Northwest Atlantic Fisheries Organization

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SCIENTIFIC COUNCIL MEETING - JUNE 1981

Provisional Report of Scientific Council

Dartmouth, Canada, 3-19 June 1981

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PROVISIONAL REPORT OF SCIENTIFIC COUNCIL

Regular Meeting, June 1981

Chairman: R. H. Letaconnoux Rapporteur: V. M. Hodder

The Scientific Council and its Standing Committees met at NAFO Headquarters in the Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada, during 8-19 June 1981, to consider and report on the various matters listed in the Agenda (Appendix IV). In addition to dealing with matters of general scientific interest, the Council considered requests by the Fisheries Commission and the coastal Contracting Parties (Canada and European Economic Community) for advice on management in 1982 of a number of stocks in Subareas 0 to 4. Representatives attended from Canada, Cuba, EEC (Denmark, Federal Republic of Germany, France, and Commission of the European Communities), Japan, Portugal, and Union of Soviet Socialist Republics (USSR), and observers attended from Spain and United States of America (USA) (see Appendix V).

Prior to the first session of the Council, the *ad hoc* Working Group on Squid Research met during 3-6 June 1981, as agreed at the September 1980 Meeting, to review all available information on squid-*Illex* biology and distribution. Its report was considered by the Standing Committee on Fishery Science.

The reports of the Standing Committees, as adopted by the Council at this meeting, are given in Appendix I (STACFIS), Appendix II (STACREC) and Appendix III (STACPUB). Brief summaries of the committee reports and other matters considered by the Council are given below. Lists of research and summary documents presented at this meeting and the February 1981 Meeting are given in Appendix VI.

I. FISHERY SCIENCE (APP. I)

1. General Fishery Trends

The total nominal catch of all species (except seaweeds) in Subareas 0 to 6 was 2.85 million tons in 1980, a decrease of 6% from the 1979 nominal catch of 3.03 million tons (see Appendix I, Table 1). The total catch of "groundfish" species decreased to 1.21 million tons in 1980 from 1.25 million tons in 1979, largely due to decreased catches of redfish, silver hake and Greenland halibut. The total catch of "pelagic" species in 1980 was 642,000 tons, a slight increase from the 1979 catch of 631,000 tons. For the "other fish" category, the total catch continued to decline to 102,000 tons in 1980 from 129,000 tons in 1979 and from 308,000 tons in 1977, mainly due to the rapid decline in the capelin fishery. The total catch of "invertebrate" species declined to 0.90 million tons in 1980 from 1.03 million tons in 1979, due mainly to decreased catches of squid and scallops.

With respect to the nominal catches of all species (except seaweeds) by subarea, increases from 1979 to 1980 were recorded for Subarea 0 (2,400 to 2,700 tons), Subarea 4 (745,000 to 762,000 tons) and Subarea 5 (533,000 to 561,000 tons), whereas decreases were recorded for Subarea 1 (165,000 to 123,000 tons), Subarea 2 (70,000 to 58,000 tons), Subarea 3 (616,000 to 489,000 tons) and Subarea 6 (894,000 to 857,000 tons).

2. Stock Assessments

a) Summary

STACFIS reviewed the state of, and advised on catch levels in 1982 for, a number of stocks in Subareas 0 to 4 which lie completely or partly within the 200-mile fishery zones of Canada and the European Economic Community (Agenda annexes 1 and 2) and the three stocks which lie outside national fishery zones in Div. 3M. Insofar as it was possible, total allowable catches (TACs) for 1982 were advised and these are listed in the last column of Table 1. Details of the

Individual stock assessments are given in the report of STACFIS (Appendix I).

For the cod stocks in Subarea 1 and Div. 2J+3KL, management options at various levels of fishing mortality and the short-term effects on catch and biomass are presented rather than a TAC associated with a particular level of fishing mortality, in accordance with the requests of Canada and the EEC.

An increase in TAC for 1982, compared with 1981, was advised only for yellowtail flounder in Div. 3LNO, and a decrease was advised for silver hake in Div. 4VWX (Table 1). No changes in TAC were advised for redfish in Div. 3M and 3LN, American plaice in Div. 3M and 3LNO, witch flounder in Div. 3NO, Greenland halibut in Subareas 0+1, roundnose grenadier in Subareas 0+1 and 2+3, argentine in Div. 4VWX, and squid-*Illex* in Subareas 3+4. In the case of the redfish and wolffish stocks in Subarea 1, the information available was inadequate for assessment, and the Council can only indicate approximate yield levels based mostly on historical catch data.

In view of the substantial contribution of recruiting year-classes to annual yields, no TACs were advised for the shrimp stocks in Subareas 0 and 1 and the capelin stocks in Subareas 2 and 3. It was agreed to defer the assessment of these stocks to a mid-term meeting, because of the necessity of having available complete information from the commercial fishery and research vessel surveys in 1981. Advice on TAC levels in 1982 for the cod stocks in Div. 3M and 3NO was also deferred to a mid-term meeting, due to the depleted condition and the continued uncertainty about the status of these stocks.

Table 1. Summary of recent catches (1975-80) and TACs (1975-81) for stocks reviewed at the June 1981 Meeting of STACFIS, together with the advised TACs for 1982.

Species	Stock area	Nominal catches (000 tons)						TACs (000 tons)							
		1975	1976	1977	1978	1979	1980[1]	1975	1976	1977	1978	1979	1980	1981	1982
Cod	1	48	33	38	38	48	48	60	45	31	...[2]	...[2]	...[2]	...[2]	( )[3]
	2J+3KL	288	214	173	139	165	172	554	300	160	135	180	180	200	( )[3]
	3M	22	22	25	33	30	10	40	40	25	40	40	13	12.7	( )[4]
	3NO	44	24	18	15	28	19	88	43	30	15	25	26	26	( )[4]
Redfish	1	9	14	31	8	9	7	-	-	-	13	...	...	...	( )[3]
	3M	16	17	20	17	20	16	16	16	16	16	20	20	20	(20)
	3LN	18	21	16	12	14	16	20	20	16	16	18	25	25	(25)
Silver hake	4VWX	116	97	37	48	52	44	120	100	70	70	70	90	80	(75)
A. plaice	3M	2	1	1	1	1	1	2	2	2	4	2	2	2	(2)
	3LNO	43	52	44	50	49	49	60	47	47	47	47	47	55	(55)
Witch	3NO	6	6	6	3	3	2	10	10	10	10	7	7	5	(5)
Yellowtail	3LNO	23	8	12	15	18	12	35	9	12	15	18	18	21	(25)
G. halibut	0+1	25	16	13	12	19	8	-	20	20	20	25	25	25	(25)
	2+3KL	29	25	32	39	34	32	40	30	30	30	30	35	55	(55)
R. grenadier	0+1	5	9	3	6	7	2	10	14	8	8	8	8	8	(8)
	2+3	27	21	15	21	8	2	32	32	35	35	35	30	27	(27)
Wolffishes	1	6	6	6	6	17	5	-	-	-	-	-	-	-	( )[3]
Argentine	4VWX	15	7	2	2	3	2	25	25	20	20	20	20	20	(20)
Capelin	2+3K	199	216	152	55	12	6	160	160	212	212	75	5	...	( )[4]
	3LNO	166	144	74	30	12	14	180	180	200	200	10	16	30	( )[4]
Shrimp	0+1	38	50	42	34	35	43	-	-	36[5]	40[5]	29.5[5]	29.5[5]	...	( )[4]
Squid-*Illex*	2-4	18	42	83	94	162	70	-	-	-	100	120	150	150	(150)

[1] Provisional statistics.
[2] Catches restricted to Greenlanders' fishery and to by-catch.
[3] See relevant subsections of STACFIS report (Appendix I).
[4] Deferred to mid-term meeting.
[5] TACs pertain to offshore grounds.

b) Additional comments relevant to assessments

i) Greenland halibut in Subarea 2 and Div. 3KL

The Council noted that the advised TAC of 55,000 tons for this stock should apply only to Div. 2J+3KL, and that any increase in the TAC should be related to removals from Div. 2GH.

ii) Squid-*Illex* in Subareas 3 and 4

In view of the continued inability to predict squid abundance in 1982, the Council reiterates the management regime proposed for squid at the February 1980 Meeting (*NAFO Sci. Coun. Rep.* 1979-80, pages 39-40). The Council also noted that the present management regime implies substantial loss of yield to the fishery in years of high abundance and that, through predation by squid, there may also be a loss of yield to the fishery for other species in years of high squid abundance.

The Council endorsed the recommendations for future research on squid, as indicated in Annex 1 to the report of STACFIS, and agreed that the *ad hoc* Working Group on Squid Research should meet for two days during the September 1981 Meeting to carry out a more complete review of the 1981 survey results and to develop a program for 1982.

iii) Cod in Div. 3M

The Council noted that a stock-recruitment relationship has not been demonstrated for this stock and endorsed the recommendation of STACFIS that the *ad hoc* Working Group on the Flemish Cap Program examine the data base to determine if such a relationship can be defined for cod in this area.

3. Mesh Assessment for Cod and Redfish in Div. 3M

The Council noted that the present data base is not sufficient to provide advice on the impact of changes in mesh size on the interaction of the cod and redfish fisheries in Div. 3M, and strongly urges that the deficiencies in the data base be defined at the September 1981 Meeting, so that a full and complete evaluation of this problem can be undertaken as soon as possible.

4. Gear and Selectivity

The Council noted the results of the mesh selection studies on silver hake in 1980, and endorsed the recommendation of STACFIS that sufficient data be collected under commercial conditions to allow accurate descriptions of the selectivity of the 60-mm and 90-mm codend mesh sizes for silver hake. The Council noted that additional selection studies on Greenland halibut had not been carried out and urged that these be continued. The results of the 1981 redfish selection experiment by Cuba in Div. 3M were utilized by STACFIS in its mesh assessment of the cod and redfish fisheries in that area.

5. Ageing Techniques and Validation Studies

The Council welcomed the initiation of comparative ageing studies on redfish, but noted that the exchange of ageing material for roundnose grenadier has not yet been undertaken, as recommended at the June 1980 Meeting (*NAFO Sci. Coun. Rep.* 1979-80, page 65). The Council noted that time was insufficient at the Shrimp Ageing Workshop in Quebec City, Canada, during 11-14 May 1981 to cover all aspects of ageing shrimp and agreed that two days should be added to the mid-term meeting for shrimp assessments, so that further consideration can be given to the various aspects of ageing techniques and management implications.

6. Other Relevant Papers

The Council welcomed the presentation of several research documents not directly related to stock assessments, but noted that these probably represent a very small proportion of the research information available for the Northwest Atlantic although not submitted for consideration by the Council.

II. RESEARCH COORDINATION (APP. II)

1. Statistics and Sampling

a) CWP activities relevant to NAFO statistics

The Council noted that STACREC had reviewed the report of the 10th Session of the Coordinating Working Party on Fishery Statistics, held at Madrid, Spain, in July 1980, particularly in regard to the classification of fishing gears, the use of 3-alpha species identifiers, the operation of the STATLANT system, and the allocation of catches by nationality, and reaffirmed previous commitments on these matters. It was also noted that the 11th Session of the CWP will be held at Luxembourg during 21-28 July 1982 and that it was necessary for the Scientific Council to designate a country that would nominate one of the NAFO representatives to attend that session.

b) Fishery statistics

The Council expressed concern about the difficulties being encountered by the Secretariat in obtaining and compiling fishery statistics for stock assessments and for publication annually in the Statistical Bulletin. The problems relate in part to the late submission of STATLANT 21A and 21B reports by some member states and in part to complications arising from the reporting of statistics accruing from joint venture operations. Consequently, the publication of *Statistical Bulletin*, Vol. 28 was delayed by nearly one year and Vol. 29 by 8 months. The Council noted that the responsibility lies with the national statistical agencies and that no obvious solution was evident except to request Council representatives to impress upon their statistical officers the importance of accurate and prompt reporting.

c) Sampling data

The Council noted that the Secretariat had received and processed a large volume of sampling data for 1979, including some data collected through the Scientific Observer Program. It was observed that some of the national lists of data indicated incomplete coverage of the fisheries, and Council representatives are urged to check these national lists and submit all non-reported length frequencies and age-length keys to the Secretariat as soon as possible.

d) List of fishing vessels for 1980

The Council noted that the national lists of fishing vessels, which operated in the Northwest Atlantic in 1980, was still very incomplete, and urged that all outstanding lists be forwarded to the Secretariat as soon as possible to facilitate the publication of the first NAFO issue of List of Fishing Vessels.

2. Biological Surveys

a) Survey activities

The Council noted that STACREC had reviewed research vessel survey activities in the Northwest Atlantic in 1980 and survey plans for 1981, the details of which are listed in Tables 1 and 2 of Appendix II.

b) The Council noted that the editor (Dr W. G. Doubleday) had prepared a further revision of the Manual on Groundfish Surveys in the NAFO Area, and that some new material had been approved by STACREC for inclusion. Subject to final editing, the Council agreed to the publication of the Manual in a special issue of Scientific Council Studies as soon as possible.

c) Other survey matters

The Council endorsed the recommendations of STACREC regarding the need for calibration of fixed-station and stratified-random surveys, particularly in Div. 3M, and for the inclusion of catchability coefficients in all reports dealing with biomass estimates from surveys.

3. Environmental Studies

a) MEDS progress report for 1980

The Council noted the progress made by MEDS (Marine Environmental Data Service) in acquiring a considerable amount of oceanographic data for 1980 but that this may represent little more than half of the data actually collected. Consequently, the MEDS summary of environmental conditions in 1980 is based on a very incomplete data base. It was agreed that the national representatives should try to speed up the reporting of data and that MEDS should try to speed up the processing of data as well. The Council also noted that MEDS continues to receive outstanding data for previous years.

b) National representatives

The Council was informed of only one change in the list of national representatives responsible for reporting oceanographic data to MEDS: Dr H. Hatanaka replaces Dr F. Nagasaki as the representative for Japan.

c) Environmental conditions in 1980

The Council noted that MEDS has again provided a summary of environmental conditions in Subareas 0 to 4 from the available data for 1980 (SCR Doc. 81/VI/82), and that this review was supplemented by STACREC from informtion given in various documents presented at this meeting. It was regretted that no information was available on environmental conditions in Subareas 5 and 6 for 1980.

4. Review of Gear Definitions

At the request of the Fisheries Commission, STACREC reviewed the definitions for various components of trawl nets. The Council approved the definitions proposed by STACREC, as given in Annex 1 to Appendix II.

III. PUBLICATIONS (APP. III)

1. Review of the Council's Publications

The Council noted STACPUB's review of the status of publications and encouraged support for Vol. 2 of the Journal of Northwest Atlantic Fishery Science through the submission of suitable manuscripts. Concern was expressed about continuing delays in the publication of fishery statistics, as a result of delays in reporting and errors in submissions by national statistical offices. Publication plans for the Manual on Groundfish Surveys and for the proceedings of special sessions at the September 1981 Meeting were approved.

2. Coordination of Research Information for the NAFO Area

The Council again encouraged countries producing scientific information relevant to the NAFO Conven-

tion Area to submit these to the Scientific Council, and approved STACPUB's plan to continually monitor the Council's success in attracting such material.

3. Proposed Ichthyoplankton Indentification Manual

The Council agreed to the establishment of an *ad hoc* working group of ichthyoplankton systematic experts to meet during the September 1981 Meeting to review the state of knowledge of ichthyoplankton identification in the NAFO Area, to decide on the feasibility of producing such a manual, and to propose mechanisms for production of a manual if the project is considered a practical and worthwhile venture. The Secretariat was requested to solicit background material, and Dr R. G. Halliday was asked to contact some experts who could meet during the September 1981 Meeting.

4. Publication and Editorial Policy

The Council approved the actions taken to date by STACPUB to establish an editorial board for its Journal, including the statements developed on the structure and function of the Board and on the terms of reference for editors (Appendix III).

5. Papers for Possible Publication

The Council noted that STACPUB had reviewed all papers presented to the November 1980, February 1981 and June 1981 Meetings, and had nominated 16 of them for possible publication in one of the Council's publication series, subject to revision by the authors and acceptance by the Editor.

IV. COLLABORATION WITH OTHER ORGANIZATIONS

1. NAFO Participation in the Work of the CWP

The Council noted that the CWP had met at Madrid, Spain, during 22-29 July 1980 and that the Report of the 10th Session was considered by STACREC. It was also noted that the 11th Session will be held at Luxembourg during 21-28 July 1982. It was agreed that the NAFO participants should be: the Chairman of STACREC, a representative to be nominated by Portugal, and a member of the Secretariat to be nominated by the Executive Secretary.

2. Assessment of Shrimp Stock at East Greenland

At the request of ICES in October 1980, the Scientific Council agreed to undertake the assessment of the shrimp stock at East Greenland during its November 1980 Meeting. The results of this assessment was communicated to ICES when the Council's report of that meeting was distributed late in 1980. The Council noted the EEC request for advice on management in 1982 of the shrimp stock at East Greenland, in agreement with ICES Resolution 1980/2:6-19 (see Annex 2 of Appendix IV), and agreed to undertake this assessment at the same meeting designated for the assessment of the shrimp stock in Subarea 0 and 1.

