

FISH RESOURCES

Report of the Working Group on Fish Stock Assessment

4.1 The Convener of the Working Group on Fish Stock Assessment (WG-FSA), Dr K.-H. Kock (Germany), presented a report of the meeting which had been held in Hobart at the offices of the Secretariat from 8 to 17 October 1991.

4.2 The Report of WG-FSA is attached in Annex 6.

4.3 The Convener noted that the start of the meeting had been delayed for one day to allow Soviet colleagues, Drs Shust and Gasiukov, time to arrive. They had experienced unforeseen travel problems and did not arrive at the meeting until 14 October when all the assessments were in their final stage of preparation. WG-FSA had tried to consider objectively all the papers submitted by Soviet scientists in the preparation of the assessments. Soviet scientists requested that a large number of their comments on the assessments prepared by Members and within the Working Group be included in the report. WG-FSA decided to accept these comments into the report to avoid a lengthy debate during Scientific Committee. These additional comments had made the report of WG-FSA somewhat lengthy and somewhat disjointed.

4.4 Prof. Beddington considered that the report was disjointed in its presentation because of the large number of individual comments that had been included at the request of the Soviet scientists. He was concerned that equal weight in the presentation of the report had been given to papers that had been correctly tabled and discussed, and a paper that was only available in summary form.

4.5 Dr Shust apologised for the late arrival of himself and Dr Gasiukov. He noted that copies of papers had been mailed to the Secretariat in August but these had failed to arrive. Complementary copies of some of these papers had been sent to the Convener in advance of the meeting, arriving in good time, and these had been tabled.

4.6 Dr Shust further noted that some aspects of assessments including those performed by both himself and Dr Gasiukov were presented in a way that they considered to be unacceptable.

4.7 In reviewing the report, the Scientific Committee thanked the Convener and the participants for all their hard work. A large number of background papers had been presented to the WG-FSA meeting, a list of these documents is given in Annex 6 (WG-FSA report), Appendix C.

New and Developing Fisheries (Annex 6, paragraphs 5.1 to 5.6)

4.8 The Scientific Committee endorsed the comments made by WG-FSA. Further discussion was taken under Scientific Committee Agenda Item 9 (Development of Approaches to Conservation of Antarctic Marine Living Resources).

Interactions of Other Components of the Ecosystem
(e.g. Birds and Mammals) with Fisheries
(Annex 6, paragraphs 5.7 to 5.11)

4.9 The Scientific Committee endorsed the comments made by WG-FSA. Further discussion was taken under Scientific Committee Agenda Item 8 (Assessment of Incidental Mortality).

Prey Requirements of Predators
(Annex 6, paragraphs 5.12 to 5.16)

4.10 The Scientific Committee endorsed the comments made by WG-FSA.

By-Catch of Young and Larval Fish in the Krill Fishery
(Annex 6 paragraphs 5.17 to 5.20)

4.11 The Scientific Committee endorsed the comments made by WG-FSA.

Review of Material for the Meeting (Annex 6, paragraphs 6.1 to 6.17)

4.12 The work of WG-FSA has always been hampered by incomplete submissions of data. Various data, requested by WG-FSA, were not submitted. The problem is most serious for data relating to the commercial fisheries. A comparison of data requested compared to data submitted is given in Annex 6, Appendix E.

4.13 This problem had been highlighted last year by the Commission (CCAMLR-IX, paragraphs 4.3 and 4.5 to 4.8). The most serious example of information not being submitted to CCAMLR was haul-by-haul and length frequency data on *Dissostichus eleginoides* in Subarea 48.3 in accordance with Conservation Measure 26/IX. No haul-by-haul data were available and length compositions had only been submitted for some months, but not the entire season.

4.14 The Scientific Committee requests the Commission to take urgent steps to ensure complete and timely data submission. Failure to address this perennial problem adequately in the past has degraded the quality of advice that Scientific Committee is able to offer and furthermore increases the uncertainty associated with the assessments.

4.15 The Scientific Committee endorsed without comment the views expressed on other topics in this section of the report.

Fisheries Status and Trends

4.16 In the Atlantic sector, commercial fishing for finfish is prohibited in Subareas 48.1 and 48.2 but is permitted in Subarea 48.3, South Georgia. The total reported catch of all species was 82 423 tonnes, twice the amount reported for the 1989/90 season. The increase was primarily due to a threefold increase in the reported catch of *Electrona carlsbergi* to 78 488 tonnes.

