (RSR) North 70 management area and discussed potential causes. The Secretariat clarified that exceptionally high catch rates from a large number of vessels contributed to the issue. The Working Group further noted that several vessels arrived in Subareas 88.1 and 88.2 well before the start of the season, in some cases up to 46 days early, with arrivals as early as mid-October 2024. While the Working Group questioned the rationale and economic viability of such a strategy, it noted the early positioning of multiple vessels in advance of the season could be a contributing factor to the overrun and warrants further investigation (paragraphs 4.58 to 4.61).

2.3 The Working Group considered the need to distribute effort more evenly within the Ross Sea fishery. It also highlighted that while vessels are required to leave an area after a fishery closure, there were currently no constraints on the presence of vessels prior to the opening of a fishery.

2.4 The Working Group requested that the Secretariat provide a separate table of catch limit overruns in future iterations of the SC-CAMLR-BG/01 report so that these events may be highlighted and tracked separately. It discussed the need to better understand these occurrences, to explore sources of catch rate variability, and to investigate ways to improve forecasting procedures.

2.5 The Working Group noted that, following the lapse of CM 51-07 (CCAMLR-43, paragraph 9.29), more than 50% of the Subareas 48.1 – 48.4 catch of krill was taken from Subarea 48.1 (corresponding to a doubling of the CM 51-07 (2023) limit for that Subarea). While this increase was partly attributable to favourable conditions in Subarea 48.1, the Working Group considered the increased fishing effort concentration concerning and warranted drawing the Scientific Committee's attention to this issue.

2.6 CCAMLR-44/BG/08 presented a summary of fishery notifications for exploratory fisheries for toothfish and krill fisheries for the 2026 fishing season.

2.7 The Working Group noted that any future increase in the number of notifications in the Ross Sea toothfish fishery would contribute to a higher likelihood of catch limit overruns and a reduction in scientific data quality (e.g. tagging data) due to more competitive fishing operations in a shorter season, especially in areas with small catch limits and high catch rates. Recognising the limitations of the forecasting procedure, it agreed to draw the Scientific Committee's attention to this issue and related dynamics (paragraphs 2.2 to 2.4).

2.8 Similarly, noting that the krill fishery in Area 48 had reached the trigger level for the first time, the Working Group highlighted the increase in notifications for that fishery in 2026 (when compared to 2025) to the Scientific Committee.

2.9 CCAMLR-44/14 provided a summary of illegal, unreported and unregulated (IUU) fishing activity and trends from September 2024 to August 2025 and IUU vessel lists.

2.10 Noting the reports of IUU fishing gear retrievals, including gill nets, the Working Group highlighted the importance of collecting photographs of such gear to facilitate identification. It noted that this topic was considered by the 'Unidentified fishing gear in the Convention Area' e-group (https://groups.ccamlr.org/group/60/stream) and requested summaries of the locations of gear recoveries with a higher spatial resolution to help understand where the gears may have been deployed.

2.11 WG-EMM-2025/01 presented a description of the classification of fishing events in CCAMLR data using fishing type codes (Commercial, Research, or Survey) and highlighted inconsistencies in the use of these codes across forms and fisheries. Noting that these codes are not used during current analyses and that their nomenclature causes confusion, the Secretariat requested that the Working Group provide feedback on the intent of this classification and whether their use should be continued.

2.12 The Working Group noted that WG-EMM had considered this paper (WG-EMM-2025, paragraph 2.210). The Working Group supported the recommendation to the Scientific Committee to consider revising the haul-by-haul (C) forms and catch and effort (CE) forms to remove the 'type of fishing' classification field relative to trawl fisheries.

2.13 Noting that some fishing events would still need to be distinguished (e.g. sets of a random stratified survey versus commercial sets), the Working Group tasked the Secretariat with establishing a process to identify fishing events that may differ from normal commercial fishing (noting that this may be accomplished outside of the haul-by-haul data forms) so that analysts could isolate those events (e.g. with a link to the corresponding Working Group paper). A proposed process should be presented to WG-FSA-2026.

2.14 WG-FSA-2025/05 presented details on proposed new separate C6 (finfish) and C1 (krill) haul-by-haul forms for trawl fisheries and accompanying instructions for review. The forms incorporate new fields as recommended by WG-IMAF, WG-SAM-2025 and WG-EMM-2025. The paper also highlights consequential Conservation Measures (CM) changes that will be required if the proposed form nomenclature is endorsed by the Scientific Committee and the Commission.

2.15 The Working Group welcomed the proposal and noted that the draft forms could be voluntarily tested in the coming season, in parallel with the current forms (as required by existing CMs). It recommended the Scientific Committee endorse the new forms and resulting CM changes.

2.16 The Working Group recalled that a workshop to review krill haul-by-haul forms (C1) had been identified as a priority (SC-CAMLR-41, Table 1), however to date this had not occurred. Such a workshop may help refine the proposed separate forms.

Icefish

3.1 WG-FSA-2025/21 presented proposed requirements for a standardised acoustic survey methodology for finfish in the CAMLR Convention Area. The authors noted that in terms of the requirements of Article II of CCAMLR, species such as icefish are both a ‘harvested’ and a ‘dependent’ species, and icefish acoustic surveys in the CAMLR Convention Area should provide the following three items: (i) an estimate of the biomass and distribution of icefish in the pelagic zone, (ii) an estimate of the biomass and distribution of krill and other finfish species (e.g., myctophids) in the pelagic zone, and (iii) an analysis of the interactions between the spatial distribution of krill and icefish, as well as the interactions between the spatial distribution of icefish and other finfish as a source of potential alternative food webs between icefish and krill. The paper also discussed methodical aspects of data collection and processing, including echosounders and their calibration, survey design, target backscattering identification (krill, icefish and other fish), fish target strength, and estimating fish biomass by length groups. The effect of various sources of uncertainty was simulated using the example of an icefish survey that was implemented in Subarea 48.3 in 2002. The authors noted that the proposed acoustic survey methodology offers the potential to assess icefish as a semi-pelagic species through the integration of combined demersal trawl and acoustic surveys. Such standardised, multi-method surveys have practical value for future icefish research in fishery areas (Subareas 48.3 and 58.5.2). The authors also emphasised the importance of developing acoustic finfish surveys to support icefish resource assessments in new areas, such as Subarea 48.2.

3.2 The Working Group supported the recommendation of WG-SAM-2025 (paragraph 3.20) that the document be reviewed by WG-ASAM, as it primarily concerns acoustic survey methodology. The Working Group noted that WG-ASAM has previously developed survey protocols for krill and could undertake similar work for finfish. It further recommended that future research proposals that include an acoustic survey for finfish include a self-assessment table to support the development, implementation, standardisation and review of survey protocols (as requested by SC-CAMLR-39, Annex 7, paragraph 4.28 and Table 9).

3.3 The Working Group recalled that a key advantage of acoustic surveys is their ability to sample the entire water column and detect diurnal vertical movements. It noted potential benefits of conducting concurrent acoustic and trawl surveys to improve understanding of habitat use throughout the water column. However, the Working Group also observed that the authors' recommendation to restrict sampling to daytime hauls may not be applicable to all acoustic surveys, as suitability depends on the target species and research objectives.

3.4 The Working Group recalled that research plans submitted under CM 24-01 are currently required to be submitted to WG-SAM and WG-FSA for review. The Working Group recommended that research plans which include an acoustic survey should be reviewed by WG-ASAM in the first instance. The Working Group further noted that this may require a change in the submission deadline for these research proposals.

Icefish in Subarea 48.3

3.5 WG-FSA-2025/P05 examined population structure in the mackerel icefish (*Champsocephalus gunnari*) using trait probability density and ecological niche modelling based on otolith shape. The study compared populations from South Georgia and the South Orkney Islands. Differences in otolith morphology (notably roundness and aspect ratio) supported the theory that the populations in these regions are distinct. The authors note that a multi-dimensional analytical approach provides valuable insights into the population structure and ecology of icefish.

3.6 The Working Group welcomed the work and noted that approaches such as Fourier Analysis provide an alternative approach to classifying shape (WG-FSA-2025/P02; paragraphs 6.25 and 6.26). The Working Group noted that otolith shape may change as the fish grow, and noted that the authors' inclusion of morphometric data in the analysis was an important factor.

3.7 WG-FSA-2025/21 reported on a Groundfish Survey conducted by the UK in Subarea 48.3 during January–February 2025 as part of its regular monitoring program. The survey objectives were to assess toothfish pre-recruitment population structure, estimate icefish biomass for stock assessment, and collect biological and dietary data on key demersal species. The mean biomass of mackerel icefish was estimated at 64 964 tonnes (lower one-sided 95th percentile confidence interval (CI): 26 958 tonnes). Three cohorts of Patagonian toothfish (*Dissostichus eleginoides*) were identified on the Shag Rocks and South Georgia shelves, and over 100 individuals were tagged, the first tagging conducted in this survey since 2006. Catches and biomass estimates for both Scotia Sea and South Georgia icefish were the highest recorded in the survey series (paragraph 6.40).

3.8 The Working Group noted the large amount of work on a wide range of research that was undertaken during the survey and the observed interannual variability in mackerel icefish biomass. The authors concluded that this variability is likely driven by a combination of factors, including environmental conditions and fluctuations in predator consumption.

3.9 WG-FSA-2025/10 presented a preliminary assessment for mackerel icefish in Subarea 48.3 fitting a length-based assessment in R using the results of the trawl survey described in WG-FSA-2025/21. Projecting forward from the lower one-sided 95th percentile CI of biomass resulted in yields of 3 430 tonnes for 2025/26 and 2 230 tonnes for 2026/27. These yields allow for 75% escapement of the unfished projected biomass and satisfy the CCAMLR decision rules.

3.10 The Working Group noted that the current length-based assessment is a suitable basis for providing management advice, given the significant difficulty in age-reading otoliths from this species. Assessments based on length-data for mackerel icefish are robust and highly precautionary, however, the Working Group welcomed any member's future work on icefish ageing. Dr J. Cleeland (UK) offered to include the collection of icefish otoliths in the objectives for future surveys if participants had plans to develop ageing or other otolith analyses.

3.11 The Working Group recommended that the catch limit for mackerel icefish in Subarea 48.3 should be set at 3 430 tonnes for 2025/26 and 2 230 tonnes for 2026/27 seasons.

Icefish in Division 58.5.2

3.12 WG-FSA-2025/18 presented the results of the 2025 random stratified trawl survey in Division 58.5.2. The survey followed the established design from previous years, using a new set of randomly selected stations, with all 163 stations completed. Total catches included 69.9 tonnes of Patagonian toothfish and 23.8 tonnes of mackerel icefish.

3.13 The Working Group noted that inclusion of a longer time series of biomass estimates for mackerel icefish and other key species, as well as length frequencies would be valuable additions to the next survey report. The Working Group further noted exploring the possible inclusion of maturity ogives may be beneficial.

3.14 WG-FSA-2025/17 presented a preliminary assessment of mackerel icefish in Division 58.5.2 using the generalised yield model in R (Grym) following the results of the trawl survey described in WG-FSA-2025/18. The 2025 survey showed a large 3+ cohort in the population and high estimated biomass. The assessment projected forward the proportion of the lower one-sided 95 percentile CI of fish aged 1+ to 3+ (9 901 tonnes). The assessment resulted in yields of 1 429 tonnes in the 2025/26 season and 1 126 tonnes in the 2026/27 season following the CCAMLR decision rules for icefish.

3.15 The Working Group recommended that the catch limit for mackerel icefish in Division 58.5.2 should be set at 1 429 tonnes in the 2025/26 season and 1 126 tonnes in the 2026/27 season.

Toothfish

General toothfish fisheries issues

4.1 WG-FSA-2025/37 presented spatial and environmental factors associated with Patagonian toothfish (*D. eleginoides*) distribution at South Georgia and the South Sandwich Islands (Subareas 48.3 and 48.4). Trawl survey data collected at South Georgia were used to fit distribution models, informed by environmental covariates, for six different size classes spanning total lengths of <26 cm to >66 cm of *D. eleginoides*, selected to approximately represent annual age groups. These were indicative of strong relationships with depth and temperature, with larger size-classes occupying progressively deeper habitats. Temperature effects were evident across all size-classes but were strongest for the three smallest size-classes, with higher abundances predicted at locations with annual mean sea surface temperature (SST) >1.8°C. Analyses of fishery-derived data from the South Sandwich Islands found catch-per-unit-effort (CPUE) declining to near zero at seafloor temperatures at or below 0.2–0.3°C.

4.2 WG-FSA-2025/25 presented findings from a study exploring the relationship between the abundance of early life stages of *D. eleginoides* and temperature in the waters around South Georgia and nearby Shag Rocks (Subarea 48.3). The study demonstrated that juvenile *D. eleginoides* showed marked interannual variability in abundance overlaid onto an apparent long-term decline from 1987 to 2023. Abundance of juveniles was highly correlated with sub-surface temperatures during the spawning and egg-dispersal periods, with cooler temperatures associated with lower abundance. While regional SST increased from 1993 to 2023, temperatures below the surface mixed layer during the spawning period appear to have decreased, which may be contributing to the apparent decline in juvenile abundance. Future work will extend the findings of WG-FSA-2025/25 and WG-FSA-2025/37 to climate projections and assess potential risks associated with habitat changes, focusing on distribution across size classes in relation to environmental variables, and the relationship between temperature, the abundance of smaller size classes and recruitment patterns.

4.3 The Working Group welcomed the work on factors affecting recruitment. However, it noted potential sensitivities of the model in the classification of size classes, time periods for developmental stages and depth zones, but noted that the applied approach is robust and transparent. It further noted that the trawl survey is effective for detecting 2+ and 3+ fish but less so for 1+ fish, which are shallower, more localised, and patchy in their distribution, and may not be well represented in the survey.

4.4 The Working Group encouraged the plans to incorporate temperature and other oceanographic variables into the projection models to study the depth-related habitat shifts of *D. eleginoides* throughout its life history. It noted that variation in egg and larval retention may be influenced by local oceanographic conditions such as tidal and geostrophic currents, and that temperature conditions in retention areas could affect subsequent recruitment success.

Toothfish age determination

4.5 WG-FSA-2025/54 presented results from comparison of ages of sister toothfish otoliths collected from Subarea 48.6, between laboratories in Korea and Japan, which used different otolith preparation methods. The study evaluated precision, bias and integration potential to ensure consistency and accuracy of the age data inputs into the *D. mawsoni* integrated assessment in Subarea 48.6. Results showed good overall agreement between laboratories in mean age. However, systematic differences in age determinations were identified, with most discrepancies identified as interpretive rather than image quality.

4.6 The Working Group welcomed ongoing efforts to harmonise ageing data and integrate results through the CCAMLR Otolith Network (CON) and emphasised that continued contributions of data and reference images from laboratories are essential to ensure the consistency and accuracy of future assessments. The Working Group discussed differences in path used to count annuli across the otolith section, and noted differences in the coefficient of variation (CV) of age reading for smaller and larger fish. While the target CV for inter-reader comparison of 10% had not yet been achieved, the Working Group considered that the level of agreement between the two preparation methods indicated that with refinement the two methods could yield data that could be pooled for the assessment.

4.7 The Working Group recommended that CON develop a timetable for incorporating age data that could be used in assessments into the CCAMLR age database. The Working Group also recommended including a categorisation of age data quality to facilitate the consideration of these data into future stock assessments.

4.8 WG-FSA-2025/56 presented a preliminary report on the re-initiation of age determination of *D. mawsoni* in Subarea 88.2, along with determination of maturity via histological analyses. The maturity ogives showed clear differences between sexes, with females (n = 25) maturing earlier than males, with the age at 50% maturity in females ($A_{50\%}$) estimated at 11.5 years and the age at 95% maturity ($A_{95\%}$) at 12 years. The transition from immature to mature status was abrupt, with little difference between the estimated $A_{50\%}$ and $A_{95\%}$. For males (n = 21), the maturity relationship was more gradual. The estimated $A_{50\%}$ was 19.4 years, with an $A_{95\%}$ of 36.8 years, indicating a wider range of ages over which the transition to maturity occurred.

4.9 The Working Group welcomed the effort on age determination of *D. mawsoni* in Subarea 88.2, where there is a shortage of validated age data. For the maturity work, it suggested combining available histological samples with those from New Zealand (WG-FSA-12/40) to increase the sample size and improve robustness of the analyses. It noted that continuing with collection and analysis of histological samples would be needed to monitor changes in maturation due to climate change. The Working Group welcomed the intention to increase ageing efforts as well as collecting and analysing histological samples in this area, as additional samples are required to develop age–length keys.

4.10 WG-FSA-2025/26 presented a report on ageing precision, age and growth of *D. mawsoni* in Subarea 88.2. The average percent error (APE) and average coefficient of variation (ACV) values of ageing precision for *D. mawsoni* were 12.0 ± 6.38 and 15.7 ± 8.17 across nine counts by three readers, respectively, indicating the difficulty in identifying annuli in the growth zone. Calculation of growth function parameters using the von Bertalanffy growth equation indicated *D. mawsoni* ranging in size from 51 to 188 cm total length were relatively slow growing (k = 0.149), especially in relation to their maximum size (L_∞ = 153.5 cm). These growth parameters are similar to those estimated from the same species in the Subarea 88.1 (Ross Sea region).

4.11 The Working Group discussed the ageing method applied in the study (unbaked double grind) and noted that this approach still exhibits relatively high variability, highlighting the need for further refinement and validation, and further development of a reference set. The Working Group noted that this work has been undertaken and would be reported to a future meeting.

4.12 The Working Group recognised the ongoing progress by the CON in developing regional reference sets, with further workshops resuming once reference sets have been developed and comparison methods agreed. These coordinated efforts are expected to improve the consistency of age determination and support future stock assessments using pooled age data among laboratories.

Toothfish tagging

4.13 WG-FSA-2025/53 presented a training video on toothfish and skate tagging for vessel crew and scientific observers. The video was funded by COLTO and produced by CapMarine. The video demonstrates best tagging practices and techniques for tagging toothfish and skates including CCAMLR data collection methods and appropriate fish handling techniques.

4.14 The Working Group welcomed the development of the tagging training video, noting that it will be a useful resource for observer and crew training. The Working Group recommended that the Scientific Committee support that the video's translation into the other official CCAMLR languages (French, Spanish and Russian) as well as Bahasa Indonesian to support broader use across fishing nations.

4.15 The Working Group further noted that in a future update of the video, the inclusion of footage of releasing tagged skates would be useful, as this procedure is complex and difficult to perform correctly.

4.16 WG-FSA-2025/27 Rev. 1 presented tag overlap statistics for vessels operating in exploratory fisheries. The report noted that there were fifteen instances (from 80 total) in which the tag overlap statistic was calculated to be between 60% and 80% during the 2025 season. The report also included a compilation of information from Members with vessels whose tag overlap statistics were <80% regarding their tagging protocol and strategy used by vessels.

4.17 The Working Group expressed concern that some Members did not respond to the Secretariat's request, and that many responses provided by Members in both 2024 and 2025 did not provide sufficient detail of the reasons that prevented their vessels from achieving a tag overlap statistic of at least 80%. The Working Group discussed approaches such as a targeted questionnaire that could both educate vessel crews on practices leading to high tag overlap statistics and gather information on factors that may hinder better performance.

4.18 The Working Group tasked the Secretariat with developing this survey for the 2026 season and to also collect information from vessels that have achieved higher than 80% to better understand the procedures and strategies used on those vessels.

4.19 The Working Group recommended conducting another survey next year with improved questions and a broader scope, including obtaining advice from vessels that achieved high tag overlap statistics.

4.20 WG-FSA-2025/08 presented a summary of Antarctic finfish research objectives to be undertaken during an expedition by the RV *Polarstern* to the Weddell Sea during the 2025/26 Austral summer. The expedition aims to characterise biodiversity and marine ecosystems in the Weddell Sea as part of the Weddell Sea Observatory of Biodiversity and Ecosystem Change (WOBEC) initiative. Research to be undertaken on *D. mawsoni* includes satellite tagging, otolith ageing and microchemistry, collection of tissue samples for genomics and phylogenetic studies, and characterisation of diet samples.

4.21 The Working Group thanked the authors for sharing the research plans for the forthcoming RV *Polarstern* expedition to the Weddell Sea and noted that this work will contribute valuable information from data-poor regions, improving understanding of the distribution, ecology and life history of *D. mawsoni* and associated finfish species.

4.22 WG-FSA-2025/24 presented a report on trophic interaction between nematodes (Anisakidae) and *D. mawsoni* in the Ross Sea Region (RSR). The study integrated baseline biological information of *D. mawsoni* in the RSR with infection status to examine the characteristics of parasitic infections. Stable isotope analysis and trace element analysis were employed to further explore host-parasitic interactions. Results showed that the RSR *D. mawsoni* population is susceptible to parasitic nematodes, however, infection prevalence varied markedly with specific prey taxa. Analysis of stomach content data identified the principal intermediate/paratenic hosts responsible for transmitting anisakids to *D. mawsoni*. Beyond diet composition and intake, infection risk and intensity were further shaped by habitat and fish maturity. Consistent with this, infections were associated with putative shifts in host energetics/metabolic status, as well as physiological condition, with downstream effects on stable-isotopic signatures. The authors recommended that the parasite should be included in future ecosystem modelling to reflect the non-neglectable role of parasites in Antarctic food web dynamics.

4.23 The Working Group noted that the research on trophic interactions between *D. mawsoni* and anisakis nematodes in the RSR was preliminary, and encouraged future research to investigate potential effects of climate change and undertake comparative analyses across species with high parasite loads such as macrourids and icefish. The Working Group also noted that the final hosts for these parasites were warm-blooded and encouraged future research to examine the proximity to populations of potential toothfish predators such as marine mammals in the area to better understand the local ecology. The Working Group also highlighted the role of parasites as indicators to explore population structure of marine species in the Southern Ocean, especially in combination with otolith chemistry and genetics.

4.24 WG-FSA-2025/28 Rev. 1 presented a characterisation of the toothfish fishery in the Amundsen Sea region (Small Scale Research Units 88.2C-H) through the 2025 season. Local abundance estimates for Research Block (RB) 882_2 and seamount 882H_1 can be obtained from tag data derived from structured fishing. However, in the remaining research blocks, tag recaptures were few and highly variable, limiting the reliability of the data at this stage. Unstandardised catch rates have been generally stable or increasing in all areas apart from RB 882_2 and seamounts 882H_9 and 882H_10.

4.25 The Working Group discussed the distinct bimodal length-frequency distributions in RBs 88.2_1–4 and the more stable size distribution of the spawning population observed in seamounts in 882H, potentially reflecting localised habitat use and ontogenetic movement patterns associated with maturity (WG-FSA-IMAF-2024/P03).

4.26 WG-FSA-2025/39 presented a study utilising Global Fishing Watch (GFW) data to analyse fishing effort in the Ross and Amundsen Seas. The analysis indicated spatial and temporal patterns of fishing effort, highlighting the intensity of fishing in specific zones, such as the Mawson Bank in the Ross Sea and designated research blocks in the Amundsen Sea. The analysis also included examples demonstrating the impact of sea ice on fishing operations, highlighting how ice coverage can impede access to fishing grounds and influence day-to-day activities.

