

HARVESTED SPECIES

Krill resources

2006/07 season

4.1 The krill catch for the period from December 2006 to October 2007 in Area 48 was 104 364 tonnes. Norway reported the largest catch of krill with a total of 39 561 tonnes (Table 1). With the exception of the Republic of Korea and Poland, all Contracting Parties have submitted complete sets of fine-scale haul-by-haul data for 2005/06 in accordance with Conservation Measure 23-06 (Annex 4, paragraphs 4.1 and 4.2). The Republic of Korea and Poland were urged to submit the requested data and to send scientists to WG-EMM to assist with the analysis of fisheries data.

Notifications for the 2007/08 season

4.2 The total krill catch notified for the 2007/08 season was 764 000 tonnes, with 25 vessels notified from nine Contracting Parties (Table 2). Ten vessels from three Contracting Parties notified that they would be using a continuous fishing system (Cook Islands, Norway and Ukraine). The high level of notifications indicated that if all the projected catch was taken, the trigger level for Area 48 (620 000 tonnes) would be exceeded. There were notifications of large catches from Acceding States (Cook Islands, 175 000 tonnes and Vanuatu, 80 000 tonnes).

4.3 The Secretariat indicated that Vanuatu had withdrawn its notification to participate in the krill fishery. This reduced the total notified catch for 2007/08 to 684 000 tonnes, which was still in excess of the trigger level in Area 48.

4.4 There were a number of instances in the notifications where there was uncertainty concerning the presence of scientific observers on the fishing vessels. It is important to indicate in the notifications whether data will be collected from these vessels and will be submitted to the Secretariat.

4.5 Japan indicated that its fishing vessel may carry an international and/or national observer. Ukraine indicated that a national observer will conduct experimental work according to a special program. The main objectives of this work include determining the best way of sampling during continuous fishing in order to provide adequate data to the CCAMLR Secretariat in accordance with the conservation measures relating to data submission, as well as recording and determining the qualitative and quantitative composition of invertebrate and fish by-catch. Furthermore, at the end of each cruise, the national scientific observer will provide a report to the CCAMLR Secretariat using forms from the CCAMLR Scheme of International Scientific Observation. The second Ukrainian vessel will fish using conventional trawling for a short period of time and will carry two scientists who will provide a report to CCAMLR.

4.6 Updates on submitted notifications were provided by some Members. Norway will send three vessels in 2007/08 and two of the vessels will only start in April–May so they will catch less than projected in their notification. The Cook Islands indicated that there will be a

staged entry of its vessels into the fishery: two vessels will commence fishing in January–February and once their methods are proven, then all seven vessels will enter the fishery.

4.7 The best information available to the Scientific Committee is that the krill fishery will increase markedly over the coming years and the Commission should be made aware that the Scientific Committee takes this predicted expansion very seriously.

4.8 Not only was there a record high level of notifications for the 2007/08 season, but also there was a significant number of new entrants and re-entrants and a wide range of fishing gears being proposed. This suggests that there are major changes occurring in the krill industry and these notifications will have to be taken more seriously than in the past.

4.9 New uses for krill appear to be driving interest in the krill fishery including the production of oil and pharmacological products (SC-CAMLR-XXVI/BG/26).

Fishing methods

4.10 Russia indicated that it would not employ a continuous fishing system, however, vessels may use pumps to clear the codends of conventional trawls. Ukraine indicated that it would be using conventional trawls as well as a continuous fishing system. One of the Norwegian vessels will use a continuous fishing system and two will use conventional trawls.

4.11 The Scientific Committee noted that there had been little progress on obtaining catch information from the continuous fishing system (Annex 4, paragraphs 4.11 to 4.13). Norway indicated that its operator was working on developing a system for real-time data collection of catch from the continuous fishing system and it would submit details to the next meeting of WG-EMM.

4.12 The Scientific Committee wished to draw to the attention of the Commission that one of the krill fishery notifications, from the Cook Islands, indicated the use of a fishing method not previously used in the Convention Area – pair trawling. The Scientific Committee noted that the Secretariat has no established data collection and analysis methods from pair trawling.

4.13 The Cook Islands has submitted detailed information on the vessels being used and it will deploy one national observer on one of the vessels. It will work with the Secretariat to resolve the data submission and analysis methods.

4.14 South Africa expressed serious concern over the potential by-catch of large pelagic organisms such as sharks, marine mammals and penguins associated with pair trawling.

4.15 The Scientific Committee noted that there were now several different fishing techniques being used in the krill fishery and that there were no standard measures of effort across the fishery. The inability to establish a measure of fishing effort in the krill fishery will severely impede the ability of the Scientific Committee to conduct an integrated assessment of the krill fishery. Additionally, the range of techniques, and the absence of biological data from these fishing methods, makes it impossible to assess the ecosystem impacts of the krill fishery. It is critical that information on the operation of the fishery be obtained in order to effectively manage the fishery. Failure to adequately manage the krill fishery would severely undermine CCAMLR's management of Antarctic marine living resources.

4.16 Australia pointed out that the development of the fishery should occur in an orderly and managed fashion (CCAMLR-XXVI/30). This would require an integrated package of measures to regulate the fishery and ensure that the ecosystem effects of the fishery are minimised. Not all measures will need to be implemented immediately but can occur in a staged and planned manner, but given the projected expansion of the fishery, it is a matter of urgency to obtain the most basic information on the fishery now and into the future.

4.17 The Scientific Committee requested that WG-EMM and WG-SAM examine how effort in the krill fishery can best be quantified. It also requested that Members send participants with appropriate expertise to these meetings so that information on fisheries operations can be thoroughly analysed.

Marine mammal by-catch

4.18 There was some concern that two fishing methods might increase the incidences of marine mammal interactions in the krill fishery. Uruguayan observers had noted that seals were attracted to the continuous fishing system. However, on the Norwegian vessel there has not been any by-catch of marine mammals because the vessel applies appropriate mitigation measures. There were observations from outside the Convention Area that pair trawling, because of the herding effect of the two vessels involved, could increase marine mammal by-catch. The Cook Islands, however, indicated that by-catch mitigation was possible in pair trawling. These concerns on by-catch indicated the importance of increased scientific observations from all types of krill fishing methods.

Advice to the Commission on krill

4.19 There had been a significant increase in the number and scale of notifications to enter the krill fishery from Members and Contracting Parties, including new entrants and re-entrants to the fishery. This increased interest appears genuine and it is likely that the krill catch will increase considerably over the next year (paragraphs 4.7 to 4.9).

4.20 The Commission's attention was drawn to the recommended changes to conservation measures in paragraph 3.41 to 3.57.

4.21 There needs to be an orderly development of the krill fishery and failure in this would undermine CCAMLR (paragraph 3.17).

4.22 There is agreement on stage-based development of allocation of krill catch limits to SSMUs in Area 48 (paragraph 3.36).

4.23 There is a scientific need for systematic observer coverage in the krill fishery (paragraph 3.13 to 3.16).

4.24 The Scientific Committee recommended that there should be an enhanced submission of information on a number of operational aspects of the krill fishery. These included (paragraphs 4.10 to 4.17 and 7.19):

- better information on catch rates and effort measures from all types of krill fisheries;
- specifications of net sizes and meshes used in the fishery;
- information on the processing capacity of the fishing vessels.

Fish resources

Fisheries information

Catch, effort, length and age data reported to CCAMLR

4.25 Fishing took place in 13 fisheries targeting icefish (*C. gunnari*), toothfish (*D. eleginoides* and/or *D. mawsoni*) and krill (*E. superba*) under conservation measures in force in 2006/07 (CCAMLR-XXVI/BG/17).

4.26 Three other fisheries were conducted in the Convention Area in 2006/07:

- 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 and Area 51 outside the Convention Area.

4.27 Catches of target species by region and gear reported from fisheries conducted in the CCAMLR Convention Area in 2006/07 are summarised in Table 1. Catches reported in 2005/06 are summarised in Table 3.