4.17 A total of 1 518 tonnes of 'Lanternfish' (Myctophidae) was reported in CCAMLR-X/MA/8 as being taken from Subarea 48.2 although no STATLANT data were submitted. Dr Shust thought that the location of these catches may be incorrect and agreed to provide clarification on this before the next meeting of WG-FSA.

4.18 The reported catches by species over the past 22 years are set out in Table 1 of Annex 6.

4.19 Despite a TAC of 26 000 tonnes there had been virtually no commercial fishing on *Champscephalus gunnari*. A reported catch by USSR of 48 tonnes was thought by WG-FSA to be a result of research fishing in April and May 1991. USSR STATLANT returns report a zero catch for this period but include 49 tonnes for November 1991, the latter tonnage was not available to WG-FSA. The total catch, therefore, was unknown.

4.20 Reported catches of *D. eleginoides* totalled 3 641 tonnes, slightly less than that allowed under Conservation Measure 24/IX.

4.21 The fishery in the Indian Ocean sector was confined to waters around Kerguelen Islands (Division 58.5.1) and on the Ob and Lena Banks (Division 58.4.4).

4.22 The reported catches by species over the past 20 years are set out in Table 19 of Annex 6.

4.23 The main species reported from the Kerguelen fishery was *C. gunnari*, of which 13 283 tonnes were taken, mainly by Soviet trawlers. 1 944 tonnes of *D. eleginoides* were caught mainly by one French trawler. A Soviet longliner, which had previously worked around South Georgia, carried out exploratory fishing on *D. eleginoides*.

4.24 The Soviet fishery on Ob and Lena Banks reported 575 tonnes of *Notothenia squamifrons*, a total within the TAC set by the Commission.

Assessments

4.25 Assessment summaries have been prepared and are included in Annex 6, Appendix J.

Notothenia rossii, *Notothenia squamifrons*, *Patagonotothen guntheri*,
Pseudochaenichthys georgianus and *Chaenocephalus aceratus* (Subarea 48.3)
(Annex 6, paragraphs 7.10, 7.14 to 7.15, 7.18, 7.185 to 7.188)

4.26 The Scientific Committee endorsed the recommendations of the Working Group.

4.27 The Scientific Committee recommends that all conservation measures which were in force with respect to the above species should be extended for a further year. Dr Shust added the reservation that he had recommended an increase in by-catch of *C. aceratus* and *P. georgianus* to 500 tonnes each (Annex 6, paragraph 7.188).

Champsocephalus gunnari (Subarea 48.3)
(Annex 6, paragraphs 7.19 to 7.85)

4.28 Four conservation measures were in force for the 1990/91 season:

- (i) from 1 November 1991, mesh size limitation of 90 mm (Conservation Measure 19/IX);
- (ii) a prohibition of a directed fishery between 1 April 1991 and 4 November 1991 (Conservation Measure 21/IX);
- (iii) a catch reporting system for the 1990/91 season (Conservation Measure 25/IX);
and
- (iv) a TAC of 26 000 tonnes (Conservation Measure 20/IX).

4.29 The TAC of 26 000 tonnes had been set by the Commission following advice from the Scientific Committee that the possible range of TACs was 44 000 to 64 000 tonnes. This lower figure had been chosen following a warning from the Scientific Committee that there was a high degree of uncertainty associated with their estimation, and, if a high TAC was set a significant by-catch of *Notothenia gibberifrons* was possible.

4.30 The total reported catch of this species during the season was thought to be little more than 93 tonnes. No commercial concentrations of the species were found and in consequence, the fishing fleet had moved to other areas in search of krill and *E. carlsbergi*.

4.31 The estimates of TAC in 1990 had been calculated using results of a UK survey and two surveys by the USSR.

4.32 Results from standing stock surveys in recent seasons are summarised in Annex 6, Table 3. There were two surveys in 1991. One by the *Falklands Protector* (UK/Germany/Poland), which is documented in WG-FSA-91/14, indicated a stock of

26 204 tonnes. The other by the *Atlantida* (USSR) had been available to the Working Group only in summary form (WG-FSA-91/23). Accordingly, the Working Group had been unable to examine the methods used in this survey nor to substantiate the results. This survey indicated a substantial stock of 192 225 tonnes.

