KRILL RESOURCES

Fishery Status and Trends

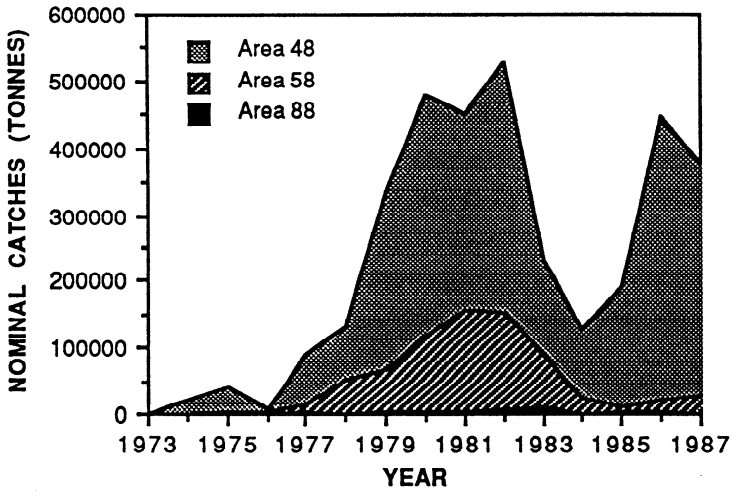
2.1 The total krill catch for 1987/88 was essentially similar to 1986/87, although a slight decrease of some 6 000 tonnes has occurred. A summary of national krill landings since 1983 is as follows:

Table 2.1: National krill landings (in tonnes) since 1982/83

	Split-Year*					
Member	1983	1984	1985	1986	1987	1988
Chile	3 752	1 649	2 598	3 264	4 063	5 938
GDR	0	0	50	0	0	0
Japan	42 282	49 531	38 274	61 074	78 360	73 112
Republic of Korea	1 959	2 657	0	0	1 527	1 525
Poland	360	0	0	2 065	1 726	5 215
Spain	0	0	0	0	379	0
USSR	180 290	74 381	150 538	379 270	290 401	284 873
Total	228 643	128 218	191 460	445 673	376 456	370 663

* The Antarctic split-year begins on 1 July and ends on 30 June. The column 'split-year' refers to the calendar year in which the split-year ends (e.g. 1988 refers to the 1987/88 split-year).

2.2 The total krill catch by statistical area and year since 1973 is illustrated in the figure below.



2.3 An analysis of the 1987/88 landings by area indicated a very slight reduction of catches in Area 48 as a whole compared with the previous year. In this regard, there was also an approximately nine-fold (75 000 tonnes) increase of the Soviet catch in Subarea 48.2 and a 26% (66 000 tonnes) reduction in Subarea 48.3.

2.4 In contrast, catches from Subarea 58.4 were down by 88% (6 490 versus 29 557 tonnes) from1986/87 levels.

2.5 With exception of the Soviet and Polish catches, krill catches by most nations were similar in 1987/88 to 1986/87 levels. Polish catches were, however, approximately 3 times (3 500 tonnes) higher while the Soviet catch was some 2% (6 000 tonnes) less. An increase in the Chilean catch of 46% (1 875 tonnes) and a subsequent reduction of 7% (5 248 tonnes) in the Japanese catch was also noted. With respect to the latter, Dr Shimadzu reported that this was a consequence of the withdrawal of one vessel from the Japanese operations in 1987/88.

2.6 In 1987/88, the total USSR krill catch (284 873 tonnes) was made up as follows:

Subarea 48.1	0	(319 tonnes in 1986/87)
Subarea 48.2	89 888	(9 731 tonnes in 1986/87)
Subarea 48.3	188 391	(254 480 tonnes in 1986/87)
Area 88	0	(288 tonnes in 1986/87)
Subarea 58.4	6 490	(25 583 tonnes in 1986/87)

2.7 Dr T. Lubimova (USSR) indicated that the slight decrease and areal redirection of the Soviet catches in 1987/88 was a result of the severe ice-conditions experienced during the most recent fishing season in Division 58.4.2.

2.8 Dr J. Gulland (EEC) drew the Committee's attention to recent discussions within the Commission Working Group for the Development of a Conservation Strategy concerning the value of information about future developments in the krill fishery. It was agreed that this information would be of interest to the Scientific Committee, particularly with respect to the formulation of management advice.