4.28 The Scientific Committee noted the work completed by the Secretariat on:

- monitoring and closure of fisheries when catch limits were reached
- review of the effectiveness of the macrourid ‘move-on’ rule
- updating of Fishery Reports
- investigating the geographic distribution of *D. eleginoides* and *D. mawsoni* in Subarea 48.6.

4.29 The Scientific Committee noted the estimates of catch and effort from IUU fishing (Annex 5, Table 2) and reported catches of toothfish in waters adjacent to the Convention Area (Annex 5, Table 4).

Input for stock assessment

4.30 The Scientific Committee noted that WG-FSA had reviewed all available research data which was subsequently used in updating stock assessments of fish in the Convention Area. This included catch-at-length/age data from fisheries, research surveys, CPUE analyses, tagging studies, biological parameters, stock structure and depredation.

Research surveys

4.31 The Scientific Committee noted that four research surveys were undertaken in 2006/07 (Annex 5, paragraphs 3.24 to 3.31):

- A bottom trawl survey in Division 58.5.2 carried out by Australia. The results of this survey were used to update assessments of toothfish and icefish in this division.
- A bottom trawl 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.
- A bottom trawl survey in the northern Antarctic Peninsula part of Subarea 48.1 was carried out by Germany. The Scientific Committee noted that the results from this survey indicated that finfish species in this region are currently below a level which would allow a reopening of bottom fisheries. The Scientific Committee was informed that the apparent lack of recruitment in several species was consistent with that found by Argentine scientists at Potter Cove.
- A bottom trawl survey of Division 58.5.1 was carried out by France which indicated that the total biomass in this area was approximately 245 000 tonnes with about half that (124 000 tonnes) being *D. eleginoides*. Some shelf and slope species (*C. gunnari* and *Notothenia rossii*) exhibited low levels of biomass compared to previous survey results (1987/88). Other species (*Channichthys rhinoceratus* and *Lepidonotothen squamifrons*) have increased in abundance.

4.32 The Scientific Committee congratulated Australia, France, Germany and the UK on completing very complex research surveys and for providing data and results in very short time periods, and for contributing to the long-term data series (Annex 5, paragraph 3.32).

4.33 In relation to the offshore survey conducted by Germany, Dr E. Barrera-Oro (Argentina) commented on the similarities between the survey results and those obtained in inshore waters of the same area (Argentine study).

4.34 Dr Barrera-Oro noted that a low but apparent constant increase in recruitment of *N. rossii* has been observed inshore since 2000. By contrast, juvenile *Gobionotothen gibberifrons* have virtually disappeared in inshore waters in the area. He further noted that although it has been 27 years since overfishing around the South Shetland Islands resulted in the closure in 1990 of Subarea 48.1 to commercial fishing, these fish species have not recovered. Therefore, the comparison between data collected in offshore and inshore parts of the shelf in the same area is very useful.

4.35 The Scientific Committee noted that these points further highlighted the importance of data from research surveys.

Tagging studies

4.36 The Scientific Committee noted the detailed discussion by WG-FSA on tagging of toothfish in both exploratory and assessed fisheries (Annex 5, paragraphs 3.33 to 3.52) and welcomed both the continuing progress in this area and the significant contribution of the

results to the assessments carried out by the Working Group. In 2006/07, 5 530 toothfish were tagged in exploratory fisheries and 244 tagged fish were recaptured (Annex 5, Tables 9 and 10). In established fisheries, 4 653 toothfish were tagged in Subarea 48.3, 292 in Subarea 48.4, 1 199 in Division 58.5.2, 677 in Subarea 58.6 (Crozet) and 2 247 fish in Division 58.5.1. In total, about 14 600 fish were tagged in the Convention Area, which represents a huge commitment towards the development of datasets on which to carry out assessments and provide management advice.

4.37 The Scientific Committee specifically noted the discussion by WG-FSA with respect to:

- (i) methods for tagging large toothfish (Annex 5, paragraph 3.33);
- (ii) the recapture rates for tags released from some nations' vessels fishing in the Ross Sea toothfish fishery (Annex 5, paragraphs 3.34 to 3.36);
- (iii) the failure of some vessels to achieve the required tagging rates in Divisions 58.4.1 and 58.4.2 and Subarea 88.2 (Annex 5, paragraphs 3.42 and 3.43);
- (iv) the utility of a time-stamped photographic record of all recaptured tags together with a photograph tag template; the Secretariat estimated the cost of producing waterproof templates would be approximately A\$1 500 (Annex 5, paragraphs 3.45 to 3.48);
- (v) additional tagging activities planned for the 'Year of the Skate' that should be coordinated by the Secretariat (Annex 5, paragraphs 3.49 to 3.51);
- (vi) the use of technological advances in tagging devices to improve understanding of fish behaviour and movement (Annex 5, paragraph 3.52).

4.38 The Scientific Committee expressed concern at the low level of recoveries of fish tagged by some vessels operating in the Ross Sea. This has created considerable doubt as to the completion of the tagging requirements by these vessels in Subareas 88.1 and 88.2. Consequently, a portion of the tag-recapture data from the Ross Sea fisheries could not be used in the assessment conducted by WG-FSA in 2007.

Management advice

4.39 The Scientific Committee recommended that the protocols for tagging very large toothfish, and plans for equipment to assist with handling such fish described in WG-FSA-07/36, be posted on the CCAMLR website, and technical coordinators be directed to this information by the Secretariat.

4.40 In all exploratory fisheries, observers should take a photographic record of all tags recovered and forward these photographs and tags to the Secretariat. Footnote 2 in Conservation Measure 41-01, Annex C, paragraph 2(v), which specifies a trial of photographing tags in 2007, should be removed.

4.41 The Scientific Committee requested that the Secretariat be asked to produce a waterproof template to assist observers with taking legible photographs of tag recaptures, to be distributed with tagging kits. The Secretariat should take responsibility for coordinating skate tagging programs in new and exploratory fisheries starting from the 2007/08 season, in preparation for the Year of the Skate in 2008/09.

4.42 The Scientific Committee requested that all skate tags used by Members in exploratory fisheries should be purchased from the Secretariat for use in the 2008/09 season onwards. The Scientific Committee requested SCAF to identify funds required by the Secretariat, which will be recovered through the sale of tags and tagging kits to Members undertaking exploratory fisheries.

4.43 The Scientific Committee asked that the Secretariat write to Members providing data on recapture rates of their tags which could then be compared to the average for the Ross Sea, and requesting that they collect and report on information that would help in investigating the possible causes of the variable tag return rates from the tagging undertaken on their vessels. One possible explanation is differences in handling practices on board vessels when tagging the fish, which might give rise to differential post-tagging mortality rates. Information reported by Members should enable a comparison of handling practices on board.

4.44 The Scientific Committee noted that there would be significant merit in having all vessels operating in the fishery in a few areas to give the spatial and temporal overlap that would assist in an investigation of the causes of the differential tag return rates from the various vessels.

4.45 The Scientific Committee recommended that the tagging experiment in Subarea 48.4 be continued, so that further data can be collected that may allow estimates of abundance to be calculated in the future.

4.46 The Scientific Committee requested that SCIC review the information that it would like from WG-FSA, in future, to allow it to address the issue of reporting on vessels that have not met the required tagging rate in new and exploratory fisheries.

4.47 The Scientific Committee recommended that Conservation Measure 41-01, Annex C, be revised by amending the second sentence of paragraph 2(i) to read 'Vessels shall only discontinue tagging if they leave the fishery having tagged toothfish at the specified rate'.

Stock structure

4.48 The Scientific Committee noted information submitted to WG-FSA by New Zealand on the plausible life history of *D. mawsoni* in the Ross Sea region and noted that it would assist in the development of operating models for a future management strategy and evaluation of toothfish resources. The Scientific Committee further noted that, while the paper was highly speculative, it raised some important questions as well as developing a working hypothesis which could be used to focus future research and modelling.

