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REPORT OF THE THIRD MEETING OF THE SCIENTIFIC COMMITTEE

OPENING OF THE MEETING

1.1* The Scientific Committee for the Conservation of Antarctic Marine Living Resources met under the Chairmanship of Dr D. Sahrhage (Federal Republic of Germany) from 3 – 12 September 1984 at the Wrest Point Hotel, Hobart.

1.2 Representatives from the following members attended the meeting: Argentina, Australia, Belgium, Chile, European Economic Community, Federal Republic of Germany, France, German Democratic Republic, Japan, New Zealand, Norway, Poland, Republic of South Africa, Union of Soviet Socialist Republics, United Kingdom and United States of America.

1.3 Representatives from the Food and Agriculture Organization of the United Nations (FAO), the Intergovernmental Oceanographic Commission (IOC), the International Union for the Conservation of Nature and Natural Resources (IUCN), the International Whaling Commission (IWC), the Scientific Committee on Antarctic Research (SCAR), and the Scientific Committee on Oceanic Research (SCOR) attended the meeting as observers. Invited scientists from Brazil and Spain participated also as observers.

1.4 It was agreed that matters of scientific content (agenda items 6–10) should be open to comment from all observers.

1.5 A list of participants is at Annex 1. A list of documents considered during the session is at Annex 2.

1.6 Responsibility for the preparation of the Scientific Committee's report was assigned to the following rapporteurs: J. Beddington (data collection and handling), D. Butterworth and D. Miller (ecosystem monitoring and management), I. Everson (krill resources), G.P. Kirkwood (fish stock assessment) and J.L. Bengtson (all other agenda items). Vice-Chairman D. Robertson coordinated the integration of these components into the final report.

* The first part of the number relates to the appropriate item of the agenda.

ADOPTION OF THE AGENDA

2.1 The Chairman noted that requests for advice on two additional items were envisaged from the Commission: assessment and avoidance of incidental mortality of Antarctic marine living resources, and interim arrangements for the designation of observers and inspectors. It was agreed that these items should be treated under agenda item 15 (other business).

2.2 The provisional agenda was adopted (Annex 3).

REPORT BY THE CHAIRMAN

3.1 The Chairman noted the high expectations and interest internationally in the work of the CCAMLR Scientific Committee. He expressed optimism for its future activities, and satisfaction that all signatory parties are now participating as full members.

3.2 The Chairman thanked the convenors and members of *ad hoc* working groups, the Secretariat, and other persons active during the intersessional period for their valuable work.

3.3 An intersessional meeting of the Ad Hoc Working Group on Data Collection and Handling, chaired by R. Hennemuth (USA), was held at Woods Hole, Mass., USA, in June, 1984.

3.4 The Ad Hoc Working Group on Publication Matters, chaired by G. Stander (Republic of South Africa), carried out intersessional activities through correspondence.

3.5 Progress is being made on the joint CCAMLR/FAO Species Identification Sheet project, under the direction of Dr W. Fischer (FAO).

3.6 The first issue of the CCAMLR Newsletter was produced and distributed in May, 1984.

3.7 The Chairman had frequent contacts with the Secretariat of CCAMLR and with members of the Executive of the BIOMASS program.

3.8 Reports of members, reflecting fisheries and scientific activities undertaken during the past year had not been received from all parties before the meeting as required in accordance with a recommendation passed during the Second Session. Reports were received from

Australia, Belgium, Chile, GDR, FRG, Japan, Norway, Poland, Republic of South Africa, USSR and USA. The representative from France indicated that a report had been prepared and would be submitted to the Scientific Committee soon. The representative from the EEC made a verbal report that no scientific or fisheries activities had been undertaken during the past year.

3.9 It was agreed that further consideration of the preparation of member reports would be treated under item 11 (Publication Policy and Procedures for the Preparation of Meeting Documents).

AMENDMENT TO RULE 8 OF RULES OF PROCEDURE

4.1 It was noted that there were ambiguities in the wording of Rule 8 of the Rules of Procedure dealing with the terms of office of Chairman and Vice-Chairmen.

4.2 A revised wording of the first paragraph of Rule 8 of Rules of Procedure was drafted and considered by the Committee.

4.3 The following amendment to the first paragraph of Rule 8 was adopted:

Rule 8

The Committee shall elect a Chairman and two or more Vice-Chairmen on the basis of procedures referred to in Rule 3 above. The Chairman and Vice-Chairmen shall be elected for a term which shall include two regular meetings, as defined in the second sentence of Rule 4, except in the case of the first Chairman who shall be elected for a term of office which shall include three regular meetings to ensure that the terms of office of the Chairman and Vice-Chairmen shall be staggered.

4.4 According to Article XVI, Paragraph 2, the amendment was forwarded to the Commission for approval.

ELECTION OF VICE-CHAIRMEN

5.1 The current Vice-Chairmen, D. Robertson (New Zealand) and W. Ranke (GDR) were nominated for re-election. There were no other nominations.

5.2 The two nominees were re-elected.

DATA COLLECTION AND HANDLING

Data Collection by CCAMLR in the Inter-sessional Period

6.1 The Secretariat presented a paper SC-CAMLR-III/4 which summarised the progress that had been made in collecting data in the inter-sessional period. There were three main areas: STATLANT data, commercial data inventory and the scientific data inventory.

STATLANT Data

6.2 During the inter-sessional period the Secretariat had compiled available STATLANT data and archived them in the Commission data base. The current position on data availability is given at Annex 4.

6.3 In summary, 8A data which contain information on total catch by species is almost complete although some USSR data are for calendar years and there is a need to report the data according to Antarctic fishing seasons. The 8B data are much less complete and in addition have a number of problems. In particular data have been presented in irregular groupings of area - sub area, effort types and species sought, making it difficult to consolidate the historical returns in a standard manner. The Scientific Committee agreed that the STATLANT data should be the basis for compiling an initial Statistical Bulletin.

Commercial Data Inventory

6.4 SC-CAMLR-III/4 indicated the progress that had been made in collating the inventories of commercial data. Inventories have been received from all members.

Scientific Data Inventory

6.5 The scientific data inventory requested by the Scientific Committee at its last meeting has been received from the following members to date: Argentina, Australia, GDR, FRG,

Japan, USSR, UK and USA. It was also noted that Poland had submitted its scientific data inventory together with commercial data.

6.6 A major report on USSR activities in the period 1962–1984 covering more than 150 expeditions was submitted to the Secretariat.

6.7 These inventories and other documents submitted with them are held in the Secretariat, where they are available for examination by members.

6.8 The Committee believed that the inventories would provide useful basic information for the work of *ad hoc* groups, the Secretariat and the Scientific Committee.

6.9 It was urged that members which had not yet submitted their scientific data inventories to the Secretariat should do so before the end of 1984.

6.10 It was also agreed to ask SCAR if it would be possible to arrange for copies of the National Reports sent to SCAR to be sent to the CCAMLR Secretariat.

Proposal for a CCAMLR Statistical Bulletin

6.11 SC-CAMLR-III/8 contains a draft Statistical Bulletin which had been prepared by the Secretariat in response to a request made by the Scientific Committee last year.

6.12 The Committee agreed that the summary of catch and effort statistics presented in Annex 5 would be published as part of the Scientific Committee report. Publication of the Statistical Bulletin should be deferred until next year by which time a complete set of the historical data was expected to have been submitted to the Secretariat.

6.13 The Scientific Committee recognised that the extent of the dissemination of this Bulletin was a matter for discussion by the Commission as it involved budgetary considerations.

Report of the Ad Hoc Working Group on Data Collection and Handling

6.14 The report of the inter-sessional meeting of the *Ad Hoc* Working Group on Data Collection and Handling, held in June 1984 at Woods Hole, USA, is given in

SC-CAMLR-III/9. The Committee welcomed this report and agreed that it would be appropriate for it to be annexed to the Scientific Committee report. It is contained at Annex 6.

6.15 The report raised a number of questions for further discussion by the Scientific Committee.

STATLANT 8A/B Data

6.16 The current Statistical Areas used by FAO in the STATLANT forms are inadequate in a number of ways and the Working Group had made some proposals to revise them. These proposals were discussed by the Committee and revised Statistical Areas were agreed involving the following changes:

<u>Area or Subarea</u>	<u>Changes</u>
48.1	Change lower boundary between 50°W and 60°W from 64°S to 65°S.
58.4	Add boundary along 62°S between 30°E and 80°E. Extend current boundary at 60°E down to 62°S. Add boundary line at 80°E down to land area. The above would subdivide 58.4 into four new subareas, 58.4.1, 58.4.2, 58.4.3, 58.4.4.
88	Sub-divide into three new subareas along 1) 105°W 2) 170°W to be identified as 88.1, 88.2 and 88.3

These changes are illustrated in the map contained at Annex 7.

6.17 The change of the boundary to area 48.1 is based on GDR commercial catches of fish taken south of 64°south. The division of areas 58 and 88 is based on the current estimates of the spatial structure of the Antarctic circumpolar current and the horizontal water column of the Antarctic surface waters. The subarea 58.4 is quite large and encompasses fairly stable separate concentrations of krill. The new divisions will encompass consistent concentrations

south of 62°S, as illustrated by Japanese data (SC-CAMLR-III/INF.9), and also those which are noted to be latitudinally separate. Area 88 is a very large area, probably containing semi-distinct concentrations; in particular USSR studies indicate that the 170°W line would separate concentrations to the east of the Ross Sea area. The 105° line was taken to separate the krill production area which feeds into 48.1.

6.18 The Committee noted in completing the 8B Forms, effort data have been included which were associated with the combined catch of both krill and fin fish.

6.19 This is clearly unsatisfactory, as the operations are different. It was noted that the STATLANT form contains a heading for main species sought and the Committee emphasised the importance of reporting data in this way. As a minimum fishing for krill and for fin fish should be reported separately, but data should also be reported separately according to main species of fin fish sought. It is also desirable to report data according to major vessel categories as required in the STATLANT format.

6.20 The Committee recommended that the proposed changes to the Statistical Areas be taken up with FAO by the Secretariat in October 1984 so that revisions to the reporting forms can be introduced for the 1984-85 season. The Committee also recommended that FAO be requested when distributing STATLANT forms for completion, to draw the attention of the statistical offices of the members concerned to the importance of maintaining the separation between species sought when completing the forms.

Collection of Catch and Effort Data

6.21 The Working Group had noted that the data collection systems used by members fishing in the Convention area were similar to that recommended by the Scientific Committee in the logbook information list (Annex 8, Scientific Committee Report 1983).

6.22 For stock assessment purposes, the Working Group had agreed that the basic data collection proposal contained in Appendix 14 of their report (Annex 6) was satisfactory, although there were some doubts about the need for identifying particular gear and vessel characteristics. For the purposes of krill stock assessment some desirable information on effort, particularly associated with assessment of searching time, had not been collected in the past.

6.23 At present, fishing vessels routinely record information on catch per haul, but not on activity. For those operations where vessels both fish and search, the Working Group suggested that some extra information to that currently recorded during fishing operations in the logbooks would add significantly to the value of the catch/effort information. This would involve recording whether trawl hauls are on the same or different krill aggregations, and/or the time spent searching between different krill aggregations. This latter information could be deduced from the data routinely collected if the periods when the vessel was searching were recorded. Delegations from fishing nations noted the difficulties of getting precise data on searching times from commercial operations. The Scientific Committee noted these difficulties, but believed it important that these data be collected. Some reservations, however, were expressed by the representative of Japan. For those operations where fishing vessels use information directly from fishery research vessels, there is less advantage in seeking information on searching time from fishing vessels.

6.24 Fishery research vessels operating in association with fishing vessels may be capable of providing information on the distribution and abundance of krill aggregations. Such information could be used in conjunction with CPUE data from fishing vessels operating in the same area to construct an index of abundance. The Working Group suggested that fishery research vessels collect, on a routine basis, information on the distribution and abundance of krill aggregations. The Scientific Committee agreed with this suggestion.

Submission of Catch and Effort Data

6.25 The Scientific Committee considered the problem of routine submission of catch and effort data referred to in Article XX of the Convention.

6.26 The Working Group had considered two basic options, the one involved submission to the Secretariat of the raw data from logbooks. The Secretariat could then process these data to any degree of detail required. The alternative involved submission by members of some form of summary of the data collected. This latter option involves a subsidiary question concerning the degree of detail required for such a summary.

6.27 The representative from Japan questioned the former option on the grounds that: submission of logbooks is rather abnormal among many other international commissions' regulations; there is a domestic law prohibiting the disclosure of precise information relating to the benefit of individual companies; and there is a priority and obligation of national scientists to analyse data and to report to CCAMLR.

6.28 A similar concern was expressed regarding the legal problems by several other delegations. However, the USA delegation noted that the obligation accepted under international agreements normally supersedes national law and questioned whether such legal problems were real.

6.29 Representatives from members fishing in the Convention Area indicated their strong preference for the latter option (Paragraph 6.26). The discussion therefore concentrated on the degree of detail in which summary statistics should be presented. The majority of the Working Group had agreed that for both fish and krill a spatial scale of 1° longitude by 0.5° latitude was the maximum desirable and had further suggested a temporal scale of ten days.

6.30 In discussion the Scientific Committee could not reach agreement on this point. Dr Lubimova (USSR) indicated her view that the spatial scale of the STATLANT data was preferable, because the processing of the great volume of raw data would be an extra burden for the Secretariat of the Commission. Apart from this, submission of such data could create technical difficulties for the USSR as it would involve re-arranging an existing national system of reporting. The representative of Japan believed that the submission of such fine data is not necessary for the moment, especially for krill, since there were negative views on the usefulness of CPUE for abundance estimates and no model has been developed to utilise such fine data.

6.31 The remainder of the Scientific Committee agreed with the majority of the Working Group that the maximum (i.e. coarsest) desirable level of reporting would be on a spatial scale of 1° longitude by 0.5° latitude in ten day periods.

6.32 The justification for this view for krill data was that the current low state of relevant knowledge of krill biology and the need to develop or refine methods for estimating abundance dictated the need for fine scale data.

6.33 For fin fish, the experience of the French scientists in assessing the fin fish stocks around Kerguelen indicated the need for this level of detail.

Level of Sampling of Commercial Catches

6.34 The Working Group in paragraphs 56 to 60 of its report stated:

‘General fishery experience has shown that a point is quickly reached beyond which measuring a larger sample from a given catch, or measuring more samples from a local concentration of fishing activity, adds little information on the length composition of the catches or population as a whole. The precise point depends on the spread of lengths within the aggregate of fish being sampled, the degree of the haul-to-haul or area-to-area variability, and the work involved in increasing the size of the samples, as compared with taking more samples. Typically, the optimum size of sample is 50 fish or less; although, because it can be difficult to take a truly random sample of a small number from a large catch, a reasonable operational guide may be a sample size of 75–100 fish per haul.

At the meeting of the *Ad Hoc* Working Group on Data Collection and Handling during the Hobart session of CCAMLR in 1983, it was suggested that a provisional target for the intensity of sampling should be, for each species, at an intensity of not less than one sample from each major area each month, or 200 fish per 500 tons caught (SC-CAMLR-II/INF.10). It was noted also, that on each fishing ground one sample per day was collected from the fishery around Kerguelen Island.

The present meeting did not have sufficient information to suggest modifications or to support these targets. It would probably be impossible to define exact sample size, but further information with a haul-to-haul or area-to-area variation, and the spread of sizes within a sample, should enable better sample sizes to be suggested. Sampling intensity should probably also depend on the magnitude of the fishery, increasing in terms of absolute numbers of samples, but decreasing as a proportion of the catch or as the size of the fishery increases.

The same considerations stated above also apply to krill sampling. The Japanese have a standard of one sample per day of 50 individuals from one haul, which the Group agreed was suitable for an initial specification and it was suggested that observation of the proportion of gravid krill in the sample would prove useful.

It was also suggested that the observation on size categories that are taken on all fishing vessels be recorded in the logbooks.’

6.35 The Scientific Committee agreed with these views.

6.36 The Scientific Committee agreed that it would now be appropriate to disband the *Ad Hoc* Working Group on Data Collection and Handling. The Committee noted that during discussion of other items of the agenda the setting up of a number of other working groups had been recommended. Such groups should be able to take over such outstanding matters as remained under the terms of reference of the *Ad Hoc* group.

6.37 The Scientific Committee, noting that there were a number of practical difficulties associated with the submission of catch and effort data to the Commission, recommended that the Data Manager should visit the appropriate institutions in the countries concerned in the hope of facilitating progress on these matters.

FISH STOCK ASSESSMENT

7.1 At its 1983 meeting, the Scientific Committee had agreed that the starting point for discussions on fish stock assessment at this meeting should be the report of the second meeting of the BIOMASS Working Party on Antarctic Fish Biology, published as BIOMASS Report Series 12. Members had been invited to submit comments on this report.

7.2 During the inter-sessional period, Dr K.-H. Kock (Federal Republic of Germany), Dr Guy Duhamel (France), and Dr J.-C. Hureau (France) under the auspices of the BIOMASS Working Group on Fish Ecology had prepared a comprehensive and updated resources review, summarising all the available data on Antarctic fish stocks and examining the present status of exploited stocks. This report was available to the Scientific Committee as SC-CAMLR-III/BG/2. The SCAR observer, in presenting the fish resources review, explained that BIOMASS is a scientific program under the responsibility of the SCAR/SCOR/ACMRR/ IABO Group of Specialists on Southern Ocean Ecosystems and their Living Resources.

7.3 On behalf of the Scientific Committee, the Chairman expressed his thanks to SCAR, to the BIOMASS Working Party on Fish Ecology and to the authors for carrying out this valuable work.

7.4 In response to the Scientific Committee's request, comments from Japanese scientists on the original BIOMASS report were presented in SC-CAMLR-III/6. Also presented was SC-CAMLR-III/5, which commented on the status of fish stocks largely in the light of the new BIOMASS report (SC-CAMLR-III/BG/2).

7.5 Further information pertaining to Polish fishing operations off South Georgia was given in SC-CAMLR-III/BG/11. In this paper, besides data which were already published, new data on Polish commercial catches were presented, as well as a preliminary assessment of the exploited fish stock biomass off South Georgia.

7.6 Each of the papers SC-CAMLR-III/2, SC-CAMLR-III/5 and SC-CAMLR-III/11 includes data which indicate evidence of possible overfishing for a number of fish stocks. Following initial presentations of the results in these papers, the Scientific Committee agreed that detailed discussions would best be carried out in a working group. Accordingly, it agreed to establish an *Ad Hoc* Working Group on Fish Stock Assessment, convened by Dr R. Hennemuth (USA), to meet on an opportunistic basis during the current session and report its findings back to the Scientific Committee for consideration.

7.7 The terms of reference for this *ad hoc* Working Group were

- to identify those fish stocks which appeared to be heavily fished, and for which conservation action might be necessary; and
- to indicate the options for conservation measures in respect of these stocks.

7.8 The report of the *Ad Hoc* Working Group is given in Annex 8. The report was accepted in its entirety by the Scientific Committee. A small working group had been set up to define the data needs for a proposed meeting on fish stock assessment in the intersessional period. This is discussed in paragraph 7.51 below.

Identification of Fish Stocks in Need of Conservation Measures

7.9 In identifying those stocks of fish for which conservation measures may be necessary, the Working Group had examined three areas: South Georgia, other South Atlantic grounds within the Convention Area and Kerguelen.

(a) South Georgia

7.10 For the species caught around South Georgia, the following were identified in light of the available data as being heavily fished and in need of conservation measures:

Notothenia rossii marmorata
Notothenia gibberifrons
Champscephalus gunnari
Dissostichus eleginoides

7.11 Of these, the *Nototheniidae*, particularly *N. rossii*, were felt by the Working Group to have been most greatly affected by fishing, and the various species of icefish were considered to be less seriously depleted. For *N. rossii*, all available evidence was consistent with indicating that this stock is very severely affected by fishing, and that the present biomass is less than 10% of the initial biomass when the fishery started. Data submitted were insufficient to assess the relationship between the present biomass and the initial biomass for other species.

7.12 Some concern was expressed over the stocks of *Pseudochaenichthys georgianus*. It was noted, however, that this species is taken primarily as a by-catch and catches have been fairly small. The available data were felt to be insufficient for a clear assessment.

(b) Other South Atlantic Grounds in the Convention Area

7.13 For stocks in other South Atlantic grounds, the Working Group found that there were insufficient data to make an assessment of the state of the stocks.

(c) Kerguelen

7.14 For the species caught around Kerguelen, the Working Group identified the following as being in need of conservation measures:

Notothenia rossii
Champscephalus gunnari

7.15 The Working Group agreed that the status of this stock of *N. rossii* was probably very similar to that of the same species around South Georgia.

7.16 Substantial catches of *C. gunnari* have also been taken around Kerguelen. The Working Group felt that there was probably less reason for serious concern about the status of this stock than for any other Antarctic stock from which significant catches have been taken.

7.17 The Scientific Committee endorsed these findings of the Working Group with respect to each of the areas.

Existing Management Measures

7.18 At South Georgia and Kerguelen, some management measures have already been applied by individual countries.

7.19 For the Soviet fisheries in the CCAMLR area, outside of the EEZ around Kerguelen, a regulation setting minimum mesh sizes of 120 mm for *N. rossii* and *D. eleginoides* and 80 mm for other species, as well as corresponding minimum fish sizes for each species and sector, have been in force since 1980 (see SC-CAMLR-III/13).

(a) South Georgia

7.20 In addition, Soviet vessels have refrained from fishing within 12 miles of South Georgia, since the beginning of the fishery.

(b) Kerguelen

7.21 Around Kerguelen, French authorities have set a number of controls. In 1978, an EEZ was created, and no fishing was permitted in the first 14 months.

7.22 After that period, the following measures were adopted:

- fishing within the 12-mile zone is forbidden;
- fishing licences are issued by French authorities;
- fishing grounds are closed completely or partially during some periods of the year;
- a minimum mesh size of 70 mm was set in 1980;
- logbooks must be submitted to French authorities;
- planning of each fishing season;
- limited number of authorised trawlers;
- quota on total catches and days of fishing;

- fishery observers appointed by the French authorities on trawlers;
- control of unloading of catches;
- presence of a fisheries patrol vessel.

7.23 From 1984, the regulations will include a TAC for *N. rossii* and *C. gunnari*, and closed seasons during the spawning seasons of the two species and a minimum size limit for *C. gunnari*.

Management Options

South Georgia

7.24 The Scientific Committee welcomed the initiatives taken by the Soviet authorities with respect to their fishing operations in this area.

7.25 It was noted that minimum mesh sizes and fish size limits had only been in force since 1980. Thus, although it was to be expected that these should have some beneficial effect, it was too early for any such effects to become apparent.

7.26 The Committee recommended that this measure should be continued and applied to all fishing fleets in the area.

7.27 However, the Committee endorsed the Working Group's views that, by itself, mesh or size regulation was unlikely to be fully effective in restoring depleted stocks.

7.28 The Committee also recommended that the area within 12 miles of South Georgia should be closed to all fishing fleets.

7.29 It noted, however, that while such a closure should give protection to juvenile fish, the refraining from fishing by Soviet vessels within 12 miles of South Georgia since the beginning of the fishery has not been fully effective in halting the decline of the stocks.

7.30 In view of the above, the Committee agreed to recommend that some further management measures are essential, given the depleted state of the identified stocks around South Georgia, particularly *N. rossii*.

7.31 The majority of members identified the following range of possible management measures that might be taken, in addition to those already recommended above:

- (a) Closure of the total fishery around South Georgia for a period;
- (b) Imposition of an appropriate global TAC, with associated by-catch provisions;
- (c) Imposition of appropriate individual species TACs.

7.32 However, the delegations of Poland, GDR and USSR did not agree to the measures identified in paragraph 7.31 (a,b,c), because they felt that there is not sufficient scientific evidence proving necessity of application of such measures at the present.

7.33 Further discussion of the latter two measures is given in paragraphs 36–38 of Annex 8.

7.34 With respect to the first of these options, Dr Robertson (NZ) made the following specific proposal, supported by Dr Kerry (Australia) and others:

that Area 48.3 be closed to all commercial trawling for fish in the 1984–85 season, and that the closure be reviewed at the 1985 CCAMLR meeting.

7.35 In support of this proposal, Dr Robertson (NZ) alluded to the urgent need for management, particularly for *N. rossii*, and the insufficiency of the currently available data to specify a detailed management program. In his view, imposition of the proposed management measure would minimise the risk of further depletion of the stocks that could occur if no action were taken until a detailed plan could be agreed. A number of other representatives indicated their support for these views.

7.36 Dr Lubimova (USSR) stated that this proposal was unacceptable. The results obtained by the Working Group which are based on insufficient evidence do not justify the proposal made by Dr Robertson (NZ).

7.37 Citing similar reasons, Dr Ranke (GDR) and Dr Slosarczyk (Poland) also stated their opposition to this proposal.

7.38 Dr Hureau (France) observed that a similar closure had been imposed by French authorities at Kerguelen. After a period of 14 months' closure it had been possible to allow fishing to continue under appropriate management regulations.

7.39 Other members believed that it would be more appropriate just to include this proposal as one of the range of options to be considered by the Commission.

7.40 The Committee noted that an extremely useful management measure imposed by the French authorities around Kerguelen was closing specific areas at certain times of the year to protect spawning fish. Unfortunately, spawning grounds for fish around South Georgia have not yet been identified, thus ruling out an option of this type.

7.41 The Committee agreed that a research vessel survey in the spawning season (May) would be very useful.

Kerguelen

7.42 As noted earlier, a wide range of management measures have been imposed on this fishery by French authorities, including individual species TACs to apply from 1984.

7.43 The Scientific Committee agreed that in principle these measures should ensure restoration of the depleted stocks in this area to levels around that of maximum net productivity, as envisioned in Article 11 of the Convention.

7.44 Thus it did not believe further conservation measures for these stocks were necessary at present.

Other South Atlantic Stocks in the Convention Area

7.45 The Scientific Committee noted the conclusions of the Working Group that there were insufficient data for these stocks to allow an assessment to be carried out. Thus no advice can be given for these stocks.

7.46 In these circumstances, it was agreed that the range of management options possible for these stocks covered the full range discussed by the Working Group.

7.47 The Scientific Committee strongly recommended that all available historical data on these stocks be collated and that additional new research data be collected.

Additional Research Needed

7.48 While much new data was available to the *Ad Hoc* Working Group, and these greatly assisted the deliberations, the Scientific Committee noted there are insufficient data available to specify a detailed management program.

7.49 As detailed in Annex 8, the Working Group identified a number of desirable lines of further study:

- analysis of detailed catch and effort data;
- simulation modelling of age and length composition;
- estimation of recruitment trends.

7.50 The Scientific Committee agreed that to carry out these additional analyses, it would be useful to hold an inter-sessional meeting of the *Ad Hoc* Working Group on Fish Stock Assessment.

7.51 It was agreed, however, that for this meeting it was essential that detailed catch and effort data be available, as well as additional biological data. The form of the detailed data required are set out in Appendix 6 of Annex 6 and Appendix III of Annex 8.

7.52 With respect to the timing and venue of the meeting, the Committee agreed that these would largely be dictated by the amount of time it would take to prepare the required data and by the availability of suitable computer equipment and stock assessment software.

7.53 It was felt that it would be preferable to hold the meeting of the *Ad Hoc* Working Group on Fish Stock Assessment in Hobart, prior to the next session of the Scientific Committee.

7.54 The Scientific Committee agreed that the intersession meeting of the *Ad Hoc* Working Group on Fish Stock Assessment should have the following terms of reference:

1. To assess the status of fish stocks in the Convention Area, including South Georgia, other areas in the South Atlantic within the Convention Area, and Kerguelen.

2. To advise on the management measures needed to achieve the Commission's objectives taking account of any requests made to the Scientific Committee by the Commission.
3. To identify further research studies and data collections which would be required for improved fish stock assessment.
4. To submit a report to the Scientific Committee which would *inter alia* assist the Committee in considering any management measure that might appear necessary.

7.55 Reference was made to the necessity of giving due consideration to the relationship between the Antarctic Ecosystem and associated or dependent marine ecosystems in waters adjacent to the Convention Area, when further analysing conservation and management measures.

KRILL RESOURCES

8.1 The representative of SCAR reported that the BIOMASS resource review on krill, being prepared by Dr Hampton (South Africa), in conjunction with Dr Nemoto (Japan) and which makes use of an earlier publication by Dr Lubimova and other USSR authors, was not yet complete. A preliminary draft version of part of the review dealing with acoustic estimation of krill and krill abundance was however available (SC-CAMLR-III/INF.14) and this formed the basis for subsequent discussions.

8.2 It was recognised that several topics requiring research activities would be identified during the course of the meeting and that these would benefit from discussion and clarification before being put to the Scientific Committee.

8.3 Dr Beddington (UK) was therefore invited to convene an *Ad Hoc* Working Group on Krill Research Priorities for the duration of this meeting. The conclusions of that group have been incorporated into the relevant sections of the report.

Krill Distribution

8.4 The circumpolar nature of the krill distribution, determined by 'Discovery' investigations has been confirmed by modern expeditions, particularly from USSR and Japan.

8.5 Evidence from physical oceanography in conjunction with the discontinuous nature of the krill distribution indicated the probability that several stocks may exist. Although this hypothesis had not been confirmed by electrophoresis, possibly because the transfer of individuals from one stock to another would mask any differences, it was felt that the hypothesis would be reasonable for management purposes.

8.6 Considerable discussion focussed on the recently observed low krill abundance in the Scotia Sea, particularly in the vicinity of Elephant Island and South Georgia. It was noted that this was not the first time such an event had occurred. Scientists from USSR reported that the 1969 season at South Georgia had been characterised by a paucity of krill while several nations, notably FRG, Poland, USSR and UK, had noted a similar situation in 1977/78. The situation during the 1983 winter, reported by UK, was of low krill abundance at South Georgia, across the Scotia Sea and in the vicinity of Elephant Island. This situation had continued through to the 1983/84 summer and had been observed by scientists from FRG, Poland (SC-CAMLR-III/BG/10), USA and USSR. Also mortality rates amongst krill-eating birds and seals at South Georgia were very high. Although oceanographic data have not been fully worked up, the available evidence indicated that the phenomenon was coincident with a southward shift of the secondary polar front, a hypothesis supported by the presence of krill concentrations in the South Orkney and South Sandwich Islands areas. Changes in the distribution of krill were evident but this did not necessarily mean that there had been a significant change in total krill abundance.

8.7 It was questioned whether the observed low abundance might be due to poor recruitment. Bearing in mind that the lifespan of krill is now thought to be seven years, this was thought highly unlikely. The Committee felt that all the evidence indicated that the cause was a natural variation in water circulation and was not the result of fishing.

8.8 The krill distribution in Prydz Bay, a region that had been studied during FIBEX and subsequent seasons by scientists from Australia, France, Japan, South Africa and USSR, had changed. Whereas initially the krill were concentrated within the bay, during the last season the main concentrations had been somewhat to the north.

8.9 The question was raised as to whether the Scotia Sea phenomenon might be present at Prydz Bay during a subsequent season and it was suggested that the monitoring during FIBEX and SIBEX be continued for a few seasons to see if this was the case.

8.10 Scientific Committee noted that SIBEX will be completed in April, 1985. Bearing in mind the importance of FIBEX and SIBEX to gaining a better understanding of ecosystem processes the Secretariat was asked to obtain a report on SIBEX results at least in preliminary form prior to the next meeting.

8.11 During a recent meeting of SCOR WG74, 'General Circulation of the Southern Ocean', held in conjunction with a meeting of IOC experts on oceanography in relation to the Antarctic marine ecosystems (Kiel, May 1984), it was discussed whether and to what extent ocean variability could have caused a different distribution and/or behaviour of krill. Further consultations led to the development of a plan for a 'Scientific Seminar on Antarctic Ocean Variability and its Influence on Marine Living Resources, Particularly Krill', to be sponsored possibly by CCAMLR, FAO and IOC in cooperation with SCAR/ SCOR/ACMRR/IABO and to be held presumably in 1986 (see also paragraph 10.10).

8.12 Acoustic methods of estimating krill abundance described in SC-CAMLR-III/INF.14 were discussed. The need for a rigorous survey design was noted. Sources of error in the estimates were discussed. These are summarised below:

- instrument calibration;
- uncertainty over Target Strength (TS) to size relationship;
- bias due to krill being outside the range of echosounders;
- bias caused by very dispersed krill going undetected.

The importance of intercalibration between ships was noted. Data should be stored as Mean Volume Backscattering Strength (MVBS) to facilitate updating biomass estimates in the light of better TS data. It was emphasised that net hauls should form an integral part of any acoustic survey by:

- confirming that echosounder data do relate to krill;
- providing size frequency distribution so as to use the most appropriate TS;
- estimating abundance of dispersed krill.

The importance of further studies on swarming was noted.

8.13 The *Ad Hoc* Group on Krill Research Priorities noted that a key factor in estimating krill abundance using hydroacoustic techniques is accurate information on the relationships between Target Strength and size and physiological state of krill, their orientation in the sound field and the operating frequency of the echosounder. It was recommended that consideration be given to undertaking experimental studies to investigate the points raised above.

Krill Growth

8.14 The *Ad Hoc* Group on Krill Research Priorities had noted that considerable progress has been made in estimating krill growth. It noted that analyses of size frequency distribution from commercial catches provided results in line with growth estimates by other methods. The lipofuscin technique was proving very useful, although currently the analytical procedures are not sufficiently fast for the processing of large samples. Some progress has been made in relating age as determined by lipofuscin analysis to morphometric measurements, which could alleviate this problem. The Group recommended that the following key areas for study be considered in the formulation of research projects:

- a) calibration of the techniques by studies on animals of known age;
- b) cross calibration of lipofuscin estimates with morphometric measurements preferably using an image analyser such as the one developed at National Marine Fisheries Service, Narragansett Laboratory, USA, in collaboration with scientists from France and Japan;
- c) development of automated sample processing.

Whilst (a) and (b) above could run concurrently, it was felt that development of large scale analysis should wait until the techniques had been fully proven.

Krill Production and Fishery

8.15 Developments in krill fishing were discussed. Fishing began in 1974 and steadily increased to a peak level of 530,000 t in the 1981/82 season. The catch has gone down to about 250,000 t during the 1982/83 and 1983/84 seasons. This reduction in total catch was, according to Soviet scientists, due to problems with processing and marketing and was not

due to difficulties in finding or catching krill. The Japanese catch of krill had risen steadily to nearly 50,000 t in the past 10 years. The catch/haul was 6.23 t/haul during 82/83 and 6.95 t/haul in 83/84 – this stable CPUE reflects a saturation in processing capacity rather than giving any real indication as to the state of the resource.

8.16 Soviet estimates of annual production of krill based on applying growth functions to biomass data from net hauls and acoustic surveys in the area dominated by krill (13–15 million km²) in 1980 were 24 to 47 g/m³ and 67 g/m³ in 1982.

8.17 Although considered under another agenda item, consideration was given to identifying problems in using predators as indicator species for monitoring changes in the krill stocks. It was noted that certain predators such as birds and seals are severely limited in their foraging ranges during the breeding season and are therefore dependent on the presence of localised krill concentrations. The size and location of such areas need to be taken into account in any assessment plans.

8.18 The *Ad Hoc* Group on Krill Research Priorities noted that currently there is no quantitative information on the effect of fishing mortality on local krill abundance. While recognising the differences between research activities and commercial activities, the group considered that such information might be obtained by regular surveys in regions of fishing activity along with detailed catch and effort information from the fishing fleet. Some information on abundance might also be obtained from examination of echosounder records from fishing boats although it was appreciated that the analytical procedures on such data might be very complicated. It was recommended that consideration be given to undertaking a feasibility study on the use of such records. Areas for operating such a project would clearly need to be designated paying due regard to the deployment of fishing effort. Suitable areas considered might include Prydz Bay and the SIBEX area in the S.W. Atlantic. It was recommended consideration be given to establishing study programs in suitable areas. The Scientific Committee endorsed these recommendations.

8.19 Several specific requirements for data collection were identified. The normal method of expressing effort in terms of hours trawling was considered inappropriate. It was felt that an index based on searching time would be preferable. It was considered advisable to collect data on as fine a spatial scale as possible (at least 1° longitude by 0.5° latitude) in the event that it might be required to that level for analysis (see paragraphs 6.29 – 6.33).