3. Proposed NAFO/ICES Study on Redfish at Greenland

The problem of biological relationships between the redfish stocks of West Greenland (NAFO Subarea 1) and the Irminger Sea stock complex (ICES Subareas V and XIV) requires further study and special research which should be separated from the usual assessment work on redfish. The Scientific Council of NAFO therefore

recommends

that a special NAFO/ICES study group should be established to further examine the biological relationships of the West Greenland and Irminger Sea redfish stocks, and that ICES is requested to make the necessary arrangements at the earliest possible opportunity, the suggested terms of reference of the

study group being: (i) to evaluate all available data on the subject, (ii) to plan and coordinate special research on the relationships of the West and East Greenland stocks, and (iii) to evaluate the data from such research projects.

V. RULES OF PROCEDURE

1. Proposed Revision to Rule 3

The Council noted the Canadian proposal to amend Rule 3.1 of the Rules of Procedure for the Scientific Council (see Annex 3 of Appendix IV). Although all representatives at this meeting unanimously agreed to the proposed amendment, its formal adoption was deferred due to the lack of a quorum.

VI. FUTURE SCIENTIFIC MEETINGS

1. Annual Meeting, September 1981

The Scientific Council and its Standing Committees will meet during 8-18 September to consider the following items:

a) Coordination of research surveys for squid in 1982.
b) Evaluation of the Flemish Cap research program.
c) Further evaluation of the Georges Bank-Gulf of Maine larval herring program.
d) Remote sensing methods and their possible application to fishery science.
e) Review of environmental conditions during the 1970-79 decade.
f) Evaluation of scientific advice provided for management of the Northwest Atlantic fish stocks, with particular reference to cod.
g) Further evaluation of changes in mesh size on cod and redfish in Div. 3M.
h) Feasibility of producing an ichthyoplankton identification manual.
i) Establishment of an editorial board for the Journal.

2. Mid-term Meetings for Assessment of Deferred Stocks

The Council noted that STACFIS had not been able to provide advice for management in 1981 of shrimp in Subareas 0 and 1, capelin in Subareas 2 and 3, and cod stocks in Div. 3M and 3NO. It was agreed that, if the Council receives a request to assess the seal stocks, an appropriate time to consider the shrimp and seal stocks would be at a meeting during 20-26 November 1981, allowing the first two days for the Shrimp Ageing Workshop to finish its work. It was further agreed that an appropriate time to assess the capelin and cod stocks would be at a meeting of 5 days in mid-February 1982. Further arrangements for these meetings will be considered at the September 1981 Meeting.

VII. NOMINATION OF OFFICERS

The Chairman observed that the item "Election of Officers" was put on the agenda for this meeting in anticipation that the proposed amendment to Rule 3.1 of the Rules of Procedure could be adopted. Lacking the necessary quorum to vote on the proposed amendment to Rule 3.1 and consequently to conduct the election of officers at this meeting, it was necessary to defer these important matters. However, the scientific representatives of the six Contracting Parties present acted as a nominating committee, and the following scientists agreed to occupy the respective offices of the Scientific Council, if elected:

Chairman : Mr R. Wells - nominated by EEC and seconded by USSR and Japan.

Vice-Chairman : Dr V. A. Rikhter - nominated by Canada and seconded by EEC and Japan.

Chairman of STACFIS: Mr J. P. Minet - nominated by Canada and seconded by USSR and Japan.

Chairman of STACREC: Dr T. K. Pitt - nominated by EEC and seconded by Canada and USSR.

Chairman of STACPUB: The Vice-Chairman of the Scientific Council becomes, by the Rules of Procedure, *ex officio* Chairman of this committee.

VIII. OTHER MATTERS

1. Provisional Report of February 1981 Meeting

The Council reviewed and formally approved the report of its meeting at Dartmouth, Nova Scotia, Canada, during 17-20 February 1981 (SCS Doc. 81/II/2).

2. Chairman's Concluding Remarks on the Work of the Scientific Council

Before adjournment, the Chairman elaborated on several remarks made during the course of this meeting concerning the work and organization of the Scientific Council, as summarized below.

It is apparent that the Rules of Procedure of the Scientific Council, with the constraints imposed by Articles of the Convention, are not flexible enough for scientific meetings, particularly with regard to voting procedures, when, despite the presence of a relatively large number of scientists, there is inadequate scientific representation of the Contracting Parties. Such a problem was evident at this meeting, as noted in the preceding section, and it may be persistent at future meetings unless a less rigid framework is adopted.

There is evidence of imbalance between such activities as providing advice on TACs and scientific discussion of more general problems. On one hand, we are requested to assess a limited number of stocks, for which discussion is limited to a selection of data and parameters for assessment purposes, whereas for some others, like squid and shrimp, discussion is enlarged to greater consideration of biological and ecological problems, and, in the case of the Flemish Cap, the cooperative research being undertaken gives a new dimension to the work of the Council. Such realities must be taken into account in future consideration of the role of the Scientific Council in these various types of activities.

We must take note of the fact that, while some research activities are coordinated under the responsibility of the Scientific Council, other research activities are conducted independently or bilaterally outside the coordinating sphere of the Council and most of the results are not presented to the Council. We must also note that, with the new regime of the sea, the traditional patterns of fisheries have changed drastically and so have the possibilities for many countries to conduct research on the exploited stocks. For example, 83% of the groundfish catch is taken by only one country in Subarea 1, and 72-92% by one country in Subreas 2 to 4. For the main cod stocks, the situation is quite similar: 84% by one country in Div. 2J+3KL, 73% by 2 countries in Div. 3NO, and 65% by 2 countries in Div. 3M. This gives to a limited number of countries the responsibility of collecting all or most of the data necessary for assessment and biological studies.

Finally we cannot forget that one coastal state is not yet a member of the Scientific Council and that there has been little or no discussion on research in Subareas 5 and 6 in recent years except through the Task Force on the Larval Herring Program.

Such is the situation, insofar as the Scientific Council is concerned, and it may be difficult to change, but it could be improved if some consideration was given to ways and means of achieving better

cooperation in fisheries research by developing programs of more general interest, as indicated by the success of the Working Group on Squid Research and by the willingness of oceanographers to participate in the activities of the Council. The key to the problem lies largely with the coastal states and their willingness to develop and pursue cooperation in fisheries research. One aspect of this problem, that is, the need for coordination of research information for the NAFO Area, was noted by STACPUB.

IX. ADJOURNMENT

The Chairman expressed his thanks to the Director of the Bedford Institute of Oceanography for the meeting facilities, to the Secretariat for their efficient work in servicing this meeting, to the Chairmen and Rapporteurs of Committees and Working Groups and to all participants for their cooperation and contributions. The meeting adjourned at 1245 hours on 19 June 1981.

APPENDIX I. REPORT OF STANDING COMMITTEE ON FISHERY SCIENCE (STACFIS)

Chairman: G. H. Winters

Rapporteurs: Various

The Committee met at Dartmouth, Nova Scotia, Canada, during 8-15 June 1981, to consider and report on matters referred to it by the Scientific Council, particularly with regard to the provision of advice on conservation measures for certain stocks in Subarea 0 and 4 (Agenda Item IV), Various scientists were designated by the Chairman to prepare draft reports on the various topics for approval and incorporation into this report. Scientists attended from Canada, Cuba, EEC (Denmark, Federal Republic of Germany, France, and the Commission of the European Communities), Japan, Portugal, Spain, USSR and USA.

The usual summary of fishery trends from 1979 to 1980 is presented in Section I below, the results of the stock assessments are given in Section II, and other matters considered by the Committee are given in Sections III to VII. The report of the *ad hoc* Working Group on Squid Research, which met during 3-6 June 1981 with T. W. Rowell as Convenor, is at Annex 1 to this report.

I. FISHERY TRENDS

1. General Trends for the NAFO Area

Provisional nominal catches in the Northwest Atlantic for 1980, as compiled from the STATLANT 21A returns and presented in SCS Doc. 81/VI/15, are summarized in Table 1, together with similar data for 1979.

The total nominal catch of all finfish and invertebrates decreased from 3.03 million tons in 1979 to about 2.85 million tons in 1980 (6%), after having increased from 2.84 million tons in 1978. The total groundfish catch declined from 1.25 million tons in 1979 to 1.21 million tons in 1980 (2%), largely due to declines for redfish (18%), silver hake (15%), Greenland halibut (24%), roundnose grenadier (73%), and wolffishes (45%), with increases noted for cod (3%), haddock (48%) and pollock (19%). The total pelagic fish catch of 642,000 tons in 1980 was only slightly more than that in 1979 (631,000 tons), with small increases in the herring and menhaden catches which constitute 90% of the total for this group. Catches for the "other fish" category decreased from 129,000 tons in 1979 to 102,000 tons in 1980 (21%), following a significant decline from 176,000 tons in 1978 and 308,000 tons in 1977, due almost entirely to a decline for capelin. The total catch of invertebrates declined from 1.03 million tons in 1979 to 0.90 million tons in 1980 (14%), due mainly to decreases for squid (47%) and scallops (17%).

2. Subarea 0

The usual low catch in this subarea increased from 2,400 tons in 1979 to 2,700 tons in 1980 (13%), with Greenland halibut and shrimp being the main species taken.

3. Subarea 1

The total nominal catch of all species declined from 165,000 tons in 1979 to 123,000 tons in 1980 (26%). Significant decreases were noted for Greenland halibut (66%), and wolffishes (71%), and an increase for shrimp (23%).

4. Subarea 2

The total nominal catch of all species declined from 70,000 tons in 1979 to 58,000 tons in 1980 (17%), due mainly to decreases for redfish (76%), Greenland halibut (66%), roundnose grenadier (80%) and capelin (55%), with an increase for cod (50%).

5. Subarea 3

The total nominal catch of all species declined from 616,000 tons in 1979 to 489,000 tons in 1980 (21%), due mainly to decreases for cod (13%), redfish (11%), yellowtail flounder (32%), herring (53%), and squid (61%). For the flatfish species the decline for yellowtail was offset by slight increases for Greenland halibut (7%) and American plaice (4%).

6. Subarea 4

The total nominal catch of all species increased from 745,000 tons in 1979 to 762,000 tons in 1980 (2%). Decreases were noted for silver hake (15%) and squid (52%), but these were offset by increases for cod (12%), haddock (52%), pollock (14%), and scallops (100%).

7. Subarea 5

The total nominal catch of all species increased from 533,000 tons in 1979 to 561,000 tons in 1980 (5%). Increases were noted for cod (24%), haddock (46%), pollock (26%), herring (28%) and menhaden (17%), and a decrease for scallops (24%).

8. Subarea 6

The total nominal catch of all species decreased slightly from 894,000 tons in 1979 to 857,000 tons in 1980 (4%), the most significant decreases being noted for scallops (28%) and other molluscs (9%).

Table 1. Nominal catches (000 tons) for 1979 and 1980[1]. (The symbol + indicates less than 500 tons.)

	SA 0		SA 1		SA 2		SA 3		SA 4		SA 5		SA 6		Total	
	1979	1980	1979	1980	1979	1980	1979	1980	1979	1980	1979	1980	1979	1980	1979	1980
Atlantic cod	-	-	48	48	26	39	244	213	203	227	50	62	+	+	572	589
Haddock	-	-	+	-	-	+	1	1	29	44	24	35	+	+	54	80
Atlantic redfishes	+	+	9	7	17	4	75	67	28	29	15	10	-	-	144	118
Silver hake	-	-	-	-	-	-	+	+	52	44	9	8	12	10	73	62
Red hake	-	-	-	-	-	-	-	+	+	1	7	3	2	2	9	6
Pollock	-	-	+	-	+	-	1	1	28	32	19	24	+	+	48	57
American plaice	-	-	6	1	+	+	56	58	19	19	11	14	+	+	93	92
Witch flounder	-	-	-	-	+	+	8	6	7	6	3	3	+	+	18	16
Yellowtail flounder	-	-	-	-	-	-	19	13	2	3	16	19	1	1	38	35
Greenland halibut	1	2	18	6	6	2	29	31	10	7	-	+	-	-	63	48
Other flounders	-	+	1	1	+	+	1	1	6	7	15	18	14	12	37	40
Roundnose grenadier	+	+	7	2	5	1	3	1	-	-	-	-	-	-	15	4
White hake	-	-	-	-	+	+	2	3	12	18	3	4	+	+	17	23
Wolffishes	-	+	17	5	+	+	2	2	2	3	1	1	+	+	22	12
Other groundfish	-	+	4	6	+	+	4	+	8	8	14	12	8	7	38	33
Atlantic herring	-	-	+	+	+	+	32	15	156	161	65	83	+	+	253	259
Atlantic mackerel	-	-	-	-	+	-	15	6	16	16	1	2	1	1	33	25
Atlantic butterfish	-	-	-	-	-	-	-	-	-	-	2	5	2	1	4	6
Atlantic menhaden	-	-	-	-	-	-	-	-	-	-	59	69	271	272	330	340
Other pelagics	-	-	-	-	-	-	2	1	1	2	3	2	5	6	11	11
Capelin	-	-	+	+	11	5	13	19	9	4	-	-	-	-	33	28
Other finfish	+	+	22	5	1	2	8	5	18	18	10	8	37	35	96	74
Squids	-	-	-	-	+	+	89	35	73	35	7	10	28	25	197	105
Clams	-	-	-	-	-	-	-	-	3	4	31	36	237	237	271	277
Scallops	-	-	-	-	-	-	+	+	13	27	140	106	61	44	214	178
Other molluscs	-	-	-	-	-	-	-	-	2	2	9	7	176	161	187	170
Shrimp	1	1	34	42	4	4	-	+	9	9	+	+	+	1	48	56
Other crustaceans	-	-	-	-	-	-	13	11	39	38	18	18	39	41	109	108
Other invertebrates	-	-	-	-	-	-	-	-	+	+	+	1	+	+	+	1
Total	2	3	165	123	70	58	616	489	745	762	533	561	894	857	3025	2853

[1] Provisional data for 1980 from SCS Doc. 81/VI/15 (Revised).

II. STOCK ASSESSMENTS

1. Cod in Subarea 1 (SCR Doc. 81/VI/48; SCS Doc. 81/VI/12)

a) Fishery trends

Provisional statistics for 1980 show the catch of cod to be 48,000 tons. A catch estimate of 51,000 tons was used in the assessment presented in SCR Doc. 81/VI/48, but it seems likely that the actual catch was somewhat higher (about 55,000 tons). The catch by Greenland fishermen in 1980 was about 47,000 tons, the same as in 1979, with trawlers accounting for 16% in 1980 compared to 23% in 1979. Recent catches and TACs are as follows:

	1973	1974	1975	1976	1977	1978	1979	1980	1981
TAC (000 tons)	-	107	60	45	31	...[1]	...[1]	...[1]	...[1]
Catch (000 tons)	63	48	48	33	73[2]	73[2]	99[2]	55[2]	

[1] Catches limited to Greenlanders' fishery and to by-catch.
[2] Estimates used for assessment of the stock.

b) Trends in distribution, abundance and stock composition

Catch-per-unit-effort for Greenland trawlers was about 25% lower than in 1979 and only about half of the high level of 3.3 tons per hour reached in 1978. This decrease was most pronounced in Div. 1C-1D, probably the result of emigration of the 1973 year-class from these divisions to more southern divisions and to East Greenland and Iceland. However, new year-classes, especially that of 1977, will recruit in the northern divisions (1B-1D) during 1981, and the catch rate will probably increase again. The inshore fishery had its major catch (26,000 tons, or 67% of the total inshore catch) in Div. 1E-1F, where the 1973 year-class predominated. A northward extension of the offshore trawl fishery to the southern part of Div. 1B was noted in 1980.

Recruitment prospects seem somewhat improved. The 1977 year-class is expected to be of major importance during 1982-84 and to offer a new possibility for rebuilding the stock. The 1979 and 1980 year-classes still have to be observed, but environmental conditions in the two years give basis for moderate optimisms for these year-classes. The 1977 year-class will probably remain in Subarea 1 to a much higher degree than did the 1973 year-class because it is of West Greenland origin. The 1975 year-class had been expected to occur as the major contributor to the fishery in 1980-81. In fact, it was the most numerous year-class in offshore catches in Div. 1C-1D in 1980 but not to the extent expected, and in inshore samples it was less important than either the 1973 year-class in Div. 1E-1F or the 1976 and 1977 year-classes in Div. 1D. Only in Div. 1B did it occur as the predominating year-class in the landings.

c) Assessment parameters

Mortality rates. Estimates of total mortality (Z) for 1978-80, derived from catch curves, were averaged for age-groups 5-7 over the period, thereby including the 1973 year-class. This resulted in a Z-value of 0.83, which the Committee considered to be a reasonable estimate when compared with the value of 1.07 estimated at the June 1980 Meeting, considering that fishing effort had decreased about 30% from 1979 to 1980. Deducting natural mortality (M = 0.20), a terminal F-value of 0.63 for 1980 was obtained. Terminal F-values for years prior to 1980 were taken from SCR Doc. 80/VI/113.

Partial recruitment. The catch curve mentioned above indicated that partial recruitment of age-groups 3 and 4 could be about 0.01 and 0.17 respectively. However, these values may be too low due to the great effect of the 1973 year-class on the catch curve. The corresponding estimates used in the assessment at the June 1980 Meeting were 0.02 and 0.47. In the present assessment, values of 0.02 and 0.33 were used as partial recruitment for age-groups 3 and 4, and the older age-groups were considered to be fully recruited.

