

HARVESTED SPECIES

Krill resources

2007/08 fishing season

- 4.1 Six vessels from five Member nations had fished for krill during the 2007/08 season.
- 4.2 The fishing all occurred in Area 48 (Table 1).
- 4.3 The krill catch in 2007/08 (reported to October 2008) was 125 063 tonnes compared to the total of 104 364 tonnes reported at CCAMLR-XXVI in October 2007 (SC-CAMLR-XXVII/BG/1). The total catch reported to May 2008 was 85 110 tonnes (Annex 4) indicating that a substantial catch (39 953 tonnes) had been taken during the winter months.

Krill fishery notifications in 2008/09

- 4.4 Nine countries submitted krill fishery notifications for 18 vessels with a total projected catch of 629 000 tonnes. This projected catch level indicated that sufficient vessel capacity exists in the krill fleet to exceed the trigger level for Area 48 and emphasised the need to make rapid progress on SSMU allocation of the krill catch (Annex 4, paragraph 4.14).
- 4.5 Notifications to fish for krill were received from nine nations: Chile (one vessel), Cook Islands (one vessel), Japan (one vessel), Republic of Korea (three vessels), Norway (four vessels), Poland (one vessel), Russia (five vessels), Ukraine (one vessel) and the USA (one vessel) (Table 3). Four additional notifications from the USA and one notification from Ukraine had been submitted to WG-EMM (SC-CAMLR-XXVII/BG/3) and had subsequently been withdrawn.
- 4.6 All notifications were for fishing in Area 48 and additionally there was one Russian notification that included krill fishing in Area 58 (SC-CAMLR-XXVII/11). The US and Russian notifications also indicated that their vessels intended to fish for krill in Subarea 48.3 during summer which is a departure from previous practice (Annex 4, paragraph 4.8).
- 4.7 Chile indicated that its vessel had caught 2 tonnes in the 2007/08 season whilst developing processing and catching techniques. These techniques have now been proved and the vessel will be fully operational from December 2008.
- 4.8 The Scientific Committee noted that the projected catches contained in the 2007 notifications to enter the krill fishery (689 000 tonnes) had also exceeded the reported catches in 2007/08 (125 063 tonnes). Thus, it was difficult to assess the seriousness of the intent to fish in the majority of notifications, however, it was acknowledged that the notifications still provide an indication of the level of interest in the krill fishery.
- 4.9 Other indications of commercial interest in harvesting krill is publicly available in the trade press and it might be appropriate for the Scientific Committee to investigate ways in which this information might be provided to inform the deliberations of the working groups.

Gear types

4.10 The notifications for entry into the krill fishery indicated that four gear types would be used: traditional trawling, pumping to clear codend, continuous fishing system and beam trawling (CCAMLR-XXVII/11). Russia clarified that the beam trawling would be used for midwater fishing, in conjunction with a pumping method and would be unlikely to have a greater impact on the benthos or pelagic communities than other pelagic fishing methods.

4.11 The Scientific Committee recommended that the notification pro forma be modified to include information on specific details of gear configuration, including mesh size, mouth opening of the net, as well as the presence and design of any seal exclusion devices, and noted that a proposed modification to Conservation Measure 21-03 had been submitted to achieve this end (CCAMLR-XXVII/36).

4.12 Reports of the scientific observers should also contain information on the gear type and diagrams of the types of gear used.

Estimation of krill catch

4.13 The Scientific Committee noted the large range of conversion factors used to relate the weight of krill products to the catch of krill by fishing vessels (Annex 4, paragraphs 4.34 to 4.39). Data submitted to CCAMLR include no information on the uncertainty associated with the estimation of conversion factors. With the increasing range of products arising from the krill fishery, the range of conversion factors was likely to get larger, therefore the Scientific Committee advised that conversion factors were unlikely to be of use in providing back-estimates of landed catch.

4.14 Information on weight of krill can come from a combination of observer data and information from the fishing vessels. Green weight can be measured effectively from both conventional trawls and from the continuous fishing method using a flow scale meter. Dr S. Iversen (Norway) informed the Scientific Committee that flow scale monitoring of green weight has been implemented on all Norwegian vessels fishing for krill.

4.15 In association with the uncertainty about the actual krill catch derived from the different conversion factors used, the Scientific Committee noted that because of this there is further uncertainty surrounding the extrapolated by-catch of early life-history stages of fish that is being caught in the krill fishery. This concern is also reflected in CCAMLR-XXVII/BG/24.

4.16 The Commission's attention was drawn to the requirement for accurate measurements of the green weight of krill by krill vessels so that the actual amount of krill removals from SSMUs can be calculated. This will be of particular importance as the catch approaches the trigger level in Area 48. Therefore, the Scientific Committee recommended the direct measurement of green weight of krill.

4.17 The Scientific Committee requested that all vessels participating in the krill fishery in the coming season report on the utility of the methods presented by ad hoc TASO

(SC-CAMLR-XXVII/BG/6) in estimating green weight during operations. The Scientific Committee requested that Members obtain these reports from their vessels and present them to TASO for consideration at its 2009 meeting.

4.18 There is also continuing value in the notification pro forma containing information on the range of products arising from the fishery.

By-catch of larval and juvenile fish

4.19 The Scientific Committee noted that despite regular reports from the Japanese fishery, there was still uncertainty over the level of by-catch of juvenile and larval fish in the krill catch over all seasons and areas in which the krill fishery was operating, and from different fishing gears.

4.20 It was noted that a Russian guide to larval and juvenile fish had been submitted to CCAMLR and this guide will be translated so that it can be used by scientific observers. The collection of information on fish by-catch should remain a priority task for observers on krill vessels.

Exploratory krill fishery notifications

4.21 The Scientific Committee noted that the notification deadline in Conservation Measure 21-02 could lead to situations in which notifications of Members' intent to participate in an exploratory krill fishery could be provided after the annual meeting of WG-EMM. The Scientific Committee therefore recommended that Conservation Measure 21-02 be modified so that notifications for exploratory krill fisheries can be received prior to the annual meeting of WG-EMM and be brought into line with other conservation measures for new and exploratory fisheries.

4.22 The Scientific Committee thanked Norway for its efforts in submitting the required notification of an exploratory krill fishery in Subarea 48.6 in advance of the meeting of WG-EMM so that it could receive the necessary scrutiny.

4.23 There is no formal estimate of krill biomass or established precautionary catch limit in Subarea 48.6. An estimate of krill biomass (B_0) would need to be calculated from an acoustic survey conducted according to CCAMLR standard protocols. Given the very large size of Subarea 48.6, WG-EMM should consider schemes for subdividing this subarea into ecologically appropriate subdivisions that could be realistically surveyed to produce estimates of krill biomass.

4.24 There is no existing exploratory fishing data collection plan for krill. The Scientific Committee recommended that a generic set of research requirements and a data collection plan be developed for exploratory krill fisheries. This data collection plan is outlined in paragraphs 4.163 to 4.185.

Advice to the Commission

4.25 The Commission's attention was drawn to the fact that for the second year running the notifications for catch levels from the krill fishery exceeded the existing trigger level in Area 48 (paragraph 4.8).

4.26 The Scientific Committee recommended that the krill fishery notification pro forma be modified to include information on specific details of gear configuration, including mesh size, mouth opening of the net, as well as the presence and design of any seal exclusion devices (paragraph 4.11).

4.27 The Scientific Committee recommended direct measurement of green weight of krill (paragraph 4.16).

4.28 The Scientific Committee recommended that Conservation Measure 21-02 be modified so that notifications for exploratory krill fisheries can be received prior to the annual meeting of WG-EMM (paragraph 4.21).

4.29 The Scientific Committee recommended the adoption of the data collection plan for exploratory krill fisheries (paragraph 4.24).

Fish resources

Fisheries information

Catch, effort, length and age data reported to CCAMLR

4.30 Fishing took place in 12 fisheries targeting icefish (*Champsocephalus gunnari*), toothfish (*D. eleginoides* and/or *D. mawsoni*) and krill (*E. superba*) under conservation measures in force in 2007/08 (CCAMLR-XXVII/BG/15).

4.31 Three other fisheries were conducted in the Convention Area in 2007/08:

- 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 58.7².

4.32 Catches of target species by region reported from fisheries conducted in the CAMLR Convention Area in 2007/08 are summarised in Table 1. Catches reported in 2006/07 are summarised in Table 2.

4.33 The Scientific Committee noted the intersessional work completed by the Secretariat on:

- monitoring and closure of fisheries when catch limits were reached;

² Also conducted in Area 51 outside the Convention Area.

- implementation of the length–mass parameters used in the assessments and development of an R script to plot the catch-weighted length frequencies;
- plotting of the catch-weighted length frequencies for *D. eleginoides* in Subarea 48.3 in two time series (1984/85 to 1996/97, and 1997/98 to present).

4.34 The Scientific Committee noted the estimates of catch and effort from IUU fishing (Annex 5, Table 2). Catches of toothfish reported in waters outside the Convention Area are considered under Agenda Item 7.

Input for stock assessment

4.35 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

4.36 The Scientific Committee noted that five research surveys were undertaken in 2007/08 (Annex 5, paragraphs 3.24 to 3.44):

- (i) 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.
- (ii) A bottom trawl survey in the Ross Sea was carried out by New Zealand as part of the IPY. Catch rates by station were presented for the eight most abundant species, along with catch-weighted length frequencies and biomass estimates of those species.
- (iii) A bottom trawl 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.
- (iv) A stratified random longline survey of Division 58.4.3b was carried out by Australia. The results from this survey were used to provide catch rates, size distribution and size-at-maturity data for toothfish in this division.
- (v) A research survey of Division 58.4.4 was carried out by Japan using trotlines with the objective of collecting biological data on toothfish needed for assessing status of stocks in this division.

4.37 The Scientific Committee congratulated Australia, Japan, New Zealand and the UK on completing research surveys and for contributing to the long-term data series.

4.38 Aspects of the research survey carried out by Japan in Division 58.4.4 are considered further under Agenda Item 4(iii).

Tagging studies

4.39 The Scientific Committee noted that several key issues with respect to tagging of toothfish in both exploratory and assessed fisheries were discussed in detail by WG-FSA (Annex 5, paragraphs 3.46 to 3.63), including:

- (i) the continuation of the tag-recapture experiment in Subarea 48.4 (Annex 5, paragraphs 3.46 and 3.47);
- (ii) difficulties in matching recaptured fish with release records (Annex 5, paragraphs 3.49 to 3.58).

4.40 The Scientific Committee considered that the requirements for photographs, entering of recapture details in logbooks and returning the tags to the Secretariat represented some redundancy, but allows for improved validation. For example, the Scientific Committee recognised that digital images could be manipulated, therefore photographic evidence alone may not be sufficient evidence of a tag return. The Scientific Committee was optimistic that the centralisation of the tagging program in new and exploratory fisheries would go some way to addressing these issues into the future.

Management advice

4.41 The Scientific Committee agreed that Members should be required to return physical tags to the Secretariat. In addition, the Secretariat should check for correct transcription of returned tags, including all alphanumeric characters.

4.42 The Scientific Committee requested that the Secretariat verify the tagging details for all tags recovered, including the following actions:

- (i) direct comparison of reported recapture details with data available in the tagging database;
- (ii) use of digital photographs and actual tags to verify tag identities;
- (iii) correspondence with Members to clarify remaining uncertainty.

Biological parameters

4.43 The Scientific Committee noted consideration of new information on biological parameters set out in Annex 5, paragraphs 3.64 to 3.80, including information on age and growth and maturity for *Dissostichus* spp. and *C. gunnari*.

General biology and ecology

4.44 The Scientific Committee noted the discussions of WG-FSA on biology and ecology which included topics pertaining to *Dissostichus* spp., *C. gunnari*, by-catch species and former target species (*Chaenodraco wilsoni*) (Annex 5, paragraphs 9.1 to 9.23). These topics included:

- distribution and abundance of *D. mawsoni*
- diet and food consumption of several species of finfish
- early-life history
- maturity and fecundity
- age and growth
- further development of species profiles.

4.45 With respect to species profiles, the Scientific Committee noted that the profile for *D. eleginoides* will be updated in the course of 2009, and recommended that the profiles for *D. mawsoni*, *D. eleginoides* and *C. gunnari* be published on the CCAMLR website in early 2010 and updated regularly (Annex 5, paragraph 9.21).

Preparation of assessment and assessment timetables

WG-SAM report

4.46 The Scientific Committee noted that WG-FSA had reviewed the relevant sections of the WG-SAM report and endorsed the recommendations of WG-SAM.

Review of preliminary stock assessment papers

4.47 The Scientific Committee noted two preliminary stock assessments for *C. gunnari* in Subarea 48.3 and Division 58.5.2 that were developed during the intersessional period and reviewed by WG-FSA. The resulting discussions and summaries leading to management advice are provided in Annex 5, paragraphs 4.2 to 4.10.

4.48 In addition, the Scientific Committee noted that WG-FSA had reviewed preliminary assessments for toothfish in Divisions 58.4.1 and 58.4.2 (Annex 5, paragraphs 4.12 to 4.14). The Scientific Committee also noted that in order to provide management advice for the exploratory toothfish fishery in Division 58.4.3a, WG-FSA had drawn on progress toward assessing this fishery presented at WG-SAM (Annex 5, paragraphs 5.44 to 5.46). WG-FSA had also examined indicative estimates of biomass for the macrourid *Macrourus whitsoni* on the continental slope of the Ross Sea (Annex 5, paragraphs 4.16 and 14.17). These assessments are discussed further under Agenda Item 4(iii).

Assessment carried out and assessment timetable

4.49 The Scientific Committee noted that no new assessments were required this year for the fisheries for *Dissostichus* spp. in Subarea 48.3, Division 58.5.2 and in the Ross Sea under the current arrangement for multi-year management.