4.33 Prof. Beddington recalled that in 1990 he had pointed out to the Scientific Committee substantial unexplained differences in the results of the UK and USSR surveys which he believed were due to differences in methodology and operation. In the light of the results of the last two years, he now found it impossible to place any credibility whatsoever on the results of the various USSR surveys. For the South Georgia region in 1990, two remarkably consistent estimates were available from USSR surveys, 878 000 tonnes (*Akademik Knipovich*) and 887 000 tonnes (*Anchar*). In normal conditions, stock size in 1991 would be predicted to be in excess of 1 million tonnes. Such results were not credible in the light of a minute commercial catch, and a complete absence of commercial concentrations of fish.

4.34 Dr Shust noted that substantial differences in the survey methodology in 1990 were only evident between vessels *Hill Cove* and *Anchar*, whereas there were no such differences between those carried out by *Akademik Knipovich* and *Hill Cove*. Furthermore, several biomass estimates obtained by *Akademik Knipovich* were submitted to the Working Group in 1990. Of these estimates, the one Prof. Beddington mentioned above was one of the highest (SC-CAMLR-IX, Annex 5).

4.35 Dr Shust accepted that there were problems in reconciling the standing stock estimates from recent surveys. He reminded the Scientific Committee that the standing stock estimate from the *Atlantida* survey was very close to the VPA projection.

4.36 There were indications from both surveys that there had been a substantial decline (77 to 80%) in the stock since 1990 in the absence of fishing. There were two possible biological explanations: increased mortality or emigration (Annex 6, paragraph 7.26).

4.37 There was indirect evidence from a number of surveys that krill predators in the area were suffering from a shortage of krill. The survey by the *Falklands Protector* had indicated that krill, the preferred prey of *C. gunnari*, was in short supply and individuals were found to be eating food of a lower calorific value.

4.38 WG-FSA-91/7 indicated that the reproductive condition of individuals sampled by the *Falklands Protector* was poor.

4.39 Two VPA assessments were presented to the meeting (paragraphs 7.37 to 7.52).

4.40 The first (WG-FSA-91/15) used standard methodology based on a VPA tuned to the bottom trawl surveys. It indicated a stock of low size with declines in spawning stock abundance and recruitment in recent years. Predicted catch levels for 1991/92 based on $F_{0.1}$ were in the range of 8 000 to 14 000 tonnes.

4.41 The second assessment was based on tuning a VPA on trawl surveys and the commercial USSR catch and effort data for a time series from 1984 to 1990, there were of course no commercial catches for 1991. This indicated a substantially larger stock size in 1991. The paper recommended a TAC level for 1991/92 based on the analysis of 59 400 tonnes.

4.42 Two assessments were made during the Working Group meeting. Although these assessments were different in some technical details from the originals submitted to the Group, the methodologies and results of the Working Group assessments were essentially the same as the two originals.

4.43 Assessment 1 indicated a stock size in 1989/90 of around 27 000 tonnes and a catch level based on $F_{0.1}$ of 9 672 tonnes.

4.44 Assessment 2 indicated a stock size in 1989/90 of around 196 000 tonnes and a catch level based on $F_{0.1}$ of 61 870 tonnes.

4.45 There was substantial discussion of these assessments in the Working Group (Annex 6, paragraphs 7.53 to 7.78). Dr P. Gasiukov (USSR) made a number of critical comments on both assessments presented to and performed at the meeting and argued that the second assessments were more reliable (Annex 6, paragraphs 7.40, 7.43, 7.45, 7.48, 7.50, 7.55, 7.60, 7.68, 7.73, 7.77). There was no unanimity on which assessment was more reliable.

Management Advice

4.46 The Working Group presented two views on possible TACs for *C. gunnari* which were in the range of 8 400 to 61 900 tonnes. Dr Gasiukov suggested that the highest value

could form the basis for a TAC. Other Members felt that a conservative level was appropriate given uncertainties on population size, year class strength, future recruitment, and the potential by-catch of *N. gibberifrons*.

4.47 The Scientific Committee discussion of the assessments and management advice followed a similar pattern to that of the Working Group. In essence, there were two views. The first that the status of the stock is poor and that a conservative management approach is desirable. The second that the status of the stock is good and that a reasonable TAC could be set. No Member shared the view that a TAC of 61 900 tonnes could be recommended.

4.48 Prof. Beddington suggested that one option the Commission might consider was to close the fishery in 1991/92 pending the results of a further survey planned by the UK for January 1992. The basis for this suggestion was the concerns expressed in the Working Group that there appeared to have been a large decline in the stock in the absence of fishing and that there were indications that reproductive performance had been adversely effected, possibly by the shortage of krill.

