

FISH RESOURCES

FISHERY STATUS AND TRENDS

3.1 The only reported finfish catches for the 1992/93 season were 3 049 tonnes of *D. eleginoides* from Subarea 48.3, 39 tonnes from Subarea 48.4 and 2 722 tonnes from Division 58.5.1 (SC-CAMLR-XII/BG/1). Catches of crabs are discussed under Item 4.

3.2 The Scientific Committee recognised that fishing plans are subject to decisions of the Commission. The following paragraphs describe plans which depend on these decisions.

3.3 Fishing plans for the 1993/94 season were considered. Russia plans to have two to three vessels fishing for toothfish in Subarea 48.3. Plans for icefish fishing have not yet been finalised but at least one vessel would be involved. The total number would depend primarily on financial matters.

3.4 Mr Cielniaszek indicated that no Polish vessels fished for finfish during the 1992/93 season but that one or two vessels may operate in Subarea 48.3 in 1993/94. At this stage it is not clear whether these vessels would be fishing for finfish or for krill.

3.5 Chilean longliners operated in the Convention Area in 1992/93. The intention of Chilean authorities is to intensify the control of this fleet. This control could include no permission for fishing in the Convention Area during the 1993/94 season unless vessels comply with all legal requirements (CCAMLR-XII, Annex 5, paragraph 32). However, the current Chilean legislation does not allow such legal action.

3.6 Dr Naganobu indicated that no Japanese vessels would be fishing for finfish in the Convention Area in 1993/94.

3.7 Dr Kim indicated that one Korean vessel would be fishing for finfish in Subareas 48.3 and 48.4 in 1993/94.

3.8 Details of the fishing plans of Ukraine are given in CCAMLR-XII/BG/15. Two vessels intend to fish for toothfish in Subarea 48.3 but, because of financial considerations, plans for icefish have not yet been finalised.

3.9 CCAMLR-XII/MA/2 outlines the intentions of France for the next season. Two trawlers will be fishing in Division 58.5.1 for toothfish and icefish subject to French regulations for these species, particularly with regard to icefish.

REPORT OF THE WORKING GROUP ON FISH STOCK ASSESSMENT

3.10 The Working Group on Fish Stock Assessment (WG-FSA) met from 12 to 19 October 1993 at CCAMLR Headquarters in Hobart. The Convener of the Working Group, Dr Everson, presented the report of the meeting.

3.11 The Report of the Working Group is attached in Annex 5.

3.12 The largest part of the meeting was concerned with stock assessments. Additional topics were discussed at the meeting and are dealt with under other Scientific Committee agenda items. These are: (i) the crab fishery in Subarea 48.3 (Annex 5, paragraphs 6.71 to 6.107); (ii) straddling and highly migratory stocks (Annex 5, paragraphs 6.147 to 6.165); and (iii) scientific observation (Annex 5, paragraphs 4.1 to 4.6)

Data Requirements Endorsed by the Commission in 1992

3.13 Various data were specifically requested by the Working Group in 1992 (SC-CAMLR-XI, Annex 5, Appendix D). Data submitted to the Secretariat in response to this request are listed in Appendix D.

3.14 Catch and biological information had been submitted from the two current fisheries for *D. eleginoides* at South Georgia and the Kerguelen Islands. Fine-scale data and length frequency information from the 1992 crab fishery in Subarea 48.3 had also been submitted. However, overall the submission of data requested by the Working Group from previous fishing seasons was disappointing.

Other Documents and Topics (Annex 5, paragraphs 5.11 to 5.24)

3.15 The Working Group discussed papers on various aspects relevant to applied ecology such as: feeding, growth and maturity studies, larval distribution, taxonomy and recruitment variability, as

well as the distribution and trophic relations of Myctophidae. Papers on the rigging of codend meshes and estimation of seabed areas on the fishing grounds were also discussed.

3.16 Although these studies had little initial impact on the actual assessments, they are topics which need to be borne in mind when determining parameter values for many of the assessments.

New Fisheries (Annex 5, paragraphs 6.1 to 6.4)

3.17 Exploratory fishing had been undertaken for *D. eleginoides* in Subarea 48.4 by a Chilean vessel at the South Sandwich Islands. It was noted that a non-member state (Bulgaria) conducted a longline fishery in this subarea and forwarded haul-by-haul catch and effort data to CCAMLR. Catch rates were low and the area of fishable ground in the region investigated is small. The Working Group agreed that the prospects for developing a commercial fishery for *D. eleginoides* in the region are very poor. In the event that there is further interest in exploratory fishing in the area, WG-FSA recommended a TAC of 28 tonnes for *D. eleginoides* in the South Sandwich Islands.

