

HARVESTED SPECIES

Krill resources

2008/09 fishery

3.1 In 2008/09 five Members fished for krill and a total of 125 826 tonnes were reported to the Secretariat (Table 1). The bulk of the catch was taken from Subarea 48.2, with a smaller amount from Subarea 48.1 and very little taken from Subarea 48.3 (SC-CAMLR-XXIX/BG/1).

2009/10 fishery

3.2 Six Members fished for krill in 2009/10 and about three-quarters of the catches were taken in Subarea 48.1 (Table 2). The reported catch to 24 October was 211 000 tonnes (SC-CAMLR-XXIX/BG/1). The two major fishing nations were Norway (120 429 tonnes) and the Republic of Korea (43 805 tonnes).

3.3 The krill fishery in Subarea 48.1 was closed when the catch reached 99.8% of the trigger level for the subarea (155 000 tonnes). This was the first time that the krill fishery has been closed because it has reached one of the trigger levels, noting that these were introduced for the first time last year. The catch in Subarea 48.1 was the highest ever recorded in this subarea.

3.4 The Scientific Committee noted that the closure of the krill fishery had occurred efficiently as the catch approached the trigger level, principally because of the voluntary reporting of catches at five-day intervals by the vessels fishing in this area.

3.5 The Scientific Committee noted that the current requirement for vessels to begin reporting catches at 10-day intervals once the catch reaches 80% of the trigger level for Area 48 (CM 23-06) was not consistent with the spatial allocation of the trigger level among subareas.

3.6 The Scientific Committee recommended that CM 23-06 be modified to reflect that the 80% (and 50%) levels referred to in CM 23-06 should apply to the subarea-specific trigger levels, and that once this level had been reached, a five-day reporting interval should be adopted.

Krill fishery notifications for 2010/11

3.7 Notifications were received from seven Members to conduct krill fisheries in Subareas 48.1, 48.2, 48.3 and 48.4, as well as Divisions 58.4.1 and 58.4.2 (Table 3). The notified krill fleet consisted of 15 vessels with a projected catch of 410 000 tonnes. Those notified in languages other than in English were translated prior to the meeting of WG-EMM so that they could be appropriately assessed by the Working Group. All notifications for krill fisheries in the 2010/11 fishing season met the requirements in CM 21-03.

3.8 The utility of the notification scheme was reiterated and it was noted that the projected level of catches in the notifications and actual catches were beginning to converge. Further, the recent increase in catch reflected the earlier increase in notifications suggesting that notifications did assist with predicting trends in the fishery.

3.9 The notifications specify a range of methods for estimating the green weight of krill, including use of volumetric, weight and conversion-calculated estimates. The Scientific Committee recommended that standardisation of methods for estimating the green weight of the catch is urgently required to achieve more accurate estimates of actual catches.

Fishing patterns

3.10 The Commission's attention was drawn to a recent change in the pattern of krill fishing operations with the catches coming mostly from Subarea 48.2 in 2008/09 and from Subarea 48.1 in 2009/10, but with little catch from Subarea 48.3 despite there being krill present in the South Georgia area in 2009/10. The fishery had concentrated on the Bransfield Strait area in 2009/10 and the catch from this region was an order of magnitude higher than catches reported from this area in the past. Additionally, the krill fishery now appears to be largely a winter operation.

3.11 Reports from Norwegian, Japanese and Korean fishing vessels indicated that, in the 2009/10 fishing season, there was little ice in the Bransfield Strait and favourable winds coupled with very big krill swarms made for good fishing conditions. These conditions were different from previous years.

Krill escape mortality

3.12 Escape mortality is calculated as the amount of krill escaping through the trawl mesh multiplied by the proportion of animals that die as a result of this process. A standard approach to collecting and processing data on escape mortality will be required to address this potentially serious issue and, to assist this, an operating manual for use by scientific observers is being developed by Russia and Ukraine (SC-CAMLR-XXVIII, paragraphs 4.14 and 4.15). The Scientific Committee expressed concern that potential methods be trialled before being requested as routine activity by observers. Ukraine agreed to conduct investigations into escape mortality of krill in the 2010/11 season in the case of Ukraine's participation as an observer in a krill cruise and to suggest how such approaches might impact the workload of scientific observers. The Scientific Committee also requested that the resulting manual (once developed) should be reviewed by WG-EMM to determine the results of, and instructions for, implementing a standardised approach.

3.13 The Scientific Committee encouraged pilot studies into escape mortality using techniques such as those outlined in SC-CAMLR-XXVIII/BG/10. Norway reported that it would trial camera systems in 2010/11.

Scientific observation

3.14 In 2009, the Commission agreed to a new general measure (CM 51-06) for scientific observation in krill fisheries, and noted that this measure should be reviewed in 2010, taking into account the Scientific Committee's recommendation on the statistical design of systematic observer coverage (CCAMLR-XXVIII, paragraph 10.7).

3.15 The Scientific Committee noted WG-EMM's discussions on scientific observations in the krill fishery (Annex 6, paragraphs 2.45 to 2.52). The Scientific Committee agreed that, although its advice remains that 100% coverage of vessels is the fastest way to develop a scientific understanding of the fishery, data collected during an initial period of 50% systematic observer coverage could characterise underlying variability and assist with the design of an observer program in the long term. A two-year program with sampling effort distributed across potential time–area strata would be useful to start establishing a baseline dataset for such work.

3.16 Three options for distributing observers among time–area strata during the 2010/11 and 2011/12 fishing seasons, in line with the requirements of CM 51-06, were developed by WG-EMM (Annex 6, Table 1). All three options would distribute observers among 50% of the time–area strata and require 20% coverage of hauls in a manner consistent with the requirements of CM 51-06 for the 2010/11 and 2011/12 fishing seasons. All three options can be modified to accommodate changes (increases) in levels of observer coverage:

- (i) Option 1 divided all notified vessels into two groups and each fishing season into two six-month periods. Observers would be deployed in a rotational strategy where 100% of vessels in each group would be observed during a single six-month period that alternates between fishing seasons.
- (ii) Option 2 divided the fishing season into four quarters and specifies 100% vessel coverage or 50% vessel coverage in specific time–area strata. The vessel coverage in each time–area stratum would alternate between fishing seasons.
- (iii) Option 3 required a minimum of 50% vessel coverage in all time–area strata in which each vessel operates.

3.17 The Scientific Committee agreed that, although option 2 provided the best opportunity for distributing observer sampling effort, option 1 was scientifically useful and operationally feasible and accordingly the Scientific Committee advised the Commission that option 1 could be implemented for observer coverage in the 2010/11 and 2011/12 fishing seasons (Annex 6, paragraph 2.49 and Table 1). This option divides vessels into two groups and divides seasons into two periods (Table 4):

100% of vessels in the first vessel group is observed in the first period of 2010/11 and the second period of 2011/12. 100% of vessels in the second group is observed in the second period of 2010/11 and the first period of 2011/12. 20% of hauls are observed on each observed vessel in accordance with the priorities and methodologies as set out in the CCAMLR *Scientific Observers Manual*.

3.18 As notifications for 2011/12 are not currently available, the Scientific Committee agreed that observation in 2011/12 should correspond with option 1, including:

- (i) At least 50% of all vessels (and at least 50% of vessels of each Member participating in the fishery where that Member has two or more vessels participating in the fishery simultaneously) should be observed in each period during which they fish.
- (ii) Any vessel that fished in 2010/11 and did not carry an observer should carry an observer in 2011/12 irrespective of the period in which it fishes.

3.19 The Scientific Committee acknowledged that this implementation scheme, or any scheme with less than 100% vessel coverage, does not provide all the information required to make a full comparison of variability across vessels, spatial and temporal strata. The best scheme for achieving this is therefore 100% coverage.

3.20 The Scientific Committee agreed that the scheme for deployment outlined above may deliver, over a two-year period, the required level of coverage and sufficient scientific data to allow it to do its work. It therefore advised the Commission that CM 51-06 could be extended for the additional year required to complete the deployment scheme.

3.21 The Scientific Committee was pleased to note that China had initiated a scientific observer scheme on its krill fishing vessels in their first season of operation, taking six observers on two vessels (Annex 7, paragraphs 1.19 and 1.20).

3.22 The Scientific Committee acknowledged the increased level of observer data from fishing nations that increased the levels of understanding of krill biology and the operation of the fishery (paragraphs 3.21 and 3.23 to 3.25).