2.9 Most krill fishing nations indicated that recent trends (i.e. slight increases or decrease in catches from year-to-year) would continue. There was general recognition that such variations were largely dependent on economic (including marketing) factors, technological developments, the availability of fishing vessels and prevailing environmental conditions (especially effects of seasonal ice-cover on krill availability). Dr Lubimova indicated the possibility that Soviet catches in the near future may increase as a result of an increase in the overall areal coverage of that nation's krill fishery. Dr O. Østvedt (Norway) also indicated that Norwegian vessels may commence a small-scale krill fishery in the not too distant future.

Data Requirements

2.10 In response to the concern expressed at last year's Scientific Committee Meeting, (SC-CAMLR-VI, paragraph 4.12), Dr Lubimova indicated that catches taken within Area 58 during 1987/88 were from Division 58.4.2 and not from previous 'unknown' areas as had been recorded in the summary catch statistics (SC-CAMLR-VII/BG/1).

2.11 In accordance with the Commission's 1986 decision (CCAMLR-V, paragraph 71), the submission of detailed catch and effort data for Subarea 48.2 was requested. In addition, the Sixth Meeting of the Scientific Committee recommended that fine-scale catch and effort data should be reported wherever possible from the CEMP Integrated Study Regions (SC-CAMLR-VI, paragraph 4.14). These regions include the following statistical subareas and divisions:

Antarctic Peninsula - 48.1, 48.5 (partially) and 88.3 (partially)
South Georgia - 48.3
Prydz Bay - 58.4.2, 58.4.3 and 58.4.4 (partially).

2.12 Since the 1987/88 season the reporting format for fine-scale catch and effort data for krill is the same as that for fish.

2.13 To date, Brazil, Korea and Poland have submitted fine-scale catch and effort data for Subareas 48.1, 48.2 and (in the case of Poland) 48.3 for the 1987/88 season. Japan had submitted such data for Subarea 48.2 since 1985/86 to the present, and for Subarea 48.1 for the 1987/88 season.

2.14 In discussion concerning the above, Dr Lubimova indicated that Soviet data for the past season (1987/88) had been prepared but due to problems with verification they had only been recently submitted.

2.15 With regard to the reporting of fine-scale catch data from Subarea 48.2, Dr Y. Shimadzu (Japan) drew attention to the 1986 request of the Commission that such data should be submitted (CCAMLR-V, paragraph 71). He indicated that this decision was based on a large increase in the krill catch from this subarea in 1985/86 compared with previous years. However, since catch levels have substantially declined, Dr Shimadzu questioned the propriety of the continued submission of fine-scale catch data from Subarea 48.2. Given that the reporting of fine-scale data has also been requested for the Integrated Study Regions of CEMP (SC-CAMLR-VI,

paragraphs 4.14), Dr Shimadzu expressed the view that the fine-scale reporting of krill catch data from Subarea 48.2 should not be continued.

2.16 In response to the above, the Committee noted that Subarea 48.2 is situated between two of the CEMP's Integrated Study Regions (48.1 and 48.3) and hence the continued reporting of fine-scale data from all three areas was emphasised.

2.17 Dr Shimadzu then drew the Committee's attention to a basic inconsistency in the original request for fine-scale effort data as set out in paragraph 71 of the Report of the Fifth Meeting of the Commission. As such, the request was ambiguous as to whether catch data alone, as opposed to both catch and effort data, was required. Dr Shimadzu indicated that in his opinion it is still unclear whether fine-scale effort data can be utilised in the evaluation of possible effects on localised predators as a consequence of krill fishing activities (SC-CAMLR-V, paragraph 5.36).

2.18 The Committee agreed that the issue of reporting fine-scale effort data needed to be resolved. However, despite Dr Shimadzu's reservations as to the ultimate utility of such fine-scale effort data the majority of Members agreed that theses data could be of some use to the CEMP.

2.19 The Committee therefore recommended that until such time as the value of fine-scale effort data in the determination of krill abundance trends could be irrevocably determined, every effort should be made to encourage the collection, and if possible submission to CCAMLR, of such data. The reporting of fine-scale catch data for Subareas 48.1, 48.2 and 48.3 should continue.