8.20 The Scientific Committee considered it essential that the best indices of effort be identified so as to improve analyses based on CPUE. The *Ad Hoc* Group recommended that

the best way of achieving this was through a workshop meeting at which a variety of modelling and simulation approaches could be run so as to identify the key factors. Such a workshop would last about 5 days and might be held during the intersessional period, probably immediately prior to CCAMLR-IV. The workshop would require a representative small but comprehensive sample of commercial data, preferably from all fishing nations. The assistance of special experts for this meeting may be required and the Committee recommended that an appropriate provision in the budget should be made.

8.21 The importance of obtaining high quality data from both research and commercial vessels was emphasised. Three main areas were seen as being important: biological data, information on non-target species and data on fishing effort. It was felt that the acquisition of such data from commercial vessels would be facilitated if scientific personnel could be made available. The provision of such observers on catching vessels was recommended.

8.22 Discussions during SC-CAMLR-II had indicated that collections of additional data would be needed to assess the impact of harvesting. Members were reminded of their obligations under Article XX paragraphs 1 and 4 of the Convention to collect and provide such data.

ECOSYSTEM MONITORING AND MANAGEMENT

9.1 The Science Officer of the Commission introduced document SC-CAMLR-III/BG/4 which summarised points raised in a number of scientific papers on ecosystem monitoring and management, including the development of plans of action, that had been prepared by the Secretariat to facilitate discussions. It was agreed to consider the agenda item under the seven sub-headings listed in this document. At the same time it was emphasised that all national and observer submissions were major contributions in their own right (SC-CAMLR-III/7, BG/1, BG/3, BG/5, BG/7, BG/8, BG/9, BG/12, BG/13, BG/14, INF.6).

Interpretation of the Objectives of the Commission

9.2 It was agreed that there was a need to consider Article II of the Convention in its entirety.

General Concept of Antarctic Ecosystem

9.3 The question of whether the availability of food (and particularly krill – *Euphausia superba*) to higher trophic levels was the major limiting factor in the Antarctic marine ecosystem was considered. There was agreement that there was no simple answer to this question, and that the ecosystem should not be treated globally but rather as a set of smaller subsystems linked not only with each other but also with ecosystems neighbouring the Convention Area. The possibility that different limiting mechanisms might be dominant in these various smaller subsystems was recognised. It was noted that many of the top predators utilised species other than krill, and also that while the food chain might be simple with respect to the small number of species involved, it remained complex as far as their ecological relationships were concerned.

9.4 Three separate biological communities were recognised:

- the community of the pack ice area;
- the community of the shelf zone;
- the community of the open water beyond the shelf zone.

The need to characterise these areas was recognised. It was stressed that a geographical definition for each habitat would not be appropriate, and flexibility should be retained in their consideration. This in turn implied the need to furnish data on as fine a spatial and temporal scale as possible.

9.5 It was suggested that analysis of tag-recovery data be undertaken in an attempt to ascertain the extent to which top predators are localised in specific areas. The magnitude of migration rates could be important in the design and analysis of possible localised perturbation experiments.

9.6 The question of whether the revised FAO statistical areas (ref. paragraph 6.16) were also to be regarded as ‘management areas’ was raised. It was considered that the primary basis in specifying the statistical area boundaries had been to ensure recording of data in terms of natural divisions. These might also be considered as a first approximation to management areas, but management considerations had to remain cognisant of the linkages between adjacent statistical areas.

Present State and Existing Trends in the Ecosystem

9.7 The Committee agreed that

- a) as a result of reduced baleen whale stocks, krill availability to other organisms had almost certainly increased (although no direct evidence in this regard existed);
- b) there was little direct but some indirect evidence that non-exploited krill predators (e.g. crabeater seals, penguins) and minke whales may have responded functionally and numerically to this increased krill availability (i.e. the effective carrying capacity for these species might have increased); however the data concerned could be differently interpreted, and the existence of these responses should be considered an open question. Observed increases in the southern fur seal population will include a component due to recovery after previous depletion through exploitation and may not necessarily be related to increased krill availability to any substantial extent. It was noted, however, that some increase in fur seal population levels at South Georgia (and possibly at other Sub-Antarctic islands) could be attributed to enhanced krill availability.

9.8 Greater clarity on whether or not changes in the age-at-maturity of crabeater seals had occurred was recognised as an important need in determining how this species might have responded to changed krill availability. It was suggested that more regular sampling should be attempted in future to try to resolve this question.

9.9 The potentially critical role of squid in understanding the dynamics of the ecosystem was emphasised. The proportion of krill in the diets of squid varied substantially between species and geographic areas. Recent research results by USSR scientists were summarised, and the hope was expressed that English translations of the relevant research publications would be available in the near future. The Committee noted the availability of a recent BIOMASS Working Party report on squid. In view of the paucity of knowledge on squid, further research in this respect was strongly recommended. It was agreed to include an item on the squid community in the agenda for the meetings of the Scientific Committee in 1985.

Management Approaches

9.10 There was some discussion on the possible approaches for the rational management of Antarctic marine living resources and on the criteria for selecting such management approaches. It was noted that some possible choices would be:

- a. to prohibit all harvesting and related activities in the Convention Area with the aim of restoring the Antarctic marine ecosystem to a condition perceived to be similar to that which existed prior to human intervention;
- b. to reduce the abundance of certain krill predators if they are found to be competing with depleted stocks of krill-eating whales, with the aim of facilitating the restoration of depleted whale stocks; or
- c. to allow rational utilisation of resources that have not been over-exploited, within levels which will ensure that any potential detrimental effects are reversible over two or three decades.

It was agreed that option (c) was the most appropriate and that option (b) would be inappropriate without better information concerning the nature and extent of competition between various krill predators.

9.11 Criteria for selecting management approaches could be: practical possibilities of achievement, risks to the stability and diversity of the system, economic feasibility, and benefits to mankind.

9.12 It was noted that there are still several difficulties at present in developing specific management strategies

- there are considerable uncertainties on various aspects of the basic structure of the ecosystem (e.g. the relative importance of krill in predator diets);
- the current status of the ecosystem is unclear;
- there is a lack of information on the current population trends of a number of species previously reduced by harvesting;

- we are unable to predict the effects of a total moratorium or of different harvesting strategies on ecosystem dynamics.

9.13 The practicality of determining whether or not only one stable state exists for the unexploited Antarctic marine ecosystem was questioned. It was also suggested that determination of population trends of previously depleted and currently protected baleen whale species would provide information in this regard; possible management responses might need to be considered if such species are still declining.

9.14 It was suggested that an initial coarse management strategy for krill might be based on attempting to ensure that the level of predation on krill by natural predators and man will not exceed that by natural predators in the pristine ecosystem.

Modelling

9.15 Three classes of models were noted:

- theoretical models, that give insight into the general behaviour of the system, but not quantitative predictions about certain aspects;
- estimation models that provide quantitative estimates;
- strategic simulation models that can be used to evaluate strategies for optimal acquisition of information relevant to management decisions.

9.16 Some members considered whole system estimation models might provide useful predictions, but others felt realistic quantitative models of this type would not be available for some considerable time. It was suggested that the manner in which predator dynamics was described in theoretical models merited attention. Strategic simulation model evaluations have emphasised the necessity for strong data ‘contrasts’ for effective model parameter estimation. This should be borne in mind in considering and developing proposals for experiments under controlled conditions. The relation of reproductive success of shore-based predators to food availability was seen as a likely area of promise for future use of modelling techniques.

9.17 In response to enquiry on what data was most needed for modelling activities, members suggested

- population sizes and krill consumption rates for the major krill predators;
- intrinsic growth rate and carrying capacity values for krill.

Indicator Species and Plan of Action

9.18 A strong association was recognised between the need to monitor krill directly and to monitor the status of dependent and related species. The final two agenda sub-items outlined in SC-CAMLR-III/BG/4 were therefore combined for the purpose of discussion.

9.19 The need to focus scientific research objectives on the impact of commercial harvesting (especially of krill) on the Antarctic marine ecosystem as a whole was noted. Documents SC-CAMLR-III/7, SC-CAMLR-III/BG/9 and SC-CAMLR-III/BG/12 were discussed. It was stressed that there was a need to focus attention on assessing variability in the ecosystem and for identifying cause and effect relationships.

9.20 Support was given to the concept of undertaking co-ordinated fishing and scientific research at selected sites in Antarctica. In particular the need for baseline data to assess and monitor the impact of fisheries on krill dependent and related species was stressed. The identification and study of 'indicator' species to monitor ecosystem changes was emphasised.

9.21 Indicator species may be defined as dependent and related species that are likely to reflect changes in the availability of harvested species, especially krill. Dependent and related species were defined as competitors, direct predators, and species indirectly dependent on target species.

9.22 Implementation of a co-ordinated effort to monitor the Antarctic marine ecosystem, both directly and through indicator species studies, was seen as a logical extension of the BIOMASS programme, due to be completed in 1986. It was also considered an imperative pre-requisite to defining interaction effects and hence pre-specifying management conditions.

9.23 It was proposed that an *ad hoc* working group be formed to assist the Scientific Committee in considering, designing and encouraging co-ordinated research of the type outlined in 9.20.

9.24 It was suggested that the terms of reference of the working group should be relatively narrow so as to deal specifically with ecosystem monitoring, assessing the natural variation in the ecosystem and investigating species related to, and dependent on krill. In accordance

with the views expressed in 9.20, information accrued on dependent and related species would be complementary to more direct estimations of the effects of exploitation of krill and fish resources.

9.25 It was noted that, in addition to considering matters relating to target species, it is important for the Scientific Committee to address issues concerning non-target species as embodied in Article II of the Convention.

9.26 Unlike harvested species, for which data will be forthcoming from fisheries activities, information on non-target species will require studies specifically designed to provide needed data. Studies of dependent and related species should be considered and recommended to provide an indirect assessment of target species and to monitor the ecological status of non-target components of the marine community.

9.27 An *Ad Hoc* Working Group on Ecosystem Monitoring was formed under the convenership of Dr K. Kerry (Australia). The following objectives and terms of reference were agreed upon:

- a) Review the objectives of ecosystem monitoring and review the life history characteristics of indicator species that are potentially suitable for monitoring studies, bearing in mind potential relationships between selected indicator species and harvested resources (especially krill).
- b) Consider sampling and data collection procedures, including the collection of baseline data, required to detect any effect of fisheries activities on components of the Antarctic marine ecosystem.
- c) Describe the types of studies that would be necessary to evaluate natural variation of relevant variables.
- d) Evaluate and recommend potential monitoring sites and areas.
- e) Consider the utility, feasibility, and design of controlled experiments undertaken in collaboration with fisheries activities to test hypotheses concerning cause/effect relationships and the possible effects of different methods and intensities of fisheries activities on components of the Antarctic marine ecosystem.

- f) Formulate and recommend specific actions for planning and implementing multi-national ecosystem monitoring programs to establish data baselines, monitor indicator species, and undertake controlled experiments.

9.28 It was recommended that the *ad hoc* working group should report back to the next regular meeting of the Scientific Committee. In order to facilitate the working group's task, it was noted that considerable data is available on certain krill-dependent species, some of which could assume indicator status with respect to potential change in the ecosystem. In particular, attention was drawn to the responses of the 'BIOMASS Working Party on Bird Ecology' and the 'SCAR Group of Specialists on Seals' to the questions of the Scientific Committee on indicator species. On behalf of the Scientific Committee the Chairman expressed appreciation for the good cooperation received from both groups.

9.29 It was agreed that an inter-sessional meeting of the *ad hoc* working group would be useful to consolidate its position prior to the 1985 meeting of the Commission. The meeting is scheduled for the week of 6 May 1985. It was gratefully acknowledged that the National Marine Mammal Laboratory of the National Marine Fisheries Service had offered to host the meeting in Seattle (USA). In accordance with sentiments expressed in 9.20 and 9.25, it was agreed that to supplement discussions that will focus on dependent and related species (e.g., pinnipeds and seabirds) it was urged that expert advice on both krill and whales be available at the meeting. The agenda for this meeting was prepared by the Convenor and is attached in Annex 9.

COOPERATION WITH OTHER ORGANISATIONS

Species Identification Sheets

10.1 Good progress has been made on the joint CCAMLR/FAO project on Species Identification Sheets for the Southern Ocean (SC-CAMLR-III/BG/6). The early publication of these sheets was encouraged to facilitate accurate identification of lesser known species such as those encountered in by-catch.

10.2 It was agreed that it would be useful for CCAMLR to assist FAO in drawing up a list of vernacular names for fish species. The Chairman would request appropriate experts to compile lists of vernacular names in English, French, German, Japanese, Korean, Norwegian, Polish, Russian and Spanish.

10.3 It is anticipated that the results of the project will be ready for publication (in English) in spring 1985. Editions in the other working languages of CCAMLR will follow as soon as possible. Thanks were extended to the editor Dr W. Fischer and to the other authors for their efforts.

FAO/UNEP Draft Global Plan of Action

10.4 The FAO/UNEP Draft Global Plan of Action for the Conservation, Management, and Utilization of Marine Mammals was briefly introduced by the FAO Observer. The reference to CCAMLR in this Plan of Action was noted. It was agreed that it would be useful for FAO and UNEP to continue their collaboration in developing this plan.

10.5 A review of marine mammal/fisheries interactions was partly funded under this program, and it is anticipated that the results will be published and available for distribution by FAO before the end of 1984.

10.6 Regarding other research proposals submitted for this program, it was noted that there is not sufficient funding available to support the level of research initially anticipated.

International Whaling Commission

10.7 A Workshop on the Feeding Ecology and Distribution of Southern Hemisphere Baleen Whales, proposed by the International Whaling Commission, cannot yet be held due to financial reasons. It was suggested that CCAMLR and IWC might consider jointly sponsoring the workshop at some time in the future. It was agreed that CCAMLR is interested in having the workshop undertaken when sufficient financial resources become available.

10.8 Minke whale research cruises have been carried out in the Antarctic under the auspices of the IWC for the past 6 years. In 1984/85 a further cruise will take place in the area bounded by 70°E – 130°E. The CAMLR Scientific Committee endorsed the importance of this work and encourages its continuation.

Intergovernmental Oceanographic Commission

10.9 The IOC Observer reported on the recent activities of the IOC Program Group for the Southern Oceans. There was an IOC meeting in Kiel during 1984 at which time oceanographers and biologists discussed research collaboration.

10.10 Plans have been developed for a Scientific Seminar on Antarctic Ocean Variability and its Influence on Marine Living Resources, particularly Krill. This seminar will take place in Paris, presumably in early 1986. It was agreed that CCAMLR should co-sponsor this seminar. The FAO Observer advised that while his organisation was interested in the subject of this seminar, it was likely that, because of other commitments, FAO would not be able to provide direct financial support for it.

International Union for Conservation of Nature and Natural Resources

10.11 The collection of papers resulting from the 1982 IUCN Symposium on Marine Mammal Fisheries Interactions will be published during 1984. The Symposium Report is currently available from IUCN.

CCAMLR Observers at Meetings

10.12 It was agreed that D. Sahrhage would represent CCAMLR at the 18th Meeting of SCAR in Bremerhaven, September 1984.

10.13 It was agreed that K. Sherman would represent CCAMLR at the 72nd Statutory Meeting of ICES in Copenhagen, October 1984.

10.14 It was agreed that there would be no CCAMLR representative in attendance at the Executive Committee Meeting and the 27th General Meeting of SCOR in Roscoff, October 1984. A report of these meetings would be requested from the SCOR Secretariat.

10.15 It was agreed that no representative from CCAMLR would attend the 4th Special Meeting of the ICCAT Commission in Las Palmas, November 1984.

10.16 It was noted that several persons associated with CCAMLR are expected to attend the IUCN/SCAR Meeting on Antarctic Conservation in Bonn, April 1985. A CCAMLR observer to this meeting will be designated at a later time.

10.17 It was agreed that J. Beddington would represent CCAMLR at the 37th Meeting of the Scientific Committee of the International Whaling Commission in Bournemouth, June 1985.

PUBLICATION POLICY AND PROCEDURES FOR PREPARING DOCUMENTS

11.1 The Scientific Committee noted the recommendations of the *Ad Hoc* Working Group on Publication Matters contained in CCAMLR-III/12/REV.1. The Group had a meeting during this session of the Scientific Committee to consider documentation and publication matters further in the light of recent experience.

11.2 The Scientific Committee endorsed the Working Group recommendation that two document categories were sufficient: working papers, relating to agenda items (about 4–5 pages in length), and background papers, which may or may not relate specifically to agenda items (a short summary is to be submitted with each background paper).

11.3 It was agreed that working papers would be translated entirely into the other working languages of the Commission. For background papers, the summary and all table and figure captions would be translated, whereas the main body of text would appear in the original language of submission.

11.4 It was noted that although the financial implications of translating all portions of working papers and background papers would be considerable, from a scientific point of view it would be desirable if all documents were available in the four official languages. It was suggested that the Commission consider whether it would be financially feasible to undertake complete translation of scientific papers.

11.5 It was recommended that the Report of the Scientific Committee be published separately from the other scientific papers considered by the Committee.

11.6 It was agreed that it would be desirable to publish a Research Bulletin. This Bulletin should be widely available to members, libraries, and the scientific community. The Chairman, Secretariat, and the *Ad Hoc* Working Group on Publications Matters agreed to

consider further during the intersessional period the details of publication of the Research Bulletin.

11.7 It was recommended that a Statistical Bulletin be published (see paragraphs 6.11 – 6.13).

11.8 It was agreed that publication of a Sampling Bulletin, although perhaps desirable at some point in the future, would be premature at present.

11.9 A discussion of the value of national bibliographies on the Antarctic marine subjects relevant to the Scientific Committee concluded that any past national bibliographies not already submitted should be sent to the Secretariat and that each year each member nation should send a bibliography (including doctoral theses) to the Secretariat.

BUDGET FOR 1985

12.1 It was proposed that funds be made available for intersessional meetings of the *Ad Hoc* Working Group on Fish Stock Assessment and the *Ad Hoc* Working Group on Ecosystem Monitoring as well as for the Workshop to consider the analysis of catch and effort for krill.

12.2 It was noted that, where possible, the timing and location of intersessional meetings should be arranged to allow:

- travel costs to be kept to a minimum,
- all members to participate,
- meetings in locations where the best facilities were available for particular groups' work.

12.3 There was discussion on the question of participation of experts in intersessional meetings. It was considered that it was desirable to arrange for the attendance of highly qualified specialists from a wide geographical range of members of the Commission. Reference was made to the provisions of Article XIX (5) of the Convention which specify that each member shall meet its own expenses arising from attendance at meetings of the Commission and of the Scientific Committee. The question was raised whether or not the participation of experts from members in intersessional meetings would come under the provisions of this Article. A decision by the Commission on this matter may be required.

12.4 It was agreed that there is also a need from time to time to arrange for the services of persons with special expertise who would be instrumental in the progress prior to or during intersessional meetings. It was agreed that such experts would not represent their countries or necessarily their organisations. It was furthermore agreed that such experts could come from a wide range of countries and/or regions. Decisions on contracts and/or funding of travel should be made by the Chairman of the Scientific Committee in consultation with the Convener concerned and the Executive Secretary.

12.5 It was suggested that the Secretariat explore the possibility of drawing up a list of experts in fields related to the objectives of the Commission.

12.6 It was proposed that funds be made available for the CCAMLR Data Manager to visit members undertaking harvesting activities in the Convention area to discuss problems of data submission and to advise on the needs of CCAMLR in this field.

12.7 The Scientific Committee developed a proposal for the budget of 1985 in accordance with the recommendations made for activities during the forthcoming intersessional period. The proposed budget was endorsed. It is given at Annex 10.

ELECTION OF CHAIRMAN

13.1 Dr Sahrhage was nominated as Chairman of the Scientific Committee. The great desirability of continuity during the early phases of the Scientific Committee was expressed by several members. No other nominations were made.

13.2 Dr Sahrhage was re-elected as Chairman for another term of office. This term will be from the end of this session to the end of the 1986 session.

NEXT MEETING

14.1 Noting that preliminary bookings had been made by the Secretariat for the period 2-16 September, 1985 at the Wrest Point Hotel, the Scientific Committee agreed to propose to the Commission that the Fourth Session of the Scientific Committee should commence on 2 September, 1985. It was felt that 7-8 days may be required for the Scientific Committee to fulfil properly its tasks. It was agreed that it was preferable to start the session on

Wednesday, 28 August or Wednesday 4 September, 1985, if meeting facilities could be booked for that period.

14.2 It was noted that because much useful work is done outside of plenary sessions, it would be desirable to make provision for *ad hoc* groups to meet prior to or early in the plenary session with translation services.

OTHER BUSINESS

15.1 The Commission requested that the Scientific Committee consider in what manner observers and inspectors may assist in achieving CCAMLR objectives.

15.2 Members of the Scientific Committee were invited to consider this matter during the intersessional period, and come to the next session prepared to discuss this issue at greater length.

15.3 It was noted that in considering this matter, it may be helpful to make a distinction between scientific observers (who could assist in improving the procurement of quality scientific data) and fishery inspectors (who could assist in monitoring compliance with fishery regulations).

15.4 Dr Lubimova (USSR) noted that she saw no advantage in making a distinction between observers and inspectors on fishery vessels. Dr Shimadzu (Japan) noted that there might be no such useful distinction since the Commission itself has requested that the Executive Secretary collect information on existing international practices for conducting systems of inspection.

CLOSE OF THE MEETING

16.1 The Chairman thanked all members and observers for their cooperation during the session and expressed on behalf of the Scientific Committee thanks to the Rapporteurs, to the Secretariat and the Interpreters. He then closed the meeting.

LIST OF MEETING PARTICIPANTS

Chairman: Dr D. SAHRHAGE
Federal Research Board for Fisheries
Hamburg, Federal Republic of Germany

ARGENTINA

Representative: Dr Orlando R. REBAGLIATI
Head of Antarctic Department
Ministry of Foreign Affairs
Buenos Aires

Alternate Representatives: Mr Héctor A. MARTINEZ-CASTRO
Counsellor, Argentine Embassy
Canberra

Miss Hilda GABARDINI
Secretary of Embassy
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LIST OF MEETING DOCUMENTS

CCAMLR-III/7	ASSESSMENT AND AVOIDANCE OF INCIDENTAL MORTALITY OF ANTARCTIC MARINE LIVING RESOURCES
CCAMLR-III/12	PUBLICATIONS PROCEDURES AND POLICIES
CCAMLR-III/12/REV.1	PUBLICATIONS PROCEDURES AND POLICIES

SC-CAMLR-III/1	PROVISIONAL AGENDA FOR THE THIRD MEETING OF THE SCIENTIFIC COMMITTEE
SC-CAMLR-III/2	ANNOTATION TO PROVISIONAL AGENDA
SC-CAMLR-III/2/REV.1	ANNOTATION TO PROVISIONAL AGENDA
SC-CAMLR-III/3	AMENDMENT TO RULE 8 OF THE RULES OF PROCEDURE OF THE SCIENTIFIC COMMITTEE
SC-CAMLR-III/4	CCAMLR DATA COLLECTION AND HANDLING
SC-CAMLR-III/5	THE ASSESSMENT OF EXPLOITED ANTARCTIC FISH STOCKS
SC-CAMLR-III/6	COMMENTS ON THE REPORT OF THE BIOMASS WORKSHOP ON ANTARCTIC FISH BIOLOGY (BIOMASS REPORT NO.12)
SC-CAMLR-III/7	ECOSYSTEM MANAGEMENT: PROPOSAL FOR UNDERTAKING A COORDINATED FISHING AND RESEARCH EXPERIMENT AT SELECTED SITES AROUND ANTARCTICA
SC-CAMLR-III/8	PROPOSAL FOR CCAMLR STATISTICAL BULLETIN
SC-CAMLR-III/9	REPORT OF THE CCAMLR AD HOC WORKING GROUP ON DATA COLLECTION AND HANDLING

SC-CAMLR-III/10	SUPPLEMENT TO PROPOSAL FOR CCAMLR STATISTICAL BULLETIN (SC-CAMLR-III/8)
SC-CAMLR-III/11	REPORT OF THE THIRD MEETING OF THE SCIENTIFIC COMMITTEE

SC-CAMLR-III/BG/1	AN APPROACH TO A MANAGEMENT STRATEGY FOR THE ANTARCTIC MARINE ECOSYSTEM
SC-CAMLR-III/BG/2	REVIEW OF THE BIOLOGY AND PRESENT STATUS OF EXPLOITED ANTARCTIC FISH STOCKS
SC-CAMLR-III/BG/3	ANTARCTIC ECOSYSTEM MANAGEMENT
SC-CAMLR-III/BG/4/REV. 1	ECOSYSTEM MONITORING AND MANAGEMENT. SUMMARY OF PAPERS PRESENTED AT THE THIRD MEETING OF THE SCIENTIFIC COMMITTEE
SC-CAMLR-III/BG/5	MONITORING INDICATORS OF POSSIBLE ECOLOGICAL CHANGES IN THE ANTARCTIC MARINE ECOSYSTEM
SC-CAMLR-III/BG/6	FAO/CCAMLR PROJECT ON SPECIES IDENTIFICATION SHEETS FOR THE SOUTHERN OCEAN (FISHING AREAS 48, 58 AND 88) PROGRESS REPORT
SC-CAMLR-III/BG/7	MARINE MAMMAL FISHERY INTERACTIONS: MODELLING AND THE SOUTHERN OCEAN
SC-CAMLR-III/BG/8	COMMENTS AND QUESTIONS ON ECOSYSTEM MANAGEMENT

SC-CAMLR-III/BG/9	SUMMARY OF THE RESPONSES OF THE BIOMASS WORKING PARTY ON BIRD ECOLOGY AND SCAR GROUP OF SPECIALISTS ON SEALS TO THE QUESTIONS OF SC-CAMLR ON INDICATOR SPECIES
SC-CAMLR-III/BG/10	DISTRIBUTION AND STOCK OF KRILL EUPHAUSIA SUPERBA DANA IN DECEMBER 1983 AND JANUARY 1984 BEFORE AND DURING THE SECOND INTERNATIONAL BIOMASS EXPERIMENT I/ SIBEX 1/
SC-CAMLR-III/BG/11	A REVIEW OF POLISH FISHERY AND ASSESSMENT OF FISH STOCK BIOMASS OFF SOUTH GEORGIA
SC-CAMLR-III/BG/12	CONSERVATION AND MANAGEMENT STRATEGY FOR THE ANTARCTIC MARINE ECOSYSTEM
SC-CAMLR-III/BG/13	REVIEW OF ANTARCTIC MARINE FAUNA
SC-CAMLR-III/BG/14	PROPOSAL: STRATEGY FOR BIOLOGICAL SAMPLING AND SAMPLE SIZE IN THE FISHERY OF ANTARCTIC KRILL

SC-CAMLR-III/INF.1	REPORT OF MEMBERS' ACTIVITIES IN 1983/84 South Africa
SC-CAMLR-III/INF.2	REPORT OF MEMBERS' ACTIVITIES IN 1983/84 United States of America
SC-CAMLR-III/INF.3	REPORT OF MEMBERS' ACTIVITIES IN 1983/84 Norway
SC-CAMLR-III/INF.4	FAO/UNEP DRAFT GLOBAL PLAN OF ACTION FOR THE CONSERVATION MANAGEMENT AND UTILISATION OF MARINE MAMMALS

SC-CAMLR-III/INF.5	REPORT OF MEMBERS' ACTIVITIES IN 1983/84 Poland
SC-CAMLR-III/INF.6	A REVIEW ON THE ANTARCTIC ECOSYSTEM MODELS PUBLISHED BY JAPANESE SCIENTISTS AND SOME COMMENTS
SC-CAMLR-III/INF.7	REPORT OF MEMBERS' ACTIVITIES IN 1983/84 Federal Republic of Germany
SC-CAMLR-III/INF.8	REPORT OF MEMBERS' ACTIVITIES IN 1983/84 Japan
SC-CAMLR-III/INF.9	A BRIEF SUMMARY OF JAPANESE FISHING ON THE ANTARCTIC KRILL, 1972/73 – 1982/83
SC-CAMLR-III/INF.10	RESULTS OF RESEARCH INTO DISTRIBUTION AND STATUS OF STOCKS OF TARGET SPECIES IN THE CONVENTION AREA – ATLANTIC, INDIAN AND PACIFIC OCEAN SECTORS OF THE ANTARCTIC
SC-CAMLR-III/INF.11	REPORT OF MEMBERS' ACTIVITIES IN 1983/84 U.S.S.R.
SC-CAMLR-III/INF.12	REPORT OF MEMBERS' ACTIVITIES IN 1983/84 Chile
SC-CAMLR-III/INF.13	PROVISIONAL FISHING REGULATORY MEASURES IN FORCE IN RESPECT TO THE SOVIET FISHING VESSELS OPERATING IN THE CONVENTION AREA
SC-CAMLR-III/INF.14	ACOUSTIC ESTIMATION OF KRILL AND KRILL ABUNDANCE (First Preliminary Draft)
SC-CAMLR-III/INF.15	REPORT OF MEMBERS' ACTIVITIES IN 1983/84 Australia

SC-CAMLR-III/INF.16

STATEMENT BY THE DELEGATION OF FRANCE

SC-CAMLR-III/INF.17

REPORT OF MEMBERS' ACTIVITIES IN 1983/84
German Democratic Republic

SC-CAMLR-III/INF.18

SOVIET FISHERY INVESTIGATIONS CONDUCTED IN
THE SOUTHERN OCEAN

**AGENDA FOR THE
THIRD MEETING OF THE SCIENTIFIC COMMITTEE**

1. Opening of the Meeting
2. Adoption of the Agenda
3. Report by the Chairman
4. Amendment to Rule 8 of Rules of Procedure
5. Election of Vice-Chairmen
6. Data Collection and Handling
7. Fish Stock Assessment
8. Krill Resources
9. Ecosystem Monitoring and Management
10. Cooperation With Other Organisations
11. Publication Policy and Procedures for the Preparation of Meeting Documents
12. Budget for 1985
13. Election of Chairman
14. Next Meeting
15. Other Business
16. Adoption of the Report of the Third Meeting of the Scientific Committee
17. Close of the Meeting

CURRENT POSITION ON AVAILABILITY OF STATLANT DATA

STAT8A05	Sources of CCAMLR's STATLANT 08A Data														
	69/70	70/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	80/81	81/82	82/83	83/84
Bulgaria									08A	08A	08A	-	-		
Chile	-	-	-	-	-	-	08A	08A	-	-	-	-	-	n/r	
France	-	-	-	-	-	-	-	-	-	-	08A	08A	08A	08A	08A
GDR	-	-	-	-	-	-	-	***	08A	08A	08A	08A	-	-	
Japan	-	-	-	-	***	***	***	***	08A	08A	08A	08A	08A	08A	
Korea	-	-	-	-	-	-	-	-	-	08A	-	-	08A	08A	
Poland							***	***	08A						
USSR	***	***	***	***	***	***	***	***	***	08A	08A	08A	08A	08A	
	69/70	70/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	80/81	81/82	82/83	83/84

08A : STATLANT 08A forms have been acquired by the CCAMLR Secretariat for these years.
 *** : Data for these years are based on ad hoc reports, or FAO's Yearbooks of Fishery Statistics.
 - : No commercial operations were conducted during these years (zero catch).
 n/r : Not yet received

STAT8B04	Sources of CCAMLR's STATLANT 08B Data														
	69/70	70/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	80/81	81/82	82/83	83/84
Bulgaria									08B	08B	08B	-	-		
Chile							08B	08B	-	-	-	-	-	n/r	
France	-	-	-	-	-	-	-	-	-	-	08B	08B	08B	08B	08B
GDR	-	-	-	-	-	-	-	n/r	n/r	n/r	n/r	n/r	-	-	
Japan	-	-	-	-	n/r	n/r	n/r	n/r	08B	08B	08B	08B	08B	08B	
Korea	-	-	-	-	-	-	-	-	-	08B	-	-	08B	08B	n/r
Poland							n/r	n/r	08B						
USSR	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	08B	n/r	n/r	n/r	08B	
	69/70	70/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	80/81	81/82	82/83	83/84

08B : STATLANT 08B forms have been acquired by the CCAMLR Secretariat for these years.
 - : No commercial operations were conducted during these years (zero effort).
 n/r : Not yet received.

SUMMARY OF CATCH AND EFFORT STATISTICS

PREFACE

1. The statistical data issued by the Commission can serve a number of purposes; for stock assessment specialists the Commission's statistical data holdings should provide one of the essential bases for the evaluation of the stocks; for non-specialists within the Commission, and for the interested public, summary statistics provide a picture of the general trends in the fisheries of the Southern Ocean, and can help identify where serious situations may soon arise, or may have already arisen.

2. The detailed data needed for stock assessment are likely to be bulky . Also interpretation may be difficult or misleading if not done with some background understanding of the fishery concerned . This material therefore may well not be published, but be kept in a readily-accessible data base for use by interested individuals or groups, particularly working groups established by the Scientific Committee.

3. The summary tables likely to be most in demand by the non-specialists within the Commission and the public are those that give historical summaries illustrating the major trends in the fisheries . These include:

- (a) For each species identified in the Commission's data base, the total catch in each split-year (ignoring national or area breakdown).
- (b) For each country, the total national catch in each split-year (ignoring species and area breakdown).
- (c) For each country, each split-year, the total catch and corresponding recorded fishing effort (indicating n/r if not yet received) . Data for krill and species other than krill should be presented in two separate tables.
- (d) For all species reported caught the catch in each major fishing area each split-year (ignoring national and, in the first instance, sub-area breakdown).

4. These tables will be updated and included in each annual statistical bulletin.

5. In addition, for those who are interested in more detailed information, e.g. which country is responsible for catches of a particular species in a particular subarea, tables elaborating these further details will be included in the first issue of the bulletin . However, after the first issue, back data will be provided for one year only.

DESCRIPTION OF SUMMARY

6. The Summary is based on STATLANT 08A and 08B type data. These consist of reported catches and corresponding effort for marine species as submitted by fishing nations for all commercial operations conducted in the Southern Ocean, i.e. major fishing areas 48, 58, and 88 since the 1969/70 fishing season. These data have been taken from the Commission's STATLANT 8A database version 5, and STATLANT 8B database version 4.

UNITS OF MEASURE

7. Catch figures presented refer to nominal catches or live weight equivalents of landings (i.e. landings on a whole or fresh weight basis). In some instances these may have been established using yield rates (conversion factors) applied to landings. Nominal catches are measured in metric tons.

8. Fishing effort is measured in number of days fished. These include all days (24 hour periods, reckoned from midnight to midnight) in which any fishing took place. Where searching is a substantial part of a fishing operation, days in which searching but no fishing took place should have been included in the days fished tabulation.

CODES

9. Coded column headings have been used within the summary to streamline presentation and to enable more efficient translation. Appendix I provides descriptions for all column heading names. Appendix 2 outlines the Antarctic statistical reporting areas and subareas as delimited during the compilation of these data. During the 1984 meeting of the CCAMLR Scientific Committee, new subareas and finer divisions of existing subareas were recommended for the reporting of 1984/85 fishing activities. Appendix 3 defines the codes used under the column heading CID (Country Identifier) in tables 6–9.

SPLIT-YEARS

10. Catches, for the most part, have been accumulated on the basis of twelve month long reporting periods referred to as split-years. The Antarctic split-year begins on July 1 and ends on June 30. The values contained under the column heading 'YR' refer to the calendar year

in which the split-year ends. An exception to this are the reports by the Union of Soviet Socialist Republics for the years 1970–1978. These catch reports were submitted as calendar year summaries and have been included until such time as they are revised into split-year data.

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11. Table 1 Commercial Catch Totals, listed for all species reported caught for each split-year.
12. Table 2 Commercial Catch Totals, listed for each fishing nation for each split-year.
13. Table 3 Commercial Catch and Effort Totals, where krill was the main species sought according to information contained in STATLANT reports, listed for each fishing nation for each split-year.
14. Table 4 Commercial Catch and Effort Totals, where species other than krill were the main species sought according to information contained in STATLANT reports, listed for each fishing nation for each split-year.
15. Table 5 Commercial Catch and Effort Totals, where the main species sought was not identified in STATLANT reports, listed for each fishing nation for each split-year.
16. Table 6 Lists all commercial catch by species, split-year, and country for the entire Convention Area and its three major fishing areas. Subtotals have been tabulated for each species, for each year, for each major fishing area.
17. Table 7 Lists all commercial catch by species, split-year, and country for the Atlantic Antarctic and its six subareas. Subtotals have been tabulated for each species, for each year, for each subarea.
18. Table 8 Lists all commercial catch by species, split-year, and country for the Indian Ocean Antarctic and its four subareas. Subtotals have been tabulated for each species, for each year, for each subarea.