General biology and ecology

4.49 The Scientific Committee noted the work of WG-FSA on biology and ecology and its main deliberations. In particular:

- (i) consideration of papers on biology and ecology (Annex 5, paragraphs 9.1 to 9.9);
- (ii) identification of three key areas of interest where papers would be requested for WG-FSA, including: (i) stock structure of *D. eleginoides*, (ii) reconstruction of the life history of *D. eleginoides* in different areas, and (iii) a field guide for skates in the Southern Ocean (Annex 5, paragraph 9.10);
- (iii) the development and publication of species profiles noting that a species profile for *C. gunnari* had been completed in the intersessional period (Annex 5, paragraphs 9.12 and 9.13).

Preparation of assessment and assessment timetables

Review of preliminary stock assessment papers

4.50 The Scientific Committee noted that WG-FSA had reviewed six preliminary stock assessments that were developed during the intersessional period. These were *D. eleginoides* in Subarea 48.3, Division 58.5.2, Subarea 58.6/58.7 (Prince Edward Islands), *Dissostichus* spp. in Subarea 88.1/88.2 (Ross Sea), *Dissostichus* spp. in Division 58.4.3b and *C. gunnari* in Division 58.5.2. The resulting discussions and summaries are provided in Annex 5, paragraphs 4.13 to 4.33. In most cases, issues that had been raised at WG-SAM had been incorporated into the revised stock assessments.

Assessment carried out and assessment timetable

4.51 All assessment work was undertaken by primary authors of preliminary assessments, and reviewed independently at the WG-FSA meeting. Tasks of independent reviewers are listed in WG-FSA-06/6, paragraph 6.3. The outcomes of the assessments were reported in the Fishery Reports (Annex 5, Appendices D to Q).

Assessments and management advice

Dissostichus eleginoides South Georgia (Subarea 48.3)

4.52 In 2005, Subarea 48.3 was subdivided into management areas containing the South Georgia–Shag Rocks (SGSR) stock and other areas, to the north and west, that do not include the SGSR stock. Within the SGSR area, three management areas (A, B and C) were defined (Conservation Measure 41-02, Annex A). Catch limits for the areas to the north and west were set at zero for 2006/07.

4.53 The catch limits for *D. eleginoides* in the 2006/07 season for management areas A, B and C were 0 (excepting 10 tonnes for research fishing), 1 066 and 2 488 tonnes respectively, with an overall catch for SGSR of 3 535 tonnes. The total declared catch of *D. eleginoides* was 3 535 tonnes. There was no evidence of IUU fishing in the 2006/07 season. Catches in areas A, B and C were 7 tonnes, 976 tonnes and 2 552 tonnes respectively.

4.54 The Scientific Committee endorsed the assessment undertaken by WG-FSA, presented in Annex 5, paragraphs 5.107 to 5.115 and Appendix J (Fishery Report). In particular, the Scientific Committee noted that:

- (i) the standardised GLMM CPUE analyses were updated (Annex 5, paragraph 5.110);
- (ii) during 2006/07, a further 4 653 tagged *Dissostichus* spp. have been released in SGSR, bringing the total number of tagged fish released to around 17 800. In 2007, 530 recaptures of tagged fish were reported (Annex 5, paragraph 5.111);
- (iii) WG-FSA agreed on a single CASAL assessment model, which was structurally similar to that presented at WG-FSA-06, updated with new data on catch, length frequency, CPUE and tagging data from 2007 (Annex 5, paragraph 5.112);
- (iv) recent CPUE, length-frequency and tag data are consistent in their information on the level of B_0 (around 100 000 tonnes) (Annex 5, paragraph 5.113);
- (v) stock status and the long-term yield were calculated using the MCMC samples for the updated assessment model, as was done last year, with the appropriate long-term yield being 3 920 tonnes (Annex 5, paragraph 5.114).

4.55 The Scientific Committee welcomed the procedure followed by WG-FSA. A preliminary assessment had been presented to the Working Group, independently reviewed during the meeting and a clear recommendation for a catch limit had resulted.

4.56 The Scientific Committee noted that the current model had produced a yield of 3 920 tonnes when updated with new data from 2007. It noted that some uncertainties with the assessment remain, such as the fits to the tag data. A significant revision of the model is under development which will allow direct estimation of present and future recruiting cohort strength which is not possible with the current model. The catch limit for 2008/09, if estimated with this new model, may be different from 3 920 tonnes.

Management advice

4.57 The Scientific Committee recommended that the catch limit for *D. eleginoides* in Subarea 48.3 (SGSR stock) should be 3 920 tonnes for the 2007/08 fishing season.

4.58 If the Commission agrees, this catch limit can be carried over into the 2008/09 fishing season, subject to the conditions detailed in paragraph 14.6.

4.59 The catch limits for *D. eleginoides* in management areas A, B and C should be adjusted in a pro-rata manner to 0 (excepting 10 tonnes for research fishing), 1 176 and 2 744 tonnes respectively. By-catch limits for skates/rays and macrourids should be similarly revised to 196 and 196 tonnes respectively.

Dissostichus eleginoides Kerguelen Islands
(Division 58.5.1)

4.60 The catch of *D. eleginoides* reported by France for this division in 2006/07 to 31 August 2007 was 3 438 tonnes. Only longlining is currently permitted in the fishery.

4.61 Prof. Duhamel reported that the catch of *D. eleginoides* in Division 58.5.1 was expected to be about 5 500 tonnes at the end of the 2006/07 season, similar to the catch level in 2005.

4.62 Analyses show a general decreasing trend in the standardised CPUE up until 2003 followed by a period up to the current year for which the CPUE estimates are relatively constant.

4.63 The Scientific Committee noted that 639 toothfish were tagged during the survey conducted on the FV *Austral* chartered at Kerguelen from September to October 2006 and further tagging had begun during the 2006/07 commercial fishing operations.

Management advice

4.64 The Scientific Committee encouraged the estimation of biological parameters for *D. eleginoides* in Division 58.5.1. It also encouraged the development of a stock assessment for this area, as well as cooperative work in the intersessional period between France and Australia on analysis of catch and effort data and other data that could be used to progress understanding of fish stock and fishery dynamics for Divisions 58.5.1 and 58.5.2 and Subarea 58.6. The Scientific Committee encouraged France to continue its tagging program in Division 58.5.1.

4.65 The Scientific Committee recommended avoidance of fishing in zones where there were high rates of by-catch of other species.

4.66 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* in Conservation Measure 32-13, remain in force.

4.67 The Scientific Committee noted that France had made significant progress in mitigating by-catch, including area/season closures (Annex 5, Appendix D, paragraph 23). It noted that the CPUE analysis would probably be robust to these changes so long as detailed haul-by-haul data continue to be available.

Dissostichus eleginoides Heard Island (Division 58.5.2)

4.68 The catch limit of *D. eleginoides* in Division 58.5.2 west of 79°20'E for the 2006/07 season was 2 427 tonnes (Conservation Measure 41-08) for the period from 1 December 2006 to 30 November 2007. The catch of *D. eleginoides* reported for this division as of 5 October 2007 was 1 956 tonnes. Of this, 1 338 tonnes (68%) was taken by trawl and the remainder by longline.

4.69 The Scientific Committee noted the work undertaken by WG-FSA, as summarised in Annex 5, paragraphs 5.128 to 5.135, and endorsed the refinements to the assessment based on the CASAL model introduced at WG-FSA-06. The Scientific Committee encouraged future work aimed at both improving the growth model and providing catch-at-age data to future assessments.

4.70 The Scientific Committee noted the differences between this assessment and those for toothfish in Subareas 48.3 and 88.1 that also use CASAL. These include the use of survey data as observations of young fish, the lack of useable tagging data, the modelling of recruitment without assuming a stock-recruitment relationship, and variability in recruitment estimated in the model from the vector of year-class strengths.

4.71 Dr Constable noted that these differences are not surprising and arise from the differences between the fisheries and the stocks themselves. The CASAL assessment used abundance-at-length estimated from a long-term survey series, catch-at-length from the fisheries and standardised CPUE time series to estimate current and initial population size and year-class strengths since 1981. These results were then used in projections to estimate the long-term annual yield that satisfies the CCAMLR decision rules for toothfish.