4.49 The Scientific Committee drew attention to the problem of by-catch of *N. gibberifrons* if a TAC were to be set. Lic. E. Barrera-Oro (Argentina) recalled the analysis performed at last year's Scientific Committee (SC-CAMLR-IX, paragraph 3.42) which indicated that a by-catch of 500 tonnes would be reached with a catch of *C. gunnari* of 14 000 tonnes.

4.50 Dr Shust proposed that some reasonable TAC could be set in the range of 8 400 to 61 900 tonnes. He commented that if the stock size was sufficiently low so that no commercial concentrations were found, no commercial catch would be taken for economic reasons.

4.51 A number of Members responded that a low stock size did not guarantee that negligible catches would be taken because fishable concentrations might still be found.

4.52 The Scientific Committee endorsed the recommendation of the Working Group concerning other conservation measures.

- (i) Conservation Measure 19/IX dealing with 90 mm mesh size should be continued.
- (ii) Conservation Measure 20/IX, the ban on bottom trawls in the directed fishery for *C. gunnari* should be continued.

- (iii) Conservation Measure 21/IX, the closed season between 1 April and the end of the next Commission meeting should be continued.

Dissostichus eleginoides (Subarea 48.3)
(Annex 6, paragraphs 7.86 to 7.128)

4.53 Three conservation measures were in force. Conservation Measure 24/IX set the TAC for the period 2 November 1990 to 2 November 1991 as 2 500 tonnes. Conservation Measures 25/IX and 26/IX related to the reporting of catch, effort and biological data.

4.54 Reported catches in 1990/91 consisted of 1 440 tonnes caught before the Commission meeting last year and 2 394 tonnes caught since. All catches were caught by longlining.

4.55 Conservation Measure 25/IX was adhered to and catch and effort data from five-day reporting periods were submitted.

4.56 Conservation Measure 26/IX had not been adhered to, no haul-by-haul data had been presented and only limited length frequency data (for a few months) has been submitted.

4.57 Mr V. Brukhis (USSR) stated that there were difficulties in radio communication with the fishing vessels. It was therefore difficult to ensure that haul-by-haul data and the relevant biological data were presented as required.

4.58 A number of Members pointed out that this situation had presumably been known at the time that Conservation Measure 26/IX was adopted.

4.59 In view of the obligation set out in Conservation Measure 26/IX to submit haul-by-haul data from the longline fishery on *D. eleginoides*, the Soviet representative agreed to extract these data from the longline vessels and submit them to CCAMLR, if possible.

4.60 Dr C. Moreno (Chile) stated that it was the intention of Chile to conduct longline operations in Subarea 48.3 as an extension of an ongoing project involving *D. eleginoides* as reported in WG-FSA-91/10. This operation would provide haul-by-haul and biological data.

4.61 Two papers, WG-FSA-91/20 and WG-FSA-91/24 contained assessments. The former, which was based on trawl surveys, gave markedly different estimates for two successive years. The latter, was a cohort analysis which used biological data from the

fishery, but which had not been tuned to either survey or CPUE data. A third assessment was performed at the meeting using a modified deLury method which used CPUE data from one and two years. There are substantial differences in the estimates of stock size and catch of $F_{0.1}$ obtained by the different methods (Annex 6, Table 8).

4.62 The Working Group was unable to reach agreement on which of the methods were most reliable.

Management Advice

4.63 The management advice presented by the Working Group reflected the uncertainties encountered in assessing the stock. The range of estimates of possible TACs was between 794 and 8 819 tonnes. Drs Shust and Gasiukov believed this range was too large and believed the appropriate range was from 3 800 to 8 819 tonnes. Other Members did not believe there was sufficient information for choosing any part of the range.

4.64 Discussion in the Scientific Committee reflected these differences, there were two views.

4.65 Prof. Beddington, supported by a number of Members, indicated that because no haul-by-haul data had been submitted and insufficient other data were available, no assessment was sufficiently reliable to use as a basis for setting a TAC.

4.66 Dr Shust stated that the TAC should be chosen from the range 3 800 to 8 819 tonnes.

4.67 Attention was drawn by a number of Members to the problems identified (paragraphs 8.4 to 8.11) with the incidental mortality of seabirds in the fishing for *D. eleginoides*. The Scientific Committee therefore draws the Commission's attention to the fact that this incidental mortality will be related to the level of any TAC set.