19. Table 9 Lists all commercial catch by species, split-year, and country for the Pacific Antarctic. Subtotals have been tabulated for each species for each year.
20. Histograms For all commercial catch by species, split-year, and major fishing area.

**TABLE 1: COMMERCIAL CATCH TOTALS, LISTED FOR
ALL SPECIES REPORTED CAUGHT FOR EACH
SPLIT-YEAR**

Species Name	1969/70	70/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	80/81	81/82	82/83	83/84
Pisces nei*	2200	3500	8700	300	3900	400	700	22550	8692	7051	7043	14709	7718	24663	
Nototheniidae nei									179	2505	1853	210	51		40
Notothenia gibberifrons							5100	5597	18639	13363	10306	8135	3194	1	531
Notothenia guentheri										15011	7381	36758	31351	5029	
Notothenia rossii	423400	161500	37400	2500	24100	7800	15700	45799	16432	8662	47124	9864	11149	2695	460
Notothenia squamifrons		26500	51400	3500	31000	7200	5800	25700	13156	1587	15950	9786	5635	1931	2
Dissostichus eleginoides								1656	1123	334	455	378	558	265	22
Pleuragramma antarcticum									234			1517	140	409	
Trematomus spp.												583			
Channichthyidae nei										269	1668	4554			
Chaenocephalus aceratus								293	2277	4018	1440	1272	676		161
Chaenodraco wilsoni										10130	956				
Champscephalus gunnari	6300	55100	17800	7200	47100	9900	29800	16381 1	183444	58111	15555	33729	62966	16259 8	9022
Channichthys rhinoceratus									82		8	2	0**	0	
Chionodraco rastrospinosus										1949	233				

* 'nei' indicates 'not elsewhere included'

** '0' indicates 'less than 0.5 metric tonnes reported'

Species Name	1969/70	70/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	80/81	81/82	82/83	83/84
<i>Pseudochaenichthys georgianus</i>								1608	13674	2100	3122	1661	956		888
<i>Micromesistius australis</i>								4			36				
Rajiformes									8	1	224	120	1	1	24
<i>Euphausia superba</i>					22346	41576	5536	124909	142787	333634	478526	448252	528341	225133	
Loliginidae								1	391	2					

**TABLE 2: COMMERCIAL CATCH TOTALS, LISTED FOR
EACH FISHING NATION FOR EACH SPLIT-YEAR**

Country	1969/70	70/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	80/81	81/82	82/83	83/84
Bulgaria, Catch									2088	3408	1225				
Chile, Catch							276	92							
GDR, Catch								790	10313	4961	9970	8279			
France, Catch											283	1921	6158	2102	1071
Japan, Catch*					646	2676	4739	12802	26438	37467	37778	27818	35256	42524	
Korea, Catch										511			1429	1959	
Poland, Catch							21	17054	64016	37486	15961	17656	8324	373	10079
USSR, Catch**	431900	246600	115300	13500	127800	64200	57600	361190	298263	374894	526663	515856	601569	375767	
Total, Catch	431900	246600	115300	13500	128446	66876	62636	391928	401118	458727	591880	571530	652736	422725	11150

* Totals are tentative figures and are expected to be revised.

** Figures for 1969/70-77/78 are calendar year rather than split-year totals.

**TABLE 3: COMMERCIAL CATCH AND EFFORT TOTALS, WHERE
KRILL WAS THE MAIN SPECIES SOUGHT ACCORDING
TO INFORMATION CONTAINED IN STATLANT
REPORTS, LISTED FOR EACH FISHING NATION
FOR EACH SPLIT-YEAR**

TABLE 4: COMMERCIAL CATCH AND EFFORT TOTALS, WHERE SPECIES OTHER THAN KRILL WERE THE MAIN SPECIES SOUGHT ACCORDING TO INFORMATION CONTAINED IN STATLANT REPORTS, LISTED FOR EACH FISHING NATION FOR EACH SPLIT-YEAR

**TABLE 5: COMMERCIAL CATCH AND EFFORT TOTALS, WHERE
THE MAIN SPECIES SOUGHT WAS NOT IDENTIFIED
IN STATLANT REPORTS, LISTED FOR EACH FISHING NATION
FOR EACH SPLIT-YEAR**

Country	1969/70	70/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	80/81	81/82	82/83	83/84
Bulgaria,	Catch:								2088	3408	1225				
	Effort:								80	120	62				
Chile,	Catch:														
	Effort:														
GDR,	Catch:							790	10313	4961	9970	8279			
	Effort:							n/r*	n/r	n/r	n/r	n/r			
France,	Catch:														
	Effort:														
Japan,	Catch:				646	2676	4739	12802							
	Effort:				n/r	n/r	n/r	n/r							
Korea,	Catch:														
	Effort:														
Poland,	Catch:						21	17054	64016		15961				
	Effort:						n/r	n/r	2631		1489				
USSR,	Catch:	431900	246600	115300	13500	127800	64200	57600	361190	298263	374894	526663	515856	601569	375767
	Effort:	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	7619

* 'n/r' indicates 'not yet received'

TABLE 6: LISTS ALL COMMERCIAL CATCH BY SPECIES, SPLIT-YEAR, AND COUNTRY FOR THE ENTIRE CONVENTION AREA AND ITS THREE MAJOR FISHING AREAS. SUBTOTALS HAVE BEEN TABULATED FOR EACH SPECIES, FOR EACH YEAR, FOR EACH MAJOR FISHING AREA.

Species Name	YR CID	ALL.AREAS	T48.0	T58.0	T88.0
Pisces nei (Marine Fishes nei)	70 SUN	2200	2000	200	0
	Subtotal	2200	2000	200	0
	71 SUN	3500	100	3400	0
	Subtotal	3500	100	3400	0
	72 SUN	8700	0	8700	0
	Subtotal	8700	0	8700	0
	73 SUN	300	0	300	0
	Subtotal	300	0	300	0
	74 SUN	3900	1900	2000	0
	Subtotal	3900	1900	2000	0
	75 SUN	400	0	400	0
	Subtotal	400	0	400	0
	76 SUN	700	300	400	0
	Subtotal	700	300	400	0
	77 POL	111	111	0	0
	77 SUN	22439	22185	254	0
	Subtotal	22550	22296	254	0
	78 BGR	168	168	0	0
	78 DDR	22	22	0	0
	78 POL	331	308	0	23
	78 SUN	8171	6997	1174	0
	Subtotal	8692	7495	1174	23
	79 BGR	321	321	0	0
	79 DDR	89	89	0	0
	79 POL	133	133	0	0
	79 SUN	6508	5090	1218	200
	Subtotal	7051	5633	1218	200
	80 BGR	360	360	0	0
	80 POL	428	428	0	0
	80 SUN	6255	6016	239	0
	Subtotal	7043	6804	239	0
	81 POL	230	230	0	0
	81 SUN	14479	14083	396	0
	Subtotal	14709	14313	396	0
	82 POL	124	124	0	0
	82 SUN	7594	7223	371	0
	Subtotal	7718	7347	371	0
	83 SUN	24663	24642	21	0
	Subtotal	24663	24642	21	0

Species Name	YR CID	ALL.AREAS	T48.0	T58.0	T88.0
Nototheniidae (Notothenids nei)	78 DDR	20	20	0	0
	78 POL	159	159	0	0
	Subtotal	179	179	0	0
	79 BGR	2464	2464	0	0
	79 DDR	21	21	0	0
	79 POL	20	20	0	0
	Subtotal	2505	2505	0	0
	80 BGR	616	616	0	0
	80 DDR	1237	1237	0	0
	Subtotal	1853	1853	0	0
	81 DDR	210	210	0	0
	Subtotal	210	210	0	0
	82 POL	51	51	0	0
	Subtotal	51	51	0	0
	84 POL	40	40	0	0
Subtotal	40	40	0	0	
Notothenia gibberifrons (Bumphead Notothenia)	76 SUN	5100	5100	0	0
	Subtotal	5100	5100	0	0
	77 DDR	370	370	0	0
	77 POL	2527	2527	0	0
	77 SUN	2700	2700	0	0
	Subtotal	5597	5597	0	0
	78 BGR	43	43	0	0
	78 DDR	1951	1951	0	0
	78 POL	9839	9839	0	0
	78 SUN	6806	6806	0	0
	Subtotal	18639	18639	0	0
	79 BGR	50	50	0	0
	79 DDR	1556	1556	0	0
	79 POL	6812	6812	0	0
	79 SUN	4945	4945	0	0
	Subtotal	13363	13363	0	0
	80 BGR	34	34	0	0
	80 DDR	917	917	0	0
	80 POL	8359	8359	0	0
	80 SUN	996	996	0	0
	Subtotal	10306	10306	0	0
	81 DDR	2411	2411	0	0
	81 POL	4949	4949	0	0
	81 SUN	775	775	0	0
	Subtotal	8135	8135	0	0
	82 POL	970	970	0	0
	82 SUN	2224	2224	0	0
Subtotal	3194	3194	0	0	

Species Name	YR CID	ALL.AREAS	T48.0	T58.0	T88.0
Notothenia gibberifrons (cont) (Bumphead Notothenia)	83 SUN	1	1	0	0
	Subtotal	1	1	0	0
	84 POL	531	531	0	0
	Subtotal	531	531	0	0
Notothenia guentheri (Guenther's Notothenia)	79 SUN	15011	15011	0	0
	Subtotal	15011	15011	0	0
	80 SUN	7381	7381	0	0
	Subtotal	7381	7381	0	0
	81 SUN	36758	36758	0	0
	Subtotal	36758	36758	0	0
	82 SUN	31351	31351	0	0
	Subtotal	31351	31351	0	0
	83 SUN	5029	5029	0	0
	Subtotal	5029	5029	0	0
Notothenia rossii (Marbled Notothenia)	70 SUN	423400	403100	20300	0
	Subtotal	423400	403100	20300	0
	71 SUN	161500	11800	149700	0
	Subtotal	161500	11800	149700	0
	72 SUN	37400	0	37400	0
	Subtotal	37400	0	37400	0
	73 SUN	2500	0	2500	0
	Subtotal	2500	0	2500	0
	74 SUN	24100	0	24100	0
	Subtotal	24100	0	24100	0
	75 SUN	7800	0	7800	0
	Subtotal	7800	0	7800	0
	76 SUN	15700	11400	4300	0
	Subtotal	15700	11400	4300	0
	77 DDR	420	420	0	0
	77 POL	2224	2224	0	0
	77 SUN	43155	7900	35255	0
	Subtotal	45799	10544	35255	0
	78 BGR	27	27	0	0
	78 DDR	1232	1232	0	0
	78 POL	1018	1018	0	0
	78 SUN	14155	3158	10997	0
	Subtotal	16432	5435	10997	0
	79 BGR	33	33	0	0
	79 DDR	163	163	0	0
	79 POL	2648	2648	0	0
	79 SUN	5818	5818	0	0
	Subtotal	8662	8662	0	0

Species Name	YR CID	ALL.AREAS	T48.0	T58.0	T88.0
Notothenia rossii (cont) (Marbled Notothenia)	80 DDR	130	130	0	0
	80 FRA	19	0	19	0
	80 POL	1194	1193	1	0
	80 SUN	45781	44059	1722	0
	Subtotal	47124	45382	1742	0
	81 DDR	1058	1058	0	0
	81 FRA	1275	0	1275	0
	81 POL	233	233	0	0
	81 SUN	7298	432	6866	0
	Subtotal	9864	1723	8141	0
	82 FRA	5032	0	5032	0
	82 POL	1100	1100	0	0
	82 SUN	5017	0	5017	0
	Subtotal	11149	1100	10049	0
	83 FRA	450	0	450	0
	83 SUN	2245	866	1379	0
	Subtotal	2695	866	1829	0
	84 FRA	109	0	109	0
	84 POL	351	351	0	0
Subtotal	460	351	109	0	
Notothenia squamifrons (Scaled Notothenia)	71 SUN	26500	0	26500	0
	Subtotal	26500	0	26500	0
	72 SUN	51400	400	51000	0
	Subtotal	51400	400	51000	0
	73 SUN	3500	400	3100	0
	Subtotal	3500	400	3100	0
	74 SUN	31000	1600	29400	0
	Subtotal	31000	1600	29400	0
	75 SUN	7200	300	6900	0
	Subtotal	7200	300	6900	0
	76 SUN	5800	500	5300	0
	Subtotal	5800	500	5300	0
	77 SUN	25700	5100	20600	0
	Subtotal	25700	5100	20600	0
	78 POL	107	9	98	0
	78 SUN	13049	351	12698	0
	Subtotal	13156	360	12796	0
	79 SUN	1587	280	1307	0
	Subtotal	1587	280	1307	0
80 FRA	36	0	36	0	
80 POL	362	0	362	0	
80 SUN	15552	272	15280	0	
Subtotal	15950	272	15678	0	

Species Name	YR CID	ALL.AREAS	T48.0	T58.0	T88.0
Notothenia squamifrons (cont) (Scaled Notothenia)	81 FRA	23	0	23	0
	81 SUN	9763	621	9142	0
	Subtotal	9786	621	9165	0
	82 FRA	15	0	15	0
	82 SUN	5620	812	4808	0
	Subtotal	5635	812	4823	0
	83 FRA	15	0	15	0
	83 SUN	1916	4	1912	0
	Subtotal	1931	4	1927	0
	84 FRA	2	0	2	0
	Subtotal	2	0	2	0
	Dissostichus eleginoides (Patagonian Toothfish)	77 POL	135	135	0
77 SUN		1521	1521	0	0
Subtotal		1656	1656	0	0
78 POL		732	730	2	0
78 SUN		391	192	199	0
Subtotal		1123	922	201	0
79 POL		207	207	0	0
79 SUN		127	124	3	0
Subtotal		334	331	3	0
80 FRA		6	0	6	0
80 POL		264	257	7	0
80 SUN		185	4	181	0
Subtotal		455	261	194	0
81 FRA		18	0	18	0
81 POL		71	71	0	0
81 SUN		289	251	38	0
Subtotal		378	322	56	0
82 FRA		24	0	24	0
82 SUN		534	354	180	0
Subtotal		558	354	204	0
83 FRA		71	0	71	0
83 SUN		194	116	78	0
Subtotal		265	116	149	0
84 FRA		19	0	19	0
84 POL	3	3	0	0	
Subtotal	22	3	19	0	
Pleuragramma antarcticum (Antarctic Sidestripe)	78 SUN	234	0	234	0
	Subtotal	234	0	234	0
	81 SUN	1517	0	0	1517
	Subtotal	1517	0	0	1517
	82 SUN	140	0	50	90
	Subtotal	140	0	50	90
	83 SUN	409	110	299	0
	Subtotal	409	110	299	0

Species Name	YR CID	ALL.AREAS	T48.0	T58.0	T88.0
Trematomus spp.	81 SUN	583	0	0	583
(Antarctic Cods)	Subtotal	583	0	0	583
Channichthyidae nei	79 DDR	269	269	0	0
(Icelfishes nei)	Subtotal	269	269	0	0
	80 DDR	1668	1668	0	0
	Subtotal	1668	1668	0	0
	81 DDR	4554	4554	0	0
	Subtotal	4554	4554	0	0
Chaenocephalus aceratus	77 POL	293	293	0	0
(Scotia Sea Icefish)	Subtotal	293	293	0	0
	78 BGR	175	175	0	0
	78 DDR	15	15	0	0
	78 POL	2087	2087	0	0
	Subtotal	2277	2277	0	0
	79 BGR	49	49	0	0
	79 DDR	4	4	0	0
	79 POL	3965	3965	0	0
	Subtotal	4018	4018	0	0
	80 BGR	22	22	0	0
	80 POL	1418	1418	0	0
	Subtotal	1440	1440	0	0
	81 POL	1272	1272	0	0
	Subtotal	1272	1272	0	0
	82 POL	676	676	0	0
	Subtotal	676	676	0	0
	84 POL	161	161	0	0
	Subtotal	161	161	0	0
Chaenodraco wilsoni	79 DDR	2028	2028	0	0
(Wilson's Icefish)	79 POL	8102	8102	0	0
	Subtotal	10130	10130	0	0
	80 POL	956	956	0	0
	Subtotal	956	956	0	0
Champscephalus gunnari	70 SUN	6300	5800	500	0
(Antarctic Icefish)	Subtotal	6300	5800	500	0
	71 SUN	55100	5200	49900	0
	Subtotal	55100	5200	49900	0
	72 SUN	17800	2100	15700	0
	Subtotal	17800	2100	15700	0
	73 SUN	7200	0	7200	0
	Subtotal	7200	0	7200	0
	74 SUN	47100	1000	46100	0
	Subtotal	47100	1000	46100	0

Species Name	YR CID	ALL.AREAS	T48.0	T58.0	T88.0
Chamsocephalus gunnari (cont) (Antarctic Icefish)	75 SUN	9900	0	9900	0
	Subtotal	9900	0	9900	0
	76 SUN	29800	22400	7400	0
	Subtotal	29800	22400	7400	0
	77 POL	3185	3185	0	0
	77 SUN	160626	106418	54208	0
	Subtotal	163811	109603	54208	0
	78 BGR	1054	1054	0	0
	78 DDR	2769	2769	0	0
	78 POL	40765	40515	250	0
	78 SUN	138856	109971	28885	0
	Subtotal	183444	154309	29135	0
	79 BGR	295	295	0	0
	79 DDR	574	574	0	0
	79 POL	11852	11852	0	0
	79 SUN	45390	45289	101	0
	Subtotal	58111	58010	101	0
	80 BGR	129	129	0	0
	80 DDR	3646	3646	0	0
	80 FRA	212	0	212	0
	80 POL	1571	1562	9	0
	80 SUN	9997	8573	1424	0
	Subtotal	15555	13910	1645	0
	81 FRA	603	0	603	0
	81 POL	9166	9166	0	0
	81 SUN	23960	23441	519	0
	Subtotal	33729	32607	1122	0
	82 FRA	1087	0	1087	0
	82 POL	4446	4446	0	0
	82 SUN	57433	42422	14996	15
	Subtotal	62966	46868	16083	15
	83 FRA	1565	0	1565	0
	83 POL	13	13	0	0
	83 SUN	161020	136733	24287	0
	Subtotal	162598	136746	25852	0
	84 FRA	924	0	924	0
	84 POL	8098	8098	0	0
	Subtotal	9022	8098	924	0
Channichthys rhinoceratus (Longsnouted Icefish)	78 POL	82	0	82	0
	Subtotal	82	0	82	0
	80 FRA	4	0	4	0
	80 POL	4	0	4	0
	Subtotal	8	0	8	0
	81 FRA	2	0	2	0
	Subtotal	2	0	2	0

Species Name	YR CID	ALL.AREAS	T48.0	T58.0	T88.0	
Channichthys rhinoceratus (cont) (Longsnouted Icefish)	82 FRA	0	0	0	0	
	Subtotal	0	0	0	0	
	83 FRA	0	0	0	0	
	Subtotal	0	0	0	0	
Chionodraco rastrospinosus (Kathleen's Icefish)	79 POL	1949	1949	0	0	
	Subtotal	1949	1949	0	0	
	80 POL	233	233	0	0	
	Subtotal	233	233	0	0	
Pseudochaenichthys georgianus (South Georgia Icefish)	77 POL	1608	1608	0	0	
	Subtotal	1608	1608	0	0	
	78 BGR	527	527	0	0	
	78 DDR	4288	4288	0	0	
	78 POL	8859	8859	0	0	
	Subtotal	13674	13674	0	0	
	79 BGR	150	150	0	0	
	79 DDR	152	152	0	0	
	79 POL	1798	1798	0	0	
	Subtotal	2100	2100	0	0	
	80 BGR	64	64	0	0	
	80 DDR	2330	2330	0	0	
	80 POL	728	728	0	0	
	Subtotal	3122	3122	0	0	
	81 POL	1661	1661	0	0	
	Subtotal	1661	1661	0	0	
	82 POL	956	956	0	0	
	Subtotal	956	956	0	0	
	84 POL	888	888	0	0	
	Subtotal	888	888	0	0	
	Micromesistius australis (Southern Blue Whiting)	77 POL	4	4	0	0
		Subtotal	4	4	0	0
		80 DDR	36	36	0	0
		Subtotal	36	36	0	0
	Rajiformes (Skates and Rays nei)	78 DDR	8	8	0	0
		Subtotal	8	8	0	0
79 DDR		1	1	0	0	
Subtotal		1	1	0	0	
80 DDR		6	6	0	0	
80 FRA		0	0	0	0	
80 POL		218	218	0	0	
Subtotal		224	224	0	0	
81 DDR		46	46	0	0	
81 FRA		0	0	0	0	
81 POL		74	74	0	0	
Subtotal		120	120	0	0	

Species Name	YR CID	ALL.AREAS	T48.0	T58.0	T88.0	
Rajiformes (cont) (Skates and Rays nei)	82 FRA	0	0	0	0	
	82 POL	1	1	0	0	
	Subtotal	1	1	0	0	
	83 FRA	1	0	1	0	
	Subtotal	1	0	1	0	
	84 FRA	17	0	17	0	
	84 POL	7	7	0	0	
	Subtotal	24	7	17	0	
	Euphausia superba (Antarctic Krill)	74 JPN	646	200	446	0
		74 SUN	21700	21700	0	0
		Subtotal	22346	21900	446	0
		75 JPN	2676	0	2676	0
75 SUN		38900	38900	0	0	
Subtotal		41576	38900	2676	0	
76 CHL		276	276	0	0	
76 JPN		4739	0	4739	0	
76 POL		21	21	0	0	
76 SUN		500	500	0	0	
Subtotal		5536	797	4739	0	
77 CHL		92	92	0	0	
77 JPN		12802	0	12801	1	
77 POL		6966	6966	0	0	
77 SUN		105049	99828	1866	3355	
Subtotal		124909	106886	14667	3356	
78 BGR		94	94	0	0	
78 DDR		8	8	0	0	
78 JPN		26047	0	25527	520	
78 POL		37	1	0	36	
78 SUN		116601	89820	26781	0	
Subtotal		142787	89923	52308	556	
79 BGR		46	46	0	0	
79 DDR		102	102	0	0	
79 JPN		37467	0	35168	2299	
79 KOR		511	0	511	0	
79 SUN		295508	266386	28522	600	
Subtotal		333634	266534	64201	2899	
80 FRA		6	0	6	0	
80 JPN		37778	0	34583	3195	
80 POL	226	226	0	0		
80 SUN	440516	356752	83764	0		
Subtotal	478526	356978	118353	3195		
81 JPN	27818	3851	22800	1167		
81 SUN	420434	285117	132237	3080		
Subtotal	448252	288968	155037	4247		
82 JPN	35256	5538	27161	2557		
82 KOR	1429	0	1429	0		
82 SUN	491656	368182	119381	4093		
Subtotal	528341	373720	147971	6650		

Species Name	YR CID	ALL.AREAS	T48.0	T58.0	T88.0
Euphausia superba (cont) (Antarctic Krill)	83 JPN	42524	5735	32071	4718
	83 KOR	1959	0	1959	0
	83 POL	360	360	0	0
	83 SUN	180290	128751	45620	5919
	Subtotal	225133	134846	79650	10637
Loliginidae (Squids nei)	77 POL	1	1	0	0
	Subtotal	1	1	0	0
	78 JPN	391	0	0	391
	Subtotal	391	0	0	391
	79 DDR	2	2	0	0
	Subtotal	2	2	0	0
TOTAL		4567052	3103563	1429130	34359

TABLE 7: LISTS ALL COMMERCIAL CATCH BY SPECIES, SPLIT-YEAR, AND COUNTRY FOR THE ATLANTIC ANTARCTIC AND ITS SIX SUBAREAS. SUBTOTALS HAVE BEEN TABULATED FOR EACH SPECIES, FOR EACH YEAR, FOR EACH SUBAREA.

Species Name	YR CID	S48.1	S48.2	S48.3	S48.4	S48.5	S48.6	S48.0	T48.0
Pisces nei	70 SUN	0	0	0	0	0	0	2000	2000
	(Marine Fishes nei) Subtotal	0	0	0	0	0	0	2000	2000
	71 SUN	0	0	0	0	0	0	100	100
	Subtotal	0	0	0	0	0	0	100	100
	74 SUN	0	0	0	0	0	0	1900	1900
	Subtotal	0	0	0	0	0	0	1900	1900
	76 SUN	0	0	0	0	0	0	300	300
	Subtotal	0	0	0	0	0	0	300	300
	77 POL	0	0	111	0	0	0	0	111
	77 SUN	0	0	0	0	0	0	22185	22185
	Subtotal	0	0	111	0	0	0	22185	22296
	78 BGR	0	74	94	0	0	0	0	168
	78 DDR	0	0	22	0	0	0	0	22
	78 POL	0	154	154	0	0	0	0	308
	78 SUN	0	0	0	0	0	0	6997	6997
	Subtotal	0	228	270	0	0	0	6997	7495
	79 BGR	3	27	291	0	0	0	0	321
	79 DDR	61	20	8	0	0	0	0	89
	79 POL	15	86	32	0	0	0	0	133
	79 SUN	0	0	0	0	0	0	5090	5090
	Subtotal	79	133	331	0	0	0	5090	5633
	80 BGR	44	160	156	0	0	0	0	360
	80 POL	64	30	334	0	0	0	0	428
	80 SUN	491	344	5181	0	0	0	0	6016
	Subtotal	599	534	5671	0	0	0	0	6804
	81 POL	0	0	230	0	0	0	0	230
	81 SUN	4230	2770	7083	0	0	0	0	14083
	Subtotal	4230	2770	7313	0	0	0	0	14313

Species Name	YR CID	S48.1	S48.2	S48.3	S48.4	S48.5	S48.6	S48.0	T48.0
Pisces nei (cont)	82 POL	0	0	124	0	0	0	0	124
	(Marine Fishes nei) 82 SUN	0	2498	4725	0	0	0	0	7223
	Subtotal	0	2498	4849	0	0	0	0	7347
	83 SUN	16	12349	12277	0	0	0	0	24642
	Subtotal	16	12349	12277	0	0	0	0	24642
Nototheniidae	78 DDR	0	0	20	0	0	0	0	20
	(Notothenids nei) 78 POL	0	50	109	0	0	0	0	159
	Subtotal	0	50	129	0	0	0	0	179
	79 BGR	0	77	2387	0	0	0	0	2464
	79 DDR	21	0	0	0	0	0	0	21
	79 POL	0	0	20	0	0	0	0	20
	Subtotal	21	77	2407	0	0	0	0	2505
	80 BGR	0	130	486	0	0	0	0	616
	80 DDR	0	1237	0	0	0	0	0	1237
	Subtotal	0	1367	486	0	0	0	0	1853
	81 DDR	0	0	210	0	0	0	0	210
	Subtotal	0	0	210	0	0	0	0	210
	82 POL	0	0	51	0	0	0	0	51
Subtotal	0	0	51	0	0	0	0	51	
84 POL	0	0	40	0	0	0	0	40	
Subtotal	0	0	40	0	0	0	0	40	
Notothenia gibberifrons (Bumphead Notothenia)	76 SUN	0	0	0	0	0	0	5100	5100
	Subtotal	0	0	0	0	0	0	5100	5100
	77 DDR	0	0	0	0	0	0	370	370
	77 POL	0	0	2527	0	0	0	0	2527
	77 SUN	0	0	0	0	0	0	2700	2700
	Subtotal	0	0	2527	0	0	0	3070	5597

Species Name	YR CID	S48.1	S48.2	S48.3	S48.4	S48.5	S48.6	S48.0	T48.0
Notothenia gibberifrons (cont) (Bumphead Notothenia)	78 BGR	0	6	37	0	0	0	0	43
	78 DDR	0	5	1946	0	0	0	0	1951
	78 POL	0	64	9775	0	0	0	0	9839
	78 SUN	0	0	0	0	0	0	6806	6806
	Subtotal	0	75	11758	0	0	0	6806	18639
	79 BGR	1	37	12	0	0	0	0	50
	79 DDR	843	439	274	0	0	0	0	1556
	79 POL	2436	2122	2254	0	0	0	0	6812
	79 SUN	0	0	0	0	0	0	4945	4945
	Subtotal	3280	2598	2540	0	0	0	4945	13363
	80 BGR	23	11	0	0	0	0	0	34
	80 DDR	0	917	0	0	0	0	0	917
	80 POL	665	420	7274	0	0	0	0	8359
	80 SUN	77	50	869	0	0	0	0	996
	Subtotal	765	1398	8143	0	0	0	0	10306
	81 DDR	0	0	2411	0	0	0	0	2411
	81 POL	0	0	4407	542	0	0	0	4949
	81 SUN	50	114	611	0	0	0	0	775
	Subtotal	50	114	7429	542	0	0	0	8135
	82 POL	0	0	970	0	0	0	0	970
82 SUN	0	589	1635	0	0	0	0	2224	
Subtotal	0	589	2605	0	0	0	0	3194	
83 SUN	0	1	0	0	0	0	0	1	
Subtotal	0	1	0	0	0	0	0	1	
84 POL	0	0	531	0	0	0	0	531	
Subtotal	0	0	531	0	0	0	0	531	
Notothenia guentheri (Guenther's Notothenia)	79 SUN	0	0	0	0	0	0	15011	15011
	Subtotal	0	0	0	0	0	0	15011	15011
	80 SUN	123	86	7172	0	0	0	0	7381
Subtotal	123	86	7172	0	0	0	0	7381	

Species Name	YR CID	S48.1	S48.2	S48.3	S48.4	S48.5	S48.6	S48.0	T48.0
Notothenia guentheri (cont)	81 SUN	2531	125	34102	0	0	0	0	36758
(Guenther's Notothenia)	Subtotal	2531	125	34102	0	0	0	0	36758
	82 SUN	0	1089	30262	0	0	0	0	31351
	Subtotal	0	1089	30262	0	0	0	0	31351
	83 SUN	0	0	5029	0	0	0	0	5029
	Subtotal	0	0	5029	0	0	0	0	5029
Notothenia rossii	70 SUN	0	0	0	0	0	0	403100	403100
(Marbled Notothenia)	Subtotal	0	0	0	0	0	0	403100	403100
	71 SUN	0	0	0	0	0	0	11800	11800
	Subtotal	0	0	0	0	0	0	11800	11800
	76 SUN	0	0	0	0	0	0	11400	11400
	Subtotal	0	0	0	0	0	0	11400	11400
	77 DDR	0	0	0	0	0	0	420	420
	77 POL	0	0	2224	0	0	0	0	2224
	77 SUN	0	0	0	0	0	0	7900	7900
	Subtotal	0	0	2224	0	0	0	8320	10544
	78 BGR	0	4	23	0	0	0	0	27
	78 DDR	0	55	1177	0	0	0	0	1232
	78 POL	0	26	992	0	0	0	0	1018
	78 SUN	0	0	0	0	0	0	3158	3158
	Subtotal	0	85	2192	0	0	0	3158	5435
	79 BGR	1	24	8	0	0	0	0	33
	79 DDR	135	13	15	0	0	0	0	163
	79 POL	334	200	2114	0	0	0	0	2648
	79 SUN	0	0	0	0	0	0	5818	5818
	Subtotal	470	237	2137	0	0	0	5818	8662
	80 DDR	0	130	0	0	0	0	0	130
	80 POL	48	36	1109	0	0	0	0	1193
	80 SUN	18715	1556	23788	0	0	0	0	44059
	Subtotal	18763	1722	24897	0	0	0	0	45382

Species Name	YR CID	S48.1	S48.2	S48.3	S48.4	S48.5	S48.6	S48.0	T48.0	
Notothenia rossii (cont) (Marbled Notothenia)	81 DDR	0	0	1058	0	0	0	0	1058	
	81 POL	0	0	233	0	0	0	0	233	
	81 SUN	0	72	360	0	0	0	0	432	
	Subtotal	0	72	1651	0	0	0	0	1723	
	82 POL	0	0	1100	0	0	0	0	1100	
	Subtotal	0	0	1100	0	0	0	0	1100	
	83 SUN	0	0	866	0	0	0	0	866	
	Subtotal	0	0	866	0	0	0	0	866	
	84 POL	0	0	351	0	0	0	0	351	
	Subtotal	0	0	351	0	0	0	0	351	
	Notothenia squamifrons (Scaled Notothenia)	72 SUN	0	0	0	0	0	0	400	400
		Subtotal	0	0	0	0	0	0	400	400
73 SUN		0	0	0	0	0	0	400	400	
Subtotal		0	0	0	0	0	0	400	400	
74 SUN		0	0	0	0	0	0	1600	1600	
Subtotal		0	0	0	0	0	0	1600	1600	
75 SUN		0	0	0	0	0	0	300	300	
Subtotal		0	0	0	0	0	0	300	300	
76 SUN		0	0	0	0	0	0	500	500	
Subtotal		0	0	0	0	0	0	500	500	
77 SUN		0	0	0	0	0	0	5100	5100	
Subtotal		0	0	0	0	0	0	5100	5100	
78 POL		0	9	0	0	0	0	0	9	
78 SUN		0	0	0	0	0	0	351	351	
Subtotal		0	9	0	0	0	0	351	360	
79 SUN	0	0	0	0	0	0	280	280		
Subtotal	0	0	0	0	0	0	280	280		

Species Name	YR CID	S48.1	S48.2	S48.3	S48.4	S48.5	S48.6	S48.0	T48.0	
Notothenia squamifrons (cont) (Scaled Notothenia)	80 SUN	0	0	272	0	0	0	0	272	
	Subtotal	0	0	272	0	0	0	0	272	
	81 SUN	36	41	544	0	0	0	0	621	
	Subtotal	36	41	544	0	0	0	0	621	
	82 SUN	0	0	812	0	0	0	0	812	
	Subtotal	0	0	812	0	0	0	0	812	
	83 SUN	0	4	0	0	0	0	0	4	
	Subtotal	0	4	0	0	0	0	0	4	
	Dissostichus eleginoides (Patagonian Toothfish)	77 POL	0	0	135	0	0	0	0	135
		77 SUN	0	0	0	0	0	0	1521	1521
		Subtotal	0	0	135	0	0	0	1521	1656
		78 POL	0	95	635	0	0	0	0	730
78 SUN		0	0	0	0	0	0	192	192	
Subtotal		0	95	635	0	0	0	192	922	
79 POL		100	37	70	0	0	0	0	207	
79 SUN		0	0	0	0	0	0	124	124	
Subtotal		100	37	70	0	0	0	124	331	
80 POL		2	0	255	0	0	0	0	257	
80 SUN		0	4	0	0	0	0	0	4	
Subtotal		2	4	255	0	0	0	0	261	
81 POL		0	0	68	3	0	0	0	71	
81 SUN		0	83	168	0	0	0	0	251	
Subtotal		0	83	236	3	0	0	0	322	
82 SUN		0	30	324	0	0	0	0	354	
Subtotal		0	30	324	0	0	0	0	354	
83 SUN		0	0	116	0	0	0	0	116	
Subtotal	0	0	116	0	0	0	0	116		

Species Name	YR CID	S48.1	S48.2	S48.3	S48.4	S48.5	S48.6	S48.0	T48.0
Dissostichus eleginoides (cont)	84 POL	0	0	3	0	0	0	0	3
(Patagonian Toothfish)	Subtotal	0	0	3	0	0	0	0	3
Pleuragramma antarcticum	83 SUN	0	110	0	0	0	0	0	110
(Antarctic Sidestripe)	Subtotal	0	110	0	0	0	0	0	110
Channichthyidae nei	79 DDR	26	243	0	0	0	0	0	269
(Icelfishes nei)	Subtotal	26	243	0	0	0	0	0	269
	80 DDR	0	1668	0	0	0	0	0	1668
	Subtotal	0	1668	0	0	0	0	0	1668
	81 DDR	0	0	4554	0	0	0	0	4554
	Subtotal	0	0	4554	0	0	0	0	4554
Chaenocephalus aceratus	77 POL	0	0	293	0	0	0	0	293
(Scotia Sea Icefish)	Subtotal	0	0	293	0	0	0	0	293
	78 BGR	0	157	18	0	0	0	0	175
	78 DDR	0	0	15	0	0	0	0	15
	78 POL	0	54	2033	0	0	0	0	2087
	Subtotal	0	211	2066	0	0	0	0	2277
	79 BGR	2	29	18	0	0	0	0	49
	79 DDR	0	0	4	0	0	0	0	4
	79 POL	1391	2132	442	0	0	0	0	3965
	Subtotal	1393	2161	464	0	0	0	0	4018
	80 BGR	0	22	0	0	0	0	0	22
	80 POL	153	181	1084	0	0	0	0	1418
	Subtotal	153	203	1084	0	0	0	0	1440
	81 POL	0	0	1189	83	0	0	0	1272
	Subtotal	0	0	1189	83	0	0	0	1272
	82 POL	0	0	676	0	0	0	0	676
	Subtotal	0	0	676	0	0	0	0	676