2.20 Finally, in view of the need to improve knowledge of possible future developments in the krill fishery (paragraph 2.8 above), the Committee recommended that, whenever possible, information about such developments should be made available each year to the Scientific Committee.

Ad Hoc Working Group on Krill

2.21 At its 1987 Meeting, the Scientific Committee recognised the absence of a forum within CCAMLR for the in-depth review of current and past research on krill biology and ecology, or for the evaluation of its application in meeting the Convention's objectives. An ad hoc Group on Krill under the convenership of Mr D. Miller (South Africa) was therefore established and terms

of reference were set out in paragraph 4.30 of the Report of the Scientific Committee's 1987 Meeting.

2.22 The Convener reported on the intersessional activities of the above Group (SC-CAMLR-VII/BG/10) and outlined a number of suggestions for future action (SC-CAMLR-VII/11).

2.23 In discussing the latter, the Committee recognised that a large number of papers submitted to the present meeting were directly pertinent to various topics which the Group had identified as being important in the execution of its function. In broad terms such papers dealt with acoustic target strength estimation (SC-CAMLR-VII/BG/30), evaluation of sampling efficiency and related problems (SC-CAMLR-VII/BG/7, 21, 22 and 40), studies of krill distribution at a variety of spatial and temporal scales (SC-CAMLR-VII/BG/13, 20, 25 and 40), and attempts to improve the general state of knowledge concerning various aspects of the krill fishery (SC-CAMLR-VII/BG/6, 12, 14 and 37).

2.24 Taking into account recent developments to co-ordinate national research on krill under the auspices of SCAR (SC-CAMLR-VII/12) and the wide variety and technical nature of the topics which the ad hoc Group is required to address, the Scientific Committee agreed to focus the Group's efforts on aspects of krill ecology most closely related to the krill fishery. This was viewed as an essential development in assisting the Scientific Committee to provide appropriate advice to the Commission.

2.25 Accordingly, the Scientific Committee recommended that the ad hoc Group should be constituted as a permanent Working Group on Krill under the convenership of Mr D. Miller (South Africa).

2.26 The terms of reference of the Working Group are to:

- review and evaluate methods and techniques for estimating krill abundance, taking note of the effects of patchiness and the influences of the physical environment;

- review and evaluate information concerning the size, distribution and composition of commercial krill catches, including likely future trends in these catches;

- liaise with the Working Group for the CCAMLR Ecosystem Monitoring Program for assessing any impact of changes in krill abundance and distribution on dependent and related species;

- evaluate the impact on krill stocks and krill fisheries of current and possible future patterns of harvesting, including changes brought about through management action, in order that the Committee may formulate appropriate scientific advice on krill to the Commission; and

- report to the Scientific Committee on information, and data, required from commercial krill fisheries.

2.27 In considering the Group's first term of reference, it was agreed that the Group would need to take account of the status of knowledge concerning the population structure, determination of growth and age, reproduction and fecundity and natural mortality of krill.

2.28 The Committee recognised that there is an urgent need for the Group to commence its work. It was therefore agreed that a meeting of the Group should be held during the intersessional period.

2.29 The major objective of this meeting will be to consider available information on the abundance and distribution of krill in selected subareas of the Antarctic. In order to achieve this the Group will need to review and evaluate:

(i) various estimation procedures used in the determination of krill abundance/ distribution;

(ii) knowledge concerning the spatial and temporal (both seasonal and annual) variability in krill stocks; and

(iii) the availability of relevant fisheries information.

2.30 It was agreed that many of the tasks which the Group would need to undertake at its meeting are complementary to developments within the Krill CPUE Simulation Study (see below). There would therefore be considerable value in holding the Group's meeting in conjunction with the planned Krill CPUE Workshop (see paragraph 2.40 below).

2.31 The Committee agreed that the meeting of the Group will be held at the Southwest Fisheries Center, La Jolla, USA during the period 7 to 14 June, 1989.

Krill cpue Simulation Study

2.32 Dr J. Beddington (UK) briefly outlined the results of the Krill CPUE Simulation Study (SC-CAMLR-VII/6).

2.33 The two consultants, Dr M. Mangel (University of California, Davis) and Prof. D.S. Butterworth (University of Cape Town) then introduced their modelling analyses which took account of data from the Soviet research vessels (SC-CAMLR-VII/BG/12) and Japanese commercial vessels (SC-CAMLR-VII/BG/37) respectively.