4.72 Long-term annual yield was estimated to be 2 500 tonnes giving 50.5% escapement with a probability of depletion of 0.08.

Management advice

4.73 The Scientific Committee recommended that the catch limit for *D. eleginoides* in Division 58.5.2 west of 79°20'E should be 2 500 tonnes for the 2007/08 fishing season.

4.74 If the Commission agrees, this catch limit can be carried over into the 2008/09 fishing season, subject to the conditions detailed in paragraph 14.6.

Dissostichus eleginoides Crozet Islands (Subarea 58.6)

4.75 The catch of *D. eleginoides* reported by France for this subarea in 2006/07 to 31 August 2007 was 333 tonnes and will probably be at the level of the 2005/06 catches. Only longlining is currently permitted in the fishery.

4.76 The Scientific Committee noted that depredation on toothfish catches by killer whales has become a major problem for this longline fishery.

4.77 Analyses show a general decreasing trend in standardised CPUE to 2002/03 with a subsequent slight increase in 2003/04 and 2005/06 and a decrease for the 2006/07 season.

4.78 During 2006/07, 677 toothfish were tagged by observers on board commercial vessels.

Management advice

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

4.80 The Scientific Committee recommended avoidance of zones of where there was a high by-catch of other species.

4.81 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* in Conservation Measure 32-13, remain in force.

4.82 The Scientific Committee noted that France had made significant progress in mitigating by-catch, including area/season closures (Annex 5, Appendix D, paragraph 23). It noted that the CPUE analysis would probably be robust to these changes so long as detailed haul-by-haul data continued to be available.

Dissostichus eleginoides Prince Edward Islands (Subareas 58.6 and 58.7)

4.83 The catch limit of *D. eleginoides* in the South African EEZ for the 2006/07 season was 450 tonnes for the period from 1 December 2006 to 30 November 2007. The catch reported for Subareas 58.6 and 58.7 as of 5 October 2007 was 125 tonnes, all of which was taken by longlines.

4.84 As with the Crozet Islands, the Scientific Committee noted that depredation on toothfish catches by killer whales has become a major problem for this longline fishery.

4.85 The CPUE series was updated for the meeting and, as in previous years, the biological parameters from Subarea 48.3 were used.

4.86 The Scientific Committee noted the details of the assessment used to estimate a long-term annual yield undertaken by WG-FSA, including an augmented two-fleet ASPM that used catches, standardised CPUE and catch-at-length data. The results from the model were only slightly sensitive to whether or not cetacean depredation was included in the calculations and whether or not year-specific weights were used with the CPUE indices. The model estimated the spawning biomass of the resource to be between 37 and 40% of its average pre-exploitation level, although significant uncertainties remain in the assessment.

4.87 The Scientific Committee expressed concern over the sensitivity of the ASPM to weightings used for different data sources and the estimation of recruitment levels for forward projections.

Management advice for *D. eleginoides* at Prince Edward Islands (Subareas 58.6 and 58.7) inside the EEZ

4.88 The Scientific Committee was unable to provide management advice for the fishery in the South African EEZ at the Prince Edward Islands. The Scientific Committee recommended that CCAMLR decision rules be used in estimating yields for this fishery.

Management advice for *D. eleginoides* at Prince Edward Islands (Subareas 58.6 and 58.7 and Division 58.4.4) outside the EEZ

4.89 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. The Scientific Committee therefore recommended that the prohibition of directed fishing for *D. eleginoides* in Conservation Measures 32-10, 32-11 and 32-12, remain in force.

Champscephalus gunnari South Georgia (Subarea 48.3)

4.90 The catch limit set for *C. gunnari* in Subarea 48.3 in the 2006/07 season was 4 337 tonnes. A total catch of 3 940 tonnes of icefish was reported to October 2007. The fishery may remain open until 14 November 2007 by which time it is expected that the full catch limit will be taken.

4.91 The Scientific Committee noted that the UK undertook a random stratified trawl survey on the South Georgia and Shag Rocks shelves and the information was used to generate a standing stock estimate. Whilst the estimated mean value of the standing stock decreased by 8%, from 105 000 tonnes in January 2006 to 98 000 tonnes in September 2007, the lower one-sided CI decreased by 35% from 37 500 to 23 400 tonnes.

4.92 The Scientific Committee endorsed the short-term assessment undertaken by WG-FSA. The Scientific Committee noted the conclusion of WG-FSA that the spawning of *C. gunnari* has little spatial overlap with the fishery and that the requirement of vessels fishing between 1 March and 31 May to undertake 20 research trawls is likely to increase the risk of seabird mortality.

Management advice

4.93 The Scientific Committee agreed that the catch limit for *C. gunnari* should be set at 2 462 tonnes in 2007/08 and 1 569 tonnes in 2008/09.

4.94 The Scientific Committee also recommended that Conservation Measure 42-01 be amended to:

- (i) remove the requirement that vessels fishing between 1 March and 31 May be required to undertake 20 research trawls (as detailed in Conservation Measure 42-01, Annex A);
- (ii) not require that the catch during the 1 March to 31 May period be limited to 25% of the overall catch limit.

4.95 The Scientific Committee further recommended that the impact of changes to Conservation Measure 42-01 should be reviewed by WG-FSA at next year's meeting, particularly in respect to the maturity of fish caught through the year and the timing of fishing effort (particularly during the March–May period).

Champscephalus gunnari Heard Island (Division 58.5.2)

4.96 The catch limit for *C. gunnari* in Division 58.5.2 in 2006/07 was 42 tonnes for the period 1 December 2006 to 30 November 2007. The catch reported for this division as of 5 October 2007 was 1 tonne.

4.97 A large 1+ year class, probably the result of spawning by the 4+ year class dominant in 2006, was observed to dominate the population in the survey undertaken in June–July 2007.

4.98 The Scientific Committee endorsed the short-term assessment undertaken by WG-FSA.

Management advice

4.99 The Scientific Committee recommended that the catch limit for *C. gunnari* in 2007/08 be set at 220 tonnes and that all other measures in Conservation Measure 42-02 should be retained.

4.100 The Scientific Committee also recommended that further work on developing a management procedure for *C. gunnari* is a high priority (SC-CAMLR-XXIV, Annex 5, Appendix M, paragraph 26).

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

4.101 Commercial finfishing in the Antarctic Peninsula and the South Shetland Islands (Subarea 48.1) and the South Orkney Islands (Subarea 48.2) was closed by CCAMLR after the 1989/90 season with the provision that these subareas should only be reopened to commercial fishing if surveys have demonstrated that the condition of fish stocks had improved to the extent which would allow commercial harvesting.

4.102 Germany conducted a bottom trawl in the Elephant Island–South Shetland Islands area (part of Subarea 48.1) from 19 December 2006 to 3 January 2007 (WG-FSA-07/22). The Scientific Committee agreed that biomass of most finfish stocks was found to be lower than during the last surveys in 2002 and 2003 and that this does not allow for a reopening of the fishery.

Management advice

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

South Sandwich Islands (Subarea 48.4)

4.104 The Scientific Committee noted the Fishery Report for *D. eleginoides* in Subarea 48.4, which is contained in Annex 5, Appendix Q. A mark–recapture experiment in Subarea 48.4 started in 2004/05 and is in its third year. It was noted that a New Zealand-flagged vessel and a UK-flagged vessel fished in the area in 2006/07 and continued the tagging program.

4.105 The Scientific Committee also noted that a total of 467 *D. eleginoides* and 11 *D. mawsoni* (total 478 fish) have been tagged and released and two *D. eleginoides* have been recaptured in the subarea. In addition, one fish tagged in Subarea 48.4 was recaptured in Subarea 48.3. It is expected that the mark–recapture experiment will continue in Subarea 48.4 over the 2007/08 season to inform the assessment of the toothfish population structure and size in accordance with Conservation Measure 41-03.

Management advice

4.106 The Scientific Committee noted that Conservation Measure 41-03 is in force until the end of the 2007/08 season and that the results of the tagging experiment would be reported at the 2008 meeting. This would provide an opportunity for WG-FSA to receive the results and develop the assessment of this fishery.

