

ADVANCES IN STATISTICS, ASSESSMENTS, MODELLING AND SURVEY METHODS

Report of the 2007 meeting of WG-SAM

2.1 The first meeting of WG-SAM was held in Christchurch, New Zealand, from 9 to 13 July 2007. The meeting was co-convened by Drs Jones and Constable. The report of WG-SAM is in Annex 7.

2.2 The Scientific Committee noted that WG-SAM addressed two broad technical areas during the 2007 meeting:

- (i) those related to fish stock assessment methods (identified primarily during the course of last year's meeting of WG-FSA);
- (ii) those associated with krill and predator-prey modelling – subdivision of krill catch into SSMUs.

2.3 With respect to refinements and new methods of parameter estimation, the Scientific Committee noted several recommendations by WG-SAM, including a call for more descriptive analyses of the tag-release and recapture data, further research in spatial patterns of tag recaptures and methods to describe movement, and the recommendation to consider the development of advice on how to manage the collection of non-toothfish tagging data (Annex 7, paragraphs 2.1 to 2.16).

2.4 The Scientific Committee noted WG-SAM's evaluation of a proposed depletion method for assessing toothfish on BANZARE Bank (Division 58.4.3b), and agreed that this approach could be useful for providing advice on potential yields in other exploratory fisheries.

2.5 WG-SAM's consideration of an alternative method for assessing toothfish in Subareas 88.1 and 88.2 (TSVPA) was noted by the Scientific Committee, along with the conclusion that WG-SAM was unable to appraise the method without the presence of the authors (Annex 7, paragraph 3.8).

2.6 The Scientific Committee was encouraged by advancements with respect to new methods for assessing by-catch species (Annex 7, paragraphs 3.14 to 3.20), such as those made for assessing rajid populations at South Georgia and in the Ross Sea (Subarea 88.1 and SSRUs 882A and 882B). The Scientific Committee endorsed the recommendations by WG-SAM for improving data necessary for an assessment, including those related to species identification, catch sampling, estimates of age and growth, tagging protocols and additional survivorship experiments.

2.7 The Scientific Committee agreed that improvements in data collection for by-catch species for assessment purposes is a high priority, and can potentially be advanced by focusing annually on a particular species group, for example, 2008/09 could be the year of the rajid, and 2009/10 could be the year of the macrourid.

2.8 The Scientific Committee noted the reviews of preliminary assessments undertaken by WG-SAM for finfish (Annex 7, paragraphs 4.1 to 4.19), and the recommendations made for

this year's assessments of toothfish in Subarea 48.3, Division 58.5.2 and the Ross Sea. The Scientific Committee agreed that research priorities for the Ross Sea assessments in the medium term be those given in Annex 7, paragraphs 4.14 and 4.15.

2.9 The Scientific Committee agreed that it is a priority to identify factors responsible for the high variability of the data quality arising from different vessels in Subareas 88.1 and 88.2, and procedures should be explored by WG-FSA to ensure consistent high-quality data for assessments in multi-vessel, multi-nation fisheries (Annex 7, paragraph 4.16).

2.10 Developments toward evaluation of management strategies, as set out in Annex 7, paragraphs 5.1 to 5.6, were noted. The Scientific Committee continued to encourage the development of management strategy evaluations.

2.11 The Scientific Committee noted that WG-SAM examined the consequences of conducting assessments at multi-year intervals for toothfish stocks, and the resulting trade-off between the risk of errors in an assessment, and the considerable time saved in the meeting of WG-FSA and intersessionally. It was noted by the Scientific Committee that where a toothfish stock is at or above target levels, and where assessments have been stable, then assessments of toothfish could be performed on a biennial cycle without incurring significant additional risk (Annex 7, paragraphs 6.11 to 6.18). The discussion and recommendations by the Scientific Committee are taken up during discussions relative to Scientific Committee activities (section 14).

2.12 The Scientific Committee noted that WG-SAM did not provide advice on the estimation of B_0 and associated CV from survey data (SC-CAMLR-XXV, paragraph 3.27) but that the Working Group expected the issue would be considered by WG-EMM.