3.18 In discussion it was noted that although catch rates of the Bulgarian vessel were far higher than the catch rates of the Chilean vessel, and also higher than catch rates of Bulgarian vessels fishing in Subarea 48.3, the Bulgarian catch rates in Subarea 48.4 declined rapidly. This was taken into account in the assessment and led to low estimates of biomass.

3.19 Dr C. Moreno (Chile) noted that the agreement between Chile and the UK to put Scientific Observers from both Member states on board the Chilean longliner that carried out the exploratory fishing in Subarea 48.4 was of great value. This sort of agreement can help to eliminate possible doubts about fisheries data and can provide valuable additional biological information.

3.20 The Scientific Committee drew attention to the fact that the Conservation Measure (44/XI) for 1992/93 with regard to this exploratory fishery allowed a TAC of 240 tonnes. This value was basically a sensible guess, thought to be a low value, since there was no information on which to base a TAC at the time. The assessment carried out at this year's meeting of WG-FSA indicates that a value of 240 tonnes is far too high and a TAC of 28 tonnes would be more appropriate.

3.21 It was noted that fishing only took place in the northern part of Subarea 48.4. Some Members felt that since the species reaches the southernmost limit of its distribution in the area and the bathymetry of the area was such that it was unlikely that large concentrations of toothfish would be found elsewhere within the subarea, the TAC calculated by WG-FSA could be related to the whole of Subarea 48.4. Other Members were of the opinion that the new fishery conducted in 1992/93

covered three islands in the north of Subarea 48.4, and therefore the catch level should relate only to these islands.

Management Advice

3.22 Most Members recommended a TAC of 28 tonnes for *D. eleginoides* in Subarea 48.4.

3.23 Some Members expressed doubt concerning the applicability of the TAC to the whole of Subarea 48.4.

3.24 The Scientific Committee also recommended that, because of the uncertainty about the applicability of this value to the entire subarea, the fishery continue to be viewed as a new fishery.

Assessments and Management Advice

3.25 Assessment summaries for the various fish stocks assessed by WG-FSA are presented in Appendix F of Annex 5.

Statistical Area 48 (South Atlantic)

Subarea 48.3 (South Georgia)

3.26 Catches from Subarea 48.3 are summarised in Table 1 of Annex 5. Apart from the 299 tonnes of *Paralomis* which is considered under Item 4, the only reported catches were 3049 tonnes of *D. eleginoides*.

3.27 Dr Kim indicated that one Korean vessel fished west of Subarea 48.3 in international waters between 9 April and 21 July 1993. The catch was 267 tonnes of *D. eleginoides*.

Dissostichus eleginoides (Subarea 48.3) (Annex 5, paragraphs 6.8 to 6.26)

3.28 The positions of catches (Annex 5, Figure 4) show that many hauls were reported from the north or west of Subarea 48.3 and outside of the Convention Area. Since these two fishing grounds

are contiguous with Subarea 48.3, it was suggested that the fish taken on these grounds may belong to the same stock as that found within Subarea 48.3 and assessments were undertaken for all the fishing grounds.

3.29 Dr Shust stated that the stock assessment and potential yield level estimate were obtained with the use of a method which did not take into account the length and age data, presented by Dr Shust, for 1991 and 1992 catches of *D. eleginoides* taken in Subarea 48.3.

3.30 Drs de la Mare and E. Balguerías (Spain) responded that the Working Group had decided not to use length-based assessment methods because they assume the stock has been in equilibrium, that is, that the catch is equal to the sustainable yield. The assessment indicates that this assumption cannot be justified.

3.31 In discussion, Prof. Beddington expressed considerable doubts that all the catches reported from the western and northern grounds were taken outside the Convention Area. Bathymetric charts show that the area to the north of Subarea 48.3 where catches were reported, forms part of a bank which is bisected by the northern boundary of Subarea 48.3. It therefore seems unlikely that fish concentrations would occur on the bank to the north of the boundary and not on the same bank to the south of the boundary. This same argument can be applied to the fishing ground to the west of Subarea 48.3, though the bathymetry is more complicated in this region.

3.32 Dr Moreno indicated that he shared these concerns about the catches reported from outside the Convention Area. The issue of whether these data were misreported or whether it is a case of a straddling stock can, however, not be resolved at this meeting. Scientific observers on board fishing vessels and research surveys could provide valuable information in this regard.