4.107 Based on the current low rates of tagging, the Scientific Committee recommended an extension of the current experiment for one or two further years.

4.108 The Scientific Committee agreed that further development of this fishery may include a similar tagging experiment for *D. mawsoni* in the southern region of Subarea 48.4 and the introduction of catch limits for by-catch species.

New and exploratory fisheries in 2006/07 and notifications for 2007/08

4.109 In 2006 the Commission agreed to seven exploratory longline fisheries for *Dissostichus* spp. in the 2006/07 season (Conservation Measures 41-04, 41-05, 41-06, 41-07, 41-09, 41-10 and 41-11). Activities in the exploratory fisheries are outlined below and summarised in Annex 5, Table 6. In most fisheries the number of vessels fishing was about half of the number notified.

4.110 Notifications for exploratory fisheries in 2007/08 are summarised in Annex 5, Table 7. Twelve Members submitted paid notifications 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. There were no notifications for new fishing areas, and no notifications were received for fisheries in closed areas. The number of vessels notified was substantially larger than for the 2006/07 fishing season, except in Division 58.4.3a and Subareas 88.1 and 88.2.

Progress towards assessments of new and exploratory fisheries

4.111 The Scientific Committee congratulated WG-FSA on making further progress this year in assessing stocks of *Dissostichus* spp. in the Ross Sea. It noted that, with the exception of Division 58.4.3b for which a Leslie depletion analysis had been undertaken by Australian scientists, the Working Group had been unable to progress the assessment of any other exploratory fisheries (Annex 5, paragraphs 5.6 to 5.9).

4.112 The Scientific Committee agreed that there was an urgent need for WG-FSA to develop assessments for all exploratory fisheries, and to ensure that appropriate data were collected to enable such assessments to be made as soon as practicable.

4.113 The Scientific Committee noted that WG-FSA had examined the power of current exploratory fishery research plans to deliver assessments of stock status. Results are preliminary, but one study suggested that for many areas, the research catch required for estimating CPUE in a single survey would need to be in excess of 40 tonnes. It also encouraged further development of an analysis which estimates the catch required to estimate stock size accurately given current tagging rates (Annex 5, paragraphs 5.10 to 5.22).

4.114 There is a need to investigate the design of research experiments that manipulate the distribution of fishing between SSRUs within exploratory fisheries (Annex 5, paragraphs 5.24 to 5.29). For instance, the catch limits for toothfish in Subareas 88.1 and 88.2 in the Ross Sea were changed in 2005 as part of a three-year experiment (SC-CAMLR-XXIV, paragraphs 4.163 to 4.166). The Scientific Committee noted WG-FSA's comment (Annex 5, paragraph 5.27) that if the concentrated sampling protocol was abandoned before or at the end of the experiment and fishing effort was dispersed, the tagging program would be diluted, which could adversely affect the assessments. The Scientific Committee endorsed the request of WG-FSA that WG-SAM undertake methodological work on designing research experiments and consider this and other issues at its meeting in 2008.

4.115 The Working Group also noted that research vessels which notify and fish specific areas are asked to provide a full report of the effort within 12 months (Conservation

Measure 24-01, paragraph 4(c)), however, it was requested that a report be submitted in time for consideration of its 2008 meeting. This task could be aided by the development of forms for research proposals and research summaries.

General management advice for new and exploratory fisheries

4.116 The Scientific Committee noted that there are significant differences in the tag recovery rates deriving from tagging by different Members (Annex 5, paragraph 5.49). It is important to understand whether this is due to operational constraints which might suggest differences in mark–recapture model parameters, or to other reasons. The Secretariat is requested to investigate this matter intersessionally (paragraph 12.9).

4.117 A number of vessels failed to achieve the required tagging rates in exploratory fisheries. The Scientific Committee reiterated the importance of meeting these tagging targets. It recommended a change to Conservation Measure 41-01, Annex C, to emphasise that tagging should be carried out continuously while fishing, rather than sporadically, such as at the end of a fishing period.

4.118 The Scientific Committee noted that in the 2006/07 season, several vessels either did not conduct or did not report research sets in the exploratory fisheries in Subarea 48.6, Divisions 58.4.2, 58.4.3a and 58.4.3b as required under Conservation Measure 41-01, Annex C (Table 2 in Annex 5, Appendices D, F, G and H). The Scientific Committee encouraged Flag States to ensure that research sets are completed and reported as the data collected from these activities are essential for developing assessments.

4.119 Noting the advice of WG-FSA on efforts to increase survivorship of discarded rajids and the proposed Year of the Skate (Annex 5, paragraph 5.52; paragraph 4.184), the Scientific Committee recommended that Conservation Measure 33-03 be amended to include the following paragraph after paragraph 3: ‘Unless otherwise requested by observers, vessels, where possible, should release rays from the line by cutting snoods and, when practical, removing the hooks’.

4.120 The Scientific Committee discussed appropriate levels for precautionary catch limits in new and exploratory longline fisheries in the case where the populations are severely depleted. It agreed that a balance needs to be struck between the levels of commercial catch that are necessary for scientific research, and the level of catch that is sustainable in severely depleted populations. Without the research, it will not be possible to determine appropriate long-term sustainable yields for these stocks or whether they have recovered to the point where fishing may be resumed, but in some cases the level of catch necessary for research may be greater than is sustainable from the population.

4.121 The Committee concluded that in the situation where research may require catches that are likely to be higher than is sustainable by a population, the Scientific Committee would recommend appropriate survey designs and catch levels required for the research, and the Commission should decide whether it required the research or whether those areas should remain closed.

4.122 Fishing by Members is only one source of mortality in such fisheries. However, the Scientific Committee was not able to conclude as to whether the presence of Members' vessels was likely to either increase or decrease the level of IUU fishing.

4.123 The Scientific Committee discussed the scientific value of the 10-tonne research exemptions that are allowed in some of the closed SSRUs in exploratory fisheries. Some of the analyses reported above suggest that such low catch limits may provide only limited information to assist stock assessments.

Dissostichus spp. (Subarea 48.6)

4.124 Three vessels (Japan, Republic of Korea and Norway) fished in the exploratory fishery in Subarea 48.6 in 2006/07. The precautionary catch limit for *Dissostichus* spp. was 910 tonnes and the total catch was 113 tonnes. The fishery operated primarily in SSRU A (the northern half of Subarea 48.6). There was no evidence of IUU fishing in 2006/07 (Annex 5, paragraphs 5.54 to 5.58).

4.125 Four Members (Japan, Republic of Korea, New Zealand and South Africa) and a total of eight vessels notified their intention to fish for toothfish in Subarea 48.6 in 2007/08. This is the same number of Members as 2006/07 but with an increased number of vessels (five last year, eight this year).

4.126 The Scientific Committee endorsed WG-FSA's recommendation that SSRU 486A be subdivided into two SSRUs along longitude 1.5°E (Annex 5, paragraph 5.59).

4.127 The Scientific Committee noted that the catch limit for Subarea 48.6 had originally been based on a pro-rata application of catch rates and seabed areas from Subarea 48.3. This method is no longer considered to be appropriate. Given the large variation in catch rates across the Convention Area, and the low catch rates in Subarea 48.6 (Annex 5, Table 8), the Scientific Committee no longer considered the catch limit of 910 tonnes to be precautionary, either north or south of 60°S.

4.128 The Scientific Committee recommended that Conservation Measure 41-04 be updated with the appropriate change to subdivide SSRU 486A and encouraged the Commission to reconsider the catch limit given that the Scientific Committee does not consider it to be appropriately precautionary.

Dissostichus spp. (Division 58.4.1)

4.129 Four Members (Republic of Korea, Namibia, Spain and Uruguay) and four vessels fished in the exploratory fishery in Division 58.4.1 in 2006/07. The precautionary catch limit for toothfish was 600 tonnes and the reported catch was 645 tonnes. The catch limit was slightly over-run in all three SSRUs open to fishing. The fishery targeted *D. mawsoni* and operated in SSRUs C, E and G. Information on IUU fishing activities indicated that 612 tonnes of toothfish were taken in 2006/07 (Annex 5, paragraphs 5.62 to 5.65).