2.34 A model of krill distribution had been prepared using information from several national acoustic data sets. The same distributional model was used in both simulation studies.

2.35 During his presentation Dr Mangel drew attention to two additional documents pertinent to the model of the Soviet fishery research vessel operations which he had developed. The first (SC-CAMLR-VII/BG/14) described in some detail the operation of the soviet commercial fishery (information which Dr Mangel was not able to utilise in the development of his model). The second (SC-CAMLR-VII/BG/20) indicated that the underlying assumptions which the Consultants had made concerning the spatial distribution of krill stocks were compatible with other available data on krill distribution.

2.36 It was agreed that the two consultants' reports were of great interest but hat it would be extremely difficult to evaluate their content given the limited time that most Committee members had had to consider them. Dr E. Marschoff (Argentina) noted that this was a clear demonstration of the problem associated with the late submission of documents for consideration during Scientific Committee proceedings. The Committee agreed with this view and that the matter of the timely submission and circulation of important papers was a matter of serious concern (refer paragraph 12.3).

2.37 Therefore, in accordance with the timetable outlined for the Simulation Study in last year's report (SC-CAMLR-VI, paragraph 4.41), the Committee recognised that further evaluation of the context of the consultant's reports was necessary to develop appropriate terms of reference for the evaluation workshop planned for 1989. A small task group was formed under the convenership of Dr E. Marschoff (Argentina) to undertake this task. A report of the deliberations of this group is appended at Annex 4.

2.38 In essence, both Consultants' studies concluded that certain catch dependent indices (in particular those containing some element of search time) could be used to assess levels of krill

abundance and that improved models of krill distribution patterns need to be developed (preferably as a result of joint scientific and fishing vessel surveys). In addition, Dr Mangel indicated that, if possible, operational analyses of krill fishing operations should be undertaken by suitably qualified personnel.

2.39 Having considered the task group's summary, the Committee accepted its recommendations to proceed with the proposed workshop (SC-CAMLR-VI, paragraph 4.41).

2.40 The Committee recommended that the Workshop be held at the Southwest Fisheries Center, La Jolla, USA during the period 1 to 6 June, 1989.

2.41 The major tasks of the Workshop will be:

(i) to provide an opportunity for detailed and final discussions on the models developed by the consultants, and their implications for the potential use of CPUE to index krill abundance;

(ii) to consider refinements of the krill distribution model used in the consultants' studies in the light of further analyses of existing krill research survey data to be tabled at the Workshop, and to investigate whether such refinements altered the conclusions drawn from the existing studies;

(iii) to consider the practicality of the routine collection of various types of search time information in the light of analyses to be presented of experimental collection of such data that has already taken place on Japanese vessels, and of some data from Soviet research vessels; and

(iv) to make recommendations to the Scientific Committee regarding the potential utility of CPUE to index krill biomass, the most effective and practical index or indices to be used, and the consequent requirements for routine data collection in the krill fishery.

2.42 Access to a mainframe computer must be available to the Workshop, so that the models developed by the consultants can be run in appropriate periods.

Advice to the Commission

2.43 In order to facilitate the development of appropriate scientific advice on krill, the Scientific Committee recommended that a permanent Working Group on Krill be formed. The primary function of this Group will be to evaluate available knowledge and formulate specific recommendations on the potential effects of krill fisheries with respect to the provision of the Convention. This Group should meet during the intersessional period in order to commence its tasks.

2.44 Having considered the report of the consultants for the Krill Simulation Study, it is recommended that a Workshop meeting be held to develop specific recommendations to the Scientific Committee on the implications of this study. This meeting should be held in conjunction with the Working Group's meeting.

2.45 Finally, the Committee recommended that the reporting of fine-scale catch data from Subarea 48.2 should continue. Similarly such data should also be reported from Subarea 48.1 and 48.3 (the Integrated Study Regions of the CEMP). Wherever possible, fine-scale effort data from all three areas should be collected, and should such data be shown to be useful, submitted to the Commission at some time in the future.