3.33 It was agreed that, at this stage, only assessments that assume that catches taken inside and just outside the Convention Area are from the same stock should be considered. In future, fishing vessels should be properly monitored to try and resolve the doubt about the catches reported outside the Convention Area. This can be done by, for example, transponders or observers on board vessels.

Management Advice

3.34 The Working Group noted that the stock projections indicate that the stock may have been depleted to around 30% of its unfished abundance. This is below the level which would be attained

when the stock is fished at $F_{0.1}$. The Working Group recommended that a substantial reduction in catch is required to allow the stock to rebuild.

3.35 Advice on possible TACs is complicated by the fact that the stock may be vulnerable to fishing outside the CCAMLR Convention Area. Several scenarios were considered by the Working Group (Annex 5, paragraph 6.25) and all indicate a TAC between 900 and 1 700 tonnes. The Working Group also indicated that it would be advisable for any reduction in TAC to be accompanied by a reconsideration of the number of vessels involved in the fishery at any one time to avoid problems with stock assessment (Annex 5, paragraph 6.26).

3.36 Three views on management advice were expressed in the Scientific Committee.

3.37 Many Members were of the opinion that the recommendations of the Working Group should be endorsed and a TAC set in the range of 900 to 1 700 tonnes.

3.38 Several Members suggested that the fishery should be closed until the issues with regard to straddling stocks have been resolved. One of the problems is that fishing outside the Convention Area cannot be controlled, which brings more uncertainty in the catch reporting. This has been noted with regard to the Chilean fleet (paragraph 3.32). Another issue that needs to be resolved is how the Commission deals with management of straddling stocks.

3.39 Dr Shust suggested that, taking into account the great uncertainty in the assessment, a TAC around 3 000 tonnes, similar to last year's TAC, could be set.

Champscephalus gunnari (Subarea 48.3)
(Annex 5, paragraphs 6.27 to 6.62)

3.40 No catches were reported for icefish, *Champscephalus gunnari*.

3.41 A revised catch-at-age matrix was provided to the Working Group and this was used to re-run assessments made at previous meetings. Stock projections based on biomass estimates from the research survey in January 1992 were used to calculate TACs for the 1993/94 season.

3.42 The Scientific Committee accepted the assessments and noted the level of uncertainty associated with them.

3.43 The proposal by the UK to conduct a research survey of *C. gunnari* in Subarea 48.3 in January 1994 was welcomed by the Scientific Committee.

3.44 As in the past, the Working Group considered TACs taking account of possible by-catch of *Notothenia gibberifrons*, *Chaenocephalus aceratus* and *Pseudochaenichthys georgianus*. No new information was available for the by-catch species. Two options for TACs were recommended by the Working Group: (i) the TAC should remain at 9 200 tonnes; or (ii) providing by-catches could be satisfactorily monitored and reported, a higher TAC of 13 000 to 21 000 tonnes could be considered.

Management Advice

3.45 Most members of the Scientific Committee agreed with the recommendations of the Working Group regarding the possible levels of TAC (paragraph 3.44).

3.46 Lic. Marschoff suggested a closure of the fishery for *C. gunnari* in Subarea 48.3 until a survey has been undertaken to allow a direct estimate of the stock to be made. He noted that the current estimates of TACs are based on projections of biomass estimates from a survey undertaken in January 1992 and not based on VPA results. Furthermore, a very large drop in biomass between 1989/90 and 1990/91 was indicated by biomass estimates from research surveys. This large drop has not yet been explained. These factors indicate a high level of uncertainty which justifies the proposed closure.

3.47 Dr Shust said that the TAC calculations were based on a survey that was quite recent (January 1992). The TAC of 9 200 tonnes set for the 1992/93 season had also been based on that survey estimate. He indicated that it was because of financial and economic reasons that no catches of *C. gunnari* had been taken in the 1992/93 season. Because of the absence of commercial fishing in recent years he suggested a catch level somewhere in the range 13 000 to 21 000 tonnes.

3.48 The Scientific Committee endorsed the recommendation made by the Working Group that the following Conservation Measures be maintained:

- (i) Conservation Measure 51/XI (effort and biological reporting system);
- (ii) Conservation Measure 49/XI (closure between 1 April 1994 and the end of the Commission meeting in 1994, to protect spawning); and

(iii) Conservation Measure 19/IX (mesh size regulation);

and recommended that the ban on bottom trawling currently contained as paragraph 4 in Conservation Measure 49/XI, be retained for the 1993/94 season.