Species Name	YR CID	S48.1	S48.2	S48.3	S48.4	S48.5	S48.6	S48.0	T48.0
Chaenocephalus aceratus (cont)	84 POL	0	0	161	0	0	0	0	161
(Scotia Sea Icefish)	Subtotal	0	0	161	0	0	0	0	161
Chaenodraco wilsoni	79 DDR	2028	0	0	0	0	0	0	2028
(Wilson's Icefish)	79 POL	8102	0	0	0	0	0	0	8102
	Subtotal	10130	0	0	0	0	0	0	10130
	80 POL	956	0	0	0	0	0	0	956
	Subtotal	956	0	0	0	0	0	0	956
Champscephalus gunnari	70 SUN	0	0	0	0	0	0	5800	5800
(Antarctic Icefish)	Subtotal	0	0	0	0	0	0	5800	5800
	71 SUN	0	0	0	0	0	0	5200	5200
	Subtotal	0	0	0	0	0	0	5200	5200
	72 SUN	0	0	0	0	0	0	2100	2100
	Subtotal	0	0	0	0	0	0	2100	2100
	74 SUN	0	0	0	0	0	0	1000	1000
	Subtotal	0	0	0	0	0	0	1000	1000
	76 SUN	0	0	0	0	0	0	22400	22400
	Subtotal	0	0	0	0	0	0	22400	22400
	77 POL	0	0	3185	0	0	0	0	3185
	77 SUN	0	0	0	0	0	0	106418	106418
	Subtotal	0	0	3185	0	0	0	106418	109603
	78 BGR	0	947	107	0	0	0	0	1054
	78 DDR	0	2603	166	0	0	0	0	2769
	78 POL	0	38446	2069	0	0	0	0	40515
	78 SUN	0	0	0	0	0	0	109971	109971
	Subtotal	0	41996	2342	0	0	0	109971	154309
	79 BGR	12	172	111	0	0	0	0	295
	79 DDR	188	386	0	0	0	0	0	574
	79 POL	7411	4331	110	0	0	0	0	11852
	79 SUN	0	0	0	0	0	0	45289	45289
	Subtotal	7611	4889	221	0	0	0	45289	58010

Species Name	YR CID	S48.1	S48.2	S48.3	S48.4	S48.5	S48.6	S48.0	T48.0
Chamsocephalus gunnari (cont) (Antarctic Icefish)	80 BGR	0	129	0	0	0	0	0	129
	80 DDR	0	3646	0	0	0	0	0	3646
	80 POL	370	439	753	0	0	0	0	1562
	80 SUN	717	1017	6839	0	0	0	0	8573
	Subtotal	1087	5231	7592	0	0	0	0	13910
	81 POL	0	0	9104	62	0	0	0	9166
	81 SUN	1700	1523	20218	0	0	0	0	23441
	Subtotal	1700	1523	29322	62	0	0	0	32607
	82 POL	0	0	4446	0	0	0	0	4446
	82 SUN	0	557	41865	0	0	0	0	42422
	Subtotal	0	557	46311	0	0	0	0	46868
	83 POL	0	0	13	0	0	0	0	13
	83 SUN	2604	5948	128181	0	0	0	0	136733
	Subtotal	2604	5948	128194	0	0	0	0	136746
	84 POL	0	0	8098	0	0	0	0	8098
Subtotal	0	0	8098	0	0	0	0	8098	
Chionodraco rastrospinosus (Kathleen's Icefish)	79 POL	370	1579	0	0	0	0	0	1949
	Subtotal	370	1579	0	0	0	0	0	1949
	80 POL	42	191	0	0	0	0	0	233
Subtotal	42	191	0	0	0	0	0	233	
Pseudochaenichthys georgianus (South Georgia Icefish)	77 POL	0	0	1608	0	0	0	0	1608
	Subtotal	0	0	1608	0	0	0	0	1608
	78 BGR	0	474	53	0	0	0	0	527
	78 DDR	0	16	4272	0	0	0	0	4288
	78 POL	0	169	8690	0	0	0	0	8859
	Subtotal	0	659	13015	0	0	0	0	13674
	79 BGR	6	87	57	0	0	0	0	150
	79 DDR	0	0	152	0	0	0	0	152
	79 POL	391	512	895	0	0	0	0	1798
	Subtotal	397	599	1104	0	0	0	0	2100

Species Name	YR CID	S48.1	S48.2	S48.3	S48.4	S48.5	S48.6	S48.0	T48.0	
Pseudochaenichthys georgianus (cont)	80 BGR	43	21	0	0	0	0	0	64	
	80 DDR	0	2330	0	0	0	0	0	2330	
	(South Georgia Icefish)	80 POL	29	34	665	0	0	0	728	
	Subtotal	72	2385	665	0	0	0	0	3122	
	81 POL	0	0	1584	77	0	0	0	1661	
	Subtotal	0	0	1584	77	0	0	0	1661	
	82 POL	0	0	956	0	0	0	0	956	
	Subtotal	0	0	956	0	0	0	0	956	
	84 POL	0	0	888	0	0	0	0	888	
	Subtotal	0	0	888	0	0	0	0	888	
	Micromesistius australis (Southern Blue Whiting)	77 POL	0	0	4	0	0	0	0	4
		Subtotal	0	0	4	0	0	0	0	4
80 DDR		0	36	0	0	0	0	0	36	
Subtotal	0	36	0	0	0	0	0	36		
Rajiformes (Skates and Rays nei)	78 DDR	0	4	4	0	0	0	0	8	
	Subtotal	0	4	4	0	0	0	0	8	
	79 DDR	1	0	0	0	0	0	0	1	
	Subtotal	1	0	0	0	0	0	0	1	
	80 DDR	0	6	0	0	0	0	0	6	
	80 POL	0	0	218	0	0	0	0	218	
	Subtotal	0	6	218	0	0	0	0	224	
	81 DDR	0	0	46	0	0	0	0	46	
	81 POL	0	0	74	0	0	0	0	74	
	Subtotal	0	0	120	0	0	0	0	120	
	82 POL	0	0	1	0	0	0	0	1	
	Subtotal	0	0	1	0	0	0	0	1	
84 POL	0	0	7	0	0	0	0	7		
Subtotal	0	0	7	0	0	0	0	7		

Species Name	YR CID	S48.1	S48.2	S48.3	S48.4	S48.5	S48.6	S48.0	T48.0
Euphausia superba (Antarctic Krill)	74 JPN	0	0	0	0	0	0	200	200
	74 SUN	0	0	0	0	0	0	21700	21700
	Subtotal	0	0	0	0	0	0	21900	21900
	75 SUN	0	0	0	0	0	0	38900	38900
	Subtotal	0	0	0	0	0	0	38900	38900
	76 CHL	276	0	0	0	0	0	0	276
	76 POL	0	0	0	0	0	0	21	21
	76 SUN	0	0	0	0	0	0	500	500
	Subtotal	276	0	0	0	0	0	521	797
	77 CHL	92	0	0	0	0	0	0	92
	77 POL	0	0	6966	0	0	0	0	6966
	77 SUN	0	0	0	0	0	0	99828	99828
	Subtotal	92	0	6966	0	0	0	99828	106886
	78 BGR	0	0	94	0	0	0	0	94
	78 DDR	0	2	6	0	0	0	0	8
	78 POL	0	0	1	0	0	0	0	1
	78 SUN	0	0	0	0	0	0	89820	89820
	Subtotal	0	2	101	0	0	0	89820	89923
	79 BGR	0	18	28	0	0	0	0	46
	79 DDR	0	0	102	0	0	0	0	102
	79 SUN	0	0	0	0	0	0	266386	266386
	Subtotal	0	18	130	0	0	0	266386	266534
	80 POL	0	226	0	0	0	0	0	226
	80 SUN	49439	173539	133774	0	0	0	0	356752
Subtotal	49439	173765	133774	0	0	0	0	356978	
81 JPN	0	0	0	0	0	0	3851	3851	
81 SUN	89108	60540	135252	0	0	217	0	285117	
Subtotal	89108	60540	135252	0	0	217	3851	288968	
82 JPN	0	0	0	0	0	0	5538	5538	
82 SUN	64045	257269	46868	0	0	0	0	368182	
Subtotal	64045	257269	46868	0	0	0	5538	373720	

Species Name	YR CID	S48.1	S48.2	S48.3	S48.4	S48.5	S48.6	S48.0	T48.0
Euphausia superba (cont)	83 JPN	0	0	0	0	0	0	5735	5735
	(Antarctic Krill) 83 POL	0	360	0	0	0	0	0	360
	83 SUN	39	116497	11480	0	0	735	0	128751
	Subtotal	39	116857	11480	0	0	735	5735	134846
Loliginidae	77 POL	0	0	1	0	0	0	0	1
	(Squids nei) Subtotal	0	0	1	0	0	0	0	1
	79 DDR	2	0	0	0	0	0	0	2
	Subtotal	2	0	0	0	0	0	0	2
TOTAL		260608	707150	775561	767	0	952	1358525	3103563

TABLE 8: LISTS ALL COMMERCIAL CATCH BY SPECIES, SPLIT-YEAR, AND COUNTRY FOR THE INDIAN OCEAN ANTARCTIC AND ITS FOUR SUBAREAS. SUBTOTALS HAVE BEEN TABULATED FOR EACH SPECIES, FOR EACH YEAR, FOR EACH SUBAREA.

Species Name	YR CID	S58.4	S58.5	S58.6	S58.7	S58.0	T58.0
Pisces nei	70 SUN	0	0	0	0	200	200
	(Marine Fishes nei) Subtotal	0	0	0	0	200	200
	71 SUN	0	0	0	0	3400	3400
	Subtotal	0	0	0	0	3400	3400
	72 SUN	0	0	0	0	8700	8700
	Subtotal	0	0	0	0	8700	8700
	73 SUN	0	0	0	0	300	300
	Subtotal	0	0	0	0	300	300
	74 SUN	0	0	0	0	2000	2000
	Subtotal	0	0	0	0	2000	2000
	75 SUN	0	0	0	0	400	400
	Subtotal	0	0	0	0	400	400
	76 SUN	0	0	0	0	400	400
	Subtotal	0	0	0	0	400	400
	77 SUN	0	0	0	0	254	254
	Subtotal	0	0	0	0	254	254
	78 SUN	0	0	0	0	1174	1174
	Subtotal	0	0	0	0	1174	1174
	79 SUN	0	0	0	0	1218	1218
	Subtotal	0	0	0	0	1218	1218
	80 SUN	239	0	0	0	0	239
	Subtotal	239	0	0	0	0	239
	81 SUN	375	21	0	0	0	396
	Subtotal	375	21	0	0	0	396
	82 SUN	364	7	0	0	0	371
	Subtotal	364	7	0	0	0	371

Species Name	YR CID	S58.4	S58.5	S58.6	S58.7	S58.0	T58.0
Pisces nei (cont)	83 SUN	4	17	0	0	0	21
(Marine Fishes nei)	Subtotal	4	17	0	0	0	21
Notothenia rossii	70 SUN	0	0	0	0	20300	20300
(Marbled Notothenia)	Subtotal	0	0	0	0	20300	20300
	71 SUN	0	0	0	0	149700	149700
	Subtotal	0	0	0	0	149700	149700
	72 SUN	0	0	0	0	37400	37400
	Subtotal	0	0	0	0	37400	37400
	73 SUN	0	0	0	0	2500	2500
	Subtotal	0	0	0	0	2500	2500
	74 SUN	0	0	0	0	24100	24100
	Subtotal	0	0	0	0	24100	24100
	75 SUN	0	0	0	0	7800	7800
	Subtotal	0	0	0	0	7800	7800
	76 SUN	0	0	0	0	4300	4300
	Subtotal	0	0	0	0	4300	4300
	77 SUN	0	0	0	0	35255	35255
	Subtotal	0	0	0	0	35255	35255
	78 SUN	0	0	0	0	10997	10997
	Subtotal	0	0	0	0	10997	10997
	80 FRA	0	19	0	0	0	19
	80 POL	0	1	0	0	0	1
	80 SUN	0	1722	0	0	0	1722
	Subtotal	0	1742	0	0	0	1742
	81 FRA	0	1275	0	0	0	1275
	81 SUN	217	6649	0	0	0	6866
	Subtotal	217	7924	0	0	0	8141

Species Name	YR CID	S58.4	S58.5	S58.6	S58.7	S58.0	T58.0
Notothenia rossii (cont) (Marbled Notothenia)	82 FRA	0	5032	0	0	0	5032
	82 SUN	237	4780	0	0	0	5017
	Subtotal	237	9812	0	0	0	10049
	83 FRA	0	450	0	0	0	450
	83 SUN	0	1379	0	0	0	1379
	Subtotal	0	1829	0	0	0	1829
	84 FRA	0	109	0	0	0	109
	Subtotal	0	109	0	0	0	109
Notothenia squamifrons (Scaled Notothenia)	71 SUN	0	0	0	0	26500	26500
	Subtotal	0	0	0	0	26500	26500
	72 SUN	0	0	0	0	51000	51000
	Subtotal	0	0	0	0	51000	51000
	73 SUN	0	0	0	0	3100	3100
	Subtotal	0	0	0	0	3100	3100
	74 SUN	0	0	0	0	29400	29400
	Subtotal	0	0	0	0	29400	29400
	75 SUN	0	0	0	0	6900	6900
	Subtotal	0	0	0	0	6900	6900
	76 SUN	0	0	0	0	5300	5300
	Subtotal	0	0	0	0	5300	5300
	77 SUN	0	0	0	0	20600	20600
	Subtotal	0	0	0	0	20600	20600
	78 POL	0	0	0	0	98	98
78 SUN	0	0	0	0	12698	12698	
Subtotal	0	0	0	0	12796	12796	
79 SUN	0	0	0	0	1307	1307	
Subtotal	0	0	0	0	1307	1307	

Species Name	YR CID	S58.4	S58.5	S58.6	S58.7	S58.0	T58.0	
Notothenia squamifrons (cont) (Scaled Notothenia)	80 FRA	0	36	0	0	0	36	
	80 POL	0	362	0	0	0	362	
	80 SUN	4370	10910	0	0	0	15280	
	Subtotal	4370	11308	0	0	0	15678	
	81 FRA	0	23	0	0	0	23	
	81 SUN	2926	6216	0	0	0	9142	
	Subtotal	2926	6239	0	0	0	9165	
	82 FRA	0	15	0	0	0	15	
	82 SUN	785	4023	0	0	0	4808	
	Subtotal	785	4038	0	0	0	4823	
	83 FRA	0	15	0	0	0	15	
	83 SUN	95	1817	0	0	0	1912	
	Subtotal	95	1832	0	0	0	1927	
	84 FRA	0	2	0	0	0	2	
	Subtotal	0	2	0	0	0	2	
	Dissostichus eleginoides (Patagonian Toothfish)	78 POL	0	0	0	0	2	2
		78 SUN	0	0	0	0	199	199
		Subtotal	0	0	0	0	201	201
79 SUN		0	0	0	0	3	3	
Subtotal		0	0	0	0	3	3	
80 FRA		0	6	0	0	0	6	
80 POL		0	7	0	0	0	7	
80 SUN		56	125	0	0	0	181	
Subtotal		56	138	0	0	0	194	
81 FRA		0	18	0	0	0	18	
81 SUN		16	22	0	0	0	38	
Subtotal		16	40	0	0	0	56	
82 FRA		0	24	0	0	0	24	
82 SUN		83	97	0	0	0	180	
Subtotal		83	121	0	0	0	204	

Species Name	YR CID	S58.4	S58.5	S58.6	S58.7	S58.0	T58.0
Dissostichus eleginoides (cont) (Patagonian Toothfish)	83 FRA	0	54	17	0	0	71
	83 SUN	4	74	0	0	0	78
	Subtotal	4	128	17	0	0	149
	84 FRA	0	19	0	0	0	19
	Subtotal	0	19	0	0	0	19
Pleuragramma antarcticum (Antarctic Sidestripe)	78 SUN	0	0	0	0	234	234
	Subtotal	0	0	0	0	234	234
	82 SUN	50	0	0	0	0	50
	Subtotal	50	0	0	0	0	50
	83 SUN	299	0	0	0	0	299
	Subtotal	299	0	0	0	0	299
Champscephalus gunnari (Antarctic Icefish)	70 SUN	0	0	0	0	500	500
	Subtotal	0	0	0	0	500	500
	71 SUN	0	0	0	0	49900	49900
	Subtotal	0	0	0	0	49900	49900
	72 SUN	0	0	0	0	15700	15700
	Subtotal	0	0	0	0	15700	15700
	73 SUN	0	0	0	0	7200	7200
	Subtotal	0	0	0	0	7200	7200
	74 SUN	0	0	0	0	46100	46100
	Subtotal	0	0	0	0	46100	46100
75 SUN	0	0	0	0	9900	9900	
Subtotal	0	0	0	0	9900	9900	
76 SUN	0	0	0	0	7400	7400	
Subtotal	0	0	0	0	7400	7400	
77 SUN	0	0	0	0	54208	54208	
Subtotal	0	0	0	0	54208	54208	

Species Name	YR CID	S58.4	S58.5	S58.6	S58.7	S58.0	T58.0
Champscephalus gunnari (cont) (Antarctic Icefish)	78 POL	0	0	0	0	250	250
	78 SUN	0	0	0	0	28885	28885
	Subtotal	0	0	0	0	29135	29135
	79 SUN	0	0	0	0	101	101
	Subtotal	0	0	0	0	101	101
	80 FRA	0	212	0	0	0	212
	80 POL	0	9	0	0	0	9
	80 SUN	14	1410	0	0	0	1424
	Subtotal	14	1631	0	0	0	1645
	81 FRA	0	603	0	0	0	603
	81 SUN	0	519	0	0	0	519
	Subtotal	0	1122	0	0	0	1122
	82 FRA	0	1087	0	0	0	1087
	82 SUN	0	14996	0	0	0	14996
	Subtotal	0	16083	0	0	0	16083
	83 FRA	0	1565	0	0	0	1565
	83 SUN	0	24287	0	0	0	24287
	Subtotal	0	25852	0	0	0	25852
	84 FRA	0	924	0	0	0	924
	Subtotal	0	924	0	0	0	924
	Channichthys rhinoceratus (Longsnouted Icefish)	78 POL	0	0	0	0	82
Subtotal		0	0	0	0	82	82
80 FRA		0	4	0	0	0	4
80 POL		0	4	0	0	0	4
Subtotal		0	8	0	0	0	8
81 FRA		0	2	0	0	0	2
Subtotal		0	2	0	0	0	2

Species Name	YR CID	S58.4	S58.5	S58.6	S58.7	S58.0	T58.0
Rajiformes (Skates and Rays nei)	83 FRA	0	1	0	0	0	1
	Subtotal	0	1	0	0	0	1
	84 FRA	0	17	0	0	0	17
	Subtotal	0	17	0	0	0	17
Euphausia superba (Antarctic Krill)	74 JPN	0	0	0	0	446	446
	Subtotal	0	0	0	0	446	446
	75 JPN	0	0	0	0	2676	2676
	Subtotal	0	0	0	0	2676	2676
	76 JPN	0	0	0	0	4739	4739
	Subtotal	0	0	0	0	4739	4739
	77 JPN	0	0	0	0	12801	12801
	77 SUN	0	0	0	0	1866	1866
	Subtotal	0	0	0	0	14667	14667
	78 JPN	0	0	0	0	25527	25527
	78 SUN	0	0	0	0	26781	26781
	Subtotal	0	0	0	0	52308	52308
	79 JPN	0	0	0	0	35168	35168
	79 KOR	511	0	0	0	0	511
	79 SUN	0	0	0	0	28522	28522
	Subtotal	511	0	0	0	63690	64201
80 FRA	6	0	0	0	0	6	
80 JPN	0	0	0	0	34583	34583	
80 SUN	83764	0	0	0	0	83764	
Subtotal	83770	0	0	0	34583	118353	
81 JPN	0	0	0	0	22800	22800	
81 SUN	132237	0	0	0	0	132237	
Subtotal	132237	0	0	0	22800	155037	

Species Name	YR CID	S58.4	S58.5	S58.6	S58.7	S58.0	T58.0
Euphausia superba (cont) (Antarctic Krill)	82 JPN	0	0	0	0	27161	27161
	82 KOR	1429	0	0	0	0	1429
	82 SUN	119381	0	0	0	0	119381
	Subtotal	120810	0	0	0	27161	147971
	83 JPN	0	0	0	0	32071	32071
	83 KOR	1959	0	0	0	0	1959
	83 SUN	45620	0	0	0	0	45620
	Subtotal	47579	0	0	0	32071	79650
TOTAL		395041	90966	17	0	943106	1429130

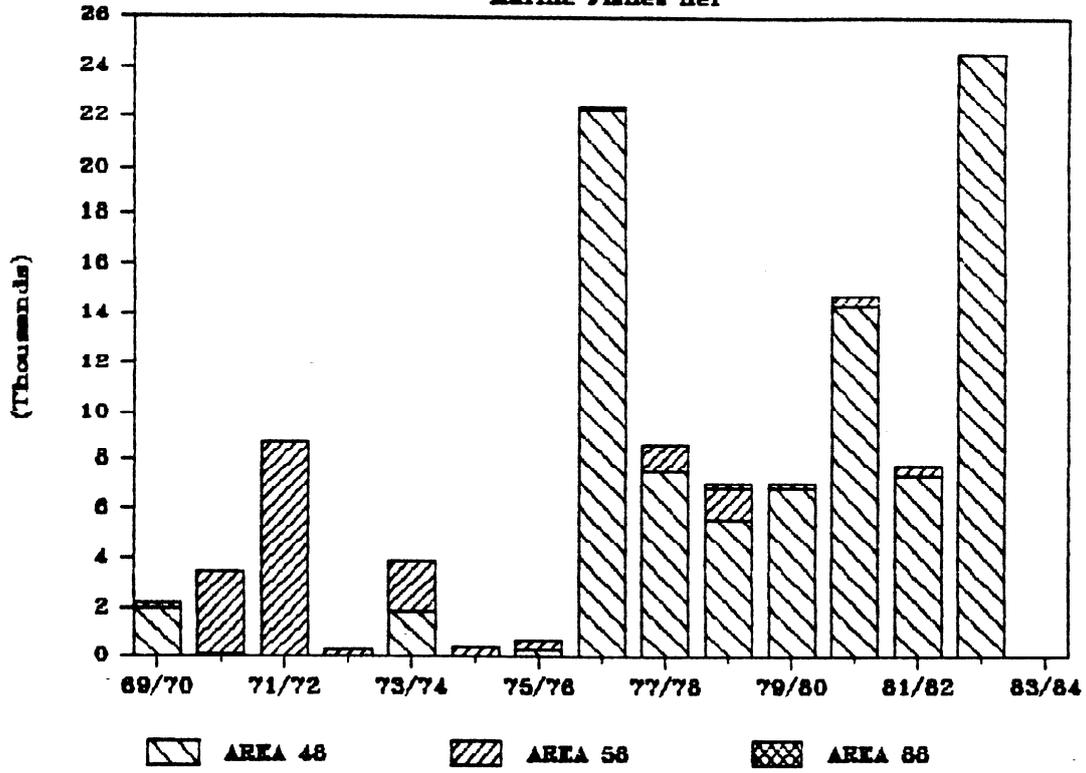
TABLE 9: LISTS ALL COMMERCIAL CATCH BY SPECIES, SPLIT-YEAR, AND COUNTRY FOR THE PACIFIC ANTARCTIC. SUBTOTALS HAVE BEEN TABULATED FOR EACH SPECIES FOR EACH YEAR.

Species Name	YR CID	T88.0
Pisces nei (Marine Fishes nei)	78 POL	23
	Subtotal	23
	79 SUN	200
	Subtotal	200
Pleuragramma antarcticum (Antarctic Sidestripe)	81 SUN	1517
	Subtotal	1517
	82 SUN	90
	Subtotal	90
Trematomus spp. (Antarctic Cods)	81 SUN	583
	Subtotal	583
Chamsocephalus gunnari (Antarctic Icefish)	82 SUN	15
	Subtotal	15
Euphausia superba (Antarctic Krill)	77 JPN	1
	77 SUN	3355
	Subtotal	3356
	78 JPN	520
	78 POL	36
	Subtotal	556
	79 JPN	2299
	79 SUN	600
	Subtotal	2899
	80 JPN	3195
	Subtotal	3195
	81 JPN	1167
	81 SUN	3080
	Subtotal	4247
	82 JPN	2557
	82 SUN	4093
	Subtotal	6650
	83 JPN	4718
	83 SUN	5919
	Subtotal	10637
Loliginidae (Squids nei)	78 JPN	391
	Subtotal	391
TOTAL		34359