Year-class estimates. Recruitment at age 3 for the years 1979 and 1980 are based on biological and environmental observations and on information about discarding of small fish. It seems clear that the 1977 year-class is the strongest since that of 1973. The two neighboring year-classes (1976 and 1978) seem to be poor, although the 1976 year-class appears to be of local importance in the Godthaab region (Div. 1D). The 1979 and 1980 year-classes are tentatively estimated with some optimism due to rather favorable water temperatures in these years.

In terms of absolute recruitment values, the 1977 year-class is considered to approach the strength of the 1973 year-class. The analyses indicate that the 1973 year-class at age 3 comprised 225 million recruits, and consequently the 1977 year-class is given an input value of 200 million recruits. The other input values are 30 million recruits for the 1976 year-class, 20 million for the 1978 year-class, 90 million for the 1979 year-class, and tentatively 75 million for the 1980 year-class.

d) Results of assessment

In the virtual population analysis, it was necessary to make some adjustment to the partial recruitment estimates initially used as input values. To bring the strength of the 1977 year-class to 200 million fish at age 3, the partial F-value for this age-group in 1980 had to be adjusted to 0.024. Another uncertainity arose concerning the 1975 year-class. The initial run indicated this

year-class to be as low as 32 million fish at age 3. From observations of this year-class in its pre-recruit years and its first two years in the fishery, a much higher value was expected. In fact, an estimate of 115 million fish was obtained at the June 1980 Meeting. However, in order for such a value to be obtained from the analysis of the 1980 age composition of catches, the F-value for age-group 5 in 1980 would have to be reduced to 0.10, which is less than the value used for age-group 4 (0.17). It therefore seems that the first estimate of the size of the 1975 year-class was too large, but the change in the estimate can be accounted for by assuming a high rate of discarding of this year-class in its first year of exploitation. In view of the uncertainity about the actual number of residuals of the 1975 year-class, the Committee considered it prudent not to set the estimated size of this year-class higher than 50 million recruits at age 3, and this value was finally used in the analyses.

The EEC has requested advice on catch and spawning stock size for the years 1982-84 under various fishing strategies. Considering the spawning stock to be all fish of age 6 and older and assuming that the 1981 catch will be about 50,000 tons, the forecasts of stock size (age 3+), spawning stock size (age 6+) and catch under various fishing strategies are as given in Table 2 and illustrated in Fig. 1.

Data available on the dependency of year-class strength upon environmental factors (water temperatures on Fylla Bank in June being the reference) and spawning biomass indicate that good year-classes usually occur in years when the reference temperature is 1.8°C or higher, but not in every such year. The material does not clearly demonstrate the dependency of year-class strength upon spawning biomass, because few years have had good temperatures and medium spawning biomass. However, no really strong year-classes have occurred over the years when spawning biomass has been at its current low level (below 150,000 tons). Since the dependency of recruitment upon spawning stock size cannot be ignored, the Committee advises that rebuilding of the spawning stock to a much higher level than at present should form the basis for management. The recruitment of the 1977 year-class appears to offer such a possibility.

Table 2. Subarea 1 cod: projections (000 tons) of stock biomass (age 3+), spawning stock (age 6+) and catch under various fishing stategies in 1982-85, assuming that the catch in 1981 will be 50,000 tons.

Year	Parameter	Options[1] 1	2	3	4	5	6
1980	Stock biomass	332					
	Spawning stock	92					
	F	0.63					
	Catch	53	Reference parameters used for				
1981	Stock biomass	325	1982-85 projections				
	Spawning stock	81					
	F	0.39					
	Catch	50					
1982	Stock biomass	401	401	401	401	401	401
	Spawning stock	80	80	80	80	80	80
	F	0.10	0.20	0.25	0.48	0.60	0.197
	Catch	27	51	62	107	128	50
1983	Stock biomass	491	461	446	389	364	461
	Spawning stock	313	283	270	214	190	284
	F	0.10	0.20	0.25	0.48	0.60	0.185
	Catch	31	54	63	91	98	50
1984	Stock size	531	470	443	347	311	475
	Spawning stock	331	271	247	159	126	277
	F	0.10	0.20	0.25	0.48	0.60	0.149
	Catch	39	65	74	96	100	50
1985	Spawning stock	429	334	296	174	134	356

[1] Option 1 with F = 0.10 in 1982-84; Option 2 with F = 0.20; Option 3 with $F_{0.1}$ = 0.25; Option 4 with F_{max} = 0.48; Option 5 with F = 0.60; Option 6 with catch of 50,000 tons in all years.

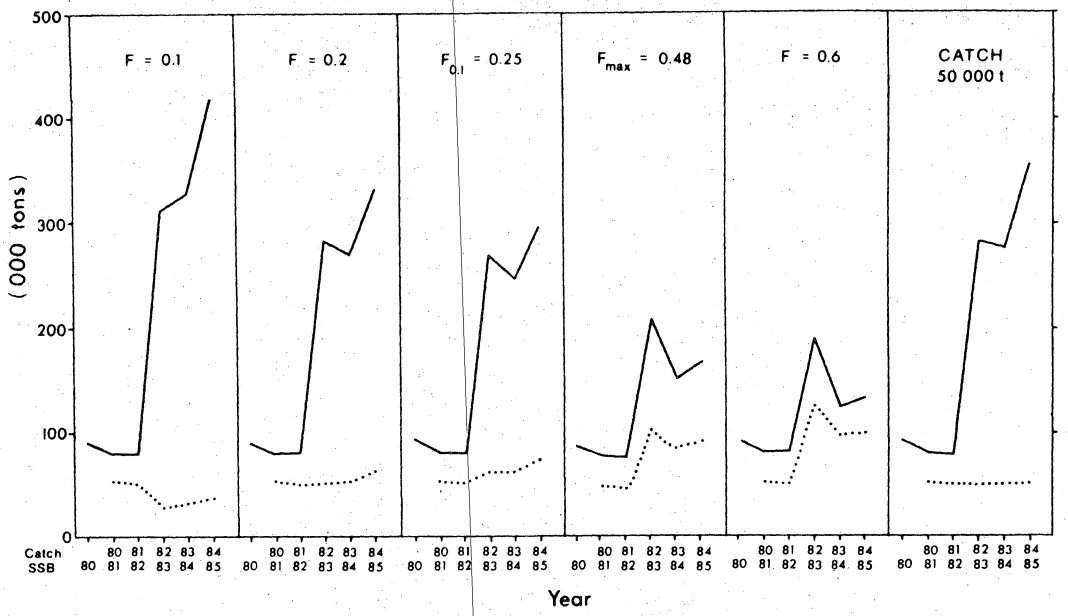


Fig. 1. Subarea 1 cod: projected catches (lower curve) and spawning stock biomass (upper curve) by various fishing strategies and assuming the nominal catch in 1981 to be 50,000 tons. Catches relate to the upper row of years indicated at the bottom of the illustration and spawning stock biomasses relate to the beginning of the years in the bottom row. The plotted data correspond to that given in Table 2.

e) Mesh size assessment

The Committee noted the EEC request for an assessment of increasing the mesh size from the present minimum (120 mm) to 130, 140 and 160 mm as alternatives. No new analysis was presented at this meeting, but the Committee refers to the conclusion reached at the June 1980 Meeting (based on the analyses in SCR Doc. 80/VI/76) that an increase in mesh size to 140-160 mm would lead to a moderate (2-9%) increase in yield per recruit and to a substantially larger increase (9-40%) in spawning biomass per recruit. The actual gain in yield and spawning biomass per recruit will vary somewhat from year to year due to the variation in growth rate and emigration rate of year-classes, but there is clearly a gain to be achieved for cod, especially insofar as the spawning stock is concerned.

2. Cod in Division 2J, 3K and 3L (SCR Doc. 81/VI/18, 65, 66, 67)

a) Fishery trends

Nominal catches during 1965-69 averaged about 650,000 tons annually but declined to an average of 200,000 tons in 1975-79. Provisional data indicate a catch of 172,000 tons in 1980. The decline in catches coincided with a decline in catch rates, implying a decrease in stock biomass. Catch restrictions were introduced in 1973 on the basis of fishing at the F_{max} level, but the management strategy since 1977 has been to limit catches to a level associated with fishing at the $F_{0.1}$ or lower level. Recent TACs and nominal catches are as follows:

	1973	1974	1975	1976	1977	1978	1979	1980	1981
TAC (000 tons)	666	657	554	300	160	135	180	180	200
Catch (000 tons)	355	373	288	214	173	139	167	172[1]	

[1] Provisional data.

b) General production analyses

Catch rates for 1959-80, standardized with respect to gear type by country, division and month, were used with the catches to fit a non-equilibrium surplus production model (SCR Doc. 81/VI/65). Although some information on catch rate was available for early 1981, this point was omitted because of its preliminary nature and extreme value. The equilibrium sustainable yield at the effort level corresponding to 2/3 MSY was estimated at close to 500,000 tons. Catch rates predicted by the model for 1981 and 1982 implies yields at 2/3 MSY effort of about 310,000 and 360,000 tons respectively.

An independently derived series of standardized catch rates showed fairly stable catch rates during 1958-68 over a wide range of effort, followed by a sharp decline from 1968 to 1972 (SCR Doc. 80/VI/67). Recovery did not occur until after 1977, even though effort during 1972-77 was very much reduced. During 1977-80, catch rates increased to the level of the 1960's. Trends in catch rates used in the surplus production model were similar, but the increase during 1977-80 was not so pronounced.

c) Assessment parameters

Biological sampling of commercial catches (or landings) of various countries was used to estimate the age composition of removals in 1980. Cod of age-groups 5-7 predominated. Data from research vessel surveys in 1980 by Canada, Federal Republic of Germany, France and USSR confirmed that these year-classes indeed were most prevalent, and also showed that the 1976 year-class (age-group 4 in 1980) was quite weak.

The partial recruitment pattern was derived from the average percentage distribution of fishing mortality at age in the 1972-78 period. These values and the average weight-at-age values derived from 1978 sampling are as follows:

Age (years)	4	5	6	7	8	9	10	11	12	13
Partial recruitment	0.27	0.57	0.77	0.92	1.00	1.00	1.00	1.00	1.00	1.00
Average weight (kg)	0.77	1.16	1.72	2.39	3.58	5.03	5.59	6.73	7.89	8.73

Regression of mean stock biomass of age 4 and older cod on standardized commercial catch rates for 1962-78 (those used in the surplus production model analysis as described above) was used to predict stock biomass from the catch rates for 1979 and 1980. The best agreement between these predicted biomass values and those estimated in the cohort analysis was achieved at a terminal F of 0.17 in 1980.

All research vessel survey data indicated that the abundance of the 1976 and 1977 year-classes was quite low, and arbitrary values of 125 million and 200 million fish respectively were taken as being appropriate for the size of these year-classes when recruiting to the fishery at age 4. For the projections, an average value of 500 million recruits at age 4 was used as the size of each subsequent year-class.

d) Projections of catch and spawning stock biomass

With terminal F = 0.17 in 1980, with partial recruitment and sizes of recruiting year-classes as indicated above, and with an assumed catch of 200,000 tons in 1981, projections (000 tons) of spawning stock biomass (age 7 and older) and catch were made for 1981-83 at three levels of fishing mortality (F):

Year	F = 0.10		F = 0.16		F = 0.20	
	Catch	Spawning biomass	Catch	Spawning biomass	Catch	Spawning biomass
1981	200	1000	200	1000	200	1000
1982	141	1300	220	1300	270	1300
1983	174	1500	259	1400	308	1300

The Committee points out that the year-classes for which assumed recruitment values were used (i.e. 1976, 1977 and 1978 year-classes) make up 20% of the projected catches in 1982 and 35% in 1983.

3. Cod in Division 3M (SCR Doc. 81/VI/67, 76, 77)

a) Fishery trends

Nominal catches from this stock were as high as 60,000 tons in 1965 and 58,000 tons in 1972, declined to an average level of 24,000 tons during 1973-77, and increased to about 30,000 tons in 1978 and 1979. Provisional data for 1980 indicate a catch of about 11,000 tons. Recent catches and TACs are as follows:

	1973	1974	1975	1976	1977	1978	1979	1980	1981
TAC (000 tons)	-	40	40	40	25	40	40	13	8.5
Catch (000 tons)	23	25	22	22	27	33	29	11[1]	

[1] Provisional data.

b) Feeding studies

Observations on the food and feeding of cod on Flemish Cap during 1970-80 (SCR Doc. 81/VI/76) indicated that the major food items were Calanoidae, Sagitta, Ctenophora, Themisto, Myctophidae, Shrimps and young redfish. The average annual intensity of feeding is not high, and consumption is of a pronounced seasonal pattern.

c) Spawning biomass

The Committee considered that the mean biomass of age 6 and older cod (age 6+) was a reasonable approximation of spawning biomass, estimates for 1972-80 being as follows:

	1972	1973	1974	1975	1976	1977	1978	1979	1980
Age 6+ biomass (000 tons)	17	9	13	7	9	7	5	15	10

The Committee noted that a relationship between water temperature on the standard hydrological section 4A and cod year-class strength has been refined (SCR Doc. 81/VI/77) and may be useful in predicting recruitment. No spawning stock-recruitment relationship has been shown for this stock, and, in view of the small absolute size of the spawning stock, the Committee

recommends

that the Flemish Cap Working Group examine the data base to determine if a stock-recruitment relationship can be defined for the cod stock in this area.

d) Assessment

This stock was assessed at the February 1981 Meeting of the Committee (SCS Doc. 81/II/2, App. I), and no new data were available to modify the analysis done at that time or the conclusion that "the low level of catch projected for 1981 at the $F_{0.1}$ level is a clear indication that the stock is severely depleted".

Catch rates for the cod stocks in Div. 2J+3KL, 3NO and 3M apparently decreased sharply in 1968 or 1969 and remained at a low level up to 1978 despite significant reductions in fishing effort for the first two stocks (SCR Doc. 81/VI/67). It was hypothesized that catch rates might in fact remain at a low level if environmental conditions in recent years have been and continue to remain unfavorable for good recruitment. An alternative explanation was that changes in fishing strategy toward catching younger and smaller cod with the attendant enhanced probability for discarding of small fish. Furthermore, it was noted that increased efficiency by the fleets would tend to have the effect of underestimating the effective fishing effort. Because insufficient new data were available for a reassessment of the stock, and noting that 1981 data from research and commercial sources will be available early in 1982, STACFIS advises that the assessment of this stock should be deferred to a mid-term meeting in early 1982.

4. Cod in Divisions 3N and 3O

a) Fishery trends

Nominal catches declined from a high of 227,000 tons in 1967 to 15,000 tons in 1978 and increased to about 28,000 tons in 1979. Provisional data for 1980 indicates a catch of 19,000 tons. Recent catches and TACs are as follows:

	1973	1974	1975	1976	1977	1978	1979	1980	1981
TAC (000 tons)	103	101	88	43	30	15	25	26	26
Catch (000 tons)	80	73	44	24	18	15	28	19[1]	

[1] Provisional data.

b) Assessment

The status of this stock was considered at the February 1981 Meeting of the Committee (SCS Doc. 81/II/2, App. I). In that report, it was noted that the stock is composed mainly of young and small fish primarily of the 1978 year-class and that low fishing mortality in the next few years would provide a gain in yield-per-recruit and a return to a more broadly-based age structure in the stock. The Committee advised that a cautious approach to the exploitation of this stock should be maintained. The advice was considered at the Special Meeting of the Fisheries Commission in early April 1981 (FC Doc. 81/IV/4), when it was agreed that the TAC for 1981 be maintained at the 1980 level of 26,000 tons until the biomass reaches one-half of the level of biomass associated with the long-term sustainable yield at F_{max}.

In the absence of new data to indicate a change in biomass level, no additional advice on the status of this stock could be provided at this time, and the Committee advises that further assessment of this stock should be deferred to a mid-term meeting in early 1982 when new information from the commercial fishery and from research surveys in 1981 will be available.

5. Redfish in Subarea 1 (SCS Doc. 81/VI/10)

a) Fishery trends

Nominal catches have fluctuated widely since 1950, increasing from 150 tons in 1951 to a maximum of 61,000 tons in 1962 and generally decreasing thereafter to a low level of about 3,000 tons in 1971-74. Catches increased again to 31,000 tons in 1977. There is some indication that the official catch figures for 1977, 1978 and 1979 may have been overestimated *NAFO Sci. Coun. Rep.* 1979-80, page 78). Recent catches are as follows:

	1973	1974	1975	1976	1977	1978	1979	1980
Catch (000 tons)	3	3	9	14	31	8	9	7[1]

[1] Provisional data.

b) Assessment

Two species of redfish occur in Subarea 1, *Sebastes mentella* and *S. marinus*. These species live in different depths with little overlapping. The fishery has been directed toward *S. marinus*, and the assessment based on catch and effort data therefore refers to this species.

This stock was assessed at the April 1979 Meeting (*ICNAF Redbook* 1979, page 74). A further assessment has not yet been possible due to the lack of sufficiently good fishing effort data for recent years. The previous assessment, based on a general production model analysis, indicated a MSY level of about 10,000 tons and an equilibrium catch at 2/3 F_{MSY} of about 9,000 tons. However, the correlation coefficient for the regression of catch-per-unit-effort on fishing effort ($r = 0.63$) indicated that catch levels derived from the model have fairly large variances.

c) General remarks

Observations in 1980 confirmed that the large quantities of small redfish taken as by-catch in the shrimp fishery belong to the species *S. mentella*. In the Report of the ICES Working Group on Redfish and Greenland halibut in Region 1 (ICES C.M. 1981/G:7), on the basis of young redfish surveys and analysis of 0-group redfish, it is noted that *S. marinus* dominates in the southern part of the East Greenland shelf and that this might indicate the same origin for the species at West Greenland and East Greenland. The same origin for *S. mentella* is less likely.