Surveys for krill

3.23 The Scientific Committee welcomed a Norwegian proposal for a krill fishing vessel to commit five days each year for the next five years to conduct research surveys in Subarea 48.2 (Annex 6, paragraphs 2.4 to 2.7). This is a major development that signals an active role for fishing vessels in providing scientific information which can be used for the management of the krill fishery.

3.24 Norway indicated that they would welcome Members' assistance in collecting predator overlap data and with the analysis of the acoustic data collected during these surveys, and that the results of these surveys would be submitted to CCAMLR.

3.25 The surveys will be standardised and will complement annual surveys conducted by the USA (in Subarea 48.1) and the UK (in Subarea 48.3), and, together, all three efforts could form an integrated monitoring program that potentially links the three areas containing major concentrations of krill and which are the focus of the commercial fishery. Germany indicated that it too was investigating the possibility of undertaking a survey in 2013 to link the US and Norwegian surveys. These surveys also provide the first opportunity to link land-based and marine research at the South Orkney Islands.

3.26 The Scientific Committee welcomed plans by Argentina to monitor krill larvae summer abundance in the Weddell Sea-Scotia Sea Confluence using a research vessel for

three years beginning in 2012, and noted that such monitoring has the potential to provide useful data on krill recruitment processes that may be indicative of spawning biomass (Annex 6, paragraphs 2.8 to 2.10).

3.27 The Scientific Committee thanked Norway and Argentina for developing these initiatives and agreed that the development of technical protocols for the calibration, collection, storage and analysis of data from acoustic surveys of krill from fishing vessels should be developed as a matter of priority by its working groups. It was noted that there are international protocols being developed for the collection of acoustic data by fishing vessels (when acoustic scientists are not present) which may assist WG-EMM in its development of specific protocols for the krill fishery; Russia agreed to provide these protocols for consideration by WG-EMM.

Krill biomass and catch limits

3.28 WG-EMM reviewed the work by SG-ASAM to correct the estimate of B_0 for Subareas 48.1 to 48.4, using data collected during the CCAMLR-2000 Survey (Annex 6, paragraphs 2.53 to 2.67). The Scientific Committee endorsed the recommendation of WG-EMM that, in the future, estimates of B_0 should use the full SDWBA model in preference to the simplified model (Annex 6, paragraph 2.56).

3.29 The Scientific Committee agreed that the recalculated B_0 estimate of 60.3 million tonnes with a sampling CV of 12.8%, derived from the full SDWBA model, represented the best estimate of krill biomass during the CCAMLR-2000 Survey. The value provided in 2007 was incorrect, and several errors were corrected in 2010.

3.30 On the basis of advice from WG-EMM (Annex 6, paragraph 2.69), the Scientific Committee recommended a new precautionary catch limit of 5.61 million tonnes for Subareas 48.1 to 48.4 (based on a harvest rate of 0.093) and agreed that this value would be appropriate for a revision of CM 51-01. It noted that the current trigger level (620 000 tonnes) is not linked to the assessment of B_0 and should not be changed at this time.

3.31 The Scientific Committee recommended that the corrections to implementation of the SDWBA model should be applied to krill biomass estimates for Divisions 58.4.1 and 58.4.2 to generate new estimates of B_0 and precautionary catch limits (Annex 6, paragraph 2.71). Given the notified catch for these regions, the present B_0 values and catch limits should remain until an appropriate reanalysis can be conducted.

3.32 The Scientific Committee endorsed WG-EMM's comments on the importance of investigating the potential impact of climate change on recruitment variability, and agreed that full review of the influence of recruitment variability on the calculation of sustainable yield be undertaken (Annex 6, paragraphs 2.72 to 2.78).

Krill meetings

3.33 The Scientific Committee noted the increasing international interest shown in krill, specifically recognising a recent Ukrainian–Russian seminar (CRAK-2010 – ‘Climate, South

Ocean Resources, CCAMLR and Antarctic Krill' on 27 and 28 September 2010, Kyiv, Ukraine (CCAMLR-XXIX/BG/35)). The seminar was organised with the assistance of the State Committee of Fisheries of Ukraine, Kyiv National Taras Shevchenko University and with support from the Antarctic Krill Conservation Project (PEW, ASOC). Key Russian, Ukrainian and Canadian experts, scientists and officials engaged in discussions of the issues of the South Ocean ecosystem, in particular Antarctic krill, and its consumers. Participants expressed concern about the unsatisfactory state of the current understanding of the krill-based ecosystem. Parties expressed their conviction in the rationale of conducting such meetings on a regular basis.

3.34 The EU announced that it is funding a workshop that aims to compile the state of knowledge about the impact of environmental change and increasing human exploitation on Antarctic krill, and to discuss potential implications for CCAMLR's ecosystem-based management approach. The Government of the Netherlands has expressed an increasing interest in CCAMLR-related work and will co-sponsor the workshop, which will be held in the Netherlands from 11 to 15 April 2011. The EU noted with concern that there may be a reduction in time available for discussions of krill biology and management at WG-EMM. The workshop aims to be complementary to CCAMLR and to contribute to WG-EMM.

Comments from Observers

3.35 ASOC presented its paper (CCAMLR-XXIX/BG/21). Interest in krill fishing continues to grow and catches have already exceeded 200 000 tonnes in 2009/10. Lack of sufficient information about abundance of krill and krill predator populations, their distribution and seasonal variability, predator-prey relationships and the effects of climate change are delaying the establishment of krill catch limits among SSMUs in Area 48. Uncertainties over krill escape mortality and the impact of krill fishing on fish larvae and krill predators are also concerning. These are urgent issues and ASOC called on CCAMLR's Scientific Committee to make recommendations to address them and for the Commission to act on them at this meeting.

Fish resources

Fisheries information

Catch, effort, length and age data reported to CCAMLR

3.36 Fishing took place in 15 fisheries targeting icefish (*Champsocephalus gunnari*), toothfish (*Dissostichus eleginoides* and/or *D. mawsoni*) and krill (*Euphausia superba*) under conservation measures in force in 2009/10 (CCAMLR-XXIX/BG/10 Rev. 1).

3.37 Three other fisheries were conducted in the Convention Area in 2009/10:

- fishery for *D. eleginoides* in the French EEZ in Division 58.5.1
- fishery for *D. eleginoides* in the French EEZ in Subarea 58.6
- fishery for *D. eleginoides* in the South African EEZ in Subareas 58.6 and 58.7.

3.38 The preliminary total catch of target species by country and region reported from fisheries conducted in the CAMLR Convention Area in 2009/10 is summarised in Table 2. Catches reported in 2008/09 are summarised in Table 1.

3.39 The Scientific Committee noted the estimates of catch and effort from IUU fishing (Annex 8, paragraphs 3.10 to 3.14, Tables 5 and 6).

3.40 The Scientific Committee noted the catches of toothfish from waters outside the Convention Area reported in the CDS (see Annex 8, paragraph 3.15 and Table 7) (see also paragraphs 3.45 to 3.47).

Research surveys

3.41 The Scientific Committee noted that two Members reported on bottom trawl surveys undertaken in 2009/10 (Annex 8, paragraphs 3.16 and 3.18):

- (i) a survey in Division 58.5.2 was carried out by Australia. The results from the survey were used to update assessments of icefish in this division;
- (ii) a survey in Subarea 48.3 was carried out by the UK. The results from the survey were used to update the assessment of icefish in this subarea.

3.42 The Scientific Committee thanked Australia and the UK for completing research surveys, the data from which will contribute to the long-term series of information on a number of finfish species besides icefish.

Tagging

3.43 The Scientific Committee noted the discussion by WG-FSA on tagging of toothfish, particularly in exploratory fisheries (Annex 8, paragraphs 3.25 to 3.32). The Scientific Committee noted that there have been significant improvements in matching recaptured tags to releases since the Secretariat started to manage the distribution of tags to vessels, and as interaction between data users, data providers and the Secretariat has improved.

3.44 The Scientific Committee noted the importance of returning photos or physical tags (preferably both) to the Secretariat to aid matching (Annex 8, paragraph 3.26), and suggested that otoliths from tagged fish may also be returned with the tags to the Secretariat for storage (see further discussion of this in paragraphs 3.55 to 3.57).

Tagging studies for *D. eleginoides* outside the Convention Area

3.45 Dr Barrera-Oro advised that the catch limit in the Argentine EEZ in Area 41 in 2009/10 was 3 250 tonnes, which was higher than the average level of 2 500 tonnes in the four previous seasons. Approximately 73% of the catch had been taken by longline vessels and 27% by bottom trawls. To date, 3 390 *D. eleginoides* have been tagged and released, but

only 20 tagged fish have been recaptured and reported. The majority of recaptures occurred in areas close to release areas, illustrating similar limited movements of toothfish to those reported for CCAMLR areas.

