ANNEX 6

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.

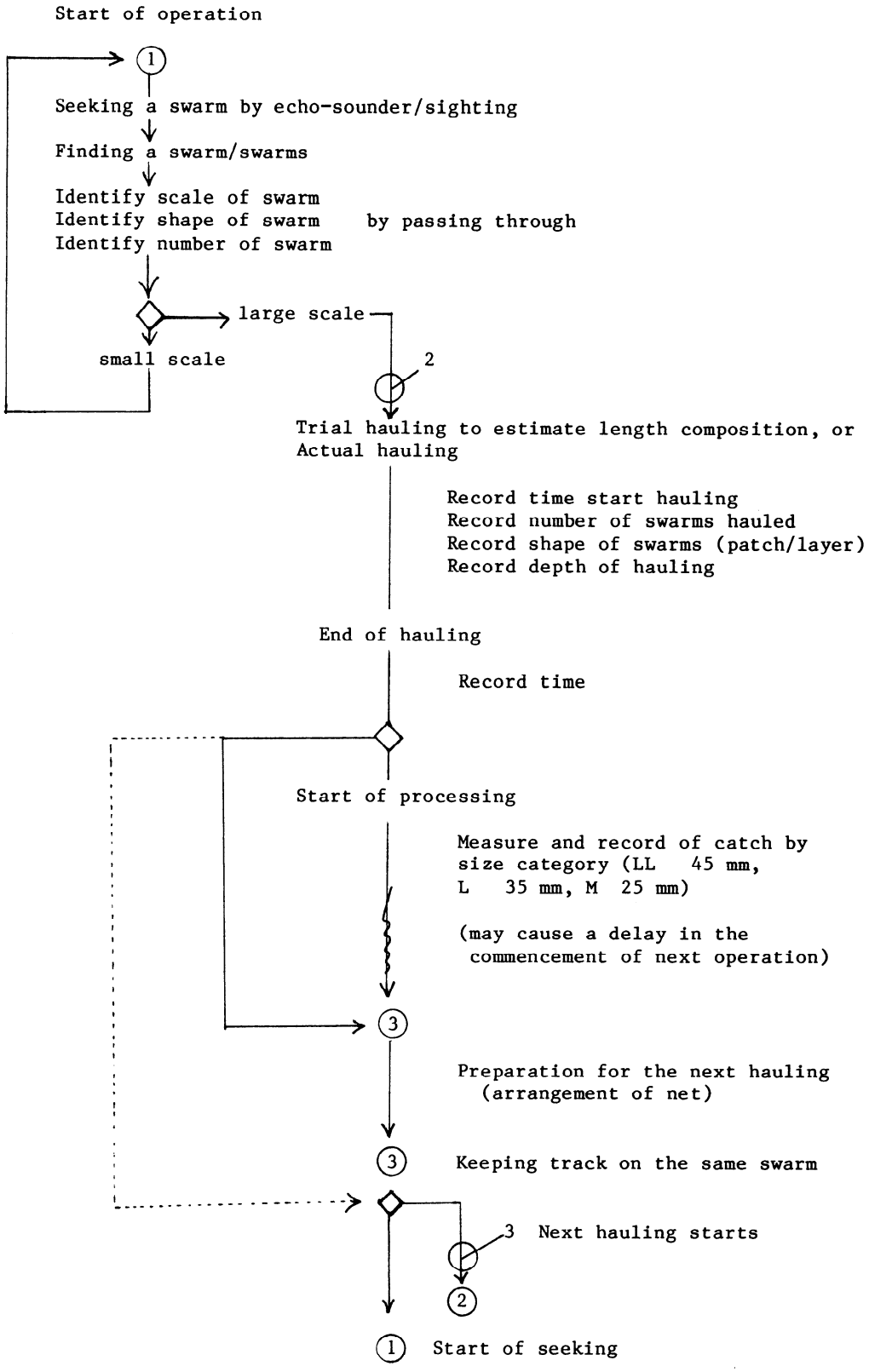
Fishing Operations and Commercial Data Recording

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 hyrdoacoustics 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.

APPENDIX I

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.