6. Redfish in Division 3M (SCR Doc. 81/VI/53)

a) Fishery trends

Nominal catches increased from a low of 700 tons in 1967 to a maximum of 42,000 tons in 1972. Recent catches and TACs are as follows:

	1973	1974	1975	1976	1977	1978	1979	1980	1981
TAC (000 tons)	-	40	16	16	16	16	20	20	20
Catch (000 tons)	22	35	16	17	20	17	20	16[1]	

[1] Provisional data.

b) Abundance

Length frequencies from USSR commercial sampling in 1980 indicate that the bulk of the catches consisted of 22-30 cm redfish in midwater trawls and 33-45 cm in bottom trawls. Data from Canadian research surveys indicate that age-groups 8-11 (22-27 cm in length) were the most important age-groups in the catches. Additionally, there is evidence of a strong 1979 year-class, even though the research trawl is not considered to be efficient for catching redfish of so young an age.

c) Assessment

The Committee noted that the general production model used in previous years may not represent the best estimate of the status of this stock due to the lack of data on catch rates for some years prior to 1968. Commercial catch rates in recent years have remained relatively stable, and Canadian research abundance indices for 1978-81 were generally stable except for 1979. Relatively good year-classes are evident in both the Canadian and USSR survey data. Older redfish are well represented in the age frequencies, which indicate that the stock has not been over-exploited at the present level of catch, and STACFIS accordingly advises that the TAC for 1982 should remain at 20,000 tons.

7. Redfish in Divisions 3L and 3N (SCR Doc. 81/VI/59; SCS Doc. 81/VI/13)

a) Fishery trends

Nominal catches declined from a high of 45,000 tons in 1959 to 14,000 tons in 1970 and then increased to 30,000 tons in 1972. Recent catches and TACs are as follows:

	1973	1974	1975	1976	1977	1978	1979	1980	1981
TAC (000 tons)	-	28	20	20	16	16	18	25	25
Catch (000 tons)	33	22	18	21	16	12	14	16[1]	

[1] Provisional data.

b) Abundance

Length frequencies from Canadian commercial sampling in 1980 indicate that the bulk of the catches in Div. 3L consisted of 35-45 cm fish in the early part of the year and 22-35 cm fish in the second half. In Div. 3N, the fleet has traditionally exploited the smaller redfish because

of difficulty due to rough bottom in fishing at depths greater than 350 m where the larger redfish are found, and both Canadian and USSR sampling indicated a concentration of effort on 22-28 cm redfish. Canadian research trawling to 665 m indicates that larger redfish are present in Div. 3N at depths greater than those usually fished by commercial vessels. Catches in USSR research trawling to a depth of 400 m reflect size-classes similar to those in the commercial fishery. From the data available, it is difficult to estimate the absolute abundance of the smaller size groups most evident in Div. 3N, but USSR survey data indicate greater abundance in the late 1970's than in the early 1970's.

c) Assessment

The Committee reviewed the catch rate data used in the general production model analysis which included data up to 1979. The catch rates pertain to Div. 3L and 3N combined, although the trawl regulations require that the fishery be prosecuted with codends of minimum 130-mm mesh in Div. 3L but not in Div. 3N. Also, the proportion of the catch taken in each division is highly variable from year to year and the fishery is on different components of the stock as indicated by the length frequencies. For example, 80% of the overall catch was taken in Div. 3N in 1975 whereas 80% was taken in Div. 3L in 1976 and 1977, thus making analysis of the data by division difficult. However, catch rates have declined during 1960-79.

The general production model analysis, reviewed at this meeting, used standardized catch-per-unit effort values derived from multiplicative models and thus is somewhat different from that presented at the June 1980 Meeting. For the current model, the yield at 2/3 F_{MSY} from unlagged data is 33,600 tons and from lagged data (6-year running average) is 22,800 tons. These yields are similar to those obtained in previous assessments using different effort standards. The appropriateness of using a general production model is suspect, because the catch-per-unit-effort and effort were poorly correlated, r being -0.56 and -0.60 for unlagged and lagged data respectively.

Fishing effort during the early 1970's on redfish in Div. 3L and 3N was considered to be above the level corresponding to F_{MSY} and the TAC was reduced in 1977 to compensate for overfishing in the preceding years. However, any subsequent recovery of the stock would be slow due to the slow growth and long life-span of redfish. The TACs were not fully utilized in 1978-80, possibly reflecting low catch rates or allocation problems with certain segments of the fishing fleet. Market conditions in some countries during 1980 were such that their allocations were not taken.

Considering the apparent abundance of young redfish in Div. 3N and the wide range of the length frequencies which might be interpreted as indicating that exploitation of the stock is with acceptable levels, but also noting the inadequency of the available data, the Committee advises that the TAC for 1982 should remain at 25,000 tons.

8. Silver hake in Divisions 4V, 4W and 4X (SCR Doc. 81/VI/49, 63, 74)

a) Fishery trends

The fishery on this stock commenced in 1958, and, with the appearance of USSR vessels in 1962, it became one of the largest single fisheries on the Scotian Shelf. Peak catches occurred in 1963 (123,000 tons), 1970 (169,000 tons) and in 1973 (299,000 tons). Recent catches and TACS are as follows:

	1973	1974	1975	1976	1977	1978	1979	1980	1981
TAC (000 tons)	-	100	120	100	70	80	70	90	80
Catch (000 tons)	299	96	116	97	37	48	56	44[1]	

[1] Provisional data.

b) Abundance

The observed monthly distribution of USSR catches of silver hake and several groundfish species were reviewed (SCR Doc. 81/VI/49, 63). As the season progressed, the catch rates for silver hake decreased in areas south of the Small Mesh Gear Line, with an indication of increasing catch rates in areas to the north of this line in 1979. The observed catch rate in 1980 has decreased to the 1978 level.

c) Assessment parameters

Catch composition. The age compositions of catches in 1961-79 were the same as those used in the previous assessment (SCR Doc. 80/VI/87) except that removals in 1979 were adjusted to reflect the final reported nominal catch in that year. The 1980 age composition used in the current assessment was estimated from length and age data collected by Canadian observers on board of vessels involved in the silver hake fishery. Some discrepancies were noted between age composition data presented by USSR and those used in the assessment.

Natural mortality. No new estimates of natural mortality were available, and it was agreed that M = 0.40 be used in this assessment in order to maintain consistency with assessments since 1977.

Weight-at-age. Average weight-at-age data for 1980 were calculated from length-weight data collected on Canadian research vessel surveys. Weight-at-age values used for the projections and for the yield-per-recruit calculations are averages of 1977-80 values (below). The yield-per-recruit analysis indicated $F_{0.1}$ = 0.447 with a yield of 0.062 kg per recruit.

Age (years)	1	2	3	4	5	6	7	8	9	10
Mean weight (g)	53	138	199	260	322	389	495	674	829	825

Partial recruitment. Starting F-values for ages 2 to 6 were weighted to population numbers, regressed against effort and adjusted to give the best fit. Partial recruitment values were obtained by averaging F-values over the years 1977 to 1979. The resultant values used in the present assessment are different from those used in the previous assessment (SCR Doc. 80/VI/87).

Age (years)	1	2	3	4	5	6	7	8	9	10
P. recruitment (previous)	0.035	0.50	1.00	0.70	0.60	0.60	0.50	0.50	0.45	0.40
" (present)	0.04	0.44	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Recruitment. Reliable recruitment estimates have been difficult to derive for this stock. Research vessel data indicate that recent recruitment has been poor. However, the reliability of the research vessel data is questionable, and a more extensive analysis is required. For this assessment, the recruitment estimate was taken as the average of the sizes of the 1974-79 year-classes at age 1, which is 1.4 billion recruits. This is higher than the value of 1.0 billion fish used in the previous assessment.

d) Catch projections

The Committee considered three options that had been generated in respect of the 1982 catch at $F_{0.1}$: the first option predicted a 1982 catch of 68,400 tons, assuming that the $F_{0.1}$ catch is 73,000 tons in 1981; the second predicted a 1982 catch of 66,000 tons, assuming that the 1981 TAC of 80,000 tons will be taken; and the third predicted a 1982 catch of 70,000 tons, assuming that the catch in 1981 will be equal to the average catch/TAC ratio for 1974-79 (0.82). A fourth option, which assumed that the 1981 catch will be equal to the average for the 1977-80 period, predicted 1982 catch of 75,000 tons. The Committee considered this to be the most realistic option, and therefore advises a 1982 TAC of 75,000 tons.

9. American plaice in Division 3M

This stock has been regulated since 1974 with nominal catches during 1973-80 in the range of 1,000-2,000 tons. The TAC has been 2,000 tons for each gear except in 1978 when it was increased to 4,000 tons on the basis of relatively high catch rates in USSR research vessel surveys in 1977. However the TAC was reduced to 2,000 tons for 1979 to 1981. There is no new information on this stock, the catches from which are mainly by-catches in the cod and possibly the redfish fisheries. Hence, STACFIS advises that the TAC should remain at 2,000 tons for 1982.

10. American plaice in Divisions 3L, 3N and 3O (SCR Doc. 81/VI/55, 61; SCS Doc. 81/VI/13)

a) Fishery trends

Nominal catches up to 94,000 tons annually have been reported from this stock. However, the catch has not exceeded 53,000 tons since 1973, as indicated below:

	1973	1974	1975	1976	1977	1978	1979	1980	1981
TAC (000 tons)	60	60	60	47	47	47	47	47	55
Catch (000 tons)	53	46	43	52	44	50	49	49[1]	

[1] Provisional data.

b) Abundance

Canadian research vessel surveys indicate relatively stable conditions since 1977, especially with regard to the recruiting year-classes (ages 5 and 6). USSR survey data (SCS Doc. 81/VI/13) indicate a somewhat similar trend, based on the overall numbers caught per set in Div. 3LNO, with an increase in abundance in Div. 3L being offset by a decline in Div. 3N. However, catch rates of Canadian otter trawlers have continued to increase from 0.41 tons per hour fished in 1977 to 0.50 tons per hour in 1979 and to 0.58 tons per hour in 1980.

c) Assessment parameters

Catch composition. Age compositions and mean weight-at-age data were derived from Canadian commercial sampling during 1980. Information from Div. 3L and 3N only was used in the assessment.

Partial recruitment. Values for 1980 and for projections to 1982 were derived from average F-values for 1977-79 from a preliminary virtual population analysis (VPA), as follows:

Age (years)	6	7	8	9	10	11	12	13	14	15	16+
Partial recruitment	0.04	0.15	0.30	0.40	0.60	0.75	0.80	1.00	1.00	1.00	1.00

Fishing mortality. A fishing mortality of 0.3 for fully-recruited age-groups (ages 13 and older) in 1980 was used to initiate the virtual population analysis. This value was the most reasonable estimate for 1980 as indicated by the regressions of biomass (ages 8-19) from VPA on catch-per-unit-effort, weighted F (ages 8-18) on directed fishing effort, and population numbers (ages 8-19) from VPA on abundance (numbers from research vessel surveys).

Recruitment. The number of 6-year-old American plaice assumed to be recruited to the fishery in Div. 3LN in 1981 and 1982 was taken as the geometric mean of the numbers of age-6 fish in the population matrix for 1976-79 (268 million).

Estimation of $F_{0.1}$. The $F_{0.1}$ value of 0.264 was calculated from a Thompson-Bell yield-per-recruit analysis, using a partial recruitment vector derived from averaging fishing mortality at age for 1965-79 and average weights at age for the same period. Natural mortality was assumed to be 0.20.

d) Assessment results

Projection for Div. 3LN from the 1980 population structure with F = 0.30 for fully-recruited age-groups indicated that the removal of the 1981 TAC (48,000 tons in Div. 3LN) would result in a fishing mortality of 0.286, which is slightly higher than $F_{0.1}$ (0.264). Projection to 1982 with recruitment of 268 million fish at age 6 implies a catch of 48,000 tons at $F_{0.1}$. For Div. 3O, catches have averaged about 6,000 tons during 1974-80. STACFIS therefore advises a continuation of the TAC of 55,000 tons for Div. 3LNO in 1982.

e) Discards

The discarding of small American plaice, based on observations on board of Canadian trawlers in 1980, continues to be significant (SCR Doc. 81/VI/55), with discard rates of 8.1% by weight and 20.2% by number. Although these rates are slightly less than in 1978 and 1979, they still indicate that substantial quantities of undersized fish are being discarded, possibly as much as 3,600 tons (15.3 million fish). These discards were not taken into account in estimating the removals at age for use in the assessment.

11. Witch flounder in Divisions 3N and 3O

a) Fishery trends

Nominal catches increased from 4,700 tons in 1969 to a high of 15,000 tons in 1971 and declined to a level of about 3,000 tons in 1978-80. Recent catches and TACs are as follows:

	1973	1974	1975	1976	1977	1978	1979	1980	1981
TAC (000 tons)	-	10	10	10	10	10	7	7	5
Catch (000 tons)	7	8	6	6	6	3	3	3[1]	

[1] Provisional data.

b) Assessment

Previous assessments have indicated that the commercial stock of witch flounder in this area is located in deep water along the southwest slope of Grand Bank. A general production model analysis presented at the June 1980 Meeting indicated an equilibrium catch at 2/3 F_{MSY} of 4,000-5,000 tons. Also, age composition data presented at that meeting indicated that the average fishing mortality was near $F_{0.1}$ when catches were in the range of 5,000-6,000 tons, thus resulting in the advice that the TAC for 1981 should not exceed 5,000 tons. No new data were available at this meeting, but, in view of the apparent stability of recent catch levels, STACFIS advises that the TAC of 5,000 tons should remain in effect for 1982.

12. Yellowtail flounder in Divisions 3L, 3N and 3O (SCR Doc. 81/VI/54)

a) Fishery trends

The nominal catch peaked at 39,000 tons in 1972, declined to 8,000 tons in 1976 and increased to 19,000 tons in 1979. The decline to 12,000 tons in 1980 was due to labor problems in the offshore component of the fishing industry. Recent catches and TACs are as follows:

	1973	1974	1975	1976	1977	1978	1979	1980	1981
TAC (000 tons)	50	40	35	9	12	15	18	18	21
Catch (000 tons)	33	24	23	8	12	16	19	12[1]	

[1] Provisional data.

b) Abundance

The catch rates of Canada (Nfld) otter trawlers have increased markedly since 1976 and is now at the high level observed in the early 1970's. Canadian research vessel survey data for 1980 showed a slight increase in abundance over 1979.

c) Assessment parameters

Catch composition. Length and age compositions and mean weight-at-age data were derived from Canadian commercial sampling in 1980. Quarterly age-length keys and monthly catches were used to estimate the numbers caught by age-group.

Partial recruitment. These values, calculated from average F-values in a virtual population analysis using the 1976-79 catch matrix, are as follows:

Age (years)	5	6	7	8	9	10	11+
Partial recruitment	0.15	0.53	1.00	1.00	1.00	1.00	1.00

Terminal F. This value for 1980 was estimated from the regression of population numbers (age 7 and older) from VPA on abundance of the age 7+ (numbers) in research vessel surveys for the 1971-79 period, and resulted in F = 0.30.

Recruitment. The geometric mean of population numbers at age 5 from the VPA for 1968-79, with terminal F = 0.30, was used as the estimate of recruitment (81.8 million fish) at age 5 for the projections to 1982.

d) Assessment results

The average fishing mortality on fully-recruited age-groups in 1980 was estimated to be 0.30, which is lower than in the preceding years. If the TAC of 21,000 tons is fully utilized in 1981, it will generate an F of 0.47 which is also lower than $F_{0.1}$ (0.518). However, it must be pointed out that 57% of the projected catch for 1982 will be generated by the recruitment of age 5 fish in 1980 and 1981. On the assumption that the 1981 TAC will be taken and that recruitment at age 5 in 1980 and 1981 will be as indicated above, STACFIS advises that a TAC of 23,000 tons in 1982 corresponds to fishing at the $F_{0.1}$ level.

13. Greenland halibut in Subareas 0 and 1

a) Fishery trends

Nominal catches peaked at 25,000 tons in 1975 and have been less than 20,000 tons since then. Provisional data for 1980 indicate a catch of 8,200 tons, of which 1,700 tons were taken in Subarea 0 and the remainder in Subarea 1, mainly in Div. 1A. There is some indication that the reported catches for 1977-79 may have been overestimated (SCR Doc. 80/VI/72). Recent TACs and catches are as follows:

	1973	1974	1975	1976	1977	1978	1979	1980	1981
TAC (000 tons)	-	-	-	20	20	20	25	25	25[1]
Catch (000 tons)	10	14	25	16	13	12	19	8	

[1] Provisional data.

b) Assessment

No new information was available for this stock, the status of which has not been assessed since 1978, when a virtual population analysis indicated a possible annual yield of 35,000 tons. However, due to some uncertainty about the data, a lower (precautionary) TAC of 25,000 tons was advised for 1979 and maintained for 1980 and 1981. Lacking sufficient data for an up-to-date assessment, STACFIS again advises that the TAC of 25,000 tons should be maintained for 1982.