3.46 Prof. O. Pin (Uruguay) advised that approximately 551 tonnes of *D. eleginoides* had been caught by Uruguayan vessels fishing inside the Uruguayan EEZ and the Argentine–Uruguayan Common Fishing Zone (ZCPAU) in Area 41 in 2009/10. No tags have been released, nor were any tags originating in other tagging programs recovered in 2009/10.

3.47 The Scientific Committee noted that the results of tagging studies outside the Convention Area provide valuable information on the movement of toothfish which may assist with the understanding of toothfish behaviour inside the Convention Area. The Scientific Committee urged Members managing fisheries for *D. eleginoides* outside the Convention Area to provide information to WG-FSA on these fisheries next year and to attend the meetings of WG-FSA, if possible.

Management advice

3.48 Noting discussions during WG-FSA (Annex 8, paragraph 3.31), the Scientific Committee endorsed WG-FSA's recommendations for the Secretariat to translate existing signs and information about the tagging program into the languages commonly spoken by crews on board vessels active in exploratory fisheries, in addition to the CCAMLR official languages.

3.49 The Scientific Committee noted the advice of WG-FSA (Annex 8, paragraph 3.32) that various tag-specific parameters (e.g. tag-induced growth retardation, immediate post-tag mortality and tag loss) had originally been determined early in the tagging programs and endorsed recommendations made by WG-FSA to periodically review these parameters.

Biology, ecology and demography

3.50 The Scientific Committee noted the work of WG-FSA on biology, ecology and demography of target and by-catch species in the fisheries. This work is the foundation of understanding the impacts of fishing on these populations, and the Scientific Committee encouraged Members to continue to contribute such information to WG-FSA.

3.51 Prof. P. Arana (Chile) highlighted a Chilean study in Management Area A of Subarea 48.3 which demonstrated a higher CPUE and a greater frequency of large toothfish from some research hauls in this area. Prof. Arana confirmed that Chile will submit a research proposal in 2011 for studies to continue in this area in 2011/12 to further explore impacts of area closures on fish resources.

Management advice

3.52 The Scientific Committee noted that WG-FSA had considered a request from ad hoc TASO on whether it was useful for observers to continue collecting macroscopic gonad staging information (Annex 8, paragraph 8.14). The Scientific Committee recognised TASO's concern with respect to this matter, but requested that WG-FSA examine the issue in more detail in order to develop a more concrete program for implementation.

3.53 The Scientific Committee considered issues discussed by WG-FSA relative to the CCAMLR Otolith Network, including the current holdings of toothfish otoliths amongst Members with limited capacity for otolith preparation or reading (Annex 8, paragraphs 8.18 to 8.24). The Scientific Committee recognised that otoliths provide a valuable input to stock assessments and that finding a solution to the coordination of otolith reading in fisheries where Member capacity was lacking was paramount to developing assessments for these fisheries.

3.54 The Scientific Committee agreed that the coordination of age determination using otoliths from exploratory fisheries would be a suitable project for the General Science Capacity Special Fund, and requested that the practical and procedural issues associated with the proposal be progressed prior to its meeting in 2011.

3.55 Considering the practical issues, the Scientific Committee requested that in advance of the next meeting, the Secretariat be tasked with determining the location and extent of current otolith holdings amongst Members and whether these holdings could be stored at the Secretariat Headquarters until a time at which they could be processed. The Scientific Committee also requested WG-FSA at its next meeting to determine which otoliths and how many would need to be aged for assessment purposes.

3.56 The Scientific Committee agreed that in order to address the procedural aspects, the *ad hoc correspondence group to develop options to build SC-CAMLR capacity in science to support CCAMLR*, working with the Secretariat, should be requested to prepare a proposal to undertake otolith processing through a sub-contractual process using the General Science Capacity Special Fund and present this at SC-CAMLR-XXX, and that this proposal should include the following:

- (i) development of a tender process to select appropriately qualified service providers;
- (ii) development of decision-making process for tenders;
- (iii) development of a timetable for the progress of the proposal.

3.57 The Scientific Committee suggested that the General Science Capacity Special Fund could be applied in the same way for acoustic analysis required by SG-ASAM.

Preparation of assessment and assessment timetables

3.58 The Scientific Committee noted that WG-FSA had reviewed and endorsed the relevant sections of the WG-SAM report (Annex 8, paragraphs 4.1 and 4.2).

Review of preliminary stock assessment papers

3.59 The Scientific Committee noted that WG-FSA had reviewed preliminary stock assessments developed during the intersessional period for *D. eleginoides* and *D. mawsoni* in Subarea 48.4, and *C. gunnari* in Subarea 48.3 and Division 58.5.2, in preparation for the assessments. The discussions relative to preliminary assessments of these three fisheries are set out in Annex 8, paragraphs 4.4 to 4.13.

Assessments carried out and assessment timetable

3.60 The Scientific Committee noted that under the current arrangement for multi-year management, no new assessments were necessary this year for *Dissostichus* spp. fisheries in Subareas 48.3, 88.1 and 88.2 and Division 58.5.2.

3.61 Assessments were carried out for:

- *D. eleginoides* in Subarea 48.4
- *C. gunnari* in Subarea 48.3
- *C. gunnari* in Division 58.5.2.

3.62 All assessment work was undertaken by primary authors of the preliminary assessments, and reviewed independently at the WG-FSA meeting. The outcomes of the assessments were reported in the Fishery Reports (Annex 8, Appendices F to T).

Assessments and management advice

Dissostichus eleginoides South Georgia (Subarea 48.3)

3.63 The Fishery Report for *D. eleginoides* in Subarea 48.3 is contained in Annex 8, Appendix M and paragraphs 5.127 to 5.130.

3.64 The catch limit for *D. eleginoides* in the 2009/10 season was 3 000 tonnes and fishing commenced in this subarea on 26 April 2010 (CM 41-02, paragraph 5). The catch of *D. eleginoides* reported for this subarea in 2010 was 2 522 tonnes, with catches of 903 tonnes and 1 618 tonnes in Management Areas B and C respectively (in addition, <1 tonne was taken during a research survey). Following the advice of the Scientific Committee, the assessment was not updated in 2010.

Management advice

3.65 The Working Group did not undertake an assessment of this stock in 2010, and had no additional management advice. It therefore recommended that CM 41-02 be carried forward in its entirety for the 2010/11 fishing season.

3.66 In the 2009/10 fishing season, five vessels fished within the five-day early extension (26–30 April), with an average by-catch of 0.4 birds per vessel. In respect of a further season extension, the Scientific Committee noted that, according to CM 41-02, paragraph 6(i), the 2010/11 fishery could start on 21 April 2011.

Dissostichus spp. South Sandwich Islands (Subarea 48.4)

3.67 The Fishery Report for *D. eleginoides* in Subarea 48.4 is contained in Annex 8, Appendix N, and the discussion by WG-FSA is in Annex 8, paragraphs 4.4 to 4.6 and 5.131 to 5.137.

3.68 A tagging experiment has been conducted in Subarea 48.4 North over the last five years. This experiment was extended to Subarea 48.4 South in the 2008/09 fishing season. Currently, there is an assessment for Subarea 48.4 North, and 2009/10 was the second year of a three-year tagging experiment in Subarea 48.4 South.

3.69 In 2009/10, one New Zealand-flagged vessel and one UK-flagged vessel conducted research fishing and reported a total catch of 114 tonnes of *Dissostichus* spp. from Subarea 48.4 (Annex 8, Appendix N, Table 1(a)).

Dissostichus spp. Subarea 48.4 North

3.70 The catch limits for *D. eleginoides* and *D. mawsoni* in Subarea 48.4 North in the 2009/10 season were 41 tonnes and 0 tonnes (except for scientific purposes) respectively, with recorded catches of 40 tonnes and 0 tonnes respectively.

3.71 The Scientific Committee noted that a single CASAL assessment model had been used for *D. eleginoides* in Subarea 48.4 North. Discussions are presented in Annex 8, paragraphs 5.131 to 5.134.

Dissostichus spp. Subarea 48.4 South

3.72 The catch limit for *Dissostichus* spp. in Subarea 48.4 South in the 2009/10 season was 75 tonnes, with a recorded catch of 74 tonnes.