APPENDIX 2

Ad Hoc Working Group on Data Collection and Handling

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

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APPENDIX 3

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

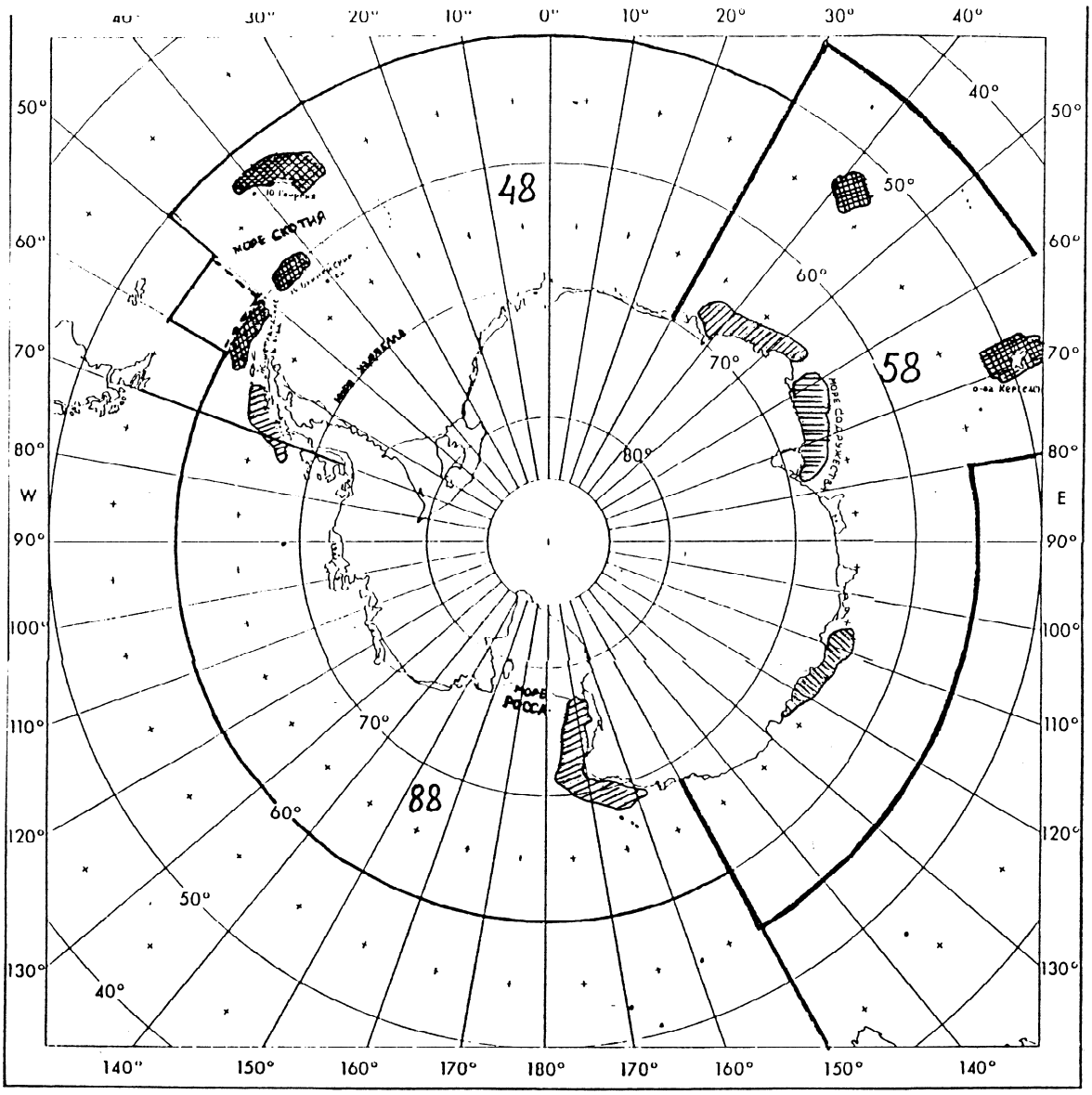
Further progress depends critically on decisions taken by the Scientific Committee at its 1984 meeting. Such decisions should properly depend upon whether or not there is now sufficient justification for defining the needed data to be reported. The most serious lack is actual attempts to assess the krill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

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

APPENDIX 5

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). *Champsocephalus 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 & Pletikosic, 1983; Duhamel & Hureau, 1984).