4.50 Discussion of assessments carried out this year by WG-FSA is provided in Annex 5, paragraphs 5.1 to 5.107. All assessment work was undertaken by primary authors of preliminary assessments and reviewed independently at WG-FSA. The outcomes of the assessments are presented in the Fishery Reports (Annex 5, Appendices D to Q).

Assessments and management advice

Dissostichus eleginoides South Georgia (Subarea 48.3)

4.51 The Fishery Report for *D. eleginoides* in Subarea 48.3 is contained in Annex 5, Appendix J.

4.52 The catch of *D. eleginoides* reported for this subarea in 2008 was 3 856 tonnes, plus 2 tonnes taken during the trawl survey. Of this total, 55 tonnes were taken by pots, the remainder by longlines. Catches in Management Areas A, B and C were 8 tonnes, 1 103 tonnes and 2 744 tonnes respectively. The estimated IUU catch for the 2007/08 season was zero. Following the advice of the Scientific Committee, the assessment was not updated in 2008.

Management advice

4.53 The Scientific Committee recommended that the catch limit for toothfish in Subarea 48.3 (SGSR stock) be set at 3 920 tonnes in the 2008/09 fishing season, the same level as in 2007/08. The Scientific Committee recommended that a new assessment of toothfish in Subarea 48.3 be carried out by WG-FSA in 2009.

4.54 The catch limits for management areas A, B and C should be 0, 1 176 and 2 744 tonnes respectively. By-catch limits for skates/rays and macrourids should remain at 196 and 196 tonnes respectively.

Dissostichus eleginoides Kerguelen Islands (Division 58.5.1)

4.55 The Fishery Report for *D. eleginoides* in Division 58.5.1 is contained in Annex 5, Appendix K.

4.56 The catch of *D. eleginoides* up to 31 August 2008 reported for this division was 2 853 tonnes. Only longlining is currently permitted in the fishery. The estimated IUU catch for the 2007/08 season was zero inside the French EEZ. Some IUU fishing may occur outside the EEZ, as reported in WG-FSA-08/10 Rev. 2.

4.57 The CPUE standardisation for Division 58.5.1 was not updated by WG-FSA.

Management advice

4.58 For Division 58.5.1, the Scientific Committee encouraged the estimation of biological parameters, the development of a stock assessment and continuation of the tagging program undertaken by France. The Scientific Committee also encouraged 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.

4.59 The Scientific Committee recommended avoidance of fishing in zones of specific high rates of by-catch.

4.60 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 Conservation Measure 32-13, remain in force.

4.61 The Scientific Committee noted that France had made significant progress in mitigating seabird by-catch, including area/season closures (SC-CAMLR-XXVI, Annex 6, paragraph II.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 Heard Island (Division 58.5.2)

4.62 The Fishery Report for *D. eleginoides* in Division 58.5.2 is contained in Annex 5, Appendix L.

4.63 The catch of *D. eleginoides* reported for this division by the time of the WG-FSA meeting was 1 496 tonnes. Of this total, 718 tonnes were taken by bottom trawl and 778 by longlines. The estimated IUU catch for the 2007/08 season was zero.

4.64 Following the recommendation by the Scientific Committee, the toothfish assessment for *D. eleginoides* in Division 58.5.2 was not updated by WG-FSA. The Scientific Committee noted that the *D. eleginoides* stock assessment in this division will be updated in 2009.

Management advice

4.65 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 2008/09 fishing season.

Dissostichus eleginoides Crozet Islands (Subarea 58.6)

4.66 The Fishery Report for *D. eleginoides* in Subarea 58.6 (French EEZ) is contained in Annex 5, Appendix M.

4.67 The catch of *D. eleginoides* reported for this subarea to October 2008 was 684 tonnes. Only longlining is currently permitted in the fishery. The estimated IUU catch for the 2007/08 season was zero inside Subarea 58.6 as reported in WG-FSA-08/10 Rev. 2.

4.68 The CPUE series for this fishery was not updated by WG-FSA in 2008.

Management advice

4.69 For this subarea, the Scientific Committee encouraged the estimation of biological parameters, the development of a stock assessment and the continuation of the tagging program undertaken by France.

4.70 The Scientific Committee recommended the avoidance of zones of high rates of by-catch.

4.71 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 Conservation Measure 32-13, remain in force.

4.72 The Scientific Committee noted that France had made significant progress in mitigating seabird by-catch, including area/season closures (SC-CAMLR-XXVI, Annex 6, paragraph II.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)

4.73 The Fishery Report for *D. eleginoides* in Subareas 58.6 and 58.7 inside the South African EEZ is contained in Annex 5, Appendix N.

4.74 The catch limit of *D. eleginoides* in the South African EEZ for the 2007/08 season was 450 tonnes for the period from 1 December 2007 to 30 November 2008. The catch reported for Subareas 58.6 and 58.7 as of 5 October 2008 was 61 tonnes, all of which was taken by longlines. The IUU catch for the 2007/08 season was assumed to be equal to the IUU catch in 2004/05 at 156 tonnes.

4.75 The CPUE series was not updated by WG-FSA in 2008.

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

4.76 The Scientific Committee reiterated its advice from previous years that the advice on appropriate future catch levels provided in WG-FSA-05/58 (see also WG-FSA-06/58 and 07/34 Rev. 1) was not based on the CCAMLR decision rules. Therefore, 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 also be used in estimating yields for this fishery and that the concerns over the sensitivity of the ASPM to weightings used for different data sources and the estimation of recruitment levels for forward projections be noted.

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

4.77 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*, described in Conservation Measures 32-10, 32-11 and 32-12, remain in force.

Chamsocephalus gunnari South Georgia (Subarea 48.3)

4.78 The Fishery Report for *C. gunnari* in Subarea 48.3 is contained in Annex 5, Appendix O.

4.79 In the 2007/08 fishing season the catch limit set for *C. gunnari* in Subarea 48.3 was 2 462 tonnes. Up to the time of the WG-FSA meeting, the fishery caught 1 326 tonnes. The fishery was subsequently closed on 25 October 2008 with a total catch of 2 366 tonnes having been taken up to 23 October.

4.80 In April 2008 the UK undertook a random stratified bottom trawl survey of the South Georgia and Shag Rocks shelves, reported in WG-FSA-08/28. The survey employed the same trawl gear and survey design as previous UK surveys in Subarea 48.3.

4.81 A short-term assessment was implemented in the GYM, using the one-sided bootstrap lower 95% confidence bound of total biomass from the 2008 survey. All other input parameters for the assessment were the same as in 2007.

Management advice

4.82 The Scientific Committee recommended that the catch limit for *C. gunnari* should be set at 3 834 tonnes in 2008/09 and 2 631 tonnes in 2009/10 based on the outcome of the short-term assessment.

Champscephalus gunnari Heard Island (Division 58.5.2)

4.83 The Fishery Report for *C. gunnari* in Division 58.5.2 is contained in Annex 5, Appendix P.

4.84 The catch limit of *C. gunnari* in Division 58.5.2 for the 2007/08 season was 220 tonnes for the period from 1 December 2007 to 30 November 2008. The catch reported for this division as of 5 October 2008 was 199 tonnes.

4.85 A large 2+ 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 2008.

4.86 The short-term assessment was implemented in the GYM, using the one-sided bootstrap lower 95% confidence bound of total biomass from the 2008 survey. All other parameters were the same as in previous years.

Management advice

4.87 The Scientific Committee recommended that the catch limit for *C. gunnari* in 2008/09 should be set at 102 tonnes.

4.88 The Scientific Committee recommended that other measures for this fishery remain the same.

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

4.89 CCAMLR closed commercial finfishing in the Antarctic Peninsula (Subarea 48.1) and the South Orkney Islands (Subarea 48.2) after the 1989/90 season. Both subareas should only be reopened to commercial exploitation if scientific surveys have previously demonstrated that the condition of fish stocks has improved to the extent that would allow commercial harvesting.

4.90 The Scientific Committee noted that the results from the three most recent surveys in these subareas indicate that fish biomass has not increased to the extent that a reopening of the fishery should be considered.

4.91 A new trawl survey will be undertaken in Subarea 48.2 by the US AMLR Program with international participation in February–March 2009.

Management advice

4.92 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)

4.93 The Scientific Committee noted the results of the three-year mark–recapture experiment conducted in the Northern Area of Subarea 48.4 (Conservation Measure 41-03). The experiment has allowed a preliminary assessment of *D. eleginoides* in the Northern Area, and the vulnerable biomass was estimated to be between 1 000 and 2 000 tonnes (Annex 5, paragraph 5.166).

4.94 The Scientific Committee also noted WG-FSA’s consideration of the UK’s proposal to continue the mark–recapture experiment in Subarea 48.4 in 2008/09 so as to allow for a full assessment of *D. eleginoides* in the Northern Area in 2009. Additionally, the UK proposed to commence a mark–recapture experiment in the Southern Area of Subarea 48.4 (Annex 5, Appendix Q, Figure 3), with the aim of collecting data required for assessments of the population structure, size, movement and growth of both *D. eleginoides* and *D. mawsoni* in the Southern Area of Subarea 48.4.

4.95 The main elements of the proposal are described in Annex 5, paragraph 5.168. Included in the proposal is a catch limit of 75 tonnes each for the Northern Area and the Southern Area.

4.96 The Scientific Committee congratulated the UK on this initiative, noting that the three-year mark–recapture experiment and the new proposal for 2008/09 provide a staged approach to the assessment of *Dissostichus* spp. in Subarea 48.4. This approach illustrates how new data may be added to existing information to develop assessments in areas where the status of stocks was previously unknown.

Management advice

4.97 The Scientific Committee endorsed the proposed extension to the mark–recapture experiment and agreed that the catch limit should be 75 tonnes in the Northern Area and 75 tonnes in the Southern Area for the 2008/09 season (Annex 5, paragraph 5.171 and Appendix Q).

4.98 In addition, the Scientific Committee endorsed the recommendation made by WG-IMAF to amend Conservation Measure 41-03 in order to align the seabird by-catch mitigation requirements for Subarea 48.4 with the IMAF risk assessment (Annex 6, paragraph 9.10), and the fishing season be extended to run from 1 December to 30 November.

New and exploratory fisheries in 2007/08 and notifications for 2008/09

4.99 In 2007 the Commission agreed to seven exploratory longline fisheries for *Dissostichus* spp. in the 2007/08 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, Tables 5 and 6.

4.100 Notifications for exploratory fisheries in 2008/09 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, for an exploratory trawl fishery for *E. superba* in Subarea 48.6, and for new pot fisheries for crab in Subareas 48.2 and 48.4.

Notification for new fisheries for crabs in Subareas 48.2 and 48.4

4.101 One Member (Russia) and one vessel notified their intention to conduct new pot fisheries for crabs in Subareas 48.2 and 48.4 in the 2008/09 season.

4.102 The Scientific Committee noted that no crab fishery has ever been attempted in Subareas 48.2 and 48.4. Noting the issues to be considered in addition to the requirements for the crab fishery discussed below, the Scientific Committee considered that the existing Conservation Measures 52-01 and 52-02 for the crab fishery in Subarea 48.3 could be used as a template to develop an experimental harvest regime for crabs in Subareas 48.2 and 48.4 should they proceed. All aspects of Conservation Measures 52-01 and 52-02 should be applied to conservation measures developed for Subareas 48.2 and 48.4 with the exception of modifications suggested below:

- (i) two scientific observers should be present, including at least one international scientific observer;
- (ii) the 2008/09 season should be defined as the period from 1 December 2008 to 30 November 2009, or until the catch limit is reached, whichever is sooner.

4.103 The Scientific Committee recommended that all by-catch of finfish during the experimental fishing regime shall be recorded for length, identified to species and then released with the least possible handling. Before the release, all specimens of *Dissostichus* spp. shall be measured and tagged. Full biological data should be taken from dead finfish by-catch and they should be returned to the sea.

4.104 The following paragraphs outline the Scientific Committee's considerations for the proposed crab fishery in each subarea.

Subarea 48.2

4.105 The Scientific Committee noted that there is no information on which to determine a catch limit for crabs in Subarea 48.2 as there is no information on the types of species or abundances that might form the basis of a sustainable fishery. The Scientific Committee considered that an approach consistent with assigning catch limits in exploratory toothfish fisheries would be appropriate, i.e. the catch should be at a nominally low level to provide for doing research on stock distribution and abundance and for helping determine strategies that will lead to an assessment of stock status and sustainable harvest strategies. It agreed that, should the crab fishery proceed in this subarea in the 2008/09 season, the experimental regime specified in the WG-FSA report (Annex 5, paragraphs 5.13 to 5.16) would be appropriate with a catch limit in the order of 250 tonnes.

Subarea 48.4

4.106 The Scientific Committee recommended that every vessel participating in the crab fishery in Subarea 48.4 in the 2008/09 season should conduct fishing operations in accordance with an experimental harvesting regime as defined in the WG-FSA report (Annex 5, paragraphs 5.17 to 5.20). The Scientific Committee agreed that, should the crab fishery proceed in this subarea, the experimental regime would be appropriate with a precautionary catch limit of 10 tonnes.

Progress towards assessments of new and exploratory toothfish fisheries

4.107 The Scientific Committee noted that WG-FSA had made further progress towards developing methods to assess exploratory fisheries (Annex 5, paragraphs 5.75 to 5.87). It further noted that they had considered two key aspects: (i) data requirements for assessing exploratory fisheries, and (ii) research designs in exploratory toothfish fisheries. The Scientific Committee acknowledged the importance of understanding stock structure, productivity and abundance, and agreed that estimation of stock abundance in many of the exploratory fisheries remains a key problem.