3.73 A preliminary assessment using the limited number of tag-recaptures to date and CPUE/area comparisons with Subarea 48.4 North suggested a vulnerable population of between 600 and 1 500 tonnes. This is lower than the estimate made in 2009, after the first season of fishing, which was based only on CPUE/area comparison (WG-FSA-09/18).

Management advice

3.74 The Scientific Committee recommended that the experiment in Subarea 48.4 South should be continued for another year, but with a reduced catch limit for *Dissostichus* spp. of

30 tonnes. The catch limit in Subarea 48.4 North should be revised to 40 tonnes of *D. eleginoides*. All other aspects of the current conservation measure (41-03) should remain unchanged.

Dissostichus eleginoides Kerguelen Islands (Division 58.5.1)

3.75 The Fishery Report for *D. eleginoides* in Division 58.5.1 is contained in Annex 8, Appendix O, and the discussion by WG-FSA is in Annex 8, paragraphs 4.14 to 4.17 and 5.138 to 5.145.

3.76 The catch of *D. eleginoides* reported for this division to October 2010 was 2 977 tonnes. Only longlining is currently permitted in the fishery. The estimated IUU catch for the 2009/10 season was zero in Division 58.5.1 (Annex 8, Appendix O).

3.77 The Scientific Committee noted that WG-FSA had reviewed progress toward the development of a formal stock assessment for *D. eleginoides* in Division 58.5.1 (Kerguelen) (Annex 8, paragraphs 4.14 to 4.17). The Scientific Committee encouraged the development of an integrated assessment model and recommended that a descriptive summary of the input data, the model stock and structural assumptions, and parameter values be submitted to WG-FSA and encouraged Members to collaborate on the development of a stock assessment for the area. Australia and France undertook to work together throughout the intersessional period in order to improve the stock assessment of the Kerguelen Plateau (Divisions 58.5.1 and 58.5.2).

3.78 The Scientific Committee recognised and appreciated the good progress that had been made in developing stock assessments for fisheries in Subarea 48.4 and Division 58.5.1.

Management advice

3.79 The Scientific Committee encouraged the estimation of biological parameters for *D. eleginoides* in Division 58.5.1 and encouraged the development of a stock assessment for this area. The Scientific Committee encouraged France to continue its tagging program in Division 58.5.1.

3.80 The Scientific Committee recommended that avoidance of fishing in zones of specific high rates of abundance in by-catch should also be considered and recommended that WG-FSA provide advice for by-catch mitigation in these areas. The Scientific Committee suggested that similar move-on rules to those used in other fisheries could be developed and encouraged Members to participate in WG-FSA to better facilitate this process.

3.81 No new information was available on the state of fish stocks in Division 58.5.1 outside areas of national jurisdiction. The Scientific Committee therefore recommended that the prohibition of directed fishing for *D. eleginoides*, described in CM 32-13, remain in force.

Dissostichus eleginoides Heard Island (Division 58.5.2)

3.82 The Fishery Report for *D. eleginoides* in Division 58.5.2 is contained in Annex 8, Appendix P, and the discussion by WG-FSA is in Annex 8, paragraphs 5.146 to 5.148.

3.83 The catch limit of *D. eleginoides* in Division 58.5.2 for the 2009/10 season was 2 550 tonnes (CM 41-08) and catch of *D. eleginoides* reported for this division by October 2010 was 1 881 tonnes. The longline fishery was active from April to September 2010 and took 1 237 tonnes; the trawl fishery was active throughout the whole season and took the remainder of the catch. The estimated IUU catch for the season was 0 tonnes.

Management advice

3.84 The Scientific Committee did not undertake an assessment of this stock in 2010, and had no additional management advice. The Scientific Committee therefore recommended that CM 41-08 be carried forward in its entirety for the 2010/11 fishing season.

Dissostichus eleginoides Crozet Islands (Subarea 58.6)

3.85 The Fishery Report for *D. eleginoides* in Subarea 58.6 (French EEZ) is contained in Annex 8, Appendix Q, and the discussion by WG-FSA is in Annex 8, paragraphs 5.149 to 5.154.

3.86 The catch of *D. eleginoides* reported for this subarea to October 2010 was 512 tonnes. Only longlining is currently permitted in the fishery. The estimated IUU catch for the 2009/10 season was zero inside Subarea 58.6 (Annex 8, Appendix Q).

3.87 The standardised CPUE series for this fishery was not updated by WG-FSA in 2010.

Management advice

3.88 The Scientific Committee encouraged the estimation of biological parameters for *D. eleginoides* in Subarea 58.6 (French EEZ), and the development of a stock assessment for this area. The Scientific Committee encouraged France to continue its tagging program in Subarea 58.6.

3.89 The Scientific Committee recommended that avoidance of zones of specific high by-catch abundance should also be considered.

3.90 No new information was available on the state of fish stocks in Subarea 58.6 outside areas of national jurisdiction. The Scientific Committee therefore recommended that the prohibition of directed fishing for *D. eleginoides*, described in CM 32-11, remain in force.

Dissostichus eleginoides Prince Edward and
Marion Islands (Subareas 58.6 and 58.7) inside the EEZ

3.91 The Fishery Report for *D. eleginoides* in Subareas 58.6 and 58.7 inside the South African EEZ is contained in Annex 8, Appendix R, and the discussion by WG-FSA is in Annex 8, paragraphs 5.155 to 5.159.

3.92 The catch reported for Subareas 58.6, 58.7 and FAO Area 51 as of 5 October 2010 was 84 tonnes (21 tonnes within the CCAMLR area and 63 tonnes within the South African EEZ but outside the CCAMLR area), all of which was taken by longlines. There was no evidence of IUU catch in 2009/10.

3.93 The standardised CPUE series was not updated by WG-FSA in 2010.

Management advice

3.94 The Scientific Committee recommended that CCAMLR decision rules also be used in estimating yields for this fishery, but also noted that South Africa is considering the adoption of an operational management procedure approach (SC-CAMLR-XXVII, Annex 7, paragraphs 6.1 to 6.3) which addresses previous concerns over the sensitivity of the ASPM to weightings used for different data sources and the estimation of recruitment levels for forward projections. The Scientific Committee noted that a catch limit for 2010 has not been set as yet, but it is likely to be in the range of 250–450 tonnes.

3.95 No new information was available on the state of fish stocks in Subareas 58.6 and 58.7 and Division 58.4.4 outside areas of national jurisdiction and therefore the Scientific Committee recommended that the prohibition of directed fishing for *D. eleginoides*, described in CMs 32-10, 32-11 and 32-12, remain in force.

Champscephalus gunnari South Georgia (Subarea 48.3)

3.96 The Fishery Report for *C. gunnari* at South Georgia (Subarea 48.3) is contained in Annex 8, Appendix S, and discussion by WG-FSA is in Annex 8, paragraphs 4.8 to 4.11 and 5.161 to 5.166.

3.97 In the 2009/10 fishing season the catch limit set for *C. gunnari* in Subarea 48.3 was 1 548 tonnes. During the 2009/10 season the fishery caught 12 tonnes by 10 October 2010 (including 11 tonnes caught during the research survey).

3.98 The Scientific Committee noted that WG-FSA had agreed that the short-term assessment for *C. gunnari* in Subarea 48.3 be implemented using the length-based method (WG-FSA-10/37) in order to calculate catch limits in accordance with the CCAMLR decision rules for icefish.

Management advice

3.99 The Scientific Committee recommended that the catch limit for *C. gunnari* should be set at 2 305 tonnes in 2010/11 and 1 535 tonnes in 2011/12 based on the outcome of the short-term assessment.

Champscephalus gunnari Heard Island (Division 58.5.2)

3.100 The Fishery Report for *C. gunnari* in Division 58.5.2 is contained in Annex 8, Appendix T, and discussion by WG-FSA is in Annex 8, paragraphs 4.12 and 4.13 and 5.167 to 5.173.

3.101 The catch limit of *C. gunnari* in Division 58.5.2 for the 2009/10 season was 1 658 tonnes. The catch reported for this division as at 10 October 2010 was 365 tonnes.

3.102 The Scientific Committee noted that the short-term assessment was implemented by means of the GYM, using the one-sided bootstrap lower 95% confidence bound of total biomass from the 2010 survey. Revised growth parameters described in WG-FSA-10/12 were also used, all other parameters were the same as in previous years.