Champsocephalus 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 Oceansector 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.

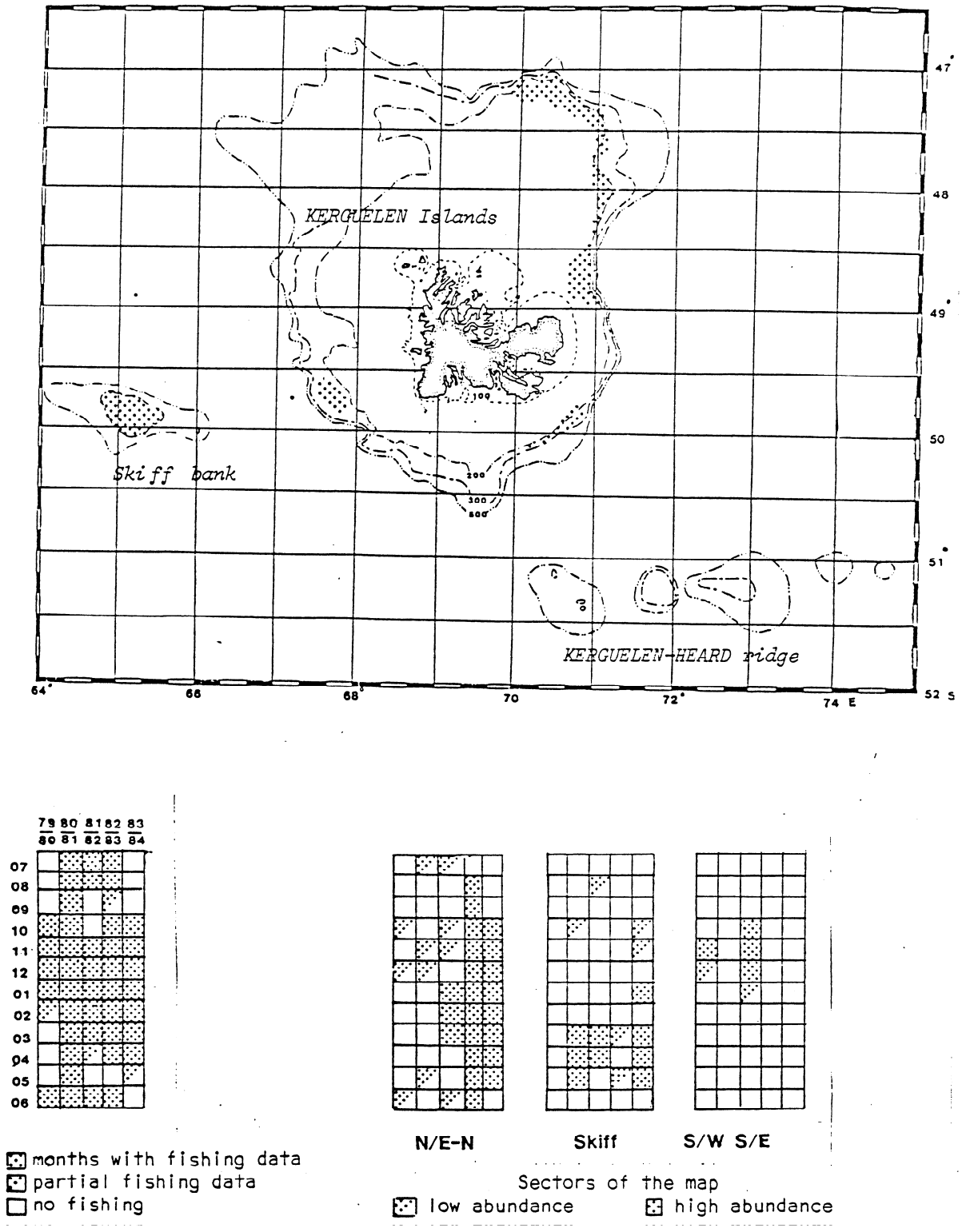


Figure 1: Spatial and temporal distribution of *Champsocephalus gunnari* on the shelf of Kerguelen Islands (and nearby banks) during the period 1979–1984.