14. Greenland halibut in Subarea 2 and Divisions 3K and 3L (SCR Doc. 81/VI/64)

a) Fishery trends

Nominal catches ranged from 25,000-30,000 tons during 1971-76, increased to 39,000 tons in 1978 and declined to about 32,000 tons in 1980. Despite the decline in overall catch after 1978, catches in the Canada (N) inshore gillnet fishery, particularly in Div. 3KL, increased steadily from 7,000 tons in 1976 to 27,000 tons in 1980. Reduced total catches since 1978 were the result of reduced allocations to the offshore otter-trawl fleets. Recent TACs and catches are as follows:

	1973	1974	1975	1976	1977	1978	1979	1980	1981
TAC (000 tons)	-	40	40	30	30	30	30	35	55
Catch (000 tons)	29	27	29	25	32	39	34	32[1]	

[1] Provisional data.

b) Biomass surveys

Stratified-random trawl surveys in Div. 2J since 1977 and in Div. 3K and 3L since 1978 have indicated that the minimum trawlable biomass in these divisions appears to be in excess of 200,000 tons. Although no new data are available for Div. 2G and 2H, the results of a survey by German Democratic Republic in late 1978 indicated a minimum trawlable biomass in excess of 100,000 tons for these two divisions. It was noted that there has been essentially no fishery in these divisions during the past two years and that this estimate may therefore be low.

c) Assessment parameters

Catch composition. Catch-at-age data for 1975-80 were used to determine levels of fishing mortality and stock size over that period. Mean weight-at-age data were derived by applying a new length-weight relationship from 1980 survey data to the weighted length-at-age data from the commercial catches in 1975-80. These weights-at-age were used to compute population biomass and catch biomass for the projections.

Terminal F. An estimate of terminal fishing mortality for 1980 was difficult to determine, because reliable catch-per-unit effort data were not available for this fishery. However, an estimate of F for fully recruited year-classes (F_T = 0.20) was derived by calculating the mortality of age 6+ fish between the November 1979 and November 1980 surveys.

Partial recruitment. These values were obtained by taking the average fishing mortality at age for 1976-78, when the pattern appeared to be stable. The partial recruitment curve was clearly dome-shaped, with age 10 being the only fully-recruited age-group.

Age (years)	5	6	7	8	9	10	11	12	13	14	15	16
Mean weight (g)	609	760	955	1192	1580	2209	2699	3371	3884	4563	5918	7144
Part. recruit.	0.021	0.108	0.329	0.690	0.876	1.000	0.912	0.699	0.696	0.389	0.275	0.144

Recruitment. For use in the projections, recruitment at age 5 was taken as the geometric mean of recruitment in 1975-79 (144 million fish), as the time series of survey data is too short to provide any realistic estimate. A Thompson-Bell yield-per-recruit curve was calculated, using average weights at age for 1975-79 and partial recruitment factors at age for 1976-78, as above. $F_{0.1}$ was consequently estimated to be 0.343.

d) Assessment results

Under the assumptions that F_T = 0.20 in 1980 and that the TAC of 55,000 tons will be fully utilized in 1971, the projection for 1982 indicates a yield of 71,000 tons at $F_{0.1}$ = 0.343. However, it was shown that an error in F_T of ± 0.05 would change the advice for 1982 by projecting a yield of 99,000 tons if F_T = 0.15 and 54,000 tons if F_T = 0.25. Due to this extreme sensitivity of F_T in providing accurate advice for 1982, the Committee concluded that the method of calculating F_T was not very reliable, considering the large variance associated with abundance indices from research vessel surveys. With the significant shift in fishing pattern from offshore trawling to highly selective gillnet fishing in the most recent years, the Committee was also concerned that the average partial recruitment pattern may not accurately represent the present situation. Although the available data indicate that this stock is in a healthy condition, it was the consensus of STACFIS that a recommendation to increase the TAC for 1982 based on this assessment was not advisable in view of the uncertainty about these two parameters. However, it was agreed that, since the fishery is confined to Div. 2J+3KL and all commercial and research vessel data pertain to these divisions, the assessment essentially relates to 2J+3KL. STACFIS therefore advises that the TAC for 1982 should remain at 55,000 tons, noting that this TAC should apply only to Div. 2J+3KL. Any increase in the TAC beyond 55,000 tons should be related to removals from Div. 2GH.

15. Roundnose grenadier in Subareas 0 and 1

a) Fishery trends

Nominal catches have fluctuated between 2,000 and 12,000 tons during 1971-79. The TAC has remained at 8,000 tons since 1977. Recent TACs and catches are as follows:

	1973	1974	1975	1976	1977	1978	1979	1980	1981
TAC (000 tons)	-	-	10	14	8	8	8	8	8
Catch (000 tons)	5	12	5	9	3	6	7	2[1]	

[1] Provisional data.

b) Assessment

The assessments since 1976 have consistently indicated a TAC of 8,000 tons. It was noted that there was no directed fishery for roundnose grenadier in recent years and the TAC's were not fully utilized. Because of the lack of new data, STACFIS advises that the TAC for 1982 should remain at 8,000 tons.

16. Roundnose grenadier in Subareas 2 and 3 (SCR Doc. 81/VI/60)

a) Fishery trends

Except for a catch of 75,000 tons in 1971, nominal catches were in the range of 12,000-28,000 tons during 1967-78 but decreased to 8,000 tons in 1979 and to 2,000 tons in 1980. Recent catches and TACS are as follows:

	1973	1974	1975	1976	1977	1978	1979	1980	1981
TAC (000 tons)	-	32	32	32	35	35	35	30	27
Catch (000 tons)	18	28	27	21	15	21	8	2[1]	

[1] Provisional data.

b) Assessment

The Committee reviewed an updated general production model analysis for the 1967-79 period and an analytical assessment based on data for 1972-78. Concern was expressed about the very low correlation coefficient ($r = -0.38$) from the regression of catch-per-unit-effort on effort, and the possible lack of a significant difference of the slope from zero, rendering the general production model inapplicable for the present data base. Regressions of biomass from cohort analysis on catch-per-unit-effort gave consistently negative slopes for all terminal F-values examined, again indicating the problems associated with the catch-per-unit-effort data. Problems also exist in projecting the results of the cohort analysis ahead 4 years to 1982. It was agreed that the data on catch rates were very unreliable, a possible result of the historical practice of not specifying the actual effort associated with the fishery directed toward roundnose grenadier. USSR scientists pointed out that the low catches in 1979 and 1980 were due to restrictions on by-catches of Greenland halibut and do not reflect a change in the status of the stock. It was noted that the average catch for the 1967-78 period was 26,000 tons. In view of the lack of adequate data on which to base an assessment, STACFIS advises that the TAC for 1982 should remain at 27,000 tons.

17. Wolffish in Subarea 1

a) Fishery trends

The nominal catches reported include two species: striped wolffish (*Anarhichas lupus*) and spotted wolffish (*A. minor*). Total catches since 1957 have been in the range of 3,000-6,000 tons. The reported catch for 1979 was 16,000 tons, but there is some indication that the officially-reported catches in 1977-79 may have been over-estimated. Recent TACs and catches are as follows:

	1973	1974	1975	1976	1977	1978	1979	1980	1981
TAC (000 tons)	-	-	-	-	-	-	-	-	-
Catch (000 tons)	5	6	6	6	6	6	16	5[1]	

[1] Provisional data.

b) Breakdown by species

The fishery carried out by small Greenlandic vessels is mainly a directed longline fishery on spotted wolffish. Wolffish catches by trawlers are by-catches in fisheries directed for cod and redfish, and the striped wolffish dominates in number but in terms of weight the difference in the catches of the two species is much smaller. On the basis of two samples from Greenland trawlers and data presented by E. Smidt (*NAFO Sci. Coun. Studies* No. 1, pages 35-39), the first attempt to breakdown the Greenlandic catches into species resulted in the following figures (tons)

	Spotted wolffish	Striped wolffish	Total catch
Trawlers	524	472	996
small vessels	2,760	145	2,905
Total	3,284	617	3,901

c) General remarks

It is not possible to carry out a detailed assessment of wolffishes until more biological data become available. However, taking into account the available statistics, the description of the fishery presented by E. Smidt (*NAFO Sci. Coun. Studies* No. 1, pages 35-40), and the discussion at the June 1980 Meeting (*NAFO Sci. Coun. Rep.* 1979-80, pages 85-86), STACFIS agreed that a catch level of 5,000-6,000 tons seems to be reasonable.

18. Argentine in Divisions 4V, 4W and 4X (SCR Doc. 81/VI/71)

a) Fishery trends

The peak catch in recent years was 17,000 tons in 1974, after which nominal catches declined to a level of 2,000-3,000 tons. Recent TACs and catches are as follows:

	1973	1974	1975	1976	1977	1978	1979	1980	1981
TAC (000 tons)	-	25	25	25	20	20	20	20	20
Catch (000 tons)	1	17	15	7	2	2	3	2[1]	

[1] Provisional data.

b) Assessment

The fishery is carried out seaward of the Small Mesh Gear Line in an area removed from the major concentrations. Trends in abundance from Canadian surveys and Japanese catch-per-unit-effort data indicate that the stock is stable. STACFIS therefore sees no reason to change the existing TAC level of 20,000 tons, which is the estimated MSY level for argentine in Div. 4VWX.

19. Capelin in Subareas 2 and 3

The Committee noted the request of Canada to consider whether the analysis of the capelin stocks carried out at the February 1981 Meeting (SCS Doc. 81/II/2) are sufficient to provide advice on management of these stocks in 1982. Considering the critical importance of recruitment to the exploitable stocks and the current inability to adequately predict recruitment, STACFIS advises that it is

more appropriate to consider the status of the capelin stocks at a meeting early in 1982, when data from the 1981 fishery and research surveys will be available.

20. Shrimp in Subareas 0 and 1

The Committee noted the request of Canada and European Economic Community for advice on management of the shrimp stocks in 1982. However, considering the substantial contribution of shrimp recruitment to annual yields and the current inability to accurately predict recruitment, STACFIS advises that it is more appropriate to assess the shrimp stocks and advise on conservation measures for 1982 at a mid-term meeting in early 1982, when data from the 1981 fishery and research surveys will be available.

21. Squid-*Illex* in Subareas 3 and 4

a) Management regime

There being no significant new information on which a forecast of 1982 abundance might be based, STACFIS continues to support the management regime proposed at the February 1980 Meeting (*NAFO Sci. Coun. Rep.* 1979-80, pages 39-40), and therefore advises that the TAC for 1982 should be maintained at 150,000 tons, subject to adjustment on the basis of any significant new information forthcoming from the 1981 fishery. The Committee recognizes that this regime implies substantial loss of yield in years of high squid abundance and also notes that information available on predation by squid on fish species implies a potential loss of yield for other fisheries in year of high squid abundance. It was further noted that early season surveys on juvenile abundance and distribution may in future allow provision of short-term advice for management 3 to 4 months before the commencement of the fishery.

b) Commencement date for the fishery

The Committee noted that some evidence indicates early season cannibalism as a major source of mortality with a serious impact on yield-per-recruit, and advises that further examination of the biological basis for the 1 July commencement data is warranted. However, the information presently available is not considered sufficient to recommend a change in the commencement date for the 1982 fishery.

III. COORDINATION OF SQUID RESEARCH (Annex 1)

1. Introduction

STACFIS noted that the *ad hoc* Working Group on Squid Research met at the Bedford Institute of Oceanography during 3-6 June 1981, with Mr T. W. Rowell as Convener, to review currently available information on squid biology and distribution and the preliminary results of the NAFO coordinated research surveys in early 1981, for the purpose of determining the spawning distribution and early life history, biology and distribution of *Illex illecebrosus* in the Northwest Atlantic (*NAFO Sci. Coun. Rep.*, 1979-80, pages 70 and 130). The full report of the Working Group, as approved by STACFIS, is given in Annex 1. A summary of the report follows.

2. Distribution and Biology

a) Preliminary results of 1981 coordinated surveys

Five research cruises were conducted between November 1980 and May 1981. Most of the effort was expended in the area between the southern slopes of the Scotian Shelf and Grand Bank and the Gulf Stream in Subareas 3 and 4. Areas along the edge of the Scotian Shelf were surveyed as were the off-shelf waters of Subareas 5 and 6 seaward to the Gulf Stream. Larvae and juvenile *Illex* were caught in Shelf, Slope, Gulf Stream and Sargasso Sea waters, but the largest numbers were found in Slope Water at 100 m. Temperatures in the areas of capture were generally above 10°C but ranged as high as 20°C. The larval samples require further treatment and identification before the larval distribution of *Illex illecebrosus* can be fully evaluated.

b) Trends in abundance and fishery characteristics

The nominal catch of *Illex* in Subareas 3 and 4 was about 70,000 tons in 1980, less than half of the TAC of 150,000 tons and only 45% of the peak catch of 153,000 tons in 1979. Commercial catches declined in all fisheries except the inshore fishery around St. Pierre. Unfavorable market conditions and reduced fishing effort were the contributing factors in the inshore Newfoundland fishery, whereas reduced quota allocations were partly responsible for the decline in offshore catches in Subareas 3 and 4 during 1980. Commercial catch rates in Subareas 3 and 4 and research survey catch rates in Subareas 3 to 6 mostly indicated greatly reduced abundance.

The similarity of trends in abundance for the region from Newfoundland to Cape Hatteras suggest the existence of one stock in the entire area or that the cause of the changes in abundance has affected all stocks in a similar manner.

c) Patterns of distribution and migration (and environmental influences)

As noted in (a) above, the greatest concentrations of larval and juvenile stages of *Illex* were found at 100 m in the warm Slope Water near the northern border of the Gulf Stream. In Subarea 4, the distribution patterns of adults and late-stage juveniles, as well as the bottom-trawl catch rates from both commercial fisheries and research surveys, appeared to be related to water temperatures, the largest catches being made at temperatures from 6 to 12°C. In Subarea 3, the fishery around St. Pierre was delayed about one month in 1980, due to the delay in elevation of the temperature above 7°C. This delay and the observation of low inshore catches of squid along the south coast of Newfoundland in 1980, in contrast with 1979, may have been related to lower temperature conditions in 1980 than in 1979. On both the Scotian Shelf and Grand Bank, the time of occurrence and abundance of *Illex* appears related to the development of high bottom temperatures from the incursion of warm Slope Water. There is some evidence of a positive correlation between January mean sea surface temperatures south of Newfoundland and subsequent squid abundance in inshore Newfoundland waters. A similar relationship was suggested for the Scotian Shelf.

Tagging studies, including one in which a squid travelled 1,260 miles from Newfoundland to Maryland in 107 days, generally indicate a late season southwesterly movement.

d) Biological characteristics

Reported mean mantle lengths of adult *Illex* in Subareas 3 and 4 were generally lower in 1980 than in 1979, and growth parameters in 1980 were more similar to those for 1978 than 1979. Length distributions for 1980 in Subarea 3 were unimodal, whereas three modes were evident in research survey data in Subarea 4. Length frequency data in Subareas 5 and 6 for 1975-79 showed wide distributions in summer and autumn, indicating very protracted or possibly near year-round spawning. The significance of summer spawning in Subareas 5 and 6 was found to vary greatly from year to year, with length frequency data indicating that up to 86% of the *Illex* may result from summer spawning in some years. In general, sexual maturity of males in Subareas 3 and 4 was less advanced on a given date in 1980 than in 1979. New laboratory observations indicated the importance of temperature on the embryonic development of *Illex*. A study on the potential impact of *Illex* as a predator of the cod, capelin and herring stocks in Subareas 2 and 3, based on correlation analysis, failed to show a negative relationship between squid abundance and year-class strength of the prey species except for the capelin stock in Subarea 2 and Div. 3K. The implications of cannibalism were examined, with very high instantaneous mortality rates indicated. Cannibalism was identified as the major source of mortality, and it was suggested that yield-per-recruit would be increased by fishing *Illex* more heavily early in the period of residence on the continental shelf.

3. Coordination of Squid Research

Preliminary results of the 1981 research surveys were reviewed, but, due to time constraints and the need for further analysis of some data, it was not possible to fully evaluate the current program or to develop a program for 1982. STACFIS endorsed the conclusions and the requirements for future research, given in Annex 1, and

recommends

that the Working Group on Squid Research should meet for two days during the September 1981 Meeting to carry out a more complete review of the results of the 1981 surveys and to develop a program for 1982.

IV. GEAR AND SELECTIVITY

1. Silver Hake Mesh Selection Studies

A joint USSR-Canada study, using 60-mm and 90-mm mesh codends, was conducted for silver hake on the Scotian Shelf by two USSR commercial trawlers during 18-28 July 1980. Only 31 paired comparative sets were made in an area slightly apart from the area of the main commercial operations, and hence the conditions of the Council's recommendation on this subject were not met. Discrepancies among Canadian and USSR observers on the quantities caught indicated serious doubt about the validity of the results. The Committee suggested that an attempt should be made to resolve the discrepancies in the data, but, nevertheless, indicated that the small amount of data and the experimental conditions precluded reaching any definitive conclusions. STACFIS accordingly

recommends

that further selection studies on silver hake under commercial conditions should be undertaken as soon as possible so that sufficient data will be available to describe accurately the selectivity of 60-mm and 90-mm mesh codends.