Management advice

3.103 The Scientific Committee recognised the importance of discussions during WG-FSA (Annex 8, paragraph 5.171) highlighting that additional work remains outstanding from the Workshop on Assessment Methods for Icefish (SC-CAMLR-XX, Annex 5, Appendix D) to evaluate whether the short-term projection method could be problematic for stocks at very low or of highly variable abundance because the method will always project a precautionary yield. The Scientific Committee also noted that this work will contribute to addressing the CCAMLR PRP recommendation whether a rebuilding strategy needs to be employed for such stocks when they have low levels of biomass. The Scientific Committee encouraged Members to work on this issue for Division 58.5.2 and Subarea 48.3 as a matter of priority.

3.104 The Scientific Committee recommended that the catch limit for *C. gunnari* in 2010/11 should be set at 78 tonnes.

3.105 The Scientific Committee recommended that other measures in the conservation measure be carried forward.

Other fisheries

Antarctic Peninsula (Subarea 48.1) and South Orkney Islands (Subarea 48.2)

3.106 The Scientific Committee noted that there was no new information available for the 2009/10 season for these subareas.

3.107 The Scientific Committee recommended that the existing CMs 32-02 and 32-04 on the prohibition of finfishing in Subareas 48.1 and 48.2 respectively remain in force.

Crab resources

Crabs (*Paralomis* spp.) (Subarea 48.2)

3.108 An exploratory fishery for crabs in Subarea 48.2 was carried out for the first time in 2009/10. The fishery was undertaken in accordance with the requirements of CM 52-02, and a total of 79 140 pot hours and 17 sets were completed by one vessel. Only three *Paralomis formosa* males were captured.

3.109 Dr Bizikov confirmed that an international observer and a Russian observer had been on board the vessel during fishing operations in Subarea 48.2. Russia has submitted observer reports to the Secretariat and planned to analyse biological data on crabs and submit the full results to WG-FSA in 2011.

Management advice

3.110 No Member has notified its intention to fish for crabs in Subarea 48.2 in the 2010/11 fishing season. The Scientific Committee endorsed the advice of WG-FSA that the crab fishery in Subarea 48.2 was not likely to be viable (Annex 8, paragraph 5.184) and accordingly recommended that CM 52-02 not be renewed for the 2010/11 fishing season.

Crabs (*Paralomis* spp.) (Subarea 48.3)

3.111 One vessel (Russia) fished for crabs in the 2009/10 fishing season from August to 15 October 2010. The Scientific Committee noted that vessel and observer (UK) data could not be submitted in time for analysis at WG-FSA-10, but strongly encouraged Russia to provide a full analysis of the data collected for WG-FSA-11.

3.112 Russia confirmed plans to submit a notification to CCAMLR to fish for crabs in this subarea in 2010/11.

Management advice

3.113 With no new information available on the stock status of crabs or the conduct of the fishery in Subarea 48.3, the Scientific Committee was unable to provide new advice and recommended that CM 52-01 remain in force.

Crabs (*Paralomis* spp.) (Subarea 48.4)

3.114 The Scientific Committee noted that no vessels fished for crabs in Subarea 48.4 in 2009/10 and therefore no new information was available on stock status in this area.

Management advice

3.115 No Member has notified its intention to fish for crabs in Subarea 48.4 in the 2010/11 fishing season. The Scientific Committee was unable to provide new advice and recommended that CM 52-03 not be renewed for the 2010/11 fishing season.

Fish and invertebrate by-catch

Data reporting for by-catch species

3.116 The Scientific Committee noted that there had been some difficulty in interpretation of reporting requirements for by-catch that is retained when caught south of 60°S, as required under CMs 26-01, 41-04 and 41-11, and subsequently discarded as offal when the vessel is north of 60°S (Annex 8, paragraphs 6.8 and 6.9).

3.117 The Scientific Committee agreed that further guidance on reporting requirements be provided to both vessels and observers by way of additional detail in the instructions on the relevant data reporting forms as follows (Annex 8, paragraph 6.10):

- C2 Retained: Individuals landed and retained on board the vessel. Some retained product may be disposed at sea at a later date in accordance with conservation measures in force for the relevant subarea or division.
- C2 Discarded: Individuals landed on board the vessel and immediately discarded overboard. This excludes individuals released alive. 'Discards' are defined as whole fish or other organisms returned to the sea dead or with low expectation of survival. Discards are prohibited south of 60°S (see CM 26-01).

The above changes should also be made to the other relevant C forms (e.g. C1, C3, C5).

- L5 Observed number discarded dead: Observed number caught, landed on board then discarded (including factory discards) during the hauling period. This is equivalent to the C2 Discarded above. This DOES NOT include individuals released alive or lost, or those individuals which are retained for processing and discarded at a later date, in accordance with the conservation measures in force for the relevant subarea/division.

Year-of-the-Skate

3.118 The Scientific Committee noted the general success of the initiatives undertaken during the Year-of-the-Skate and noted the need to continue to collect data on tagged skates, and endorsed the advice of WG-FSA, including:

- (i) removing the requirement for tagging of one in five skates in new and exploratory fisheries from paragraph 2(iii) in CM 41-01, Annex C; paragraph 13 of CM 41-04, 41-09 and 41-10; paragraph 11 in CM 41-05; and paragraph 14 in CMs 41-06 and 41-07 (Annex 8, paragraph 6.27);
- (ii) using the tagging protocols developed during the Year-of-the-Skate, including tagging with T-bar tags, where any further tagging is carried out by Members (Annex 8, paragraph 6.21);
- (iii) replacing the existing text in CM 33-03, paragraph 4, with (Annex 8, paragraph 6.26):

On all vessels, all skates must be brought on board or alongside the hauler to be scanned for tags and for their condition to be assessed.

3.119 The Scientific Committee also endorsed the advice (Annex 8, paragraph 6.28) to replace the text in paragraph 2(vi) of CM 41-01, Annex C, with the following:

- (vi) recaptured tagged toothfish should be biologically sampled (length(s), weight, sex, gonad stage), an electronic time-stamped photograph should be taken of the removed tag alongside the recovered otoliths, detailing the number and colour of the tag;
- (vii) recaptured tagged skates should be biologically sampled (all length(s), weight, sex, gonad stage), two electronic time-stamped photographs should be taken; one of the whole skate with tag attached, and one close-up of the tag detailing the number and colour of the tag.

3.120 The Scientific Committee noted that WG-FSA had requested the Scientific Committee to consider a system of incentives to encourage crew to continue to scan skates for tags (Annex 8, paragraphs 6.29 and 6.30). It was noted that such incentives may also assist with the recovery of tagged toothfish where they are captured by vessels outside the Convention Area, and that incentive systems have been shown to improve the rates of reporting of tags in some fisheries outside the Convention Area.

3.121 The Scientific Committee agreed that the potential for poor reporting of tagged toothfish and skates was an issue that should be brought to the attention of SCIC. It further requested that the Commission consider methods for improving the reporting of tagged skates and tagged toothfish recaptured outside the Convention Area.

Focused data collection for macrourids in the Convention Area

3.122 The Scientific Committee noted the discussion by WG-FSA on the need for focused data collection for macrourids. It endorsed the advice of WG-FSA that during 2010/11 observers be asked to focus on correctly identifying macrourids to species. To assist WG-FSA with evaluating the need for a fully focused data collection program on macrourids in 2011/12, it also encouraged Members to analyse available data to determine key gaps not currently being addressed (Annex 8, paragraph 6.35).

Review of move-on rules

3.123 The Scientific Committee noted that WG-FSA had reviewed the move-on rules for macrourids and rajids in Subarea 48.4 under CM 41-03, and endorsed its advice that these rules should remain unchanged in 2010/11 (Annex 8, paragraph 6.42).

IUU gillnetting

3.124 The Scientific Committee noted that no new information was available to WG-FSA on the levels and types of by-catch resulting from gillnet fishing as conducted by IUU vessels (Annex 8, paragraph 6.44). It encouraged Members to collect any information that may reduce the uncertainty in IUU gillnet by-catch, and provide such data for consideration by WG-FSA.

New and exploratory finfish fisheries

Review of experience with new and exploratory fisheries: development of a research framework for data-poor fisheries

3.125 The Scientific Committee recognised that WG-FSA had engaged in a review of fisheries described as ‘data-poor’ and that this was directly relevant to the Performance Review Rec. 3.1.1.2.