Notothenia gibberifrons (Subarea 48.3)
(Annex 6, paragraphs 7.177 to 7.179)

4.68 The Scientific Committee endorsed the recommendations of the Working Group.

Management Advice

4.69 The analyses undertaken by the Working Group indicated a TAC of 1 500 or 3 000 tonnes would be appropriate.

4.70 It was agreed, however, that the TAC could only be obtained by bottom trawling which would result in by-catch of other species in Subarea 48.3 (Annex 6, paragraph 7.196). It was also agreed that the potential effects on other species should preclude direct fishery by any fishing method for *N. gibberifrons* in 1991/92. Some Members felt the by-catch in the pelagic fishery for *C. gunnari* should be limited to 500 tonnes of *N. gibberifrons* (see Conservation Measure 20/IX).

4.71 Dr Shust suggested that a TAC of 1 500 tonnes as a by-catch in pelagic fisheries could be recommended.

General Considerations on the Re-Opening of a Directed Fishery and the Application of TACs to 'By-Catch' Species in Subarea 48.3 (Annex 6, paragraphs 7.189 to 7.197)

4.72 The recommendations of the Working Group were endorsed by the Scientific Committee.

Management Advice

4.73 In any mixed bottom trawl fishery where catches are at $F_{0.1}$ (the agreed policy of the Commission) or F_{max} , the TAC of *N. gibberifrons* will be reached first if catches of the various species remain in similar proportions to those calculated from Polish catches (i.e., the TAC of *N. gibberifrons* is limiting). The sustainable yield of the target species *C. gunnari* from a bottom trawl fishery therefore cannot be higher than six times the TAC for *N. gibberifrons* (8 800 tonnes at F_{max}). If that fishery is targetting *C. gunnari*, the MSY from the fishery including all species would be about 13 000 tonnes under the most favourable circumstances, and would likely be much less given the uncertainties surrounding these estimates and the adverse effects of bottom trawling on benthos which may affect fish communities in the medium or long-term, e.g. by habitat destruction (see WG-FSA-90/24).

4.74 Given the low current yield ($F_{0.1}$) and potential yield (MSY) of a bottom trawl fishery in Subarea 48.3, the uncertainties surrounding the ratios of the species in catches of mixed

fishery and in stock size estimates and the potentially adverse effects of habitat destruction, the Working Group recommended that the prohibition of bottom trawling should remain in force.

Electrona carlsbergi (Subarea 48.3)
(Annex 6, paragraphs 7.129 to 7.150)

4.75 The Scientific Committee endorsed the recommendations of WG-FSA and made several additional observations which are reported below.

4.76 No information was available to either WG-FSA or the Scientific Committee on the design of midwater trawls used in the *E. carlsbergi* fishery although indications from CCAMLR-X/13 implied that the nets used were very large. Soviet scientists were asked to provide a description of trawls used in time for the next meeting of WG-FSA.

4.77 The assessments provided in Annex 6 were based largely on standing stock estimates from two surveys. Dr Shust noted that three such surveys had been undertaken and agreed to arrange for the detailed data to be supplied to the next meeting of WG-FSA.

4.78 It was noted that there are particular problems with assessing this species because part of the population is thought to occur north of the Polar Frontal Zone (PFZ) and hence outside the CCAMLR Convention Area. The degree to which there is mixing between areas on either side of the PFZ is unknown, as is the degree of aggregation and distribution of fishable concentrations within Subarea 48.3. To reduce the uncertainty over the estimates WG-FSA had based its analysis on two-year old fish because that is the age-class on which the fishery is based and its distribution was inferred from the surveys in Subarea 48.3.

4.79 In spite of an extremely limited database, WG-FSA had provided an assesement for *E. carlsbergi*. This was in response to a request from the Commission that the Scientific Committee estimate the potential yield of this species as a matter of urgency (CCAMLR-IX, paragraph 4.27).

Management Advice

4.80 It was noted that an $F_{0.1}$ policy is not appropriate for this species since it would imply very low ratios of exploited to unexploited spawning stock biomass. The Working Group

decided to use an **F**-value that would allow a ratio of 50% exploited to unexploited spawning stock biomass to determine TAC levels.

4.81 The Scientific Committee recommends to the Commission that a conservation measure in the form of a TAC should be set because of the very rapid expansion in the fishery.