4.27 The Working Group noted that the paper illustrated how this publicly available Automatic Identification System (AIS) data can be used to analyse spatial and temporal fishing effort in the Convention Area. Noting that the current algorithms used by GFW tend to overestimate fishing effort in these regions, WG-FSA discussed the possibility of refining the

GFW algorithms by including the historical fishing footprint and updated bathymetry. This would help better distinguish fishing activity from other action, such as moving through ice. The Working Group also recognised the potential for collaboration between CCAMLR and GFW to improve the GFW algorithms and tailor them to Southern Ocean fisheries and the potential to integrate AIS data with CCAMLR's detailed vessel position and catch data to validate and enhance analyses. The Working Group noted the relevance to state of Antarctic environment reporting (SC-CAMLR-44/BG/31) i.e. reporting of sea ice extent at region scales relevant to fishery areas.

Toothfish stock assessment workplan

4.28 The fishery for *D. mawsoni* in Subarea 48.4 operated in accordance with CM 41-03 and associated measures. The catch limit for *D. mawsoni* in Subarea 48.4 in 2024/25 was 37 tonnes and 41 tonnes were taken. Details of the fishery for *D. mawsoni* in Subarea 48.4 and the stock assessment are contained in the Fishery Report (https://fisheryreports.ccamlr.org/).

4.29 WG-FSA-2025/09 presented a characterisation of Antarctic toothfish and Patagonian toothfish fisheries in Subarea 48.4 up to season 2024/25, including fishery history, by-catch, CPUE, length distribution, sex ratio, maturity stages and tagging information. The document highlighted (i) the evolution of the management of the fishery, (ii) the shifting overlap area between the two species, (iii) the influx of small Patagonian toothfish likely linked to the recruitment event observed in nearby Subarea 48.3 and (iv) the temporally stable length distributions of Antarctic toothfish.

4.30 The Working Group noted that the bimodality in the length distribution of Patagonian toothfish in recent years was likely due to strong recent recruitment rather than changes in the spatial distribution of the fishery, which remained stable. It further noted that the proportion of Patagonian to Antarctic toothfish was not solely reflective of biological processes but rather of changes in the relative catch limits between the two species and fishing locations through time. The Working Group recalled previous work (Soeffker et al., 2022) investigating the biology of Patagonian and Antarctic toothfish in this region and noted that the current hypothesis is that some individuals from the Patagonian toothfish population in Subarea 48.3 may move from 48.3 to 48.4.

4.31 WG-FSA-2025/14 presented an updated estimation of the local biomass of *D. mawsoni* in Subarea 48.4 using the Chapman mark-recapture estimator. The mean estimate of biomass over the past five years was 846 tonnes, which led to a catch limit of 32 tonnes when applying the agreed harvest rate of 3.8%. A length-based model using Casal2 was also developed, incorporating constant catch scenarios to explore various harvest rates ranging from 3.8% to 15%, and projected forward for 35 years, in accordance with the recommendation of WG-FSA-IMAF-2024 (paragraphs 4.110 and 4.111). Applying the CCAMLR decision rules for toothfish on the vulnerable biomass would result in a much higher harvest rate of 12–15%, compared to the current 3.8%. Given that the parameters in the stock assessment model implemented in Casal2 were largely borrowed from other stocks and may not reflect the unique dynamics in Subarea 48.4, the authors suggested using the tag-based Chapman estimator and the 3.8% precautionary harvest rate rule until further development of the stock assessment model.

4.32 The Working Group thanked the authors and noted that the method for investigating potential long term exploitation rates for this stock has been used previously in Subarea 88.2. The Working Group noted that, given the area does not constitute an entire biological stock, using the 3.8% exploitation rate would be precautionary.

4.33 The Working Group further noted that the assessment methodology for *D. mawsoni* in 48.4 was now mature and the advice stable (Table 2). As such, this assessment could be moved to a two-year assessment cycle, starting in 2026/27 in line with the other toothfish assessments.

4.34 The Working Group recommended a catch limit for *D. mawsoni* in Subarea 48.4 of 32 tonnes, consistent with an exploitation rate of 3.8%. It further recommended that assessments for this Subarea be carried out every two years, starting in 2026/27 to be in line with other toothfish stock assessments.

4.35 The fishery for *D. eleginoides* in Subarea 48.4 operated in accordance with CM 41-03 and associated measures. The catch limit for *D. eleginoides* in Subarea 48.4 in 2024/25 was 19 tonnes, and 6 tonnes were taken. Details of the fishery for *D. eleginoides* in Subarea 48.4 and the stock assessment are contained in the Fishery Report (https://fisheryreports.ccamlr.org/).

4.36 WG-FSA-2025/12, along with WG-FSA-2025/13 and WG-FSA-2023/15, presented a new integrated assessment model using Casal2 and bridging analysis for *D. eleginoides* in Subarea 48.4, with associated diagnostics and a stock annex. The assessment data were updated with the observations for the 2023 and 2024 seasons. Alternative approaches to data-weighting for age-length observations used in the model were investigated. Results indicated that the current status of the stock is at 65% of B_0 in 2025. Projections indicated that a constant catch of 33 tonnes in the 2025/26 and 2026/27 seasons would be consistent with the CCAMLR decision rules. U-based rules were also tested, and suggested slightly higher catch limits of 44 tonnes. The authors recommended the use of the 'Francis weighting' to paired age-length data and to set the catch limit for next two seasons to 33 tonnes.

4.37 The Working Group recommended the catch limit for Patagonian toothfish in Subarea 48.4 be set at 33 tonnes for the 2025/26 and 2026/27 seasons, and noted the authors' intention to present an updated stock assessment in 2026 to be in line with other integrated toothfish stock assessments.

4.38 WG-FSA-2025/16 presented the results of the Random Longline Survey (RLS) conducted in Division 58.5.2 and designed to develop an unbiased tag-based abundance index for the stock assessment of *D. eleginoides*. The authors noted that Chapman biomass estimates for the 2024 season, based on commercial hauls only and based on research hauls only, were higher than those estimated for the 2021 to 2023 seasons. However, the relative change in magnitude in annual biomass estimates and large confidence intervals from RLS Chapman tag-based estimates indicated that a larger sample size would be needed to achieve the intent of the trial of developing an unbiased fishery-independent biomass time series.

4.39 The Working Group welcomed the initiation of this survey and noted the importance of developing a time series of fishery independent tag recapture data. The Working Group recommended that the design of this survey could be presented to the Working Group as this could assist in designing similar surveys in other fisheries. It also noted that it would be valuable to analyse data collected on by-catch species.

4.40 WG-FSA-2025/38 presented modelling work on the abundance and length composition of *D. eleginoides* in Division 58.5.2 from the random stratified trawl survey (RSTS) since 2004. Bayesian hierarchical modelling of RSTS data provided more precise estimates of abundance, biomass, and length composition than the current non-parametric approach. The estimated relative abundance by length bin may serve as another approach to quantifying year class strength patterns and trends of specific length classes. Strong cohorts appeared approximately every three years and remain visible for about four years. This analysis confirmed the relevance of current stratification of the RSTS and proposed minor refinements to improve abundance estimates for toothfish.

4.41 The Working Group acknowledged the value of this modelling approach and suggested to incorporate spatio-temporal autocorrelation in the analyses. It also suggested to use abundance rather than biomass in further work.

4.42 The Working Group further noted that this process smoothed the index prior to including it in the stock assessment model, potentially removing some variability the model would have interpreted as uncertainty. It also suggested that once the length indices were included in the model, checks could be carried out to confirm that the conversion to age by the model was adequate.

4.43 WG-FSA-2025/36 presented the continuation of the work contained in WG-FSA-IMAF-2024/69 on the refinement of the stock assessment in Division 58.5.2. The authors concluded that attempts to use biomass time series values estimated externally from the model using the Chapman estimator were inadequate since the model was unable to fit the biomass times series with reasonable catchability estimates. The authors suggested that alternative options for incorporating tagging data into the HIMI integrated stock assessment such as spatial Brownie tag-recapture models (Brownie et al., 1985) should be pursued, noting this methodology has been successfully used for the assessment of the Macquarie Island Patagonian toothfish fishery.

4.44 WG-FSA-2025/30 presented an update on the development of a framework to implement a spatial stock assessment for Division 58.5.2, addressing the recommendations from WG-SAM-2025. Potential spatial strata were investigated using various datasets. A spatial structure with two areas was proposed for the development of a spatially explicit length and age based spatial model using Template Model Builder in R (RTMB), alongside comparative work with a spatial stock assessment implemented in Casal2.

4.45 The Working Group welcomed these two papers and the ambitious work plan to develop a new spatially structured model next year, alongside a comparative analysis with models in Casal2. It noted that the current stock assessments in Casal2 have Brownie-like elements, as they model the recapture history of discrete release events, not a tag pool model. However, subsequent recapture events are modelled independently and use scanned catch to calculate recapture probability which resembles more a sequential Chapman estimator. The Working Group noted that the suite of existing stock assessment models is not currently spatially explicit as is proposed for the updated stock assessment in Division 58.5.2. It further noted that the development of length- and age-based models as proposed in WG-FSA-2025/30 would help in addressing some of the identified issues on conversion between age and length data in the current models using Casal2.

4.46 The Working Group noted that the stock assessment model estimated high values for catchability for the biomass estimates from the tag indices (around 3-4) when that parameter was unconstrained. The Working Group noted that this result could be explained by spatial heterogeneity in tagging, which might be resolved with an adequate spatial model. It further noted that the appropriate spatial scale would likely be difficult to ascertain, and diagnostics such as age and length frequencies over time could help refine the spatial structure. The Working Group encouraged continued collaboration between the different teams working on stock assessments with spatial tag data.

4.47 The Working Group noted that more age data might be required as the spatial complexity of the models increases. The Working Group also noted that the data indicated that tagged toothfish were less likely to be recaptured after one year at liberty than after two years at liberty and suggested further investigations of this pattern.

4.48 The Working Group encouraged the development of the new age-structured model (with both length and length-conditional age structured elements) using RTMB and comparative work with a spatial model using Casal2. It also noted that the choice of spatial area definitions would be tested through the models and might need to be refined at a later date.

4.49 No new information was available on the state of fish stocks in Division 58.5.2 outside areas of national jurisdiction. The Working Group, therefore, recommended that the prohibition of directed fishing for *D. eleginoides*, described in CM 32-02, remain in force in 2025/26.

4.50 WG-FSA-2025/22 presented the main results of the POKER ('POissons de KERguelen') V survey, which was carried out in Division 58.5.1 in October 2024. It is an update of document WG-SAM-2025/24 following WG-SAM recommendations, including the specification of trawls and the correction of toothfish age. The sampling design was modified compared to previous POKER surveys (2006, 2010, 2013 and 2017) to focus on juvenile habitat. More than 25 fish species were recorded, along with their corresponding biological data. The catch of mackerel icefish (*C. gunnari*) was low compared to previous surveys, which was attributed to the changes in sampling design. Notable temporal fluctuations in species distribution and biomass were observed, especially in the biomass of the three skate species which increased substantially in 2024. Despite an increase in Patagonian toothfish biomass compared to 2017, it remained below the long-term average. Strong cohorts of both 1- and 2-year-old fish suggested strong toothfish recruitment in recent years (2022 and 2023). Work is ongoing to estimate biomass by age class using spatially explicit models and a series of annual recruitment surveys is planned for the next three years to track the 2024 cohorts and understand the factors influencing recruitment.

4.51 The Working Group thanked the authors for providing the supplementary information requested by WG-SAM-25. The Working Group noted that skate egg cases were rarely sampled and welcomed their identification to species level and contribution to further research.

4.52 The Working Group noted that a different trawl was used for most of the 2024 survey due to operational issues encountered during the survey. It further noted that the change of gear across the series should be considered when developing time series for assessment purposes, in terms of both selectivity and catchability. Furthermore, the Working Group suggested the increase in catch amount of some species could be due to the effect of the change in gear. The Working Group noted that the 2025 survey will use the same gear as the POKER I, II and IV surveys.

4.53 The Working Group noted the differing trends in biomass of two dominant species: *Notothenia rossii* which was nearly extinct in the 1980s has been increasing since 2006, whereas *C. gunnari* biomass has been decreasing through the time series. The Working Group noted that the survey was not designed for data input into an icefish assessment in 2024.

4.54 WG-FSA-2025/35 presented the first results of an attempt to implement a sex-disaggregated stock assessment model for *D. eleginoides* in Division 58.5.1, along with updating sex-specific biological parameters, including growth, maturity, and length–weight relationships. The stock assessment model using Casal2 with integration of these sex-specific parameters was compared with outputs from a single-sex model. Results revealed substantial differences between male and female biological parameters. Incorporating sex-specific parameters led to noticeable changes in estimates of spawning stock biomass and stock status relative to the single-sex baseline. Further work is required to refine the sex-based framework and ensure it is robust and reliable enough to support scientific advice for management.

4.55 The Working Group welcomed this update and progression on the development of the sex-disaggregated stock assessment. It noted that the POKER survey age data were provided to the model with an assumed 50% males at this stage and recommended alternative methods to account for sex ratio in POKER data. It further recommended to plot CVs on growth and maturity curves and that the use of sex-disaggregated diagnostics be further investigated.

4.56 The Working Group noted that it may be worth extending the maximum age class in the Patagonian toothfish stock assessments beyond 35 years, as females keep growing after 35 years. It further noted that as many fish over the age of 35 years are observed in catches, the current assumption of natural mortality might not be appropriate and sensitivity analyses might help investigate this.

4.57 The Working Group further noted that maturity and growth estimates are highly influential on the estimated Spawning Stock Biomass (SSB) and recommended that the authors compare the different methods used to derive these values in the different CCAMLR stock assessments.

4.58 WG-FSA-2025/29 presented the summary of the fishery in the Ross Sea region (Subarea 88.1 and Small-Scale Research Units 88.2A–B) through the 2024/25 fishing season. In recent years, the N70 fishery has seen an increase in vessel numbers and eastward expansion in fishing effort, leading to a shorter 2025 season (the area was closed four days after opening), a catch limit exceeded by over 50%, increased unstandardised CPUE, and reduced tag recapture rates compared to previous years. The S70 fishery has seen a localised concentration of effort, a decrease of CPUE and an increase in tag recapture rates.

4.59 The Working Group noted the different trends in CPUE and tag recapture rates in N70 and S70. The Working Group also noted that a very short season in N70 might affect the quality of the tagging data as vessels rush to catch fish in a short period, and be linked to the tagging overlap statistics issues on seamounts and ridges in N70 as discussed in paper WG-FSA-2025/27 (paragraphs 2.2, 2.3 and 2.8).

4.60 The Working Group further noted that vessels entered the Convention Area into the Ross Sea Region (Subarea 88.2) up to 46 days prior to the opening of the fishery. It noted that this behaviour might affect the interpretation of the catch and effort data and be a contributing factor in the short season in N70. The Working Group noted that the ability to enter the

Convention Area a long time prior to the commencement of fishing was at odds with the requirement to leave any management area as soon as that area was closed to fishing (paragraphs 2.2, 2.3 and 2.8).

4.61 The Working Group recommended that further investigations into catches, catch rates, tag release, tag recapture data and tag overlap statistics from vessels which operated in N70 are needed.

4.62 WG-FSA-2025/32 evaluated the potential of age-specific abundance indices derived from the Ross Sea Shelf Survey (RSSS) to improve the monitoring of year class strength (YCS) and enhance assessment performance. Age-specific indices for ages 7–8 provided strongest correlations (>0.5) with year class strengths estimated by the stock assessment model, suggesting adequate sample sizes were caught in the RSSS, while younger (5–6-year-old) and older (10–20-year-old) age classes showed poorer correlations due to availability or gear selectivity. The authors recommended using age-specific RSSS indices for ages 7–8 in future Antarctic toothfish assessments, while maintaining the existing approach for comparison.

4.63 The Working Group welcomed the analysis. It commented that such a process could be tested for other surveys, noting that the ages selected could be stock and survey specific. The Working Group noted the improved fits to the proposed survey indices, and recommended a sensitivity using the existing approach be presented alongside the proposed new indices.

4.64 The Working Group noted that the survey is providing information about relative cohort strength from young fish, helping to understand potential recruitment cycles. It further noted that recruitment patterns may be confounded with model misspecifications and long-term recruitment cycles. The Working Group encouraged further work on recruitment time series and the inclusion of temporal autocorrelation.

Verification of stock assessment models

4.65 The Secretariat verified the integrated stock assessments using Casal2 following the adopted procedure (WG-FSA-IMAF-2024, paragraph 4.34). This year, one assessment in Casal2 produced advice (WG-FSA-2025/12) and all steps of the procedure were successfully verified (Table 3).

4.66 The icefish stock assessments in Subareas 48.3 and 58.5.2 and the Patagonian toothfish integrated stock assessment in Subarea 48.4 were also successfully verified during the meeting.

Management Strategy Evaluation (MSE) workplan

4.67 WG-FSA-2025/11 presented proposed steps towards the development of CCAMLR Management Strategy Evaluations (MSE). The paper presented an update on intersessional progress to develop a generic toothfish MSE framework based on Casal2 and proposed potential performance indicators, along with breakout rules to evaluate the robustness of fisheries management advice. The paper requested feedback on the development and approach. The paper recommended that performance indicators from WG-SAM-2024, paragraph 6.10 should be included in the MSE: (i) median spawning biomass relative to SSB_0, (ii) proportion of years below 20% of SSB_0, (iii) proportion of years below 30% of SSB_0, (iv) proportion of years below 40% of SSB_0, (v) proportion of years below the target level, (vi) median total annual catch (tonnes), (vii) standard deviation of total annual catch (tonnes), and (viii) distribution of changes in the catch limit. Further, the paper proposed including the distribution of harvest rates (U) as a performance indicator.

4.68 WG-FSA-2025/41 presented a preliminary framework of performance indicators, metrics, and breakout rules for the development of management strategies for Ross Sea region toothfish. The framework used a three-tier status system that would trigger different scientific or management actions. The tiers suggested were (i) green (normal operation) (ii) amber (warning flags requiring heightened scientific consideration) and (iii) red (critical flags, also known as exceptional circumstances, triggering management interventions). The paper proposed that when exceptional circumstances were triggered, a structured response protocol should be developed that ensures rapid and appropriate action.

4.69 The Working Group welcomed both papers and discussed a range of issues regarding the work on an evaluation of harvest control rules (HCRs) for toothfish.

4.70 The Working Group recalled the discussions on MSEs at WG-SAM-2025 (paragraphs 5.7 to 5.18) and the proposal to implement initial work for an MSE in two components (WG-SAM-2025, paragraph 5.13):

(i) a generic toothfish operating model with a relatively simple fishery and data generation to compare the current constant-catch CCAMLR Decision Rules for toothfish to alternative harvest rules, such as those identified in WG-SAM-2024, paragraph 6.10 ('Component 1'), and

(ii) a stock-specific MSE to ensure that the harvest strategy is robust for that particular fishery ('Component 2').

4.71 The Working Group noted that a generic MSE approach (Component 1) could be used to evaluate and compare the current constant catch decision rules and potential alternative decision rules based on harvest rates. However, it would be difficult to represent all stock-specific characteristics in a generic MSE as there are many differences between fisheries and data characteristics which will impact the MSE. The Working Group also noted that there may be cases where an HCR is tested and found suitable for a particular fishery but less suitable for another fishery.

4.72 The Working Group noted that there were likely to be significant difficulties in fully evaluating Component 1. The Working Group also noted that constant catch rules were unlikely to be optimal when stocks were approaching or near target levels and were not considered best practice in most other fisheries. The Working Group agreed that the future development of MSEs for toothfish should focus on HCRs based on harvest rates. The Working Group noted that the objectives of the current CCAMLR Decision Rules would continue to form the basis for the development of HCRs based on harvest rates.

4.73 The Working Group noted that there were alternative methods to implementing HCRs based on harvest rates, including HCRs that applied a harvest rate to a biomass indicator or HCRs that updated harvest rates based on the changes in stock status indicators. The Working

Group encouraged the development of such alternatives and their evaluation in order to determine where these may provide more robust advice.

4.74 Therefore, the Working Group recommended that work should be prioritised for stock-specific MSEs using HCRs based on harvest rates. The Working Group noted that the objectives and general implementation principles would need to be consistent among stock-specific MSEs, but that the resulting, preferred HCRs, may be different depending on the stock specific characteristics, productivity, data collection and uncertainties.

4.75 The Working Group noted that generic decision rules may be derived from these stock-specific MSEs and could be applicable to fisheries which have a stock assessment but for which no stock-specific MSE has been conducted yet. The Working Group noted that generic rules could be identified following the development of stock-specific MSEs.

4.76 Since MSEs require a significant amount of work, the Working Group recommended collaboration among Members conducting MSEs to share model experience and approaches.

4.77 The Working Group noted that an MSE typically contains an operating model to represent the fish population and the fishery; an observation model to represent data collection; an estimation model to estimate population size or a recommended harvest rate; a harvest control rule model to determine the catch limit; and an implementation model which removes the catch from the fish stock.

4.78 The Working Group noted that best practice in many MSEs has been to use different model structure between the operating model and estimation model, and to represent a higher level of complexity in the operating model relative to the estimation model.

4.79 The Working Group noted that the operating models should be sex-disaggregated models with sex-specific biological parameters and incorporate spatial structuring of the population as appropriate for that specific fish stock. Spatial structuring includes, for example, different population composition, differing exploitation rates by depth or region, and closed or unfishable areas (e.g. due to sea ice).

4.80 The Working Group recalled that WG-SAM-2025 proposed key uncertainties to be evaluated, including those relating to estimates of natural mortality, growth and maturity, bias in abundance estimates, and recruitment patterns such as stock-recruitment steepness, recruitment variability, autocorrelation and trends, and any other key stock-specific uncertainties and parameter values that relate to the implemented estimation model (WG-SAM-2025, paragraph 5.14 and Table 5.1).

4.81 The Working Group noted that changes in these parameters due to climate change, with plausible future ranges, are being monitored (WG-FSA-IMAF-2024 Tables 19, 20 22 and 23). It recommended that changes in these parameters are an important uncertainty to include within the operating model of all MSEs, noting environmental conditions and impacts will likely differ among stocks.

4.82 The Working Group noted that observations and their uncertainty implemented in the observation model, such as for tag-recapture and age composition data, need to be consistent with the values and assumptions used in the real assessments. However, the uncertainty estimated in the current tag-based stock assessments is likely to underestimate overall uncertainty in biomass estimates. Therefore, uncertainty around tag-based observations in the MSE should be chosen so that they result in more realistic uncertainty levels for biomass from the estimation model.

4.83 The Working Group noted that the estimation model should generally be simpler than the operating model and include misspecifications of key parameters, for example for spatial processes and recruitment patterns. The Working Group noted that the estimation models that are simpler than integrated stock assessments could also be evaluated in the MSEs. The Working Group recommended that, once an MSE is adopted, integrated stock assessments should continue to be used to check that the fish stock is still within the parameter bounds evaluated by the MSE.

4.84 The Working Group noted that data weighting processes as usually conducted in stock assessments are difficult to fully replicate and hence implement in the estimation model of an MSE.

4.85 The Working Group noted that uncertainties in the management implementation where realised catches are different from the actual catch limit due to, for example, IUU catches, should be included in fisheries where this represents a key uncertainty.