4.130 Eight Members (Australia, Japan, Republic of Korea, Namibia, New Zealand, Spain, Ukraine and Uruguay) and a total of 15 vessels notified their intention to fish for toothfish in Division 58.4.1 in 2007/08. This is higher than in 2006/07, when six Members notified nine vessels.

4.131 Spain has notified (COMM CIRC 07/114) its intention to conduct research fishing under the 10-tonne research exemption of Conservation Measure 24-01 in SSRUs 5841 D, F and H, which are currently closed to commercial fishing.

4.132 The Scientific Committee recommended that the tagging rate be maintained at at least three fish per tonne for this fishery (Annex 5, paragraph 5.83).

4.133 The Scientific Committee could not provide further advice on the management of this division. It strongly encouraged WG-FSA to undertake a preliminary assessment of catch and tagging data at its next meeting and endorsed the recommendation that a depletion analysis be conducted for Division 58.4.1 (Annex 5, paragraph 5.84).

Dissostichus spp. (Division 58.4.2)

4.134 Two Members (Republic of Korea and Namibia) and three vessels fished in the exploratory fishery in Division 58.4.2 in 2006/07. The precautionary catch limit for toothfish was 780 tonnes and the reported catch was 124 tonnes. The fishery targeted *D. mawsoni* and operated in SSRUs A and E. Information on IUU fishing activities indicated that 197 tonnes of toothfish were taken in 2006/07 (Annex 5, paragraphs 5.66 to 5.69).

4.135 Nine Members (Australia, Japan, Republic of Korea, Namibia, New Zealand, South Africa, Spain, Ukraine and Uruguay) and a total of 15 vessels notified their intention to fish for toothfish in Division 58.4.2 in 2007/08. This is higher than in 2006/07, when six Members notified nine vessels.

4.136 The Scientific Committee recommended that the tagging rate be maintained at at least three fish per tonne (Annex 5, paragraph 5.83).

4.137 The Scientific Committee could not provide further advice on the management of this division. It strongly encouraged WG-FSA to undertake a preliminary assessment of catch and tagging data at its next meeting and endorsed the recommendation that a depletion analysis be conducted for Division 58.4.2 (Annex 5, paragraph 5.84).

Dissostichus spp. (Division 58.4.3a)

4.138 Two Members (Japan and Spain) and two vessels fished in the exploratory fishery in Division 58.4.3a in 2006/07. The precautionary catch limit for toothfish was 250 tonnes and the reported catch was 4 tonnes. The fishery operated in SSRU A. There was no evidence of IUU fishing in 2006/07.

4.139 One Member (Uruguay) and one vessel notified their intention to fish for toothfish in Division 58.4.3a in 2007/08. This is lower than the number of notifications in 2006/07.

4.140 The Scientific Committee could not provide further advice on the management of this division.

4.141 The Scientific Committee endorsed the recommendation of WG-FSA that the tagging rate in this division should be increased to three fish per tonne (Annex 5, paragraph 5.83).

Dissostichus spp. (Division 58.4.3b)

4.142 Four Members (Japan, Namibia, Spain and Uruguay) and four vessels fished in the exploratory fishery in Division 58.4.3b in 2006/07. The precautionary catch limit for toothfish was 300 tonnes and the reported catch was 253 tonnes. The fishery operated in SSRU A. Information on IUU fishing activities indicated that 2 293 tonnes of toothfish were taken in 2006/07.

4.143 Six Members (Australia, Japan, Republic of Korea, Namibia, Spain and Uruguay) and a total of 11 vessels notified their intention to fish for toothfish in Division 58.4.3b in 2007/08. This is more vessels than were notified for the 2006/07 fishing season.

4.144 The Scientific Committee noted that WG-FSA had made some progress in understanding the dynamics of toothfish in this area. In particular, a preliminary depletion analysis had been undertaken. However, it noted with concern the conclusion that the southern areas in particular had been subject to a rapid and severe depletion, and that significant numbers of juvenile animals have still not been found (Annex 5, paragraphs 5.74 to 5.80).

4.145 The Scientific Committee recommended that Division 58.4.3b be subdivided into two SSRUs at latitude of 60°S. The southern SSRU should be closed to fishing, given the rapid and unsustainable depletion seen in this area. The current catch limit of 300 tonnes is too high to be considered precautionary if applied to the northern SSRU alone and should be reviewed. The Scientific Committee recommended that Conservation Measure 41-07 be revised accordingly.

4.146 The Scientific Committee endorsed the recommendation of WG-FSA that the tagging rate in this division should be increased to three fish per tonne (Annex 5, paragraph 5.83).

4.147 Australia has notified its intention to conduct a research survey in Division 58.4.3b in the 2007/08 fishing season. The Scientific Committee agreed that in order for the survey to obtain the most scientifically useful data on the distribution of fish over BANZARE Bank, commercial fishing should not take place in Division 58.4.3b in the 2007/08 fishing season until the survey is completed, or until 1 June 2008, whichever is the sooner.

4.148 To enable Members to manage their fishing activity in Division 58.4.3b in the 2007/08 fishing season, and to provide for the best scientific outcome of the survey, Australia will notify the Secretariat at least three months before the start of the research survey of the date of that start, and will further notify the Secretariat of the date of completion of the survey.

Dissostichus spp. (Subareas 88.1 and 88.2)

4.149 In 2006/07, eight Members (Argentina, Republic of Korea, New Zealand, Norway, Russia, South Africa, UK and Uruguay) and 15 vessels fished in the exploratory fishery in Subarea 88.1. The fishery was closed on 2 February 2007 and the total reported catch of *Dissostichus* spp. (excluding research fishing) was 3 093 tonnes (101% of the limit) (CCAMLR-XXVI/BG/17, Table 3). The following SSRUs were closed during the course of fishing:

- SSRUs 881B, C and G closed on 28 December 2006, triggered by the catch of *Dissostichus* spp. (total catch 584 tonnes; 164% of the catch limit);
- SSRUs 881H, I and K closed on 2 February 2007, triggered by the catch of *Dissostichus* spp. (total catch 2 080 tonnes; 104% of the catch limit).

4.150 There was no evidence of IUU fishing in 2006/07.

4.151 Five Members (Argentina, Norway, Russia, UK and Uruguay) and seven vessels fished in the exploratory fishery in Subarea 88.2. The fishery closed on 31 August 2007 and the total reported catch of *Dissostichus* spp. was 347 tonnes (63% of the limit) (CCAMLR-XXVI/BG/17). SSRU 882E was closed on 4 March 2007, triggered by the catch of *Dissostichus* spp. (total catch 325 tonnes; 95% of the catch limit).

4.152 Nine Members (Argentina, Republic of Korea, Namibia, New Zealand, Russia, South Africa, Spain, UK and Uruguay) and a total of 21 vessels notified their intention to fish for *Dissostichus* spp. in Subarea 88.1 in 2007/08. Seven Members (Argentina, New Zealand, Russia, South Africa, Spain, UK and Uruguay) and a total of 15 vessels notified their intention to fish for *Dissostichus* spp. in Subarea 88.2 in 2007/08. These are similar to the levels of notifications in 2006/07.

4.153 Spain has notified (COMM CIRC 07/114) its intention to conduct research fishing under the 10-tonne research exemption of Conservation Measure 24-01 in SSRU 881A which is currently closed to commercial fishing.

4.154 The Scientific Committee noted with approval the improvements in the assessment of this stock. It also noted the considerable progress by New Zealand in understanding the life cycle and distribution of toothfish in the Ross Sea (Subarea 88.1 and SSRUs 882A and B) (Annex 5, paragraphs 3.62 to 3.66).