4.82 Two options on which a TAC might be based were considered. The first was to set a TAC for the whole of Subarea 48.3 and the second for the Shag Rocks shelf area and its immediate vicinity.

4.83 The extreme uncertainty over the estimates that WG-FSA was able to provide caused some problems in deciding on a suitable TAC. The options are listed in Annex 6, Table 12. Bearing in mind the uncertainty in the estimates the Scientific Committee suggested that a TAC could be set in the range 245 000 to 398 000 tonnes for the whole of Subarea 48.3 and in the range 32 700 to 53 000 tonnes for the Shag Rocks shelf region.

4.84 Soviet experts feel that these values are only preliminary, since they do not fully take into account those factors mentioned in paragraph 4.71.

South Orkney Subarea (48.2)
(Annex 6, paragraphs 7.198 to 7.224)

4.85 Commercial fishing for finfish in this subarea has been prohibited under Conservation Measure 27/IX.

4.86 A standing stock survey undertaken by scientists from Spain indicated that there had been a slight increase in most species since the last survey. However, most species appear still to be well below their initial stock size.

4.87 No standing stock surveys are currently planned for this subarea during the forthcoming season.

Management Advice

4.88 WG-FSA had considered the implications of re-opening the fishery to bottom trawling, different scenarios were considered, none of which would result in a potential yield exceeding one to three thousand tonnes. Most Members recommended that the Conservation Measure 27/IX should be retained.

4.89 Dr Shust suggested that a limited fishery, in accordance with the calculated MSY should be allowed as it would provide valuable data on which to base future assessments.

4.90 Dr Everson noted that the provision of data from the commercial fishery had, in the past, been extremely poor and felt that it would be inappropriate to allow even a limited fishery in the circumstances. This view was supported by other Members.

Antarctic Peninsula Subarea (48.1)
(Annex 6, paragraphs 7.225 to 7.227)

4.91 The recommendations of the Working Group were endorsed by the Scientific Committee.

Management Advice

4.92 In view of the very limited new information available to re-assess the state of the stocks in the Peninsula region, the Scientific Committee recommended that the conservation measures in force for the 1990/91 season should be extended (Conservation Measure 27/IX).

Statistical Area 58

4.93 In 1990/91 fishing took place in Divisions 58.4.1 and 58.5.1. In addition, an exploratory longline fishing cruise took place in Division 58.5.1 in the deep sea zone (>500 m) off the Kerguelen Islands shelf. There was also a joint French/Soviet scientific cruise in the same area to investigate the *Notothenia rossii* stock.

Division 58.5.1 (Kerguelen)
(Annex 6, paragraphs 7.232 to 7.237 and 7.245 to 7.251)

4.94 The Working Group's advice with respect to *N. rossii*, *D. eleginoides* and *N. squamifrons* was endorsed by the Scientific Committee without comment.

Management Advice

4.95 The existing regulations in force which prohibit directed fishing on *N. rossii* should continue in order to protect the adult stock. Trends in the abundance of juvenile *N. rossii* need to continue to be monitored and research on prespawner and spawner biomass should be continued during the 1991/92 spawning season.

4.96 Previous biomass estimates and VPA analyses of the *N. squamifrons* stock reported to WG-FSA from 1988 to 1990 indicate that the stock size is very low. In the light of this, even a low level of catches could prevent recovery of the stocks of this species.

4.97 In view of the steadily declining CPUE of *D. eleginoides* in the western sector, the management advice in paragraph 166 of the Report of the 1989 Meeting of WG-FSA (SC-CAMLR-VIII, Annex 6) that the catch should not exceed 1 100 tonnes should be continued. This will need to be revised if the new fishing grounds identified this season are further exploited. Bearing in mind that this species is likely to become of increased importance in the Kerguelen fishery, further information on age, growth and other parameters is needed for stock assessment in the future.

Champsocephalus gunnari (Division 58.5.1)
(Annex 5, paragraphs 7.238 to 7.244)

4.98 The advice of the Working Group was endorsed by the Scientific Committee.

Management Advice

4.99 Given the steady decline in index of abundance at similar ages in successive cohorts, the catch in the 1991/92 season of 3 year old fish should be less than that on previous cohorts at the same age (i.e., less than 17 000 tonnes). The cohort analysis does not indicate a

significant decrease in year class strength between cohorts. This analysis, however, makes assumptions about parameters such as **F** and **M**, and so is possibly a less reliable index than CPUE, which is a direct observation from a large body of data.

