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Report of the Working Group on Fish Stock Assessment (WG-FSA-2025)

(Hobart, Australia, 6 to 16 October 2025)

This is a preliminary[1] version of the WG-FSA-2025 Report as adopted on Thursday 16 October 2025.

[1] Preliminary in this case means that further proofreading and verification is still to be done by the Secretariat.

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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-CCAMLR-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 auto-correlation.

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 minimizing 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 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 – 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 (paragraph 4.91-4.93).

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 nothenioid 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 focussed 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 by-caught 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-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 – 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 (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 (para 3.23-3.24) 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 urgency 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.

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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 Run21	B_0	1 064	1 064	12
	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-19/03, 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-19/02, 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 rate for proposed vessels are indicated in Table 6	Y: Tag detection and survival rate for proposed vessels are indicated in Table 6 (paragraph 4.180)	Y: Tag detection and survival rate for proposed vessels are indicated in Table 7	Y: Tag detection and survival rate for proposed vessels are indicated in Table 6
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 specialized teams for processing and analysing data. In particular, we have a team focused on demersal stocks, including the Patagonian toothfish. This multidisciplinary team has data processing,	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-19/03, SC-CAMLR-39/BG/28, WG-SAM-2021/23, WG-FSA-2022/40,	Y: Section 3. Survey design, data collection and analysis

	analyses protocols and statistical estimators of biological, population, and ecological parameters for demersal species, including Patagonia toothfish.		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: Section
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 minimizing 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: bycatch estimates (1.5 tons 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-19/02, 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-19/03, 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 (2022, 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 5: 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		
FRA	*Cap Kersaint*	NA	NA				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 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		
FRA	*Cap Kersaint*	NA	NA				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 bycatch trial sub-sampling methodology in the 2026/27 season

Haul Number	Weight of krill (gm)	Weight of by-catch (gm)

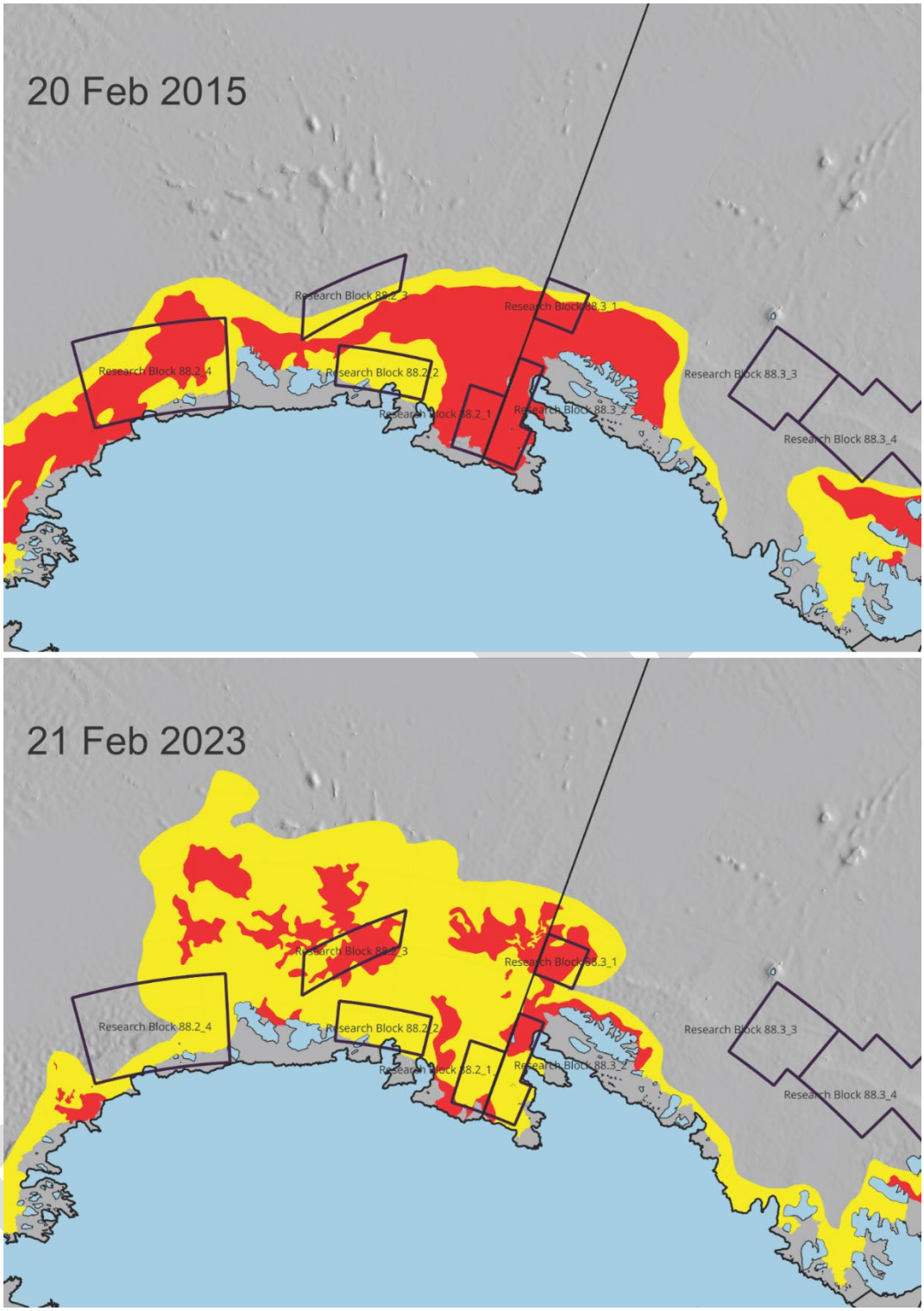

Figure 1 Worst-case (2015) and best-case (2023) records of Antarctic Sea Ice annual minimum since 2015 near the Subarea 882 and 883 boundary. Yellow indicates 1 to 8 tenths sea ice cover and red 8 to 10 tenths of sea ice cover. Black polygons indicate current research blocks.