4.155 The Scientific Committee noted with some concern that the release and recapture from parts of the fleet were not considered reliable enough to be used in the assessment. The assessment was based on only the tags released and recaptured by New Zealand vessels. This reflected a subset of the tagging data, some 50% (7 000) of the 13 700 tags released to date (Annex 5, paragraph 5.99). The Scientific Committee noted that the assessment selected to provide management advice was the most conservative of the alternative assessments presented.

4.156 The Scientific Committee endorsed the advice of WG-FSA that the experimental system of closed and open areas defined in 2005 for the Ross Sea should continue for the duration of the three-year experiment (from the 2005/06 fishing season to the end of the 2007/08 fishing season) (Annex 5, paragraphs 5.94, 5.95 and 5.102 to 5.104).

4.157 Noting the revised assessment by WG-FSA (Annex 5, paragraph 5.101), the Scientific Committee recommended that the allowable catch for the Ross Sea should be revised to 2 700 tonnes. The Scientific Committee had no new advice from which to revise the catch limits for SSRUs 882C, D, E, F and G, and therefore recommended that the levels set for the 2006/07 fishing season apply for the 2007/08 fishing season.

4.158 If the Commission agrees, this catch limit can be carried over into the 2008/09 fishing season, given the caveats detailed in paragraph 14.6.

Bottom fishing in CCAMLR high-seas areas

4.159 The Scientific Committee noted that it has been tasked to review the criteria for determining what constitutes significant harm to benthos and benthic communities (Conservation Measure 22-05; CCAMLR-XXV, paragraphs 11.25 to 11.38). It also noted that, in 2006, the United Nations General Assembly (UNGA) agreed the Sustainable Fisheries Resolution (61/105), which calls upon States and RFMOs or other arrangements to take immediate action to ensure fish stocks are managed sustainably and to protect vulnerable marine ecosystems (VMEs), including seamounts, hydrothermal vents and cold-water corals, from destructive fishing practices. More specifically, UNGA Resolution 61/105 calls upon States and RFMOs and other arrangements to regulate and manage all bottom fisheries in high-seas areas so as to prevent significant adverse impacts on VMEs by no later than 31 December 2008 (UNGA Resolution 61/105, OP80 – OP91).

4.160 Dr Constable introduced the report on bottom fishing in high-seas areas undertaken by WG-FSA (Annex 5, paragraphs 14.1 to 14.50) as well as papers on this topic:

- (i) SC-CAMLR-XXVI/10 – Bottom fishing in high-seas areas of CCAMLR;
- (ii) SC-CAMLR-XXVI/BG/27 – Antarctic seafloor geomorphology as a guide to benthic bioregionalisation;
- (iii) SC-CAMLR-XXVI/BG/28 – CCAMLR Bioregionalisation Workshop: update on benthic bioregionalisation of the Southern Ocean;
- (iv) SC-CAMLR-XXVI/BG/30 – Demersal fishing interactions with marine benthos in the Southern Ocean: an assessment of the vulnerability of benthic habitats to impact by demersal gears.

4.161 The Scientific Committee thanked Drs Constable and Holt for their detailed contribution in SC-CAMLR-XXVI/10 advancing many of the concepts, principles and actions that will need to be included in consideration of bottom fisheries by CCAMLR.

4.162 The Scientific Committee thanked WG-FSA for the development of practical guidelines for providing scientific advice to the Commission on the different components for managing bottom fisheries in high-seas areas of the Convention Area. It noted that these outcomes will usefully advance the work of the Commission to meet the requirements in the UNGA resolution by December 2008. It also noted that many of the components identified in the report of WG-FSA can draw on existing practices and procedures within the Scientific Committee and its working groups (Annex 5, paragraph 14.7), including:

- (i) Article IX;
- (ii) the exploratory fisheries conservation measure (Conservation Measure 21-02);
- (iii) past new and exploratory fisheries measures that have been used to avoid benthic impacts (Conservation Measures 41-05 and 41-11) and undertake experimental work to investigate whether impacts might arise if fishing were to proceed (Conservation Measures 43-04 [186/XVIII], 212/XIX);
- (iv) existing approaches to avoid and mitigate by-catch of finfish, birds and marine mammals, including approaches to acquiring information through research or fishery data collection activities and for using that information to advise on appropriate conservation measures;
- (v) the regulatory framework considered by the Scientific Committee (SC-CAMLR-XVIII, paragraphs 7.11 to 7.23; SC-CAMLR-XIX, paragraphs 7.2 to 7.20) and the Commission (CCAMLR-XIX, paragraphs 10.2 to 10.8).

4.163 The Scientific Committee endorsed the report of WG-FSA, including the questions to be addressed and the tasks to be undertaken, taking special note of the following:

- (i) the agreement of WG-FSA on practical definitions (Annex 5, paragraph 14.4) of destructive fishing practices, vulnerability of an ecosystem to fishing and what constitutes significant harm, equivalent to significant adverse impacts in the terms of the UNGA resolution, and the necessity to develop operational definitions based on them or procedures by which these could be identified during the conduct of bottom fisheries;
- (ii) the work of UN FAO to develop approaches on these concepts;
- (iii) some assemblages are easily classified as vulnerable when they are characterised by slow-growing, habitat-forming, sessile species (Annex 5, paragraph 14.5):
 - (a) significant interactions with these types of assemblages, including cold-water coral communities (also known as deep-water or deep-sea corals), sponge communities and other communities associated with seamounts, hydrothermal vent communities and methane cold seep communities, should be avoided as an important first step in mitigating significant adverse impacts;
 - (b) there was sufficient evidence globally that benthic habitats comprising slow-growing, habitat-forming, sessile species could take much longer than three decades to recover from significant fisheries disturbances (Annex 5, paragraph 14.6);
- (iv) there will need to be specific requirements of fisheries to provide data to assist in identifying VMEs in need of protection (Annex 5, paragraph 14.11);
- (v) the history of bottom fishing in the CCAMLR high-seas areas is summarised in Annex 5, paragraphs 14.12 and 14.13, with longline fishing being the primary

method of fishing in high-seas areas of CCAMLR in recent years, the footprints of which are characterised in Annex 5, Figures 8 to 16 (summarised by statistical subareas, divisions and SSRUs for the last five years in Table 4);

- (vi) the effective fishing footprint is also a useful concept for characterising where the fisheries may have had the greatest interactions with benthic ecosystems;
- (vii) avoiding significant adverse impacts could be achieved using a number of mechanisms, including, *inter alia*, the development of mitigation methods, within-season avoidance (move-on) provisions or the designation of longer-term closed areas (Annex 5, paragraph 14.21);
- (viii) research and data collection will be required from fishing vessels to support this process and some fishing activity may be required when evidence of VMEs has arisen to help document the nature and extent of VMEs along with developing mitigation measures to avoid significant adverse impacts. Such activities would need to be undertaken in such a way that they would not contribute to causing significant adverse impacts in the interim of establishing management approaches for an area (Annex 5, paragraph 14.22).

4.164 The Scientific Committee agreed that the proposed procedure provided by WG-FSA, which is based on existing practices and procedures, could be updated to that shown in Figure 1 and used as the framework for indicating what research and data collection activities might be required at different stages of the process of managing bottom fishing. It also clearly shows what is needed to develop scientific advice on (Annex 5, paragraphs 14.21 to 14.39):

- (i) practical guidelines on identifying evidence of VMEs during fishing activities;
- (ii) procedures that could be followed if evidence of VMEs is found;
- (iii) research and data collection programs needed to:
 - (a) evaluate VMEs and the potential for significant adverse impacts;
 - (b) develop approaches to avoid and mitigate significant adverse impacts of fishing on benthic ecosystems.

The Scientific Committee endorsed the descriptions of the components of this procedure as described in Annex 5, paragraphs 14.26 to 14.39, noting that a different treatment between fished and non-fished areas might not be necessary once a clear process is established.