4.100 The cause of disappearance of age 3 fish still needs to be resolved during the 1991/92 season.

Division 58.5.2 (Heard Island)
(Annex 6, paragraph 7.253)

4.101 The Working Group noted that no fishery occurred in this area, no new data were available and therefore no advice could be given. This was endorsed by the Scientific Committee.

Management Advice

4.102 No fishery occurred in this area, and no other new data are available. No advice can be provided.

Subarea 58.4 (Annex 6, paragraphs 7.254 to 7.258)

4.103 The Scientific Committee endorsed the analyses of the Working Group.

Data Requirements (Annex 6, paragraphs 8.1 to 8.15)

4.104 The Scientific Committee endorsed the list of data requirements specified by the Working Group with the following additional comments. These are set out in Annex 6, Appendix E.

4.105 Dr D. Robertson (New Zealand) drew the Scientific Committee's attention to item 22 in Annex 6, Appendix E (information on levels of discarding and conversion rates from fish product to nominal weight) pointing out that errors in conversion factors could cause enormous errors in estimating the impact of fishing. Most Members agreed that information on discards and conversion rates should be obtained from the Observer Scheme currently under discussion (paragraphs 10.1 to 10.8).

4.106 Dr Shust indicated that the list of activities proposed under the Observation Scheme was continually growing and that information on discards and conversion rates would be yet another item in an already heavy workload. Dr Everson responded by suggesting that the proposed level of sampling was only a small addition to a list that had been agreed by all Members in recent years.

4.107 Dr Holt noted that the requirements for data agreed by the Scientific Committee had undergone little change in recent years and yet, generally speaking, there had been a very poor response to these requirements. He felt that the lack of data should be a factor that is taken into account by the Commission in determining management plans.

Workshop on Survey Design

4.108 Difficulties associated with survey design and the application of the 'swept area' method to survey data on demersal species that are patchily distributed have been a considerable problem to WG-FSA in the past. The problem was again in evidence in this year's assessments, for example, those of *C. gunnari* in Subarea 48.3 (Annex 6, paragraph 7.24) and Subarea 48.2 (Annex 6, paragraph 7.204). The Working Group at its meeting in 1990 and again in 1991 drew attention to the need for investigation of this problem as a matter of priority (SC-CAMLR-IX, Annex 5, paragraph 91). Because of the specialised and detailed examination required, this work cannot be done during a regular meeting of the WG-FSA.

4.109 The Working Group therefore recommended that a workshop on survey design and analyses of research vessel surveys be held in the 1991/92 intersessional period. The following terms of reference were identified for the workshop:

Theoretical Aspects	Practical Aspects (influencing theoretical aspects)
<ul style="list-style-type: none"> • Survey design for sampling different types of fish distribution • Two-phase surveys • Properties of estimators of biomass and definition of acceptable levels of CV 	<ul style="list-style-type: none"> • Sources of errors in comparisons between surveys: <ul style="list-style-type: none"> - gear comparison - method of choosing location of trawl stations

Synthesis
<ul style="list-style-type: none"> • Survey design and how to carry out the survey • Cost effective allocation of sampling resources

4.110 Dr Kock offered to host such a workshop in Hamburg, Germany, preferably in June 1992 for eight working days. This offer was gratefully accepted.

Working Group Convener

4.111 Mr Østvedt, Chairman of the Scientific Committee, thanked Dr Kock for presenting the report of the Working Group to the Scientific Committee and noted that in accordance with his intention, stated last year, Dr Kock had relinquished the Convenership of the Working Group. Members were unanimous in their praise for the amount of work, dedication and attention to detail that he had afforded the Working Group over the five years during which he had been its Convener. Mr Østvedt presented Dr Kock with a pair of magic spectacles essential for rational assessment of fish stocks.

4.112 In responding, Dr Kock thanked all his colleagues in the Working Group for their excellent collaboration, often in the face of enormous difficulties, over the years. He also thanked the Scientific Committee for its support of the work of the group and the Secretariat for their excellent support and guidance over the years. He wished his successor well in the future. Finishing on a sadder note he noted that a recent newspaper article was based on reports by an Estonian observer on board Soviet fishing vessels. The information contained in the report sought to discredit most of the data which is submitted to CCAMLR with obvious implications for the Working Group. This is a problem, he noted, that is present in fisheries world-wide and not confined to CCAMLR.

4.113 Dr Everson was then elected Convener of WG-FSA.