3.126 The term ‘data-poor fisheries’ was considered by WG-FSA as referring to a fishery for which a robust stock assessment that provides advice on catch limits according to CCAMLR decision rules has not been developed due to lack of information. At present, robust assessments of stock status of toothfish are lacking in many areas (e.g. Subareas 48.6 and 58.4). For the purposes of this report, the Scientific Committee has adopted the term ‘data-poor exploratory fisheries’ to include all those fisheries that are closed or exploratory fisheries for which stock assessments are lacking.

3.127 The Scientific Committee noted the following points in clarifying how research in exploratory fisheries could be advanced:

- (i) research requirements that require special allocation of catch by the Commission, including research catch in closed areas, would be considered to be CCAMLR-sponsored research;
- (ii) the term ‘data-poor fisheries’ had been useful in WG-FSA to separate the Ross Sea exploratory fishery for *Dissostichus* spp. from other exploratory fisheries; some of the exploratory fisheries, including those in Divisions 58.4.4 and 58.4.3b, have been closed or had the catch limit set to zero on the basis of advice from the Scientific Committee;
- (iii) a consideration by WG-FSA of research standards to be met by commercial fishing vessels if they are to participate in research for CCAMLR purposes is an important part of the WG-FSA advice on data-poor exploratory fisheries and is the issue for which WG-FSA has least information. Methods for research and assessments of toothfish are well established, whereas the difficulties in the implementation of the research programs seem to be the greatest gap.

3.128 The Scientific Committee agreed that the characteristics of data-poor exploratory fisheries matched the definition of an exploratory fishery given in CM 21-02, paragraph 1(ii). A number of fisheries in the Convention Area may currently be described as data-poor and continue to match the definition of an exploratory fishery (Table 5). Those that currently carry substantial fishing activity are in Subarea 48.6 and Divisions 58.4.1 and 58.4.2 where, despite many years of a structured research and tagging program, data are currently insufficient to undertake a stock assessment. The Scientific Committee agreed that its objective for all fisheries is to develop management advice on catch levels consistent with Article II of the CAMLR Convention.

3.129 It was noted that, of all the exploratory fisheries for toothfish, robust information on abundance and yield, and advice on appropriate harvest levels, was only available for the fisheries in Subarea 88.1 and SSRU 882E. The Scientific Committee noted that for these fisheries all requirements in paragraph 1 of CM 21-02 have now been met (Table 5). The research and assessment work in these areas has led to an evaluation of the distribution, abundance and demography of *D. mawsoni* leading to an estimate of the potential yield of the fisheries, many reviews of the potential impact of the fisheries on dependent and related species, and allowed the Scientific Committee to formulate and provide advice to the Commission on appropriate harvest levels and other aspects of conservation over the last eight years.

3.130 The Scientific Committee recalled that the characteristics of successful assessments included the use of well-designed experiments to develop an integrated tag-based assessment of *Dissostichus* spp. in Subarea 48.4 (SC-CAMLR-XXVIII, paragraph 4.87), and the use of a multi-national multi-year tag-based assessment for Subareas 88.1 and 88.2. In recalling these successful experiments, the Scientific Committee agreed that concentrating tagging effort spatially was a key factor that led to the success of the tag-based assessment. Further, the Scientific Committee noted that successful assessments in Subarea 48.3 and Division 58.5.2 have also included data collected from trawl surveys.

3.131 The Scientific Committee agreed that the research standards to be met by commercial vessels if they are to participate in research for CCAMLR purposes is an important issue. It further considered that the standard of research applied by vessels fishing in exploratory fisheries as carried out under the research data and collection plan (CM 41-01) should also be of a high level. The Scientific Committee also agreed that trawl surveys of juvenile and young adults could also contribute to successful stock assessments.

3.132 The Scientific Committee endorsed the generalised work plan developed by WG-FSA for implementing research in data-poor exploratory fisheries as summarised in Annex 8, paragraph 5.11 (see also Item 9).

3.133 The Scientific Committee recommended that some specific elements of the work plan be considered as a high priority focus topic for WG-SAM in the coming intersessional period with the following terms of reference:

WG-SAM focus topic: work plan for implementing research proposals for data-poor exploratory fisheries. To consider:

- (i) methods for evaluating capability of vessels and gear types to contribute to research outcomes and for calibrating vessels and gears, including specific case studies relevant to current exploratory fisheries such as in tag-recapture programs;
- (ii) proposed research designs and data collection protocols for estimating stock status in data-poor exploratory fisheries;
- (iii) methods for assessing stock status in data-poor exploratory fisheries.

New and exploratory toothfish fisheries

3.134 Seven exploratory longline fisheries for *Dissostichus* spp. were agreed for the 2009/10 season (CMs 41-04 to 41-07 and 41-09 to 41-11), an exploratory trawl fishery for *E. superba* in Subarea 48.6 (CM 51-05), and exploratory fisheries for crab in Subareas 48.2 and 48.4 (CMs 52-02 and 52-03). Activities in the exploratory fisheries are outlined below and summarised in Annex 8, Table 1. The planned exploratory fishery for krill in Subarea 48.6 was not carried out.

3.135 Nine Members notified for exploratory longline fisheries for *Dissostichus* spp. in Subareas 48.6, 88.1 and 88.2 and Divisions 58.4.1, 58.4.2, 58.4.3a and 58.4.3b for the 2010/11 season (Annex 8, Table 8). Another Member (France) withdrew its notifications for Subareas 88.1 and 88.2 prior to the meeting.

Tagging in exploratory toothfish fisheries

3.136 Under CM 41-01, each longline vessel fishing in exploratory fisheries for *Dissostichus* spp. in 2009/10 was required to tag and release *Dissostichus* spp. at a specified rate per tonne (Annex 8, Table 10). All vessels achieved the required tagging rate. Consideration of the

cumulative tag-releases prepared by the Secretariat showed that in exploratory fisheries all vessels released tags continuously, at or above the required rates, throughout their fishing trips.

3.137 Each longline vessel fishing in exploratory fisheries for *Dissostichus* spp. in 2009/10 was also required to tag and release *Dissostichus* spp. in proportion to their occurrence by size and species in the catch. The Scientific Committee noted that the analyses of the tag overlap statistic by WG-FSA showed that in most subareas/divisions at least one vessel had achieved a high ($\geq 60\%$) overlap between tag-release length frequency and catch-weighted length frequency (Annex 8, paragraphs 5.18 to 5.21, Table 12). The Scientific Committee agreed that a high overlap statistic was achievable by all vessels fishing in exploratory fisheries.

3.138 The Scientific Committee was encouraged to see that many vessels had improved their performance over the last three years, and that, for example, the *Tronio* in Subarea 88.1 had improved from 20% in 2009 to 62% in 2010. However, it also noted that despite its advice from last year on this issue (SC-CAMLR-XXVIII, paragraphs 4.148 to 4.151), there are still some vessels whose overlap statistic is low ($< 30\%$) – *Insung No. 1* in Subarea 88.1, *Jung Woo No. 2* in Subarea 88.1 and *Jung Woo No. 3* in Subarea 88.2. Furthermore, although *Insung No. 1* achieved a medium score for *D. eleginoides* in Subarea 48.6, it failed to tag any of the 2 404 much larger *D. mawsoni* caught in the same subarea, making it impossible to estimate a statistic.

3.139 The Scientific Committee recalled its advice from last year that tagging large numbers of small fish in these exploratory fisheries would have very limited use for the estimation of abundance (SC-CAMLR-XXVIII, paragraph 4.150). It reiterated its concern that the failure to tag a representative part of the fished population was seriously undermining its ability to carry out robust stock assessments in the exploratory fisheries. The Scientific Committee recommended that the issue of achieving compliance with the tagging requirements of CM 41-01, Annex C, be considered by SCIC.

3.140 The Scientific Committee considered that Members with vessels which had consistently low overlap statistics should advise their vessels to implement CM 41-01, Annex C, by translating the requirement to tag toothfish at a particular rate per tonne into a corresponding rate per number of fish. The appropriate tagging rate per number of fish will vary in different areas as a function of the average weight of the fish. The indicative tagging rate per number of fish to achieve the conservation measure is given by subarea/division and SSRU in Table 6. This could be implemented on the vessel by systematically selecting every *N*th fish for tagging, noting that if that fish is in poor condition, the next fish in good condition should be tagged instead. Thus, for example, in SSRU 486A every 20th fish should be tagged. It also recalled that a paper had been submitted to WG-FSA in 2007 which outlined methods by which large toothfish could be tagged in good condition (WG-FSA-07/36), and advised that vessels consider such methods when tagging larger fish.