**HISTOGRAMS: FOR ALL COMMERCIAL CATCH BY SPECIES,
SPLIT-YEAR, AND MAJOR FISHING AREA.**

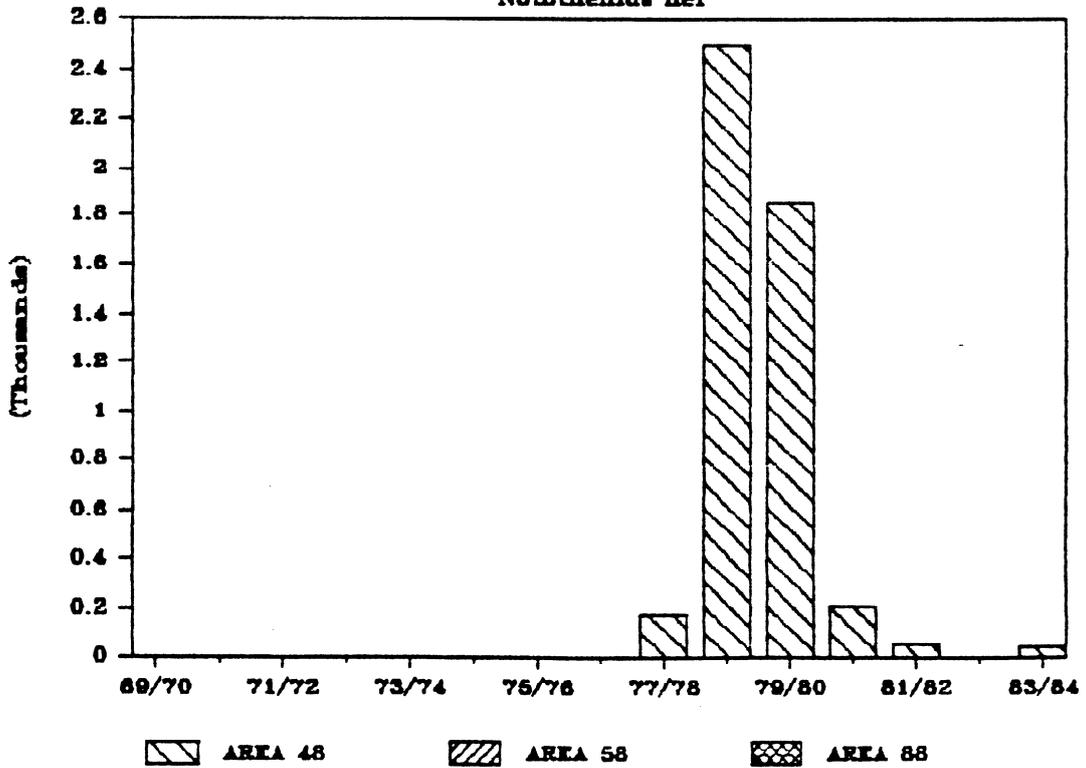
PISCES NEI , 1969/70-1983/84

Marine Fishes nei



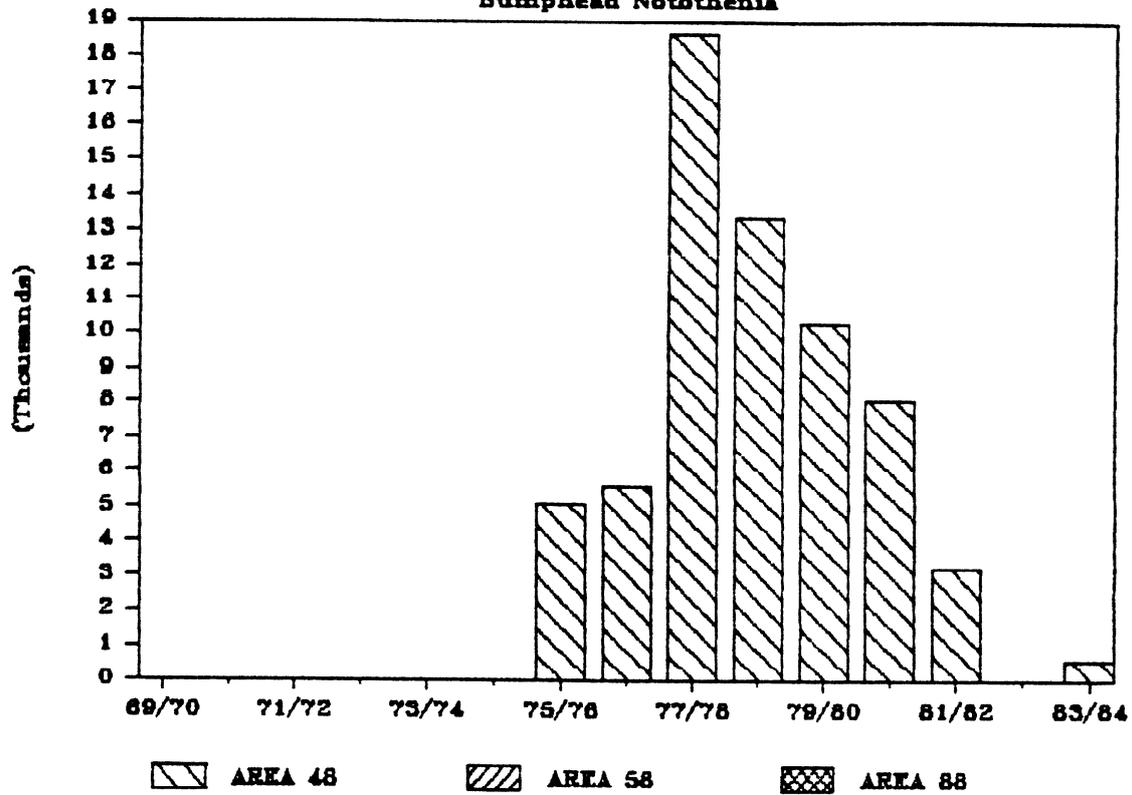
NOTOTHENIIDAE NEI , 1969/70-1983/84

Nototheniids nei



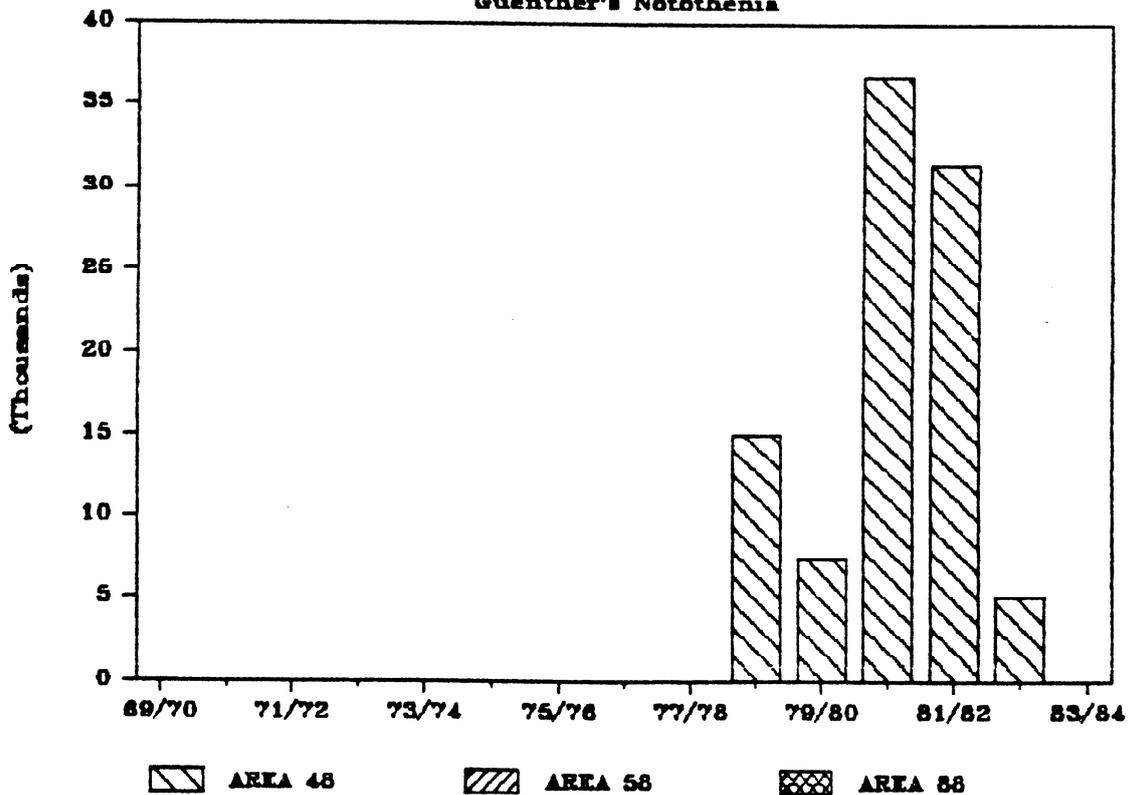
N. GIBBERIFRONS , 1969/70-1983/84

Bumphead Notothenia



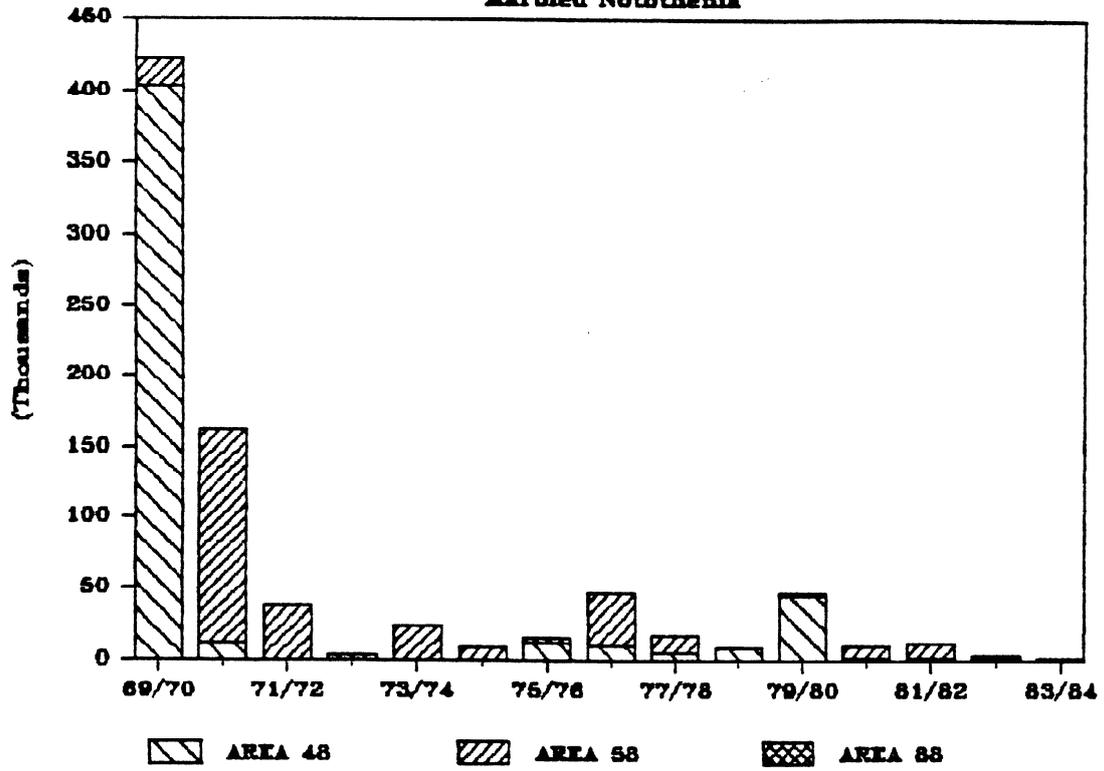
N. GUENTHERI , 1969/70-1983/84

Guenther's Notothenia



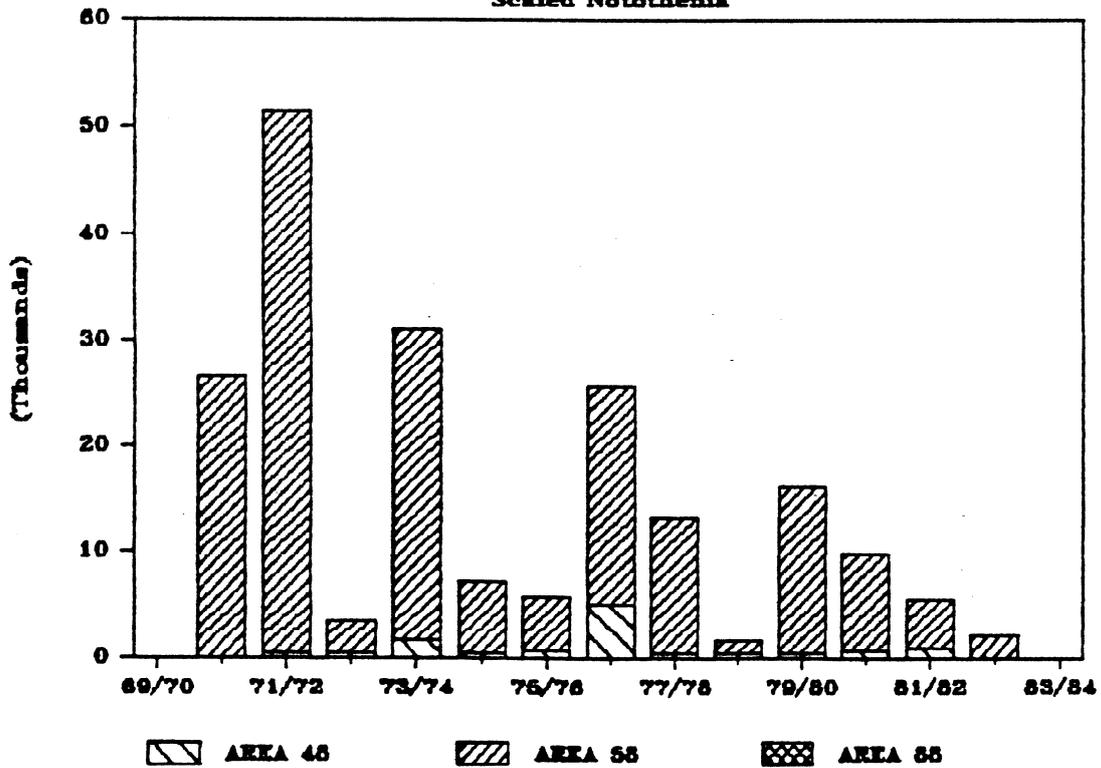
N. ROSSII , 1969/70-1983/84

Marbled Notothenia



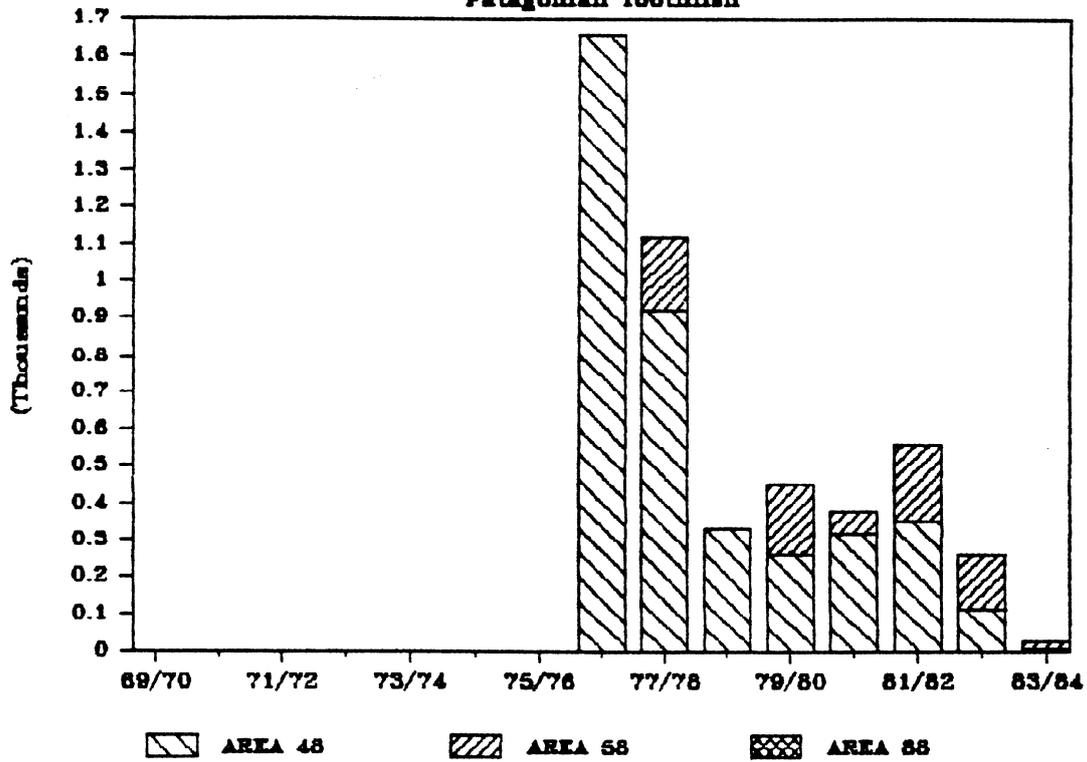
N. SQUAMIFRONS , 1969/70-1983/84

Scaled Notothenia



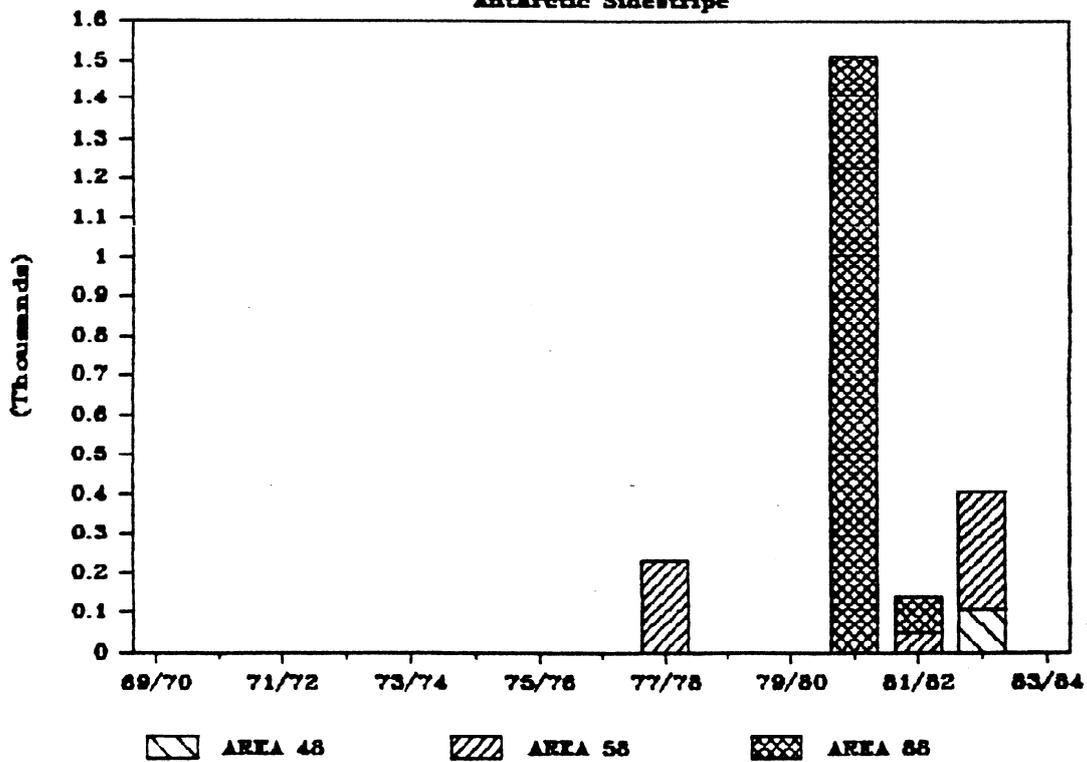
D. ELEGINOIDES , 1969/70-1983/84

Patagonian Toothfish



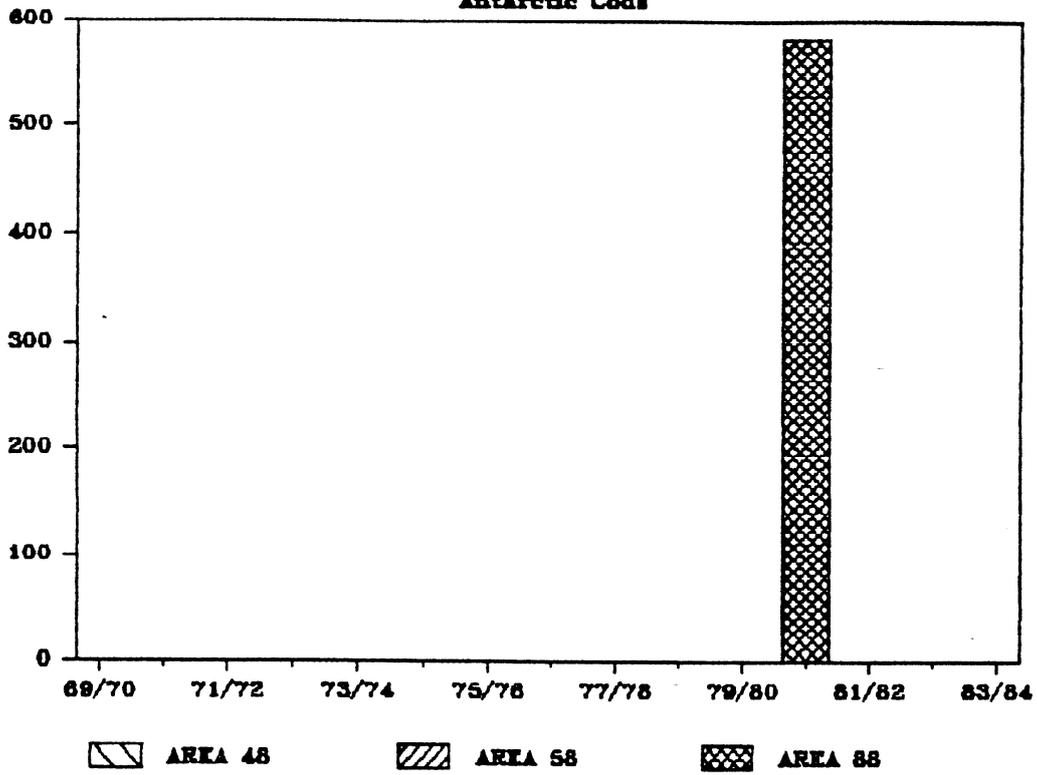
P. ANTARCTICUM , 1969/70-1983/84

Antarctic Sidestripe



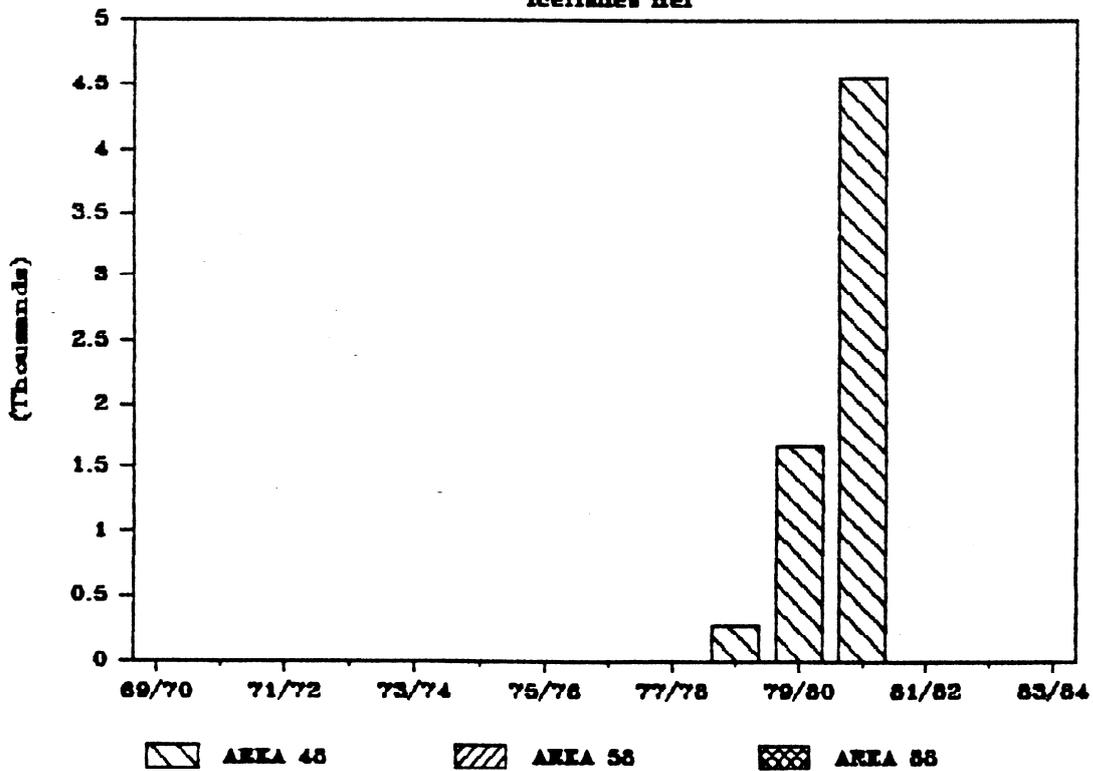
TREMATOMUS SPP. , 1969/70-1983/84

Antarctic Cods



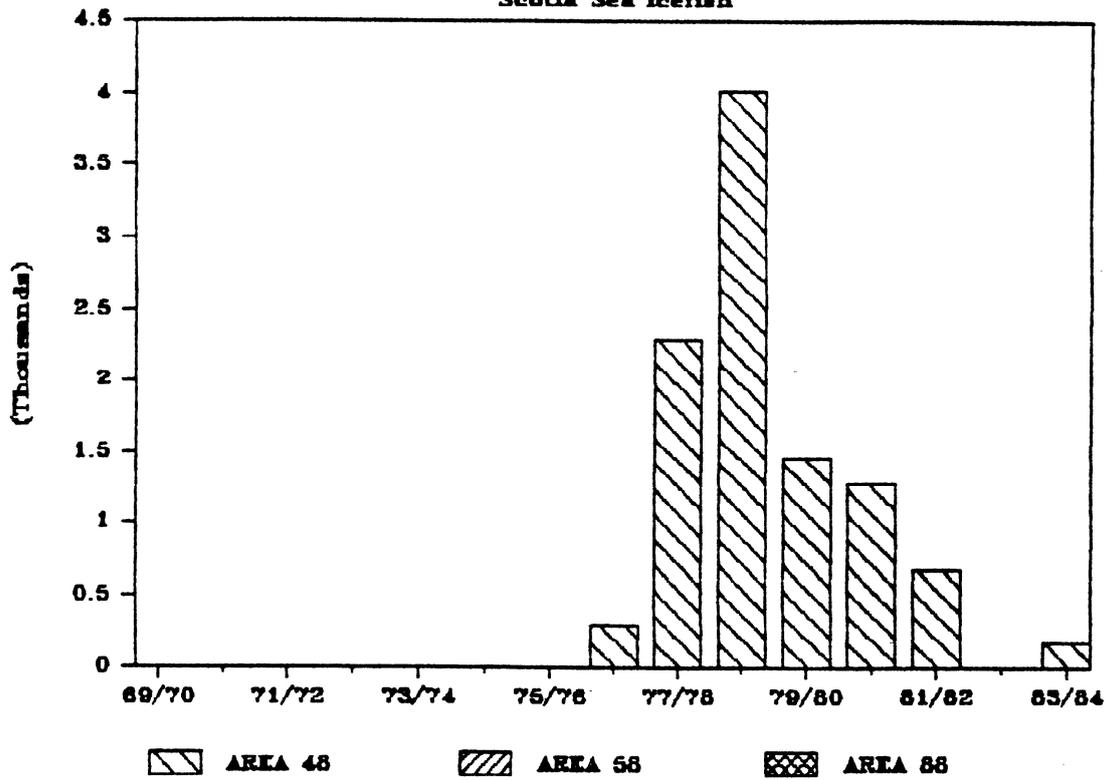
CHANNICHTHYIDAE NEI , 1969/70-1983/84

Icefishes nei



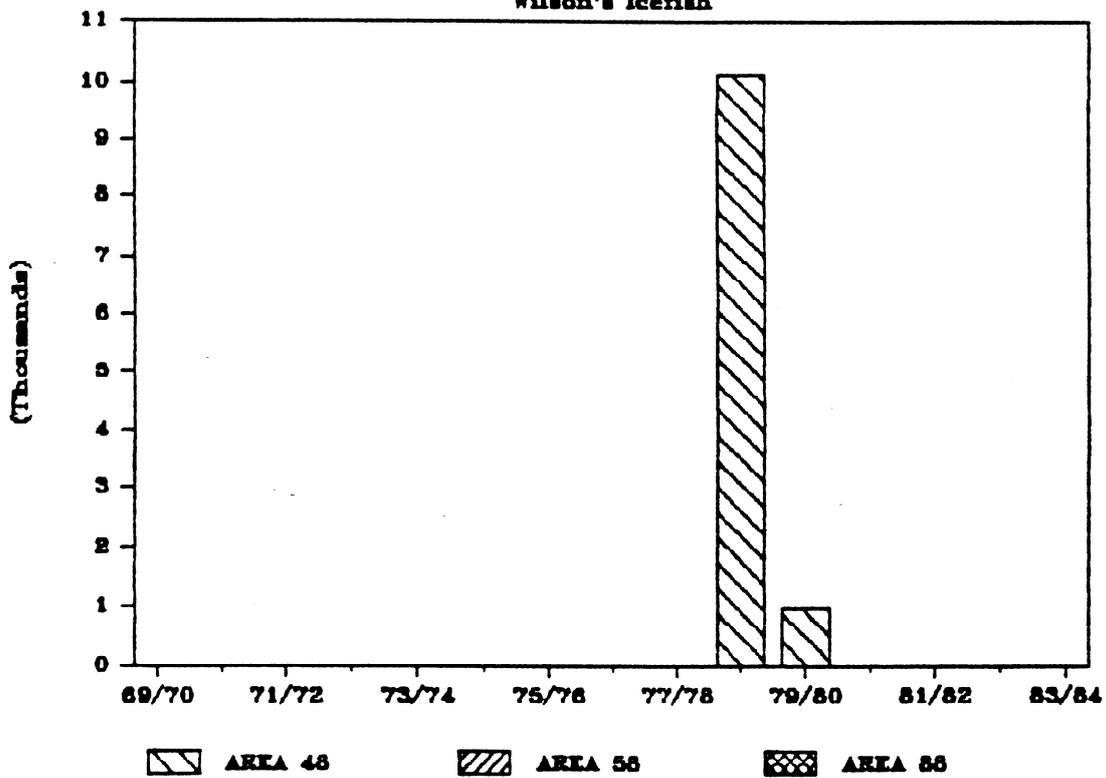
C. ACERATUS , 1969/70-1983/84

Scotia Sea Icefish

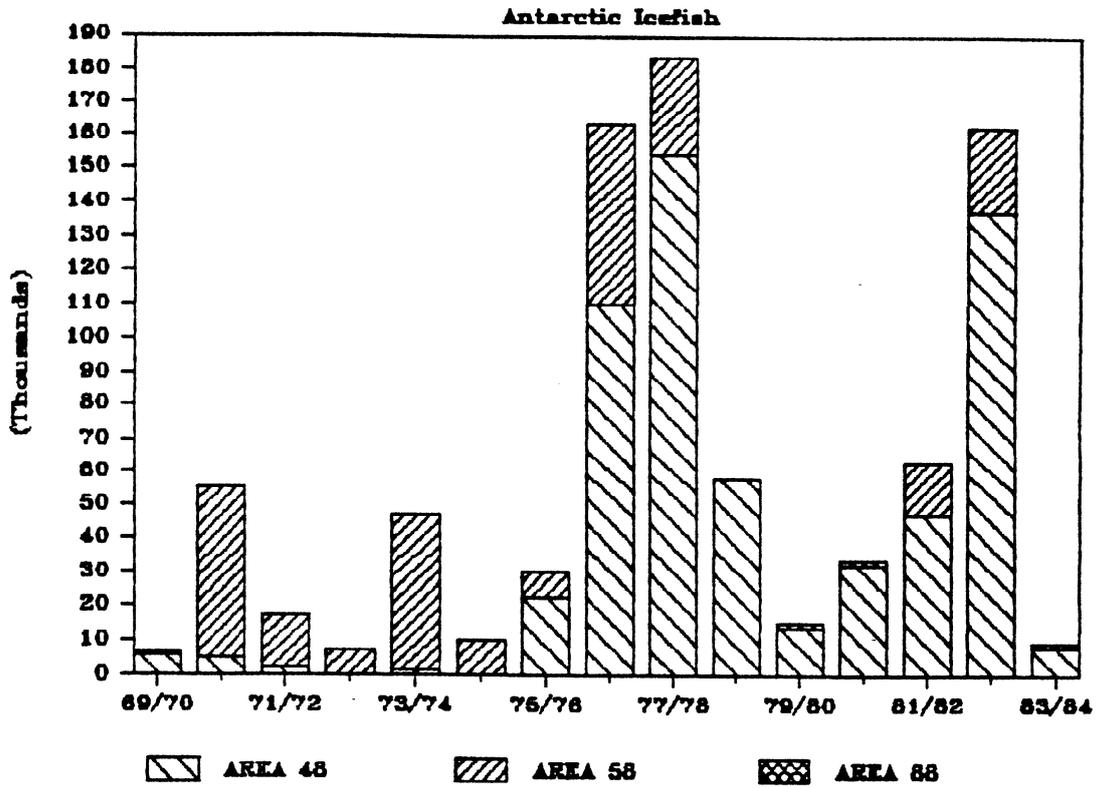


C. WILSONI , 1969/70-1983/84

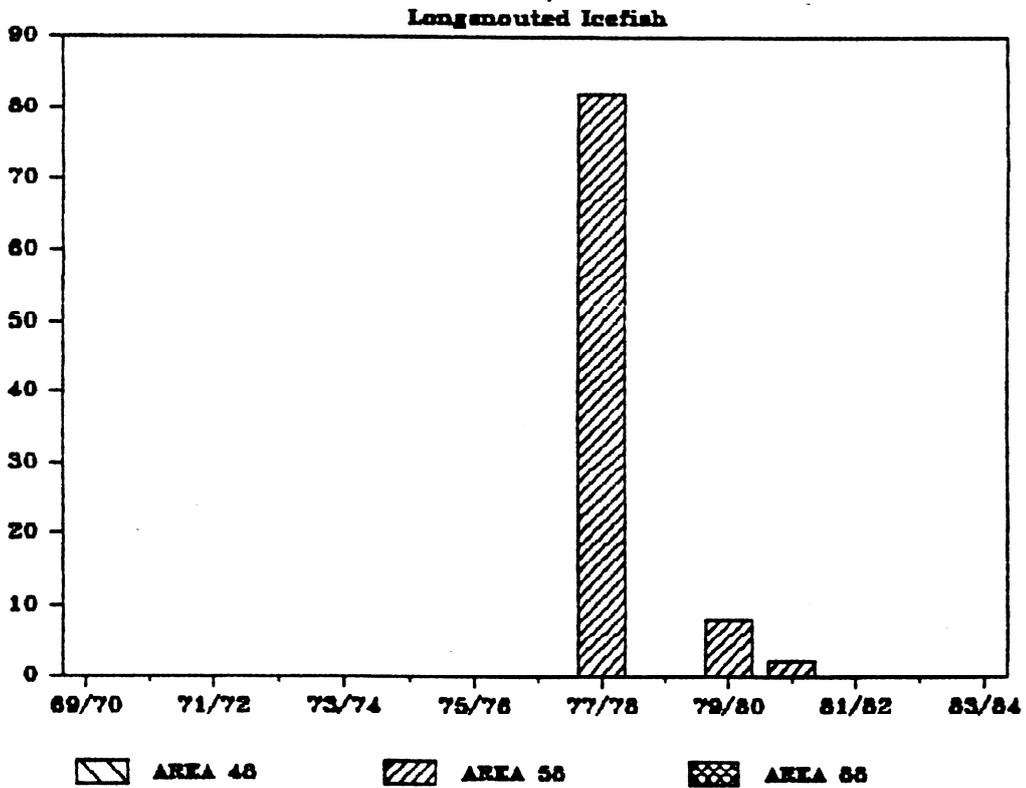
Wilson's Icefish



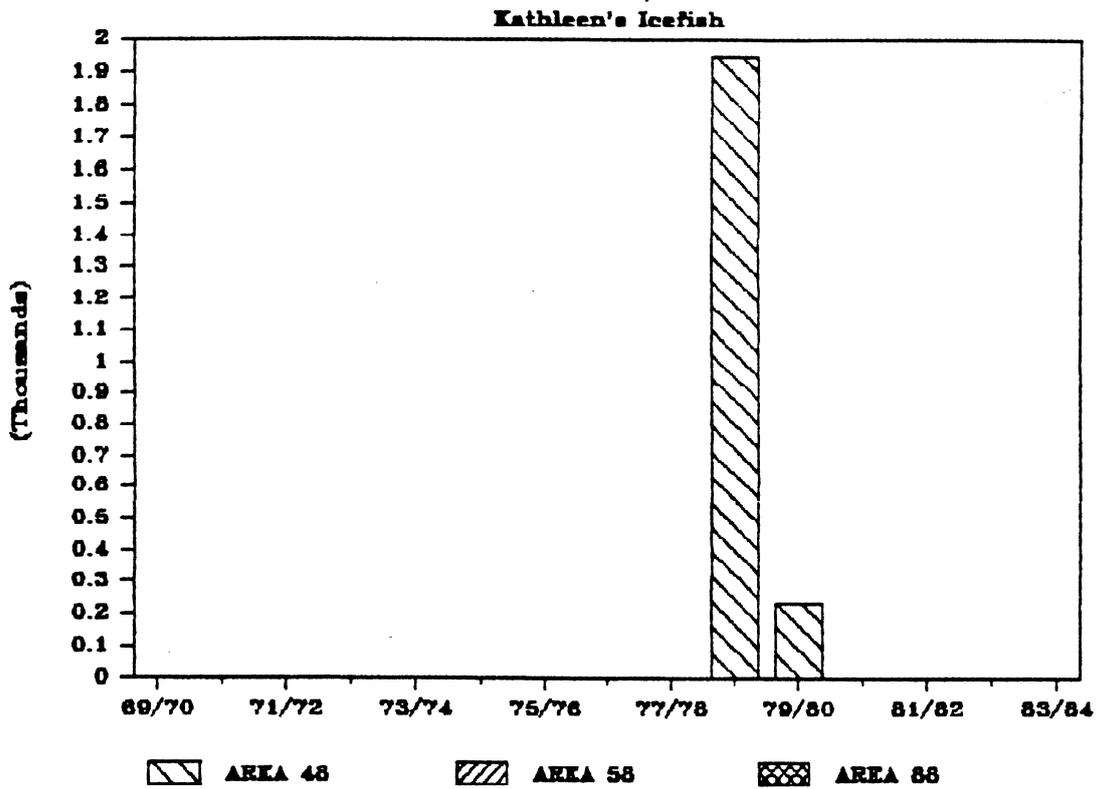
CH. GUNNARI , 1969/70-1983/84



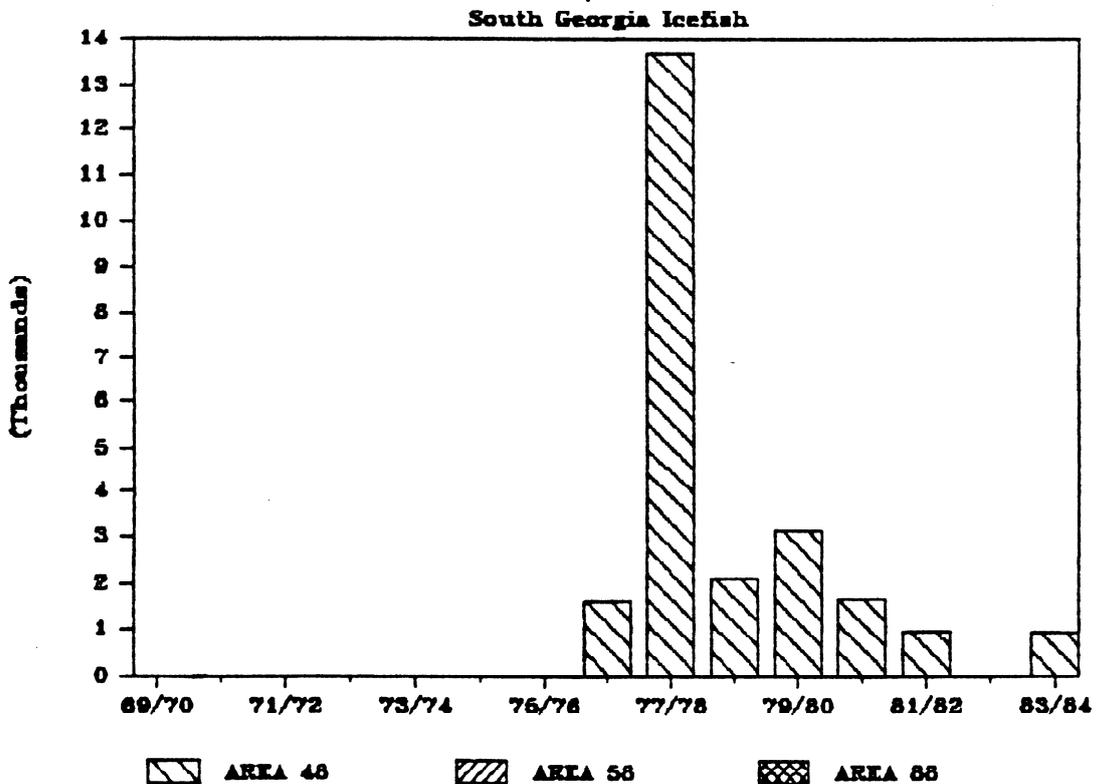
C. RHINOCERATUS , 1969/70-1983/84



C. RASTROSPINOSUS , 1969/70-1983/84

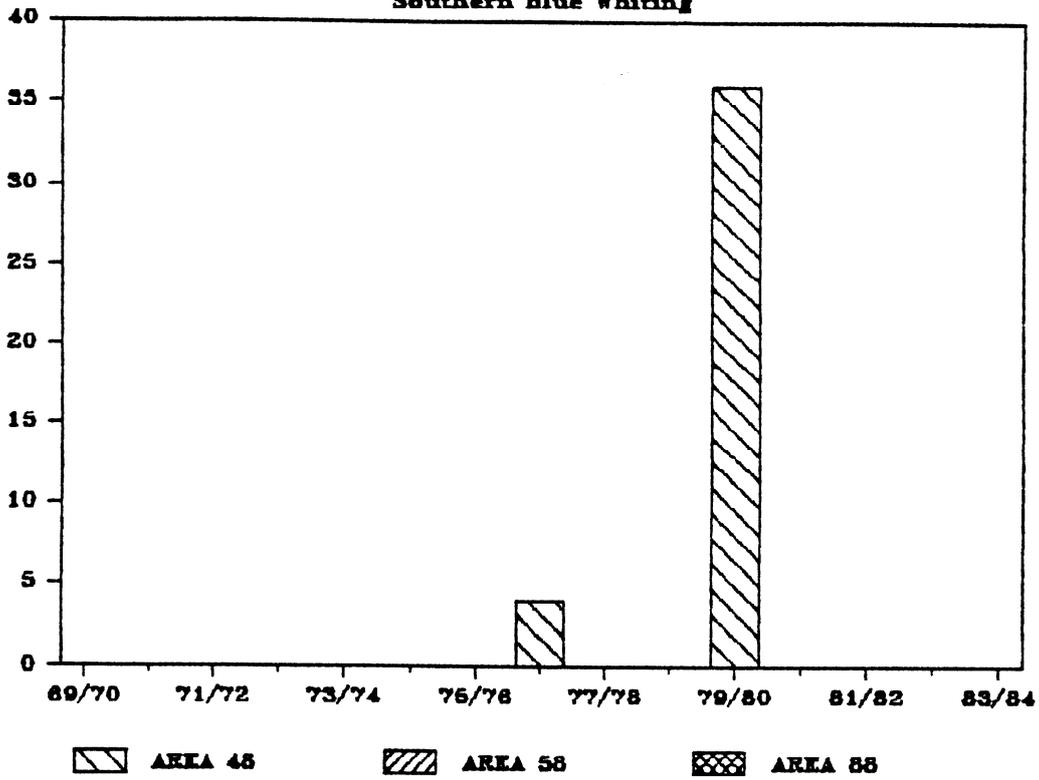


P. GEORGIANUS , 1969/70-1983/84



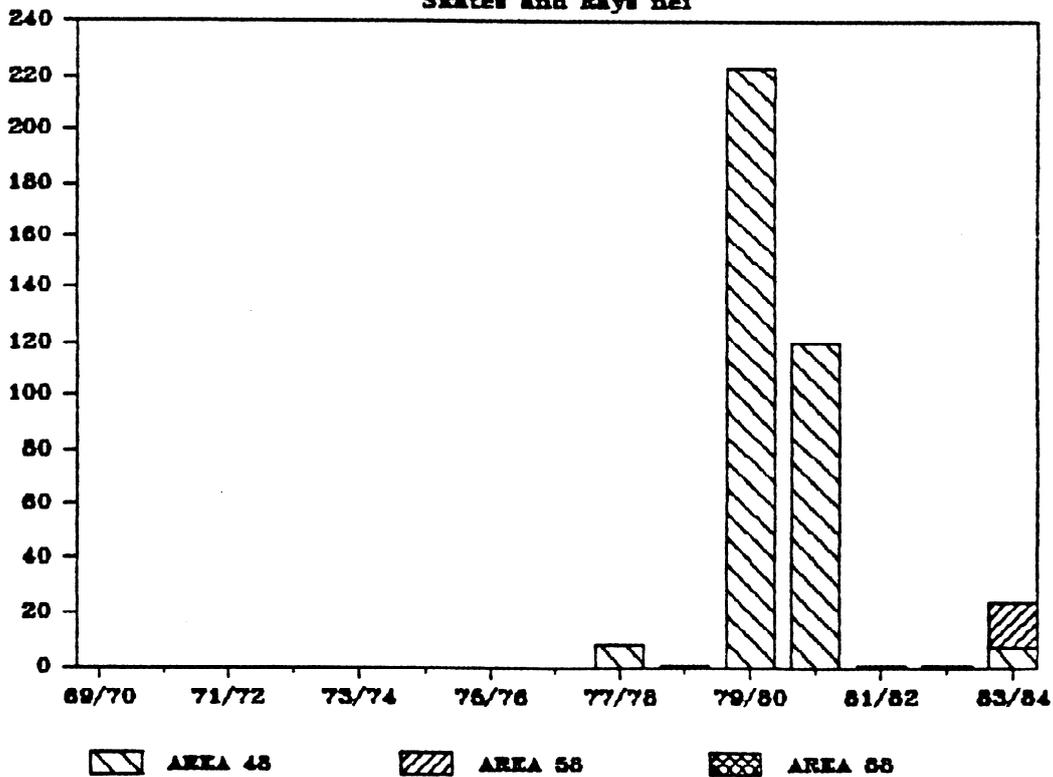
M. AUSTRALIS , 1969/70-1983/84

Southern Blue Whiting



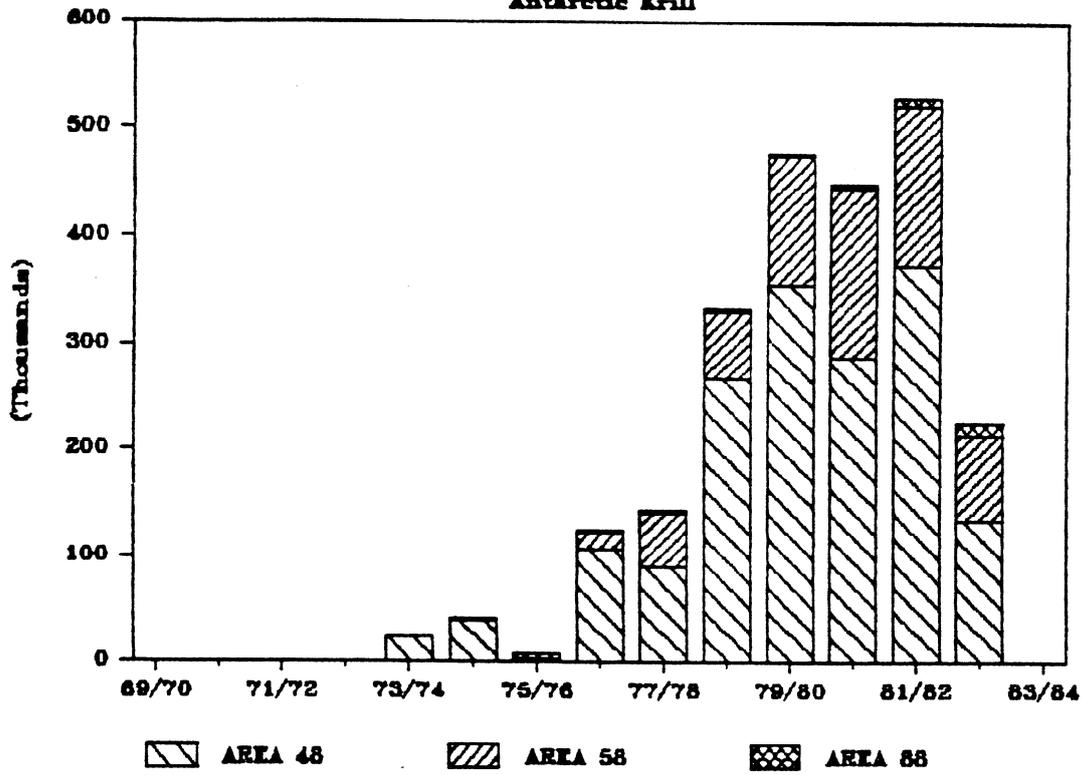
RAJIFORMES , 1969/70-1983/84

Skates and Rays nei



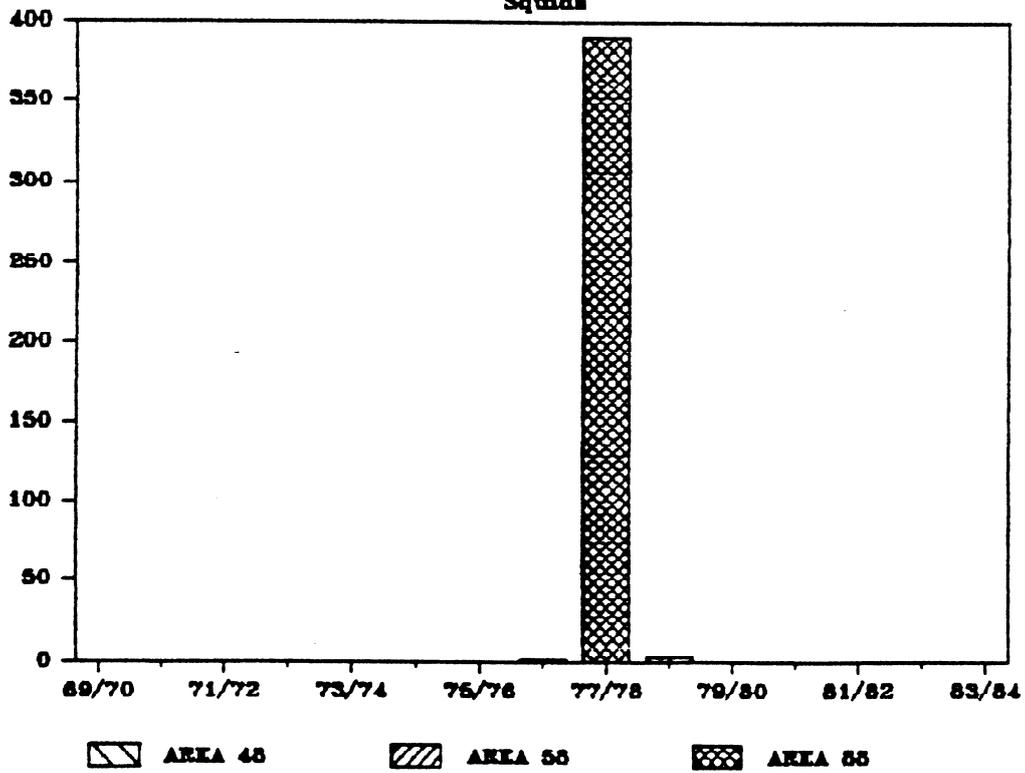
E. SUPERBA , 1969/70-1983/84

Antarctic Krill



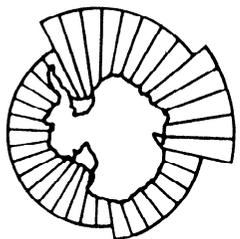
LOLIGINIDAE , 1969/70-1983/84

Squids



COLUMN HEADING DESCRIPTION

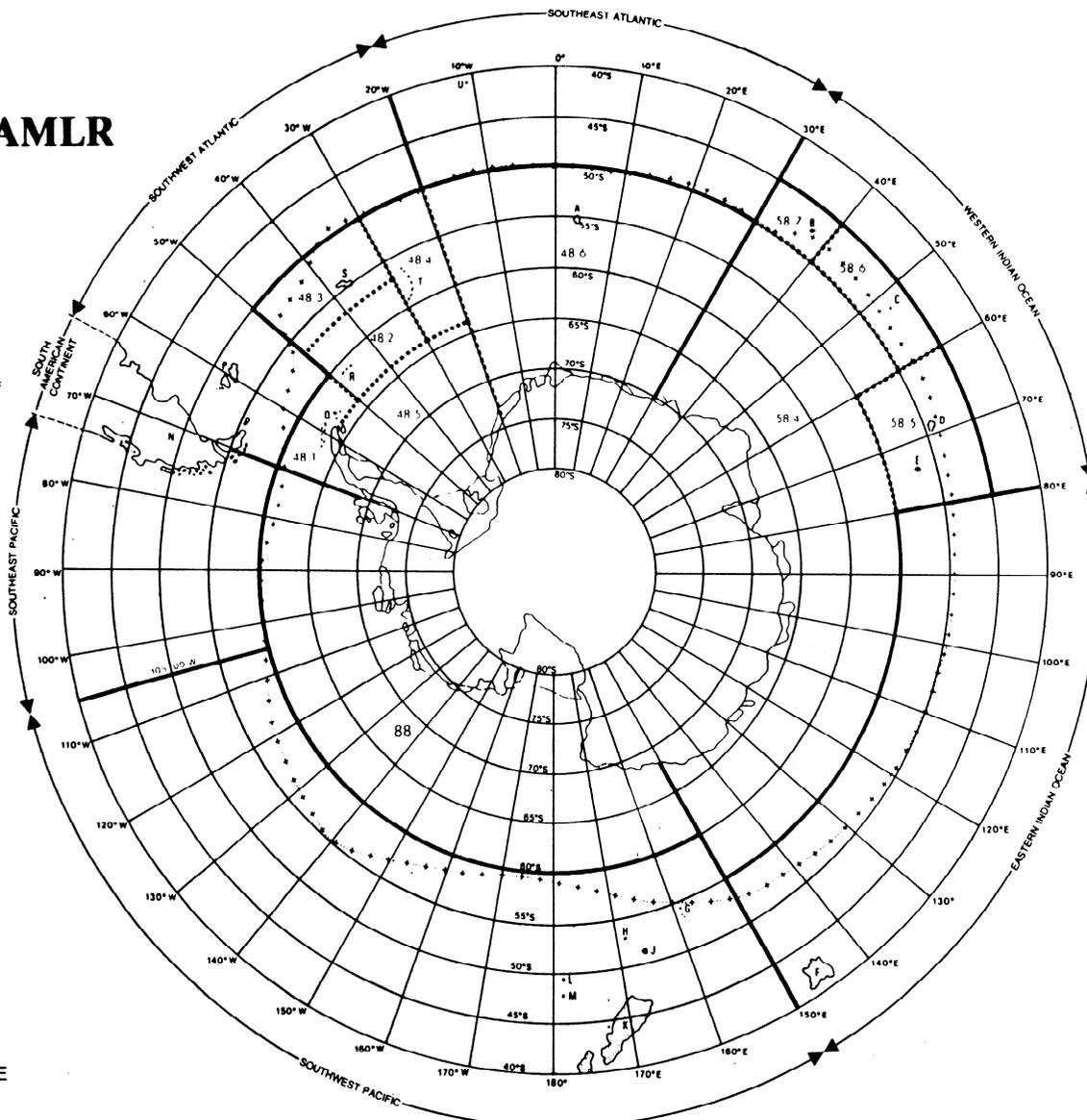
Element Name	Element Description
YR	Year in which Split-year (Fishing Season) ends.
CID	Country Identifier; Refer to Code Table Two, Appendix 3.
ALL AREAS	Total Metric Tons, Areas 48, 58, and 88.
S48.1	Total Metric Tons, Subarea 48.1 (Peninsula).
S48.2	Total Metric Tons, Subarea 48.2 (So. Orkney).
S48.3	Total Metric Tons, Subarea 48.3 (So. Georgia).
S48.4	Total Metric Tons, Subarea 48.4 (So. Sandwich).
S48.6	Total Metric Tons, Subarea 48.6 (Bouvet).
S48.0	Total Metric Tons, Area 48, Subarea Unknown.
T48.0	Total Metric Tons, Area 48.
S58.4	Total Metric Tons, Subarea 58.4 (Enderby Wilkes).
S58.5	Total Metric Tons, Subarea 58.5 (Kerguelen).
S58.6	Total Metric Tons, Subarea 58.6 (Crozet).
S58.7	Total Metric Tons, Subarea 58.7 (Marion & Edward).
S58.0	Total Metric Tons, Area 58, Subarea Unknown.
T58.0	Total Metric Tons, Area 58.
T88.0	Total Metric Tons, Area 88.



CCAMLR

Boundaries of the
Statistical Reporting
Areas in the
Southern Ocean

Prior to September 1984



LEGEND

- STATISTICAL AREA
- - - - - STATISTICAL SUBAREA
- · · · · ANTARCTIC CONVERGENCE
- CONTINENT, ISLAND

LEGEND

- A Bouvet Island
- B Prince Edward and Marion Islands
- C Crozet Islands
- D Kerguelen Islands
- E McDonald and Heard Islands
- F Tasmania
- G Macquarie Islands
- H Campbell Island
- J Auckland Islands
- K South Island
- L Antipodes Islands
- M Bounty Islands
- N South America
- P Falkland Islands (Malvinas)
- Q South Shetland Islands
- R South Orkney Islands
- S South Georgia
- T South Sandwich Islands
- U Gough Island

CODE TABLE TWO
COUNTRY IDENTIFICATION CODES

CID	FULL COUNTRY NAME
ARG	Argentina
AUS	Australia
BGR	Bulgaria
CHL	Chile
FRA	France
DDR	German Democratic Republic
DEU	Germany Federal Republic of
JPN	Japan
KOR	Korea Republic of
NZL	New Zealand
NOR	Norway
POL	Poland
ZAF	South Africa
SUN	Union of Soviet Socialist Republics
GBR	United Kingdom of Great Britain and Northern Ireland
USA	United States of America

**REPORT OF THE AD HOC WORKING GROUP
ON DATA COLLECTION AND HANDLING**

(11–16 June, 1984)

Woods Hole, Massachusetts, USA *

* This Annex 6 does not contain all appendices originally provided with the Report of this Working Group. The complete set of appendices is in Document SC-CAMLR-III/9.

Introduction

1. During the September 1983 meeting of the Scientific Committee of the Convention for the Conservation of Antarctic Marine Living Resources (SC-CAMLR), an *ad hoc* Working Group was formed to consider data collection and handling. The terms of reference are contained as Annex 9 to the Report of the 1983 Meeting of the Scientific Committee of CCAMLR. It was agreed that the Working Group should be convened in Woods Hole, Massachusetts, U.S.A., by Mr Hennemuth during June 1984 in order to consider the types of assessments that likely will be required in order to determine and monitor the status of Antarctic marine stocks, and to consider and provide advice to the Scientific Committee on the kinds of data needed to support required assessments. The agreed agenda items are in Appendix 1.

2. The meeting was commenced on 11 June. The participants are listed in Appendix 2. Mr F. Ralston and Dr D. Powell of the CCAMLR Secretariat were appointed rapporteurs. **

Review of the Secretariat's Activities Related to Commercial Fishing Data

3. During the 1983 meeting of the Scientific Committee, a form was prepared to provide an inventory of past commercial fishing data. The form was included as Annex 6 of the Report of the Scientific Committee's second meeting. Members agreed to complete the form and return it to the Secretariat. The results of this process were to be compiled by the Secretariat and presented during the third Scientific Committee meeting in September 1984.

4. Additionally, the Secretariat was asked to acquire all Antarctic STATLANT data. Firstly, all 08A and 08B forms returned to FAO were to be obtained. Secondly, requests to members for additional data were to be made where the data appeared to be incomplete. Members agreed to fill in the historical gaps in these data. Once completed, this data set is to be used in order to produce a draft statistical bulletin for discussion by the Scientific Committee at its next meeting.

** The Chairman's comments on the Report is in Appendix 3 to the Report.

Status of Inventory of Past Commercial Fishery Data

5. As of 12 June, twelve responses regarding the commercial inventory had been received. It was indicated during the meeting that no commercial operations had been conducted by Argentina, the United Kingdom, South Africa, and the United States. Australia, Belgium, the Federal Republic of Germany, and New Zealand had previously reported that no commercial operations had been undertaken. Commercial fishing data have been identified by the following members: Chile (1975/76, 1976/77, and 1982/83 to 1983/84), France (1979/80 to 1983/84), the German Democratic Republic (1976/77 to 1980/81) and Japan (1972/73 to 1982/83).

STATLANT 08A Catch Data

6. All available STATLANT 08A data have been acquired from FAO by the Secretariat. Additionally, five 08A reports were submitted directly to the Secretariat by two of the commercial fishing nations. During the meeting the German Democratic Republic submitted revised 08A reports which supersede previous data for the years 1977/78 to 1979/80. Twenty-three STATLANT 08A reports had been received by the time of the meeting.

7. The Chilean representatives advised that the STATLANT 08A forms for the split-years 1975/76, 1976/77 and 1982/83 would be completed and submitted to the Secretariat as soon as practicable.

8. The Japanese 08A returns obtained from FAO had been superseded by revised data as contained in the FAO Yearbooks of Fishery Statistics. In order to provide the Secretariat with more precise data than is available from the Yearbooks, the Japanese delegate indicated that subarea specific catch data would be provided for 1977/78 to 1979/80 and that 08A reports from 1980/81 to 1982/83 would be submitted in July 1984. Earlier 08A data from 1972/73 to 1976/77 will be assembled under 08A format and submitted in September 1984.

9. STATLANT 08A forms have been submitted by the Soviet Union for split years 1978/79 to 1981/82. It was indicated that 08A forms from 1969/70 to 1977/78 and 1982/83 will be provided to the Secretariat as soon as is practically possible.

STATLANT 08B Effort and Catch by Month Report

10. All available STATLANT 08B data have been acquired from FAO by the Secretariat. Additionally, five 08B reports were submitted directly to the Secretariat by two of the commercial fishing nations. Sixteen STATLANT 08B reports had been received by the time of the meeting.

11. The delegate from the German Democratic Republic advised that 08B reports for 1977/78 to 1980/81 will be provided to the Secretariat by the end of 1984. These will conform to the revised 08A catch data submitted on 12 June 1984.

12. The Chilean representatives advised that STATLANT 08B forms for the split-years 1975/76, 1976/77 and 1982/83 would be submitted to the Secretariat as soon as practicable.

13. The Japanese delegate advised that the 08B reports from 1980/81 to 1982/83 would be provided in July 1984. The 08B reports for the years 1972/73 to 1976/77 will be prepared and submitted as soon as practicable.

14. Soviet STATLANT 08B reports from 1969/70 to 1977/78 and 1979/80 to 1982/83 will be prepared and submitted to the Secretariat as soon as is practically possible.

15. It was noted that the FAO Fishery Information, Data, and Statistics Service attempts to edit 08A returns for accuracy. Discrepancies are resolved with the help of nations submitting the data. FAO does not normally process, edit or present 08B data and the 08B returns received to date by CCAMLR have not been completed by nations in a uniform way. This will make it difficult to consolidate fishing effort in a standardised manner.

16. The current status of STATLANT data held by the Secretariat is shown in Annex 4 to the Report of the Scientific Committee.

Spatial and Temporal Distribution of Fish and Krill Fishing Stocks

Fish

17. The USSR presented graphical information prepared by Soviet scientists on the geographical distribution of its past fisheries and indicated areas of future potential fishing (Appendix 4). The GDR delegate presented a document describing the areas fished in the

past by its fleet, and also the results of exploratory cruises. France provided a document on the spatial and temporal distributions of fish around Kerguelen Island. (Appendix 5).

18. The Antarctic islands seem to have independent stocks of fishes. This is indicated by differences between areas for both morphological and meristic characters of identical species. However, behavioural habits and life histories of a given species are similar throughout the area.

19. Commercial concentrations of fishes are mostly found at depths less than 500 metres. Consequently, commercial harvesting activities have been and can be expected to continue to be conducted over shelf areas along the continent and around islands.

20. There are fluctuations in fish distribution and density related to hydrological conditions and weather patterns which are seasonal and can vary from year to year. Coastal regions serve as nursery areas for *Nototheniidae*. Seasonal movements of several of the major species are related to their spawning cycles.

Krill

21. Japan described the distribution of its fishery from 1972/73 to 1982/83. Chile provided a document on the development and distribution of its fishing activities in the Antarctic.

22. The krill fishery has been concentrated in several localities of the Southern Ocean. In the Atlantic sector krill fishing has been closely associated with the productive areas of the Scotia Ridge, Weddel-Scotia Confluence and the west side of the Antarctic Peninsula. The only important fishing grounds near to the Antarctic Convergence are off South Georgia. In the Indian Ocean Sector the Enderby-Wilkes area is important, particularly off the shelf ice edge between longitudes 90°E and 120°E.

23. Genetically different stocks of krill have not yet been identified. There may however be distinct demographic stocks where mixing rates, although slow, are great enough to obviate any measurable genetic variation. If the recruitment and age structures of different demographic stocks vary, there may be reason to treat the population as multiple stocks.

24. It is possible that certain areas within the Southern Ocean contain closed stocks (e.g. Prydz Bay). Others are characterised by large-scale inward transport. For example, it has

been estimated that in South Georgia the annual consumption of krill by predators exceeds the size of the standing stock, implying movement of krill from outside areas.

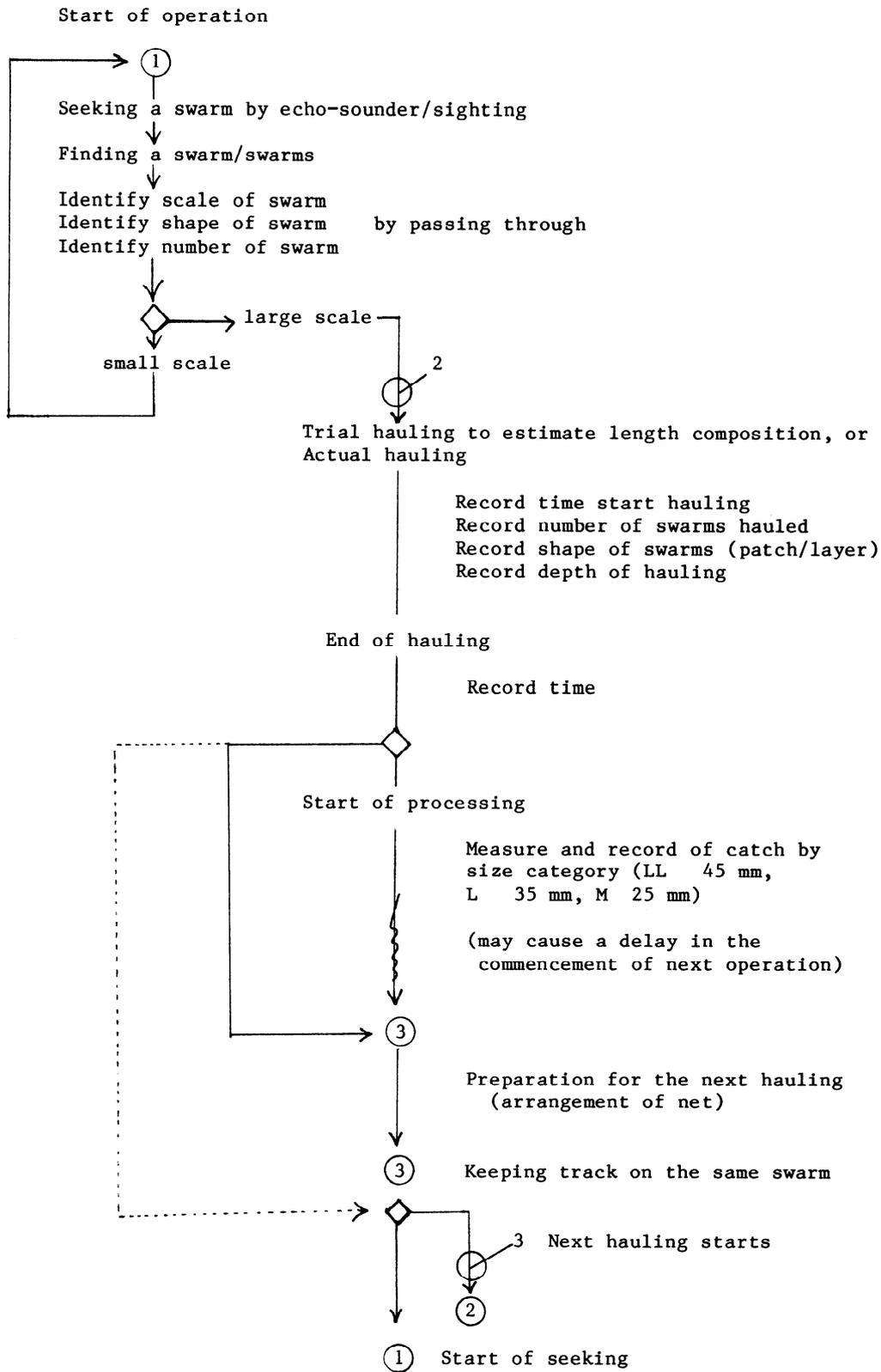
Fishing Operations and Commercial Data Recording

25. According to Japanese data krill are usually caught using midwater trawl nets towed at depths less than 50 metres. Searching for krill is conducted primarily using sonic detection methods, although some visual searching occurs. It is not unusual for coordinated searching strategies to be employed in locating krill swarms, and fleets of vessels use radio communications to close in on large swarms once located.

26. The Group agreed that a more detailed understanding of fishing operations was necessary to interpret data for catch and effort. Delegates from the fishing nations were asked to describe the operation of their fleets.

27. The Japanese delegation provided the following schematic representation of Japanese krill fishing operations.

Operating flow of Japanese Krill Fishery (in case of independent vessels)



28. The delegate from the USSR informed the meeting that the USSR operation was similar in most respects to that of the Japanese. The particular feature of the Soviet fishery operation is the wide use of fishery research vessels' data obtained on fishing grounds. These data provide information on krill distribution during fishing operations.

29. It was noted that a fuller description of the operation of fishery research vessels would be presented at the next Scientific Committee meeting.

30. It was reported that neither Chilean nor Japanese trawlers use searching vessels to augment the fishery operations.

31. It was suggested that data from searching vessels would be particularly useful in analysing commercial catch and effort data for abundance-estimation purposes. It was hoped that such data might provide some measure of patchiness or spatial distributions of krill in the commercially important fishing regions. Data from the fishery research vessels will be identified by delegations during the next CCAMLR meeting using the previously agreed Scientific Data Inventory (SC-CAMLR-II/11, Annex 7).

32. It was agreed that because fishery research vessels contribute in part to the searching process it would be necessary to record such activities aboard fishery research vessels as well as trawlers.

33. The papers tabled by the Chilean delegation proposed a basic format for the data collection from commercial krill fishing in detail, including copies of log sheets and instructions for their completion. (Appendix 6).

34. It was agreed that Chile, Japan, and the USSR would prepare papers on their krill fishing operations and national systems for recording basic data for presentation at the next meeting of the Scientific Committee. It was indicated that log sheets would be useful as attachments to these papers.

Methods and Data Employed for Assessment of State of Fish and Krill

Discussion Papers

35. Several papers prepared for this meeting were tabled for discussion under this agenda item (Appendix 7).

36. The Working Group agreed to structure the item so as to deal first with krill and then fish.

Krill

37. There was a general discussion of the particular difficulties, raised in the UK paper, of stock assessments of shoaling species such as krill. The varying concentrations in super swarms, swarms, and dispersed animals can give misleading results if standard catch-per-unit-effort (CPUE) data, routinely collected as catch per fishing hour, are used. For example, the catch per tow will probably represent the density within a swarm, while for vessels fishing on an exterior patch or super-swarm the catch per unit searching time will represent the density of swarms within the super-swarm.