Notothenia gibberifrons, *Chaenocephalus aceratus*,
Pseudochaenichthys georgianus, *Notothenia rossii*,
Patagonotothen guntheri and *Notothenia squamifrons*
(Subarea 48.3) (Annex 5, paragraphs 6.63 to 6.66)

3.49 The Scientific Committee endorsed the advice of WG-FSA and recommended that all Conservation Measures for these species should remain in force.

Electrona carlsbergi (Subarea 48.3)
(Annex 5, paragraphs 6.67 to 6.70)

3.50 It was noted that WG-FSA could not provide further advice because there is no new information and any TAC which might be considered would be based on a stock for which the age structure and biomass are unknown.

3.51 Fishing plans of Members (paragraphs 3.3 to 3.8) indicate that it is unlikely that there will be a fishery for this species in 1993/94.

Management Advice

3.52 On the basis of the known biological characteristics of the stock, the TAC of 245 000 tonnes set in Conservation Measure 53/XI for *Electrona carlsbergi* in Subarea 48.3 may be sustainable. However, any fishery would be based on a stock for which the age structure and biomass are unknown, and in the light of this uncertainty a precautionary TAC should be set below 245 000 tonnes. The species composition and biological characteristics of the by-catch are also unknown. Therefore the Scientific Committee recommends that a new biomass survey be conducted if any fishery on this species is resumed.

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

Champscephalus gunnari, *Notothenia gibberifrons*,
Chaenocephalus aceratus, *Pseudochaenichthys georgianus*,
Chionodraco rastrospinosus and *Notothenia kempi*
(Subareas 48.1 and 48.2) (Annex 5, paragraph 6.108)

3.53 The Working Group reiterated the advice offered in 1992 that the fisheries in Subareas 48.1 and 48.2 should remain closed until a survey is conducted to provide more accurate estimates of the status of the stocks in these subareas.

Management Advice

3.54 The Scientific Committee endorsed the recommendations of the Working Group and recommended that Conservation Measures in force should be maintained.

3.55 The Scientific Committee also proposed that this would continue to be its advice until new data or survey results from one or both these areas are provided to the Working Group.

Statistical Area 58 (Indian Ocean Sector)

Kerguelen Islands (Division 58.5.1)

3.56 Disappointment was expressed that no scientist from France could attend the meeting of WG-FSA in 1993, since this hampered the effective provision of advice from WG-FSA. It was hoped that a scientist from France would be able to attend the 1994 meeting of WG-FSA.

Dissostichus eleginoides (Division 58.5.1)
(Annex 5, paragraphs 6.112 to 6.132)

3.57 In 1992/93 the only fishery in Statistical Area 58 was for *D. eleginoides* in Division 58.5.1 (Kerguelen Islands). 826 tonnes were taken by France and 1 896 tonnes by Ukraine (CCAMLR-XII/BG/15). Two longliners operated for a limited period in the 1992/93 season and caught 92 tonnes in the western sector.

3.58 Three fishing grounds are recognised: north, northeast and west of Kerguelen. A detailed stock assessment was not possible for the stock in the western sector. A longterm sustainable yield of 1 400 tonnes was estimated from a 1988 trawl survey. No assessment was attempted for the northern sector and it was therefore impossible to determine whether the current catch level of 6 000 tonnes is sustainable.

3.59 Dr G. Duhamel (France) outlined regulations that are in force in the area around Kerguelen with regard to *D. eleginoides*. The fishery is managed separately for the northern and western sectors or fishing grounds.

- (i) In the western sector only a small-scale longline fleet of two vessels operated in the 1992/93 season with a TAC of 1 000 tonnes. The policy for this sector is likely to remain the same in future. No trawling is allowed in this sector.
- (ii) In the northern sector a TAC of 1 800 tonnes for the foreign fleet was in force in 1992/93 for the first time. The French fishery is controlled by the numbers of trips per vessel. In 1992/93 one trip was allowed for one trawler only. This fishery is only conducted by trawlers.
- (iii) The northeastern sector has not yet been exploited on a commercial scale.

3.60 Dr Duhamel added that additional measures also apply, for example, a closure between 1 May and 30 June and a mesh size regulation of 120 mm as adopted by CCAMLR. Last year two observers operated in the Kerguelen area through the year and the scientific data that were collected have been transmitted to CCAMLR.