2. Other Selection Studies

The Committee noted that the mesh selection studies on Greenland halibut, initiated in 1979 (SCR Doc. 80/VI/69) have not been continued, and therefore reiterates its previous recommendation that such studies should be continued, using a range of mesh sizes including the current minimum mesh size in effect (130 mm).

The Committee welcomed the report of a Cuban selection study on redfish in Div. 3M (SCR Doc. 81/VI/44), noting that the results were utilized in the mesh assessments described in Section VI below.

V. AGEING TECHNIQUES AND VALIDATION STUDIES

1. Redfish Ageing and Validation

Comparative ageing of the same redfish specimens has been initiated by the exchange of material between Canadian and Federal Republic of Germany scientists. The first comparison of age determinations from scales and otoliths showed a wider range of ages per cm length group in the Canadian otolith interpretations. The scale readings by Federal Republic of Germany scientists were within the same ranges but showed less variation due partly to the fact that only about 50% of the scale readings were recorded as reliable, whereas the otolith readings were recorded for the whole sample. A conclusive analysis is not yet possible because of the limited amount of material examined to date. The Committee agreed that the comparative studies should be continued, using more comprehensive material, especially for larger redfish. The exchange sample will be provided by Federal Republic of Germany.

2. Roundnose Grenadier Ageing Studies

The Committee was informed that the ageing studies on roundnose grenadier between scientists of Federal Republic of Germany and German Democratic Republic have not yet been initiated.

3. Progress Report on Shrimp Ageing Workshop (SCS Doc. 81/VI/14)

In accordance with the recommendation from the November 1980 Meeting (*NAFO Sci. Coun. Rep.*, 1979-80, page 158), an ageing workshop on shrimp (*Pandalus borealis*) was convened by Mr J. Frechette at Quebec City, Canada, during 11-14 May 1981, to conduct an in-depth analysis of shrimp samples with a view to developing criteria for the ageing of shrimp. Statistical methods were used to divide size compositions into age-groups on the assumption that modal classes correspond to age-groups. This use of size compositions to age shrimp implies an optimum sampling strategy which must take into account the different parameters influencing the representation of age-groups. However, caution was advised regarding the proposed minimum requirement for 500 shrimp per sample and the measurement of carapace length to 0.1 mm. A statistical approach should be used to study further the matter of standardized sampling procedures.

Concerning the utilization of age-group separation for estimating age-class strength and hence recruitment, it was pointed out that selectivity and availability problems associated with the younger age-groups do not necessarily exclude the possibility of predicting recruitment. It was noted that a more comprehensive report on the ageing workshop will be presented at a later meeting. As time was insufficient to cover all aspects of ageing shrimp, STACFIS

recommends

that two days should be added to the next meeting at which the shrimp stocks will be reviewed to further consider some aspects of ageing techniques and management implications.

4. Other Ageing Studies

The Committee noted that there was no new information available on age determination of squid or other species.

VI. MESH ASSESSMENTS

1. Mesh Assessment for Redfish in Division 3M (SCR Doc. 81/VI/44, 52)

An attempt was made to determine the mesh size at which the maximum yield-per-recruit might be obtained, using the Beverton and Holt mesh assessment model. It was noted that the selection factors given by Valdes and Fraxedas (SCR Doc. 81/VI/44) fall within the range given by Holden (*ICES Coop. Res. Rep.*, Ser. A, No. 25, 1971) and presented in table 3 of SCR Doc. 81/VI/52. The mean of these values for polyamide is 2.90, which was used as the selection factor.

The growth parameters used were the same as those employed in calculating the yield curves presented in SCR Doc. 81/VI/52, with parameters for male and female combined as follows:

W_∞ = 1070 g t_o = 0.17 yr
L_∞ = 42 cm t_r = 6.00 yr
K = 0.094

An estimate of the total mortality coefficient of 0.1, based on age-groups 16 years and older, was obtained from the age composition of three samples from Canadian catches in the third and fourth quarters of 1980. As the estimate of total mortality (Z) was the same as the value normally used for natural mortality (M = 0.10), a series of runs was made for F = 0.05, 0.10. Maximum yield-per-recruit was obtained at the following mesh sizes (to nearest 10 mm):

	Mesh size (nearest 10 mm) for F		
M	0.05	0.10	0.20
0.05	100	110	110
0.10	70	80	90

Given the variability of the results and the uncertainty concerning the level of fishing mortality (F), the Committee concluded that it was not possible at this time to advise on the mesh size which would give the maximum yield-per-recruit for this stock.

2. Mesh Assessment of Cod in Division 3M (SCR Doc. 81/II/2)

The Committee noted that, at present growth rates, increases in yield-per-recruit of cod are indicated with mesh sizes up to 6 inches (152 mm) in manila codends. Calculations indicated that losses in yield in 1982 would be in the order of 10-35%, if a change in mesh size were applied in 1982, but would be marginal thereafter. Gains in yield would occur after about 1990. An increase in mesh size would result in an increase in spawning stock.

An assessment of losses and gains for an increase in mesh size from 120 to 130 mm in the cod fishery of the central Labrador area was reviewed (SCR Doc. 81/VI/58). The results indicated that the losses and gains would be about the same order of magnitude as those calculated for the cod stock in Div. 3M, with about the same time period before the first long-term gains would occur. The Committee noted that the above mesh assessment results apply only to the otter-trawl fishery, whereas other gears, such as gillnets and longlines with different selectivities, also exploit the cod stock in Div. 3M.

The Committee recognizes that significant by-catches of redfish may occur in the directed fishery for cod, and there is the potential for significant by-catches of cod in the redfish fishery at shallower depths. However, it was concluded that the present data base is not sufficient to provide advice on the impact of changes in mesh size on the cod and redfish fisheries in Div. 3M. The Committee was informed that USSR selectivity studies on cod and redfish were completed in June and that the results of these studies may be available at the September 1981 Meeting. STACFIS therefore

recommends

that the deficiencies in the data base be clearly defined at the September 1981 Meeting, so that the necessary data can be obtained to carry out a complete evaluation of the impact of changes in mesh size on the interacting fisheries for cod and redfish on Flemish Cap.

3. Mesh Size Equivalents

The use of equivalents was reviewed by an ICES/ICNAF Working Group in 1971 (*ICES Coop. Res. Rep.*, Ser. A, No. 25). The selectivity results were found to be extremely variable, and it was concluded that there are many factors (e.g. meshing and catch size) which contribute more to the variability than selectivity differences between materials. Consequently, the selectivity differences between materials can be ignored.

VII. REVIEW OF SCIENTIFIC PAPERS

1. Redfish Speciation and Stock Deliniation (SCR Doc. 81/VI/57, 70, 80)

Three papers on this general subject were considered. The paper on speciation (SCR Doc. 81/VI/70) attempts to show, from vertebral numbers sampled from different depths and areas, that redfish previously considered to be *Sebastes mentella* are composed of two groups, *S. mentella* and *S. fasciatus*. Discussion centered around the apparent change in vertebral numbers from north to south and whether this was a cline typical of that found in meristic studies on many other species. In SCR Doc. 81/VI/57, an attempt is made to redefine the stocks of redfish around the edge of Grand Bank, with the suggestion of a stock in Div. 3L and one in Div. 3NO, based on growth differences. The question arose as to whether the samples collected were from sufficient depths to contain the older age-groups in Div. 3L and 3N, as these older age-groups would influence growth differences between the different areas which might bias the conclusions. In SCR Doc. 81/VI/80, a review of data on anal fin ray counts by depth and division suggested the possibility of redefining stocks. The data indicate a north to south cline, as found in the data on vertebral numbers, although not as clear.

2. Atlantic Saury (SCR Doc. 81/VI/56)

USSR studies from research cruises during October and November 1980 in Subarea 4 indicated that Atlantic saury were distributed in the near-surface layer in temperatures of 9.4 to 14.8°C. The biomass, in an area of approximately 19,000 square miles, was estimated to be about 85,000 tons, and it was suggested that the migrating concentrations were large enough for a successful fishery.

3. Length Measurements of Roundnose Grenadier (SCR Doc. 81/VI/20)

This paper deals with the problem of length measurements of roundnose grenadier, indicating that the pre-anal length is different in males and females of the same total length. Also, inaccuracies apparently occur in measuring pre-anal length because of distortion caused by varying fullness of the stomachs. The Committee noted that these problems were discussed by STACREC at the June 1980 Meeting (*NAFO Sci. Coun. Rep.*, 1979-80, pages 66 and 94) and that the anal-fin length was recommended as the more appropriate partial length measurement.

4. Eggs of Roundnose Grenadier (SCR Doc. 81/VI/75)

Little is known about reproduction and early ontogony of this species. The celled structure of the membrane appears to be sufficiently different from that of the eggs of other species of grenadiers to be useful as a distinguishing character for egg identification.

5. Young Argentine on the Scotian Shelf (SCR Doc. 81/VI/75)

Catches of 0-group argentine are reported for the first time, specimens being caught in six Canadian ichthyoplankton surveys on the Scotian Shelf and in a joint Canada-USSR survey during September-November 1980. The observations are consistent with spawning in March-April, with growth in length of 6.7 cm by October. Vertical migration studies in October indicate that juveniles stay close to the bottom during daylight, migrate off the bottom at sunset, spend the hours of darkness in the upper layers and return to the bottom at sunrise.

ADJOURNMENT

The Chairman expressed his thanks to Mr T. Rowell who convened the Working Group on Squid Research, to Mr J. Frechette for is preliminary report of the Workshop on Ageing Shrimp, to those scientists who assisted by preparing the initial draft reports on the various matters under consideration, to all partipants for their cooperation during the course of the meeting, and to the Secretariat for their support.

ANNEX 1. REPORT OF *AD HOC* WORKING GROUP ON SQUID RESEARCH

Convener: T. W. Rowell

The Working Group met at the Bedford Institute of Oceanography, Dartmouth, Canada, during 3-6 June 1981, to review currently available information on squid biology and distribution and the preliminary results of the coordinated research surveys conducted in late 1980 and 1981 for the purpose of determining the spawning distribution and early life history of *Illex illecebrosus* in the Northwest Atlantic (*NAFO Sci. Coun. Rep.*, 1979-80, pages 70 and 130). Scientists participated from Canada, Cuba, European Economic Community (France), Japan, Portugal, USSR and USA. The results of the reviews are presented in the following sections.

I. DISTRIBUTION AND ABUNDANCE

1. Preliminary Results of 1980/81 Coordinated Surveys

Five research vessel cruises conducted in late 1980 and early 1981 were related to the coordinated survey program.

a) RV *Argus*, 1 November-1 December 1980 (SCR Doc. 81/VI/39)

Two bottom trawl sets and 40 Engel midwater trawl (EMT-400) sets during 1-15 November in Subarea 4, extending from the edge of the Scotian Shelf seaward to the Sargasso Sea, resulted in the capture at 50-100 m of eight *Illex* (larvae and early juveniles) which have not been identified beyond the genus level. During 16 November-1 December, 10 bottom trawl sets in Subarea 4 and 36 EMT sets in Subareas 3 and 4 resulted in the capture of 144 adult *Illex illecebrosus* on LaHave Bank and Basin, four on Sable Island Bank and four on Grand Bank, the average mantle length of these being 206 mm. Nine adults (mean length of 230 mm) were taken in EMT sets close to the continental shelf in Shelf Water.

b) RV *A. T. Cameron*, 24 January-16 February 1981 (SCR Doc. 81/VI/39)

Twelve bottom trawl sets at the edge of the Scotian Shelf and 78 EMT-400 sets in transects extending from the edge of the shelf to the Sargasso Sea resulted in the capture of one juvenile *Illex illecebrosus* (60 mm in length) in Shelf Water at 100 m where the temperature was 7.2°C.

c) RV *Gadus Atlantica*, 20 February-11 March 1981 (SCR Doc. 81/VI/23)

This survey, which extended from the northern edge of Slope Water south of St. Pierre Bank and Grand Bank southward to the Gulf Stream, resulted in the capture of 8,275 juvenile *Illex illecebrosus* in 45 EMT-80 sets, the catch rate being 183.9 animals per set. Catches were made throughout the 24-hour period but more frequently during dusk and darkness. Two exceptionally large catches (3,462 in darkness and 2,546 in daylight) were made at 100 m near the northern boundary of the Gulf Stream. Catches in the upper 300 m occurred at stations where the temperature was higher than 10°C and salinity higher than 35°/oo. No catches were made in water clearly identified as Gulf Stream water. The specimens taken in the EMT sets were 10-30 mm in length. The Bongo net samples have not yet been examined for squid larvae.

d) RV *Atlant*, 15-19 February 1981

This survey, intended to parallel the February surveys of the *A. T. Cameron* and *Gadus Atlantica* in Subareas 3 and 4, was conducted in Subareas 5 and 6. A preliminary XBT transect extended from Georges Bank seaward to the Sargasso Sea. A narrow and deep warm-core eddy was identified close to the northern edge of the Gulf Stream and nine stations were sampled with an EMT-80. Eleven juvenile *Illex* (45-65 mm in length) were taken in the periphery of the eddy and three larvae (3.0-6.2 mm) were caught in the southern extreme of the transect where water temperatures were close to 20°C.

e) RV *Atlant*, 3 March-4 May 1981 (SCR Doc. 81/VI/41)

A total of 99 stations were occupied on 8 transects running perpendicular to the Scotian Shelf. The transects were 50 miles apart and the stations usually at 50 mile intervals, but the intervals were reduced to 10-25 miles when the water masses required better definition. *Illex* juveniles (10-150 mm manille length) were caught at 69 stations in depths of 50-500 m. Maximum abundance occurred in a zone 50-70 miles wide near the edge of the Gulf Stream. Eleven stations, occupied in a warm-core eddy, resulted in small numbers of *Illex* being caught in the periphery and six within the core. Abundance appeared to be highest at 50-100 m, somewhat lower at 200-300 m, and lowest at 500 m. However, catches at 300 m were generally higher than those at 200 m. The size distributions indicated increased size of juveniles along the transects from the

Gulf Stream to the Scotian Shelf, but there was no significant change in size distributions along lines connecting stations in a southwest-northeast direction.

2. Fishery and Abundance Trends

a) Fishery trends

Nominal catches of *Illex* in Subareas 2 to 4 increased rapidly from an annual average of 4,500 tons in 1970-74 to 153,000 tons in 1979 (Table 1). Preliminary data for 1980 indicate significant declines for both Subareas 3 and 4, the overall catch of 70,000 tons being 55% lower than in 1979.

The inshore catch at Newfoundland was only 32,400 tons in 1980, a 61% decrease from 1979. Market conditions and reduced fishing effort were noted as contributing factors in this decline (SCR Doc. 81/VI/27). While the French inshore catch around St. Pierre and Miquelon remained at about the same level in 1980 (1880 tons) as in 1979 (1846 tons), the offshore fishery by France in Subdivision 3Ps and Div. 4W yielded 600 tons in 1980, a 77% decrease from 1979 (SCR Doc. 81/VI/37). The Canadian catch in Subarea 4 was only about 2,300 tons in 1980, a 65% decrease from the previous year, and the international fleet caught 32,000 tons in 1980, a 50% decline from 1979. A reduction in quota allocations in 1980 was partly responsible for the decline in catch by the international fleet (SCR Doc. 81/VI/35).

Table 1. Nominal catches by subarea and TACs, 1972-80.

Year	Nominal catches (tons) by subarea 2	3	4	Total SA 2-4	TAC (tons)
1972	-	26	1,842	1,868	-
1973	2	620	9,255	9,877	-
1974	31	17	389	437	-
1975	-	3,751	13,993	17,744	25,000[1]
1976	-	11,257	30,510	41,767	25,000[1]
1977	6	32,748	50,726	83,480	25,000[1]
1978	-	40,697	51,987	92,684	100,000
1979	-	81,820	71,279	153,099	120,000
1980	1	34,701	34,825	69,527	150,000

[1] Countries without specific allocations could each take up to 3,000 tons.

b) Fishing power estimates

Two estimates of fishing power coefficients were made for Japanese vessels (SCR Doc. 81/VI/31) and for the entire international fleet engaged in the squid fishery in Subarea 4 (SCR Doc. 81/VI/35). For the Japanese fleet, no significant differences were noted for vessels of 1000, 1500 and 2000 GRT but the catch-per-unit effort (CPUE) for 3000 GRT vessels was about twice that of the smaller ones. For the overall international fleet, mean catch rates in 1980 varied greatly among vessel classes and by month. The CPUE data for August and September, during which 61% of the total *Illex* catch was taken, were taken as most representative of differences in fishing power. Allowing a factor of 1.0 for vessels of tonnage class 151-500, the factors for the other classes were 0.5 for tonnage class 501-1000, 3.7 for tonnage class 1001-2000, and 6.8 for tonnage class 2000+ vessels. Both studies indicate that the fishing power of vessels greater than 2000 tons is considerably larger than that of the smaller vessels.

c) Catch rates in 1980

The French inshore catch in Subdiv. 3Ps did not decline in 1980 and the catch rate was 37.7 tons per dory compared with 36.9 tons per dory in 1979, although in 1980 the fishery was delayed by about one month due to the late arrival of squid to the inshore area (SCR Doc. 81/VI/37). However, in the offshore areas of Subdiv. 3Ps and Div. 4W, the catch rate in the French fishery was only 5.5 tons per day in 1980 compared with 17.0 tons per day in 1979 (SCR Doc. 80/II/12), indicating a 68% decline in abundance. In Subarea 4 during August and September 1980, the catch rates of the international fleet were 15 and 13 tons per day respectively, whereas in July and September 1979 the catch rates were 24 and 22 tons per day respectively (SCR Doc. 81/VI/35), implying a 40% reduction in biomass from 1979 to 1980 in the area permitted for the international fleet. The catch rates for the Japanese fleet by month and division in Subarea 4 were also considerably lower in 1980 than in the preceding two years, about one-half to one-third of the values in 1979 and one-half to two-thirds of the values in 1978 (SCR Doc. 81/VI/30).

d) Abundance indices

Various abundance indices for squid *Illex* in Subareas 3 to 6, based on stratified-random trawl surveys and commercial catch rates, are listed in Table 2., together with sources of the information. In addition to these two classes of indices, relative abundance indices from other sources were considered and compared (Table 3). The methods were classified into three categories: stratified-random trawl surveys, areal expansion of commercial fishery catch rates, and other indices of abundance.