4.108 The Scientific Committee recognised the importance of tagging studies for acquiring information necessary for assessments, and agreed on the factors identified by WG-FSA that are important for tagging programs to be successful (Annex 5, paragraph 5.77). The Scientific Committee agreed on the need for good spatial overlap of tags and subsequent fishing effort and that the tagging rate had to be sufficiently high to ensure reasonable recovery of tags. The Scientific Committee noted that WG-FSA had examined the requirement of a constant tagging rate, as well as the required spreading of tags throughout the area (Annex 5, paragraph 5.81). The Scientific Committee noted that plots of tagging rate per vessel demonstrated high variability, and recommended that this issue be referred to SCIC, noting that the attention of Members might need to be drawn to its recommendations last year (SC-CAMLR-XXVI, paragraph 4.117) and the associated changes made last year to Conservation Measure 41-01 (Annex 41-01/C, paragraph 2(i)) to address this issue.

4.109 The Scientific Committee agreed that in the absence of reliable tagging information, the only other information currently available is CPUE. However, there is concern that CPUE estimates in some exploratory divisions are not compatible, as is the case when different vessels fish in different locations each year.

4.110 The Scientific Committee recalled that there is a requirement for vessels fishing in exploratory fisheries to carry out up to 20 research sets, which must have a minimum distance of 5 n miles. However, some of the lines being fished are up to 40 km long which makes the 5 n mile minimum distance ineffective as an effort-spreading mechanism. The Scientific Committee considered that an alternative might be to have a more structured research fishing plan, fishing in a more systematic pattern with shorter lines analogous to the experimental design used for the crab fishery in Subarea 48.3.

4.111 The Scientific Committee noted that WG-FSA had recommended that vessels entering a new SSRU in Subarea 48.6 and open SSRUs in Subarea 58.4 should be required to carry out 10 research sets. Sets would be carried out on, or close to, supplied positions within strata

based on fishable area where that information is available. Alternate positions could be supplied to replace any positions that were found to be unfishable for any reason. It also considered that, if carried out annually by the same vessels, they could be used to develop a time series of relative abundance indices.

4.112 The Scientific Committee agreed that each open SSRU in Subareas 48.6 and 58.4 would be divided into two strata: (i) previously fished, and (ii) unfished or lightly fished. Five research sets, each comprising a minimum of 3 500 hooks and a maximum of 5 000 hooks, would be carried out in each stratum in accordance with Conservation Measure 41-01, Annex 41-01/B.

4.113 The Scientific Committee further noted that the location of the research sets would be randomly determined in the following manner. For Divisions 58.4.1 and 58.4.2, the location of the five research sets in the fished stratum would be produced by bootstrapping (without replacement) from the mid-points of the location of sets made previously in the fished stratum. Within the unfished stratum, the location of each of the five research sets would be provided by giving the vessel a random line of longitude. The vessel would then be required to ensure that each research set was in a general north–south orientation that intersected the 1 000 m contour and that line of longitude. For Subarea 48.6 and Divisions 58.4.3a and 58.4.3b, the location of the five research sets in each of the fished stratum and in the lightly fished stratum would be produced by bootstrapping (without replacement) from the mid-points of the location of sets made previously in each of the respective strata.

4.114 The Scientific Committee requested the Secretariat generate lists of random stations for each vessel participating in these exploratory longline fisheries, and for the list to be sent to notifying Members prior to the start of the 2008/09 season.

4.115 The Scientific Committee noted that preliminary assessments of *Dissostichus* spp. for the open SSRUs in Divisions 58.4.1 and 58.4.2 had been developed during the meeting of WG-FSA (Annex 5, paragraphs 5.21 to 5.29). These assessments had led to preliminary estimates of yield and recommendations on the reduction of catch limits for those open SSRUs.

4.116 Drs K. Shust and Pshenichnov, on behalf of Russia and Ukraine respectively, noted that the estimates of toothfish biomass in Divisions 58.4.1 and 58.4.2 related only to the open SSRUs. They noted that tagging of toothfish resulted in inadequately low tag-recaptures in Divisions 58.4.1 and 58.4.2 (WG-SAM-08/4), probably due to migrations of toothfish from the sites of tagging to the closed SSRUs. They also noted that the assumption that CPUE is proportional to toothfish density is not correct for a longline fishery, and that this leads to an increase in the uncertainty of the analysis. In open SSRUs the biomass of toothfish was estimated by means of an unknown constant (the catchability) (WG-FSA-08/43). Catchability of longline as a whole and longlining of toothfish in particular is unknown, and should not be used for biomass estimation. Drs Shust and Pshenichnov also pointed out that catches of immature (1–4 years old) fish in Division 58.4.2 (WG-FSA-08/23) using bottom trawls give ground to suggest that recruitment and biomass of fish in this division is higher than presented in WG-FSA-01/43.

4.117 Many Members noted that toothfish in Divisions 58.4.1 and 58.4.2 may come from the same stock, including fish on BANZARE Bank. This conclusion is drawn from the data and analyses for this region by WG-FSA over the last two years. The analyses do not suggest that

the stock is depleted but that the region-wide population is likely to be much less than, say, in Subareas 88.1 and 88.2. As a result, there is no expectation that the stock in Divisions 58.4.1 and 58.4.2 is depleted in the open areas compared to the closed areas. Strategies to concentrate effort in such a way to collect data to assist with assessments remain the best approaches for developing these fisheries.

Dissostichus spp. (Subarea 48.6)

4.118 Four Members (Japan, Republic of Korea, New Zealand and South Africa) notified their intention to fish in the exploratory fishery in Subarea 48.6 in 2007/08; however, to date, none fished and the fishery remains open until 30 November 2008. The precautionary catch limit for *Dissostichus* spp. was 400 tonnes. There was no evidence of IUU fishing in 2007/08.

4.119 Two Members (Japan and Republic of Korea) and a total of three vessels notified their intention to fish for toothfish in Subarea 48.6 in 2008/09.

4.120 The Scientific Committee endorsed the recommendation of WG-FSA that the tagging rate in this subarea should be increased to three fish per tonne (Annex 5, paragraph 5.65).

4.121 The Scientific Committee also agreed that vessels entering an SSRU in Subarea 48.6 would be required to carry out research sets in accordance with the procedure outlined in paragraphs 4.112 to 4.114.

Dissostichus spp. (Division 58.4.1)

4.122 Four Members (Republic of Korea, Namibia, Spain and Uruguay) and six vessels fished in the exploratory fishery in Division 58.4.1 in 2007/08. The precautionary catch limit for toothfish was 600 tonnes and the reported catch so far was 413 tonnes. Information on IUU activities indicated that 94 tonnes of toothfish were taken in 2007/08 (Annex 5, paragraphs 5.30 and 5.31).

4.123 Six Members (Japan, Republic of Korea, New Zealand, South Africa, Spain and Uruguay) and a total of 13 vessels notified their intention to fish for toothfish in Division 58.4.1 in 2008/09.

4.124 The Scientific Committee recommended that the tagging rate be maintained at a minimum of three fish per tonne (Annex 5, paragraph 5.100).

4.125 The Scientific Committee noted that a preliminary assessment of *Dissostichus* spp. in Division 58.4.1 had been carried out by UK and Spanish scientists and presented to WG-FSA (Annex 5, paragraphs 5.21 to 5.29). The Scientific Committee noted that this was the first assessment of *Dissostichus* spp. in this division and thanked the scientists involved for carrying out this work.

4.126 The Scientific Committee agreed that, although uncertain, the median estimates of yield provided for the open SSRUs in Annex 5, Table 13, provided the best available scientific advice on the yields for *Dissostichus* spp. in this division. However, the Scientific Committee was unable to provide consensus advice on catch limits for this division.

4.127 Some members of the Scientific Committee considered that the current network of open and closed SSRUs in this division made it difficult to assess the entire stock (paragraph 4.116). The Scientific Committee agreed that the issue of potential bias caused by open and closed SSRUs was best addressed by WG-SAM. The Scientific Committee requested Members to submit papers to the 2009 meeting of WG-SAM that addressed this issue.

4.128 The Scientific Committee also recommended that vessels entering an SSRU in Division 58.4.1 should be required to carry out research sets in accordance with the procedure outlined in paragraphs 4.112 to 4.114.

Dissostichus spp. (Division 58.4.2)

4.129 Two Members (Republic of Korea and Namibia) and three vessels fished in the exploratory fishery in Division 58.4.2 in 2007/08. The precautionary catch limit for toothfish was 780 tonnes and the reported catch so far was 217 tonnes. There was no evidence of IUU fishing in 2007/08.

4.130 Six Members (Australia, Japan, Republic of Korea, New Zealand, Spain and Uruguay) and a total of nine vessels notified their intention to fish for toothfish in Division 58.4.2 in 2008/09.

4.131 The Scientific Committee recommended that the tagging rate be maintained at a minimum of three fish per tonne (Annex 5, paragraph 5.100).

4.132 The Scientific Committee noted that a preliminary assessment of *Dissostichus* spp. in Division 58.4.2 had been carried out by UK and Spanish scientists and presented to WG-FSA (Annex 5, paragraphs 5.21 to 5.29). The Scientific Committee noted that this was the first assessment of *Dissostichus* spp. in this division and thanked the scientists involved for carrying out this work.

4.133 The Scientific Committee agreed that, although uncertain, the median estimates of yield provided for the open SSRUs in Annex 5, Table 13, provided the best available scientific advice on the yields for *Dissostichus* spp. in this division. However, the Scientific Committee was unable to provide consensus advice on catch limits for this division.

4.134 Some members of the Scientific Committee considered that the current network of open and closed SSRUs in this division made it difficult to assess the entire stock (paragraph 4.116). The Scientific Committee agreed that the issue of potential bias caused by open and closed SSRUs was best addressed by WG-SAM. The Scientific Committee requested Members to submit papers that addressed this issue to the 2009 meeting of WG-SAM.

4.135 The Scientific Committee also recommended that vessels entering an SSRU in Division 58.4.2 should be required to carry out research sets in accordance with the procedure outlined in paragraphs 4.112 to 4.114.

Dissostichus spp. (Division 58.4.3a)

4.136 One Member (Uruguay) and one vessel fished in the exploratory fishery in Division 58.4.3a in 2007/08. The precautionary catch limit for toothfish was 250 tonnes and the reported catch was 9 tonnes. There was no evidence of IUU fishing in 2007/08.

4.137 One Member (Japan) and one vessel notified their intention to fish for toothfish in Division 58.4.3a in 2008/09.

4.138 The Scientific Committee recommended that the tagging rate be maintained at a minimum of three fish per tonne (Annex 5, paragraph 5.100).

4.139 The Scientific Committee noted that a preliminary assessment of *Dissostichus* spp. using a biomass dynamic surplus production model in Division 58.4.3a had been carried out by UK scientists and presented to WG-SAM (Annex 7, paragraphs 3.6 to 3.8). The Scientific Committee noted that this was the first assessment of *Dissostichus* spp. in this division and thanked the scientists involved for carrying out this work.

4.140 The catch limit for Division 58.4.3a in 2007/08 was 250 tonnes. The Working Group agreed that the assessment suggested that this level of catch was not sustainable and that the catch limit for this division be reduced to a level in the range of 86 to 113 tonnes.

4.141 The Scientific Committee also recommended that vessels entering an SSRU in Division 58.4.3a should be required to carry out research sets in accordance with the procedure outlined in paragraphs 4.112 to 4.114.

Dissostichus spp. (Division 58.4.3b)

4.142 Three Members (Japan, Namibia and Uruguay) and three vessels fished in the exploratory fishery in Division 58.4.3b in 2007/08. The precautionary catch limit for toothfish was 150 tonnes and the reported catch was 139 tonnes. Information on IUU activities indicated that 246 tonnes of toothfish were taken in 2007/08 (Annex 5, paragraph 5.50).

4.143 Three Members (Japan, Spain and Uruguay) and a total of three vessels notified their intention to fish for toothfish in Division 58.4.3b in 2008/09.

4.144 The Scientific Committee recommended that the tagging rate be maintained at a minimum of three fish per tonne (Annex 5, paragraph 5.100).

4.145 The Scientific Committee noted that a random longline survey of BANZARE Bank had been carried out by Australia in May 2008 (Annex 5, paragraph 3.32). The Scientific Committee agreed that the catch rates of *Dissostichus* spp. were very low during the survey,

consistent with toothfish being depleted in the surveyed area. However, it was unable to reach consensus on the stock status of *Dissostichus* spp. across the entire division.

4.146 The Scientific Committee agreed that the research has shown the following:

- (i) Based on fishing information until last year, the fisheries across BANZARE Bank show that the preferred fishing grounds were depleted in the Southern Area (SSRU B closed to fishing in 2007/08, Conservation Measure 41-07 (2007)).
- (ii) Based on the survey and fisheries across BANZARE Bank, there are very few fish apart from in the preferred fishing grounds.
- (iii) The fish found in the preferred fishing grounds are large and likely spawning, there are no small fish and fish are male dominated (79%).
- (iv) In the survey, the fish are large and mostly male.
- (v) Spawning fish in East Antarctica have only been found on BANZARE Bank (WG-FSA-07/44 and Annex 5, paragraph 3.32).

4.147 The Scientific Committee noted that only two of the three preferred fishing grounds in the area were covered by the random survey. However, the random nature of the survey implies the area was adequately covered. Japan noted it would have liked to see the third preferred fishing ground surveyed and a larger number of stations sampled to provide a more robust estimate of biomass. The Scientific Committee recommended that WG-SAM should look at how to design longline surveys and, in particular, how to deal with preferred fishing grounds and how to reconcile datasets from different types of fishing gear. It also referred back to Annex 5, paragraphs 5.84 to 5.87, which deal with the design of research surveys.