38. It seems therefore unlikely that it will be easy to devise a single figure of total effort, or catch-per-unit-effort which can be used as a reliable index of fishing mortality, or of total stock abundance. Rather it may be necessary to build up information on stock abundance, and changes in abundance, from different sources, each relating to different elements that determine total abundance (within swarm density, size of swarms, frequency of swarms, etc). Data on the time spent searching is likely to be important for second elements.

39. A particular pattern arises from the fact that the active fishing operations tend to be concentrated in a few locations which make up only a small proportion of the potential krill habitat. Information on krill in the other areas, even if only of a qualitative nature (presence/absence, intensity of acoustic signals, etc), will therefore be of great value. This implies that data will be needed on the operation of the vessel, i.e., for what period it is searching, what period fishing, what period handling the catch, etc.

Provision of Catch-Per-Unit-Effort (CPUE) Data for Krill

40. At present, fishing vessels routinely record information on catch per haul, but not on activity. For those operations where vessels both fish and search, the Working Group suggested that some extra information to that currently recorded during fishing operations in the logbooks would add significantly to the value of the catch effort information. This would involve recording whether trawl hauls are on the same or different krill aggregations, and/or the time spent searching between different krill aggregations. This latter information could be

deduced from the data routinely collected if the periods when the vessel was searching were recorded. Delegations from fishing nations noted the difficulties of getting precise data on searching times from commercial operations.

41. For those operations where fishing vessels use information directly from fishing research vessels, there is less advantage in seeking information on searching time from fishing vessels. Fishery research vessels operating in association with fishing vessels may be capable of providing information on the distribution and abundance of krill aggregations. Such information could be used in conjunction with CPUE data from fishing vessels operating in the same area to construct an index of abundance. The Working Group suggested that fishery research vessels collect, on a routine basis, information on the distribution and abundance of krill aggregations. The way this information could be provided will depend on the characteristics of the fishery research vessel, e.g., whether it possesses an echo integrator or not.

42. The information that is required falls into two broad but related categories:

1. Distributional data which describes the geographical limits of the aggregation. Such data would be derived from the cruise track.
2. Quantitative data which describes the abundance over the aggregation. Such data would best be obtained using echo integrators. Alternatively, simple qualitative data, in terms of presence/absence of swarms or some simple measure of swarm categories per unit distance, could provide simple contour maps to stratify abundance data from other sources. The acoustic data will need to be complemented by data from net hauls to identify the species composition and the size frequency distribution of acoustical targets.

Hydroacoustic and Net Surveys

43. The Group agreed that hydroacoustic and net surveying could provide useful information for assessing stock abundance provided the surveys were carefully planned. The two techniques need to be used together providing information on the species being detected and also size frequency information for target strength estimation. Net surveys are the only possibility for surveying very dispersed krill because of the inability of hydroacoustics to detect low concentrations.

Fish

44. The Group noted that at the 1983 meeting of the Scientific Committee it was agreed that items on ecosystem management and fish stock assessment would be included on the agenda of the 1984 meeting. Members are to prepare papers on both subjects for consideration at the meeting and are to include their comments on past reports of the BIOMASS Fish Ecology Working Group and a recently completed review of the ecosystem prepared by BIOMASS.

45. The section of that review dealing with fish has been prepared by Drs Kock, Duhamel and Hureau, and the Chairman asked the authors to briefly summarise the appropriate parts of their work.

BIOMASS Review of Exploited Antarctic Fish Stocks

46. The review includes a summary of the development of the fishery, sections on the life cycle of the species, review of data relevant to population dynamics and stock assessment (length and age at sexual maturity, length-weight relationships, age and growth, natural mortality), catch statistics and landings, influence of fishing on the stocks (length-frequency distributions, CPUE, fishing mortality, detrimental effects of by-catch in krill fisheries on recruitment), preliminary biomass estimates, advice on fisheries management, and recommendations for future work to be done.

47. The conclusions of the review were constrained by the lack of sufficiently good data for all regions in the area. All available data were used, both published and unpublished, including FAO data and particularly STATLANT 8B data from Polish operations from 1978 to 1982 in the South Atlantic and French data from the Kerguelen fishery.

48. The authors conclude that there is an obvious decline in abundance of some species of fish in the South Georgia and Kerguelen areas.

Data Collection

49. Since 1979, the USSR has fished the waters around Kerguelen Island under an agreement with the French Government. The operation of the agreement was described by

Drs Hureau and Duhamel, and a copy of the log sheet in which the catch and effort data are recorded was distributed to the Working Group. In addition to the fishing record, length-frequency sampling is carried out on all vessels by French observers.

50. The delegate of the German Democratic Republic described the data collection system of the GDR and outlined some analyses of the data for 1977 to 1981 fishing in the South Atlantic. The catch per unit effort was found to vary within a season and no clear trend was evident from their analyses. It was acknowledged that the data set used in the calculation was limited. GDR data are virtually all from commercial operations. Only one research cruise has been conducted by the GDR.

51. The Soviet delegate briefly reported on the data collection by the Soviet Union. A standard log is used by fishing vessels to record data on each haul. Length-frequency data are collected by survey and fishery research vessels.

Catch and Effort

52. The Working Group concluded that the data collection systems used by members fishing in the convention area were similar and compared well with the logbook information list included as Annex 8 in the Report of the 1983 Meeting of the Scientific Committee.

53. It was agreed that for the purpose of stock assessment of both finfish and krill most of the information given in the list in Appendix 6 was needed, although some doubts were expressed about the need for identifying particular types of equipment and vessel characteristics. Delegates from fishing nations indicated concern that certain data could not easily be collected in the future and had not been collected in the past.

54. Questions were raised as to how the fine units of fishing effort as listed were to be used. It was noted that this type of data is best applied in conjunction with various information on the behavioural habits and distributions of exploited stocks. Consequently, work should be planned quickly which is aimed at improving the distributional, behavioural and biological understanding of krill stocks and further evaluating data needs.

Length Sampling

55. The sampling of catches from commercial or research vessels was considered from two points of view – the sampling design needed for optimum deployment in a sampling program of given manpower and other resources, and the minimum target levels required to obtain useful data.

Fish

56. General fishery experience has shown that a point is quickly reached beyond which measuring a larger sample from a given catch, or measuring more samples from a local concentration of fishing activity, adds little information on the length composition of the catches or population as a whole. The precise point depends on the spread of lengths within the aggregate of fish being sampled, the degree of the haul-to-haul or area-to-area variability, and the work involved in increasing the size of the samples, as compared with taking more samples. Typically, the optimum size of sample is 50 fish or less; although, because it can be difficult to take a truly random sample of a small number from a large catch, a reasonable operational guide may be a sample size of 75–100 fish per haul.

57. At the meeting of the Ad Hoc Working Group on Data Collection and Handling during the Hobart session of CCAMLR in 1983, it was suggested that a provisional target for the intensity of sampling should be, for each species, at an intensity of not less than one sample from each major area each month, or 200 fish per 500 tons caught (SC-CAMLR-II/INF.10). It was noted also, that on each fishing ground one sample per day was collected from the fishery around Kerguelen Island.

58. The present meeting did not have sufficient information to suggest modifications or to support these targets. It would probably be impossible to define exact sample size, but further information with a haul-to-haul or area-to-area variation, and the spread of sizes within a sample, should enable better sample sizes to be suggested. Sampling intensity should probably also depend on the magnitude of the fishery, increasing in terms of absolute numbers of samples, but decreasing as a proportion of the catch or as the size of the fishery increases.

Krill

59. The same considerations stated above also apply to krill sampling. The Japanese have a standard of one sample per day of 50 individuals from one haul, which the Group agreed was suitable for an initial specification and it was suggested that observation of the proportion of gravid krill in the sample would prove useful.

60. It was also suggested that the observations on size categories that are taken on all fishing vessels be recorded in the logbooks.

61. The Group therefore recommended that countries should bring to the September meeting in Hobart information on which better proposals could be made for sample sizes and for sampling strategy. This information could be in the form of statistical analysis, or in the form of original data, i.e., individual length samples. It was also requested that countries bring information on the numbers and sizes of samples collected during the 1983/84 season preferably by month and area.

Commercial Data Handling

62. The Working Group considered the routine data needed for stock assessment purposes. It was noted that the catch and effort data, including information from fishery research vessels, mentioned earlier in this report, would be the raw material for stock assessment. The Group recognised that in principle it may be necessary to go back to data on individual hauls. At the current state of the fishery that would imply the processing of about 250,000 individual haul records.

63. Two options were considered. Raw data from the logbooks could be submitted to the Secretariat for transcribing, sorting and editing and be available within the Commission's data bank for analysis at any level of detail required. Alternatively the detailed logbook data could be processed and stored in national institutions, and only certain summaries reported to the Commission for storing in the data bank. In that case it would be important that the national data files of the detailed data as collected be maintained in such a way that if the Commission needed more detailed information or analyses in the future these could be supplied.

64. In any case for the purposes of preliminary analysis and stock assessment there was a need for certain summaries of the detailed logbook data to be prepared, whether this was done by the Secretariat from a detailed Commission data base, or as reports from Country members to the Secretariat.

65. There was considerable discussion on how the data were to be reported to the Secretariat if summarised data were to be submitted. There was particular concern about the spatial and temporal scale. Most participants agreed that the current low state of knowledge of krill biology and the need to develop or refine methods for estimating abundance dictated the need for fine scale data. Ultimately calculations based on the fine scale data could be compared with calculations on broader scales and so arrive at the optimum spatial distribution for both submission of data and stock assessment.

66. For finfish the group agreed that a fine spatial scale was required. Most of the group agreed that based on experience with the Kerguelen fishery and analyses of data for the South Georgia area, a spatial distribution of 0.5° latitude by 1.0° longitude was the maximum desirable.

67. It was suggested that because of the structure of the water currents around islands a maximum of 0.5° latitude by 1.0° longitude was also desirable for krill, but in oceanic areas a broader scale might be acceptable.

68. There are strong seasonal patterns of abundance and availability in both finfish and krill. This implies the need for reporting on a relatively fine temporal scale. Some information and discussion suggested that about a ten day period might be appropriate.

69. It was recognised that in the submission of summarised data, statistical procedures would have to be used to aggregate the data in space and time and that these procedures would have to be phased in over time because of the practical difficulties involved in setting up new data handling requirements in member organisations.

70. It was noted that less emphasis was likely to be placed on STATLANT data as the more detailed data from logbooks became available. However there would still be a continuing need for STATLANT reports for some purposes. For example some sources of detailed data cover only a proportion of the total fishery and need to be adjusted upwards to total catch on the basis of comprehensive summary data of the STATLANT type.

71. There was some disagreement among the group as to whether or not its terms of reference extended to providing advice on changes to the STATLANT statistical areas. It was agreed that because the subject was related closely to other work in the Group a discussion of boundaries would be useful. It was acknowledged however that actual proposals to amend boundaries would require more detailed preparation before being submitted to the Scientific Committee.

72. It was suggested that the STATLANT data could be improved by further division of sub-area 58.4 and area 88 to better define the fish and krill distributions.

73. In sub-area 58.4 a further division along 60°E, 90°E and 120°E was suggested. Area 88 is bounded by 60°S latitude, 150°E and 105°N with no sub-divisions. Although this area is lightly fished at present a division to contain the Ross Sea was considered worthwhile as this is an area where both fish and krill may be exploited in the future. Boundaries at 140°W and 105°W were suggested.

74. It was reported that the Southern boundary of sub-area 48.1 was causing some difficulty in the reporting of fishing operations. Catches in the region of Joinville Island were quite often made near the boundary of the sub-area leading to errors in reporting location. A re-definition of the boundary from 64°S to 65°S was suggested to overcome the problem.

75. It was noted that these new sub-divisions would not be necessary if the more detailed data from logbook records became available in the near future since data could be aggregated into any spatial distribution desired.