2.13 The Scientific Committee noted the advice from WG-SAM on the points to be considered in developing an integrated assessment of krill in Annex 7, paragraphs 3.12 and 3.13, and endorsed the need for:

- management strategy evaluation methods to help identify the best approaches for integrated assessments of krill;
- length-frequency data to be routinely provided from the fishery for several years in advance of a model being used for assessments;
- the collection of high-quality biological data from all commercial vessels.

2.14 In 2006, the Scientific Committee had requested further consideration and development of approaches to subdivide the catch limit for krill in Area 48 among SSMUs. It noted the outcomes of the discussion by WG-SAM on this issue in Annex 7, paragraphs 5.7 to 5.51 and 8.1 to 8.6. In particular, the Scientific Committee:

- (i) agreed to a staged approach towards subdividing the krill catch among SSMUs (Annex 7, paragraph 5.10) and that such an approach would involve, at each stage:

- (a) an evaluation of the risks to krill, predators and the fisheries of the different options for subdividing the catch given the uncertainties in model structures, our understanding of the dynamics of the krill-based ecosystem and the future interactions of the fishery with the system;
 - (b) risks would be evaluated for different levels of maximum aggregate catch across SSMUs;
 - (c) advice at each stage would be on the strategy for subdividing catch along with the attendant risks at different aggregate catches;
- (ii) noted that there would be value in exploring structured fishing in managing krill fisheries in SSMUs (Annex 7, paragraphs 5.13 and 5.14) as a form of Option 6, which is similar to the approach used for exploratory toothfish fisheries, provided that due account was given to the costs to the fisheries of different approaches;
 - (iii) noted that the maximum catch to be subdivided among SSMUs at present should only be the aggregate catches for Subareas 48.1, 48.2 and 48.3 (Annex 7, paragraph 5.15);
 - (iv) agreed that Stage 1 of a subdivision could be an initial subdivision based primarily on Options 2 to 4, and that Options 5 and 6 should be accorded a high priority starting in 2009 (Annex 7, paragraph 5.16);
 - (v) agreed that the empirical considerations by WG-SAM are appropriate for Stage 1 (Annex 7, paragraphs 5.17 to 5.27), including comments from WG-EMM (Annex 4, paragraphs 6.39 to 6.47), and noting that it is important that benchmarks be established to ensure that the models appropriately approximate reality in this process (Annex 7, paragraph 5.24);
 - (vi) welcomed the progress on the development of models for this task, noting that FOOSA (KPFM2) is well advanced for this task (Annex 7, paragraphs 5.28 to 5.36);
 - (vii) agreed that the scenarios for Stage 1 are appropriate (Annex 7, paragraphs 5.37 and 5.38);
 - (viii) endorsed the approach for developing performance measures (Annex 7, paragraphs 5.39 to 5.47) and the risk assessments for Stage 1 (Annex 7, paragraph 5.48);
 - (ix) endorsed the process for providing advice on Stage 1 to the Scientific Committee in 2008 (Annex 7, paragraph 5.49), noting that:
 - (a) the models and approaches will be reviewed by WG-SAM and the results developed and reviewed by WG-EMM;

- (b) the development of advice may take longer than envisaged by WG-SAM and that the Scientific Committee needs to be kept informed during the intersessional period on progress in this process in case contingency plans need to be developed;
- (x) encouraged Members to participate in the work of WG-SAM and WG-EMM in developing advice on the subdivision of krill catch amongst SSMUs.

2.15 The Scientific Committee noted that advice was provided to the working groups by WG-SAM:

- (i) WG-EMM (Annex 7, paragraphs 8.1 to 8.6)
- (ii) WG-FSA (Annex 7, paragraphs 8.7 to 8.15)
- (iii) ad hoc WG-IMAF (Annex 7, paragraph 8.16).

2.16 The Scientific Committee endorsed the advice of WG-SAM in respect of:

- (i) the role and terms of reference of WG-SAM (Annex 7, paragraphs 8.18 and 8.19);
- (ii) the process for determining what is within the remit of WG-SAM (Annex 7, paragraph 6.3);
- (iii) how the Working Group would approach the validation and verification of software and approaches (Annex 7, paragraph 6.5);
- (iv) the approach for structuring the future work program for WG-SAM (Annex 7, paragraphs 6.6 to 6.10).