4.165 The Scientific Committee agreed that the full development of the process will require further work in both the Scientific Committee and the Commission and by Members during the intersessional period to meet the requirements of the UNGA resolution (Annex 5, paragraph 14.40). It noted that such work could include, *inter alia*:

- (i) development of rules and data collection requirements needed to trigger actions for different gears and situations during a season with respect to avoidance of potentially vulnerable areas and the gathering of data to assist in identifying VMEs;

- (ii) identifying the method for specifying areas in which evidence of VMEs is detected in order that interim within-season protection could be established either for the vessel concerned or the fishing fleet;
- (iii) developing an approach, including data requirements, for annual assessments of benthic interactions of bottom fishing and identification of Vulnerable and Potentially Vulnerable Areas;
- (iv) consideration of the requirements for observations and reporting;
- (v) consideration of the available management approaches to avoid and mitigate significant adverse impacts on VMEs;
- (vi) further consideration of the relationship between effective fishing footprint and geomorphological features;
- (vii) a method for assessing the amount of seabed directly affected by the gears, such as through the use of cameras, where such methods could then be used to better evaluate the potential spatial extent of disturbance of VMEs at scales less than the resolution of the cell size used in evaluating the effective fishing footprint.

4.166 The Scientific Committee agreed that existing practices can be used to advance the requirements of the UNGA resolution with respect to avoiding significant adverse impacts on VMEs. The process described here is an elaboration of the by-catch procedures already in place and shows the advances in CCAMLR of the ecosystem approach to managing fisheries.

4.167 The Scientific Committee noted that this process makes it easier to understand what needs to be done and when and how this work contributes to CCAMLR achieving its objectives and complying with the UNGA resolution (Annex 5, paragraph 14.42). It also noted that additional resources will need to be brought to these tasks.

4.168 The Scientific Committee noted the work of Australia in developing camera gear that can be deployed on fishing gears by observers to be able to observe the interactions between fishing and benthic habitats (SC-CAMLR-XXVI/BG/30; see also Annex 5, paragraph 14.11). It welcomed these developments and encouraged Members to collaborate with Australia in its work.

Advice to the Commission

4.169 The Scientific Committee addressed issues surrounding Conservation Measure 22-05 (CCAMLR-XXV, paragraphs 11.25 to 11.38) and the implementation, from a scientific perspective, of the 2006 UNGA Sustainable Fisheries Resolution (61/105) in paragraphs 4.159 to 4.168.

4.170 The Scientific Committee agreed that the report of WG-FSA provided a useful foundation for this work, taking special note of the points in paragraph 4.163.

4.171 The Scientific Committee agreed that the procedure in Figure 1 can be used as the framework for indicating what research and data collection activities might be required at

different stages of the process of managing bottom fishing (paragraph 4.164). It noted that the work to be undertaken to assist this process could include, *inter alia*, the points in paragraph 4.165 (paragraph 14.5), but that it can use existing practices to advance the requirements of the UNGA resolution with respect to avoiding significant adverse impacts on VMEs (paragraphs 4.166 and 4.167). The procedure is an elaboration of the by-catch procedures already in place and shows the advances in CCAMLR of the ecosystem approach to managing fisheries.

Crab resources (Subarea 48.3)

4.172 No target fishery for crabs was carried out in the last four seasons and no proposal for their harvest has been received by CCAMLR for the 2007/08 season.

Advice to the Commission

4.173 The Scientific Committee recommended that the existing Conservation Measures 52-01 and 52-02 on crabs should remain in force.

Squid resources

Martialia hyadesi (Subarea 48.3)

4.174 No target fishery for squid (*Martialia hyadesi*) was carried out in the last four seasons and no new request has been submitted to CCAMLR to continue exploratory fishing in the 2007/08 season.

Advice to the Commission

4.175 The Scientific Committee recommended that the existing Conservation Measure 61-01 on *M. hyadesi* should remain in force.

Fish and invertebrate by-catch

4.176 The Subgroup on By-catch met several times during the WG-FSA meeting, and a number of its conclusions are relevant to the Scientific Committee, particularly those involving scientific observers.

4.177 None of the limits on by-catch set in the conservation measures applying to the statistical areas managed by CCAMLR were exceeded during the 2006/07 season.

4.178 It was noted that a higher level of by-catch of macrourids was reported from longliners using autolines than for those using the Spanish longline system, although the total by-catch of macrourids has decreased considerably in the Ross Sea over the last two years.

4.179 The UK presented experimental trials aimed at limiting the by-catch of macrourids. It is hoped that further trials will be conducted in future.

4.180 Given that there are a number of inconsistencies and gaps in the recording of data in the formats for submission of data to CCAMLR, the Scientific Committee recommended that:

- (i) the instructions for observers be amended to indicate that individual skates should be recorded on either L5 or L11 forms, but not on both;
- (ii) the longline and pot tally forms used by observers be amended to reflect catch definitions in the C2 form;
- (iii) the C2 form be modified to enable gear other than Spanish longlines and autoline systems to be recorded;
- (iv) the form for the tally period for trawl fishing (T3) be amended to record the weight of subsamples and the number of individuals of each species retained or discarded.

4.181 The Scientific Committee recommended that 2008/09 be made the Year of the Skate. In preparation for this, the following priorities were identified:

- (i) formation of a subgroup to communicate intersessionally and coordinate planning;
- (ii) development of detailed region-specific identification guides for skates based on characters which could be easily determined on vessels by observers;
- (iii) modification of the L11 form (for 2008/09) to enable adequate recording of detailed information about the fate of skates caught;
- (iv) the skate tagging program in new and exploratory fisheries be revised and tested in 2007/08 prior to being adopted by all vessels in 2008/09;
- (v) the Secretariat be asked to coordinate the skate tagging program in new and exploratory fisheries, and be the repository of skate tagging kits for new and exploratory fisheries.

4.182 The Scientific Committee recommended that the Year of the Skate incorporate all *Dissostichus* spp. fisheries in the Convention Area, with a tagging program focusing on new and exploratory fisheries.

4.183 In response to a question from Prof. Fernholm voicing concerns that the 'cut-off' system for skates was no longer a priority, but was being replaced by bringing skates on board before releasing them, the Convener of WG-FSA explained that it was preferable, for their survival, to bring skates on board (because of lower risk of damage to the body of the skate, especially in heavy seas) and that this procedure was, furthermore, extremely desirable for the

observer who could then determine the species involved and detect any tags that may be present, which is difficult when skates were released in the water alongside the vessel (cut off).

4.184 The Scientific Committee therefore recommended that, for the 2007/08 season, where possible, skates be brought on board prior to release, and that this measure would become mandatory in the Year of the Skate.

4.185 No new data was presented which would allow new advice to be developed on by-catch limits.

4.186 However, preliminary trials were presented to WG-SAM by the UK for Subarea 48.3 and by New Zealand for the Ross Sea. Dr Hanchet specified that one of the aims of the New Zealand IPY/CAML survey in the Ross Sea, planned for summer 2008, would be to estimate the abundance of macrourids in that area.

4.187 The efficacy of the trigger level for the move-on rule in Conservation Measure 33-03, paragraph 5, was reviewed in response to a request from the Scientific Committee in 2006 (SC-CAMLR-XXV, paragraph 4.233), and as a result the Scientific Committee considered that a threshold level of macrourid catch is required by each vessel in each 10-day period in each SSRU to trigger the move-on rule.

4.188 The Scientific Committee recommended that paragraph 5 of Conservation Measure 33-03 be amended as follows:

‘If the catch of *Macrourus* spp. taken by a single vessel in any two 10-day periods in a single SSRU exceeds 1 500 kg in each 10-day period and exceeds 16% of the catch of *Dissostichus* spp. by that vessel in that SSRU in those periods, the vessel shall cease fishing in that SSRU for the remainder of the season.’ (A 10-day period is defined as day 1 to day 10, day 11 to day 20 or day 21 to the last day of the month.)

4.189 The Scientific Committee recommended that the amendment made to Conservation Measure 33-03 be reviewed by WG-FSA in 2008, particularly with respect to the effects of the change on macrourid catches and catch rates.

4.190 Finally, it is requested that guides be prepared for the identification of benthic organisms specific to areas in which observers carry out their activities to enable observers to identify benthic by-catch to the phylum level, and record their weights.