76. It was also noted that with the exception of the revision of sub-area 48.1 the suggested changes to the statistical areas would not require a revision of past catch and effort data in order to maintain the historical series because the new subareas are subdivisions of the present subareas.

77. FAO should be notified in October if revisions to the reporting forms are to be introduced for the following season.

**Agenda for Mid-Term Meeting of *Ad Hoc* Working Group
on Data Collection and Handling**

June 11 – 15, 1984

Woods Hole, Mass.

- Objectives
- (1) To consider the types of assessments that likely will be required to determine and monitor the status of fish and krill stocks;
 - (2) to consider and provide advice to the Scientific Committee on the fishing data necessary to do the stock assessments; and
 - (3) to outline steps to develop the system of reporting, processing and presenting data so as to facilitate required assessments and related work of the Scientific Committee.

Items for Consideration:

- (1) Methods and models for assessing fish and krill stocks.
- (2) Methodology of using catch and effort data for krill stock assessment.
- (3) Data sets needed to meet requirements of assessment models.
- (4) The type, frequency, sample size, etc., of biological samples to be collected and in what temporal and spatial divisions.
- (5) Types of data formats, summaries required from member countries or to be produced by the Secretariat, to support analytical studies by the Scientific Committee, and also requirements for routine monitoring of the fish and krill stocks.

Information for the Working Group Meeting:

- (1) Distribution and population/sub-population descriptions for krill.
- (2) Available publications on studies of assessments of state of krill and fish stocks.
- (3) Available studies from members on the methods of stock assessment and the types of data employed.
- (4) Studies by member scientists and co-opted members outlining special problems and considerations in relation to assessment and data needs.
- (5) Available information on past fishing activities and practices of member countries.
- (6) Formats for reporting forms, Statistical Bulletins and other documents being used by members and other International Commissions to facilitate stock assessments.

Ad Hoc Working Group on Data Collection and Handling

Meeting at Woods Hole, Massachusetts, USA, 11–16 June 1984

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Ad Hoc Working Group on Data Collection and Handling

Woods Hole, Massachusetts,

USA 11–16 June 1984

CHAIRMAN'S COMMENTS

There were three objectives defined by the Scientific Committee for the Working Group (SC-CAMLR-II/INF.10). The Report of the Working Group reflects the discussions and advice that the Group could agree upon. This document provides a summary of achievements, and some comments on future activities at and beyond the CCAMLR meeting in September that the Working Group as a whole did not have time to include in the Report.

Objective 1

To consider the types of assessments that likely will be required to determine and monitor the status of fish and krill stocks.

The lack of adequate information on the biology and ecology of the resources was a limiting factor. For fish the past activities of the BIOMASS Working Party on Fish Biology has provided experience upon which to formulate some conclusions about the validity of methodology. The use of catch-and-effort data to estimate trends in population size in the traditional models seems valid, particularly because bottom trawling is the principal gear used.

For krill there is not much past experience, but the methods which have been formulated for some pelagic fish stocks, e.g. herring and tunas, and for whales, provide a basis for initial approaches and development.

Objective 2

To consider and provide advice to the Scientific Committee on the fishing data necessary to do stock assessments.

The descriptions of distributions and fishing operations provided at the meeting were useful in defining time-and-space scales with which analytical studies would have to deal. It became clear that the catch-per-haul data would provide estimates of the density of localised concentrations. These, in turn, would form part of aggregations of increasing scales in time and space which would require, for definition, data on the time and type of searching operations of the fishing vessels – and of fleets of vessels because of intercommunication. This aspect would be more important for the oceanic fisheries associated with the continental shelf areas than the island shelf areas, and particularly for krill fisheries.

Fishery research vessels operate at times as the searching arm of the fishing fleets. In this case, the data from the fishery research vessels themselves could best provide the needed information on searching activities to define the larger time-and-area scale aggregations of the stocks.

The Report contains a list of necessary data which includes that which would accommodate the needs discussed by the Group.

The Group also considered the needs for biological samples, and suggested some guidelines for collection. It concluded that specific statistical studies should be made available to aid in specifying a standard.

Objective 3

To outline steps to develop the system of reporting, processing, and presenting data so as to facilitate required assessments and related work of the Scientific Committee.

For the detailed data from fishing vessels, two main options were considered for reporting: (1) submission of the detailed data from vessel logbooks (c.f. Appendix 6 of the Report) to the Secretariat for processing and presentation in the form required for analyses, or (2) submission of summaries of the data to be processed by the Secretariat. For the latter, different time-and-data scales were considered, but while the need seemed to dictate rather fine-scale – for example, 1° longitude by 0.5° latitude and 10-day periods – at least for initial studies, some members of the group felt that more study and consideration was required. The Group did not have enough information to fully resolve this matter.

The Group also considered the STATLANT reporting system because of its probable value in the interim before the more detailed data system could be implemented, and because it might be desirable in any event to maintain its time-and-area scales of summary as a long-term series. Some advice is offered on possible further division of the present subareas.

General

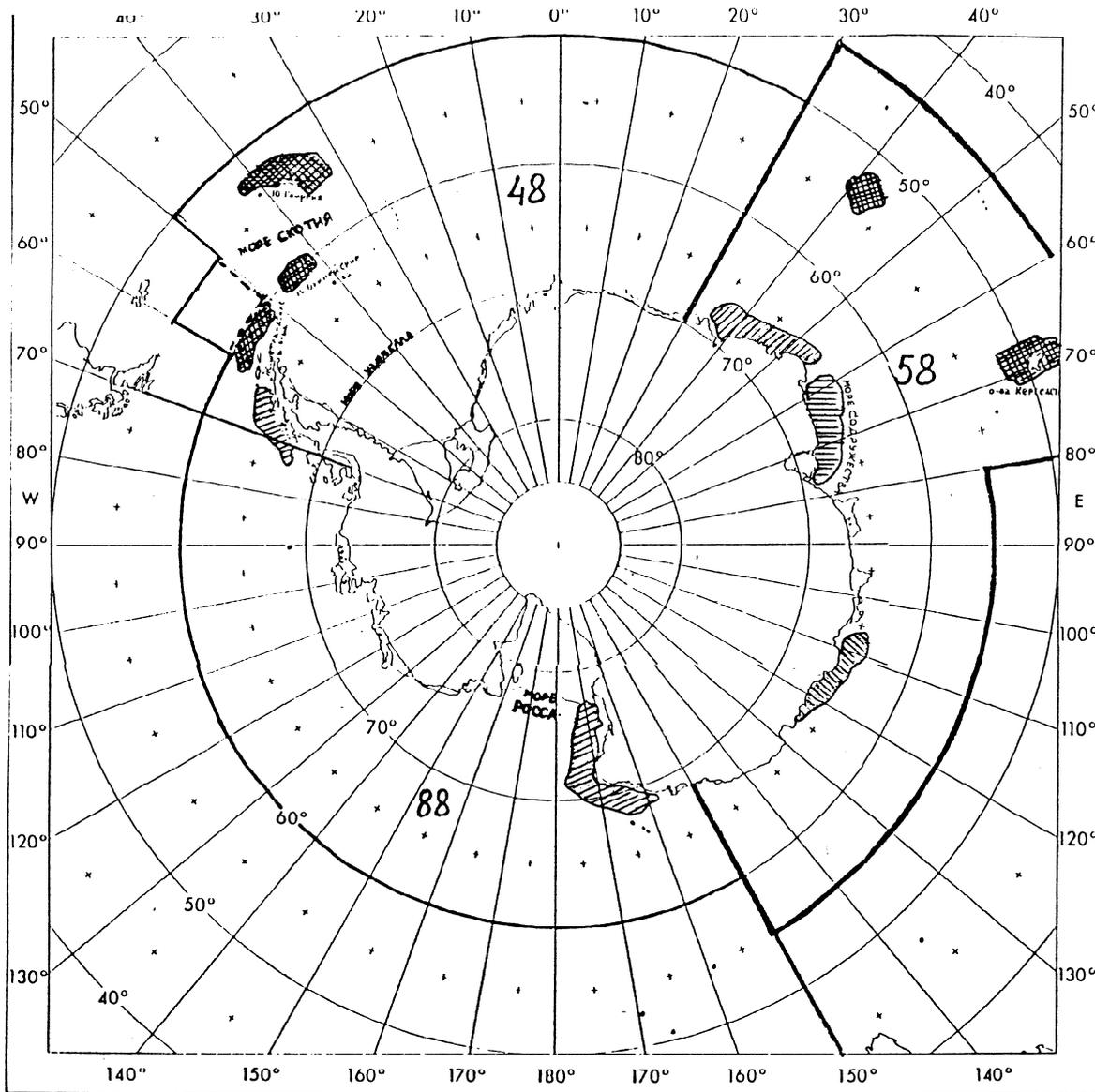
Further progress depends critically on decisions taken by the Scientific Committee at its 1984 meeting. Such decisions should properly depend upon whether or not there is now sufficient justification for defining the needed data to be reported. The most serious lack is actual attempts to assess the krill stocks based on available catch and effort data.

While the terms of reference of the Working Group stressed future data collection, if more information and study is required before a system of collection and reported can be specified and implemented, and if such a system is to be implemented in the near future, then the past data must be utilised. The Scientific Committee should therefore arrange to complete studies over the next year which include analysis of historical catch/effort data. These studies might involve CCAMLR group to define a common data base and methodology, with preparation and analysis completed in national laboratories.

Most of the Group did arrive at agreement on the needs, and felt that the Committee now could go on to discuss implementation. This would inevitably involve a phase-in process to allow countries to develop procedures. Members of the Group were necessarily constrained in advice they could offer by important considerations that only National Representatives could handle.

The *Ad Hoc* Group completed what it could of its assignment; it was not asked and does not offer any advice on what groups should be organised nor how they should be structured. It was, as always, of value to have the opportunity of a special meeting to discuss at length the important issues. It would also be of some value to promote continuity of scientists' participation in future meetings dealing with the same subject matter. This is a matter which the Scientific Committee may want to keep in mind. At the same time, technical people who are familiar with both national fishing and data handling procedures would be desirable participants in future meetings.

КАРТА-СХЕМА распределения районов, уже осваиваемых промыслом
/ СССР, ПНР, ФРГ и др. / и перспективных исследуемых научно-
-поисковыми экспедициями



48, 58, 88 - статистические районы ФАО;  - районы осваиваемые промыслом;
 - перспективные обследуемые районы.

Основные виды рыб в промысловых районах: *Notothenia rossi*, *N. squamifrons*,
Champsocephalus gunnari, *Notothenia quentheri*.

Основные виды рыб в перспективных районах приматериковых морей:
Pleurogramma antarcticum, *Chaenodraco wilsoni*, *Chionodraco hamatus*,
Trematomus sp.

**Preliminary Results of the Spatial and Temporal
Distribution of Fish Populations Around the Kerguelen Islands**

G. DUHAMEL & J.C. HUREAU

The study of the fisheries statistics collected during the last past five years (1979/80 to 1983/84) in the area of Kerguelen Islands (Indian Ocean sector) obviously shows that only three species occur in 99% of the total catch (102 288 metric tons). *Champscephalus gunnari* alone forms 50.5% of the total catch (51685 tons), *Notothenia squamifrons* reaches 26.8% (27436 tons) and *N. rossii rossii* 21.5% (21994 tons). This channichthyid and these two nototheniids can be considered as the most abundant species of this area. The remaining fishes (1.2%) consist mainly of *Dissostichus eleginoides*, *Channichthys rhinoceratus* and rajiids (*Bathyraja eatoni* and *B. irrasa*).

Since 1979, statistical and biological data are regularly collected on board trawlers fishing on the shelf and on the nearby banks of the archipelago. These data are completed with coastal ichthyological studies. The so gathered information allow a study of the spatial and temporal distribution of the three abundant species.

A first synthesis of the data included in the fishing logbooks used by each trawler since 1979 (databank KERPECHE) leads to the fact that for the studies period (60 months), only 14 months were free of fishing (maximum interval without fishing = 3 successive months) and 4 months were the object of a partial fishing. So the coverage of the area can be considered as good.

Each species has been studied separately using an abundance index for several geographic sectors. The aim of this note being not to evaluate the abundance, the unit has not been precised but is proportional to the catch per unit effort and to the statistical data transmitted to FAO through Statlant A and B. The coastal waters are closed to exploitation, so it is not included in the figures but its study helps in the interpretation of the fish distribution.

Some peculiarities of the biological cycle of each species (growth, reproductive cycle, diet) are used to obtain an interpretation of the spatial and temporal distribution of the

populations. The methods used for their analysis have been described previously (Hureau, 1970; Duhamel, 1981, 1982; Duhamel & Pletikotic, 1983; Duhamel & Hureau, 1984).

Champscephalus gunnari

Two areas of the shelf (N/NE and Skiff bank) revealed regular presence of this species (fig.1). The most important shoals are observed in the N/N-E at depths between 150 and 280 metres. If the abundance is not very high before summer 1981/82, it is particularly high the two following years and their temporal distribution then, becomes annual. The Skiff bank is mainly occupied regularly in austral Autumn except in 1982/83, but the shoals are found deeper, because of the depth of the bank. Finally, some temporary shoals (260–350 m) have been noted in Spring 1979/80 in the SW part of the shelf (260–280 m), and also in 1981/82 in the shallow waters of the SE just before the apparition of the shoals in the NE.

C. gunnari from Kerguelen Islands, has biological characteristics slightly different from these of the South Atlantic populations. It is a semi-pelagic species with a planktonic diet (amphipods hyperiids, euphausiids, myctophids ...) which imply typical nycthemeral migrations (Duhamel & Hureau, 1984). The growth is fast since the sexual maturity is obtained at a size of 25–26 cm. (Age 0; 9 cm, I: 18 cm, II: 25 cm, III: 29 cm, and IV: 33 cm). The analysis of the spawning cycle and of the size composition in the two main sectors could justify the hypothesis of two separate stocks around the archipelago. In the N/NE sector, spawning occurs during winter, in the second sector (Skiff bank), it occurs earlier in autumn. Spawning occurs in the coastal zone after a migration of the spawners. Larvae and postlarvae are pelagic and form large concentrations, easily detectable acoustically and used by predators (*D. eleginoides* and *N. rossii*).

The bottom concentrations contain fish aged more than two years and, outside the spawning period, they are correlated to the planktonic high productive areas. The dispersion of the shoals is in relation with the diminution of the quantity of prey directly linked to the hydrological conditions around the archipelago.

These biological data explain the distribution of the species. The Skiff bank seems to be only a prespawning zone, the presence of the species during other seasons seems to be more variable. On the other hand, the N/NE sector is continuously occupied all during the year, which is certainly in relation with a high productivity area. The exploitation previous to 1979 seems to have deeply disturbed this distribution in this latter sector and it is only since the arrival of new recruits in 1981–82 that the great importance of this sector has been shown.

Notothenia squamifrons

The distribution of this species around Kerguelen islands is limited to the South sector and to the E/NE sector, with temporary concentrations on the Kerguelen-Heard banks. This species lives deeper (250–450 m) than *C. gunnari*, at least for the adult part of the population. Its abundance is limited to the austral summer and declines from South to NE (fig. 2).

N. squamifrons, a common species all over the Indian Ocean sector of the southern ocean (Duhamel, Hureau & Ozouf-Costaz, 1983), is demersal with a depth distribution correlated to the age, the adults occurring in deeper waters.

The growth is slow, the sexual maturity late but the fecundity is high. The spawning occurs yearly during autumn in deep waters.

The first shoals appear just after the spawning seasons. The stomach content analysis then show that the predation is active on prey (salps and other planktonic organisms) which aggregate along the slope of the shelf. A decrease of the mean length during the fishing season would show that the adults go first to the deeper zones at the beginning of autumn. The absence of this species is noticeable in winter, except occasionally in the SE. Its presence in the coastal zone is very rare all during the year, except for the youngest age classes.

Notothenia rossii rossii

This species shows variations of its spatial and temporal distribution much more complex than the two preceding species. The SE sector is inhabited by this species at a depth of more than 300 metres during winter. The other sectors of the shelf are mostly occupied during the other seasons at very variable depths (100–400 m); however the fish is then more dispersed (fig. 3).

The life cycle of *N. rossii* is now well known (Olsen, 1954; Freytag, 1977; Duhamel, 1982). Spawning is annual around Kerguelen and occurs in only one deep spawning place (SE). The pelagic larvae then migrate to the coastal zone which is a nursery zone; then they are inaccessible to fishing. At the beginning of sexual maturity they join the adults on the shelf. Each year the adults migrate to the spawning area where they concentrate in June. If

the food is abundant enough, they stay in this area but generally they disperse to more productive areas.

This cycle explains the winter concentrations in the SE and the summer dispersion in the South and E/NE. The Skiff bank only seems to shelter adults all over the year but the abundance is never high.

These various interpretations are mainly based on the biological cycles; nevertheless, it is necessary to bear in mind that the Kerguelen archipelago has a special hydrological situation (proximity of the Antarctic Convergence) together with local upwellings. The hydrological structure of the region will allow to have a better knowledge of the spatial and temporal distribution of fish. Moreover we must emphasise that Heard Island also has a shelf which gives possibilities of dispersion to the various species, mainly to the semi-pelagic ones *C. gunnari* and *N. rossii*, which probably do summer migrations to this shelf.

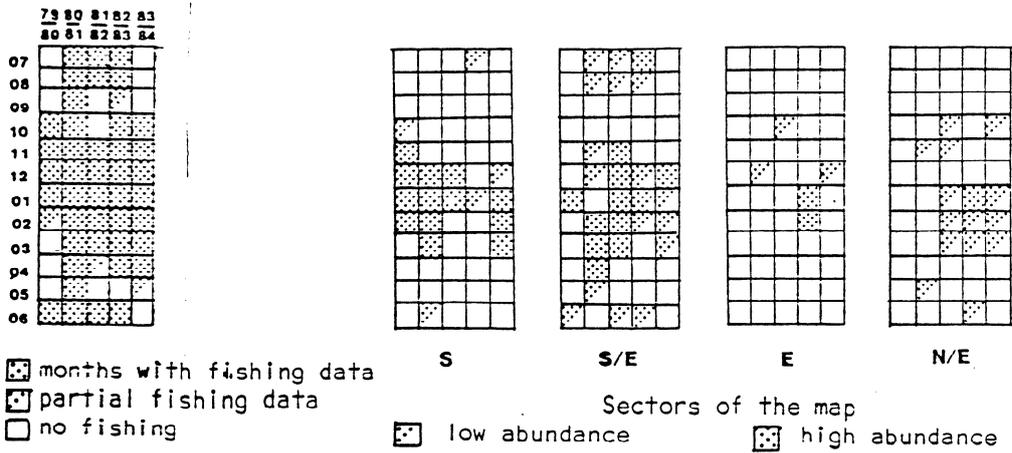
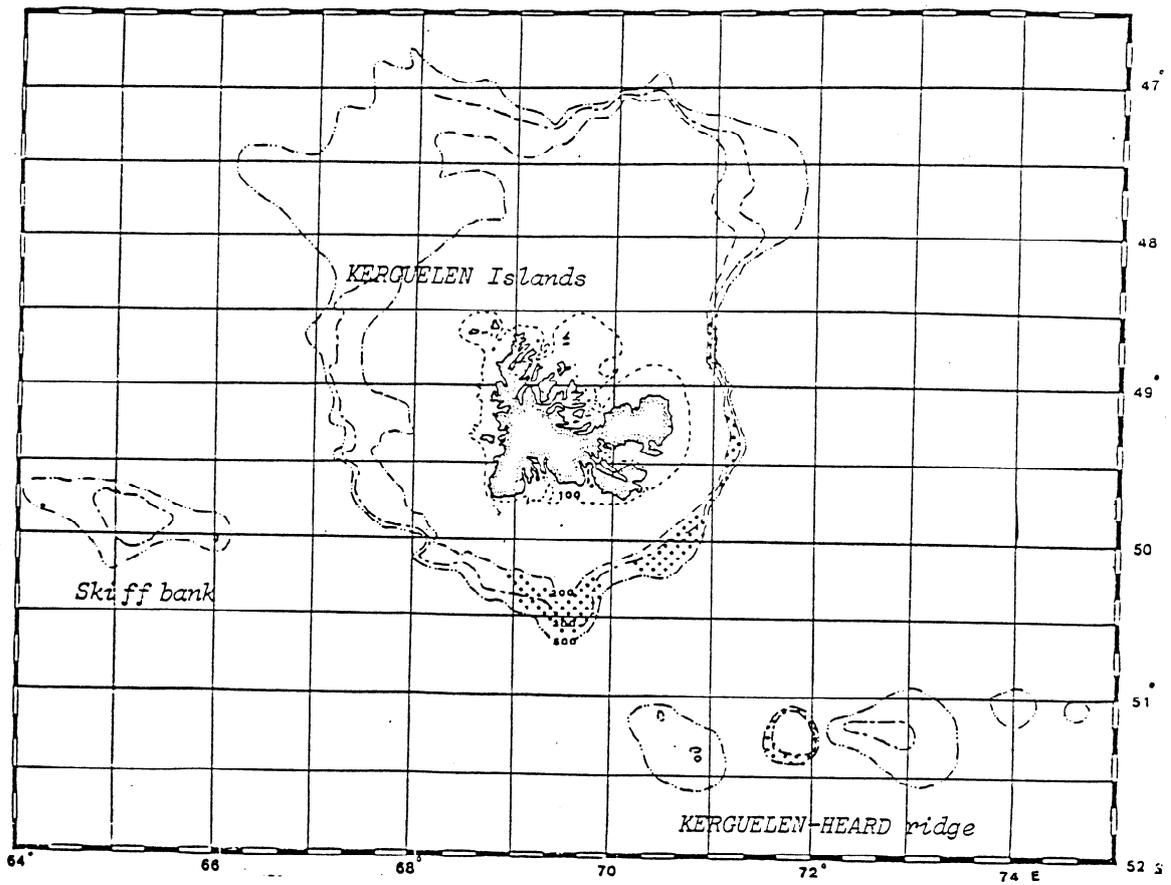


Figure 2: Spatial and temporal distribution of *Notothenia squamifrons* on the shelf of Kerguelen Islands (and nearby banks) during the period 1979–1984.

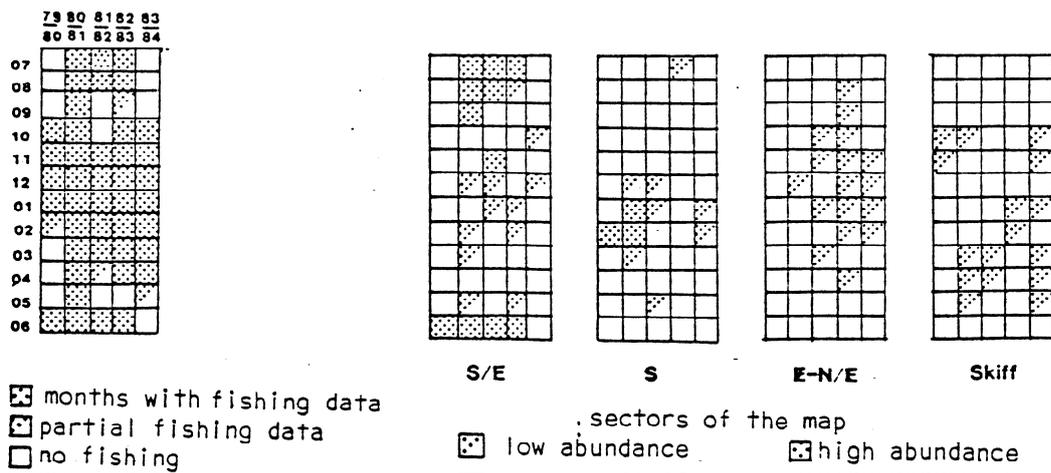
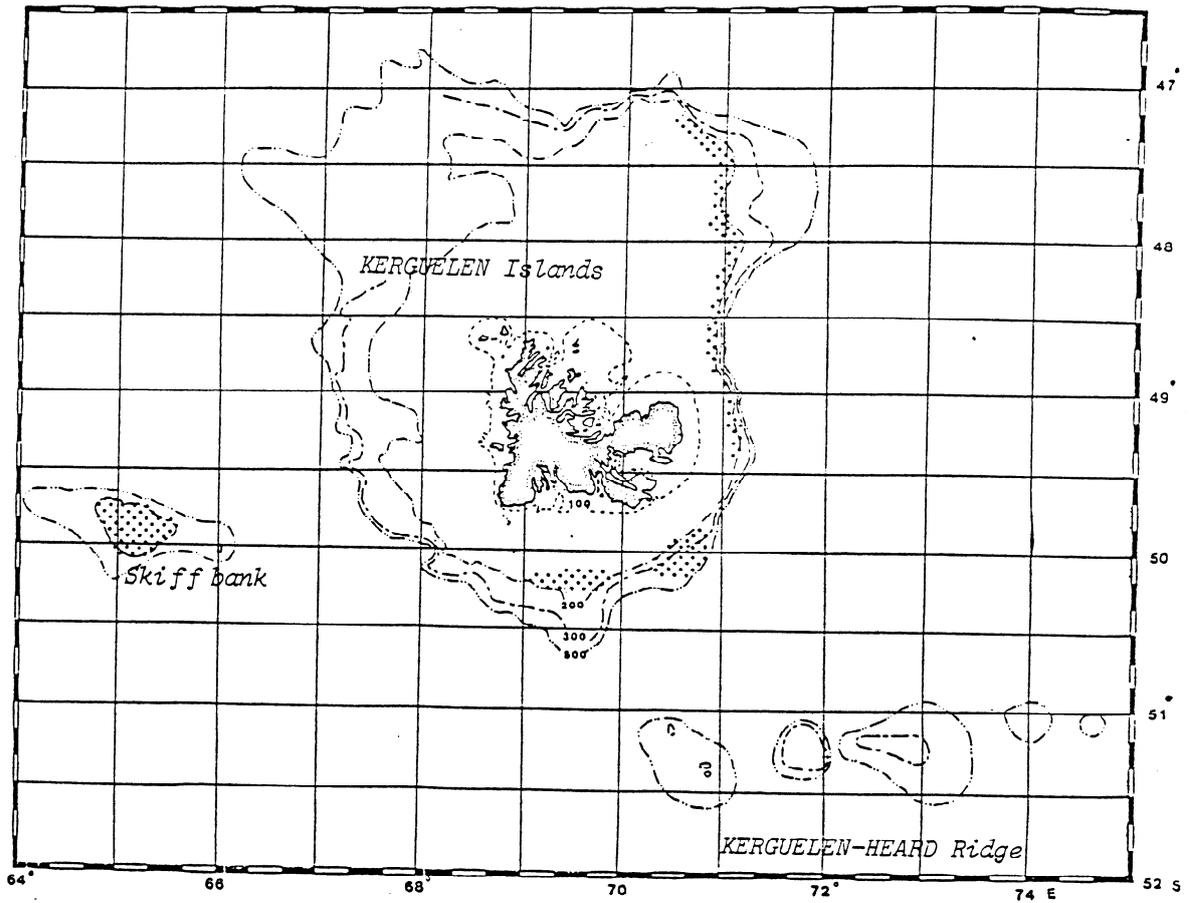


Figure 3: Spatial and temporal distribution of *Notothenia rossii rossii* on the shelf of Kerguelen Islands (and nearby banks) during the period 1979–1984.

PROPOSALS FOR BASIC DATA COLLECTION1. Data for Fish and Krill Statistics

The desirable information is as follows:

(a) Description of Vessel

- name of ship
- type of vessel
- registration number and port of registration
- ship nationality
- gross registered tonnage
- length overall (m)
- maximum shaft power (kW at ... rev/min) or horse power

(b) Description of Gear

- trawl type (according to FAO nomenclature)
- code number for trawl type
- mesh size at mouth ((mm) fish only)
- mesh size at codend ((mm) stretched)
- liner mesh size (mm)
- net plan (includes strip lengths, twine sizes, mesh sizes)
- gear plan (otter boards, bridles, etc. as appropriate)
- underwater acoustic equipment, echosounders (types and frequencies), sonar (types and frequencies), netsondes (yes/no)

(c) Tow Information

- date
- position at start of fishing (in degrees and minutes)
- time at start of fishing (in hour and minutes GMT; if local time, indicate the variation from GMT)
- time at end of fishing (before hauling)
- bottom depth ((m) fish only)
- fishing depth (only if midwater trawl)
- direction of trawling (if the track changed during trawling, give the direction of the longest part of the track)
- towing speed

(d) Environment

- presence or not of ice in water
- cloud coverage or type of weather
- speed of wind (knots) or wind force (Beaufort Scale) and direction
- sea surface temperature
- air temperature

(e) Catch Records for Each Tow

- estimated total catch (kg)
- approximate species composition (percent of total)
- amount and composition of discards
- number of boxes of each size of fish per species if any
- presence of fish larvae

(f) General Information

- daily record of: time begin searching, time end search to begin haul, time resume search after haul, time end searching

LIST OF ALL DOCUMENTS SUBMITTED DURING MEETING

1. Points and Questions About Measuring Effort for Krill Fishing That We Might Agree To.
 - Tim D. Smith, USA
2. Mathematical Simulation As a Means of Improving Methods of Conducting Surveys and Processing Their Results.
 - Kizner, VNIRO, USSR
3. Antarctic Ecosystem Management.
 - D.S. Butterworth, South Africa
4. Comments and Questions on Ecosystem Management.
 - John A. Gulland, FAO
5. Some Notes on the Catch and Effort Statistics Needed for Stock Assessment of Krill.
 - John R. Beddington and Inigo Everson, UK
6. Inventory of Existing Logbooks and Proposals for Basic Information.
 - Annex 8 to the Report of the 1983 Meeting of the Scientific Committee of CCAMLR
7. *Ad Hoc* Working Group on Data Collection and Handling. Terms of Reference.
 - Annex 9 to the Report of the 1983 Meeting of the Scientific Committee of CCAMLR
8. Inventory of Commercial Fishery Data Before September 1983.
 - Annex 6 to the Report of the 1983 Meeting of the Scientific Committee of CCAMLR
9. Antarctic Fisheries Catch Statistics, 1977/78 to 1981/82.
 - CCAMLR Secretariat
10. Summary Status of Commercial Inventory.
 - CCAMLR Secretariat

11. Inventory of Commercial Fishery Data Before September 1983.
 - Chilean National Section of CCAMLR, Chile
12. Inventory of Commercial Fishery Data Before September 1983.
 - Ministry of Foreign Affairs, Japan
13. Proposal -- Data That Could be Obtained from the Krill Fishery As Per Requirement of CCAMLR.
 - Chilean National Section of CCAMLR, Chile
14. Instructions to Field Data Record Sheet for Krill Commercial Fishing.
 - Chilean National Section of CCAMLR, Chile
15. Spatial Distribution of Past, Present, and Prospective Fishing Areas of the USSR.
 - VNIRO, USSR
16. Spatial Distribution of Krill Fishing by Japan, 1973-1983.
 - Japan
17. Distribution and Abundance of Antarctic Krill (*Euphausia superba*) in the Bransfield Strait.
 - Oscar Guzman, F., Chilean National Section of CCAMLR, Chile
18. Chilean Fishing Operations in the Antarctic.
 - Chilean National Section of CCAMLR, Chile
19. Preliminary Results of the Spatial and Temporal Distribution of Fish Populations Around the Kerguelen Islands.
 - Guy Duhamel and Jean-Claude Hureau, EEC and France
20. Review of the Spatial and Temporal Distribution of the GDR Fishery in the Atlantic Sector of Antarctica, 1977–1981.
 - GDR
21. Report of the Informal Meeting, *Ad Hoc* Working Group on Data Collection and Handling.
 - From the 1983 Scientific Committee Meeting

22. STATLANT Summary.
 - CCAMLR Secretariat

23. *Ad Hoc* Working Group on Data Collection and Handling, Woods Hole, Massachusetts, USA, 11–16 June 1984. Meeting Arrangements, Working Agenda/Timetable, and Requests for Information.
 - Convener -- Richard C. Hennemuth, USA

24. Maps of:
 - Convention Area
 - Main Fishing Areas in the Atlantic Sector of the Southern Ocean
 - Map B. Kerguelen, Heard Islands region of the South Indian Ocean

25. Log Sheet from Kerguelen Fishery.
 - France

26. List of Necessary Data to Study the Distribution of *E. superba* and the Dynamics of Its Resources.
 - USSR

27. Calculation of Parameters Related with the Management of *Euphausia superba* Dana as a Renewable Resource. (Received too late for discussion during meeting).
 - Aldo P. Tomo and Enrique Marschoff

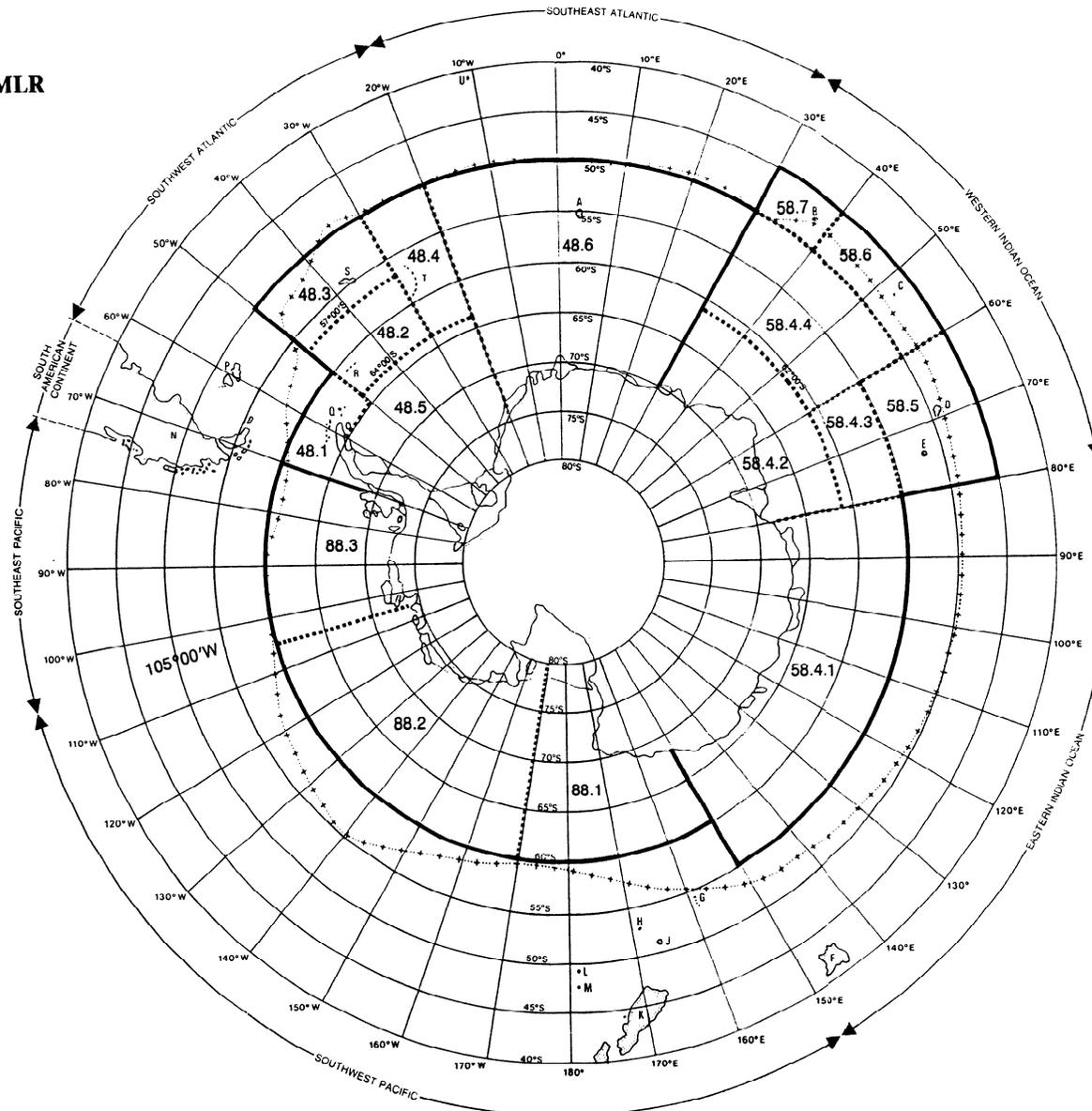
28. Method for Data Treatment of Biological Samples of Multidimensional Parameters Applied to: *Euphausia superba* Dana (Krill) (+) (Received too late for discussion during meeting).
 - Jorge Santiago Panizza, Aldo Pascual Tomo, Enrique Marschoff and Carlos Massigoge; Institute Antartico Argentino.