Table 2. Abundance indices for Illex illecebrosus in Subareas 3 to 6 determined from stratified random trawl surveys and commercial catch rates.

Country	Area	Time period	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	Source
Canada[1]	4VWX	July	9.6	40.7	14.4	14.4	25.1	52.5	337.9	80.8	30.9	152.2	26.6	SCR 81/VI/34
USA[1]	5Z+6	Sep-Nov	3.4	1.9	3.5	1.3	0.3	12.4	28.7	15.8	28.4	32.1	17.0	SCR 81/VI/33
France[2]	3Ps	Jun-Oct	(inshore)									36.9	37.7	SCR 81/VI/37
France[3]	3Ps & 4W	Aug-Oct	(offshore)									17.0	5.5	SCR 81/VI/37
International[3]	SA 4	Jul-Sep										23.0	14.0	SCR 81/VI/35

[1] Mean number per tow. [2] Tons per dory. [3] Tons per day.

Table 3. Relative abundance indices for Illex illecebrosus in Subareas 3 to 6 based on (A) stratified random trawl surveys, (B) areal expansion of commercial fishery data, and (C) qualitative index of inshore abundance.

Country	Area	Time period	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	Source
A. Canada	4VWX	July	0.36	1.53	0.54	0.54	0.94	1.97	12.70	3.04	1.16	5.68	1.00	SCR 81/VI/34
USA	5Z+6	Sep-Nov	0.20	0.11	0.21	0.08	0.02	0.73	1.69	0.93	1.67	1.89	1.00	SCR 81/VI/33
B. Japan[1]	4VWX	Sep	-	-	-	-	-	-	-	-	3.28	6.21	1.00	SCR 81/VI/31
C. Canada[2]	3		1	2	1	2	1	4	4	5	4	5	4	SCR 81/VI/25
Canada[3]	3										1.88	2.19	1.0	SCR 81/VI/28

[1] Based on abundance indices in the 90-140 fathom depth zone.
[2] Subjective indices; see text for explanation.
[3] Based on survey catches of percent trawling time with squid catches of 60%, 70% and 32% in 1978, 1979 and 1980, respectively.

i) Stratified-random surveys

Canadian surveys carried out on the Grand Bank since 1948 were examined by area and time in SCR Doc. 81/VI/28 to determine the best set of survey data that might provide the best indication of *Illex* abundance in inshore Newfoundland waters later in the year. Survey catches on the southwest slope of Grand Bank during 8-30 June were selected for this purpose. The relative estimates of abundance from these surveys in 1978, 1979 and 1980 expressed as percentages of total trawling time during which squid were caught, were 60%, 70% and 32% respectively. These have been transformed in Table 3, with the 1980 value represented by a factor of 1.0.

During a French bottom-trawl survey on the Scotian Shelf (Div. 4VWX) in September 1980 (SCR Doc. 81/VI/38), 75 hauls were made randomly in 22 strata at depths of 90-365 m. All sets were made during daylight when squid were assumed to be concentrated near the bottom. Estimates of minimum trawlable biomass, by the areal expansion method assuming that all squid in the path of the trawl are caught, were 108,700 tons (481 million individuals) for depths of 50-100 fathoms (92-183 m) and 45,000 tons (184 million individuals) for depths of 100-200 fathoms (183-366 m). The total biomass estimate of 153,700 tons is compared with other estimates in Table 4. The mean catch per 30-min tow over the entire survey was 384 squid. This compares with Canadian estimates, made in the same area and in the same manner from July surveys during 1970-80, of 10 to 338 individuals per 30-min tow (SCR Doc. 81/VI/34).

Squid catch rates from annual Canadian bottom-trawl surveys on the Scotian Shelf in July, adjusted for diurnal effects as the sruvey is conducted during day and night (SCR Doc. 81/VI/34), indicated a sharp decline (82%) in abundance from 1979 to 1980 (Table 2). Biomass estimates from these survey data for 1970-79 were previously presented in SCR Doc. 80/II/17, but this time series was not updated to 1980. However, the corrected catch rates from SCR Doc. 81/VI/34 were related to past estimates of biomass and a biomass estimate of 15,700 tons was calculated for 1980 (Table 4).

Squid catch rates (stratified mean catch per tow in numbers) from USA autumn bottom-trawl surveys in Subareas 5 and 6 indicate a general increase in abundance after the mid-1970's and a sharp decline (47%) from 1979 to 1980 (Table 2).

Table 4. Summary of biomass estimates (000 tons) for Illex illecebrosus in Div. 4VWX.

Country	Time period	Survey area	1978	1979	1980	1981	Comments
Canada[1]	July		19.0	147.6	15.7	-	Stratified random trawl survey
Japan	Sep	4,766 mi^2	233.0	667.0	69.0	-	Areal expansion -fishery catch rates
France	Sep	19,867 mi^2	-	-	153.4	-	Stratified random trawl survey
USSR	Aug	71,014 mi^2				580-1917	Areal expansion -March-May off-shelf juvenile survey extrapolated to August on-shelf adult abundance

[1] See text for explanation.

ii) Areal expansion of commercial catch rates

Estimates of *Illex* biomass along the edge of the Scotian Shelf from the Japanese squid fishery in September for 1978, 1979 and 1980 were presented in SCR Doc. 81/VI/31. Fishing effort was standardized for all vessels and gear types and CPUE values were calculated by 10-fath depth zones within 30' x 30' unit areas. These were expanded over the total area of the southeastern edge of the Scotian Shelf acccrding to the following assumptions: the average distance between the wing tips of the trawl used by 2000 GRT vessels was 26 m, the towing speed was constant at 3.5 knots, and all squid in the path of the trawl were caught. Using only the catches during daylight, biomass estimates of 233,000 tons, 667,000 tons and 69,000 tons were calculated for 1978, 1979 and 1980 respectively (Table 4). As for other estimates, the biomass increased in 1979 and decreased sharply in 1980. Since about 90% of the fishing effort was expended in fishing at 90-140 fath (165-256 m), the estimates for this depth zone are used in Table 3 to estimate the relative indices of abundance from the Japanese fishery. These relative indices indicate a decrease in abundance of 84% from 1979 to 1980 in the surveyed area.

iii) Other indices of abundance

Qualitative estimates of squid abundance in Newfoundland waters have been made since 1948 (SCR Doc. 81/VI/28). These estimates are based on collating reports from such sources as newspaper articles, fisheries reports and field observations. Abundance levels were assigned numerical values ranging from 1 (very scarce) to 5 (very abundant). These indices for 1970-80 (SCR Doc. 81/VI/28) are given in Table 3. During 27 March-4 May 1981, a USSR survey for *Illex* covered an area of 71,014 mi^2 in the offshore waters of Div. 4VWX (SCR Doc. 81/VI/43). Abundance estimates for the surveyed area from the Scotian Shelf to the northern edge of the Gulf Stream), calculated by methods of horizontal and vertical interpolation (SCR Doc. 80/II/36) were in the range of 5.2 billion to 17.0 billion animals. These juvenile squid ranged in length from 10 to 150 mm but were generally less than 60 mm. The authors extrapolated this March-May estimate of offshore abundance of juveniles to later abundance on the Scotian Shelf during the period of recruitment, by assuming that all of the juveniles in the surveyed area would migrate to the Scotian Shelf, that mortality would not exceed 50% from the time of the survey and time of recruitment, and that the average weight of squid would be about 225 g (230 mm mantle length, from SCR Doc. 81/VI/38) at the time of recruitment. The biomass in August 1981 is forecasted to be in the range

of 585,000-1,917,000 tons (Table 4). It was noted that the major limitation to this forecast lay in the assumptions of migration only to the Scotian Shelf and of 50% mortality between survey and recruitment times. It was also noted that squid upon recruitment to the fishery are smaller in length and weight than the values used in calculating the biomass estimate and that cannibalism (SCR Doc. 81/VI/40) might increase the early season mortality factor well beyond the suggested level of 50%. However, it was recognized that such off-shelf indices of juvenile abundance may in the future provide a valuble means of short-term prediction of later on-shelf abundance and availability to the fishery.

iv) General considerations

It was recognized that there are many factors which affect the accuracy of abundance indices. Squid tend to be more dispersed throughout the water column at night and are less vulnerable to the bottom trawl. Consequently, the catch rates from day and night operations during bottom-trawl surveys must be adjusted for diurnal effects for use in calculation of biomass estimates, although such adjustments are not critical for the calculation of relative catch rates if the relative proportion of day and night sets does not change from year to year. Biomass estimates from bottom trawling may be too low when squid are off the bottom as during the night, during dark days or during the day when the height of the trawl does not reach the height of the squid concentrations. Moreover, data from bottom trawl surveys may not reflect consistent year-to-year trends in squid abundance if different weather conditions (e.g. different numbers of misty or cloudy days), result in different vertical distribution patterns.

Considering all of the information available, however, the similarity in trends of abundance for the area from Newfoundland to Cape Hattaras (Table 3) suggest that one stock exists in the entire area or that the cause of the changes in abundance has affected all stocks in a similar way.

Patterns of Distribution and Migration (and Environmental Influence)

a) Oceanic distribution of larval and early juveniles

Surveys conducted from February to May 1981 in Subareas 3 and 4 indicated that the distribution of small juveniles was closely related to the physical properties of the water masses (SCR Doc. 81/VI/23, 41). Greatest catches occurred at 100 m in warm Slope Water near the northern boundary of the Gulf Stream. Catches also occurred at greater depths dominated by North Atlantic Central Water, as indicated by lower temperatures and stable salinity values of about 35°/₀₀, and there were some small catches within and on the oceanic side of the Gulf Stream.

b) Distribution of adults and large juveniles

i) Subarea 4

From commercial fishery data, concentrations of squid appeared to be small on the southern part of the Scotian Shelf during July to November 1980, due apparently to lower-than-normal temperature conditions (SCR Doc. 81/VI/30). Differences in bottom-trawl survey catch rates seemed to be associated with bottom temperature, but the largest catches occurred during daylight, indicating diel vertical migration (SCR Doc. 81/VI/31, 34).

The French bottom-trawl survey and the Japanese commercial data indicate that the largest catches near the edge of the Scotian Shelf in September 1980 were associated with incursions of 6-12°C Slope Water onto the Shelf (SCR Doc. 81/VI/31, 38). In the French survey, maximum catches were made where bottom temperatures ranged from 7.5 to 9.5°C. High sea-surface temperatures outside the Shelf Water in March (1977-81) may be associated with early immigration onto the Scotian Shelf in some years (SCR Doc. 81/VI/32).

ii) Subarea 3

It was noted that the delay of approximately one month in the commencement of the fishery around St Pierre in 1980 may have been related to the delay in elevation of the temperature about 7°C (SCR Doc. 81/VI/37). This delay and the observation of low squid abundance inshore along the south coast of Newfoundland in 1980 compared with the situation in 1979 (SCR Doc. 81/VI/27) may have been due to lower temperature conditions in 1980 than in 1979. Although squid were unusually scarce along the south coast of Newfoundland, they were distributed around St Pierre and Miquelon and in all other areas of insular Newfoundland.

The time of occurrence of squid on the slope of Grand Bank in May-June appears to be related to the time of development of high bottom temperatures due to incursions of warm

Slope Water (SCR Doc. 81/VI/28). There also appears to be a positive correlation between January mean sea-surface temperatures off the continental slope south of Newfoundland and squid abundance in inshore Newfoundland waters later in the year. This relationship, together with the temperature-related occurrence of squid on the southern Grand Bank in June may provide an indication of July-November levels of squid abundance in inshore waters. The presence of unusually high numbers of icebergs drifting south of latitude 48°N during May-June in some years may be associated with conditions which are unfavorable for inshore squid migration.

c) Migration

Based on a tag return, the longest distance of travel yet reported for a short-finned squid, from northeastern Newfoundland to a point off the coast of Maryland, was 1260 miles (minimum) in 107 days (SCR Doc. 81/VI/24). A return from inshore tagging at Nova Scotia indicated that the squid travelled in a southwesterly direction along the coast a minimum distance of 300 miles in 70 days (SCR Doc. 81/VI/36). Three other tag recoveries reported inshore at Nova Scotia also indicated movement in a southwesterly direction. As previously reported (SCR Doc. 80/II/33), overall tagging observations tend to support a generally northeastward movement of squid early in the commercial fishing season and a southwestward movement late in the season. It was recognized that such long distance tag recaptures may in future provide valuable insight on migration, stock identity and the location of spawning sites.

II. BIOLOGICAL CHARACTERISTICS

1. Sex composition, growth and maturation

Juvenile *Illex*, caught during Canadian surveys in February-March 1980 extending from the Grand Bank southward to the Gulf Stream (SCR Doc. 81/VI/23), ranged in length from 10 to 30 mm. The sex ratio was 50:50 and the length distribution from each set was unimodal. The length-weight relationships have a lower exponent than is the case for adults:

$$\text{Male: } W = 0.08\ L^{2.13} \qquad \text{Female: } W = 0.07\ L^{2.24}$$

The adult short-finned squid, taken by midwater trawl in the November survey off the Scotian Shelf (SCR Doc. 81/VI/39), with a mean mantle length of 230 mm were larger than those taken by bottom trawl on the shelf (206 mm), and most of the specimens were in maturity stages 2 and 3 except for one mature female (stage 4). Mean mantle lengths of squid in the Japanese commercial fishery (bottom and off-bottom trawls) in Subarea 4 were on the average lower in 1980 than in 1979, the reported values for 1980 being 186 mm in July, 212 mm in August, 222 mm in September, 232 mm in October and 226 mm in November (SCR Doc. 81/VI/30). Canadian sampling of catches of the international fleet on the Scotian Shelf from late April to November 1980 indicated increases in mantle length from 136 mm to 229 mm for males and 133 mm to 249 mm for females. Growth parameters for 1980 were more similar to those of 1978 than of 1979.

Three modes were identified in the length distribution of short-finned squid from a French research survey in September 1980 at depths of 50-200 m (SCR Doc. 81/VI/38). The dominant mode (80% of the specimens) consisted of maturing animals, with mean lengths of male and female being 215 mm and 226 mm respectively. The next largest mode was comprised mainly of immature animals with mean length of about 165 mm. The third mode (2% of the specimens) consisted of immature squid of 80-130 mm in length. The length-weight relationship for these samples were as follows:

$$\text{Male: } W = 0.00993\ L^{3.322} \qquad \text{Female: } W = 0.01478\ L^{3.082}$$

Length frequencies from the Canadian survey on the Scotian Shelf in July showed rather wide distributions (SCR Doc. 81/VI/34), suggesting limited summer spawning or divergent growth rates. The mean lengths seemed to be positively correlated with bottom temperature. Inshore sampling of squid at various locations in Nova Scotia showed divergent patterns of length (SCR Doc. 81/VI/36), the pattern in those samples from the South Shore being relatively consistent from week to week and with offshore samples, whereas sample lengths from the Chedabucto Bay area fluctuated greatly from week to week, implying that different sizes of squid were moving into and out of the area.

Length frequencies from USA bottom-trawl surveys in Subareas 5 and 6 during 1973-79 show wide distributions (30-350 mm mantle length) in summer and autumn (SCR Doc. 81/VI/33). This wide range in size is attributed to greatly protracted and possibly year-round spawning.

In Subarea 3, samples from the French fishery during 21 July-15 October 1980 indicated growth rates of 12 mm and 16 mm per month for males and females respectively (SCR Doc. 81/VI/37). These growth

rates are very similar to those for 1979, but the average sizes were smaller in 1980. The size distributions were unimodal, and the sex ratio was dominated by males until mid-September about a month later than in 1979, presumably due to slower increase in water temperature in 1980.

From inshore commercial sampling in Subarea 3 and Div. 4R in 1980 (SCR Doc. 81/VI/27), the percentage of males began to decline early in the season (mid-August). In general, the sexual maturity of males on a given date was less advanced in 1980 than in 1979. One mature female was found inshore on the west coast of Newfoundland in September (SCR Doc. 81/VI/26). Such early maturation, also evidenced for six mature females captured in summer between 1968 and 1978, is possibly related to high water temperatures. The maturity stages assigned to these specimens, based on the nidamental gland length/mantle length index, corresponded with descriptions of maturity based on visual examination, indicating that the index of maturity proposed for captive females seem to be applicable to specimens from the wild population (Amaratunga and Durward, *ICNAF Sel. Papers*, No. 5: 37-42).