4.148 The Scientific Committee was unable to provide management advice on catch limits in this division.

4.149 The Scientific Committee recommended that vessels entering an SSRU in Division 58.4.3b should be required to carry out research sets in accordance with the procedure outlined in paragraphs 4.112 to 4.114.

Dissostichus spp. (Subareas 88.1 and 88.2)

4.150 In 2007/08, eight Members (Argentina, Republic of Korea, New Zealand, Russia, South Africa, Spain, UK and Uruguay) and 15 vessels fished in the exploratory fishery in Subarea 88.1. The fishery was closed on 31 August 2008 and the total reported catch of *Dissostichus* spp. was 2 259 tonnes (84% of the catch limit) (CCAMLR-XXVII/BG/15, Table 2). During the course of fishing, SSRUs B, C and G were closed on 19 December 2007, triggered by the catch of *Dissostichus* spp. (total catch 259 tonnes; 83% of the catch limit).

4.151 The IUU catch for the 2007/08 season was estimated to be 187 tonnes (Annex 5, paragraph 5.66).

4.152 Four Members (New Zealand, Russia, UK and Uruguay) and four vessels fished in the exploratory fishery in Subarea 88.2. The fishery closed on 31 August 2008 and the total reported catch of *Dissostichus* spp. was 416 tonnes (73% of the catch limit) (CCAMLR-XXVII/BG/15, Table 2). SSRU E was closed on 1 February 2008, triggered by the catch of *Dissostichus* spp. (total catch 333 tonnes; 98% of the catch limit). There was no evidence of IUU fishing in 2007/08.

4.153 Nine Members (Argentina, Chile, Republic of Korea, 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 2008/09. Nine Members (Argentina, Chile, Republic of Korea, New Zealand, Russia, South Africa, Spain, UK and Uruguay) and a total of 19 vessels notified their intention to fish for *Dissostichus* spp. in Subarea 88.2 in 2008/09.

4.154 In accordance with the advice of Scientific Committee in 2007, 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.

4.155 The Scientific Committee noted that an extensive review of the three-year experiment in the toothfish fisheries in Subareas 88.1 and 88.2 had been carried out by New Zealand scientists (Annex 5, paragraphs 5.88 to 5.90). The review outlined the objectives and achievements of the three-year experiment, and identified minor changes to the operational framework to meet the science and management objectives of the fishery. The Scientific Committee thanked New Zealand for carrying out this work

4.156 Most Members agreed that considerable progress had been made on the stock assessment for *D. mawsoni* in Subareas 88.1 and 88.2 as a result of the experiment.

4.157 However, Drs Shust and Pshenichnov, on behalf of Russia and Ukraine respectively, expressed the opinion that the three-year experiment of toothfish tagging in the Ross Sea had been unsuccessful, as it did not result in significant improvement of toothfish stock assessment in those subareas. They pointed out several sources of substantial uncertainty of stock assessments of toothfish in the Ross Sea based on the tag-returns (WG-SAM-08/8). The first source is the absence of data from the closed SSRUs. Another source comes from taking into account tag-returns from the New Zealand fishery only, which operates from year to year within restricted areas of the Ross Sea and adjacent waters. Together, these sources may result in considerable underestimation of toothfish biomass and catch limit in the Ross Sea. Taking into account the reasons mentioned above, continuation of the toothfish tagging program should not be further confined to open SSRUs only. The uncertainties related to the current tagging schedule may be amplified even further under three- or five-year experiments of toothfish fishery management. Taking all this into account, Drs Shust and Pshenichnov suggested that the Commission consider the possibility of opening all closed SSRUs in order to distribute the exploratory effort across the entire Subareas 88.1 and 88.2 and provide better estimates of the toothfish stock in those subareas.

4.158 The Scientific Committee recognised the differing views of Members regarding the network of open and closed SSRUs in these two subareas (Annex 5, paragraphs 5.89 and 5.94 to 5.96). It recommended that the relative merits of the different views on harvest strategies and research programs for toothfish in the Ross Sea be evaluated using simulations (see

Annex 7, paragraphs 5.1 to 5.6). It recommended that such work be submitted to WG-SAM for review of the simulation and assessment methodologies before submitting the outcomes to WG-FSA for consideration.

4.159 The Scientific Committee also noted that additional approaches to assessing and modelling the Ross Sea fishery were being carried out by New Zealand and Russian scientists and encouraged the further development of these new modelling approaches and their submission to WG-SAM for review and evaluation (Annex 5, paragraph 4.11; Annex 7, paragraphs 8.1 to 8.3).

4.160 The Scientific Committee endorsed the following recommendations:

- (i) The creation of an additional SSRU in the region to the west of 170°E in the western Ross Sea including Terra Nova Bay and McMurdo Sound (i.e. SSRU 881J west). It further recommended that this new SSRU (881M) (Figure 2) should be closed to fishing because of its importance as a corridor for sub-adult toothfish moving between the shelf and the northern area to spawn.
- (ii) Retain the current amalgamation of SSRU catch limits, and in addition amalgamate the catch limits for SSRUs 881J (east of 170°E) and 881L.
- (iii) Re-adjust proportional catch limits in these revised SSRUs based on revised seabed areas and new CPUE.
- (iv) Allow retention of catch limits for toothfish and by-catch species for ‘out of season’ experiments in open SSRUs.
- (v) Continue with biennial assessments of *D. mawsoni* in the two subareas.
- (vi) Develop specific data collection and research plans for the Subarea 88.1 and 88.2 fisheries.

4.161 The revised proportions of the catch limit to be allocated for the shelf, slope and northern regions of Subarea 88.1, based on proportional seabed area and CPUE using the methodology described in SC-CAMLR-XXIV, paragraphs 4.152 to 4.176, are given in Table 4.

Northern region: SSRUs 881B, C, G = 0.13
Slope region: SSRUs 881H, I, K = 0.74
Shelf region: SSRUs 881J, L = 0.13
SSRUs 881A, D, E, F, M = 0.

4.162 The Scientific Committee recommended new catch limits for *Macrourus* spp. in Subarea 88.1 based on the advice provided in Annex 5, paragraphs 6.16 to 6.22 and Table 17.

Research and data collection plans for exploratory krill fisheries

General aspects

4.163 The Scientific Committee reviewed the hierarchical characterisation of potential research and data collection plans for exploratory krill fisheries provided by WG-EMM (Annex 4, Tables 1 and 2) and agreed that:

- (i) data collection from the ‘commercial fishing’ option (Annex 4, Table 1) would not be sufficient to satisfy future needs for scientific advice on exploratory krill fisheries;
- (ii) flexibility should be provided by allowing Members (and vessels flagged under them) to select one research and data collection plan from a small set of plans that, while generic (Annex 4, paragraph 4.74), can nevertheless be adopted on a case-specific basis;
- (iii) the set of research and data collection plans should include both fishery-dependent (Annex 4, Table 1) and fishery-independent (Annex 4, Table 2) plans;
- (iv) sufficient time was not available to specify all the details required for each data collection plan in such a set and, therefore, the set of plans agreed for the 2008/09 krill fishing season should be considered provisional and subject to further review and refinement by WG-EMM and the Scientific Committee in 2009;
- (v) vessels prosecuting exploratory krill fisheries and collecting data under a fishery-dependent plan should conduct both normal fishing operations and the research operations specified by the plan, with the distribution of fishing effort between normal and research operations determined on the basis of how much krill is caught during normal operations;
- (vi) the set of data collection plans should be accompanied with a catch limit that is likely to be consistent with Article II of the Convention.

4.164 The Scientific Committee agreed that the set of data collection plans for case-specific selection by Members (and vessels flagged under them) should include:

- (i) ‘standardised systematic/random research trawls by fishing vessels’ (Annex 4, Table 1);
- (ii) ‘standardised systematic acoustic transects by fishing vessels’ (Annex 4, Table 1);
- (iii) ‘predator monitoring’ (Annex 4, Table 2);
- (iv) ‘research survey from scientific vessel’ (Annex 4, Table 2).

4.165 With respect to plans (i) and (ii) above, the Scientific Committee agreed that research trawls would provide the best information on krill demographics and that acoustic transects

would be more likely to provide the information needed to estimate a precautionary catch level. Both strategies could provide information on the spatial distribution of krill.

4.166 In considering the possibility that acoustic transect data may be collected during prosecution of an exploratory krill fishery in 2008/09, the Scientific Committee agreed that SG-ASAM should, as a matter of priority, advise on protocols for the collection and analysis of acoustic data from commercial fishing vessels (paragraph 2.7).

Plan implementation

4.167 A schematic representation of the plans described below is provided in Figure 3.

4.168 The Scientific Committee agreed that, within a fishing season, vessels participating in exploratory krill fisheries should first conduct normal exploratory fishing operations and then conduct additional research requirements. Vessels would conduct normal fishing operations until they voluntarily decide to stop fishing for the season or until the catch limit for the exploratory fishery is reached. Vessels would then be expected to complete all required research operations – this must be completed within a fishing season.

4.169 The Scientific Committee agreed that:

- (i) exploratory units are defined as areas of 1° latitude by 1° longitude size, and the vertices of these units shall occur at integer points of latitude and longitude;
- (ii) ‘fishing’ is defined as any time that fishing gear, conventional trawls, pumped codends and continuous pumping gear are in the water;
- (iii) a research haul is defined as a randomly located, oblique haul made with a research net to a depth of 200 m with a duration of 0.5 h. A set of research hauls is defined as three research hauls separated by a minimum of 10 n miles;
- (iv) an acoustic transect is defined as a randomly located, continuous path, travelled at constant speed of 10 knots or less and in a constant direction. The minimum distance between start and end points is 30 n miles, and a set of acoustic transects is defined as two transects separated by at least 10 n miles.

4.170 The Scientific Committee agreed that, during normal exploratory fishing operations, vessels can choose to fish in any exploratory unit and use whatever methods best suit their unique fishing strategies. Nevertheless, to facilitate future comparisons between data collected during normal exploratory fishing operations and research operations, vessels would be required to conduct one set of acoustic transects or one set of research hauls in each exploratory unit visited during normal fishing operations.

4.171 The Scientific Committee recommended that the fishery-dependent data collection plans (plans (i) and (ii) in paragraph 4.164) be operationalised as follows:

- (i) on completion (either voluntarily or if the catch limit has been reached) of normal exploratory fishing operations, the vessel will transit to the nearest, previously unvisited, exploratory unit and begin research operations;

- (ii) the vessel will determine how many previously unvisited exploratory units must be surveyed during research operations by dividing the catch obtained during normal exploratory fishing operations by 2 000 tonnes and rounding that number to the nearest integer;
- (iii) the vessel will then select a number of exploratory units equal to the number of units determined by the calculation in item (ii) above and conduct one set of acoustic transects or one set of research hauls in each of these units;
- (iv) exploratory units visited during research operations must not have been visited during normal exploratory fishing operations;
- (v) the survey will be conducted in a way that ensures the exploratory units visited during research operations will surround the units in which normal exploratory fishing operations previously occurred.

4.172 The Scientific Committee agreed that research hauls should be conducted with nekton trawls commonly used in scientific research (e.g. IKMT or RMT type nets) that have 4–5 mm mesh, including the codend. Members would be required to provide detailed information on the configuration of nets used to conduct research trawls.

4.173 The Scientific Committee agreed that acoustic transects should be conducted using a scientific echo sounder collecting information at 120 kHz. If possible, the echo sounder should be calibrated.

4.174 The Scientific Committee agreed that all vessels participating in exploratory krill fisheries should embark at least one scientific observer who would collect data throughout the duration of every fishing trip. More than one observer may be required to collect all the required information.

4.175 With respect to the fishery-independent data collection plans (plans (iii) and (iv) in paragraph 4.164), the Scientific Committee agreed that:

- (i) that predator monitoring efforts should, as far as possible, follow CEMP Standard Methods and be conducted for a period of time sufficient both to cover the entire breeding period of land-based predators and to cover the duration of any exploratory fishing that occurs during their breeding season;
- (ii) that the conduct of a survey from a research vessel should follow all data collection and analysis protocols specified for the CCAMLR-2000 Survey.

Data collection and reporting

4.176 With respect to data collection and reporting during research fishing operations, the Scientific Committee agreed that, as far as possible, data collection protocols should be consistent with those specified in the CCAMLR *Scientific Observers Manual*. Thus, while prosecuting an exploratory krill fishery, questions regarding data collection during research fishing should first be addressed by consulting this manual.

4.177 The Scientific Committee agreed that the data required from every research haul include:

- (i) the start and end positions and times of the haul;
- (ii) the date on which the haul was conducted;
- (iii) characteristics of the haul such as tow speed, the maximum amount of wire payed out during a tow, the average wire angle during the tow, and calibrated flow-meter values that can be used to provide accurate measures of volume filtered;
- (iv) an estimate of the total catch (in numbers or volume) of krill;
- (v) a random sample of up to 200 krill or the entire catch, whichever is less, to be taken from the haul by the observer – the length, sex and maturity stage should be measured and recorded for all krill according to protocols in the CCAMLR *Scientific Observers Manual*.

4.178 The Scientific Committee agreed that, *inter alia*, the data required from acoustic transects should:

- (i) as far as possible, be recorded following protocols specified for the CCAMLR-2000 Survey;
- (ii) be linked to data recorded from a GPS;
- (iii) be continuously recorded and then electronically archived every five days or whenever the vessel moves between exploratory units, which ever occurs most frequently.

4.179 The Scientific Committee acknowledged that biological data collected from net tows is critical for interpreting acoustics data. Therefore, it was further agreed that all acoustic transects should be accompanied by at least one net haul. These hauls can be conducted either with commercial trawls or with research trawls, but it is necessary for detailed information on either type of trawl to be provided to the Secretariat. Trawls that accompany acoustic transects can be conducted during the transect or immediately after the completion of the transect. In the latter case, the trawl should be conducted along a previous segment of the transect line. Trawls that accompany acoustic transects should be at least 0.5 h in duration, and the data collected from these hauls should be the same as those required for research hauls.