**CCAMLR STATISTICAL AREAS
AS AMENDED AT III CCAMLR MEETING,
SEPTEMBER 1984**



CCAMLR

Boundaries of the
Statistical Reporting
Areas in the
Southern Ocean



LEGEND
 — STATISTICAL AREA
 STATISTICAL SUBAREA
 - - - - - ANTARCTIC CONVERGENCE
 — CONTINENT, ISLAND

LEGEND

- A Bouvet Island
- B Prince Edward and Marion Islands
- C Crozet Islands
- D Kerguelen Islands
- E McDonald and Heard Islands
- F Tasmania
- G Macquarie Islands
- H Campbell Island
- J Auckland Islands
- K South Island
- L Antipodes Islands
- M Bounty Islands
- N South America
- P Falkland Islands (Malvinas)
- Q South Shetland Islands
- R South Orkney Islands
- S South Georgia
- T South Sandwich Islands
- U Gough Island

**REPORT OF AD HOC WORKING GROUP
ON FISH STOCK ASSESSMENT**

(6-7 September, 1984)

A. INTRODUCTION

1. The Working Group met under the Chairmanship of Dr R. Hennemuth (USA) on 6 and 7 September, 1984. Dr J.A. Gulland (FAO) was appointed rapporteur. The terms of reference of the group were, briefly,

- (a) to identify those fish stocks which appeared to be heavily fished, and for which conservation action might be necessary;
- (b) to indicate the options for conservation measures in respect of these stocks.

2. The main working document for the group was the draft review of the fish stocks prepared as part of the BIOMASS programme by Drs K.-H. Kock, G. Duhamel and J.-C. Hureau (SC-CAMLR-III/BG/2). Useful information was also contained in the report on Polish fisheries (SC-CAMLR-III/BG/11), and the analysis presented by the UK (SC-CAMLR-III/5), the comments by Japan (SC-CAMLR-III/6), as well as the data from STATLANT forms and other material in the CCAMLR data base.

B. STOCKS REQUIRING MANAGEMENT ACTION

3. In reviewing the current state of the stocks the working group considered four main types of data in respect of each stock – the total catch; the catch per unit effort (c.p.u.e.) in the commercial fisheries; the total biomass, as estimated from survey data; and the biological data (especially mean weight; mean length and mean age). The summaries of these data for the two major areas (South Georgia and Kerguelen) are given in Appendices I and II to this report.

4. The general pattern of fishing in the region has been for a short period (sometimes only one season) of high catches to be followed by a period of low catches, with a large volume of catches occurring again, if at all, only after a period of some years. Though there are differences between areas, and between species, as set out in the later sections, the overall picture is one of successive fishing down of a number of accumulations of fish, and of a resource that is, as a whole, heavily exploited. The notothenids, especially *N. rossii*, are probably the species that have been most greatly affected by fishing, and the various species of icefish are less seriously depleted.

5. The *ad hoc* group therefore believed that the Scientific Committee should urgently consider the need for management measures for the fin-fish stocks, with a view to the introduction as soon as possible of whatever measures are found to be appropriate. Further studies would undoubtedly change some aspects of the assessments set out below, and would enable the details of the management measures, e.g. the duration of a closed season, the optimum mesh size, or the magnitude of a TAC for a particular stock, to be specified with more precision. Such studies, especially those which took advantage of more detailed statistical information, would, as discussed later, be highly desirable. Some stocks might be shown to be less heavily fished than currently estimated, but it is also possible that others are in fact even more seriously depleted than suggested here.

B.1. South Georgia

Notothenia rossii marmorata

6. The catches of over 400,000 tons of this species reported from the South Atlantic in 1970 almost certainly came from South Georgia, but may have included a small amount of other species. After a small catch in 1971, no catches were reported until 1976. Apart from 1976 and 1980 annual catches since 1971 have been very small, mostly around 1,000 tons or less.

7. Estimates of c.p.u.e. and biomass, which are available since 1978 and 1976 respectively, vary considerably from year to year, but, with reservations due to changes in target species, suggest a downward trend. The biomass in 1976 was probably around 40,000 tons or less. In comparison the biomass at the beginning of the 1970 season must have been, to supply the observed catches, at least 400,000 tons, though it was probably not much more.

8. The average size and age of the fish has decreased steadily since 1970, and the average weight in 1981 was only one quarter of that in 1970. The mean size is now close to that at sexual maturity.

9. In summary, all available evidence is consistent in indicating that this stock is very severely affected by fishing, and that the present biomass is less than 10% of the initial biomass when the fishery started.

Notothenia gibberifrons

10. This species does not appear to support a directed fishery, and annual catches have tended to be smaller but less variable than for other species. Since the first reported catches in 1976, the reported total has varied between 2,500 tons and 10,000 tons, with no obvious trend. There is an indication of a downward trend in c.p.u.e., but this is inconclusive because of a change in target species by the Polish vessels concerned.

11. The strongest evidence of the effect of fishing comes from the substantial and fairly steady decrease in mean length and mean age since 1976. The mean length in the catches is now about the same as the length at maturity, indicating that a proportion of immature fish occur in the catch.

Champscephalus gunnari

12. There have been two periods of intense directed fishing on this species (the two seasons 1976/77 and 1977/78, and the 1982/83 season) when catches from the Atlantic sector exceeded 100,000 tons annually, though for the first period it is not clear how much came from S. Georgia. Otherwise, catches have been moderate to small. Because of changes in target species, the available c.p.u.e. data, without detailed information on position or target species, tells us little about trends in abundance. Estimates of biomass are comparable with some of the annual catches, indicating a high fishing mortality.

13. This fish appears to mature at a relatively early age. After the initial period when older fish, (4 years old and upwards and 35–45 cm in length) were common, catches have been dominated by 3-year-old, 25–30 cm fish so that variability in annual catches reflects variability in recruitment. This change in age composition confirms the impact of heavy fishing, but does not necessarily indicate ‘over-fishing’ in a biological sense. However, the reliance on what seems to be a single age-group, makes the fishing vulnerable to any change in recruitment patterns.

Dissostichus eleginoides

14. Reported catches have been small. There appears to be no directed fishery, and some fish may be included in reported catches of other species. It is difficult to assess the state of this species because the catches are primarily of juveniles and there is little or no fishing on

adults, and also because its occurrence in the South Georgia area is highly variable from year to year. Estimates of c.p.u.e. and biomass of the exploited segment of the stock indicate a downward trend, but the drop in biomass exceeds the reported catch which indicates the change may not be a simple direct result of fishing.

Pseudochaenichthys georgianus

15. Reported catches of this species have been small, around 1,000 tons per year since 1977 except for a peak catch of 9,000 tons. Estimates of biomass show no clear trend, and modal estimates of around 30,000 tons could suggest only a small fishing mortality.

16. In contrast the c.p.u.e. data do suggest a significant decline. The extent of the estimated decline depends on the method of analysis used, but the more detailed analysis based on monthly c.p.u.e. indicate that the stock in 1983 was only a small fraction of that in 1977.

B.2. Other South Atlantic Grounds

17. Assessment of the stocks in other parts of the south Atlantic is made difficult by the absence of sub-area breakdown in the available statistics for any catches before 1977 and for one of the major fishing countries before 1980. About 38,000 tons of *Champscephalus gunnari* were taken by Poland in sub-area 48.2 (South Orkney) in the 1977/78 season, and it is possible that a large proportion of the catches of over 100,000 tons reported by the Soviet Union as caught in area 48 in each of the 1976/77 and 1977/78 seasons came from this sub-area. In subsequent years, no large catches of fish have been reported from any of the Atlantic sub-areas other than 48.3 (S. Georgia). The greatest single season catch of one species was some 19,000 tons of *Notothenia rossii* in area 48.1 (A. Peninsula) probably, according to the BIOMASS group, from off Elephant Island) in 1979/80. No catches have been reported from this stock in subsequent years.

18. The available c.p.u.e. and biological data are very limited. More data are needed in order to make an assessment of the state of the stocks.

B.3. Kerguelen

Notothenia rossii

19. After moderate catches in 1969/70, peak catches of nearly 150,000 tons were taken in 1970/71. Later catches have fluctuated between less than 2,000 tons, and 35,000 tons in 1976/77.
20. Since 1980 there has been a substantial fall in c.p.u.e. and in mean length, and there has been a reduction in the total spawning area since 1981.
21. The status of this stock is probably very similar to that of the same species round S. Georgia. The initial catches around 1970 greatly reduced an accumulation of old fish, and the catches since 1977 have exceeded the replacement capacity of the reduced stock.

Champscephalus gunnari

22. Catches have fluctuated considerably with peak catches of 25,000 to 50,000 tons annual occurring at intervals of approximately 5 years, without any very marked downward trend.
23. Good indices of c.p.u.e. are available from log-book data from 1980 onwards, but show no clear trend, though the figure for 1983/84 is reported to be low.
24. Size and age composition data are available from 1975. These show that the fishery is based on small (ca.30cm), and young (3–4 year old fish). There is, however, no downward trend in the average size or age.
25. There is probably less reason for serious concern about the status of this stock than for any other Antarctic fish stock from which significant catches have been taken.

C. IMPROVED STOCK ASSESSMENT

26. While the material reviewed above shows that fishing is having a great effect on virtually all harvested fish stocks, and provides *prima facie* evidence that management is needed – urgently in the case of *Notothenia rossii* – the present analysis is not sufficient to

specify a detailed management programme which would maintain stocks at, or restore them to, some optimum condition, and ensure sustained harvesting within the guidelines set by the Convention. Several lines of further study seem desirable, including the following:

(i) Analysis of detailed catch and effort data

The figures of c.p.u.e. considered here may fail to give a reliable measure of the true changes in abundance because of changes in target species, and area and time of fishing; also some measures of fishing effort, e.g. days fishing, may not reflect true fishing mortality because of loss of time to handle the catch or bad weather, or improvements in gear. These factors need to be taken into account through a more full examination of the original data in as detailed a form as possible.

(ii) Simulation modelling of age and length composition

Given information on the population parameters (growth, use of recruitments, mortality) of each stock, it should be possible to determine the expected changes, from the unexploited condition, in biomass, mean length, mean age etc corresponding to different levels of fishing, e.g. $F_{0.1}$, F_{\max} etc., and compare these with the observed changes. Preliminary examination of the use of the method during the meeting confirmed that this was likely to be a valuable approach. Calculations based on parameters for three species round South Georgia, given in Annex III, using ages of first capture appropriate to the fishery before 1980 were in general agreement with the conclusions from other data that these stocks were heavily fished. However, further studies along these lines, to compare more closely the expected and observed trends in c.p.u.e., age-composition, and to narrow the range of possible parameters, would help to produce more quantitative assessment. In particular, they could be useful in determining the relation of the current fishing mortality to that which would be desirable according to various policy criteria.

(iii) Recruitment changes

Apart from changes in total mortality and hence in mean age, biomass per recruit etc., superficial analysis suggests there have been significant changes in recruitment in some stocks. At Kerguelen recruitment of *Chamsocephalus gunnari* may have

increased, possibly in response to reduced predation. On the other hand at S. Georgia, and possibly also at Kerguelen, recruitment of *Notothenia rossii*, appears to have decreased substantially. If the large catches at South Georgia came from perhaps 10–15 year-classes, each year-class would have produced on an average, 30-40,000 tons, whereas recent year-classes, as judged by the decline in stock arising from catches averaging less than 5,000 tons annually, are producing little more than 10% of this figure.

27. It is highly desirable, especially in relation to Article II 3(a) of the Convention, to get better estimates of the trends in recruitment (e.g. from cohort analysis or VPA), and especially to consider whether the decline in recruitment of *N. rossii* (if shown to be real) is caused by a depletion of the spawning stock.

28. To carry out these additional analyses, the group felt it would be useful to have a special mid-term meeting. If this were held it would be important, especially in relation to item (i), that detailed catch and effort statistics were available to the meeting. Availability of additional biological data, especially from countries for which data were not available to the BIOMASS group, was also important. A small group was asked to specify the form of the detailed data that should be provided for the proposed meeting. The suggestions of this group are set out in Appendix III.

C. MANAGEMENT

29. The group noted that management and conservation measures have already been applied in some Antarctic fisheries. For the Soviet fisheries a regulation setting minimum mesh sizes of 120 mm for *N. rossii* and *D. eleginoides* and 80 mm for smaller species, and corresponding minimum fish sizes for each species and sector, have been in force since 1980 (SC-CAMLR-III/INF.13). Soviet vessels also have refrained from fishing within 12 miles of South Georgia, from the beginning of the fishery, but this does not seem to have been fully effective in halting the decline in the stocks.

30. Round Kerguelen the French authorities have set a number of controls. A minimum mesh size of 70 mm has been set since 1980. From 1984 the regulations will include TAC for *N. rossii* and *C. gunnari*, and closed seasons during the spawning seasons of the two species.

31. The group welcomed these initiatives, and noted that a general application of these measures should have some beneficial effect. Consideration of further measures was desirable.

32. Mesh size. The advantages and disadvantages of this approach are well known in respect of other areas, and this experience seems directly transferable to the Antarctic, except that the shape of some species means that entanglements of small fish by their gill-covers can reduce the effectiveness of larger meshes. A properly enforced mesh regulation, with the mesh size appropriately chosen for the stock concerned, can allow small fish to grow, and can alleviate the effects of 'growth over fishing'. However, the amount of fishing is not controlled, and by itself mesh regulation is unlikely to be fully effective in restoring depleted stocks. While the group did not have the time or information to calculate optimum mesh sizes for each stock, it believed that the mesh sizes currently in force in the Soviet fishery would be useful first approximations. Because of the occurrence of both adults and juveniles of *N. gibberifrons* on the fishing grounds, mesh regulation is likely to be particularly useful for this species.

33. Minimum fish sizes. The effectiveness of this measure taken by itself depends on whether the fishermen can avoid catching small fish, and whether, if caught, they can be returned to the sea alive. The group had no information on these points. At a minimum, size limits matched to the selection size of a minimum legal mesh size assists in the enforcement of the latter measure.

34. Closure of nursery areas.. Similar remarks apply as for mesh regulation. Closure of areas in which small fish predominate can, like mesh regulation, be helpful in alleviating growth overfishing, but at best offers only a partial solution to the problem of re-building depleted stocks. The absence of Soviet fishing within 12 miles of South Georgia should have given protection to juvenile *N. rossii*. This measure should be continued and applied to all fishing fleets.

35. Closure of spawning areas. Since the abundance of the spawning stock is affected by any fishing, whether at the time of spawning or some months earlier, the main significance of these closures is to reduce the overall amount of fishing, especially when the stock is most concentrated. The effectiveness of this measure in rebuilding a depleted stock depends on the size of the catches that are taken outside the closed season, either in a directed fishery or as a by-catch when fishing for other species. For seriously depleted stocks it may be necessary to consider a lengthy closure. At the present time we do not have sufficient information to define the spawning areas. A research vessel survey in the spawning season (May) should be

very useful for this. The history of the fishery for *N. rossii* after the large catches in 1970 suggests a closure of some years might be needed.

36. Catch quotas. When there is sufficient knowledge about the abundance and the surplus production of stock, catch quotas or TACs can ensure, given adequate enforcement, that removals from a stock match its productivity and that fishing mortality is kept at the desired level. At present the group did not have sufficient information to be able to suggest specific figures of TAC corresponding to the surplus production, or optimum fishing mortality, for any individual stock. However, it was pointed out that in the case of severely depleted stocks, the immediate need was for low and conservative figures, which would assure, with a fair degree of confidence, that the stock would start to rebuild. Such a TAC would be revised, probably upwards, as more information became available and the stocks recover. In the case of *Notothenia rossii* at South Georgia, the current information suggests that a precautionary TAC to serve such a purpose would have to be even smaller than catches in recent years.

37. For small TACs the by-catches in fisheries directed at other species can raise problems. If significantly large they can nullify the whole effect of the control measure. Measures to limit by-catch are in force in several fisheries in the northern hemisphere, with varying success. In considering measures to protect *N. rossii* or other severely depleted species the Commission would need to consider carefully methods to limit by-catch to the lowest level possible. In this connection the group noted that recent statistics included some 15% of unidentified species, and urged that proper identification should be made when reporting statistics.

38. While optimal management of an area in which several species are taken requires separate limits for each species when all species are heavily exploited, a combined TAC for all species in an area can be a valuable measure. An overall TAC for all fin-fish species would probably require less detailed information than separate TACs for each species. However, some members felt that the estimation of even approximate TACs was not within the terms of reference of the Working Group. It was agreed that further studies are needed if TACs are to be specified more accurately.

APPENDIX 1

Area : SOUTH GEORGIA
 Species : NOTOTHENIA ROSSII

	Total Catch (t)	Target Species	CPUE (t/h)		Biomass (t)		Mean length, weight, age			
			Polish Commercial Vessels	Research Vessels	From Commercial Catches	From Research Vessel Catches	\bar{l} (cm)	\bar{w} (g)	\bar{t}	
70	403100	N. rossii					68.1	3664	9.3	
71	11800						-	-	-	
72							-	-	-	
73							59.4	2418	6.8	
74							-	-	-	
75							-	-	-	
76	11400					35682	56.5	2077	6.5	
77	8320	C. gunnari in Polish vessels			37928	-	59.1	2381	-	
78	992*	Opportunistic in Polish vessels	0.05		5606	9326	53.5	1796	-	Total catch 48: 5143
79	2114*	Opportunistic in Polish vessels	0.44		-	1421	50.5	1476	-	Total catch 48: 8662
80	24897	Opportunistic in Polish vessels	0.07		-	-	-	-	-	

* Data exclude U.S.S.R. which did not provide data by subareas

** Polish catches only

Area : SOUTH GEORGIA
 Species : NOTOTHENIA ROSSII

	Total Catch (t)	Target Species	CPUE (t/h)		Biomass (t)		Mean length, weight, age		
			Polish Commercial Vessels	Research Vessels	From Commercial Catches	From Research Vessel Catches	\bar{l} (cm)	\bar{w} (g)	\bar{t}
81	233	C. gunnari in Polish vessels	0.02		2327		43.0	906	5.3
82	1100	C. gunnari in Polish vessels	0.15		34284		47.8	1249	-
83	866	-	-		-		-	-	-
84	351**	C. gunnari in Polish vessels	0.06		2600		-	-	-

* Data exclude U.S.S.R. which did not provide data by subareas

** Polish catches only

Area : SOUTH GEORGIA
 Species : CHAMPSOCEPHALUS GUNNARI

70	5800								
71	5200								
72	2100								
73									
74	1000								

* Data exclude U.S.S.R. which did not provide data by subarea

** Probably mostly taken around South Orkney Islands

Probably taken off South Georgia

*** Bottom and pelagic trawl data combined

**** Polish catches data

Area : SOUTH GEORGIA

Species : CHAMPSOCEPHALUS GUNNARI

	Total Catch (t)	Target Species	CPUE (t/h)		Biomass (t)		Mean length, weight, age		
			Polish Commercial Vessels	Research Vessels	From Commercial Catches	From Research Vessel Catches	\bar{l} (cm)	\bar{w} (g)	\bar{t}
75									
76	22400					141469	35-45		
77	109603#	C. gunnari in Polish vessels			226606	-	35-45		
78	4779*	Opportunistic in Polish vessels	0.11		2372	34713	25-32	≈ 3	Total catch 48: 154309**
79	5361*	Opportunistic in Polish vessels	0.02		-	1152	25-32	≈ 3	Total catch 48: 28317
80	7592	Opportunistic in Polish vessels	0.05		-	-			
81	29322	C. gunnari in Polish vessels	0.62		88414	-	25-30	≈ 3	
82	46311	C. gunnari in Polish vessels	0.62		46192	-	25-30	≈ 3	
83	128184	-	-		-	-			
84	8098****	C. gunnari in Polish vessels	1.46		153000***	-			

* Data exclude U.S.S.R. which did not provide data by subarea

** Probably mostly taken around South Orkney Islands

Probably taken off South Georgia

*** Bottom and pelagic trawl data combined

**** Polish catches data

Area : SOUTH GEORGIA

Species : NOTOTHENIA GIBBERIFRONS

	Total Catch (t)	Target Species	CPUE (t/h)		Biomass (t)		Mean length, weight, age			
			Polish Commercial Vessels	Research Vessels	From Commercial Catches	From Research Vessel Catches	\bar{l} (cm)	\bar{w} (g)	\bar{t}	
70										
71										
72										
73										
74										
75										
76	5100						40094	(41.2)	(802)	
77	3070	C. gunnari in Polish vessels			22339	-		37.0	576	
78	9775*	Opportunistic in Polish vessels	0.53		19989	20100		34.0	443	Total catch 48: \approx 18500t
79	2540*	Opportunistic in Polish vessels	0.47			5894		(30)	(302)	Total catch 48: 9910t
80	8143	Opportunistic in Polish vessels	0.45		-	-				

* Data exclude U.S.S.R. which did not provide data by subareas

** Polish catches only

() Research vessel catches

Area : SOUTH GEORGIA

Species : NOTOTHENIA GIBBERIFRONS

	Total Catch (t)	Target Species	CPUE (t/h)		Biomass (t)		Mean length, weight, age		
			Polish Commercial Vessels	Research Vessels	From Commercial Catches	From Research Vessel Catches	\bar{l} (cm)	\bar{w} (g)	\bar{t}
81	7648	C. gunnari in Polish vessels	0.30		13693	-			
82	3756	C. gunnari in Polish vessels	0.13		25801	-	32.0	368	
83									
84	531**	C. gunnari in Polish vessels	0.10		17700				

* Data exclude U.S.S.R. which did not provide data by subareas

** Polish catches only

() Research vessel catches

Area : SOUTH GEORGIA

Species : DISSOSTICHUS ELEGINOIDES

70

71

72

73

74

* Polish catches only

Area : SOUTH GEORGIA

Species : DISSOSTICHUS ELEGINOIDES

	Total Catch (t)	Target Species	CPUE (t/h)		Biomass (t)		Mean length, weight, age		
			Polish Commercial Vessels	Research Vessels	From Commercial Catches	From Research Vessel Catches	\bar{l} (cm)	\bar{w} (g)	\bar{t}
75									
76						13497	-	-	
77	1656	C. gunnari in Polish vessels			4676	-	63.3 49.1	2956 1280	South Georgia Shag Rocks
78	922	Opportunistic in Polish vessels	0.03		-	7322	-	-	
79	331	Opportunistic in Polish vessels	0.01		-	646	-	-	
80	261	Opportunistic in Polish vessels	0.02		-	-	50.5 39.3	1404 616	South Georgia Shag Rocks
81	322	C. gunnari in Polish vessels	< 0.01		233	-	-	-	
82	354	C. gunnari in Polish vessels	-		-	-	-	-	
83	116		-		-	-	-	-	-
84	3*	C. gunnari in Polish vessels	0.01		-	-	-	-	

* Polish catches only

Area : SOUTH GEORGIA

Species : PSEUDOCHAENICHTHYS GEORGIANUS

	Total Catch (t)	Target Species	CPUE (t/h)		Biomass (t)		Mean length, weight, age		
			Polish Commercial Vessels	Research Vessels	From Commercial Catches	From Research Vessel Catches	\bar{l} (cm)	\bar{w} (g)	\bar{t}
70									
71									
72									
73									
74									
75									
76							36401		
77	1608	C. gunnari in Polish vessels		–	23210	–			
78	8759	Opportunistic in Polish vessels	0.47	–	39703	31057			
79	1104	Opportunistic in Polish vessels	0.19	–	–	4192			
80	665	Opportunistic in Polish vessels	0.04	–	–	–			
81	1584	C. gunnari in Polish vessels	0.11	–	8717	–			

* Polish catches only

Area : SOUTH GEORGIA

Species : PSEUDOCHEAENICHTHYS GEORGIANUS

	Total Catch (t)	Target Species	CPUE (t/h)		Biomass (t)		Mean length, weight, age		
			Polish Commercial Vessels	Research Vessels	From Commercial Catches	From Research Vessel Catches	\bar{l} (cm)	\bar{w} (g)	\bar{t}
82	956	C. gunnari in Polish vessels	0.13	–	16940	–			
83	–	–	–	–					
84	888*	C. gunnari in Polish vessels	0.16	–	70500	–			

* Polish catches only

APPENDIX 2

Area: 58.5

Species: N. ROSSII ROSSII

	Total Catch (t)	Target Species	CPUE (t/h)	Biomass (t)		Mean length, weight, age		
			Commercial Vessels	From Commercial Catches	From Research Vessel Catches	\bar{l} (cm)	\bar{w} (g)	\bar{t}
70	(20300)							
71	(149700)							
72	(37400)							
73	(2500)							
74	6150	C. gunnari N. rossii N. squamifrons						
75	6667	C. gunnari N. rossii N. squamifrons						
76	1859	C. gunnari N. rossii N. squamifrons						
77	6318	C. gunnari N. rossii N. squamifrons						
78	17239	C. gunnari N. rossii N. squamifrons						
79	No fishing							

Area: 58.5
 Species: N. ROSSII ROSSII

	Total Catch (t)	Target Species	CPUE (t/h) Commercial Vessels	Biomass (t)		Mean length, weight, age		
				From Commercial Catches	From Research Vessel Catches	\bar{l} (cm)	\bar{w} (g)	\bar{t}
80	1721	C. gunnari	7.7	–	–	–	55	7
81	7991	C. gunnari N. rossii N. squamifrons	3.8	–	–	–	52	6.5
82	9881	C. gunnari N. rossii N. squamifrons	4.0	–	–	–	49	6
83	1881	C. gunnari N. rossii N. squamifrons	2.2	–	–	–	50	6
84	749	C. gunnari N. rossii N. squamifrons	1	–	–	–	–	–

Area: 58.5
 Species: C. GUNNARI

70	(500)							
71	(49900)							
72	(15700)							
73	(7200)							
74	26714	C. gunnari N. rossii N. squamifrons	–	–	–			

Area: 58.5
 Species: C. GUNNARI

	Total Catch (t)	Target Species	CPUE (t/h)	Biomass (t)		Mean length, weight, age		
			Commercial Vessels	From Commercial Catches	From Research Vessel Catches	\bar{l} (cm)	\bar{w} (g)	\bar{t}
75	30043	C. gunnari N. rossii N. squamifrons	–	–	–	24.1 (Skiff Bank) 32.3 (Others)	3 4	
76	8841	C. gunnari N. rossii N. squamifrons	–	–	–			
77	26947	C. gunnari N. rossii N. squamifrons	–	–	–			
78	42668	C. gunnari N. rossii N. squamifrons	–	–	–	27.4 (Skiff Bank) 32.0 (Others)	3 4	
79	No fishing							
80	1368	C. gunnari N. rossii N. squamifrons	(1.4) (Others)			26.5 (Others)	3	
81	1052	C. gunnari N. rossii N. squamifrons	1.2 (Skiff Bank)			28.1 (Skiff Bank)		
82	15990	C. gunnari N. rossii N. squamifrons	1.5 (Skiff Bank) (4.4) (Others)			31.6 (Skiff Bank) 24.9 (Others)	4 3	
83	25927	C. gunnari N. rossii N. squamifrons	≈ 8.0 (Others)			29.0 (Others)	3	
84	(7139)	C. gunnari N. rossii N. squamifrons	2.3 (Skiff Bank) ≈ 2 (Others)			28.0 (Skiff Bank) 33.0 (Others)	3 4	

DATA NEEDS FOR A MID-TERM MEETING

Stocks of Interest

Particular attention should be paid to the stocks (especially *N. rossii*) around South Georgia, but the mid-term meeting should also consider other Atlantic sub-areas, and the stocks around Kerguelen.

Analyses to be Carried Out

The types of analysis that the meeting expects to carry out will determine what types of data needed to be supplied, and how these data need to be processed. To enable the working group to progress successfully it is very important that the greatest amount possible of data processing is carried out in advance of the meeting, so that the participants can concentrate on the interpretation of the results. To this end, this note sets out some of the requirements for preliminary processing, as well as the data needs *per se*.

The main lines of analysis considered were:

- (a) Use of c.p.u.e. data to estimate trends in biomass or abundance;
- (b) Virtual Population Analysis (VPA) or cohort analysis, to estimate annual values of fishing mortality, and of population numbers or biomass;
- (c) Age-structured analysis, to study patterns of yield per recruit etc.;
- (d) Swept-area analyses, to estimate total biomass;
- (e) Distributional studies, to consider possible locations/timing of closed areas/seasons to protect juveniles or spawning concentrations.

C.P.U.E. Analysis

Because of changes in area or season fished, or in target species, the ratio of total catch to total effort does not reflect correctly changes in biomass. The working group would need to compare series of c.p.u.e. values in different years for the same small area and time division in each year, in order to have a meaningful index of biomass. Figures for different area/time strata could then be combined, e.g. by analysis of variance techniques, to produce a best index of abundance for each year.

To do this the time/area division should be as small as possible. The Woods Hole meeting (SC-CAMLR-III/9, para 66) proposed a maximum spatial grid of 0.5° latitude by 1° longitude. This should be used, but if it proves impracticable to extract all the data in time for the mid-term meeting, the STATLANT B divisions (by month, by sub-area, by main species sought) was the minimum acceptable. It was essential to have at least some years of fine detail c.p.u.e. for comparative purposes. In any case the data should be submitted for the whole period of the fishery.

For the Kerguelen fishery the French authorities have complete log-book data for all countries since 1980, which might be made available to the working group.

Noting that there might be questions of confidentiality, it was suggested that the Commission should write formally to French authorities asking them to make these data available to the working group.

VPA Analysis

Two stages are involved: the production of a set of estimates of the total numbers of fish of each age caught each year, and VPA proper, – the analysis of this set of data to produce estimates of annual values of F and population numbers. The first of these at least should be completed in advance of the meeting of the working group.

Since complete catch-at-age data is not available for all species in all years for all countries, some interpolation and combination of data will be necessary. This will require some subjective judgement, for which the Commission's Data Manager will require advice from members of the working group.

The basic data requirements are for each year, and each species and sub-area, total catch in numbers if available, total catch in each length group (or percentage length composition), and age-length-keys, or other information (e.g. growth curves) to facilitate the conversion from length to age. In principle these data could be presented already summarised by years, but for other purposes, it would be desirable to separate the data by months.

Age-structured Analysis

The basic needs are simple – essentially current estimates of growth parameters, ages or sizes at recruitment, and at maturity, mortality rates etc. These might be best presented as estimates from publications, or from studies in press or in progress. The working group should have available to it computers and programs to enable yield per recruit, mean length, or other calculation to be made quickly and easily.

Swept Area Analysis

The results of research vessel surveys should be presented giving (a) sufficient information on the gear, vessel, towing speed etc. to enable the area swept per hour to be estimated, and (b) catch per hour of each species by depth zone, and area. The tabulations of the areas of bottom within each depth zone made by I. Everson should be made available to the group.

Distribution Studies

These may not require much analysis or data processing as such, but if the working group is to give serious consideration to the location or timing of possible closed areas or closed seasons, it must have available to it detailed information on the location of nursery or spawning areas. This could be presented in the form of charts or maps, or as length or age composition data with fine area and time breakdown.

Operational Matters

Time and place of mid-term meeting: In order to keep travel costs within reasonable bounds, and to ensure that the extraction and processing of data is completed before the meeting, there are two practicable possibilities: (a) in Europe (possibly ICES headquarters,

Copenhagen) in July-August; (b) in Hobart immediately before the next Commission meeting. If the meeting is not held in Hobart, it should be ensured that fully adequate computing facilities are available. Attendance of experts from all member countries was desirable.

Because substantial work will be involved in computing the national data, transmitting it to CCAMLR, and as necessary processing it, the Data Manager should visit the main countries concerned, by early in 1985, to check on progress, clarify precisely what data is required, and to determine the best way of submitting the data (on written forms, computer tapes etc.), bearing in mind the computer facilities available nationally and in CCAMLR.

DRAFT AGENDA

(agreed on 13 September 1984)

AD HOC WORKING GROUP ON ECOSYSTEM MONITORING

Meeting 6 – 11 May 1985
National Marine Mammal Laboratory
National Marine Fisheries Service
Seattle, Washington USA

1. Review the objectives of ecosystem monitoring.
2. Review the responses to the CCAMLR Scientific Committee of the SCAR Group of Specialists on Seals and the BIOMASS Working Party on Bird Ecology.
3. Review the life history characteristics and parameters of dependent and related species likely to be useful to ecosystem monitoring studies.
4. Identify dependent and related species which have greatest potential to function as indicators of the possible effects of krill harvesting.
5. Consider the types of studies necessary to establish baseline data and to evaluate natural variation in biological and environmental variables.
6. Describe sampling and data collection procedures required to detect effects of fisheries activities on components of the ecosystem.
7. Consider experiments to be undertaken in collaboration with fisheries activities.
8. Evaluate potential sites and areas for ecosystem monitoring programs.
9. Formulate and recommend specific actions for planning and implementing multi-national ecosystem monitoring programs.
10. Other items.
11. Adoption of report.

SCIENTIFIC COMMITTEE BUDGET

SCIENTIFIC COMMITTEE BUDGET

(Approved by the Commission)

Ad Hoc Working Group on Fish Stock Assessment

1. The Scientific Committee recommended that there should be an inter-sessional meeting of this Working Group for five days at either Hobart or another venue.
2. The budget would need to allow for computing, stationery and administrative expenses, translation and publication of the report, and costs related to the participation of an invited specialist.
3. Costs have been estimated as follows:

1 x Invited expert	
- travel costs & per diem	\$A5500
Publication & translation of report	4700
Stationery/Administration	1000
Computing	<u>6000</u>
Total Cost	\$A <u>17200</u>

Ad Hoc Working Group on Ecosystem Monitoring

4. The *ad hoc* Working Group was formed under the convenership of Dr K. Kerry (Australia). Its objectives and terms of reference are detailed in the Committee's report.
5. The Scientific Committee recommended that an inter-sessional meeting of the Group be held in Seattle (U.S.A.) 6–11 May 1985. Invited experts on both krill and whales should be available at the session. The budgetary implications are for administrative costs, two invited specialists, and for translation and publication of the report.

6. Costs have been estimated as follows:

2 x Invited experts	\$A6000
Publication & translation of report	4700
Stationery/Administration	<u>4000</u>
Total Cost	\$A <u>14700</u>

Workshop to Improve the Use of C.P.U.E. in Krill Stock Assessment

7. The ad hoc working group on Krill Research Priorities considered it essential that the best indices of effort be identified so as to improve analyses based on C.P.U.E. The Scientific Committee has recommended that a workshop meeting be held to run a variety of modelling and simulation approaches.

8. Such a workshop could be held in Hobart immediately prior to CCAMLR-IV.

9. The budget includes provision for the expenses of two invited experts, computing, administration and cost associated with the translation and publication of the report.

10. Costs have been estimated as follows:

2 x Invited experts	\$A11000
Consultants fees	3000
Publication & translation of report	4700
Stationery/Administration	1000
Computing	<u>6000</u>
Total Cost	\$A <u>25700</u>

CCAMLR/IOC Scientific Seminar on Ocean Variability and its Influence on the Antarctic Marine Living Resources, particularly Krill

11. The Scientific Committee recommended that CCAMLR should co-sponsor with the Inter-governmental Oceanographic Commission (IOC) on Scientific Seminar, to be held presumably in early 1986 in Paris. Preparatory work needs to be carried out during 1985.

12. The purpose of the Scientific Seminar would be to provide an opportunity for closer cooperation between oceanographers and biologists to evaluate the consequences of natural variations in the ocean currents around the Antarctic on the distribution and behaviour of krill and other animals.

13. The budgetary implications are as follows:

	1985	1986
Travel expenses and per diem for 2 invited experts to prepare background papers. The preparatory meeting in Hamburg	3,000	
Translate into 4 languages and issue worldwide prospectus and invitations. Translate and publish abstracts of Scientific Contributions	5,000	
Stationery/Administration	1,000	1,000
Translate, publish and distribute final report	_____	<u>5,000</u>
Total Cost \$15,000	<u>9,000</u>	<u>6,000</u>

14. The contribution is to be made on the understanding that IOC will provide Secretariat and other services to the value of \$15,000.

Species Identification Sheets

15. At its last meeting the Commission agreed to contribute to the joint publication of Species Identification Sheets with FAO.

16. It was agreed to fund this project over three years as follows:

1984	20,000
1985	14,000
1986	<u>12,000</u>

\$A46,000

17. If any additional funds became available then this project could be completed in 1985.

18. It is expected at the completion of the project FAO will supply detailed information of the expenditures incurred including the funds provided by FAO.

19. The total budget for the Scientific Committee as proposed is \$80,600.