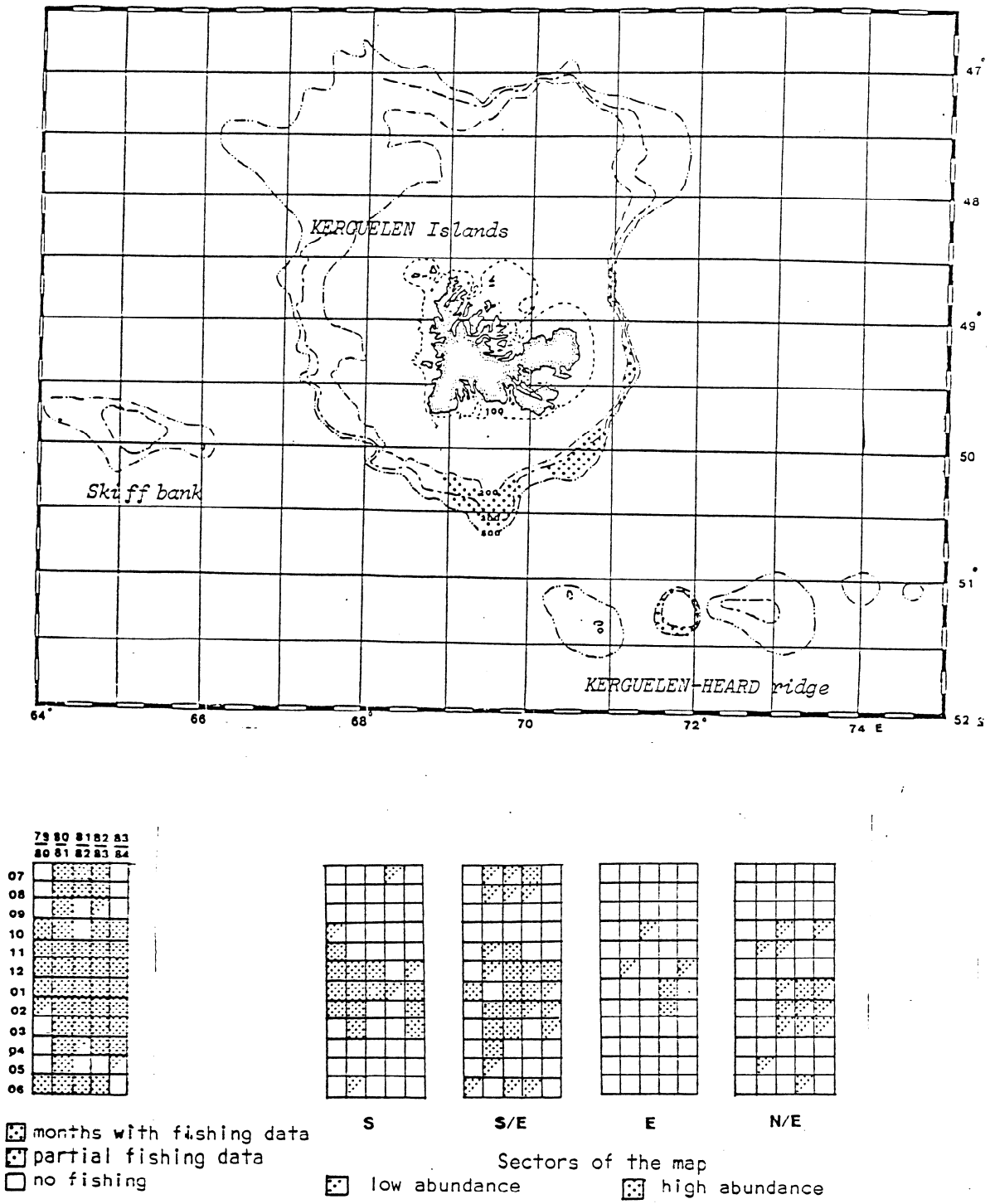


Figure 2: Spatial and temporal distribution of *Notothenia squamifrons* on the shelf of Kerguelen Islands (and nearby banks) during the period 1979–1984.