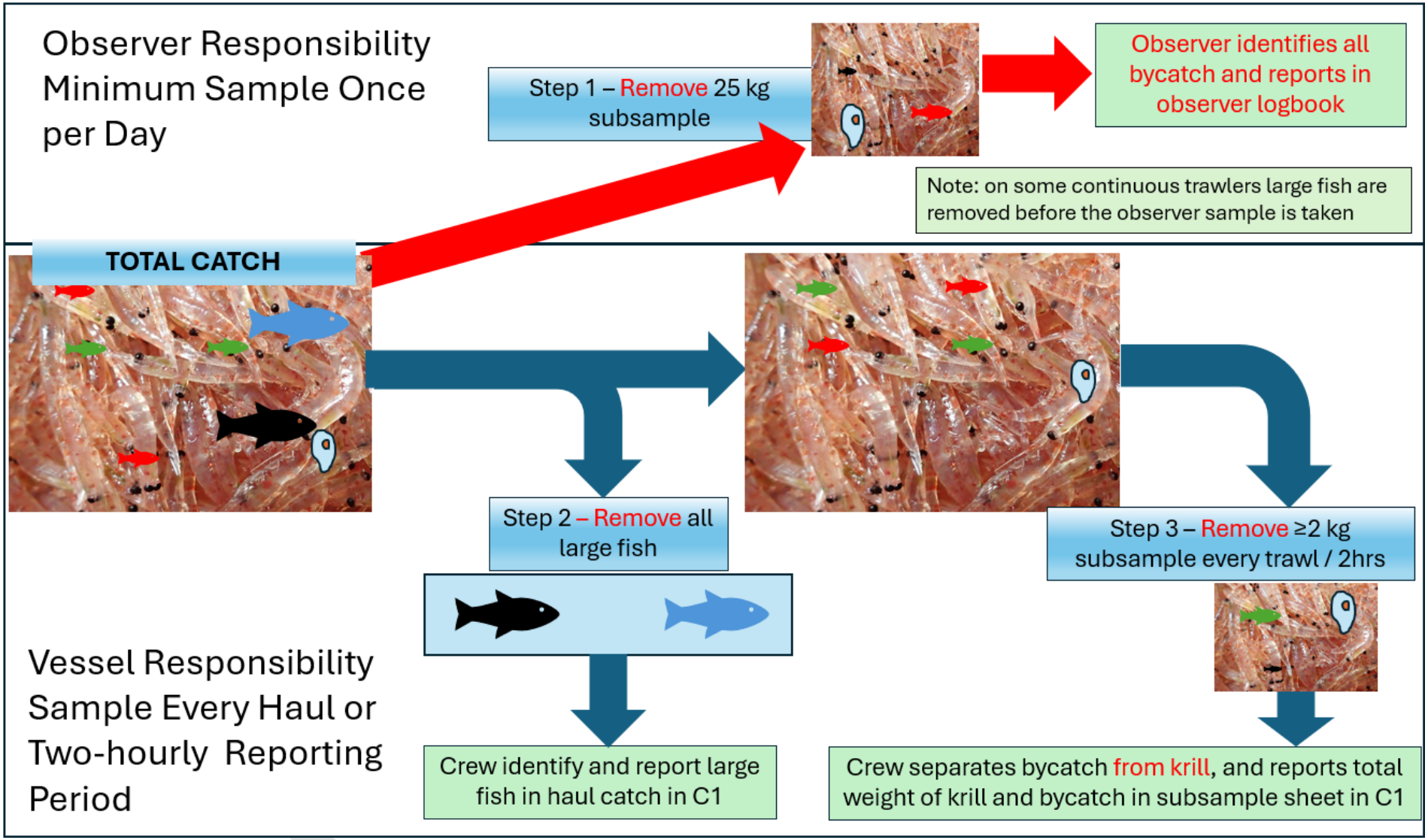

Figure 2 Flow diagram simplifying the two streams of the proposed trial methodology (i.e., observer sampling vs vessel crew sampling) for the sub-sampling of krill-fisheries by-catch. Illustration by Dr M. Collins (UK).

Appendix A

List of Participants

Working Group on Fish Stock Assessment
(Hobart, Australia, 6 to 16 October 2025)

Chair	Mr Sobahle Somhlaba Department of Agriculture, Forestry and Fisheries
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	Dr Cara Masere Australian Antarctic Division, Department of Climate Change, Energy, the Environment and Water
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	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
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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 bycatch 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, and WG-SAM-2025 paragraphs 3.23-3.24), 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

Appendix F

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[2] (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.

[2] Members are required to submit a single Fisheries Operation Plan for all vessels for each exploratory fishery notification.