4.180 All data collected during research operations should be reported, by the Member prosecuting the exploratory fishery, to the Secretariat no later than one month after the conclusion of each fishing trip.

4.181 For normal fishing operations, the Scientific Committee agreed to a minimum set of reporting requirements for an exploratory krill fishery:

- (i) 10-day catch and effort reporting system in accordance with Conservation Measure 23-02;

- (ii) haul-by-haul catch and effort data in accordance with Conservation Measure 23-04, including the monthly reporting deadline;
- (iii) scientific observer data in accordance with the CCAMLR Scheme of International Scientific Observation.

4.182 Data collected during the conduct of fishery-independent plans should be submitted to the Secretariat following guidelines developed for CEMP data and for CCAMLR-2000 data and in sufficient time to be considered by the next meeting of WG-EMM.

4.183 The Scientific Committee recognised that in providing Members (and the vessels flagged under them) the flexibility to select among research and data collection plans in the set of four plans outlined above, it would be necessary to collect detailed information on the configuration of every commercial trawl used during a fishing trip.

Catch limitations

4.184 To maximise the likelihood that CCAMLR will be able to achieve the objectives specified in Article II, the Scientific Committee advised an annual catch limit of 15 000 tonnes for exploratory krill fisheries. The Scientific Committee further advised that no more than 75% of this catch limit should be taken from areas within 60 n miles of known breeding colonies of land-based krill-dependent predators.

4.185 The Scientific Committee emphasised that the research and data collection plans agreed for the 2008/09 fishing season are provisional and, therefore, will require review and possible revision at the next meetings of WG-EMM and the Scientific Committee.

Proposal to combine conservation measures for new and exploratory fisheries

4.186 Dr Holt introduced CCAMLR-XXVII/33 which contained a proposal prepared by the USA to combine Conservation Measures 22-01 (new fisheries) and 22-02 (exploratory fisheries). The paper recalled that the new and exploratory conservation measures were developed over several years and that this resulted in a lack of consistency in information and requirements specified in the two measures. The new fishery measure serves predominately to notify the Commission of the intention to fish, with a generalised request for data. There is no organised protocol to ensure specific data are collected and reported. However, the exploratory fishery measure has detailed requirements for a data collection plan and a fishery operations plan. It also requires placement of a CCAMLR scientific observer to collect biological and fishery data on board the vessel. The use of separate new and exploratory conservation measures therefore potentially delays by one year the ability of the Commission to start gathering information needed to assess the status of proposed fisheries.

4.187 The proposed combined conservation measure attempts to ensure a minimum change in existing text which has already been agreed by the Commission in the two measures. The

requirements under the proposed merger are the same as required by the existing exploratory fishery measure. The definition of an exploratory fishery has simply been expanded to include the first year of the fishery.

4.188 Dr Parkes welcomed the paper prepared by the USA and noted that the proposed unification of the conservation measures on new and exploratory fisheries is in accordance with the conclusions of previous discussions in the Scientific Committee on the development of a unified regulatory framework for CCAMLR (SC-CAMLR-XIX, paragraphs 7.2 to 7.23). Those discussions considered in detail the relationship between the new and exploratory measures and tabulated the existing regulatory requirements and how they might be generalised for application to the development of all fisheries (SC-CAMLR-XIX, Tables 7 and 8).

4.189 An important conclusion of the previous discussions was that a unified framework would negate the requirement for definitions of fishery types or stages that have become complex and ambiguous (SC-CAMLR-XIX, paragraph 7.10). Dr Parkes suggested that in the process of unifying the new and exploratory fisheries measures there was an opportunity to remove the need for a specific definition of an exploratory fishery, which has resulted in some difficulty in interpretation in the past. This could be achieved by having the provisions of the new measure apply to all fisheries, except those specifically listed in an annex. The fisheries to be listed in the annex would be those currently regarded as 'established' or 'assessed' fisheries. The Scientific Committee could provide advice each year on which fisheries should be listed, based on the information requirements for assessments and the preparation of management advice.

4.190 The Scientific Committee agreed that fisheries would need to be listed using the usual descriptions of species, gear and area.

4.191 Dr Constable thanked Dr Holt for presenting this proposal. Regarding the listing of fisheries, Dr Constable noted that, as fisheries develop and data enable full assessments to be undertaken, so fisheries may progress beyond the scope of the existing measure for exploratory fisheries. For example, the data collection plans and fishery operations plans for the toothfish fisheries in the Ross Sea have enabled the development of an assessment, however, it is not just a question of data availability, but also of the quality of those data that are important in determining the extent to which a fishery can be assessed and robust management advice developed.

4.192 The Scientific Committee agreed that there is significant merit in combining the new and exploratory fisheries conservation measures in order to rationalise the data collection and research requirements for fisheries in the early stages of development. It also recommended to the Commission that a list be made of fisheries to which the measure does not apply. If a fishery is not listed, then the measure would automatically apply.

Squid and crab resources

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

4.193 Crabs were not exploited in the 2007/08 season. Russia notified the Commission of its intention to fish for crabs in this subarea during the 2008/09 season. It indicated its intention to conduct fishing operations in accordance with conditions specified under Conservation Measures 52-01 and 52-02.

Management advice

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

Squid (*Martialia hyadesi*) (Subarea 48.3)

4.195 Squid were not exploited in the 2007/08 season. No proposal for the harvest of squid has been received by CCAMLR for the 2008/09 season.

Management advice

4.196 The exploratory fishery on squid was subject to Conservation Measure 61-01. No new information on the species was available. The Scientific Committee recommended that the conservation measure remain in force.

Fish and invertebrate by-catch

Macrourus move-on rules and by-catch limits in new and exploratory fisheries

4.197 The Scientific Committee noted that WG-FSA had reviewed the levels of fish and invertebrate by-catch, and noted that none of the limits on by-catch set in the conservation measures applying to the statistical areas managed by CCAMLR were exceeded during the 2007/08 season.

4.198 The Scientific Committee noted that WG-FSA had reviewed the performance of the modified by-catch move-on rule for *Macrourus* spp. in new and exploratory fisheries (Conservation Measure 33-03). As *Macrourus* spp. by-catch had not increased in 2007/08, the Scientific Committee recommended that the modified move-on rule be retained.

4.199 The Scientific Committee noted that WG-FSA was able to provide revised advice on precautionary by-catch limits for *Macrourus* spp. in the Ross Sea, as a result of a trawl survey conducted by New Zealand as part of IPY activities (Annex 5, paragraphs 6.16 to 6.22).

4.200 The Scientific Committee endorsed the recommendation that revised by-catch limits be apportioned across SSRUs as indicated in Table 17 of Annex 5, and welcomed the decoupling of the by-catch limit from the toothfish catch limit.

Year-of-the-Skate

4.201 The Scientific Committee noted the discussion by WG-FSA on protocols for data collection for the Year-of-the-Skate during the 2008/09 fishing season. It endorsed the recommendation that logbook forms L5 and L6 be altered, and L11 be removed to simplify the recording of data on skates (Annex 5, paragraph 6.34).

4.202 The Scientific Committee recommended that during the Year-of-the-Skate, all skates be brought on board or alongside the hauler to be correctly identified, scanned for tags and for their condition to be assessed. During 2008/09, all vessels should retain all skates that are dead or with life-threatening injuries (condition 1 or 2 in the logbook). For skates that are likely to survive if released (condition 3 or 4), the skate should be released by cutting the snood as close to the hook as possible or cutting the snood and removing the hook from the skate, providing this does not further injure the skate. The Scientific Committee requested that WG-FSA review this approach at its meeting in 2009.

4.203 The Scientific Committee endorsed the recommended tagging rate of one in every five skates caught in new and exploratory fisheries during 2008/09 up to a maximum of 500 skates per vessel, with all skates double-tagged. The tagging program will be coordinated by the Secretariat, which will be the repository for skate tagging kits. The Scientific Committee further endorsed that any tagged skates should be identified to species, measured before they are released and that, where possible, tagging experiments be undertaken to compare different tag types and estimate tag-shedding rates.

4.204 The Scientific Committee agreed that, when skates are caught on a line, they should be randomly sampled by observers at a rate of three skates/thousand hooks, with the *Dissostichus* spp. sampling reduced to four toothfish/species/thousand hooks for the purpose of collecting biological measurements. If sufficient numbers of skates are not caught to meet this protocol, it is proposed the total number of biological samples per line should remain constant with the additional sampling carried out on *Dissostichus* spp. The Scientific Committee recommended that increased recording of biological information for skates initially be limited to the Year-of-the-Skate, but be reviewed at next year's meeting of WG-FSA.

4.205 The Scientific Committee recommended that skates should not be sacrificed for biological sampling, and that female maturity stage only be recorded if the skate is dead or has sustained life-threatening injuries (conditions 1 and 2). All live skates which are part of the biological sampling and which have not sustained life-threatening injuries, should be handled with care and released after biological information has been recorded, if they are still suitable for release (i.e. still in condition 3 or 4).

Benthic invertebrate identification guides

4.206 The Scientific Committee welcomed the production of new tools for identifying benthic invertebrate by-catch, including a field guide to the invertebrates in Division 58.5.2 by Australia and an identification poster of benthic taxa for the Ross Sea by New Zealand, and noted that these tools could be used to improve the collection of data on potential VME encounters.

Bottom fishing activities and VMEs

4.207 The Scientific Committee recalled its deliberations last year on bottom fishing in CCAMLR high-seas areas (SC-CAMLR-XXVI, paragraphs 4.159 to 4.171), including endorsement of the report of WG-FSA, the questions to be addressed and special note of a number of issues (SC-CAMLR-XXVI, paragraphs 4.162 and 4.163). The Scientific Committee endorsed the procedure and definitions provided by WG-FSA, which are based on existing practices and procedures (SC-CAMLR-XXVI, paragraph 4.164 and Figure 1) and which clearly show what is needed to develop scientific advice on:

- (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.

4.208 The Scientific Committee also recalled the endorsement by the Commission of the framework provided by the Scientific Committee (CCAMLR-XXVI, paragraphs 5.11 and 5.12) and the proposed further work (CCAMLR-XXVI, paragraphs 5.13 to 5.15). It tasked the Scientific Committee with developing pragmatic and flexible guidelines for:

- (i) identifying VMEs
- (ii) defining actions taken by vessels which may encounter evidence of VMEs during the course of fishing.

These would be reviewed at its next meeting (CCAMLR-XXVI, paragraph 5.16).

4.209 The Scientific Committee noted the deliberations this year on this issue by WG-EMM (Annex 4, paragraphs 3.21 to 3.44) and WG-FSA (Annex 5, paragraphs 10.3 to 10.109). It agreed to structure its discussion according to the structure of advice from WG-FSA, which was organised in response to the expectations by the Commission for advice on guidelines and the implementation of Conservation Measure 22-06.

Guidelines

4.210 The Scientific Committee considered the following in providing advice to the Commission according to its request in CCAMLR-XXVI, paragraphs 5.13 to 5.15.

4.211 The Scientific Committee agreed that a suitable test of the guidelines would be whether significant adverse impacts on VMEs would be avoided while the scientific advice and management approaches were developed and refined.

Identifying VMEs

4.212 The Scientific Committee noted the deliberations of WG-FSA on identifying VMEs (Annex 5, paragraphs 10.44 to 10.55).

4.213 Knowledge exists on the distribution and abundance of benthic taxa in the Southern Ocean in sufficient form to develop maps of the distribution of some types of taxa (Annex 5, paragraph 10.45 and 10.64). It was noted that there may be a large degree of endemism, particularly on seamounts (Annex 5, paragraphs 10.46 and 10.47). It was also noted that there may be other sources of data on the distribution of VMEs and VME taxa, including data from recent IPY and CAML voyages (Annex 5, paragraph 10.48). Nevertheless, the Scientific Committee agreed that the general distribution of VMEs in the Southern Ocean will need to be inferred using habitat models (Annex 5, paragraph 10.49). These could be used to develop risk-assessment maps for predicting the level of risk of impacting VMEs in different fishing locations.

4.214 The Scientific Committee agreed (Annex 5, paragraphs 10.50 and 10.65) that direct evidence of VMEs, if available, should be included in the development of risk-assessment maps and in identifying VMEs that need to be avoided. It was agreed that camera evidence is the most compelling for identifying VMEs but that evidence gathered by research sampling devices, such as beam trawls, sleds and grabs, would be very strong indications of the presence of VME taxa.

4.215 The Scientific Committee noted that fishing gears are likely to be poor sampling devices of VME taxa (Annex 5, paragraphs 10.51 and 10.66). The Scientific Committee agreed that the presence of VME taxa or indicators of VMEs in samples from any of these methods would be evidence that VMEs could be present. However, it also agreed that the converse of no VME taxa or indicators of VMEs in the samples did not necessarily represent an absence of VMEs. The degree to which this could be concluded would be dependent on the selectivity and sampling efficiencies of the gears.

4.216 The Scientific Committee noted the lack of empirical evidence of the vulnerability of benthic taxa to the different bottom fishing gears used in exploratory fisheries (Annex 5, paragraphs 10.52 and 10.67). Consequently, it agreed that, in the first instance, the risk-assessment map will need to rely on expert opinion on vulnerability and possible impacts of fishing gears on different habitat types and VMEs.