3.141 The Scientific Committee requested that the Commission take appropriate action for all vessels to achieve a high ($\geq 60\%$) overlap between tag-release length-frequency and catch length-frequency data and that CM 41-01, Annex C, be altered to reflect this. The equation for calculating the overlap statistic is given below:

$$\theta = \left(1 - \frac{\sum_{i=1}^n |P_i - P_c|}{2} \right) \times 100$$

where P_i was the proportion of all fished tagged in length bin i , P_c was the proportion of all fish caught (i.e. the sum of all the fish caught and either landed or tagged and released), for 20 cm length bins. θ is therefore one minus half the sum of the absolute differences in the proportions-at-length in 20 cm length bins, over the range of the data, expressed as a percentage.

3.142 To assist Members in meeting this threshold, the Scientific Committee suggested that vessels could use the indicative tagging rate outlined in Table 6, and included in the CCAMLR Tagging Protocol.

3.143 The Scientific Committee recommended that the tag overlap statistic should be the metric by which compliance with CM 41-01 is evaluated and noted that the indicative tag rates in Table 6 are provided for information purposes only.

3.144 The very low recovery of tags from the exploratory fisheries in Subareas 48.6 and 58.4 remains a concern. A number of possible reasons for the low recovery rates had been identified by WG-FSA (Annex 8, paragraphs 5.22 to 5.24), but the continued lack of information coming from these fisheries makes it difficult to provide advice on precautionary catch limits for these fisheries.

3.145 The Scientific Committee agreed that the continuation of fishing, when combined with the continuing absence of information, may increase the uncertainty over whether the stock status is above safe levels.

Other issues in exploratory fisheries

3.146 The use and implementation of research hauls was reviewed by WG-SAM (Annex 4, paragraphs 3.5 to 3.9) and by WG-FSA (Annex 8, paragraphs 5.25 to 5.28). They agreed that the current single allocation of starting positions could be augmented in areas of sea-ice by providing each vessel with up to three random lots of start positions for the required research hauls in a given SSRU. Since 2002/03, a total of 1 654 research hauls had been made in the exploratory fisheries in Subareas 48.6 and 58.4, and the Scientific Committee noted that WG-FSA had considered there was likely to be sufficient data available by 2011 to review these data at its next meeting.

3.147 The Scientific Committee noted that an approach for determining and summarising data collection requirements (including catch and effort data, length, sex, gonad stage sampling, tagging and VME reporting requirements) in Subareas 88.1 and 88.2 had been developed by New Zealand (Annex 8, paragraphs 5.31 to 5.33). The Scientific Committee agreed that the table of data collection requirements outlined in Annex 8, Table 16, provided a useful summary of the data collection requirements in Subareas 88.1 and 88.2, and that such a table would be a useful summary to have for all CCAMLR fisheries.

3.148 The Scientific Committee requested the Secretariat prepare a table of the data collection requirements for each new and exploratory fishery that summarises the data collected, frequency of data collection (i.e. samples per thousand hooks), and the rationale for that frequency, following the format outlined in Annex 8, Table 16. The Scientific Committee recommended these tables be used by WG-FSA in 2011 to review the data collection requirements in each fishery, and should be included within the Fishery Reports as a description of the data collection required.

Dissostichus spp. Subarea 48.6

3.149 Two Members (Japan and the Republic of Korea) and three vessels fished in Subarea 48.6 SSRUs D and E in 2009/10. The precautionary catch limit for *Dissostichus* spp. was 200 tonnes north of 60°S (SSRUs A and G) and 200 tonnes south of 60°S (SSRUs B–F). Information on this fishery is summarised in Annex 8, Appendix F.

3.150 The combined SSRUs B, C, D, E and F were closed on 21 March 2010 (catch limit for *Dissostichus* spp.: 200 tonnes; final reported catch: 197 tonnes). The combined SSRUs A and G (catch limit for *Dissostichus* spp.: 200 tonnes; reported catch to date: 98 tonnes) are currently open and one vessel was fishing. There was no evidence of IUU fishing in 2009/10.

3.151 The total number of tag-recaptures increased to 12 in Subarea 48.6 in 2009/10. However, there are still very few tag-recaptures from this subarea, and no progress could be made on assessments of *D. eleginoides* in Subarea 48.6. The overlap in size frequency of tagged fish with the overall size frequency of fish caught was medium for two vessels and high for one vessel which fished in 2009/10. One vessel which had fished in SSRUs A and G, where both species of *Dissostichus* occur, had not tagged any *D. mawsoni* (see Annex 8, Appendix F, Figure 3).

3.152 Three Members (Japan, Republic of Korea and South Africa) and a total of six vessels notified their intention to fish for toothfish in Subarea 48.6 in 2010/11.

Dissostichus spp. Division 58.4.1

3.153 Two vessels from two Members (Japan and the Republic of Korea) fished in the exploratory fishery in Division 58.4.1 in 2009/10. The precautionary catch limit for toothfish was 210 tonnes in three SSRUs (C: 100 tonnes, E: 50 tonnes and G: 60 tonnes), of which 196 tonnes were taken between 1 December 2009 and 20 February 2010. Information on this fishery is summarised in Annex 8, Appendix G.

3.154 High levels of IUU fishing have been reported in 2005/06 and 2006/07 and an estimated IUU catch of 910 tonnes was taken in 2009/10.

3.155 Vessels were required to tag and release *Dissostichus* spp. at a rate of three fish per tonne of green weight caught and both vessels achieved the target rate. A total of 5 012 *D. mawsoni* and 314 *D. eleginoides* have been tagged and released in Division 58.4.1, and 20 *D. mawsoni* and one *D. eleginoides* have been recaptured in that division. In 2009/10,

615 *D. mawsoni* and 12 *D. eleginoides* were tagged with three *D. mawsoni* and one *D. eleginoides* recaptured. The vessels in Division 58.4.1 had a medium level of overlap in the size frequency of tagged fish with the overall size frequency of fish caught.

3.156 Five Members (Japan, Republic of Korea, New Zealand, South Africa and Spain) and a total of 11 vessels notified their intention to fish for toothfish in Division 58.4.1 in 2010/11.

Dissostichus spp. Division 58.4.2

3.157 In 2009/10, the exploratory fishery for *Dissostichus* spp. in Division 58.4.2 was limited to Japanese, Korean, New Zealand, Spanish and Uruguayan vessels using longlines only. Only one Member (Republic of Korea) fished in the division and reported a catch of 93 tonnes. SSRU E was closed on 17 February 2010 (SSRU E catch limit for *Dissostichus* spp.: 40 tonnes; final reported catch: 40 tonnes), and SSRU A and consequently the fishery was closed on 24 February 2010 (SSRU A catch limit for *Dissostichus* spp.: 30 tonnes; final reported catch: 53 tonnes). The other SSRUs (B, C and D) were closed to fishing. Information on this fishery is summarised in Annex 8, Appendix H.

3.158 The fishery targeted *D. mawsoni* and operated in SSRUs A and E in 2009/10. It was estimated that 432 tonnes of *D. mawsoni* were taken by IUU fishing in 2009/10.

3.159 A total of 291 toothfish were tagged and released in 2009/10 and no tagged toothfish were recaptured. The vessel in Division 58.4.2 achieved the target tagging rate of three tags per tonne of green weight with a high level of overlap in the size frequency of tagged fish with the overall size frequency of fish caught.

3.160 Five Members (Japan, Republic of Korea, New Zealand, South Africa and Spain) and a total of eight vessels notified their intention to fish for toothfish in Division 58.4.2 in 2010/11.

Dissostichus spp. Division 58.4.3a

3.161 In 2009/10, the exploratory fishery for *Dissostichus* spp. in Division 58.4.3a was limited to Japanese and Korean vessels using longlines only. The precautionary catch limit for toothfish was 86 tonnes, but no vessel participated in this fishery. Information on this fishery is summarised in Annex 8, Appendix I.

3.162 There was no evidence of IUU fishing in 2009/10.

3.163 No toothfish were tagged and released in 2009/10 and no tagged toothfish were recaptured during that season.

3.164 One Member (Japan) and one vessel notified their intention to fish for toothfish in Division 58.4.3a in 2010/11.

Dissostichus spp. Division 58.4.3b

3.165 In 2009/10, the exploratory fishery for *Dissostichus* spp. in Division 58.4.3b was limited to research fishing conducted by Japanese, Korean, South African and Uruguayan vessels using longlines only, and no more than one vessel per country was permitted to fish at any one time. In November 2007, the division was divided into two SSRUs: A north of 60°S and B south of 60°S. In November 2008, the area north of 60°S was further subdivided into four SSRUs (A, C, D and E). The precautionary catch limit for *Dissostichus* spp. in the fishery was set to zero tonnes in each SSRU. An additional limit of 72 tonnes was set for research fishing between 1 December 2009 and 31 March 2010 within four designated sampling sectors (CM 41-07, Annex A, Figure 1). Information on this fishery is summarised in Annex 8, Appendix J.