4.86 The Working Group recommended that the Scientific Committee note that:

(i) The current constant-catch Decision Rules for toothfish, with a 35-year projection period, do not constitute a best practice approach to fisheries management. These rules are also difficult to evaluate in an MSE.

(ii) MSE work should focus on HCRs based on harvest rate such as those recommended by WG-SAM-2024 (paragraph 6.7). The Working Group also noted that other HCRs may be suitable for a particular stock, including for example HCRs that define changes in catch limits relative to current catch limits.

(iii) The key uncertainties to be included in the MSE may be specific to each stock but should include plausible ranges of key uncertainties including potential changes due to climate change (paragraphs 4.80 and 4.81).

(iv) The potential performance indicators proposed by WG-SAM-2024 (paragraph 6.10), average annual variability (AAV) and the preliminary performance measures proposed in WG-FSA-2025/11 and WG-FSA-2025/41 should be further considered and developed over the intersessional period by analysts when developing MSEs.

(v) A framework for the scientific and management response for when exceptional circumstances are triggered should be developed.

Exploratory fisheries with research plans notified under CM 21-02

Dissostichus spp. in Subarea 48.6

4.87 WG-FSA-2025/45 presented an update on the research delivered as part of the research on *D. mawsoni* in Subarea 48.6 between 2013/14 and 2024/25. The authors reported that under Objective 1, the Cap-DLISA workshop had been held (CCAMLR-44/BG/31), and a fishery characterisation produced for Subarea 48.6 (WG-FSA-2025/34). Under Objective 2, ageing work had been undertaken (WG-FSA-2025/54; WG-SAM-2025/11; WS-ADM3), four PSATs had been released, particle tracking models had been developed (WG-FSA-2025/42), DNA samples had been collected and a paper submitted on trophic ecology (WG-FSA-2025/58). Under Objective 3, CTD and cameras had been deployed, and an analysis of sea ice trends (WG-FSA-2025/04) and salinity data (WG-FSA-2025/31) had been undertaken.

4.88 Dr Okuda informed the Working Group that the vessel *Shinsei Maru No. 8* had recently returned to RB 486_2 in order to complete the season's planned fishing that had been interrupted by ice coverage.

4.89 The Working Group noted the progress against multiple objectives in this research plan, including summaries of tagging data showing tagged fish at liberty for up to 10 years, and noted that samples from these fish may provide important insights into the stock structure of *D. mawsoni* in this Subarea. The Working Group noted the changes in estimated age compositions following a revision to ageing protocols as recommended by WS-ADM3 and welcomed plans to reanalyse these samples with the revised protocols once agreed reference sets were completed. It recommended that the change in ageing protocols be indicated on the plots until the otoliths have been reanalysed to aid interpretation of the figures.

4.90 The Working Group encouraged further work using the tagging data to analyse the movement of fish between and within research blocks.

4.91 CCAMLR-44/BG/31 Rev. 1 presented a summary of the Cap-DLISA workshop held in Tenerife, Spain in June 2025 in order to develop Member scientists' capacity to apply integrated stock assessment methods to CCAMLR data-limited toothfish research fisheries using Antarctic toothfish in Subarea 48.6 as a case study.

4.92 The Working Group welcomed the contribution to the development of a stock assessment in this area, and also the development of R packages to assist with the analysis of age compositions and Generalised Additive Models (GAMs), such as those used in CPUE standardisation. The approaches developed during the workshop were applied in the analysis of results from a number of other research plans presented to the Working Group. It noted the substantial progress that had been made by collaboration between Members in the research, both on and off the water.

4.93 The Working Group noted that the workshop had been supported by contributions from the General Capacity Building Fund and the General Science Capacity Fund, and was hopeful that such important activities could continue to be funded (paragraph 4.177). The Working Group recommended the Scientific Committee consider the urgent need to develop more stable funding sources to help the work Scientific Committee and its working groups.

4.94 WG-FSA-2025/34 presented a detailed fishery characterisation of Subarea 48.6 based on methods developed during the Cap-DLISA workshop. The authors summarised the catch and effort in each of the research blocks, results of the biological sampling, including ageing and growth estimation, and results of the tagging program. The authors presented input files for a preliminary sex-disaggregated stock assessment developed in Casal2 incorporating IUU, spatial structure and sex-specific age-length keys.

4.95 The Working Group welcomed the substantial progress made by the authors toward developing a stock assessment for this Subarea. It noted that the analysis had developed a summary of the data and resulted in significantly enhanced understanding of the underlying biological processes in this area.

4.96 The Working Group noted that length compositions showed consistent presence of large, adult fish in all research blocks, providing an indication that not all fish move northward to spawn as currently hypothesised (WG-SAM-18/33 Rev.1), and that there could be spawning areas along the Antarctic continental slope. The Working Group noted that fish of around 100 cm length were caught much less frequently than either smaller or larger fish, and that this bimodal distribution of samples may lead to difficulties estimating growth parameters robustly and in tagging program performance. The Working Group further noted that the connectivity of *D. mawsoni* stock between research blocks in Subarea 48.6 has been supported consistently by otolith chemistry (WG-FSA-18/75; WG-FSA-2022/36) and genetic (WG-FSA-2022/16) analyses.

4.97 The Working Group noted that the low catch frequency of fish around 100 cm in length has also been observed in other areas (e.g. the south of Subarea 88.2 and Subarea 88.3). This pattern may be influenced by multiple factors, including the fish's feeding habits, distribution patterns and gear selectivity, and is a high priority for future investigations to develop stock assessments in these areas.

4.98 WG-FSA-2025/42 presented preliminary results of modelling the transport of eggs and larvae of *D. mawsoni* in the Weddell Sea region using ocean and sea ice data. Virtual particles were released from identified spawning grounds and pathways simulated for three years under two surface advection schemes: ocean-only (OAS) and ice-ocean (IOAS). The results indicated that sea ice advection significantly influences transport speed and direction, particularly in continental slope regions. Transport success to nursery grounds varied by release location, timing, and advection scheme. The authors noted that Subareas 48.1 and 48.2 showed consistently high success rates of recruitment of particles reaching a hypothesised continental shelf area of recruitment, while Subarea 48.4 and offshore banks such as Elan and BANZARE Bank simulations exhibited low recruitment success. Continental slope regions in Divisions 58.4.1, 58.4.2, and Subarea 48.6 demonstrated high recruitment success under OAS, though IOAS often reduced success due to altered transport pathways. These findings highlight the importance of incorporating vertical migration and linking climate variability (e.g. SAM, ENSO) into future models to better understand recruitment dynamics and support fisheries management in Subarea 48.6.

4.99 The Working Group welcomed the work and highlighted the links with similar approaches being developed for *D. eleginoides* and *E. superba* (Brigden, 2019; WG-EMM-2025/69). The Working Group noted model particles that reach the continent are stopped, with consequences for simulated transport of particles near coasts, and encouraged the authors to consider including a reflecting boundary condition in the model. The Working Group also suggested that further developments could include investigating the effect of diurnal vertical movement and response to climate change scenarios.

4.100 WG-FSA-2025/31 presented the results of CTD sensor deployments in 2020, 2021, 2024 and 2025 conducted from FV *Tronio*. The authors noted that according to the temperature profiles, the surface mixed layer (10–50 m) temperatures in 2024 and 2025 were higher than in 2020 and 2021 in both RB 486_4 and RB 486_5. These findings are consistent with SST dynamics and with the sea ice concentration distribution in the area. The authors noted that vertical mixing occurred in the upper 0–50 m, whereas the 50–200 m layer was strongly stratified and vertically stable. Below 200 m, mixing is minimal, which is consistent with the density structure illustrated by temperature-salinity diagrams. Reliable salinity measurements were only available in 2020–2021; therefore, analyses based on density and temperature-salinity analyses were restricted to these years. For 2024–2025, analyses are restricted to temperature-only diagnostics.

4.101 The Working Group recognised the importance of good quality in situ oceanographic data when understanding the behaviour and distribution of fish and encouraged proponents of research plans to include this in their data collection and analysis. The Working Group noted that the deeper thermocline in RB 486_4 than RB 486_5 would likely result in high nutrient concentrations in the mixed layer leading to greater primary productivity in this area.

4.102 The Working Group noted the potential for Conductivity Temperature Depth (CTD) data collected from fishing or other vessels to be made available and suggested collaboration with COLTO to make the data accessible through the FISHSOOP program to enable integration into oceanographic models or other analysis (SC-CAMLR-44/BG/10).

4.103 WG-FSA-2025/04 presented an updated analysis of Sea Ice Concentration (SIC) SST and winds in RBs 486_5 and 486_4. The authors noted the SICs in RB 486_5 and RB 486_4 from January to March 2025 were the second and the third lowest, respectively, in the 2018–2025 period. SST spikes in both RB 486_5 and RB486_4 reversed to a decreasing trend in 2025, after reaching the highest level in 2024. This suggests that the warming phase in 2021–2024 may have changed to a cooling phase in 2025. The cooling phase in SST corresponds to an increase in SIC in both RB 486_5 and RB 486_4 in SIC and SST charts. In January and March 2025, the -1.7°C and -1.0°C isotherms SST in RB 486_5 were located further North compared to those in 2024, which indicates lower SST and higher SIC distribution in 2025. Stronger northerly winds in January to March 2025 may have contributed to the lower SICs by pushing the ice onshore and, in addition, stronger easterly winds in February to March in 2025 may have strengthened the onshore ice transport, resulting in earlier sea ice development in March 2025.

4.104 The authors noted that the repeated accessibility (RA) analysis presented here, based on SIC data from 2012 to 2025, shows lower RA in RB 486_5 compared to RB 486_4. In RB 486_4, approximately three-quarters of the region (particularly in the northern part) is repeatedly accessible with RA values >50%, whereas RB 486_5 only shows RA values >50% in a smaller area in the western part of RB 486_5 (around 71°S). In RB 486_4, most longlines were deployed in areas with RA ≥50%, while in RB 486_5 longlines were deployed mainly in area between 20 and 50% of RA.

4.105 The authors noted that between RB 486_4 and RB 486_5, there were different operational behaviours. All the three fishing vessels go to RB 486_5 first and, once finished, they move to RB 486_4. In RB 486_5, for the last 4 – 5 years there had been lower sea ice concentration, so they had access to larger fishing grounds. Different operational behaviours in RB 486_4 and RB 486_5 are generated by the ice coming or leaving the areas during the fishing period.

4.106 The Working Group noted that the analysis showed a period of warming had transitioned into a period of cooling in recent years. The Working Group noted that this may present accessibility problems for RB 486_5 and may influence the period that the research block was accessible. The Working Group recalled that ice coverage may be also an important factor influencing the recruitment of *D. mawsoni*.

4.107 WG-FSA-2025/58 Rev. 1 presented the first metabarcoding based description of *D. mawsoni* diet from the Weddell Sea sector (Subarea 48.6) and compared it with long term datasets from the Ross Sea and the Amundsen and Bellingshausen sector (Subareas 88.1 and 88.3). Stomach contents from 124 fish were analysed using DNA metabarcoding of the COI region with downstream ordination. In Subarea 48.6, diets were dominated by fishes, especially grenadiers (*Macrourus* spp.) and the icefish *Chionobathyscus dewitti*, with cephalopods generally less prevalent. Differences between slope and shelf were driven primarily by *Macrourus caml* and, secondarily, *C. dewitti*, with shelf signatures distributed across multiple taxa. Depth was further identified as the primary gradient shaping prey composition, with fish size and longitude providing additional, though smaller, effects. The results indicated habitat-driven structuring of diet and geographic foraging plasticity in Antarctic toothfish, suggesting the potential for the long-term use of trophic indicators in regional monitoring.

4.108 The Working Group noted that toothfish show a combination of predatory and scavenging behaviours, and noted that diet studies may help identify the behavioural changes that lead to few fish of intermediate sizes being observed in catches in the areas fished (paragraphs 4.96 and 4.97). The Working Group noted that the approach allowed identification of invertebrates such as sea cucumbers, which would not be identifiable from a traditional diet analysis relying on the hard parts remaining in the stomach. The Working Group also noted the discrimination of *Macrourus* species, indicating a spatial split between *M. caml* and *M. whitsoni*, although low sample size made the results preliminary. The Working Group noted that the use of pooled samples precluded conclusions about the proportion of fish feeding on squid.

4.109 The Working Group recommended continuing the research plan for the exploratory fishery in Subarea 48.6 as proposed by WG-SAM-2025/02.

4.110 The Working Group recommended that the catch limit for *D. mawsoni* in Subarea 48.6 be based on the trend analysis shown in Table 1 for the 2025/26 fishing season.

Dissostichus mawsoni in Divisions 58.4.1 and 58.4.2

4.111 WG-FSA-2025/19 presented a report of exploratory fishing activities undertaken by Australia, France, Japan, Korea and Spain between the 2011/12 and 2024/25 fishing seasons (as per Milestone 1.3) and ageing of collected toothfish otoliths (as per Milestone 1.4).

4.112 WG-SAM-2025/03 presented an update of the research plan for continuing research in the *D. mawsoni* exploratory fishery in Divisions 58.4.1 and 58.4.2 from 2022/23 to 2025/26 under CM 21-02, paragraph 6(iii) for the last year of the 4-year research plan. Compared to the research plan that was presented in WG-FSA-IMAF-2024/25, there was one vessel replacement. The plan retained a proposal for structured fishing in Division 58.4.1 to allow for an evaluation of the effects of gear type on the collected data which had been developed based on a recommendation by WG-SAM-2024 (paragraph 8.19).

4.113 The Working Group noted that the research plan had ambitious objectives and was well designed to achieve them. It also noted the value of this research plan in combining research from multiple scientific disciplines, and the importance of resuming data collection in Division 58.4.1 in order to achieve the management objectives of this exploratory fishery, including developing the stock assessment.

4.114 Dr Kasatkina emphasised that the research plan in Division 58.4.1 does not meet the requirements of CM 21-02, paragraph 6 (iii), under which this research plan is submitted (SC-CAMLR-43, paragraphs 3.68 and 3.69). Dr Kasatkina noted that multiple gear types should not be used for multi-vessel research proposals submitted under CM 21-02, paragraph 6(iii), as research plans should be reported in accordance with Conservation Measure 24-01, Annex 24-01/A, format 2, which refers to using standardised gear. She noted that there are no provisions in the Rules of Procedure of the Scientific Committee and the Commission for partial implementation of CCAMLR Conservation Measures.

4.115 The other participants of the Working Group noted that the use of standardised gear types is not a requirement for research proposals submitted under CM 21-02 paragraph 6(iii). They also noted that the interpretation of Conservation Measures is a matter for the Commission.

4.116 The Working Group recalled that the use of multiple gear types in this area has been the subject of numerous discussions in the last six years (WG-SAM-2025, paragraph 7.9).

4.117 Dr Kasatkina noted that the issue of gear standardisation had been ongoing for many years but that there are no proposals to provide investigations in this aspect. She noted that in previous years several papers on the different results (abundance indices, population structure and productivity indices, distribution of toothfish and dependent species) obtained using different gears had been presented but this data was not taken into account (WG-FSA-17/16; WG-SAM-17/23; WG-FSA-16/13 Rev. 1; SC-CAMLR-XXXVII/BG/23). She recalled that the Russian Federation provided proposals to investigate the impact of the gear on the result of the catch taking into account CPUE, gear and species composition in the Special Research Zone (SRZ) of the Ross Sea MPA (WG-FSA-18/33 Rev. 1) but that this proposed research was not adopted by the Working Group and Scientific Committee. She noted that the proposed research plan in Division 58.4.1 was presented in WG-SAM-2025, and that she had provided comments that had not been addressed (WG-SAM-2025, paragraph 7.8). Dr Kasatkina noted that using standardised fishing gear and standard procedures for adjusting and monitoring of its parameter when conducting multi-vessel research programs is a traditional and mandatory practice in ICES areas (WG-SAM-2019/34). She noted that currently there is no scientifically based evidence adopted by the Scientific Committee that would allow proponents of the research plan in Division 58.4.1 to ignore the use of standardised fishing gear in multi-vessel research plan for toothfish (WG-FSA-IMAF-2024/77; SC-CAMLR-43, paragraph 3.68).

4.118 The other participants of the Working Group noted that the research plan in Division 58.4.1 incorporated a design where vessels were allocated fishing locations that included a comparison and calibration among and within gear types across the research blocks, and that this design would allow the effect of gear type to be analysed and standardised.

4.119 The Working Group recalled that WG-SAM-2025 had recognised the scientific value of resuming the exploratory fishery in Division 58.4.1. The Working Group also recalled that SC-CAMLR-43 had recognised that the proposed research program in Division 58.4.1 is an appropriate scientific experiment that should be conducted in order to evaluate the effects of longline gear type on the collected data (paragraphs 3.71 and 3.72).

4.120 The Working Group noted that various papers developing and applying methods of standardisation and calibration had been presented to this Working Group, covering work in the Ross Sea, Subarea 88.3 and Subarea 48.6. These analyses showed how standardising CPUE and understanding the influence of particular factors can be carried out, and that the tools to do this post hoc analysis have been developed.

4.121 The Working Group noted that as a result of research undertaken since 2003, a broad stock hypothesis had been developed and updated for this area (WG-SAM-2022/09). The Working Group noted that continuing the research in this area would lead to further refinement of the stock hypothesis, and that this development of understanding was continuing even in areas which had an extensive history of fishing, such as the Ross Sea Region.

4.122 The Working Group noted that there were substantial differences among the age structures in different RBs of 58.4.2, for example a much higher proportion of young fish in RB 5841_1 (Prydz Bay). The Working Group also noted that that inter-lab comparisons had shown good consistency in age interpretation of toothfish otoliths for these Divisions.

4.123 The Working Group noted that macrourid otoliths had been collected, and that the analysis of by-catch species is planned as a milestone for 2026.

4.124 The Working Group endorsed the research plan for the exploratory fishery in Division 58.4.2 but was unable to reach consensus on how to proceed in the exploratory *D. mawsoni* fishery in Division 58.4.1.

4.125 The Working Group recommended that the catch limit for *D. mawsoni* in Divisions 58.4.1 and 58.4.2 be based on the trend analysis shown in Table 1 for the 2025/26 fishing season.

Research proposals targeting toothfish notified under CM 24-01

Dissostichus spp. in Subarea 48.2

4.126 WG-FSA-2025/40 presented a revised research fishery proposal for *Dissostichus* spp. in the Subarea 48.2 under CM 24-01, paragraph 3, by Ukraine from 2025/26 to 2027/28. The proposal has been revised to address recommendations from WG-SAM-2025 (WG-SAM-2025, paragraph 6.14). The main objectives are unchanged from WG-SAM-2025/18:

(i) to obtain a relative abundance of the adult population of *Dissostichus* spp. and determine their biological parameters;

(ii) to determine the spatial distribution of the two toothfish species in the study area;

(iii) to assess the impact of fishing operations of different types of bottom longlines on vulnerable marine ecosystems, by-catch, and the environment in general, using underwater video systems;

(iv) to carry out electronic monitoring of the processes of setting and hauling longlines, and tagging procedures;

(v) to undertake plankton and oceanographic research;

(vi) to obtain biological and other observational data in order to evaluate the achievement of the objectives of the South Orkney Islands Southern Shelf Marine Protected Area; and

(vii) to collect biological data for toothfish and by-catch species.

4.127 The Working Group noted that there is little justification in the proposal for the following points:

(i) proposed research objectives in a closed area;

(ii) power analysis to set the number of stations; and

(iii) catch limits proposed in WG-FSA-2025/40 (150 tonnes), which indicate a greater exploitation rate against estimated biomass (4.6%) than used in the Trend analysis (4%).

4.128 WG-FSA-2025/48 presented a revised research fishery proposal for *Dissostichus* spp. in Subarea 48.2 under CM 24-01, paragraph 3, by Chile from 2025/26 to 2027/28. The proposal has been revised to address recommendations from WG-SAM-2025 (WG-SAM-2025, paragraphs 6.11-6.12) including further information and analyses based on the CCAMLR databases for these Subareas. The main objectives are unchanged from WG-SAM-2025/04:

(i) to obtain relative abundance estimates for toothfish by depth strata using CPUE indices;

(ii) to investigate the toothfish population structure (ratio between Antarctic and Patagonian toothfish, size and age structure, mean length);

(iii) to continue the tagging and recapture program;

(iv) to characterise by-catch species; and

(v) to characterise the interactions of seabirds and marine mammals with fishing operations.

4.129 The Working Group noted that the proposal needs to indicate a more detailed description of the methodology for otolith ageing works, including engagement with the CON, and investigating toothfish movement. It also noted that several years have passed since the last research was conducted, therefore the likelihood of recapturing tagged fish in these RBs is low.

4.130 The Working Group encouraged proponents to analyse data collected from previous toothfish research activities in Subarea 48.2 to help inform the current proposal and to consider investigating toothfish distribution and connectivity in broader areas as a part of their objectives.

4.131 The Working Group noted that the catch limit proposed in WG-FSA-2025/48 is higher than previous research (75 tonnes and 48 sets) in this Subarea.

4.132 The proponents explained that the proposed catch limits of 72 tons for the northern RB and 59 tons for the southern RB were based on a power analysis designed specifically to obtain an unbiased estimate of toothfish abundance with a 12% CV, ensuring robust data collection.

4.133 The Working Group noted that it had no basis to assess whether the combined effects of both research proposals being undertaken in parallel would be precautionary. As such, the Working Group could not reach consensus on conducting the scientific research for *Dissostichus* spp. in the Subarea 48.2 as proposed in WG-FSA-2025/40 and WG-FSA-2025/48 in parallel.

4.134 The Working Group recommended that proponents address the following issues to improve the research proposals:

(i) Issues that are common for both proposals:

(a) submit a paper to WG-SAM which indicates how objectives/milestones in previous research plans in the area have been completed;

(b) in future research plans, indicate the rationale for three years research duration while considering research objectives;

(c) consolidate sampling rate of biological measurements and sample collection; and

(d) focus on one or two key research questions to clarify the priority of the research project.

(ii) Issues that are specific to WG-FSA-2025/40 by Ukraine:

(a) indicate a rationale for the proposed catch limit based on a power analysis with consideration of both the research feasibility and precautionary approach;

(b) provide more detailed descriptions for minimising impacts on by-catch taxa; and

(c) provide more detailed descriptions about the "ecosystem index" that will be derived from the research, and how this could be used.

(iii) Issues that are specific to WG-FSA-2025/48 by Chile:

(a) consider revising the proposed research objectives to account for the limited area of shallow depths available;

(b) revise research blocks to efficiently investigate the stock hypothesis and to enhance possibility of recaptures of tagged fish;

(c) provide the rationale for developing a stock assessment in this Subarea if not attempting to start a new fishery;

(d) contribute to improving the by-catch identification guides for macrourids;

(e) expand broader ecosystem studies in addition to toothfish objectives; and

(f) note that previous depletion experiments for toothfish in CCAMLR have been unsuccessful and consider how alternative approaches could be used.

4.135 The proponents noted that inclusion of the depletion experiments was done following the WG-SAM-2025 suggestions to estimate an absolute abundance index and that it was not included in the original proposal by Chile (WG-SAM-2025/04).

Management advice

4.136 Due to the extensive review and commentary of these two research plans, they were not included in the research plan review table (Table 4).