4.217 On the basis of advice from WG-FSA (Annex 5, paragraphs 10.54 and 10.68) and WG-EMM (Annex 4, paragraphs 3.31 to 3.33), the Scientific Committee agreed that it would be useful to hold an expert workshop to consider the issues surrounding bottom fisheries and the need to avoid significant adverse impacts on VMEs. It agreed that the terms of reference should be:

Workshop on Vulnerable Marine Ecosystems with respect of CCAMLR Conservation Measure 22-06

To provide guidance on the following questions that are necessary to reduce uncertainty on the potential for CCAMLR bottom fisheries for causing significant adverse impacts on VMEs, taking account of the commentaries by WG-FSA, WG-EMM and SC-CAMLR, and the development of definitions and concepts in the WG-FSA report in 2007 (SC-CAMLR-XXVI, Annex 5, paragraphs 14.4 to 14.6):

- (i) What habitats and habitat-forming taxonomic groups and rare taxa would be consistent with a VME, including methods for assisting in identifying the extent of habitats based on distributions and densities of habitat-forming taxonomic groups?
 - (a) What are the likely life-history attributes of indicative VME taxa in those VMEs and, as a result, the likely resilience and resistance of those VMEs to bottom fishing impacts; what is the potential vulnerability of those VMEs to different gear types?
 - (b) What is the lowest level of taxonomic resolution that could be used to describe taxonomic groups consistent with, or indicative of, a VME?
 - (c) What is the likely importance of VME taxa to fish assemblages and the degree to which fish diversity could be used as indicators of VMEs?
- (ii) What methods could be used for identifying potential locations of vulnerable taxa?
 - (a) What data are available, such as in the SCAR MarBIN database, for identifying the location of VMEs?
 - (b) In the absence of direct observations of VMEs, how might maps be developed indicating where these VMEs are likely to be?
 - (c) To what degree might benthic taxa be limited in their distribution?
- (iii) What indicators could be used by fishing vessels to signal when they are fishing on VMEs?

4.218 On behalf of the USA, Dr Holt offered to host the one-week workshop in the USA during the coming intersessional period. The Scientific Committee thanked the USA for this generous offer, noting that the USA will correspond with Members once a venue and appropriate time are determined.

4.219 Dr Jones and Dr K. Martin-Smith (Australia) were appointed by the Scientific Committee as Co-conveners of the workshop, encouraging them to correspond with Members to involve as many experts on Southern Ocean benthic ecology as possible. The Scientific Committee agreed that three experts should be invited to the workshop to help its work.

4.220 The Scientific Committee agreed that the work on identifying VMEs and understanding the risks to VMEs of impacts by bottom fishing activities could be separated as

a task from consideration of mitigation measures and data collection plans (Annex 5, paragraphs 10.55 and 10.69). Consideration of VMEs and risk could be undertaken in WG-EMM, and the consideration of mitigation measures could be part of the work of WG-FSA.

Actions to be taken by fishing vessels encountering VMEs

4.221 The Scientific Committee noted the advice by WG-FSA on defining actions taken by vessels which may encounter evidence of VMEs during the course of fishing which are described further in sections relevant to the implementation of Conservation Measure 22-06 (Annex 5, paragraphs 10.70 to 10.109). This is further considered in paragraphs 4.244 to 4.253.

Advice on tasks in Conservation Measure 22-06

4.222 The Scientific Committee considered the following advice on tasks identified in Conservation Measure 22-06.

Advice on submissions by Members of preliminary assessments and proposed mitigation measures

4.223 In accordance with the requests of Conservation Measure 22-06, paragraph 7, the Scientific Committee noted the review by WG-FSA of the preliminary assessments and proposed mitigation measures submitted by Members proposing to participate in bottom fishing (Annex 5, paragraphs 10.24 to 10.28 and 10.72). The Scientific Committee noted that only five Member proposals out of the total of 12 proposals submitted by 11 Members contained preliminary assessments. As a consequence, the Scientific Committee was unable to review and advise on the potential impacts of all new and exploratory fishery proposals.

4.224 The Scientific Committee noted the preliminary assessments and mitigation measures proposed by Members, which were collated in CCAMLR-XXVII/26. It also noted the summary of data on benthos in the CCAMLR database provided by the Secretariat in that paper. The Scientific Committee reviewed the benthos by-catch reporting (C2 and observer data) from vessels that have been included in notifications for the 2008/09 exploratory fisheries. This analysis confirmed that there was insufficient data in the database to assess and review the potential impact on VMEs or possible mitigation requirements for exploratory fishery notifications that were not accompanied by preliminary assessments.

4.225 The Scientific Committee noted the large variation in substance of the preliminary assessments and agreed that a common approach is needed for providing these assessments, similar to the requirements for notifying exploratory fisheries (Annex 5, paragraphs 10.25 and 10.73). The Scientific Committee recommended that the Commission adopt the pro forma developed by WG-FSA (Annex 5, paragraphs 10.25 and 10.26) and provided in Table 20 of Annex 5 as a suitable standard for Members submitting preliminary assessments of the potential for their proposed bottom fishing activities to have significant adverse impacts

on VMEs. The pro forma is designed to be consistent with the requirements for proposals on exploratory fisheries and is based on the requirements set out in paragraphs 7(i) and (ii) in Conservation Measure 22-06.

Advice on procedures and standards for assessing potential effects
of proposals and possible mitigation measures

4.226 The Scientific Committee noted that it is tasked to review, refine and, as needed, develop procedures and standards for assessing potential effects of proposals and possible mitigation measures (Conservation Measure 22-06, paragraph 7(iii)). The Scientific Committee noted that WG-FSA advised on three types of procedures and approaches:

- (i) the magnitude of the existing footprint of bottom fisheries relevant to Conservation Measure 22-06 and the possible impacts that such a footprint may have had on VMEs (Annex 5, paragraphs 10.9 to 10.23);
- (ii) the risk of past and future bottom fishing activities contributing to significant adverse impacts on VMEs (Annex 5, paragraphs 10.29 to 10.31, 10.49 and 10.50);
- (iii) approaches to the development of mitigation measures for vessels (Annex 5, paragraphs 10.32 to 10.43).

Existing footprint of bottom fisheries

4.227 The Scientific Committee noted the updated maps provided by WG-FSA on the historical footprint of bottom fisheries with respect to Conservation Measure 22-06 (Annex 5, paragraph 10.17 and Figure 7).

4.228 The Scientific Committee agreed that most attention on evaluating potential impacts of bottom fishing on VMEs needs to be given to locations with the most fishing effort relative to seabed area (Annex 5, paragraph 10.76). It also recognised the need to distinguish between effort in shallow areas compared to deeper areas, which has only been undertaken for some areas of East Antarctica, including BANZARE Bank. It endorsed the method of WG-FSA in calculating potential proportions of seabed areas that may have been affected by longlines (Annex 5, paragraphs 10.9 to 10.12, 10.18 and 10.19) using a low and high value for the estimated width of the area affected by an individual longline – 1 m and 25 m. It also endorsed the recommendation of WG-FSA to update seabed area information for the three depth strata from reliable sources for all SSRUs (Annex 5, paragraph 10.20) for these calculations in the future, noting that 550 m depth should be used in place of 600 m depth in demarcating depth strata.

4.229 The Scientific Committee noted the results (Annex 5, Table 18) remain at a coarse resolution relative to the scale of VMEs considered by WG-FSA (Annex 5, paragraph 10.83). At the broad scale, these calculations indicate that up to 3–4% of the overall fishable area may have been affected on the seamounts in the north of the Ross Sea in SSRUs 881B and C over the last 10 years. It also noted that these data could be used to assess the possible

contributions to impacts in different areas of proposed fishing activities (Annex 5, paragraph 10.80). However, the calculations do not consider VMEs in the actual areas fished as shown in Annex 5, Figure 7, and there is insufficient information on the areas proposed to be fished in the coming exploratory fisheries to advise on how they might contribute to impacts on VMEs. The Scientific Committee noted the general points surrounding these methods, including that such analyses will need to take account of the potential for lines to be overlapping, the degree of impact within the footprint is difficult to ascertain because of the absence of empirical data on the effects of the different types of longlines on benthic habitats and VME-taxa, and observed by-catch from longlines may not be a good indicator of interactions of longlines with VMEs. These points are elaborated in detail in Annex 5, paragraph 10.22.

4.230 The Scientific Committee noted that reducing the uncertainty in evaluations of accumulated impacts and the potential for proposed fishing activities to contribute to future impacts will be dependent on improving methods for assessing footprints coupled with the developing assessments of risk in different areas (Annex 5, paragraph 10.82).

4.231 The Scientific Committee noted the likely differences in habitat types and biodiversity between the following locations:

- (i) near-shore waters surrounding Antarctica, in depths less than 200 m
- (ii) shelf and bank areas down to 550 m
- (iii) slope areas down to 1 500 m
- (iv) areas deeper than 1 500 m.

In this respect, the Scientific Committee noted that research activities in shallow embayments might also impact VMEs either by sampling with commercial-size gear or accumulating the impacts of small trawling equipment. It was also noted that both of these circumstances are not currently covered by Conservation Measures 22-06 and 24-01. It agreed that it would be useful to consider further how to approach this issue at the Joint SC-CAMLR–CEP Workshop in 2009. For example, some consideration might be given as to whether there should be research limits on the total amount of research trawling that would be allowed in some areas.

Risk-assessment approaches

4.232 The Scientific Committee agreed that a risk-assessment approach similar to that used by WG-IMAF would be valuable and that the method considered by WG-FSA could be developed further in this regard (Annex 5, paragraphs 10.29 and 10.30). It noted that the risk of significant adverse impacts should be evaluated at spatial scales commensurate with the scale of VMEs, i.e. much smaller spatial resolution than that considered by WG-IMAF. The important elements of a risk assessment would include, *inter alia*, the following concepts:

- (i) Not all areas are equal with regard to probability of encounters with, or impacts to, a VME but information needed to assess such probabilities is very limited.
- (ii) Models of likely habitat can be developed based on geomorphological, oceanographic and other environmental data and relating these to observations

of where different VME taxa might be found. Observations can include direct observations (using videos, benthic sampling equipment) or indirect observations such as by-catch from fisheries.

- (iii) An appropriate scale for characterising risk would be 0.5° latitude and 1.0° longitude, consistent with CCAMLR fine-scale areas.
- (iv) different areas will have different risks, e.g. higher-risk areas might be seamounts, heads of canyons and depths shallower than 550 m.
- (v) There will be different requirements for data collection, research and mitigation for different levels of risk and different gear types.
- (vi) The assignment of risk would need to be reviewed as new information becomes available.

4.233 The Scientific Committee noted the work on a risk-assessment framework in WG-EMM (Annex 4, paragraphs 3.22 to 3.29) and WG-FSA (Annex 5, paragraphs 10.29 and 10.30). It also noted that WG-FSA was unable to develop a risk-assessment map for use in providing advice this year on the possible effects of proposed fishing activities. It agreed that the approach should be developed further for the next meeting of WG-FSA (Annex 5, paragraph 10.84). It also agreed that direct evidence of VMEs should be included, when available, in the development of risk-assessment maps and in identifying VMEs that need to be avoided (Annex 5, paragraph 10.50). However, the Scientific Committee also noted the lack of empirical evidence of the vulnerability of benthic taxa to the different bottom fishing gears used in exploratory fisheries (Annex 5, paragraph 10.52). Consequently, it agreed that, in the first instance, the risk-assessment map will need to rely on expert opinion on vulnerability and possible impacts of fishing gears on different habitat types and VMEs, which will be facilitated by the workshop above (paragraph 4.217).

Mitigation measures

4.234 The Scientific Committee noted that mitigation measures include area closures prior to a fishing season as well as management of encounters of VMEs by vessels. It continued its discussions on the latter issue when considering advice on practices when evidence of VMEs is encountered (paragraphs 4.244 to 4.253).

4.235 The Scientific Committee noted that fishing is prohibited in all areas shallower than 550 m in Divisions 58.4.1 and 58.4.2 (Conservation Measures 41-04 and 41-05) because of the higher risk to benthic habitats (Annex 5, paragraph 10.83(iv)). In respect of the objectives in Conservation Measure 22-06, the Scientific Committee agreed that a prohibition on fishing shallower than 550 m should be more generally applied to bottom fisheries covered by Conservation Measure 22-06. The Scientific Committee noted that, notwithstanding this advice, specific provision may need to be given to a crab fishery using pots as proposed for an exploratory fishery for 2008/09 (CCAMLR-XXVII/20). This is because the experimental harvest regime agreed by WG-FSA (Annex 5, paragraphs 5.13 and 5.14) may be impacted by such a prohibition. The Scientific Committee agreed that if pot fishing occurs in Subarea 48.2, then it would need gear-specific mitigation requirements in order to enable exploratory activities on shelf areas (see paragraph 4.231).

Advice on the occurrence of VMEs

4.236 The Scientific Committee noted the advice of WG-FSA (Annex 5, paragraphs 10.63 to 10.69 and 10.96 to 10.100) and WG-EMM (Annex 4, paragraphs 3.21 to 3.38) on identifying VMEs for consideration in the requirement in Conservation Measure 22-06, paragraph 12.

4.237 The Scientific Committee noted that data were available in CCAMLR-XXVII/26 to review locations of catches of VME taxa but noted the issues of quality and quantity of those data (paragraph 4.224).

4.238 The Scientific Committee noted the submission of notifications of VMEs in Division 58.4.1 (SC-CAMLR-XXVII/13). It noted the review by WG-EMM of an earlier draft of the notification (Annex 4, paragraphs 3.34 to 3.38) and the review by WG-FSA (Annex 5, paragraphs 10.56, 10.57 and 10.98). It endorsed the view of WG-FSA that these were obvious cases of VMEs, with clear evidence of biodiversity-rich benthic communities.