3.166 In 2009/10, one Member (Japan) and one vessel participated in research fishing. The vessel operated in the southeastern sampling sector and reported a total catch of 14 tonnes of *Dissostichus* spp. (*D. eleginoides*: 2 tonnes, *D. mawsoni*: 12 tonnes).

3.167 Information on IUU activities indicated that 171 tonnes of toothfish were taken in 2009/10.

3.168 A total of 60 toothfish were tagged and released in 2009/10, including eight *D. eleginoides* and 52 *D. mawsoni*. One tagged toothfish (*D. eleginoides*) was recaptured during the 2009/10 season. The vessel in Division 58.4.3b had only a medium level of overlap in the size frequency of tagged fish with the overall size frequency of fish caught.

3.169 One Member (Japan) and one vessel notified their intention to fish for toothfish in Division 58.4.3b in 2010/11.

3.170 The Scientific Committee noted that WG-FSA had considered a research fishing proposal tabled by Japan during WG-FSA-10 (Annex 8, paragraphs 5.69 to 5.73). It concurred with the general advice provided by WG-FSA in relation to the 2011 research proposal to conduct research fishing on BANZARE Bank outlined in those paragraphs. It further noted that the sampling design undertaken for the proposed research in Division 58.4.3b was not submitted for review by any SC-CAMLR working group, and recommended that future research plans be reviewed by WG-FSA.

3.171 Dr K. Taki (Japan) noted that the distribution and abundance of *Dissostichus* spp. were only surveyed in the southeastern sector by the Japanese vessel during the 2009/10 survey, and that no new data were collected from the remaining three sectors. He reiterated the need to obtain new information for all four sectors in any subsequent surveys.

3.172 The Scientific Committee recalled its previous advice (SC-CAMLR-XXVIII, paragraph 4.165) noting the need for research plans to deliver data that would lead to stock assessments. The proposal by Japan acknowledged the need to move toward tag-based assessments, and suggested that the proposed research fishing for 2011 will lead to this objective. However, it also noted that without a minimum estimate of biomass it is very difficult to determine the total number of tags required to be released, or subsequent tagging rates for proposed removals to achieve biomass estimates with target CVs as recommended previously. It agreed that such research proposals could consider the possibility of conducting

trawl surveys as an alternative method to using longline methods for establishing initial biomass estimates that could be used to inform the design of longer-term tagging programs.

Management advice on Subarea 48.6 and
Divisions 58.4.1, 58.4.2, 58.4.3a, 58.4.3b

3.173 The Scientific Committee agreed that it could provide no new advice on catch limits for Subarea 48.6 and Divisions 58.4.1, 58.4.2 and 58.4.3a.

3.174 Should the Commission agree catch limits for the exploratory fisheries in Subarea 48.6 and Divisions 58.4.1, 58.4.2 and 58.4.3a, the Scientific Committee recommended that all measures in the research and data collection plans, including the requirement to tag toothfish at the rate of three toothfish per tonne and the requirement for research hauls, be retained.

3.175 The Scientific Committee noted that a research plan for data-poor exploratory fisheries was being developed which could provide advice for these subareas and divisions in the future (Annex 8, paragraphs 5.1 to 5.12).

3.176 In progressing a research plan to develop *D. mawsoni* assessments for Division 58.4.1, the Scientific Committee encouraged Members to collaborate in the intersessional period to progress elements of the generalised work plan (Annex 8, paragraphs 5.10 to 5.12), and in particular to provide inputs over the biology and ecology of *D. mawsoni* in this division. Further, the Scientific Committee also noted that a special research area that could be investigated in this process could be the combined SSRUs F and G in Division 58.4.1. Possible canyons and submarine features in this area could be investigated for their importance to *D. mawsoni*. Research in both these SSRUs may provide an opportunity to compare the characteristics of an area with a known history of fishing with an area that has been closed over the same period.

3.177 The Scientific Committee recommended that the catch limits for Division 58.4.3b be retained for 2010/11.

3.178 The Scientific Committee noted that a research plan was being developed which could provide advice for Division 58.4.3b in the future (Annex 8, paragraphs 5.1 to 5.12). The Scientific Committee could not reach consensus on advice for additional catch for research fishing.

Dissostichus spp. Subareas 88.1 and 88.2

3.179 Five Members (Argentina, Republic of Korea, New Zealand, Spain and the UK) and 12 vessels fished in the exploratory fishery in Subarea 88.1. The fishery was closed on 9 February 2010 and the total reported catch of *Dissostichus* spp. (excluding research fishing) was 2 870 tonnes (101% of the limit) (Annex 8, Appendix K, Table 3). The following SSRUs were closed during the course of fishing:

- SSRUs 881B, C and G closed on 23 December 2009, triggered by the catch of *Dissostichus* spp. (total catch 370 tonnes; 100% of the catch limit);

- SSRUs 881J and L closed on 29 January 2010, triggered by the catch of *Dissostichus* spp. (total catch 358 tonnes; 96% of the catch limit);
- SSRUs 881H, I and K closed on 9 February 2010, triggered by the catch of *Dissostichus* spp. (total catch 2 142 tonnes; 102% of the catch limit).

The IUU catch for the 2009/10 season was estimated to be 0 tonnes.

3.180 Eight Members (Argentina, Japan, Republic of Korea, New Zealand, Russia, Spain, UK and Uruguay) and a total of 20 vessels notified their intention to fish for *Dissostichus* spp. in Subarea 88.1 in 2010/11.

3.181 Four Members (Argentina, Republic of Korea, Spain and the UK) and five vessels fished in the exploratory fishery in Subarea 88.2. The fishery closed on 31 August 2010 and the total reported catch of *Dissostichus* spp. was 314 tonnes (55% of the limit) (Annex 8, Appendix K). The IUU catch for the 2009/10 season was estimated to be 0 tonnes.

3.182 Seven Members (Argentina, Republic of Korea, New Zealand, Russia, Spain, UK and Uruguay) and a total of 18 vessels notified their intention to fish for *Dissostichus* spp. in Subarea 88.2 in 2010/11.

3.183 The Fishery Report for *Dissostichus* spp. in Subareas 88.1 and 88.2 is in Annex 8, Appendix K. In 2005, the Scientific Committee recommended that Subareas 88.1 and 88.2 be split into two areas for stock assessment purposes: (i) the Ross Sea, and (ii) SSRU 882E.

3.184 Vessels were required to tag and release *Dissostichus* spp. at a rate of one fish per tonne of green weight caught and all vessels achieved the required target rate. However, the tagging overlap statistic varied widely between vessels ranging from 20% to 87%.

3.185 The Scientific Committee noted that WG-FSA had discussed the possibility of developing a time series of relative abundance of recruitment in the southern Ross Sea based on a research longline survey conducted from a commercial longline vessel (Annex 8, paragraphs 5.92 and 5.93). The Scientific Committee agreed that a time series of relative recruitments from a well-designed survey could be a useful input into the Ross Sea stock assessment model. It also considered this could be important with respect to monitoring future effects of climate change. The Scientific Committee requested Members develop a survey design to meet these objectives and submit it to an intersessional working group for evaluation.

3.186 The Scientific Committee also considered the question of how such a survey might be carried out, without compromising fishing activities, in the austral summer fishing season. It agreed that, if this research was to be conducted from a commercial fishing vessel, the fishers concerned should not be compromised by the fact that it is an Olympic fishery.

3.187 The Scientific Committee agreed that measures in the research and data collection plans, including the requirement to tag toothfish at the rate of one toothfish per tonne, be retained for the exploratory fisheries in Subareas 88.1 and 88.2. It also encouraged the further development of the data collection plan for these fisheries as outlined in Annex 8, paragraphs 5.31 and 5.34.

3.188 In accordance with the advice of the Scientific Committee in 2009, the assessment for Subareas 88.1 and 88.2 was not updated. The Scientific Committee agreed that the management advice on catch limits for Subareas 88.1 and 88.2 could be carried forward from last year.