Management Advice

3.61 The Scientific Committee endorsed the recommendations made by WG-FSA for a TAC of not more than 1 400 tonnes for the western sector. Concern was, however, expressed that a proper assessment could not be conducted at WG-FSA.

Notothenia rossii and *Notothenia squamifrons*
(Division 58.5.1) (Annex 5, paragraph 6.111)

3.62 Dr Duhamel noted that although the fishery for *Notothenia rossii* was closed, research has continued to assess the juvenile stock and there are currently some indications of a recovery in the juvenile part of the stock, which is likely to imply an increase in the adult stock in the near future. A scientific survey on the adult stock would be welcome.

3.63 There is no direct fishery for *Notothenia squamifrons* and there is no information on the current status of the stock.

Management Advice

3.64 The Scientific Committee endorsed the recommendations of WG-FSA that the fisheries for these two species should remain closed.

Champsocephalus gunnari (Division 58.5.1)
Kerguelen Plateau (Annex 5, paragraphs 6.133 to 6.140)

3.65 No new information on the recruiting cohort was available. Dr Duhamel explained that no data were available since the fishery was closed during the 1992/93 season. The reason for the closure was that individuals of the new cohort (1991) had not yet reached the minimum legal size of 25 cm. A recruitment study would be available at next year's meeting.

Management Advice

3.66 The Scientific Committee endorsed the recommendations of WG-FSA that fishing be delayed until the 1994/95 season and only restricted fishing on the 3+ age group that is expected to form the fishery in that year should be allowed. If any fishing occurs in the 1993/94 season the catch should be as low as possible.

Champsocephalus gunnari (Division 58.5.1)
Skif Bank (Annex 5, paragraph 6.141)

3.67 No new information was available to allow WG-FSA to assess this stock.

Heard Island (Division 58.5.2)

3.68 A demersal fish survey was undertaken around Heard Island in August and September this year and information on this survey will be reported to next year's meeting.

Coastal Areas of the Antarctic Continent (Divisions 58.4.1 and 58.4.2)

3.69 No new information was available to WG-FSA to allow assessment of the stocks in these areas.

Ob and Lena Banks (Division 58.4.4)

3.70 It was noted that the planned survey to the Ob and Lena Banks did not take place and is now rescheduled for the 1993/94 season. The observer from Ukraine, Dr Yakovlev, indicated that there is still some uncertainty as to whether the survey would take place or not due to financial circumstances.

Management Advice

3.71 It was noted that a TAC is already in force until the end of the Commission meeting in 1994 (Conservation Measure 59/XI). The Scientific Committee again endorsed the recommendation of WG-FSA that a survey be conducted on both banks and the stock be re-assessed before the fishery is re-opened.

General Advice on the Management of Fish Stocks

High Seas Fisheries and Straddling Stocks

3.72 The Scientific Committee noted WG-FSA's comments that there was evidence that *D. eleginoides* in the South Atlantic is a straddling stock, occurring both in the Convention Area (Subareas 48.3 and 48.4) and along the Patagonian slope and associated banks inside and outside

Chilean and Argentinian territorial waters, and that some other species occurring in the Convention Area were also straddling stocks (Annex 5, paragraph 6.148 and 6.149).

3.73 Dr Moreno recalled the concerns of the Working Group that there had been substantial exploitation of *D. eleginoides*, possibly from a single stock, both inside and outside the Convention Area, and emphasised the importance of further research on this stock and of harmonising management measures on stocks which occur both inside and outside the Convention's boundaries.

3.74 The Scientific Committee agreed that the matter of effective harmonisation of management measures across the Convention's boundaries was urgent and should be brought to the attention of the Commission.

High Seas Fisheries Statistics

3.75 The Scientific Committee endorsed the recommendation of the Working Group (Annex 5, paragraph 6.165) that the CCAMLR Secretariat be represented at an FAO *Ad Hoc* Consultation on the Role of Regional Fishery Agencies in Relation to High Seas Fishery Statistics (La Jolla, USA, 13 to 16 December 1993).

Safe Biological Limits

3.76 The Scientific Committee endorsed comments of WG-FSA on this subject (Annex 5, paragraph 6.162 and 6.163).

Consideration of Ecosystem Management Interactions with WG-Krill (Annex 5, paragraphs 7.1 to 7.6)

3.77 Three papers describing the potential impact of krill fishing on juvenile fish were discussed in WG-FSA. There is clear evidence of by-catch of juvenile fish in krill hauls. The Scientific Committee reiterated that a lot more information is needed to assess the extent of the problem. Of particular importance is information on temporal, spatial and between-fleet variability of the magnitude and species composition of the by-catch.