4.239 The Scientific Committee endorsed the draft VME notification form developed by the Secretariat on the basis of the requirements in Conservation Measure 22-06 and tabular notification in SC-CAMLR-XXVII/13 (Annex 5, paragraphs 10.58, 10.59 and 10.99). It was designed in such a way that it could be submitted by Members as part of the 5-day reporting system during fishing operations but could also be used by Members undertaking research activities. The Scientific Committee recommended that it be used as the means of notifying the Secretariat when evidence of VMEs is encountered.

4.240 The Scientific Committee noted the request of WG-FSA to consider the method by which these notifications would be reviewed and the process for adding a VME to the Register of VMEs. The Scientific Committee noted that the latter process would need to be considered by the Commission. With respect to the method for reviewing notifications, the Scientific Committee noted that the notifications in SC-CAMLR-XXVII/13 had been reviewed by both WG-EMM and WG-FSA. It noted that such notifications only need to be reviewed by WG-EMM, following the division of responsibilities considered below (paragraph 4.268; Annex 5, paragraph 10.55).

4.241 The Scientific Committee noted that the requirements for protecting VMEs may change as more information becomes available, including data on the spatial extent of VMEs, and their vulnerability to fishing.

Advice on known and anticipated impacts

4.242 The Scientific Committee noted that WG-FSA was unable to provide advice this year on actual or potential encounters with VMEs by exploratory longline fishing (Annex 5, paragraphs 10.101 and 10.102), including no advice on known and anticipated impacts, but that some depth strata in some SSRUs may have experienced higher levels of interactions with bottom fishing gear than other areas in Subarea 88.1 (Annex 5, Table 18). The Scientific Committee recommended that this be further reviewed next year.

4.243 The Scientific Committee endorsed the recommendation of WG-FSA that a report akin to the Fishery Reports on 'Bottom Fisheries and Vulnerable Marine Ecosystems' be

developed for collating the available knowledge on VMEs, the potential for significant adverse impacts, risk assessments and potential for impacts arising from bottom fisheries (Annex 5, paragraph 10.103). It requested that a template for that report be developed at the workshop (paragraph 4.217) and reviewed by WG-FSA and WG-EMM, including consideration of how such a report will be compiled and updated. It noted that, once established, the substance of the report could be separated into the relevant fishery reports.

Advice on practices when evidence of VMEs is encountered

4.244 In considering approaches to the development of mitigation measures and practices when evidence of VMEs is encountered, the Scientific Committee noted that these approaches could be naturally divided into three main classes of action – activities by observers, responses of vessels and reporting requirements (Annex 5, paragraph 10.32).

4.245 The Scientific Committee agreed that observations of benthic by-catch will be important in the coming year and endorsed the recommendation of WG-FSA that the measurements identified by WG-FSA (Annex 5, paragraphs 10.33 and 10.88) should be taken in the coming year. The Scientific Committee also endorsed the view of WG-FSA that it would be desirable for observers to obtain information on the operations of the gear and for developing monitoring protocols. However, given the high workloads of observers, these were considered to be lower priorities for the coming year (Annex 5, paragraph 10.34).

4.246 The Scientific Committee noted the consideration by WG-FSA of how vessels should respond to evidence of VMEs (Annex 5, paragraphs 10.36 to 10.40 and 10.89). The Scientific Committee also noted the consideration by WG-FSA on the reporting of encounters of fishing vessels with VMEs (Annex 5, paragraph 10.90).

4.247 The Scientific Committee noted the proposed mitigation measures and responses to encounters with VMEs from the preliminary assessments in Annex 5, Table 21. It noted the features for mitigation in these proposals were, collectively:

- (i) evidence of a VME would be measured as a general quantity that could be easily determined by a vessel;
- (ii) the Secretariat will need to be notified of encounters;
- (iii) an area, including an appropriate buffer to account for uncertainty in location, surrounding the encounter needs to be determined for additional management of vessel and/or fleet operations;
- (iv) effort in such locations should be limited.

4.248 The Scientific Committee noted that a difficulty in the discussion was resolving the tension between protecting VMEs from significant adverse impacts and obtaining the information on whether those impacts are arising or have arisen. Under such circumstances, a strategy for avoiding significant adverse impacts on VMEs, such as through identifying areas that need to be avoided, will need to be developed taking account of the issues in the report of WG-FSA, paragraph 10.38 (Annex 5, paragraph 10.91).

4.249 The Scientific Committee noted the observation by WG-FSA that continuing to fish in areas for which by-catch evidence indicates a possibility of interactions with a VME is contradictory to trying to protect VMEs from significant adverse impacts. Also, continuing such fishing in an area where evidence of a VME has been found may be contrary to Conservation Measure 22-06, paragraph 8 (Annex 5, paragraph 10.93).

4.250 The Scientific Committee recognised this conundrum (Annex 5, paragraph 10.40). It also noted that WG-FSA could not calculate the level of evidence of VMEs to trigger actions for the different vessels at its meeting this year and that WG-FSA agreed full compliance in providing data on benthos by-catch will be important in order to determine vessel-specific recommendations on trigger levels. An alternative strategy to vessel-specific trigger levels would be to identify areas that need to be avoided by all vessels (see Annex 5, paragraph 10.94).

4.251 The Scientific Committee agreed that it would be useful to undertake simulations of different management approaches to evaluate which avoidance/research approaches may be most useful in avoiding significant adverse impacts to VMEs when there is no information on which to judge a suitable approach, and requested Members to submit such simulations to WG-SAM for review and then to WG-FSA for consideration of the results.

4.252 In further considering the practices that could be recommended for the coming season, the Scientific Committee noted the following issues:

- (i) the need to develop an approach that could be administered by vessels without relying on observers, including notifications of encounters to the Secretariat;
- (ii) the need to limit effort in areas with VMEs but with some provision for research activities to provide data for review by the Scientific Committee and its working groups, noting that the approach should not lead to inadvertent significant adverse impacts on a VME;
- (iii) some comparisons of benthos by-catch between vessels in similar areas could be helpful;
- (iv) mechanisms for managing interaction should occur across the fleet, for example, areas identified as potentially having a VME should be given protection from the whole fleet rather than it being vessel-specific;
- (v) a general approach should be developed that would be used by all vessels but with specific variations for different gear types where needed;
- (vi) measures for this year would be reviewed next year based on the results of the 2008/09 season.

4.253 The Scientific Committee agreed practices for the coming season can be considered in five parts:

- (i) identification by a vessel of a possible encounter during fishing operations
- (ii) observation requirements
- (iii) declaration of a Risk-Area
- (iv) management actions
- (v) review.

Identification by a vessel of a possible encounter
during fishing operations

4.254 The Scientific Committee agreed that it should be the vessel's responsibility to record and notify evidence of a possible encounter with a VME. It also agreed the following on how such evidence could best be accumulated:

- (i) longlines would be divided into segments containing 1 000 hooks or 1 200 m, whichever is the shorter length of line, and pot lines would be divided into 1 200 m segments. These segments become the monitoring and encounter units for both longlines and pots respectively;
- (ii) at this stage, a potential interaction would best be measured by an accumulated volume of all sessile invertebrates as described on the New Zealand poster (WG-FSA-08/19);
- (iii) for branching species, such as corals, which may not be easy to fit into a volume measurement, an equivalent weight to add to the volume of other material could be 1 kg corresponding to 1 litre;
- (iv) all line segments should be monitored for benthos.

4.255 With respect of the use of volume and weights which are to indicate possible encounters, the Scientific Committee noted that a taxon-specific approach may be needed in the future. This is because of the possible need to take account of rare, small or susceptible species, particularly if those taxa are easily affected by longlines but have a low likelihood of being landed. It requested that the workshop advise on this issue.

4.256 The Scientific Committee agreed on the need for clear terminology and definitions for determining actions to be taken by vessels. The following terms were agreed:

- (i) VME-indicator-unit
Either one litre of sessile taxa (paragraph 4.254(ii)) that can be placed in a bucket, or, for taxa covered under paragraph 4.254(iii) (branching species that may not easily fit into a volume measurement), one kilogram.
- (ii) VME-evidence
In the interim of further advice on such evidence, a combined measure of at least 10 VME-indicator-units of sessile taxa (paragraph 4.254(ii)) recovered over a given section of line would be evidence of a possible encounter with a VME.
- (iii) Risk-Area
An area around the location where the VME-evidence is recovered should be designated as an area where a VME may occur and would be potentially at risk from continued fishing until such time as the VME-evidence and other data on the area were reviewed and management actions determined.

4.257 The Scientific Committee noted that the quantity of 10 VME-indicator-units to be used as VME-evidence was derived from the data and experience from fishing in the Ross Sea and the Indian Ocean. This formed the basis of information in CCAMLR-XXVII/26. The

Scientific Committee agreed that this is a useful foundation for determining the VME-indicator-units quantity this year. It noted that data from the coming season would be useful for advising on VME-evidence in the future.

4.258 The Scientific Committee agreed that if the VME-evidence is recovered within one line segment, then the location of that segment should be regarded as a Risk-Area in need of interim protection from fishing for the remainder of the season.

4.259 The Scientific Committee agreed that when VME-evidence is recovered, the vessel should immediately notify the Secretariat and Flag State of the location of the segment(s) in which that evidence was encountered.

4.260 The Scientific Committee noted that the designation of Risk-Areas according to accumulating VME-evidence in a single line segment may not alone provide protection to VMEs for which evidence may be split between line segments or be accumulated at close to the trigger level in each of a number of consecutive line segments. It was agreed that these scenarios of interactions with VMEs were possible but the Scientific Committee could not agree on strategies that might be used to determine when those VMEs could be designated as Risk-Areas. The Scientific Committee noted that VME-evidence accumulated over consecutive line segments could be used to designate a Risk-Area around those consecutive line segments.

Observation requirements

4.261 The Scientific Committee agreed that observers should be asked to do the following:

- (i) during 'tally period', observer to note benthos coming to the surface;
- (ii) on an encounter, observers review the benthos recovered for taxonomic detail (New Zealand poster, WG-FSA-08/19);
- (iii) routine examination of any other material accumulated by the vessel outside the tally period;
- (iv) all material reviewed by the observer should have an approximate location (at least to the resolution of that line segment).

Declaration of a Risk-Area

4.262 The Scientific Committee agreed that a buffer of 1 n mile around the segment(s) in which the evidence was obtained would be appropriate for determining the size of a Risk-Area, in order to allow for further data to be collected in the vicinity.

4.263 The Scientific Committee agreed that for a Risk-Area defined by a single line segment the location could be easily managed by a vessel if there was a mid-point of the segment used

with a radius of protection of 1 n mile. This could be managed as an area of avoidance using a way point in a vessel's navigation system. The Scientific Committee noted that this approach will include adjacent segments in a Risk-Area.

4.264 The Scientific Committee noted that the approach described in paragraph 4.263 may not provide the protection needed if the VME extended over a number of miles as described in SC-CAMLR-XXVII/13 and, for example, the segment in which the VME-evidence was obtained were to intersect it at its periphery.

4.265 The Scientific Committee noted that the usual buffer in existing CCAMLR by-catch conservation measures was 5 n miles. However, it was noted this buffer had previously been applied to motile species, whereas VMEs were, at present, considered primarily on the basis of sessile and sedentary biota. The Scientific Committee noted that 5 n miles was used as the buffer in the recent measure on bottom fishing by the European Council in its Regulation No. 734/2008.

Management actions

4.266 The Scientific Committee agreed that the VME-indicator-units of benthos by-catch should be reported by the vessel for each segment of the line as defined above.

4.267 The Scientific Committee agreed that the vessel should immediately cease setting lines intersecting with a Risk-Area. The fleet should immediately cease setting lines intersecting with the Risk-Area after notification by Secretariat, which needs to occur within 24 hours of receiving a report of a VME-encounter.

Review

4.268 The Scientific Committee agreed that WG-FSA should be tasked to review the observer and vessel data at its next meeting and provide further advice on mitigation measures and practices when evidence of VMEs is encountered, taking account of the results of the workshop.

General

4.269 The Scientific Committee noted that:

- (i) interim arrangements will need to be used in this coming year while further advice is developed and, thus, the system may not be perfect but will need to be sufficiently precautionary;
- (ii) management and mitigation approaches agreed in other fora could be considered (European Community, NAFO).

Advice on other mitigation measures

4.270 With respect to Conservation Measure 22-06, paragraph 7(iii), the Scientific Committee has no further advice on other mitigation measures.

Advice on research and data collection plans

4.271 With respect to research and data collection plans for bottom fisheries under Conservation Measure 22-06, the Scientific Committee endorsed the view of WG-FSA (Annex 5, paragraph 10.106) that whatever strategy is adopted for the coming year, it will be important to collect as much benthos by-catch data as possible for analysis next year. It also agreed that experience of WG-IMAF showed the following to be important in combating the incidental mortality of seabirds in fisheries and will be relevant to avoiding significant adverse impacts on VMEs:

- (i) education of the crews of vessels participating in exploratory bottom fisheries will help increase awareness of the value of VMEs, in terms of their marine biodiversity and as habitat to fish assemblages, and the importance of developing mitigation measures to avoid impacts on them;
- (ii) continued development of methods to reduce the frequency of gear loss that could impact on VMEs.

4.272 The Scientific Committee endorsed the agreement of WG-FSA that it would be useful for observers to provide information on the following (Annex 5, paragraphs 10.33 and 10.107):

- (i) the locations and types of taxa being landed, where identification should be at least to the level of morphotypes provided in the poster developed by New Zealand;
- (ii) the numbers and, where possible, total mass of each taxon being landed;
- (iii) information on the likely geographic origin of the taxa – noting that observations by hook or by magazine could be related to the geographic position of the line on the substratum, although this may require an observer to be provided with a hand-held GPS to note the position of the vessel when a taxon is landed;
- (iv) in the future, an increase in the level of detail may be triggered by catches of specific types of taxa but it was recognised that for the near future records should be maintained of all landed taxa and that information by observers should be as complete as possible for the periods of observation.