4.137 The Working Group recommended that the Scientific Committee provide guidance to the proponents of the two proposals in Subarea 48.2 for coordinating their research plans or combining into a single proposal, as encouraged by WG-SAM-2025 (WG-SAM-2025, paragraph 6.15). The coordinated or joint proposal should provide justification for:

(i) conducting research fishing in the closed area;

(ii) proposing a higher catch limit than in previous research (75 tonnes); and

(iii) be restructured to align with the purpose of the research linked to Commission or Scientific Committee priorities.

4.138 The Working Group also requested guidance from the Scientific Committee on whether fishing within closed areas is a priority for the current work of the Scientific Committee and Commission.

Dissostichus eleginoides in Subarea 48.3

4.139 WG-FSA-2025/47 presented a revised fishery research proposal for *D. eleginoides* in Subarea 48.3A under CM 24-01, paragraph 3, by Chile from 2025/26 to 2027/28. The proposal had been revised to address recommendations from WG-SAM-2025 (WG-SAM-2025, paragraphs 6.17-6.18) including further information and analyses based on the CCAMLR databases for Management Areas A and B. The main objectives are unchanged from WG-SAM-2025/05:

(i) to obtain relative abundance estimates for toothfish by depth stratum;

(ii) to investigate the toothfish population structure (including the relative proportions of Antarctic and Patagonian toothfish, and their size and age structure);

(iii) to continue the tag release and recapture program;

(iv) to characterise by-catch species, and

(v) to characterise interactions of seabirds and marine mammals with fishing operations.

4.140 The Working Group noted that the proposed catch limit for the research fishing in this closed area is similar in value to the catches taken in some years when a commercial fishery operated in the area, and considerably higher than the 10-tonne limit previously set for the area (CAMLR-XXIII, paragraph 4.36).

4.141 The proponents explained that the proposed catch limit of 41.5 tonnes was based on a power analysis (as recommended by WG-SAM 2025, paragraphs 6.17 and 6.18). This analysis was specifically designed to obtain an unbiased estimate of toothfish abundance with a 12% CV, which ensures robust data collection.

4.142 The Working Group noted that assessments of the toothfish stock are already conducted for the entirety of Subarea 48.3, which includes the Management Area 48.3A proposed for investigation in this proposal. The Working Group questioned the rationale for conducting scientific research focused on only 48.3A for the current research objectives.

4.143 The proponents of this research proposal explained that outcomes of this research would provide more information of this specific area, which could contribute to assessment and management in the entire Subarea 48.3.

4.144 The Working Group noted that, considering the current stock assessment model in Subarea 48.3, the additional data provided by this research plan is unlikely to significantly alter the stock assessment results. The Working Group also noted that sample sizes developed in research plans under CM 24-01 should be determined based on the number necessary to achieve the research objectives, rather than in comparison to the requirements of commercial or exploratory fisheries and that the data collected from those samples should be maximised.

4.145 The proponent mentioned that the sampling design and the sample sizes were carefully developed from a scientific perspective, specifically to ensure the collection of robust and unbiased data in support of the research objectives. To estimate catch limit in data limited areas it is necessary to gather all the information available to calibrate the catch limit levels.

4.146 The Working Group noted that there is no consensus on conducting scientific research for *D. eleginoides* in the Subarea 48.3A as proposed in WG-FSA-2025/47. The Working Group also noted that the research plan was reviewed mainly focusing on the scientific aspects (e.g. research design, research capacity, data analysis method, and impact on ecosystem and harvest species) without evaluating the rationale of the current research objectives and proposed catch limit.

4.147 At the time of adoption, Dr Montenegro noted that the proposal provided a detailed rationale for the current research objectives and proposed catch limit, as outlined in the "Rationale for Research" section. The proposal specifically addresses critical knowledge gaps in the scientific foundation for managing the Management Area A Patagonian toothfish. Furthermore, following an 18-year closure, the absence of contemporary data from Management Area A presents a valuable opportunity to enhance understanding of population dynamics across the entire stock.

Management advice

4.148 The Working Group requested the Scientific Committee to consider whether there is rationale to conduct the research as proposed in WG-FSA-2025/47 in Subarea 48.3 Management Area A where there is a zero-catch limit, and within a closed area covered by a stock assessment.

Dissostichus mawsoni in Subarea 88.1

4.149 WG-FSA-2025/46 presented the results of the 2025 RSSS, the 14th in the series. Results from the 2025 survey indicated strong recruitment of Antarctic toothfish coming into the fishery. The time series of relative abundance and age structure in Antarctic toothfish from the RSSS provides information about year class strength, variability, and autocorrelation, and hence is an important input into the Ross Sea region toothfish stock assessment.

4.150 WG-FSA-2025/43 presented the research plan to continue the RSSS from 2025/26-2027/28. The design of the survey is the same as in previous years, with station numbers based on a power analysis that was undertaken in 2022. The objectives are to (1) monitor Antarctic toothfish recruitment (2) monitor trends in abundance of the larger (sub-adult and adult) toothfish in regions where predators of toothfish are abundant (McMurdo Sound and Terra Nova Bay) and (3) collect and analyse a wide range of data and samples from these areas including benthic invertebrates, fish stomach and tissue samples, and associated environmental and acoustic data. Objectives (2) and (3) are specified as high-priority research topics in the research and monitoring plan for the Ross Sea region Marine Protected Area (RSrMPA).

4.151 The Working Group noted that the recommended clarifications to the research proposal requested by WG-SAM-2025 (paragraphs 6.4 – 6.9) had been implemented in the research plan. The Working Group further noted that the RSSS was important for informing a long-term time series of recruitment and provided the ability to track age and length cohorts as they move from the shelf to deeper areas where the fishery occurs.

4.152 The Working Group noted that this research plan has provided a long history of international collaboration, with Dr M. Mori (Japan) having participated in 2025, and that Mr S. Somhlaba planned to participate in 2026. The Working Group further noted that this survey provided an opportunity for samples to be collected for other research projects. Those seeking samples from the survey should contact the proponents as early as possible prior to the survey to ensure protocols can be developed and equipment can be loaded prior to vessel departure.

4.153 The Working Group discussed the possibility of inclusion of predator information into the research plan as highlighted by WG-SAM-2025 (paragraph 6.6). The Working Group noted that the information on predator monitoring was collected and presented in WG-EMM-2025/45, and that an analysis would be conducted in the future once sufficient data were available.

4.154 The Working Group evaluated the proposal in the assessment table (Table 4) and agreed that the survey design would achieve its objectives.

Management advice

4.155 The Working Group recommended the research outlined in WG-FSA- 2025/43 for the 2025/26 – 2027/28 seasons proceed, with a catch limit set at 64 tonnes for 2025/26, 85 tonnes for 2026/27 and 64 tonnes for the 2027/28 season.

Dissostichus mawsoni in Subarea 88.3

4.156 WG-FSA-2025/52 Rev. 1 presented a summary of biological parameter estimates and data available to be used in a stock assessment for Subarea 88.3. The parameters included estimates of age-length keys, size and age at maturity using histological methods, length weight relationships, and tag movements. Pooled length frequencies showed a clear bimodality near 60 – 70 cm and 130 – 160 cm. Tag movement showed 63% of tags were recaptured in Subarea 88.3, 13% in Subarea 88.2 and 23% in Subarea 88.1.

4.157 The Working Group welcomed the analyses undertaken and noted that it would be beneficial to include more detail on the tag recaptures in relation to length frequencies, areas of release and recapture, sex and maturity stage for understanding movement pattern of *D. mawsoni*. The Working Group further noted the movement of tagged fish showed connection across the whole of Area 88 and that plans to update the stock hypotheses for this area would be valuable.

4.158 The Working Group further noted that the bimodal pattern in length frequencies with lower numbers of fish between 90 – 110 cm appears in many areas including Subareas 48.6 and 88.2, not just in Subarea 88.3. The Working Group further noted that these length classes are found in high proportions in areas such as the southern Ross Sea Region and recommended that research plans consider mechanisms to determine where these fish may reside within their respective areas. The Working Group suggested investigating size composition in individual lines to understand underlying mechanisms of the spatial pattern in the length frequency.

4.159 WG-FSA-2025/55 Rev. 1 presented an analysis of trophic dynamics of Antarctic toothfish in Subarea 88.3 based on compound-specific stable isotope analyses incorporating individual size and spatial variability. The results of the study suggest:

(i) juvenile toothfish share trophic position overlapping with prey taxa, suggesting potential competition before shifting to higher predator role with growth;

(ii) Antarctic toothfish appear to integrate the pelagic and benthic ecosystems of the Bellingshausen Sea by feeding on both pelagic prey (e.g., Channichthyidae) and benthic prey (e.g., Macrouridae); and

(iii) prey taxa showed spatial variability in nitrogen baselines and basal sources among research blocks.

4.160 The Working Group noted the value of this study and of an increased sample size, particularly of fish in the 90 – 110 cm range to allow for detecting changes in dynamics of Antarctic toothfish as they grow. The Working Group further noted that the Southern Ocean isoscapes (St John Glew and Espinasse et al., 2021) would be beneficial in conducting stable isotope analysis.

4.161 WG-FSA-2025/57 presented a comparison of Antarctic toothfish diet composition in Areas 48 and 88 using stomach content analysis. In all areas the main prey items were fish, typically macrourids and icefish.

4.162 The Working Group noted that diet and its shifts through life history is an important part of tracking the biology of the species. The Working Group discussed whether exploring diet by length classes could help elucidate where the 90 – 110 cm toothfish are residing, or why they may leave sampled areas.

4.163 WG-FSA-2025/49 Rev. 1 provided a notification for a research plan targeting Antarctic toothfish in Subarea 88.3 by Korea and Ukraine. This research has four objectives:

(i) to provide an assessment of the stock status of Antarctic toothfish;

(ii) to improve understanding of toothfish biology, including abundance, distribution, and stock structure;

(iii) to improve information on by-catch species; and

(iv) to improve understanding of trophic relationships and ecosystem changes.

4.164 The Working Group noted insufficient data were available in RB 883_2 to allow estimating a catch limit using the trend analysis. The Working Group recommended that the catch limit for RB 883_2 be set at 20 tonnes and be effort limited using the locations provided in WG-FSA-2025/49 Rev.1, Figure 8.

4.165 The Working Group further noted that RB 883_2 is often affected by high ice cover. The Working Group discussed the ice cover in recent years (Figure 1) and concluded that access to this RB, whilst challenging in some years, was still feasible for ongoing research in this research block.

4.166 The Working Group recalled the discussions in the Commission (CCAMLR-XXXVI, paragraphs 5.20 to 5.24) on a proposal to establish 88.3 as an exploratory fishery. The Working Group noted that the proponents have completed the research plan discussed in 2017, and another 3-year research plan since then. It further noted that research in this area has been undertaken for a long time now and is on its way to developing a stock assessment. The Working Group recommended that Subarea 88.3 could move to an exploratory fishery notified under Conservation Measure 21-02 paragraph 6 (iii) and requested the Scientific Committee to consider this option.

4.167 The Working Group evaluated the proposal in the assessment table (Table 4) and agreed that the survey design would achieve its objectives.

Management Advice

4.168 The Working Group recommended the research outlined in WG-FSA-2025/49 Rev. 1 for Subarea 88.3 for the 2025/26 season proceed.

4.169 The Working Group recommended that the catch limits for Subarea 88.3 be based on the trend analysis as shown in Table 1, with the effort-limited Research Block 2 being conducted with seven sets for each vessel and a catch limit of 20 tonnes.

General issues concerning research proposals notified under CMs 21-02 and 24-01

4.170 The Co-Conveners of WG-SAM presented a table developed by WG-SAM-2025, identifying the proposed and ongoing research plans under CM 21-02 or CM 24-01, their proposed years of fishing, and the years in which each Working Group is required to review them (Table 5). The Working Group noted the utility of this table in guiding their work.

4.171 Dr Demianenko (Ukraine) informed the Working Group that the proposed research plan presented in WG-SAM-2025/15 and WG-ASAM-2025/11 would not proceed in 2025/26 due to the change in Flag State of the vessel intended to be used. Therefore, the Working Group did not review this proposed research and noted the proponent's intention to re-submit the proposal for consideration in future years.

Trend analysis

4.172 WG-FSA-2025/01 presented updated estimates of toothfish biomass in research blocks for data-limited toothfish fisheries, and the resulting catch limits for the 2025/26 season as determined using the trend analysis decision rules. The report also provided extended time series of CPUE-derived biomass estimates and catch limits as requested by WG-SAM (WG-SAM-2025, paragraph 5.20(iv)).

4.173 The Working Group thanked the Secretariat for implementing the trend analysis and requested the following revisions for future years:

(i) Identify whether there was an effect on the trend analysis resulting from difference in spatial buffers between those used in the trend analysis rules (5 km, see WG-SAM-2025/06), and those described in CM 41-01 Annex B (one or two fine-scale rectangles wide)

(ii) Clarify that CPUE calculations shown by year are calculated as a median of three years, where appropriate in future reports.

4.174 Dr Thanassekos (Secretariat) provided an update regarding the development of the Agent-Based Model (ABM) that will be used as one of the operating models in the future MSE of the trend analysis (WG-FSA-2023/08; WG-FSA-2023, paragraph 4.9). In that update, preliminary tagging simulations were compared between the ABM and Casal2 (see also WG-SAM-2024/09).

4.175 The Working Group welcomed the work, and noted the thorough testing of the ABM, which showed a high level of consistency with modelling of tagging processes in a model implemented in Casal2. The Working Group noted that it would be beneficial to include comparisons to additional operating models, such as those developed for assessment of the Macquarie Island toothfish stock.

Progress towards stock assessments under research plans

4.176 The Working Group noted that the data-limited fisheries notified under CM 21-02 are progressing rapidly towards stock assessments.

4.177 The Working Group further noted the success of the first Cap-DLISA workshop, and recommended that another workshop in the future would be valuable to help progress stock assessments in these areas and those notified under CM 24-01 (such as Subarea 88.3) to continue development towards a stock assessment which can be used for management advice (paragraphs 4.91 to 4.93).

Review of research plans

4.178 To simplify the review process, the Working Group requested that the proponents of any kind of research proposal add a self-assessment table into research proposals and to clearly indicate the revised points reflecting comments and recommendations from other working groups.

4.179 The Working Group noted the comparison of relative tag detection and survival rates undertaken as part of the Ross Sea Region assessment and fishery characterisation had been updated in 2025 (WG-FSA-2025/29). The Working Group noted that these statistics had been used in previous years to provide information about the relative tagging performance of vessels proposed for research plans. Noting the utility of these statistics across the research plans, the Working Group requested that New Zealand provide these values to the Secretariat whenever they are updated and that research proponents contact the Secretariat for the relevant values in completing their research proposals.

4.180 The Working Group reviewed the results of the updated analysis (Table 6) and noted that two vessels (FVs *Antarctic Aurora* and *Cap Kersaint*) had undertaken little or no fishing in the Ross Sea Region, and so their relative tag performance could not be evaluated in this way. The Working Group noted that this table is useful as it allows for reference with simple descriptions when evaluating the items concerning tag detection and survival rate in item 3.2 of the research plan review table (Table 4).

4.181 The Working Group noted that it would be useful to extend the analysis to investigate whether there were trends in the performance of vessels, or to restrict the analysis to more recent data. The authors noted that although such analyses may be useful, there may be insufficient data to draw conclusions from them (Table 6).

4.182 The Working Group recommended that the research plans should provide information on how the quality of data collection is evaluated to identify any potential issues within their research plans to ensure reliable data collection at sea is undertaken.

4.183 The Working Group recalled that the current review table (Table 4) used to assess research plans was developed based on discussions in 2017 (WG-FSA-17, paragraphs 4.1 to 4.11) and further refined in 2019 (WG-FSA-2019, paragraphs 4.26 to 4.28).

4.184 The Working Group noted that the review table has proven effective in reducing the difficulty in evaluating research plans among areas. It further noted, however, that as research plans in data-limited fisheries have developed since its introduction, this table does not capture the details required to assess the progress of research plans beyond the first year. The Working Group further noted that exploratory fisheries notified under CM 21-02 paragraph 6(iii) are specified due to their data limited status in developing a stock assessment in their respective areas.

4.185 The Working Group discussed that as research plans have developed, the progress of the research plans notified under CM 21-02 beyond the first year should be evaluated based on:

(i) the quality of at sea data collection,

(ii) the quality of parameter estimates towards a stock assessment,

(iii) the development steps of a stock assessment, and

(iv) the progress of other nominated milestones.

4.186 The Working Group recommended that:

(i) Research plans be evaluated in their first year based on the criteria in Table 7.

(ii) The Conveners of WG-SAM and WG-FSA, and the Chair of the Scientific Committee develop a paper for review by WG-SAM and WG-FSA in 2026 which outlines metrics for reviewing research plans in subsequent years.

4.187 The Working Group suggested that the paper could include criteria such as those outlined in Appendix D. The Working Group noted that the criteria listed currently focused on development of a stock assessment and that alternative criteria may be needed both for non-assessment milestones, and for research plans notified under CM 24-01.

4.188 The Working Group further noted that these criteria would require a greater level of detail in the milestones of research plans than those currently provided. This would allow easier tracking of meaningful progress of research plans.

Krill

5.1 WG-FSA-2025/P01 provided an update of a krill stock assessment and precautionary catch rates for Divisions 58.4.1 and 58.4.2 that were previously presented in WG-FSA-2023/68. The authors noted that this work has now been published in a peer-reviewed journal and that during the review process a small error in the code used for estimating maturity was detected and resolved. As such, the published paper was presented again at this Working Group for consideration. The authors estimated 50% length at maturity for *E. superba* to be 41.67 mm and 42.29 mm for Divisions 58.4.1 and 58.4.2 respectively. Based on the implementation of the Generalized Yield Model (Grym), the estimated precautionary harvest rates for krill in Divisions 58.4.1 and 58.4.2-East ranged between 0.0854–0.1201. The authors applied these estimated values to the biomass estimates from the Japanese KY1804 survey (2018/19) in Division 58.4.1 and the TEMPO voyage (2021) in Division 58.4.2-East and estimated a total precautionary catch limit for Division 58.4.1 of 391 754 tonnes. Based on the three strata biomass estimates by Abe et al. (2023) the authors recommended a subdivision of 141 970 tonnes west of 103°E, 58 256 tonnes between 103°E and 123°E, and 191 528 tonnes east of 123°E. In Division 58.4.2-East, the total catch limit proposed is set at 2 088 872 tonnes, with a subdivision of 1.448 million tonnes west of 55°E and 640 872 tonnes east of 55°E. The authors also proposed that the current trigger levels in CM 51-03 for both subdivisions of Division 58.4.2 remain in force until such time that an updated SOA can inform on a spatial allocation of catch within this Division.

5.2 The Working Group thanked the authors for presenting the revised version of the krill assessment for these Divisions and noted previous discussions in WG-FSA-2023 (paragraphs 3.20 to 3.28) and the endorsement of the previous stock assessment and the proposed catch limits by the Scientific Committee in 2023 (SC-CAMLR-42, paragraphs 2.91 to 2.96, 2.98 and 2.99).

5.3 Some participants noted that the spatial distribution of the catches and acoustic surveys and biomass estimates should be further discussed in WG-ASAM and WG-EMM.

5.4 The Working Group noted that the proposed catch limits apply independently to the two Divisions. The Working Group noted that the parameters for this assessment have been already reviewed by WG-EMM-2023 (paragraphs 4.6 to 4.8), and biomass estimation approach has been endorsed as best available science by WG-FSA-2023 (paragraphs 3.20 to 3.28).

5.5 The Working Group supported the assessment of the harvest rates for *E. superba* in Divisions 58.4.1 and 58.4.2-East and recommended a total catch limit for Division 58.4.1 of 391 754 tonnes (141 970 tonnes west of 103°E, 58 256 tonnes between 103°E and 123°E, and 191 528 tonnes east of 123°E) and 2 088 872 tonnes (1.448 million tonnes west of 55°E and 640 872 tonnes east of 55°E) in Division 58.4.2.

5.6 Some participants expressed concerns about discussing krill in WG-FSA as they considered that the relevant expertise is only present in WG-EMM.

5.7 The Working Group noted previous discussion on this issue in SC-CAMLR-43 (paragraph 11.22) and that WG-EMM-2023 supported the original work for this krill stock assessment for Divisions 58.4.1 and 58.4.2 to be considered by the WG-FSA-2023 (WG-EMM-2023, paragraph 4.8). For this reason, it was noted that, whilst krill stock assessment has been added to the WG-EMM workplan, at this stage, it is also on the WG-FSA workplan, and WG-FSA has the relevant expertise and is best placed to provide comments and recommendations to the Scientific Committee until it is decided otherwise in the future.

Non-target catch

6.1 WG-FSA-2025/07 presented a summary of IMAF and warp strike activities, and extrapolated estimates for the 2024/25 season. The authors noted that the paper was presented to WG-FSA-2025 to maintain an annual reporting record, given there is no meeting of WG-IMAF in 2025. The authors noted that data presented were up to and including 15 September 2025 and that full analyses for the 2024/25 season will be presented at WG-IMAF-2026. The extrapolated number of seabird mortalities for the season to date was 30 individuals, which is the second lowest on record. The authors further noted one humpback whale (*Megaptera novaeangliae*) mortality (detailed in WG-EMM-2025/27), and one Southern elephant seal (*Mirounga leonina*) mortality.

6.2 The Working Group noted the low estimates of seabird and mammal mortality from longline fisheries operating in the Convention Area. It recalled that low mortalities in the longline fishery had not always been the case, and such continued low rates in mortalities was welcome progress. The Working Group requested that future iterations of this paper report estimated seabird mortalities for all longline fishery areas, even where values were zero, to allow for easier comparison among areas.

6.3 The Working Group discussed the categorisation of warp strike severity and the potential importance for finfish trawl vessels. It noted that the discrepancy in recording warp strike severity between finfish and krill trawl vessels caused potential confusion when interpreting warp strike estimates in the paper. The Working Group agreed that this is an issue best taken forward to WG-IMAF-2026 and requested that the Secretariat highlight this issue. The Working Group requested that further analyses be done on warp strike and IMAF data, including spatiotemporal analysis (based on the methods presented in WG-SAM-2025/21) and noted the utility of camera monitoring in observing bird and mammal behaviour near fishing gear.

6.4 WG-FSA-2025/50 and WG-FSA-2025/51 presented results of a trial of video monitoring of strikes associated with the net monitoring cable in the 2023/24 season aboard FV *Fu Xing Hai* and FV *Shen Lan*, respectively. These papers represent updates to WG-FSA-IMAF-2024/56 Rev. 1 and WG-FSA-IMAF-24/57, respectively. Updates to the post-cruise video observation increased total observation hours, such that 545.6 hours (18.5% of fishing time) were observed for the FV *Fu Xing Hai* and 437.1 hours (20.6% of fishing time) were observed for the FV *Shen Lan*. Observations of the FV *Fu Xing Hai* recorded 88 total seabird strikes, 49 of which were heavy. Observations of the FV *Shen Lan* recorded 19 total seabird strikes.

6.5 The Working Group thanked the authors for this contribution, noting that any updates would be provided to WG-IMAF-2026 and suggested that it may be worthwhile submitting the report to the Agreement on the Conservation of Albatrosses and Petrels (ACAP).