3.78 The Scientific Committee endorsed WG-Krill's deliberations on this matter (Annex 4, paragraphs 3.26 and 3.34) and noted that the Working Group had stressed that appropriate

statistical procedures should be applied to studies of the by-catch of juvenile fish in the krill fishery. These procedures should be standardised as far as possible.

3.79 It was also noted that the potential impact on commercially harvested fish species can only be properly assessed if the species in the by-catch are identified.

3.80 The Scientific Committee recommended that more studies on by-catch of larval and juvenile fish in krill catches be conducted. It also requested WG-FSA to provide information on when and where juvenile fish are most vulnerable to the fishery.

Interactions with WG-CEMP (Annex 5, paragraphs 3.17 to 3.19)

3.81 These matters are dealt with under Item 8 of the Scientific Committee report.

Research Surveys (Annex 5, paragraphs 8.1 to 8.8)

Trawl Survey Simulation Studies

3.82 A revised algorithm for estimating standing stock and its variance by the swept area method was agreed. The Scientific Committee endorsed the comments made by WG-FSA in this regard.

Recent and Proposed Surveys

3.83 The UK intends to conduct a bottom trawl survey in Subarea 48.3 in January 1994.

3.84 The proposed survey of the Ob and Lena Banks in 1993 by Ukraine had not been carried out but may now be planned for 1994 (see paragraph 3.70).

3.85 It was noted that CCAMLR-XII/MA/7 indicates that Russia intends to conduct two research cruises to the Atlantic sector. No information on these proposed cruises was available at WG-FSA.

3.86 Dr Shust said that plans for these research cruises had not yet been finalised because they have not yet been financed. If the surveys were to proceed, the agreed bottom trawl survey design and recommended manual (SC-CAMLR-XI, Annex 5, Appendix H, Attachment E) would be adopted.

3.87 The Scientific Committee reiterated the need for submission of detailed proposals six months in advance of the proposed survey as required by the Commission (CCAMLR-V, paragraph 60).

3.88 Dr Everson noted that this requirement was of particular importance in the light of the research catch exemption provision, which is currently 50 tonnes. In Subarea 48.4, for example, WG-FSA has estimated that an appropriate TAC for *D. eleginoides* would be 28 tonnes, which is below this limit.

DATA REQUIREMENTS

3.89 The Scientific Committee endorsed the list of data requirements specified by WG-FSA and set out in Annex 5, Appendix D.

3.90 The Scientific Committee endorsed the recommendation of WG-FSA that the submission date for STATLANT data be changed to 31 August.

Software and Analyses Required for the 1994 Meeting (Annex 5, paragraphs 9.2 to 9.5)

3.91 The Scientific Committee endorsed the recommendations made by WG-FSA.

3.92 It was noted that the program to scan haul-by-haul data for use in local depletion analyses (Annex 5, paragraph 9.4) would not simply identify declining series of CPUE but would also use other criteria such as geographic extent and time-scale to estimate localised fishing activity.

MANAGEMENT UNDER CONDITIONS OF UNCERTAINTY ABOUT STOCK SIZE AND SUSTAINABLE YIELD

3.93 Discussions in WG-FSA of this topic are reported in Annex 5, paragraphs 6.156 to 6.161.

3.94 Prof. Beddington said that the conclusions of WG-FSA are sensible and agreed that the approach used in the IWC is an appropriate methodology. In terms of CCAMLR, it is possible to look at the levels of uncertainty in each of the fisheries and advise on particular fisheries. Since the data

and management procedures from the different fisheries are quite different, it would be difficult to come to general conclusions.

3.95 The Scientific Committee agreed that more work on this topic is required and welcomed papers that focus on particular fisheries.

3.96 It was suggested that, together with advice on management provided to the Commission, some indication of the level of uncertainty may be useful.

3.97 In terms of krill, the Scientific Committee agreed that the principles of management under uncertainty are being incorporated in the management approach for this stock and that work is advancing well in this regard. In terms of fish stocks, a lot more work is required to incorporate uncertainty in an objective way as outlined in WG-FSA (Annex 5, paragraphs 6.156 to 6.161).

3.98 The Scientific Committee was of the view that, under conditions of increasingly poor data availability, management measures would most appropriately start to follow options from a choice of precautionary low catch levels as specific advice on TACs from traditional assessments became less reliable.