4.273 The Scientific Committee noted the need to improve reporting of benthic by-catch in order for such data to be useful for analyses of the interaction of bottom fishing activities with VMEs.

Advice to the Commission

4.274 With respect to the development of guidelines on identifying VMEs and on actions to be taken by fishing vessels encountering VMEs (CCAMLR-XXVI, paragraphs 5.13 to 5.15), the Scientific Committee requested the Commission to:

- (i) note:
 - (a) a suitable test of the guidelines would be whether significant adverse impacts on VMEs would be avoided while the scientific advice and management approaches were developed and refined (paragraph 4.211);
 - (b) the progress made by WG-FSA on methods and approaches for identifying VMEs (paragraphs 4.212 to 4.214);
 - (c) fishing gears are likely to be poor sampling devices of VME taxa. The presence of VME taxa or indicators of VMEs in samples from any of these methods would be evidence that VMEs could be present. However, the converse of no VME taxa or indicators of VMEs in the samples did not necessarily represent an absence of VMEs. The degree to which this could be concluded would be dependent on the selectivity and sampling efficiencies of the gears (paragraph 4.215);
 - (d) the lack of empirical evidence of the vulnerability of benthic taxa to the different bottom fishing gears used in exploratory fisheries (paragraph 4.216);
 - (e) advice on defining actions taken by vessels which may encounter evidence of VMEs during the course of fishing are described in sections relevant to the implementation of Conservation Measure 22-06;
- (ii) endorse:
 - (a) an expert Workshop on Vulnerable Marine Ecosystems with respect of CCAMLR Conservation Measure 22-06 to provide guidance on the questions necessary to reduce uncertainty on the potential for CCAMLR bottom fisheries for causing significant adverse impacts on VMEs, taking account of the commentaries by WG-FSA, WG-EMM and SC-CAMLR, and the development of definitions and concepts in the WG-FSA report in 2007 (SC-CAMLR-XXVI, Annex 5, paragraphs 14.4 to 14.6) (paragraphs 4.217 to 4.219);
- (iii) agree:
 - (a) that the general distribution of VMEs in the Southern Ocean will need to be inferred using habitat models (paragraph 4.213), which can then be used to develop risk-assessment maps for predicting the level of risk of impacting VMEs in different fishing locations. In the first instance, the risk-assessment map will therefore need to rely on expert opinion on vulnerability and possible impacts of fishing gears on different habitat types and VMEs.

4.275 The Scientific Committee considered the following advice on tasks identified in Conservation Measure 22-06.

4.276 With respect to advice on submissions by Members of preliminary assessments and proposed mitigation measures, the Scientific Committee recommended the Commission to:

- (i) note:
 - (a) only five Members out of the 11 Members that submitted a total of 12 proposals contained preliminary assessments (paragraph 4.223). As a consequence, the Scientific Committee was unable to review and advise on the potential impacts of all new and exploratory fishery proposals;
 - (b) insufficient data were available in the CCAMLR database to assess and review the potential impact on VMEs or possible mitigation requirements for exploratory fishery notifications that were not accompanied by preliminary assessments (paragraph 4.224);
 - (c) the large variation in substance of the preliminary assessments and that a common approach is needed for providing these assessments, similar to the requirements for notifying exploratory fisheries (paragraph 4.225);
- (ii) adopt:
 - (a) the pro forma in Table 20 of Annex 5 as a suitable standard for Members submitting preliminary assessments of the potential for their proposed bottom fishing activities to have significant adverse impacts on VMEs. The pro forma is designed to be consistent with the requirements for proposals on exploratory fisheries and is based on the requirements set out in paragraphs 7(i) and (ii) in Conservation Measure 22-06 (paragraph 4.225).

4.277 With respect to advice on procedures and standards for assessing potential effects of proposals and possible mitigation measures, the Scientific Committee recommended the Commission to:

- (i) note:
 - (a) discussion and analyses of the magnitude of the existing footprint of bottom fisheries relevant to Conservation Measure 22-06 and the possible impacts that such a footprint may have had on VMEs (paragraphs 4.226 to 4.230);
 - (b) discussions on assessing risks of past and future bottom fishing activities contributing to significant adverse impacts on VMEs (paragraphs 4.232 and 4.233);
 - (c) discussions on the development of mitigation measures not related to advice on practices when evidence of VMEs is encountered (paragraphs 4.234 and 4.235);

- (ii) endorse:
 - (a) the development of a risk-assessment framework and risk-assessment maps for indicating the risks of significant adverse impacts from bottom fisheries in the CAMLR Convention Area under Conservation Measure 22-06 (paragraphs 4.232 and 4.233), where the spatial resolution of such maps would be at a scale commensurate with the expected extent of VMEs rather than at the level of management areas;
- (iii) agree:
 - (a) that a prohibition on bottom fishing shallower than 550 m should be more generally applied to bottom fisheries covered by Conservation Measure 22-06, as is currently applied in Divisions 58.4.1 and 58.4.2 (paragraph 4.235) but noting that specific provision will need to be given to a crab fishery using pots as proposed for an exploratory fishery for 2008/09 (paragraph 4.235);
- (iv) provide advice on:
 - (a) what it might consider to be most useful from analyses of the magnitude of the existing footprint of bottom fisheries relevant to Conservation Measure 22-06 (paragraphs 4.227 to 4.231).

4.278 With respect to advice on the occurrence of VMEs, the Scientific Committee recommended the Commission to:

- (i) note:
 - (a) the discussion on the occurrence of VMEs (paragraphs 4.236 to 4.241);
 - (b) that the requirements for protecting VMEs may change as more information becomes available, including data on the spatial extent of VMEs, and their vulnerability to fishing (paragraph 4.241);
- (ii) endorse:
 - (a) the review process for notifications of VMEs and that a notification be reviewed by WG-EMM before consideration by the Scientific Committee (paragraph 4.240);
- (iii) agree:
 - (a) that the areas notified in SC-CAMLR-XXVII/13 in Division 58.4.1 are VMEs with clear evidence of biodiversity-rich benthic communities (paragraph 4.238);
- (iv) adopt:
 - (a) the draft notification form for Members to notify the Secretariat when evidence of VMEs is encountered (paragraph 4.239).

4.279 With respect to advice on known and anticipated impacts, the Scientific Committee recommended the Commission to:

- (i) note:
 - (a) consideration of known and anticipated impacts (paragraphs 4.242 and 4.243);
- (ii) endorse:
 - (a) further work on assessing known and anticipated impacts of bottom fishing activities under Conservation Measure 22-06 (paragraph 4.242);
 - (b) the development of a report akin to the Fishery Reports on 'Bottom Fisheries and Vulnerable Marine Ecosystems' by collating the available knowledge on VMEs, the potential for significant adverse impacts, risk assessments and potential for impacts arising from bottom fisheries (paragraph 4.243).

4.280 The Scientific Committee wished to advise the Commission that, in the absence of (i) direct observations of impacts by fishing gear, (ii) censuses of the distribution and abundance of benthic habitats, and (iii) evaluation of the ecological consequences of the effects of fishing on those habitats and critical ecological processes, a precautionary strategy will need to be adopted that will successfully avoid significant adverse impacts on VMEs in the interim of impact assessments being completed and long-term mitigation strategies being developed. The Scientific Committee also noted the following issues need to be considered in formulating such a strategy:

- (i) Many VME taxa are expected to be sessile, slow growing and long-lived, which means that if such taxa are depleted they are unlikely to recover in two to three decades as required in Article II. Therefore, escapement of VME taxa in space is an important consideration in maintaining viable VMEs.
- (ii) Precautionary strategies need to be adopted to avoid significant adverse impacts on VMEs and VME taxa that are restricted in their distribution, such as, for example, locally endemic taxa.
- (iii) Consistent with the precautionary approach, controlled acquisition of data will be needed.
- (iv) A single fishing event is unlikely to cause significant adverse impacts on VMEs, but cumulative effects between assessments and management decisions could give rise to significant adverse impacts. Strategies are needed to limit cumulative effects between assessments as it will ultimately be a single fishing event that will cause the significant adverse impact in the course of a fishing period between assessments.
- (v) Interim strategies could include:
 - (a) large-scale closures of areas with a reasonable likelihood of including representative VMEs;

- (b) small-scale closures of areas on the basis of a limited by-catch of benthos during fishing operations, noting that benthos affected by longline systems may not be well represented in landed by-catch;
 - (c) temporary closures of areas as in (b) while research is undertaken to establish the spatial extent of habitats and VMEs.
- (vi) Without appropriate knowledge, it will be very difficult to predict when the effects of bottom fishing will have accumulated to cause significant adverse impacts on VMEs. Under such circumstances, significant adverse impacts may not be detected until after such impacts have obviously occurred.
- (vii) If bottom fishing activities must overlap significantly with areas in which VMEs occur because of the distribution of fish, then the escapement of VMEs may need to be greater than expected. This is because of the need to allow for inadvertent impacts on VMEs, which could accumulate to cause significant adverse impacts.

4.281 With respect to advice on practices when evidence of VMEs is encountered, the Scientific Committee recommended the Commission to:

- (i) note:
 - (a) its discussion on approaches to the development of mitigation measures and practices when evidence of VMEs is encountered (paragraphs 4.244 to 4.260);
 - (b) the conundrum between protecting VMEs from significant adverse impacts and obtaining the information on whether those impacts are arising or have arisen and that continuing to fish in areas for which by-catch evidence indicates a possibility of interactions with a VME is contradictory to trying to protect VMEs from significant adverse impacts and may be contrary to Conservation Measure 22-06, paragraph 8 (paragraphs 4.248 to 4.250);
 - (c) that it would be useful to undertake simulations of different management approaches to evaluate which avoidance/research approaches may be most useful in avoiding significant adverse impacts to VMEs when there is no information on which to judge a suitable approach and requested Members submit such simulations to WG-SAM for review and then to WG-FSA for consideration of the results (paragraph 4.251);
 - (d) consideration by the Scientific Committee of advice for the 2008/09 season on specific practices when evidence of VMEs is encountered during bottom fishing activities (paragraphs 4.252 to 4.268);
 - (e) interim arrangements will need to be used in the coming year while further advice is developed (paragraph 4.269);
 - (f) management and mitigation approaches agreed in other fora could be considered (European Community, NAFO) (paragraph 4.269);

(ii) endorse:

- (a) the collection of benthos by-catch data by observers, including specific requirements for the coming year (paragraph 4.261), to facilitate analyses on VMEs and the effects of bottom fishing next year (paragraph 4.245);
- (b) the definitions for VME-indicator-units, VME-evidence and Risk-Areas for use in determining what actions fishing vessels might take when evidence of a possible encounter with a VME occurs (paragraph 4.254 to 4.257);
- (c) that WG-FSA be tasked to review the observer and vessel data at its next meeting and provide further advice on mitigation measures and practices when evidence of VMEs is encountered, taking account of the results of the workshop;

(iii) agree:

- (a) that a vessel will be responsible for recording and reporting benthos by-catch, monitoring for VME-evidence and for notifying the Secretariat and Flag State of a possible encounter with a VME based on the VME-evidence (paragraphs 4.254, 4.255 and 4.266);
- (b) on the method by which VME-evidence would be accumulated using segments of lines as monitoring units and that all segments should be monitored for benthos by-catch (paragraph 4.254);
- (c) on what will constitute a Risk-Area and its management in 2008/09, taking account of the Scientific Committee's:
 - agreement that if the VME-evidence is recovered within one line segment, then the location of that segment should be regarded as a Risk-Area in need of interim protection from fishing for the remainder of the season (paragraph 4.258);
 - agreement that when VME-evidence is recovered, the vessel should immediately notify the Secretariat and Flag State of the location of the segment(s) in which that evidence was encountered (paragraph 4.259);
 - note that the designation of Risk-Areas according to accumulating VME-evidence in a single line segment may not alone provide protection to VMEs for which evidence may be split between line segments or be accumulated at close to the trigger level in each of a number of consecutive line segments and that VME-evidence accumulated over consecutive line segments could be used to designate a Risk-Area around those consecutive line segments (paragraph 4.260);
 - consideration and agreements on what would be required to declare a Risk-Area, including the designation of buffer zone (paragraphs 4.262 to 4.265);

- note that vessels should immediately cease setting lines intersecting with a Risk-Area and the fleet should immediately cease setting lines intersecting with the Risk-Area after notification by Secretariat, which needs to occur within 24 hours of receiving a report of a VME-encounter (paragraph 4.267).

4.282 The Scientific Committee has no advice for the Commission on other mitigation measures (paragraph 4.270).

4.283 With respect to advice on research and data collection plans, the Scientific Committee recommended the Commission to:

(i) note:

- (a) that whatever strategy is adopted for the coming year, it will be important to collect as much benthos by-catch data as possible for analysis next year (paragraph 4.271);
- (b) that experience of WG-IMAF showed the following to be important in combating the incidental mortality of seabirds in fisheries and that it will be relevant to avoiding significant adverse impacts on VMEs (paragraph 4.271):
 - education of the crews of vessels participating in exploratory bottom fisheries will help increase awareness of the value of VMEs, in terms of their marine biodiversity and as habitat to fish assemblages, and the importance of developing mitigation measures to avoid impacts on them;
 - continued development of methods to reduce the frequency of gear loss that could impact on VMEs;

(ii) endorse:

- (a) the data to be collected by observers (paragraph 4.272);

(iii) agree:

- (a) on the need to improve and take action to ensure reporting of benthic by-catch is useful for analyses of the interaction of bottom fishing activities with VMEs (paragraph 4.273).

4.284 The Scientific Committee noted that paragraphs 2 and 4 of Conservation Measure 22-05 could be deleted as they were no longer relevant.