6.6 The Working Group noted the need for further information on how total fishing time was calculated where multiple trawl nets were deployed at the same time. It further noted that data on seabird behaviour relative to wind and trawl direction collected in this study would be useful in understanding the environmental factors that influence the number of seabird strikes.

6.7 The Working Group noted the inherent challenges of monitoring warp strikes on fishing vessels due to weather exposure and highlighted the potential for video monitoring to improve both data quality and observer safety and efficiency. It further noted the potential utility of AI in analysing video footage for this purpose.

6.8 The Working Group noted that the current CCAMLR data collection form assumes that the warp and net monitor cables can be observed simultaneously, but this is not the case for all vessels due to their locations. The Secretariat thanked the observers aboard these two vessels for reporting in such detail as to make this distinction clear. The Working Group considered an amended Warp Strike Observation worksheet presented by the Secretariat specifying the observation area, and requested the Scientific Committee endorse the changes to the worksheet and accompanying instructions, and forward onto WG-IMAF to ensure its implementation for the 2027 season.

6.9 The Working Group noted that under CM 25-03/Annex A, the requirement for warp strike observation time was 2.5% of total fishing time, rising to 5% of total fishing time from the 2024/25 season onwards.

6.10 Dr Kasatkina expressed the opinion that there is no scientific basis for the current requirement of number of hours of seabird strike observation, and requested the Secretariat revise the SISO protocols to increase the requirement for seabird strike observation hours.

6.11 Other participants noted that discussion of warp strike observation requirements had taken place at WG-IMAF-2023 and further discussion should take place at WG-IMAF, where relevant expertise was in place, and that any increase in observation requirements would need to be balanced with other tasks of the observers.

6.12 WG-FSA-2025/P03 presented results from an eDNA study of fish diversity in the Bransfield Strait and northern South Shetland Islands. Thirty-two fish species were identified from a total of 18 water samples. The dominant species in the Bransfield Strait was mackerel icefish (*C. gunnari*), while at the South Shetland Islands the dominant species was marbled rockcod (*N. rossii*). The authors compared their results to those from previous studies in the area using bottom trawling and camera deployments. Different species were detected using the different approaches, highlighting the importance of using multiple methods to build a complete picture of fish diversity. The authors noted that eDNA provides a rapid and accurate biomonitoring approach, particularly in areas which are difficult to access.

6.13 The Working Group thanked the authors for this work and noted that the study only identified the presence of notothenioid fish and emphasised the importance of selecting appropriate primers for eDNA detection due to both the genetic similarity among notothenioid species, and to ensure detection of the diverse array of other species. The Working Group further welcomed the inclusion of environmental factors in these analyses, and noted the importance of conducting sampling for eDNA throughout the water column as the vertical distributions of different species may influence the presence of their eDNA at different depths. It further noted that filter feeding organisms such as sponges could be used for collecting eDNA from demersal areas for such purposes.

6.14 WG-FSA-2025/P04 presented results of an otolith microchemistry study of *Electrona carlsbergi*, a sub-Antarctic lanternfish, in the Antarctic Circumpolar Current and the Antarctic Slope Current. *E. carlsbergi* is a common species in this area, a favourite species of myctophid for some people, and is often caught as by-catch in the krill fishery. Samples were collected from different water masses from individuals of similar ages, with otolith microchemistry conducted on both the otolith edge and nucleus. Individuals from the ACC and ASC could be separated at both the edge and nucleus on the basis of ratios of Mg:Ca and Ba:Ca, and Mg:Ca and Li:Ca, respectively. The authors noted that *E. carlsbergi* spawns in the Argentine Basin, and the mechanisms for their presence in the waters of the Convention Area was unclear. The authors hypothesised that *E. carlsbergi* may move across the ACC using eddies, and noted the importance of investigating physical oceanography when studying stock hypotheses and population structures.

6.15 The Working Group thanked the authors and agreed with the importance of understanding the physical environment in relation to fish movement and population structure. Members reflected on opportunities for collaboration to further understand this species' migratory patterns, including conducting microchemistry on otoliths from a wider range of locations, using particle tracking models to investigate potential passive transport, employing oxygen isotope thermometry on otoliths, and otolith shape investigation. The Working Group further noted that climate change effects on the locations and persistence of fronts and eddies may impact passive transport of fish, and this could be investigated via oceanographic modelling.

6.16 SC-CAMLR-44/BG/33 presented an updated on the work of the SCAR Action Group on Fish (SCARFISH). SCARFISH aims to identify and fill knowledge gaps about Southern Ocean fish, provide fish research to CCAMLR to inform an ecosystem-based approach to fish management, and to broaden the diversity of Southern Ocean fish researchers. SCARFISH presently has seven task groups which the authors encouraged Working Group participants to join:

(i) Horizon scan – identifying key issues in Southern Ocean fish research in CCAMLR and beyond

(ii) Fish biology, life histories and ecological strategies (FLE) – currently focused on producing identification keys for larval fish in the Southern Ocean

(iii) Biogeography, modelling and management tools (BMM) – working towards making the results of such modelling available to CCAMLR

(iv) Genomics, physiology and pathology (GPP) – currently undertaking a literature review

(v) Fieldwork – including sample coordination

(vi) Data – making historic data publicly available and working towards consistent and high-quality future data collection

(vii) Outreach – both public facing and communication to CCAMLR.

6.17 The Working Group thanked the authors for this paper and noted that SCARFISH was a lead contributor to the updated WG-FSA Workplan 2 c (vi) (SC-CAMLR-43, Table 10) to develop biological parameters of by-catch species, and that this item was of high priority. The authors welcome suggestions in the WG-FSA report that SCARFISH can follow up. The Working Group noted that rather than having a specific task group on climate change, SCARFISH has included this as a common topic for each task group and will be integrated throughout its work. Regarding the SCARFISH fieldwork and sample coordination working group, participants reflected on the difficulty of moving samples internationally, and that an alternative was for researchers to travel to countries where the samples were stored. The Working Group further noted the value of collaboration between SCARFISH and the SCAR Krill Expert Group (SKEG) where appropriate, noting the proposed SCARFISH-SKEG joint workshop at the SCAR Open Science Conference in 2026.

Fish by-catch (macrourids, skates, other)

6.18 WG-FSA-2025/20 presented biological assessments of the four macrourid species (*M. caml*, *M. carinatus*, *M. holotrachys* and *M. whitsoni*), which are the main by-catch species across the CCAMLR longline fisheries. The study focused on Subarea 48.3. Results showed pronounced female-biased sex ratios in three species (*M. holotrachys*, *M. carinatus,* and *M. caml*), strong depth-based segregation by body length, distinct distributions and habitat preferences related to environmental features. By-catch rates were highest to the South of South Georgia and variable across species: *M. holotrachys* was the most frequently caught and had a wide range both spatially and bathymetrically (∼1000–1750 m); *M. whitsoni* was caught less frequently and in deeper water (> 500 m), was mostly caught in the northeast and east, and had the most restricted distribution; *M. carinatus* was mainly caught in the west, including Shag Rocks.

6.19 WG-FSA-2025/33 confirmed the occurrence of *M. whitsoni* in the toothfish longline fishery by-catches in Subarea 48.3 and northern South Sandwich Islands (Subarea 48.4) using DNA barcoding of the mitochondrial 'COX1' gene. The observed estimates of evolutionary divergence indicated a 1% divergence between samples of *M. whitsoni* and *M. caml*. In *M. whitsoni*, the occurrence of two haplotypes separated by one mutation, one dominant ubiquitous and one peripheral would be indicative of connectivity over large distances.

6.20 The Working Group thanked the authors of these studies and noted that trials across the CAMLR Convention Area to discriminate macrourids at species level has proved to be very difficult. The Working Group discussed the factors that affected the species composition and sex-differentiated distribution along habitats. It considered whether smaller fish being less reliant on scavenging were therefore less likely to be attracted to baited hooks. Additionally, smaller fish may be less physically able to take baited hooks due to their smaller mouth size, which could potentially be a factor in the female bias as male macrourids are much smaller. The Working Group also noted that interannual variability in macrourid by-catch does not correspond to toothfish catches as fishing vessels tend to avoid macrourids in the fishing grounds. The Working Group noted that a flowchart on macrourid species identification is in development and encouraged the participants to jointly contribute to the development of such a flowchart to assist scientific observers in the identification of these species.

6.21 WG-FSA-2025/59 presented diet composition and feeding strategy of Macrouridae, the main by-catch group in longline fisheries in the Convention Area, in Area 88 (Subareas 88.1 and 88.3). Results showed that *M. caml* was a fish and crustacean feeder that primarily consumed crustaceans (mainly euphausiids), but *M. carinatus* was both a carnivorous and piscivorous fish that mainly consumed fishes. Both *M. caml* and *M. carinatus* were opportunistic and specialised predators and showed narrow niche width and that their feeding strategy could be dependent on depth, size and location. The stomachs of all *M. whitsoni* were empty in Subareas 88.1 ($n = 10$) and 88.3 ($n = 1$).

6.22 The Working Group welcomed this study and noted that more samples are required to explore the diet of these species, and that approaches such as using stable isotope analysis, particularly compound-specific isotope analysis, may be useful in investigating the niche separation of these species.

6.23 WG-FSA-2025/60 evaluated a practical morphological key on the identification of *M. caml* and *M. whitsoni* for field use based on pelvic-fin ray counts and lower-jaw tooth rows. A total of 300 specimens collected over three consecutive fishing seasons (2022/23–2024/25) were independently identified by observers at sea and re-examined in the laboratory. Results showed that identification performance varied among observers. The most commonly occurring misidentification was *M. caml* misidentified as *M. whitsoni*. *Macrourus carinatus* was rarely observed, and its inclusion or exclusion in the analysis did not affect conclusions. Two externally visible characters for on-deck assessment were proposed for prospective application: the anterior shape of the snout (assessed from a ventral view) and body and fin colours. The morphological key proved to be field-usable across observers, though targeted refinement and training were recommended. The authors indicated that the key will be re-evaluated based on additional trials.

6.24 The Working Group thanked the authors for their valuable addition to macrourid species identification, and for making it available for vessels in the fishery. The Working Group noted that morphological characters, especially colour, may vary as a function of location and suggested that such variations be recorded by the group and added to the training manual as well for two additional species, *M. carinatus* and *M. holotrachys*. The Working Group encouraged interested participants to compile all available information to consolidate guidance offered to observers onboard fishing vessels.

6.25 WG-FSA-2025/P02 photographed 800 otoliths across the four *Macrourus* species collected from longline fishery in Division 58.5.2, and conducted otolith shape and outline analysis. Species identification was further predicted using random forest models (RFM) based on species initial observer identifications with otolith morphometrics. RFM prediction accuracy varied from >95 % for *M. holotrachys* and *M. caml* to 70% and 60% for *M. carinatus* and *M. whitsoni*, respectively. Fourier descriptors proved to be the most important variables in discriminating between species pairs. Additional morphometrics such as otolith width, perimeter, and length were also highlighted as useful.

6.26 The Working Group welcomed the paper and noted that reliable results are highly dependent on the quality and comparability of images of otoliths and encouraged the authors to provide advice to help others with comparable studies. The Working Group discussed standardisation by size and sex, as these may influence the shape of otoliths. The Working Group also noted that the method described in the paper can be applied to historic otoliths collection and may be useful to increase the taxonomic resolution of such records.

By-catch management in krill fisheries

6.27 WG-FSA-2025/03 presented an updated analysis of total by-catch in the krill fishery in Subareas 48.1–48.3 based on data collected by SISO observers. Unlike previous analyses focused on fish taxa, this study included all reported taxa and applied a revised method to upscale observer records (taken from 25 kg subsamples of the catch) using observer-derived estimates of total by-catch, without reliance on crew-reported by-catch data. The results indicated that large by-catch events were spatially localised and sporadic, with those of fish and salps not occurring simultaneously, possibly reflecting limited ecological overlap between the two groups. The Secretariat requested feedback from the Working Group on the updated upscaling method, the subsequent revision of figures in the krill fishery report, and the potential application of model-based workflows (see WG-SAM-2025/21) to estimate extrapolated by-catch.

6.28 The Working Group thanked the Secretariat for the updated analysis on total by-catch in the krill fishery using the proposed haul-level upscaling methodology, which does not use crew-reported by-catch data. It noted that the method provides a sound framework for consistent estimation across vessels and seasons.

6.29 The Working Group noted the importance of improving the species identification of the bycaught fish and recalled WG-FSA-IMAF-2024/13 and paragraph 4.3 of SC-CAMLR-2024, highlighting the need for continued taxonomic validation of observer by-catch records and the inclusion of updated species lists in observer guidance materials to enhance identification accuracy. In considering the broader context of by-catch management, the Working Group also noted that WG-FSA-IMAF-2024/P01 and WG-FSA-IMAF-2024/05, which provided seasonal by-catch patterns and operational factors influencing by-catch variability in the krill fishery.

6.30 The Working Group noted that the continuing progress of this analysis could lead to the provision of information that could be included in future Ecosystem Status Reports. The Working Group further noted that the workflow outlined in WG-SAM-2025/21 would assist in determining appropriate spatial scales for extrapolation.

6.31 The working group endorsed the following recommendations in WG-FSA-2025/03:

(i) To adopt the new upscaling method for by-catch analysis for future analysis.

(ii) To separate into two annual reports of total by-catch report and a fish by-catch report, and updating Figures 6 to 9 of the fishery report using the new method.

(iii) To highlight the usefulness of additional comments and photos in observer cruise reports to help verify large by-catch events and unusual specimens.

6.32 The Working Group tasked the Secretariat with assessing whether the model-based workflow described in WG-SAM-2025/21 could be used to inform further extrapolations of by-catch weights (see also SC-CAMLR-43, paragraph 4.2).

6.33 WG-FSA-2025/06 presented the results of a combined survey on by-catch data collection, marine mammal exclusion devices, and stick water composition circulated to Members participating in the krill fishery (as requested by SC-CAMLR-43; paragraph 4.19). Responses were received from 11 of 12 vessels operating in 2025, covering traditional, continuous, and dual trawl methods. While by-catch data collection and reporting practices were generally consistent across the fleet, the design and construction of marine mammal exclusion devices and the composition and discharge of stick water varied substantially among vessels. The paper noted that vessel crew typically collect by-catch specimens, with officers and observers responsible for identification and reporting, and that more detailed guidance on by-catch data collection would be beneficial. The Secretariat recommended that WG-FSA-2025 consider developing subsampling methodologies to improve by-catch reporting, and that WG-IMAF-2026 review the results on marine mammal exclusion device design and stick water composition.

6.34 The Working Group thanked the Secretariat for presenting the combined survey results and acknowledged the value of the paper in collating information on by-catch data collection, marine mammal exclusion devices, and stick water composition across vessels participating in the krill fishery. The Working Group supported the continued development of subsampling methodologies to improve the estimation of total by-catch and noted that maintaining both observer- and vessel-derived data streams will be important for evaluating and refining subsampling frequencies and ensuring methodological consistency across vessels and fishing configurations.

6.35 The Working Group agreed that clear guidance on vessel subsampling protocols was required to ensure comparability between observer- and vessel-derived datasets, and that this work would strengthen compliance with CM 23-06 requiring vessels to report total by-catch, while also improving the accuracy of estimates of by-catch. Participants noted that operational variability among vessels may limit the feasibility of a single standardised approach and therefore identified the need for a set of core sampling requirements that could be adapted to different fishing configurations.

6.36 The Working Group agreed that, for analytical and reporting purposes, the key distinction for data collection by vessel crew should be between krill and non-krill catch and that a trial implementation could provide useful feedback on sampling practicality and data reporting and allow for improved concordance with observer sampling.

6.37 The Working Group recalled previous analyses (WG-FSA-IMAF-2024/13) indicating limited variability in overall by-catch patterns, but agreed that refinement of subsampling practices and frequencies, together with standardised reporting, would enhance the robustness and comparability of future assessments.

6.38 The Working Group recommended that improvements be made to existing reporting structures and that the revised methodology (Figure 2) could be implemented together with an updated by-catch reporting form (Table 8).

6.39 The Working Group further recommended that:

(i) As a trial, the proposed method would require vessels to continue to separate and report large fish by-catch in the C1 forms, but also take samples of at least 2 kg from the catch from every haul (traditional) or every two hours (continuous) and report the weight of each component of the catch (krill and non-krill, without the need to identify by-catch species)

(ii) An additional worksheet would be added to the revised C1 form, with a proposed target for introduction in 2026/27 season (Table 8).

6.40 WG-FSA-2025/44 presented a review of International Union for Conservation of Nature (IUCN) Red List assessments for the icefish *Chaenocephalus aceratus* and *Pseudochaenichthys georgianus*, which were classified as *Vulnerable* and *Endangered*, respectively in 2023. The authors reported that these designations were based primarily on outdated and inferred data, without consideration of a 36-year time series of scientific trawl survey data showing stable or increasing biomass in the South Georgia region. The paper noted that directed fishing for these species has been prohibited since 1990, with only minor by-catch reported from krill and mackerel icefish fisheries. The authors concluded that the current IUCN listings lacked empirical justification and expert consultation, recommending that both species be reassessed and potentially classified as Least Concern. The authors further noted inconsistencies in the IUCN Red List process and recommended that WG-FSA and the Scientific Committee liaise with IUCN to ensure that future assessments incorporate CCAMLR datasets and expertise.

6.41 The Working Group thanked the authors for the detailed re-evaluation and for presenting the assessment results to WG-FSA-2025. Participants identified the SCARFISH Action Group as one of the potential facilitators to ensure that CCAMLR data and expertise are incorporated into future IUCN assessments. The importance of regional IUCN coordinators, whose role is to identify experts from relevant regions and taxa, was acknowledged.

6.42 The Working Group noted that the upcoming IUCN Southern Ocean fish workshop, to be held from 16 to 20 March 2026 in Puerto Varas, Chile, will provide an important opportunity to strengthen CCAMLR's engagement in these processes. The Working Group further noted that many species in the region are data deficient, as well as the importance of adopting a staged approach to the assessment of Southern Ocean fish species, prioritising those for which data are available, those which have previously been assessed, and those for which there is conservation concern.

VME management and habitats of particular concern

6.43 Although no papers were submitted under this agenda item, participants expressed their appreciation for the updated CCAMLR VME Taxa Classification Guide (2023, version 2).

Scheme of International Scientific Observation

7.1 WG-FSA-2025/02 presented the implementation of the CCAMLR Scheme of International Scientific Observation (SISO) during the 2025 season up to 15 September 2025. Data from 36 longline trips and 11 trawl trips were received, detailing observer deployments across the CAMLR Convention Area. Plans for the 2026 season were outlined, including updates to observer manuals to improve data accuracy for conversion factors used in estimating green weight for stock management in the longline and finfish fishery. Additionally, a new observer worksheet will be introduced to record seabird abundance observations for the finfish and krill trawl fishery by estimating species-specific counts within a 25-m radius before warp strike observations. This worksheet facilitates a quick assessment of seabird numbers before observations and provides the option to record whether the observation was visual or video-based.

7.2 The Working Group noted that the number of observer tasks on krill vessels continues to rise and emphasised the need for balancing the priorities of observer tasks (WG-FSA-2023, paragraphs 3.49 and 3.50). The Working Group further noted that two observers on a vessel may be needed to manage these tasks (WG-FSA-IMAF-2024, paragraph 5.32).

7.3 Many participants noted the value of one of those observers being an international observer.

7.4 The Working Group further noted that no implementation issues regarding observer deployment or treatment were reported.

7.5 The Working Group acknowledged the vital role of observers, emphasising their essential contributions to data collection, including biological data collection and tagging, which support scientific assessments. The Working Group expressed support for appropriately recognising their valuable contributions and recommended maintaining the names of observers on the CCAMLR website, provided that their consent is confirmed for this.

7.6 The Working Group noted that WG-SAM-2025 (paragraphs 3.23 and 3.24) approved an updated Conversion Factor (CF) collection protocol for SISO observers. The analysis (WG-SAM-2025/01) informed the necessary sampling frequency in space and time to ensure accurate CF factor estimates for toothfish fisheries.

7.7 The Working Group recommended that the changes to the CF sampling protocols proceed, noting that the exclusion of batch processing of fish be more explicitly highlighted in the instructions to observers.

7.8 The Working Group considered the recommendations from the CF workshop (WS-CF-2022). It noted that the link between observer-recorded CFs and those used by vessels remains unclear and requires further investigation. The Working Group emphasised the need to understand better how vessels determine and use CF values (which are sometimes constant over several years or more). Furthermore, the Working Group reviewed past and upcoming tasks that WS-CF-2022 considered, and how pending actions could be tackled in the future (Appendix E).

7.9 The Working Group recommended that the Scientific Committee consider requesting Members to provide the methods used by vessels to determine the conversion factors reported in their C2 data.

7.10 Some Members suggested that this could be achieved by including an additional requirement in fisheries operation plans within CM 21-02 paragraph 6(ii), which would specify the conversion factors used and the methods by which they are derived (Appendix F).

7.11 Recalling the importance of CFs for calculating reported catches, the Working Group requested the Secretariat to prepare a comparison between the values used by vessels and those reported by observers. In that context, the Working Group noted that the updated sampling protocol proposed for future seasons would increase the amount of information available for such analyses (WG-SAM-2025, paragraph 3.24).

Future work

8.1 The Working Group considered revisions to its current workplan based on SC-CAMLR-43, Table 10, compiled with the workplans of the other working groups, and recommended the following changes:

(i) In the combined workplan, the priority column should reflect the urgency for the Scientific Committee rather than for individual working groups, and therefore item 1 e (iii) should be 'high'.

(ii) Item 1 g (v) should include Secretariat support.

(iii) Insert a new row under 1 d (i) 'research plan evaluations' titled 'research plan framework review'.

(iv) The Working Group requested that the Scientific Committee consider the need for the progress columns in the workplan, noting that items in progress will have an identified leader, completed items would be marked as 'completed' under the urgency column, and items not yet started would have an 'x' in the relevant working group column.

(v) The Working Group noted that the addition of new workplan topics has led to some duplication of concepts and that the new combined workplan format will allow the conveners to identify this duplication and streamline the workplan.

(vi) Add 'for finfish' to add specificity to the topic of age data listed in item 1 g (i), and (v).

(vii) Change the urgency of Administrative Item A to 'completed', pending discussion by the Scientific Committee.

8.2 The Working Group noted that the Scientific Committee workplan would be reviewed by the Working Group conveners and considered by the Scientific Committee to endorse.

Other business

9.1 Mr Maschette informed the Working Group that Australia would be conducting the annual Random Stratified Trawl Survey at Heard Island and McDonald Islands in CCAMLR Division 58.5.2 in March 2026. Australia also plans to conduct marine science activities as part of a voyage to Heard Island during December 2025 to January 2026. The aims of marine science activities include assessments of benthic habitats and biodiversity, demersal and pelagic fish biodiversity and the importance of inshore settlement for ecologically important fish species, distribution and abundance of main phytoplankton groups, and biodiversity and spatial distribution of species occurrences through eDNA.