2.17 The Scientific Committee noted that models used in assessment and evaluation work need to be stable and verifiable. It asked WG-SAM to develop a format for reporting and archiving the work to validate and verify software and approaches, and for archiving assessment runs.

Subgroup on Acoustic Survey and Analysis Methods

2.18 Dr Collins (Co-convener) reported on the meeting of SG-ASAM, which was held in Cambridge, UK, in April 2007 (Annex 8). Two invited experts (Drs Macaulay and Korneliussen) attended the meeting. The meeting focused on the development of methodologies for acoustic surveys of icefish (*C. gunnari*) and the review of the acoustic sampling protocols for krill (*E. superba*) for use by CCAMLR-IPY projects.

2.19 The Scientific Committee noted that the principal recommendations from SG-ASAM with respect to krill and icefish were considered at the meetings of WG-EMM and WG-FSA respectively, and are dealt with under other agenda items.

2.20 The Scientific Committee noted the prevalence and ecological importance of myctophids in Antarctic waters and encouraged further work on this group.

Future meetings

2.21 The Scientific Committee recommended that the next meeting of SG-ASAM should be held in conjunction with the ICES WG-FAST meeting in 2009 to consider acoustic results from IPY surveys, developments in TS modelling, and other new observations.

2.22 The Scientific Committee recommended that the Data Manager should attend future meetings of SG-ASAM, and that the Secretariat cost associated with attending meetings away from Hobart should be included in the Scientific Committee's budget.

CCAMLR-IPY Planning Meeting

2.23 The CCAMLR-IPY Planning Meeting was held in Cambridge, UK, in May 2007 (SC-CAMLR-XXVI/BG/3), with one day held in conjunction with SG-ASAM to discuss data collection protocols.

2.24 The Planning Meeting noted that a coordinated survey of Antarctic krill would not be possible during IPY, but that various nations will be undertaking cruises in the Southern Ocean to collect acoustic data, including:

- (i) a Norwegian survey in the northern part of Subarea 48.6 on *G.O. Sars* focusing on krill and the pelagic ecosystem, and a study of target strength of icefish and krill in Subareas 48.3 and 48.6;
- (ii) a German survey on the *Polarstern* in the southern region of Subarea 48.6, which will collect acoustic data and RMT samples;
- (iii) a New Zealand survey in the Ross Sea on the *Tangaroa*;
- (iv) a Japanese survey on the *Umitaka Maru* in Divisions 58.4.1 and 58.4.2;
- (v) UK surveys on the *James Clark Ross* in the Scotia Sea and western Antarctic Peninsula.

2.25 Dr Holt indicated that, as part of the US AMLR program, the USA will undertake a 30-day survey in the area of the South Orkney Islands that will include acoustic data collection.

2.26 Dr L. Pshenichnov stated that Ukraine was unable to participate in the IPY Survey, but will be sending scientists on board krill fishing vessels to collect data.

2.27 The Scientific Committee noted that some Members, who did not have vessels available for IPY surveys, will be participating on board vessels listed above.

2.28 The Scientific Committee noted that the CCAMLR-2000 Survey protocols and information on krill sex and maturity stages from CCAMLR's *Scientific Observers Manual* are now available in a public IPY-related area of the CCAMLR website.

2.29 The Scientific Committee recommended the following guidelines for archiving CCAMLR-related data from IPY surveys:

- (i) store data in internationally recognised data repositories;
- (ii) submit metadata records to CCAMLR and SCAR-MarBIN;
- (iii) acoustic, trawl, CTD and net data will be stored and archived by CCAMLR under specified data access requirements;
- (iv) data used for CCAMLR assessments must be held by CCAMLR – both in raw and processed form.

2.30 The Scientific Committee recommended that the Secretariat produce a summary of all IPY acoustic data and related metadata submitted to CCAMLR, and report to SG-ASAM by April 2009. The Scientific Committee further recommended that SG-ASAM should examine the available acoustic data and any analyses at its 2009 meeting and advise the Scientific Committee on their value for krill biomass estimation.

2.31 The Scientific Committee commended the Steering Group on its role in coordinating the CCAMLR-IPY initiative.