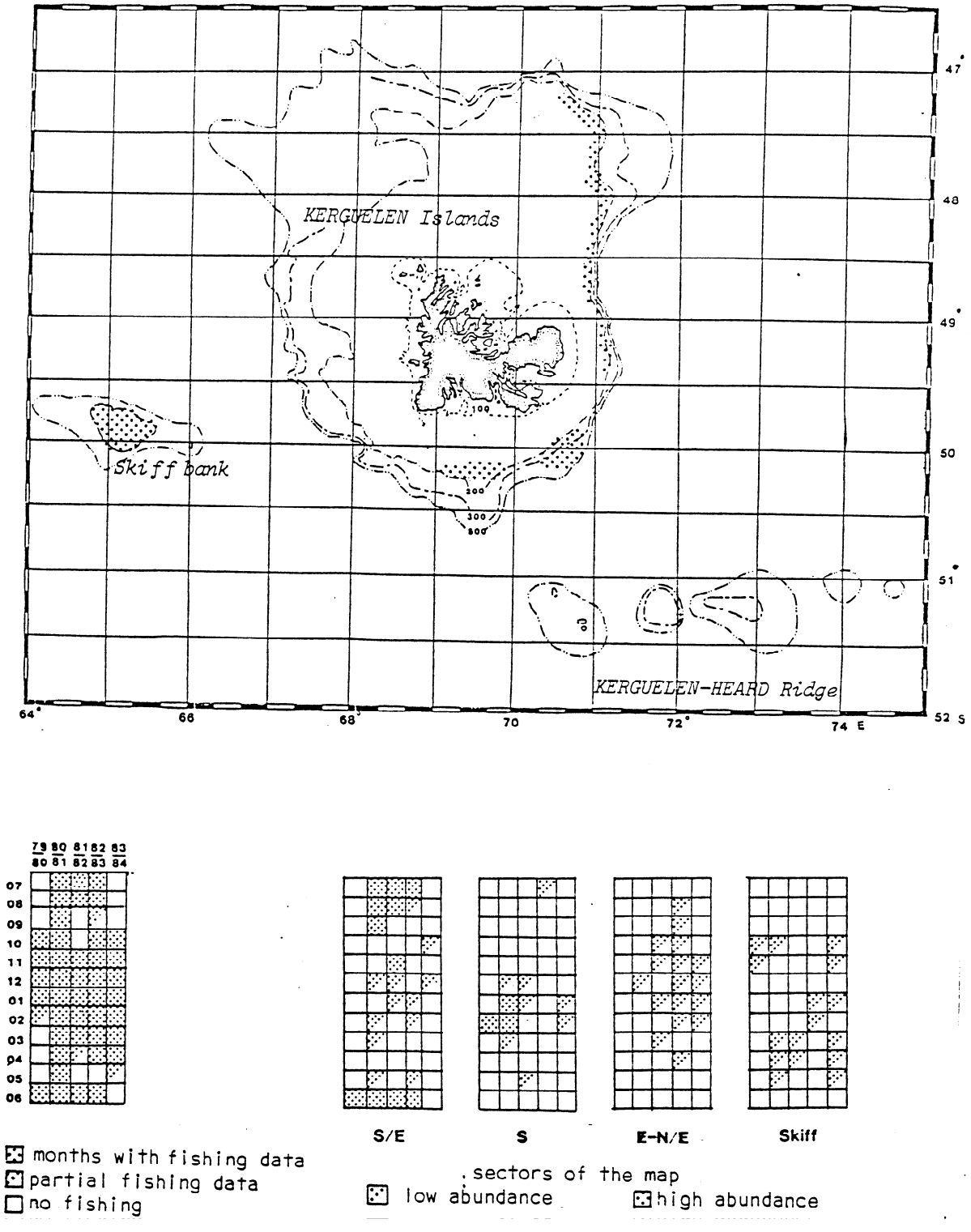


Figure 3: Spatial and temporal distribution of *Notothenia rossii rossii* on the shelf of Kerguelen Islands (and nearby banks) during the period 1979–1984.

APPENDIX 6

PROPOSALS FOR BASIC DATA COLLECTION

1. 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

APPENDIX 7

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.