9.2 Following requests made by WG-SAM recently (e.g. WG-SAM-2025, paragraph 8.2) but also in the past, as well as in other Working Groups or discussions, the Secretariat notified the Working Group of the creation of a centralised point of access to the range of codes and resources that have accumulated over the years, at: https://ccamlr-science.github.io/Toolbox/. The Secretariat invited those participants that were involved in the production of any of the resources listed on the webpage to request their information be added to list of contributors.

9.3 The Working Group thanked the Secretariat for the useful initiative and effort in assisting Members in managing Antarctic marine living resources by making these tools organised and accessible.

9.4 Dr Earl reported on an ICES Workshop on the Development of Quantitative Assessment Methodologies based on Life-history traits, exploitation characteristics, and other relevant parameters for data-limited stocks (WKLIFE XIV), which met in Horta, Portugal from 1–5 September 2025. The meeting report will be published shortly by ICES, and a journal paper is being developed, characterising data-limited stocks in the Northeast Atlantic. Among other topics, the workshop considered approaches to harvest-rate rules, based on management strategy evaluations, spatial indicators, swept area biomass and length/life-stage-based methods. Within the meeting, WKLIFE XIV hosted a half-day session on a collaborative ICES-FAO deep-sea fisheries (DSF) project. Several case study stocks were introduced within this framework, providing a platform for shared learning and dialogue. Among these case studies was the toothfish trend analysis rules applied to research blocks. A goal of the project is the development of an open-access GitHub repository to host data-limited methods, along with guidance on their use. Experts from inside and outside the ICES community are invited to contribute to future meetings of WKLIFE, and should contact the chairs to register interest (https://www.ices.dk/community/groups/Pages/WKLIFEXIV.aspx).

Advice to the Scientific Committee

10.1 The Working Group's advice to the Scientific Committee is summarised below using the agenda structure of the 2025 Scientific Committee meeting. These advice paragraphs should be considered along with the body of the report leading to the advice. Non-advice paragraphs which the Working Group wished to highlight to the Scientific Committee are indicated in italics.

- (i) Harvested species – General
  - (a) C and CE forms and fishing even classification (paragraph 2.12)
  - (b) New C1 and C6 forms (paragraph 2.15)
  - (c) Toothfish conversion factor sampling (paragraphs 7.7, 7.9 and 7.10)
  - (d) Warp strike monitoring forms (paragraph 6.8)
  - (e) Krill fishery by-catch sampling (paragraphs 6.38 and 6.39)
  - (f) Krill fishery observer (paragraphs 7.2, *7.3* and 7.5)
- (ii) Krill in Statistical Area 48
  - (a) Krill catch in Subarea 48.1 (paragraph 2.5)
  - (b) Krill fishery notifications increase (paragraph 2.8)
  - (c) By-catch in the krill fishery (paragraph 6.31)
- (iii) Krill in Statistical Area 58
  - (a) Krill assessment in Divisions 58.4.1 and 58.4.2 (paragraph 5.5)
- (iv) Harvested species – Finfish General issues
  - (a) Submission of age data (paragraph *4.7*)
  - (b) Tagging training video (paragraph 4.14)
  - (c) Tagging performance (paragraph 4.19)

(d) Management strategy evaluations (paragraphs 4.72, 4.74, 4.86 and *4.70* to *4.76*)

(e) Stock assessment development in research plans (paragraphs 4.93, 4.176 and 4.177)

(f) Research plan reviews (paragraphs 4.185 and 4.186)

(v) Statistical Area 48 – Icefish

(a) Acoustic survey research proposal review (paragraphs 3.2 and 3.4)

(b) Catch limit advice for 48.3 *C. gunnari* (paragraph 3.11)

(vi) Statistical Area 48 - Toothfish

(a) Catch limit advice for *D. mawsoni* in Subarea 48.4 (paragraph 4.34)

(b) Catch limit advice for *D. eleginoides* in Subarea 48.4 (paragraph 4.37)

(c) Research plan for *D. mawsoni* in Subarea 48.6 (paragraphs 4.109 and 4.110)

(d) Research plans for *Dissostichus* spp.in Subarea 48.2 (paragraphs 4.133, 4.137 and 4.138)

(e) Research plans for *D. eleginoides* in Subarea 48.3 (paragraph 4.148)

(vii) Statistical Area 58 – Icefish

(a) Catch limit advice for 58.5.2 *C. gunnari* (paragraph 3.15)

(b) Catch limit advice for Division 58.5.2 outside of national jurisdiction (paragraph 4.49)

(viii) Statistical Area 58 – Toothfish

(a) Research plan in 58.4.1 and 58.4.2 (paragraphs *4.115, 4.119, 4.120*, 4.124 and 4.125)

(ix) Statistical Area 88 – Toothfish

(a) Early arrival of vessels to the RSR (paragraphs *2.3*, 4.60 and 4.61)

(b) RSR Catch overruns (paragraph 2.7)

(c) Catch limit advice for the Ross Sea Shelf Survey (paragraph 4.155)

(d) Research plan for *D. mawsoni* in Subarea 88.3 (paragraphs 4.166, 4.168 and 4.169)

(x) Climate change

(a) Toothfish recruitment success (paragraphs *4.4* and *4.106*).

(b) Monitoring age at maturity (paragraph *4.9*)

(c) Changes in parasite infection dynamics (paragraph *4.23*)

(d) Influence of sea ice on fishing operations (paragraphs *4.27, 4.87* and *4.88*)

(e) Parameters to test during MSE (paragraph *4.81*)

(f) Influence of sea ice dynamics and oceanography on larval transport (paragraph *4.99*)

(g) Collection of environmental data by fishing vessels (paragraphs *4.101* and *4.102*)

(h) Monitoring for species presence in changing environments (paragraph *6.13*)

(i) Climate influences on eddy advection (paragraph *6.15*)

(j) SCARFISH work to understand Antarctic fish ecology (paragraph *6.17*).

(xi) Scientific Committee strategic plan and working group priorities (paragraph 8.1)

Discussion links to the effects of climate change

10.2 The Working Group noted that managing the effects of climate change is an integral part of the discussions of WG-FSA under all agenda items and that for full context of the discussions, the reader is referred to the paragraphs in the report. The Working Group further noted that although these paragraphs are not necessarily direct advice to the Scientific Committee, they provide a meeting-level summary of commentary by the Working Group about how climate change is impacting the work of CCAMLR and how it is considered in developing advice to the Scientific Committee.

Adoption of the report and close of meeting

11.1 The report of the meeting was adopted requiring 4.6 h of discussion.

11.2 The Working Group noted many of its participants have English as a second language and encouraged anglophones to speak slowly and clearly so that all can fully understand and participate in the discussions.

11.3 The Working Group applauded the convener for finishing the meeting in record time, with both a shorter meeting and a speedy adoption finishing on Thursday.

11.4 At the close of the meeting, Mr Somhlaba thanked the participants for the high-quality papers, the rapporteurs for developing the report, the subgroup leaders for their quick and integrative summaries back to the meeting, and the Secretariat for their support before, during, and after the meeting itself. He noted that he had been convening the meeting since Covid started, and that this would be his last meeting as convener of WG-FSA but had complete confidence in the upcoming convener.

11.5 The Chair of the Scientific Committee, Dr Cárdenas, thanked Mr Somhlaba for his hard work running long meetings and noted his success had set a very high bar for the next convener, and was happy that Dr Okuda had volunteered to take on the role if approved by the Scientific Committee.

11.6 Dr Collins also thanked the convener for his skill in guiding the meeting with good humour in navigating some difficult decisions, always in a helpful way.

11.7 Dr A. Makhado (South Africa) thanked the convener for his efficiency in leading the Working Group and looked forward to hosting the intersessional working groups next year.

11.8 Dr Zhu congratulated Mr Somhlaba for serving as convener for 5 years as a wonderful leader. He also thanked the Secretariat for their efficient support of the working groups.

References

Abe, K., R. Matsukura, N. Yamamoto, K. Amakasu, R. Nagata and H. Murase. 2023. Biomass of Antarctic krill (*Euphausia superba*) in the eastern Indian sector of the Southern Ocean (80–150°E) in the 2018–19 austral summer. *Prog. Oceanogr.*, 218: 103107. doi: https://doi.org/10.1016/j.pocean.2023.103107.

Brigden, K. 2019. The reproductive ecology of Patagonian toothfish, *Dissostichus eleginoides*, around the sub-Antarctic island of South Georgia: spatial and temporal patterns and processes spanning two decades of data. Doctor of Science thesis, School of Biological Sciences, University of Aberdeen, UK.

Brownie, C., D.R. Anderson, K.P. Burnham and D.S. Robson. 1985. Statistical inference from band recovery data. *U.S. Fish & Wildlife Service Resource Publication*, 156. 320 p.

Soeffker, M., P.R. Hollyman, M.A. Collins, O.T. Hogg, A. Riley, V. Laptikhovsky, T. Earl, J. Roberts, E. MacLeod, M. Belchier and C. Darby. 2022. Contrasting life-history traits of two toothfish (*Dissostichus* spp.) species at their range edge around the South Sandwich Islands. *Deep-Sea Res. Part II: Top. Stud. Oceanogr.*, 201: 105098. doi: https://doi.org/10.1016/j.dsr2.2022.105098.

St John Glew, K., B. Espinasse, B.P.V. Hunt, E.A. Pakhomov, S.J. Bury, M. Pinkerton et al. 2021. Isoscape models of the Southern Ocean: Predicting spatial and temporal variability in carbon and nitrogen isotope compositions of particulate organic matter. *Global Biogeochemical Cycles*, 35, e2020GB006901. doi: https://doi.org/10.1029/2020GB006901.

Table 1: Research Blocks biomass estimates (B, tonnes) and catch limits (CL, tonnes) determined using the trend analysis (WG-FSA-2025/01). Greyed cells indicate research blocks that may require catch advice for the upcoming season. PCL: previous catch limit; ISU: increasing, stable or unclear; D: declining; Y: yes; N: no; -: no fishing in the last Season; x: no fishing in the last 5 Seasons. []: insufficient data. Recommended catch limits are subject to approval by the Commission.

Area	Subarea Division	Research Block	Species	PCL	Trend decision	Adequate recaptures	CPUE Trend Decline	B	B×0.04	PCL×0.8	PCL×1.2	Recommended CL for 2026
48	48.1	481_1	*D. mawsoni*	43	x	x	x	x	x	x	x	x
		481_2	*D. mawsoni*	43	-	-	-	-	-	-	-	43
		481_3	*D. mawsoni*	0	x	x	x	x	x	x	x	x
	48.2	482_N	*D. mawsoni*	75	x	x	x	x	x	x	x	x
		482_S	*D. mawsoni*	75	x	x	x	x	x	x	x	x
	48.3	483A	*D. mawsoni*	0	x	x	x	x	x	x	x	x
	48.6	486_2	*D. mawsoni*	152	ISU	Y	Y	5815	233	122	182	182
		486_3	*D. mawsoni*	50	ISU	N	N	2796	112	40	60	60
		486_4	*D. mawsoni*	151	ISU	Y	N	38355	1534	121	181	181
		486_5	*D. mawsoni*	242	ISU	Y	Y	84985	3399	194	290	290
58	58.4.1	5841_1	*D. mawsoni*	112	x	x	x	x	x	x	x	x
		5841_2	*D. mawsoni*	80	x	x	x	x	x	x	x	x
		5841_3	*D. mawsoni*	79	x	x	x	x	x	x	x	x
		5841_4	*D. mawsoni*	46	x	x	x	x	x	x	x	x
		5841_5	*D. mawsoni*	116	x	x	x	x	x	x	x	x
		5841_6	*D. mawsoni*	50	x	x	x	x	x	x	x	x
	58.4.2	5842_1	*D. mawsoni*	124	ISU	Y	N	8464	339	99	149	149
		5842_2	*D. mawsoni*	165	ISU	N	Y	10001	400	132	198	132
	58.4.3	5843a_1	*D. eleginoides*	0	x	x	x	x	x	x	x	x
	58.4.4	5844b_1	*D. eleginoides*	18	x	x	x	x	x	x	x	x
		5844b_2	*D. eleginoides*	14	x	x	x	x	x	x	x	x
88	88.2	882_1	*D. mawsoni*	184	-	-	-	-	-	-	-	184
		882_2	*D. mawsoni*	378	ISU	Y	Y	16603	664	302	454	454
		882_3	*D. mawsoni*	390	ISU	N	N	13657	546	312	468	468
		882_4	*D. mawsoni*	266	ISU	Y	N	16156	646	213	319	319

Area	Subarea Division	Research Block	Species	PCL	Trend decision	Adequate recaptures	CPUE Trend Decline	B	B×0.04	PCL×0.8	PCL×1.2	Recommended CL for 2026
		882H	*D. mawsoni*	166	ISU	Y	N	6732	269	133	199	199
	88.3	883_1	*D. mawsoni*	10	ISU	N	N	3939	158	8	12	12
		883_2	*D. mawsoni*	20	x	x	x	x	x	x	x	x
		883_3	*D. mawsoni*	30	ISU	N	Y	7624	305	24	36	24
		883_4	*D. mawsoni*	30	D	N	Y	2989	120	24	36	24
		883_5	*D. mawsoni*	8	-	-	-	-	-	-	-	8
		883_6	*D. mawsoni*	52	-	-	-	-	-	-	-	52
		883_7	*D. mawsoni*	43	-	-	-	-	-	-	-	43
		883_8	*D. mawsoni*	10	x	x	x	x	x	x	x	x
		883_9	*D. mawsoni*	10	x	x	x	x	x	x	x	x
		883_10	*D. mawsoni*	10	x	x	x	x	x	x	x	x
		883_11	*D. mawsoni*	23	[]	N	[]	2512	100	18	28	100
		883_12	*D. mawsoni*	23	[]	N	[]	4211	168	18	28	168

Table 2: Advised catch limits for Antarctic toothfish in Subarea 48.4.

Season	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
Advice (tonnes)	45	45	50	42	43	37	32

Table 3: Secretariat verification of integrated stock assessments in Casal2 submitted to WG-FSA-2025. P(B<20%B_0) and P(B<50%B_0) are the probabilities (P) that the spawning biomass (B) falls below set proportions of the pre-exploitation level (B_0), as specified in the CCAMLR toothfish decision rules 1 and 2 respectively.

Assessment/Model Run	Variable	Reported value	Secretariat value	WG-FSA-2025 paper No
Subarea 48.4 TOP	B_0	1 064	1 064	12
Run21	Objective function	2 231	2 231	
	P(B<20%B_0)	0.014	0.014	
	P(B<50%B_0)	0.472	0.472	

Table 4: Review of research plans for exploratory fisheries under CM 21-02 and scientific research under CM 24-01.

Subarea/division:	48.3A	58.4.1	88.1	88.3
Proposal:	WG-FSA-2025/47	‘WG-SAM-2025/03 ** The research activity at Division 58.4.2 has been conducted in 2022/23–2024/25 fishing season. This is the last year of an ongoing four-year plan with no significant change proposed for Division 58.4.2’	WG-SAM-2022/01 Rev. 1 WG-FSA-2022/41 Rev. 1 WG-FSA-2025/43 (See also WG-SAM-17/39, WG-SAM-15/44, WG-SAM-13/33, WG-SAM-12/28, and WG-SAM-11/16)	WG-SAM-2025/13 WG-FSA-2025/49
Members:	CHL	AUS, FRA, JPN, KOR, ESP	NZL	KOR, UKR
Conservation measure under which the proposal is submitted:	CM 24-01	CM 21-02	CM 24-01	CM 24-01
Time period:	2025/26–2027/28	2022/23–2025/26	2025/26–2027/28	2024/25–2026/27
Main species of interest:	*Dissostichus spp.*	*Dissostichus mawsoni*	*Dissostichus mawsoni*	*Dissostichus mawsoni*
Main purpose of the research (e.g. abundance, population structure, movement)	Abundance, population structure, movement, and by-catch [1]	Abundance	Population structure and distribution, monitoring of recruitment	Abundance, stock structure, connectivity
Is the purpose of the research linked to Commission or Scientific Committee priorities?	Y[1]	Y: Section 1a	Y: Sections 2.1–2.3 The research is designed to be used in the RSR assessment and research links directly to 17 or 22 topics under the RSrMPA research and monitoring plan	Y: 1. Objective of the research plan (a).
1. Quality of the proposal				
1.1 Is there enough information to evaluate the likelihood of success of the research objectives?	Y: the proposed catch limit of 41.5 tonnes per season aligns with the research objectives. Based on historical CPUE data from Subarea 48.2 and bootstrap analysis, it supports 50 sampling	Y: Sections 3a, 3b and 3c	Y: Sections 3, 6 Proponents have successfully implemented the survey and data collection for most years of the series	Y: Section 1 (b). A detailed description is provided on how the research will meet each objective. The proponents have successfully implemented the survey and data collection

	stations across three depth strata (600–2000 m) to achieve a 12% CV for toothfish abundance. The two-stage cluster sampling for population structure and tagging, with clear sample sizes and statistical methods, supports feasibility[1]			during the previous survey conducted in this area
2. Research design				
2.1 Is the proposed catch limit in accordance with research objectives?	Y: the proposed catch limit of 41.5 tonnes per season aligns with research objectives. It supports 50 sampling stations across three depth strata (600–2000 m) to achieve a 12% CV for toothfish abundance, based on historical CPUE data, ensuring robust estimates of abundance, population structure, and movement while minimising depletion risks [1]	Y: Sections 4a and 4b	Y: Section 4 The survey is effort-limited and catch limits for the recent research plans were based on the 95th percentile of catch from the full time series for the core strata, plus catch based on the 90th percentile for the special strata, and should not restrict the survey data collection	Y: Sections 3, 4. The CLs (Catch Limit) for the Research Blocks are calculated using the Trend Analysis, except for Block 2 where the survey is effort limited, and the CL is based on 75th percentile of catch time series in the area. Although this approach yielded a relatively high CL, it was decided to adopt a more precautionary approach, and the CL was conservatively set at 20 tonnes, the same as last year
2.2 Is the sampling design appropriate to achieve research objectives?	Y: the stratified random sampling and the two-stage cluster sampling design are appropriate for estimating parameters of interest (abundance, size structure, age structure, among the main ones). The survey targets 10 fish per 1 000 hooks (25 per set), exceeding CCAMLR's guideline of 7 fish per 1 000 hooks, enhancing statistical robustness for abundance and population structure assessments while	Y: Section 3b e.g. WG-SAM-2019, paragraphs 6.6 and 6.7, 6.11 to 6.13 and Table 1.	Y: Sections 4.1, 5 Stratified random design, power analysis to determine number of stations needed for CV 10% in the core area; data collection for all organisms. Standardised gear through the entire series	Y: Section 3 A description on the use of each Research Block and survey design is provided.

	remaining conservative to minimise depletion[1]			
2.3 Have the environmental conditions been thoroughly accounted for?	Y: the proposal accounts for environmental conditions in Subarea 48.3A	Y: Appendix 2, Section b	Y: Section 4.3 The survey is scheduled to occur before the austral autumn freeze-up	Y: Section 3. Sea-ice analysis suggests reasonably good accessibility across the survey area.
3. Research capacity				
3.1 Have the research platforms demonstrated experience in:				
3.1.1 Conducting research/exploratory fishing following a research plan?	Y: the research platforms have proven experience. IFOP, the coordinating institution, has conducted compliant fisheries research, including surveys and by-catch studies. FV *Globalpesca I* has experience in sustainable toothfish fisheries using trotline gear, aligning with the proposed research plan's method.	Y	Y: WG-SAM-11/16, WG-FSA-12/41, WG-SAM-13/32, WG-SAM-14/25, WG-FSA-14/51, WG-SAM-15/44, WG-SAM-16/14, WG-SAM-17/39, WG-FSA-17/57, WG-SAM-17/01, WG-SAM-18/10, WG-FSA-17/41, WG-SAM-2019/03, SC-CAMLR-39/BG/28, WG-FSA-2021/23, WG-FSA-2022/40, WG-FSA-2023/09, WG-FSA-IMAF-2024/65, WG-FSA-IMAF-2024/72, this proposal – WG-SAM-2025/08 The research platform has successfully carried out this research annually since 2012.	Y: WG-SAM-15/09, WG-SAM-16/11, WG-SAM-17/43, WG-SAM-18/05, WG-SAM-2019/02, WG-SAM-2021/01, WG-SAM-2022/05, WG-SAM-2023/04, WG-SAM-2024/03, WG-FSA-15/56, WG-FSA-17/40, WG-FSA-18/42, SC-CAMLR-39/BG/06, WG-FSA-2021/34, WG-FSA-2022/26, WG-FSA-2023/20 Rev. 1, WG-FSA-IMAF-2024/52 Rev. 1, WG-FSA-2025/49

3.1.2 Collecting scientific data?	Y: the research platforms have experience in collecting scientific data. The Instituto de Fomento Pesquero (IFOP) has conducted fisheries research, including surveys. FV *Globalpesca* has collected catch and effort data in sustainable toothfish fisheries.	Y: Section 5	Y: Section 4.7, Appendix D Wide range of biological, acoustic, and environmental data collected over survey time series	Y: Section 3 Data will be collected consistent with CM 41-01, Annex A, and observer sampling requirements are proposed in Table 3
3.2 Do the research platforms have acceptable tag detection and survival rates?	Y: tag detection and survival rates for proposed vessels are indicated in Table 5	Y: tag detection and survival rates for proposed vessels are indicated in Table 5 (paragraph 4.180)	Y: tag detection and survival rates for proposed vessels are indicated in Table 5	Y: tag detection and survival rates for proposed vessels are indicated in Table 5
3.3 Have the research teams sufficient resources and capacity for:				
3.3.1 Sample processing?	Instituto de Fomento Pesquero (IFOP) has extensive experience in fisheries research, including processing biological samples (e.g. length, age, maturity, and ageing otoliths) from longline surveys, specifically toothfish studies	Y: Section 3b	Y: Section 3.2 Data collected on the survey were part of regular reviews WG-SAM-2022/13 and WG-SAM-2025/09 and are reported upon annually. Age compositions from the survey are included within the biennial Ross Sea toothfish assessment	Y: Section 3 The two vessels have several years of research experience in the Convention Area
3.3.2 Data analyses?	Y: the Fisheries Development Institute (www.ifop.cl), with 61 years of experience conducting fisheries research and surveys in Chile has specialised teams for processing and analysing data. In particular, we have a team focused on demersal stocks, including the Patagonian toothfish. This multidisciplinary	Y: Table 5	Y: Sections 4; WG-SAM-11/16, WG-FSA-12/41, WG-SAM-13/32, WG-SAM-14/25, WG-FSA-14/51, WG-SAM-15/44, WG-SAM-16/14, WG-SAM-17/39, WG-FSA-17/57, WG-SAM-17/01, WG-SAM-18/10, WG-FSA-17/41, WG-SAM-2019/03, SC-CAMLR-39/BG/28, WG-SAM-	Y: Section 3. Survey design, data collection and analysis

	team has data processing, analyses protocols and statistical estimators of biological, population, and ecological parameters for demersal species, including Patagonian toothfish.		2021/23, WG-FSA-2022/40, WG-FSA-2023/09, WG-FSA-IMAF-2024/65, WG-FSA-IMAF-2024/72 Data analyses have been carried out annually, and the results implemented into the stock assessments and other research. Abundance and age compositions from the survey are included within the biennial Ross Sea toothfish assessment.	
4. Data analyses to address the research questions				
4.1 Are the proposed methods appropriate?	Y: the proposed methods are appropriate. The stratified random sampling targets a 12% CV for toothfish abundance using historical CPUE and CCAMLRGIS. Two-stage cluster sampling (10 fish per 1 000 hooks or 25 per line) aligns with CCAMLR guidelines. Standardised gear ensures comparability, and seabird/mammal observations follow protocols. A model-based framework addresses non-random sampling, ensuring robust inferences	Y: Section 3c	Y: Sections 2, 4 Random stratified survey with standardised gear maintained constant over the entire series since 2012	Y: Sections 3c–g
5. Impact on ecosystem and harvest species				

5.1 Is the catch limit proposed consistent with Article II of the Convention?	Y: the proposed catch limit of 41.5 tonnes is consistent with CCAMLR's Article II and supports 50 sampling stations to achieve a 12% coefficient of variation (CV) for toothfish abundance, while minimising depletion risks through stratified random sampling. By-catch estimates (1.5 tonnes total) remain well below CM 33-03 limits, and historical data for Subarea 48.3 indicate low VME (Vulnerable Marine Ecosystem) encounters[1]	Y: Sections 4a and 4b	Y: Sections 4.1, 4.2 Catch will be allocated from within the Subarea 88.1 catch limit.	Y: the proposed CLs are obtained based on the standard approach used in CCAMLR (WG-SAM-13/37, WG-SAM-16/18 Rev. 1)
5.2 Are the impacts on dependent and related species accounted for and consistent with Article II of the Convention?	Y: by-catch estimates (1.5 tonnes total) are below CM 33-03 limits, with historical data showing low VME encounters. Reported catches in Subarea 48.3 over the past four years are approximately 82 tonnes for *Macrourus* spp. and ~2.3 tonnes for skates and rays (CCAMLR Secretariat, 2024). Seabird and marine mammal monitoring, following CCAMLR protocols, assesses ecosystem impacts, ensuring sustainable management [1]	Y: Figure 1, section 4c	Y: Sections 4.2, 4.3 Appendix C, SC-CAMLR-39/BG/03, SC-CAMLR-39/BG/28	Y: the CLs for key by-catch species are proposed based on CM 33-03. The survey will comply with CM 25-02 for the minimisation of seabird by-catch and CM 22-06 for VMEs.
6. Progress towards objectives for ongoing proposals				
6.1 Have the past and current milestones been completed?	NA	Y: Table 5, section 1c	Y: WG-SAM-11/16, WG-FSA-12/41, WG-SAM-13/32, WG-SAM-14/25, WG-FSA-14/51, WG-SAM-15/44, WG-SAM-16/14, WG-SAM-17/39, WG-FSA-17/57,	Y: WG-SAM-15/09, WG-SAM-16/11, WG-SAM-17/43, WG-SAM-18/05, WG-SAM-2019/02, WG-SAM-2021/01, WG-SAM-2022/05, WG-SAM-2023/04, WG-SAM-2024/03, WG-FSA-

			WG-SAM-17/01, WG-SAM-18/10, WG-FSA-17/41, WG-SAM-2019/03, SC-CAMLR-39/BG/28, WG-FSA-2021/23, WG-SAM-2022/13, WG-FSA-2022/40, WG-FSA-2023/09, WG-FSA-IMAF-2024/65, WG-FSA-IMAF-2024/72	15/56, WG-FSA-17/40, WG-FSA-18/42, SC-CAMLR-39/BG/06, WG-FSA-2021/34, WG-FSA-2022/26, WG-FSA-2023/20 Rev. 1, WG-FSA-IMAF-2024/52 Rev. 1, WG-FSA-2025/49.
6.2 Has previous advice from the Scientific Committee and its working groups been addressed?	Y: the revised proposal incorporates all revisions recommended by WG-SAM (2005), ensuring alignment with the feedback provided during that review.	Y: WG-FSA-2019, paragraph 4.91	Y: see WG-FSA-2025/43 and WG-FSA-2025/46 updates of WG-SAM-2025/08 and WG-SAM-2025/09 where all the questions from WG-SAM-2025 were addressed	Y: the survey has been endorsed by SC-CAMLR-43 (paragraph 3.108). Proponents addressed the advice provided by WG-SAM-2025, which includes activities to improve the ageing work (WG-FSA-IMAF-2024/62 Rev. 1) and a map to compare proposed stations along actual fishing location. Survey needs to continue to improve low number of tag recaptures in the area.
6.3 Are all the objectives likely to be completed by the end of the research plan?	Y: the objectives are expected to be completed by 2027/28. The timeline (2025/26–2027/28) includes fieldwork, data processing, and reporting to WG-SAM, WG-FSA, and SC-CAMLR.	Completion of research objectives is conditional on the continuation of the exploratory fishing activities in Division 58.4.1.	Y: only one survey out of 14 was not completed due to weather and contingency protocols have since been implemented.	Y: all objectives are likely to be achieved, and workshops such as CAP-DLISA could greatly assist in advancing the stock-assessment objective.
6.4 Are there any other concerns?	Y: there are concerns about rationale of research objectives and proposed catch limit. There is toothfish stock and by-catch assessment in this subarea.	Y: despite extensive discussions between the proponents of this research plan and Russia since 2018, the different parties were not able to agree on a sampling design in Division 58.4.1 exploratory fishery.	N	N

[1] This item has not been reviewed due to concerns about rationale of research objectives and proposed catch limit. The provided answer is from the self-assessment provided by the proponents.

Table 5: Summary review schedule of proposed and ongoing research proposals under CM 21-02 and CM 24-01 as of 15 June 2025. New proposals submitted either under CM 21-02 or CM 24-01, paragraph 3 should be submitted by 1 June and reviewed by WG-SAM and WG-FSA. Ongoing proposals need to be notified each year by 1 June with proposals under CM 24-01 to be reviewed by WG-FSA annually and proposals under CM 21-02 to be reviewed by WG-FSA every other year. AUS – Australia, CHL – Chile, ESP – Spain, FRA – France, JPN – Japan, KOR – Republic of Korea, NZL – New Zealand, UKR – Ukraine, ZAF – South Africa.

CM	Research notification	Title of notification	Member	Area	Fishing seasons	Years since approval (approved year)	Meeting year		
							2025	2026	2027
21-02	WG-SAM-2025/03	Continuing research in the *Dissostichus mawsoni* exploratory fishery in East Antarctica (Divisions 58.4.1 and 58.4.2) from 2022/23 to 2025/26; Research plan under CM 21-02, paragraph 6(iii)	AUS, FRA, JPN, KOR, ESP	58.4.1	2022/23–2025/26	new	SAM[1]		
21-02	WG-SAM-2025/03	Continuing research in the *Dissostichus mawsoni* exploratory fishery in East Antarctica (Divisions 58.4.1 and 58.4.2) from 2022/23 to 2025/26; Research plan under CM 21-02, paragraph 6(iii)	AUS, FRA, JPN, KOR, ESP	58.4.2	2022/23–2025/26	3 (WG-SAM-2022/04[2])	-		
21-02	WG-FSA-IMAF-2024/23	Revised new research plan for Antarctic toothfish (*Dissostichus mawsoni*) exploratory fishery in Statistical Subarea 48.6 from 2024/25-2027/28): Research Plan under CM 21-02, paragraph 6(iii)	JPN, KOR, ZAF, ESP	48.6	2024/25–2027/28	1 (WG-FSA-IMAF-2024/23)	-	FSA	
24-01	WG-FSA-2025/43	Proposal to continue the time series of research surveys to monitor abundance of Antarctic toothfish (*Dissostichus mawsoni*) in the southern Ross Sea, 2025/26-2027/28: Research Plan under CM 24-01	NZL	88.1	2025/26–2027/28	New	SAM FSA	FSA	FSA
24-01	WG-FSA-2025/49	Continuing research plan for Antarctic toothfish (*Dissostichus mawsoni*) under CM 24-01, paragraph 3 in Subarea 88.3 by Korea and Ukraine from 2024/25 to 2026/27	KOR, UKR	88.3	2024/25–2026/27	1 (WG-FSA-IMAF-2024/52)	FSA	FSA	
24-01	WG-SAM-2025/15 / WG-ASAM-2025/11	Fishery research proposal – The acoustic-trawl survey *Champsocephalus gunnari* in the Statistical Subarea 48.2	UKR	48.2	2025/26–2027/28	New	SAM Withdrawn (paragraph4. 171)		
24-01	WG-FSA-2025/40	New Fishery Research Proposal Plan Under CM 24-01 Paragraph 3 to Conduct the Survey *Dissostichus spp*. in the Statistical Subarea 48.2 during seasons 2025/2026, 2026/2027, 2027/2028	UKR	48.2	2025/26–2027/28	New	SAM FSA	FSA	FSA

CM	Research notification	Title of notification	Member	Area	Fishing seasons	Years since approval (approved year)	Meeting year		
							2025	2026	2027
24-01	WG-FSA-2025/48	Revised new Research Plan for Toothfish (*Dissostichus spp*.) under CM 24-01, paragraph 3 in Subarea 48.2, conducted by Chile from season 2025/26 to 2027/28	CHL	48.2	2025/26–2027/28	New	SAM FSA	FSA	FSA
24-01	WG-FSA-2025/47	Revised new Research Plan for Patagonian Toothfish (*Dissostichus eleginoides*) under CM 24-01, paragraph 3 in Subarea 48.3A, conducted by Chile from season 2025/26 to 2027/28	CHL	48.3	2025/26–2027/28	New	SAM FSA	FSA	FSA

1: Review for research plan at Division 58.4.1.
2: The proposal was approved for only Division 58.4.2.

Table 6: Proposed update to review table for new research plans for exploratory fisheries under CM 21-02 and scientific research notified under CM 24-01.

Subarea/division:
Proposal:
Members:
Conservation measure under which the proposal is submitted:
Time period:
Main species of interest:
Main purpose of the research (e.g. abundance, population structure, movement):
Last year where fishing/research fishing occurred:
Is this proposal a continuation of previous proposals?
1. Quality of the proposal
If the proposal is the continuation of a previous proposal, have the past milestones been completed?
Has previous advice from the Scientific Committee and its working groups been addressed?
Is there enough information to evaluate the likelihood of success of the research objectives?
Are all the objectives likely to be completed by the end of the research plan?
2. Research design & data collection
2.1 Is the proposed catch limit in accordance with research objectives?
2.2 Is the sampling design appropriate to achieve research objectives?
2.3 Is the data collection plan suitable to meet research objectives? (i.e. power analysis)
2.3 Have the environmental conditions been thoroughly accounted for?
3. Research capacity
3.1 Have the research platforms demonstrated experience in:
3.1.1 Conducting research/exploratory fishing following a research plan?
3.1.2 Collecting scientific data?
3.2 Do the research platforms have acceptable tag overlap statistic, tag detection and survival rates?
3.3 Have the research teams sufficient resources and capacity for:
3.3.1 Sample processing?
3.3.2 Data analyses?
3.3.3 Are members part of multiple research plans? If yes, do they have sufficient capacity across all proposals?
4. Data analyses to address the research questions
4.1 Are the proposed methods appropriate?
5. Impact on ecosystem and harvest species
5.1 Is the catch limit proposed consistent with Article II of the Convention?
5.2 Are the impacts on dependent and related species accounted for and consistent with Article II of the Convention?
6. Others
6.1 Are there any other concerns?
6.2 If research proposal is notified under CM 24-01, which CM exemptions are requested?

Table 7: Vessels notified for research plans in 2025/26, and the results of modelled relative tag survival and tag detection rates for fishing in the Ross Sea Region, and Research Plan area for which the vessel is notified. AUS – Australia, CHL – Chile, ESP – Spain, FRA – France, JPN – Japan, KOR – Republic of Korea, NZL – New Zealand, UKR – Ukraine. NA – insufficient data is available to estimate the performance of this vessel.

Member	Vessel	Survival	Detection	48.2	48.3a	48.6	58.4.1	58.4.2	88.1	88.3
AUS	*Antarctic Discovery*	0.78	1				x	x		
AUS	*Antarctic Aurora*	NA	NA				x	x		
CHL	*Globalpesca I*	1	1	x	x					
ESP	*Tronio*	1	0.86			x	x			
FRA	*Sainte Rose*	1	0.56				x	x		
JPN	*Shinsei Maru No. 8*	0.98	0.34			x				
KOR	*Kingstar*	1	0.94							x
KOR	*Southern Ocean*	0.4	0.42				x			
NZL	*Janas*	0.98	1						x	
NZL	*San Aotea II*	1	1						x	
NZL	*San Aspiring*	1	1						x	
UKR	*Marigolds*	0.87	0.99							x
UKR	*Calipso*	0.81	0.88	x						

Table 8: Data sheet addition to facilitate the proposed by-catch trial sub-sampling methodology in the 2026/27 season

Haul Number	Weight of krill (gm)	Weight of by-catch (gm)

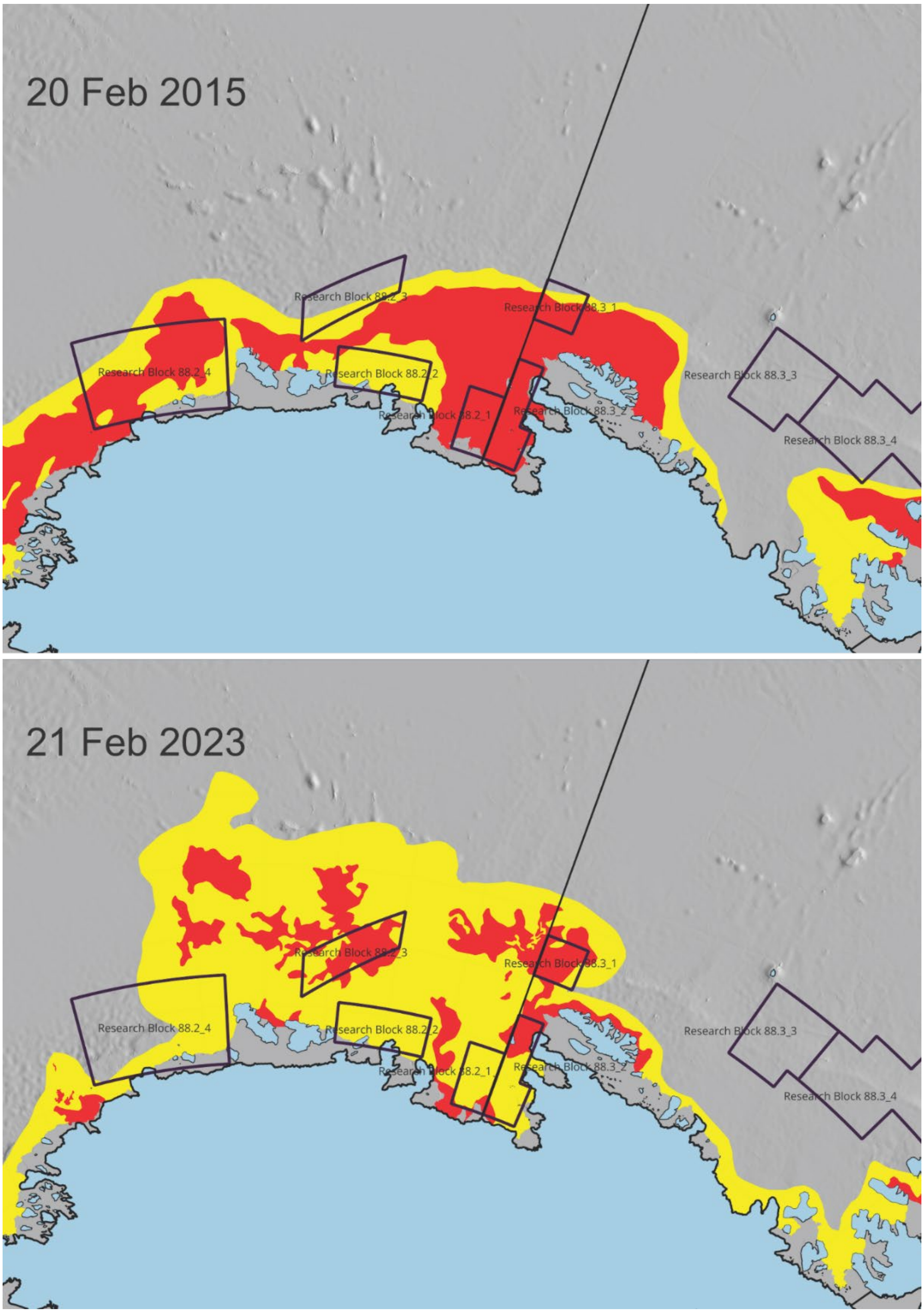

Figure 1: Worst-case (2015) and best-case (2023) records of Antarctic Sea Ice annual minimum since 2015 near the Subareas 88.2 and 88.3 boundary. Yellow indicates 1 to 8 tenths sea ice cover and red 8 to 10 tenths of sea ice cover. Black polygons indicate current research blocks.

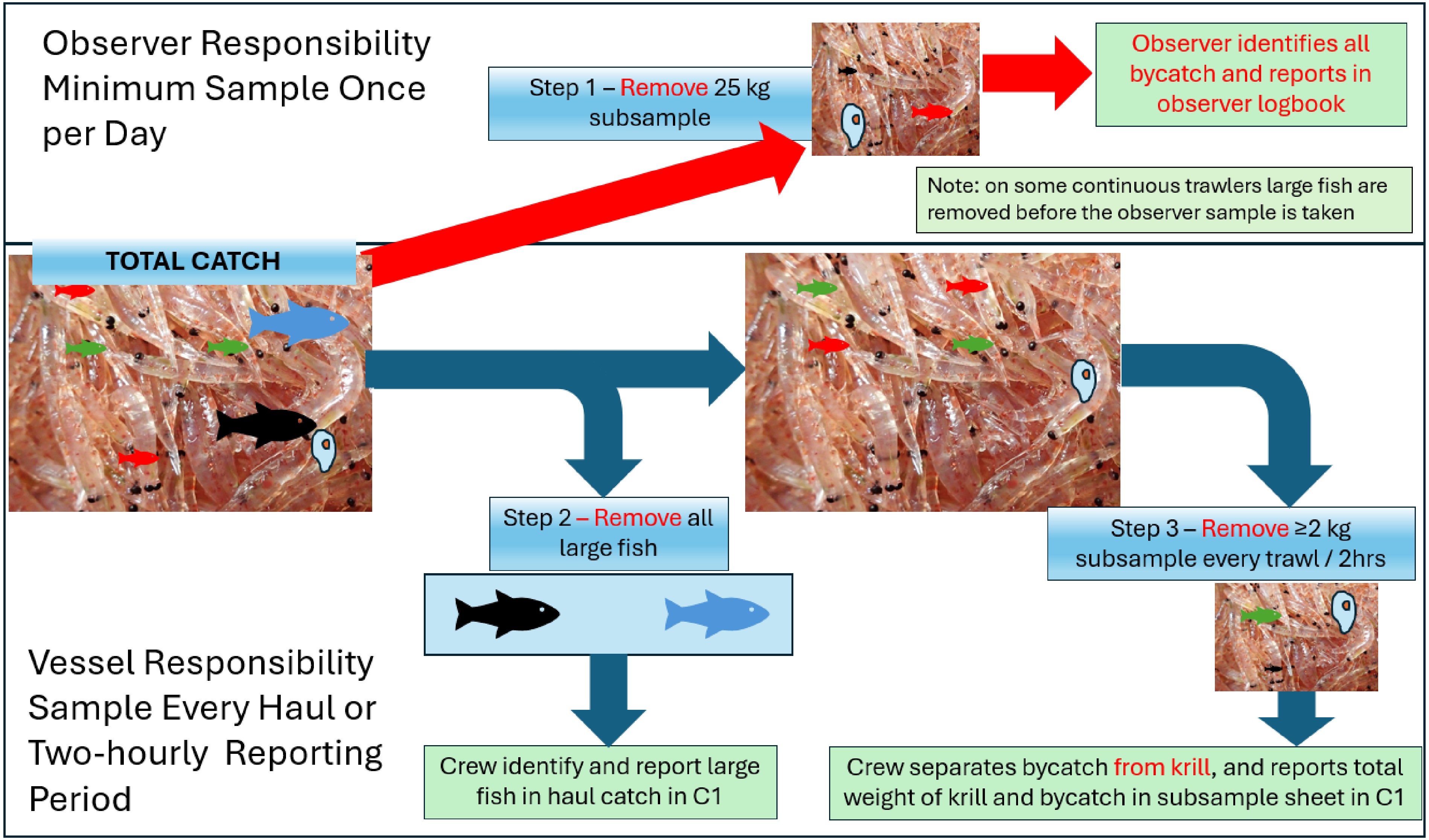

Figure 2: Flow diagram simplifying the two streams of the proposed trial methodology (i.e., observer sampling vs vessel crew sampling) for the sub-sampling of krill-fisheries by-catch. Illustration by Dr M. Collins (UK).

Appendix A

List of Participants

Working Group on Fish Stock Assessment
(Hobart, Australia, 6 to 16 October 2025)

Convener	Mr Sobahle Somhlaba Department of Agriculture, Forestry and Fisheries
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	Dr Leonid Pshenichnov SSI "Institute of Fisheries, Marine Ecology and Oceanography" (IFMEO) of the State Agency of Melioration and Fisheries of Ukraine
United Kingdom	Dr Sarah Alewijnse Centre for Environment Fisheries and Aquaculture Science (Cefas)
	Dr Rachel Cavanagh British Antarctic Survey
	Dr Jaimie Cleeland BAS
	Dr Martin Collins British Antarctic Survey
	Dr Timothy Earl Centre for Environment, Fisheries and Aquaculture Science (Cefas)
United States of America	Dr Jefferson Hinke National Marine Fisheries Service, Southwest Fisheries Science Center
	Dr Christopher Jones National Oceanographic and Atmospheric Administration (NOAA)

Appendix B

Agenda

Working Group on Fish Stock Assessment
(Hobart, Australia, 6 to 16 October 2025)

1. Opening of the meeting

2. Review of CCAMLR fisheries in 2024/2025, notifications for 2025/2026 and data collection priorities

3. Icefish

4. Toothfish

    4.1 General *Dissostichus* fisheries issues

    4.2 Toothfish stock assessment workplan

    4.3 Management Strategy Evaluation workplan

    4.4 Exploratory fisheries with research plans notified under CM 21-02

    4.5 Research proposals targeting toothfish notified under CM 24-01

5. Krill

6. Non-target catch

    6.1 Fish by-catch (macrourids, skates, other)

    6.2 By-catch management in krill fisheries

    6.3 VME management and habitats of particular concern

7. Scheme of International Scientific Observation

8. Future work

9. Other business

10. Advice to the Scientific Committee

    10.1 Discussion links to the effects of climate change

11. Adoption of the report and close of meeting

Appendix C

List of Documents

Working Group on Fish Stock Assessment
(Hobart, Australia, 6 to 16 October 2025)

WG-FSA-2025/01	2025 trend analysis: Estimates of toothfish biomass in Research Blocks CCAMLR Secretariat
WG-FSA-2025/02	Implementation of the CCAMLR Scheme of International Scientific Observation during 2024/25, and updates of forms and instructions for season 2026 CCAMLR Secretariat
WG-FSA-2025/03	Total by-catch in the krill fishery – 2025 report CCAMLR Secretariat
WG-FSA-2025/04	2025 updated analysis of the sea ice concentration in research blocks 4(RB4), and 5(RB5) of Subarea 48.6 with sea surface temperature and winds and statistical analysis of repeated accessibility Namba, T., R. Sarralde, K. Teschke, F. Bellotto Trigo, T. Okuda, S. Somhlaba, V. Rojo and J. Pompert
WG-FSA-2025/05	Proposed new separate C1 and C6 trawl haul-by-haul forms for krill and finfish fisheries, and consequential Conservation Measure changes CCAMLR Secretariat
WG-FSA-2025/06	Results from the combined by-catch, marine mammal exclusion device and stick water composition survey circulated to Members participating in krill fisheries CCAMLR Secretariat
WG-FSA-2025/07	Summary of Incidental Mortality Associated with Fishing (IMAF) activities data collected during the 2025 season, and extrapolated IMAF and warp strikes from observed fishing effort CCAMLR Secretariat
WG-FSA-2025/08	Antarctic Finfish Research as part of The Weddell Sea Observatory of Biodiversity and Ecosystem Change (WOBEC) Jones, C.D., R. Leeger and F.C. Mark

WG-FSA-2025/09	Fishery characterisation for Antarctic toothfish (*Dissostichus mawsoni*) and Patagonian toothfish (*D. eleginoides*) in Subarea 48.4 Thompson, A., S.R. Alewijnse, T. Earl, L. Readdy and A. Riley
WG-FSA-2025/10	Preliminary Assessment of Mackerel Icefish (*Champsocephalus gunnari*) in Subarea 48.3 based on the 2025 Groundfish Survey Thompson, A. and T. Earl
WG-FSA-2025/11	Steps towards the development of a CCAMLR Management Strategy Evaluation Earl, T., S.R. Alewijnse, L. Readdy and A. Dunn
WG-FSA-2025/12	Assessment of Patagonian Toothfish (*Dissostichus eleginoides*) in Subarea 48.4 Readdy, L. and T. Earl
WG-FSA-2025/13	Assessment of Patagonian Toothfish (*Dissostichus eleginoides*) in Subarea 48.4: Assessment diagnostics Readdy, L. and T. Earl
WG-FSA-2025/14	Population assessment of Antarctic toothfish (*Dissostichus mawsoni*) in Subarea 48.4 – 2025/26 fishing season update Alewijnse, S.R., L. Readdy and T. Earl
WG-FSA-2025/15	Stock Annex for the 2025 assessment of Subarea 48.4 Patagonian toothfish (*Dissostichus eleginoides*) Readdy, L. and T. Earl
WG-FSA-2025/16	Results from the random longline survey 2024 in the Heard Island and McDonald Islands (HIMI) Patagonian toothfish fishery Ziegler, P. and C. Masere
WG-FSA-2025/17	A preliminary assessment for mackerel icefish (*Champsocephalus gunnari*) in Division 58.5.2, based on results from the 2025 random stratified trawl survey Maschette, D. and P. Ziegler
WG-FSA-2025/18	Results from the 2025 random stratified trawl survey in the waters surrounding Heard Island in Division 58.5.2 Coghlan, A., D. Maschette, T. Lamb, C. Masere and P. Ziegler
WG-FSA-2025/19	Report on exploratory fishing in Divisions 58.4.1 and 58.4.2 between the 2011/12 and 2024/25 fishing seasons Maschette, D., C. Masere and P. Ziegler

WG-FSA-2025/20	Taxonomy, distribution and ecology of the four *Macrourus* species bycaught in the longline fishery at South Georgia (Subarea 48.3) Abreu, J., P.R. Hollymnan, J.J. Freer, M.L. Romero Martinez, J.P. Queirós, T. Jones, R.A. Phillips, J.C. Xavier and M.A. Collins
WG-FSA-2025/21	Demersal fish survey around South Georgia and Shag Rocks (Subarea 48.3) in January–February 2025 Collins, M.A., K. Owen, H.W. James, R.T. Nichol, J.P. Queirós, M.L. Romero Martinez, P. Reid, C.M. Waluda and J.B. Cleeland
WG-FSA-2025/22	Results from the 2024 demersal fish survey (POKER V) on the Kerguelen shelf and Skiff bank (Division 58.5.1). Péron, C., M. Kauffmann, N. Gasco, F. Massiot-Granier, F. Ouzoulias, C. Chazeau and A. Martin
WG-FSA-2025/23	Methodical aspects of fish acoustic survey under example of icefish (*Champsocephalus gunnari*) survey – data collection and processing Kasatkina, S.
WG-FSA-2025/24	A report on trophic interaction between nematodes (Anisakidae) and Antarctic toothfish (*Dissostichus mawsoni*) in the Ross Sea region, Antarctic Wang, B.X., J. Devine, D.M. Lin, C.C. Wang and G.P. Zhu
WG-FSA-2025/25	Temperature variation associated with interannual variability in abundance of juvenile Patagonian toothfish (*Dissostichus eleginoides*) at South Georgia Cavanagh, R.D., T. Jones, S.E. Thorpe, J. Cleeland, T. Earl, J.J. Freer, S.L. Hill, O.T. Hogg, P.R. Hollyman, C.M. Waluda and M.A. Collins
WG-FSA-2025/26	The first report of ageing precision, age and growth of Antarctic toothfish (*Dissostichus mawsoni*) in Subarea 88.2, CCAMLR Convention Area Zhu, G.P., J. Jiang, I. Slypko, K. Demianenko, J.L. Zhang, J.L Liu and J. Devine
WG-FSA-2025/27 Rev. 1	Details of tagging performance from vessels with tag overlap statistics between 60 and 80% in exploratory CCAMLR fisheries in season 2025 CCAMLR Secretariat

WG-FSA-2025/28 Rev. 1	A characterisation of the toothfish fishery in the Amundsen Sea region (Small Scale Research Units 88.2C-H) through 2024–25 Mormede, S. and A. Dunn
WG-FSA-2025/29	A characterisation of the toothfish fishery in the Ross Sea region (Subarea 88.1 and SSRUs 88.2A-B) through 2024–25 Mormede, S. and A. Dunn
WG-FSA-2025/30	A framework for implementing a spatial stock assessment for the Heard Island and McDonald Islands Patagonian toothfish (*Dissostichus eleginoides*) fishery in Division 58.5.2 Masere, C., R. Leadbetter, D. Maschette, P. Ziegler, P. Bessell-Browne and R. Hillary
WG-FSA-2025/31	Analysis of seawater temperature (T) and salinity (S) in the southern part of Subarea 48.6, research blocks 4 and 5 with CTD data sampled by F/V Tronio in 2020, 2021, 2024 and 2025, Sea Ice Concentration (SIC) and Sea Surface Temperature (SST) Namba, T., R. Sarralde, V. Rojo and J. Pompert
WG-FSA-2025/32	Evaluation of Age-Specific RSSS Indices for Antarctic Toothfish Stock Assessment in the Ross Sea Region Dunn, A. and S. Mormede
WG-FSA-2025/33	DNA barcoding reveals the presence of Whitson's grenadier – *Macrourus whitsoni* in sub-Antarctic waters of South Georgia (Subarea 48.3) Romero Martínez, M.L., J. Abreu, J.P. Queirós, J.C. Xavier, P.R. Hollyman, E. Fitzcharles and M.A. Collins
WG-FSA-2025/34	Characterisation of the toothfish fishery in Subarea 48.6 through the 2024/25 season Okuda, T., S. Somhlaba, R. Sarralde, M. Mori, V. Rojo and A. Dunn
WG-FSA-2025/35	First attempt of a sex-specific stock assessment model for *Dissostichus eleginoides* in Division 58.5.1 Ouzoulias, F., C. Péron, and F. Massiot-Granier
WG-FSA-2025/36	Incorporating tagging data within the Casal2 integrated stock assessment of Patagonian toothfish (*Dissostichus eleginoides*) for the Heard Island and McDonald Islands (HIMI) longline fishery in Division 58.5.2 Masere, C., R. Leadbetter, D. Maschette and P. Ziegler

WG-FSA-2025/37	Spatial and environmental factors associated with Patagonian toothfish (*Dissostichus eleginoides*) distribution at South Georgia and the South Sandwich Islands (Subareas 48.3 & 48.4) Jones, T., R.D. Cavanagh, S.E. Thorpe, T. Earl, J.J. Freer, S.L. Hill, C.M. Waluda, J. Cleeland, O.T. Hogg, P.R. Hollyman and M.A. Collins
WG-FSA-2025/38	Exploratory modelling of the random stratified trawl survey (RSTS) around Heard Island and McDonald Islands (HIMI) in Division 58.5.2 Leadbetter, R., C. Masere, D. Maschette and P. Ziegler
WG-FSA-2025/39	Mapping Fishing Effort: Insights from the Ross and Amundsen Seas. Utilising Global Fishing Watch Data to Analyse Fishing Effort in the Ross and Amundsen Seas: a valuable aid for Sustainable Ocean Governance Fenaughty, J.M.
WG-FSA-2025/40	New Fishery Research Proposal Plan Under CM 24-01 Paragraph 3 to Conduct the Survey *Dissostichus* spp. in the Statistical Subarea 48.2 during seasons 2025/2026, 2026/2027, 2027/2028 Delegation of Ukraine
WG-FSA-2025/41	Performance indicators and breakout rules for the toothfish management strategy for the Ross Sea region Dunn, A. and S. Mormede
WG-FSA-2025/42	Preliminary results of modelling egg and larval transport of Antarctic Toothfish (*Dissostichus mawsoni*) in the Weddell Sea region Mori, M. and T. Okuda
WG-FSA-2025/43	Proposal to continue the time series of research surveys to monitor abundance of Antarctic toothfish (*Dissostichus mawsoni*) in the southern Ross Sea, 2025/26-2027/28: Research Plan under CM 24-01 Delegation of New Zealand
WG-FSA-2025/44	Recent IUCN Red List assessments of two species of icefish (Channichthyidae) reveal concerns about the Red List process and opportunities for improvement Collins, M.A., M. Belchier, P. Brickle, J.B. Cleeland, I. Everson, S.L. Hill, P. Hollyman, K.A. Hughes, H.W. James, C.D. Jones, T. Jones, S.A. Morley, S.J. Parker, L.S. Peck, J.P. Queirós, W.D.K. Reid and R.D. Cavanagh

WG-FSA-2025/45	Report on exploratory fishing operations in Subarea 48.6 between the 2012/13 and 2024/25 fishing seasons Okuda, T., M. Mori, S. Chung, S. Somhlaba, R. Sarralde Vizuete and V. Rojo
WG-FSA-2025/46	Results of the 2025 Ross Sea Shelf Survey and summary of the survey series to date Mormede, S., M. Mori and W. Lyon
WG-FSA-2025/47	Revised new Research Plan for Patagonian Toothfish (*Dissostichus eleginoides*) under CM 24-01, paragraph 3 in Subarea 48.3A, conducted by Chile from season 2025/26 to 2027/28 Delegation of Chile
WG-FSA-2025/48	Revised new Research Plan for Toothfish (*Dissostichus* spp.) under CM 24-01, paragraph 3 in Subarea 48.2, conducted by Chile from season 2025/26 to 2027/28 Delegation of Chile
WG-FSA-2025/49 Rev. 1	Continuing research plan for Antarctic toothfish (*Dissostichus mawsoni*) under CM 24-01, paragraph 3 in Subarea 88.3 by Korea and Ukraine from 2024/25 to 2026/27 Delegations of the Republic of Korea and Ukraine
WG-FSA-2025/50	Report of the trial on net monitoring cable/warp seabird-strike mitigation measures conducted by the Chinese F/V FU XING HAI during the 2023/24 fishing season Fan, G., S. Lin, J. Wang, Y. Yang, Y. Ying, H. Huang, J. Zhu, X. Wang, Y. Xu, H. Yu and X. Zhao
WG-FSA-2025/51 Rev. 1	Report of the trial on net monitoring cable/warp seabird-strike mitigation measures conducted by the Chinese F/V SHEN LAN during the 2023/24 fishing season Xue, F., L. Wang, H. Hua, Y. Ying, G. Zhu, G. Fan and K. Yang
WG-FSA-2025/52 Rev. 1	Year-1 findings for preliminary stock assessment of Antarctic toothfish (*Dissostichus mawsoni*) in Subarea 88.3 Chung, S., I. Slypko, M. Kim, J. Park and G.W. Baeck
WG-FSA-2025/53	Training video on toothfish and skate tagging for vessel crew and scientific observers Williamson, M. and C. Heinecken
WG-FSA-2025/54	Sister otolith cross-reading in Subarea 48.6: evaluating precision, bias, and integration potential Chung, S., M. Mori, M. Kim, J. Park and T. Okuda

WG-FSA-2025/55 Rev. 1	Re-defining Trophic Dynamics of Antarctic toothfish in Subarea 88.3 by Compound-specific Stable Isotope Analyses: Individual Size and Spatial Variability Shin, K.-H., J. Yun, H.Y. Yun, H.-E. Cho and S. Chung
WG-FSA-2025/56 Rev. 1	Preliminary report on the re-initiation of age determination of Antarctic toothfish (*Dissostichus mawsoni*) in Subarea 88.2 Chung, S., M. Kim and J. Park
WG-FSA-2025/57	Diet composition and feeding strategy of Antarctic toothfish, *Dissostichus mawsoni* in Areas 48 and 88 Baeck, G.W., S. Chung, J. Park, E. Kim and H. Song
WG-FSA-2025/58 Rev. 1	DNA metabarcoding of Antarctic toothfish (*Dissostichus mawsoni*) stomach contents from Subarea 48.6 in 2025 Lee, S.R., S. Chung, J. Park, E. Kim, H. Song and H.-W. Kim
WG-FSA-2025/59	Preliminary study on the diet and feeding ecology of Macrouridae in Subareas 88.1 and 88.3 Baeck, G.W. and S. Chung
WG-FSA-2025/60	Field validation of morphological identification keys for Antarctic grenadiers (*Macrourus* spp.) with additional externally visible characters in Subareas 88.1 and 88.3 Chung, S., M. Kim, J. Park, E. Kim, H. Song and G.W. Baeck

Other documents

WG-FSA-2025/P01	Resource potential and maturity estimates of *Euphausia superba* in East Antarctica Maschette, D., S. Wotherspoon, H. Murase, N. Kelly, P. Ziegler, K. Swadling and S. Kawaguchi. *Front. Mar. Sci.*, 12 (2025), doi: https://doi.org/10.3389/fmars.2025.1448250
WG-FSA-2025/P02	Quantifying distinctions in the otolith shape of morphologically similar Sub-Antarctic grenadier species (*Macrourus*) to assess fishery observer identifications Connor, W., C. Masere, P. Coulson and A. Marshell. *Fish. Res.*, 288: 107448 (2025), doi: https://doi.org/10.1016/j.fishres.2025.107448

WG-FSA-2025/P03	Environmental DNA as a novel tool for monitoring fish community structure and diversity feature in the northern Antarctic Peninsula Wang, C.C., Y.W. Yu, F. Llompart, Z. Chen, Y.M. Liu and G.P. Zhu *Estuarine, Coastal and Shelf Science*, 313: 109076 (2025), doi: https://doi.org/10.1016/j.ecss.2024.109076
WG-FSA-2025/P04	Using otolith chemistry to reflect population structure of the Subantarctic myctophid *Electrona carlsbergi* in the Antarctic Circumpolar Current and Antarctic Slope Current off the South Shetland Islands Zhu G.P., H.R. Qian, L. Wei, B.A. Fach, S. Bestley, C.B. Yan and J.A. Ashford. *Palaeogeography Palaeoclimatology Palaeoecology*, 675:113062 (2025), doi: https://doi.org/10.1016/j.palaeo.2025.113062
WG-FSA-2025/P05	Integrating otolith shape and niche model to infer population structure of mackerel icefish (*Champsocephalus gunnari*) between South Orkney Islands shelf and South Georgia shelf, Antarctic Zhu, G.P. and Y.F. Peng *Fish. Res.*, 285: 107367 (2025), doi: https://doi.org/10.1016/j.fishres.2025.107367
CCAMLR-44/BG/08 Rev. 1	Fishery Notifications 2025/26 CCAMLR Secretariat
CCAMLR-44/BG/31 Rev. 1	Cap-DLISA Workshop Report Delegation of South Africa
SC-CAMLR-44/BG/01	Catches of target species in the Convention Area CCAMLR Secretariat
SC-CAMLR-44/BG/33	SCAR Action Group on Fish (SCARFISH): Updates and Opportunities SCAR
WG-EMM-2025/01	Classification of fishing events in CCAMLR reporting forms CCAMLR Secretariat
WG-SAM-2025/03	Continuing research in the *Dissostichus mawsoni* exploratory fishery in East Antarctica (Divisions 58.4.1 and 58.4.2) from 2022/23 to 2025/26; Research plan under CM 21-02, paragraph 6(iii) Delegations of Australia, France, Japan, Korea and Spain

Appendix D

Proposed initial metrics for consideration in review of ongoing research plans which aim to develop stock assessments for management advice

1. Ongoing research plan review questions:

1. Has the planned sampling design been fully implemented?
2. Milestones progress:
   a. Current milestones due (including annual report of data collection*)
   b. Overdue milestone progress
   c. Other milestones progress

2. Ongoing research plan milestones:

Milestones for stock assessment development should include at least the following items:

1. Ageing:
   a. numbers aged
   b. CV
   c. Index of average percent error (IAPE)
2. Biological parameter estimates:
   a. Length-weight estimates
   b. Age-length keys
   c. Growth
   d. Maturity
3. Stock assessment development steps.

3. Ongoing research plan data review

*Annual report of research plan progress should include, where appropriate:

1. Sample numbers and rates for toothfish and by-catch species:
   a. Length
   b. Weight
   c. Sex
   d. Maturity stage
   e. Otoliths
2. Length distribution plots:
   a. Overall
   b. By research block
   c. By vessel
3. Length weight plots.
4. Sampling locations.
5. Tagging overlap statistics.
6. Tagging rates.

Appendix E

Summary of Recommendations from the Conversion Factor workshop, and their status

Recommendation from WS-CF-2022	*Status*
The Workshop requested that the Secretariat undertake a similar generalised linear model (GLM) analysis to explore factors on which to base a stratified approach to setting CFs. Further consideration of the future approach should be based on this further analysis.	Completed: WG-SAM-2025/01.
The Workshop recommended that the Secretariat develop a more complete guide to collecting CF data for both observers and vessels, updating that once the sampling methodology for CF tests and CF data implementation has been agreed.	Completed. Observer and vessel instructions updated.
The Secretariat will undertake a standardisation analysis to identify recorded factors that influence the CF value and report to WG-FSA-2022.	Completed: WG-FSA-2022/12.
The Workshop considered that there was a need for a more consistent approach for undertaking CF tests and supplying data to the Secretariat, and a consistent approach for setting CFs to be utilised by the vessels. A suggested approach for this is given in Figure 2.	Partially complete: CF test instructions have been refined for both vessels and observers, and improved new sampling instructions have been issued to observers with data collection beginning in 2026. Proposed changes to the Fishery Operation Plan (WG-FSA-2025, paragraph 7.10) would provide information on how CFs are calculated and applied by Members.
The Workshop recommended the Secretariat consider and propose a standard reporting of CF data to identify how well the data collection system is performing.	For observer data, any analysis should be postponed until the new collection methodology is implemented (WG-SAM-2025/01; WG-SAM-2025, paragraphs 3.23 and 3.24), so it can potentially be first presented at WG-FSA-2026. For vessels, the Secretariat proposes to present the CF value per vessel, area and season for past five years for consideration.

Suggested changes to Conservation Measure 21-02 to include details on conversion factors used by vessels

The inclusion of conversion factors in the fishery operations plan for vessels operating in exploratory fisheries would require the following addition to CM 21-02, paragraph 6 (see blue text below labelled (g)). An example of what would be provided in the Fishery Operations Plan is also provided.

6. Any Member proposing to participate in an exploratory fishery shall, by 1 June[4] prior to the season in which it intends to fish:

(i) notify its intention to the Commission by submitting, to the Secretariat, a notification that includes the information prescribed in Conservation Measure 10-02, paragraph 3, in respect of vessels proposing to participate in the fishery, with the exception that the notification shall not be required to specify the information referred to in Conservation Measure 10-02, paragraph 3(ii). Members shall, to the extent practicable, also provide in their notification the additional information detailed in Conservation Measure 10-02, paragraph 4, in respect to each fishing vessel notified. Members are not hereby exempted from their obligations under Conservation Measure 10-02 to submit any necessary updates to vessel and licence details within the deadline established therein as of issuance of the licence to the vessel concerned;

(ii) as part of any notification, prepare and submit to the Secretariat by 1 June a Fishery Operations Plan for the fishing season, and a preliminary assessment of the impact of planned activities on vulnerable marine ecosystems if required under Conservation Measure 22-06, paragraph 7(i), for review by the Working Groups on Statistics, Assessments and Modelling (WG-SAM), Ecosystem Monitoring and Management (WG-EMM), Fish Stock Assessment (WG-FSA), the Scientific Committee and the Commission[5]. Fishery Operations Plans submitted after 1 June will not be considered by the relevant working group(s), the Scientific Committee or the Commission. The Fishery Operations Plan shall include as much of the following information as the Member is able to provide, so as to assist the Scientific Committee in its preparation of the Data Collection Plan:

(a) the nature of the exploratory fishery, including target species, methods of fishing, proposed region and maximum catch levels proposed for the forthcoming season;

(b) specification[6] and full description[7,8] of the types of fishing gear to be used;

(c) biological information on the target species from comprehensive research/survey cruises, such as distribution, abundance, demographic data and information on stock identity;

(d) details of dependent and related species and the likelihood of their being affected by the proposed fishery;

(e) information from other fisheries in the region or similar fisheries elsewhere that may assist in the evaluation of potential yield;

(f) if the proposed fishery will be undertaken using bottom trawl gear, information on the known and anticipated impacts of this gear on vulnerable marine ecosystems, including benthos and benthic communities;

(g) full description of the conversion factor(s) to be used and the method of calculation.

Fisheries Operation Plan[1] (CM 21-02, paragraphs 6(ii)(a) and 6(ii)(c) to 6(ii)(f))

(a) The nature of the exploratory fishery, including target species, methods of fishing, proposed region and maximum catch levels proposed for the forthcoming season:

Example of suggested Fisheries Operation Plan contents:

Target species	Antarctic toothfish (*Dissostichus mawsoni*)
Methods of fishing	Bottom longlining. The vessel/s will operate an Autoline system employing integrated weight line (IWL) (see CCAMLR Fishing Gear Library at http://www.ccamlr.org/en/publications/fishing-gear-library).
Methods of deriving conversion factor(s) used by the vessel	Conversion factor(s) reviewed weekly and updated based on value calculated by observer.
Subarea or division where fishing would occur	Subarea 88.2
Maximum catch levels proposed for the forthcoming season	Within the catch limit set by CCAMLR. The catch will be influenced by factors such as ice coverage, season length, and the extent of fishing by vessels flagged to other CCAMLR Members.

[1] Members are required to submit a single Fisheries Operation Plan for all vessels for each exploratory fishery notification.