2. Fecundity, Spawning and Larval Development

A fecundity estimate of 36,288 ova was obtained for a mature female caught in September 1980 on the west coast of Newfoundland (SCR 81/VI/26). This specimen represents the first record of a mature female taken so far north and in inshore waters. The fecundity estimate is much lower than that reported for capative animals (400,000 ova) but is close to estimates reported previously for mature females from the wild population.

Data collected during 1973-79 in Subareas 5 and 6 provide evidence of summer spawning of *Illex* (SCR Doc. 81/VI/33). Although fully mature females were rarely observed in any season, mature males were apparently present in each season. Autumn samples contained the highest proportion of mature individuals in most years, indicating the predominance of winter spawning. Significant numbers of squid were found to be mature during the spring and summer, indicating that some spawning also occurs in these seasons. The importance of summer spawning appears to vary from year to year, but the length frequencies indicate that up to 86% of the squid in the Cape Hattaras area in the autumn of some years may be the result of summer spawning. Although the percentages of mature animals are lower for the more northerly regions of Subareas 5 and 6, they still indicate to a lesser degree that some summer spawning may occur in some years in the Georges Bank and southern New England areas.

Laboratory observations on the embryonic development of *Illex illecebrosus*, based on both artificially and naturally fertilized eggs, are described and the major stages illustrated in SCR Doc. 81/VI/29. It was noted that the basic pattern of development resembles that of *Todarodes pacificus*. The observations indicated that the gelatinous egg mass appears to have important functions related to the avoidance of polyspermy and to chorionic expansion during later developmental stages. Among the factors appearing to be important for normal embryonic development, temperature conditions play a significant role. The observations indicate that fertilization can occur at temperatures as low as 7°C, but normal development required minimum temperatures in the range of 10-30°C. The development time was also temperature-dependent, 11 to 8 days at temperatures from 13 to 21°C.

3. Food and Feeding

An analysis of correlations between squid abundance (estimated from catch and subjective abundance indices) and the abundance of age-group 0 and age groups 0 and 1 combined (estimated by virtual population techniques) of cod, capelin and herring stocks indicated no evidence that squid predation is a major factor in determining finfish recruitment (SCR Doc. 81/VI/25). The total food consumption by squid in 1979 was estimated to be about 4 million tons. Although the food consumption by squid in a year of high squid abundance must be very large, the analysis failed to demonstrate a negative association between squid abundance and year-class strength of finfish prey, with the exception of capelin in Subarea 2 and Div. 3K.

Data in SCR Doc. 81/VI/41 indicated that young squid (50-150 mm) fed mainly on euphausiids, shrimp, amphipods and other crustaceans. Stomach contents of small squid (10-40 mm) contained only unidentified remnants and fat globules. Stomach analyses of squid (150-260 mm) sampled inshore at Nova Scotia (SCR Doc. 81/VI/31) indicated that about 90% of animals had empty stomachs and caeca, but fish was the dominant class of prey in those stomachs containing some food.

4. Mortality

The implications of cannibalism as a source of natural mortality were investigated from reported data on the frequency of occurrence of squid in stomachs, the proportions of empty stomachs and the efficiency of food conversion to growth (SCR Doc. 81/VI/40). The available information indicated that cannibalism is the major source of mortality from June to the end of the season, but squid is not a major food item in small animals. To what extent squid cannabilize on prey as large as the predator was not known, but generally the prey were much smaller. The instantaneous mortality rate due to cannibalism was estimated to be about 0.3 per 2-week period. This is much larger than previously reported estimates of natural mortality. The presence of high proportions of squid in the stomachs

of larger squid throughout the period of their occurrence on the Scotian Shelf implies that small squid are available as food throughout the summer and autumn. This observation supports the hypothesis of protracted spawning.

5. Yield-per-recruit Analysis

A yield-per-recruit analysis attempted to quantify the major sources of mortality in the squid stock (SCR Doc. 81/VI/40). Cannibalism was identified as the largest source of mortality, and it was suggested that total mortality during the whole season on the Scotian Shelf may be as high as 10.0. Such high mortality is not seen in the commercial catch-rate data for the past four years, but this discrepancy may be due to fishing practices of the commercial fleet in seeking the highest concentrations or to continuous recruitment. Under the assumptions used in the model, with high natural mortality, the analysis indicated that the yield-per-recruit would be increased by fishing intensely early in the period of residence of squid on the shelf. For the simulated data, $F_{0.1}$ was greater than 1.0 per 2-week period. The target exploitation rate of 0.4 for squid, proposed by STACREC (*ICNAF Redbook*, 1978, page 32), is equivalent to F = 0.2 per 2-week period.

III. CONCLUSIONS

1. The total catch of squid in Subareas 3 and 4 in 1980 was considerably lower than in 1979.

2. Estimates indicate that the biomass in 1980 was much lower than in 1979 and probably of the same order as in 1978 or during 1971-75.

3. As previously noted (SCS Doc. 80/II/1), biomass estimates of recruited squid stocks do not provide a basis for projection of future stock levels.

4. While considerable new knowledge has been developed regarding the life-cycle, distribution, and possible migration patterns, it is still not possible to relate off-shelf larval and juvenile abundance to later on-shelf and inshore abundance. It is noted that, with greater understanding of the off-shelf to on-shelf migration patterns and of the range of mortality coefficients acting between larval and juvenile stages and recruited adults, it may be possible in future to predict biomass abundance prior to the fishery.

5. The existence of a relationship between squid distribution and water temperature and a positive correlation between squid abundance estimates (e.g. catch rates) and water temperature has been demonstrated.

6. Parallel changes in abundance indices throughout the species range and information on the off-shelf distribution and size characteristics of larval and juvenile squid appear to support the possibility of a single stock or stock complex with still unknown spawning areas.

7. Considerable information has been collected concerning the general distribution and related abiotic factors for early juvenile *Illex* in the off-shelf areas of Subareas 4 and 3, south of the Grand Bank. Subareas 5 and 6, which appear important to fuller understanding of the biology distribution and life-history of *Illex*, have not been adequately studied.

8. A yield-per-recruit model, considered by the Working Group, indicated that an earlier fishing season may be appropriate, and it is suggested that the date for commencement of the fishery be re-examined.

IV. FUTURE RESEARCH REQUIREMENTS

1. The Working Group noted the progress being made in understanding the life history, distribution and migration of *Illex*, and urged that national and cooperative research efforts continue to focus on elucidation of the spawning, larval and early juvenile stages as a basis for future stock predictions.

2. The Working Group noted that studies to date have provided only limited information on larval distribution and no significant information on spawning distribution, and recommends that future studies be directed at these stages of the life cycle.

3. The Working Group noted that cooperative studies on the spawning, larval and early juvenile stages have been concentrated on the more northern areas of distribution in Subareas 3 and 4. It is recommended that increased effort be applied to studies in Subareas 5 and 6.

4. The Working Group noted that continued success of inshore tagging experiments and again suggested that future research be directed toward the development of offshore tagging techniques, since offshore tagging is considered to have greater potential for determining migratory patterns.

5. The Working Group noted that hydrological processes appear to be of fundamental importance in determining the transport and distribution of larval and early juvenile *Illex* in the Gulf Stream/Slope Water interface area, and recommends that increased emphasis be placed on studies which will increase understanding of these processes.

6. The Working Group suggests that special studies be conducted to estimate mortality coefficients for squid migrating onto the shelf and to determine the catchability and selectivity of research gear.

7. The Working Group notes the value of bottom trawl surveys for provision of indices of squid abundance, and recommends that such surveys be continued and that procedures be standardized and coefficients be developed for comparison between gears.

8. The Working Group notes the importance of feeding studies to the understanding predator/prey relationships and the dynamics of squid populations and recommends that they be continued.

V. COORDINATION OF SQUID RESEARCH FOR 1982

Preliminary results of the 1981 coordinated research on squid were reviewed, but insufficient time and the need for further analysis of some data prevented a complete evaluation of the current program, and consequently it was not possible to develop specific plans for cooperative research and surveys in 1982. The conclusions and future research requirements presented in the two preceding sections reflect the consensus of the Working Group regarding the desirability of continuing the cooperative studies and indicate those areas of research which should be emphasized. The Working Group therefore

recommends

that a more complete review of the results of the 1981 surveys and the development of a research program for 1982 should be undertaken at the September 1981 Meeting, noting that two days would be appropriate for this purpose.

APPENDIX II. REPORT OF STANDING COMMITTEE ON RESEARCH COORDINATION (STACREC)

Chairman: V. A. Rikhter

Rapporteurs: Various

The Committee met at Dartmouth, Nova Scotia, Canada, during 16-18 June 1981, to consider and report on matters referred to it by the Scientific Council (Agenda Item III). Scientists attended from Canada, Cuba, EEC (Denmark, Federal Republic of Germany, France and the Commission of the European Communities), Japan, Portugal, Spain, USSR and USA.

In considering the various sections of the agenda, the Chairman appointed Dr R. W. Trites to lead the discussion on matters dealing with Environmental Studies and Dr. W. G. Doubleday for matters dealing with Biological Surveys. The Assistant Executive Secretary and several participants including the discussion leaders contributed to the preparation of the initial drafts of this report.

I. STATISTICS AND SAMPLING

1. CWP Activities Relevant to NAFO Statistical Matters (SCS Doc. 81/VI/3, 11)

a) Tenth Session of CWP

The Assistant Executive Secretary briefly reviewed the Report of the Tenth Session, which was held at Madrid, Spain, during 22-29 July 1980 (SCS Doc. 81/VI/3). Attending on behalf of NAFO were the Assistant Executive Secretary (V. M. Hodder) and Canadian nominees (W. G. Doubleday and D. Tilley). Dr Doubleday was elected Chairman of the Session. The CWP considered a wide range of statistical matters, some of which are directly relevant to the work of the Scientific Council (SCS Doc. 81/VI/11). It was noted that STACREC had dealt with two of the CWP recommendations at its September 1980 Meeting, namely, the list of standard abbreviations for countries, and the future structure of the CWP (NAFO Sci. Coun. Rep. 1979-80, page 127). With reference to other CWP recommendations, STACREC reaffirmed previous commitments regarding (i) the international standard statistical classification of fishing gear, (ii) the use of 3-alpha species identifiers, (iii) use of standardized STATLANT forms and notes for collecting fishery statistics, and (iv) the allocation of catches by nationality. STACREC also welcomed the effort of FAO in compiling an up-to-date list of conversion factors (to convert landings to nominal catches), and endorsed the CWP recommendation that FAO establish a computerized data base of national conversion factors and provide for regular updating at 3-year intervals. Dr Doubleday observed, from recent Canadian studies, that the factors for converting gutted fish to whole weight were quite reliable but that the factors for converting fillets to whole weight were highly variable.

b) Eleventh Session of CWP

STACREC noted that the 11th Session will be held at Luxembourg during 21-28 July 1982 at the invitation of EUROSTAT and that plans for this Session are already in progress through consultations between member agencies. Noting that the names of NAFO representatives was required at least 6 months in advance of this Session, it was agreed that two of the representatives will be Assistant Executive Secretary and the Chairman of STACREC, and that the country which nominates the third representative should be decided by the Scientific Council following the election of officers.

2. Fishery Statistics

a) STATLANT 21A reports

These reports, with a 15 April deadline, consist of provisional nominal catch statistics by species and division and are supposed to provide the Secretariat with reasonably complete annual statistics well in advance of the June Meeting, so that they can be compiled and documented for that meeting. At the start of this June 1981 Meeting, despite the clearly designated deadline, STATLANT 21A reports for several countries were still outstanding. However, most of these became available during the meeting, and consequently the provisional nominal catches for 1980 could be compiled before the end of the meeting (SCS Doc. 80/VI/15).

b) STATLANT 21B reports

These reports, with a 30 June deadline, containing detailed nominal catch and effort data broken down by gear, tonnage class, main species, division and month, are used as the final statistics for publication in the Statistical Bulletin.

i) Statistical Bulletin, Vol. 28 for 1978. This volume should have been published in December 1979 but was not issued until the autumn of 1980, nearly a year behind schedule. The major problems were the difficulty in obtaining STATLANT 21B reports from some countries, despite repeated requests, and the complication of sorting out national statistics and those accruing from joint venture operations to avoid the possibility of double-counting or under-counting.

ii) Statistical Bulletin, Vol. 29 for 1979. The publication of this volume has also been significantly delayed for the same reasons given above. However, it was noted that all 1979 data are now in hand and that the volume will probably be ready for distribution in August 1981. In connection with this first NAFO issue of the Statistical Bulletin, the Assistant Executive Secretary noted some minor changes in format, in accordance with previous recommendations of STACREC, the most significant being a new Table 5 to replace Tables 5 and 6 of the ICNAF Statistical Bulletin, and use of the standard abbreviations for countries, with those for EEC member states prefixed by the letter E for convenience in listing them as a group.

iii) STATLANT 21B reports for 1980 (deadline 30 June 1981).

It was noted that about half of these reports have already been received by the Secretariat and that the early receipt of the remainder could result in publication of Statistical Bulletin Vol. 30 before the end of 1981.

c) Response difficulties

The problems encountered by the Secretariat in acquiring and documenting fishery statistics have persistently been discussed in the scientific meetings of ICNAF and NAFO. Usually more than half of the STATLANT 21A and 21B reports are received close to the designated deadlines, but the lack of response for several months by one or two countries seriously hampers the work of the Secretariat. The responsibility lies with the national statistical offices, and it was recognized that the problem would not be reduced by changing the deadlines.

d) Historical Catches for 1970-79 (SCS Doc. 81/VI/10)

As requested at the June 1980 Meeting, the preparation of a summary document giving 10-year tabulations of catches of selected species by stock area and country has been continued.

3. Sampling Data

a) Processing of length samples (SCS Doc. 81/VI/16)

In accordance with previously adopted requirements for the reporting of length frequencies and age-length keys separately on the new sampling forms (CFS-1 and CFS-2), the Secretariat has modified its procedure for processing the more detailed data. In view of the large volume of data involved, progress has been rather slow, but all available length-frequency data received for 1979 have been computerized, and provisional lists of the samples are given in SCS Doc. 81/VI/16. The Committee noted that a large volume of sampling data for 1979 collected through the Scientific Observer Program had been reported to the Secretariat by Canada (Newfoundland), and that similar data collected by observers of Canada (Maritimes) are expected to be reported in the near future. Noting that the national lists of sampling data indicate incomplete or no coverage of the fishery in some cases, STACREC urged scientists to check their national lists and to submit all non-reported data to the Secretariat as soon as possible, to facilitate the production of Sampling Yearbook, Vol. 24 for 1979.

b) Age-length keys

Except for data reported by Canada (Newfoundland) both nationally and through the Scientific Observer Program, very few age-length keys for 1979 have been reported on sampling form CFS-2. Preparation for the computerization of these data have only just begun, mainly because the bulk of the data were received only recently.

c) Sampling Yearbook, Vol. 23 for 1978

STACREC was informed that the data base for this volume lacked the USA data for Subarea 5 and 6 until recently, but that these data are now in hand and the Yearbook will be issued in 3-4 months.

d) Greenland halibut data

STACREC noted that the Secretariat had received USSR length compositions and age-length keys for the 1969-76 period by division for Subareas 0 and 1, but that there was no information as to when similar data for Subareas 2 and 3 could be expected.

4. List of Fishing Vessels for 1980

STACREC noted that the Secretariat had requested member countries, through a circular letter issued in January 1981, to submit their 1980 lists of fishing vessels by 15 May 1981. Since only about half of the reports have been received to date (SCS Doc. 81/VI/17), STACREC urged that the outstanding lists should be forwarded to the Secretariat as soon as possible, for inclusion in the first NAFO issue of this publication.

5. Tagging Activities in 1980 (SCS Doc. 81/VI/6)

Tagging activities in the Northwest Atlantic during 1980, as reported to the Secretariat, were reviewed and the usefulness of the information was discussed. It was agreed that the program should be continued.

II. BIOLOGICAL SURVEYS

1. Review of Survey Activity in 1980

The Committee noted that the following documents contained material relevant to biological surveys in 1980 and earlier years: SCR 80/IX/115, 116, 120, 130, 132, 133, 134, 137, 143, 146, 150, 151, 152, 153; SCR 80/XI/169; SCR 81/II/5, 9, 10, 11, 12, 13, 14, 15; SCR 81/VI/22, 28, 32, 34, 38, 39, 47, 51, 53, 54, 56, 59, 61, 63, 66, 68, 69, 71, 73, 76, 77; SCS 81/VI/12, 13, 18. Since many of these documents contained the results of investigations previously considered by STACFIS, only those documents containing new information relevant to the agenda of STACREC were discussed. Such information, supplemented by additional details provided by the participants, enabled the compilation of the list of surveys carried out in the NAFO area in 1980 (Table 1).

Changes in level of survey activities were highlighted by participating scientists. Canada (M) increased survey activity on swordfish in Subareas 3 to 6, on scallops in Div. 4T, and combined acoustic and trawl surveys on pollock, redfish and herring in Div. 4X. For Canada (N), there were no major changes except for a Greenland halibut cruise which was carried out in Subarea 2 and Div. 3K, and a food and feeding survey on the Grand Bank. The Federal Republic of Germany increased survey activity on cod and redfish in Subarea 1 and in ICES Subarea XIV (East Greenland) as compared to recent years, and continued the time series of stratified random groundfish surveys in Div. 2J. France continued stratified-random groundfish surveys and undertook cod tagging and surveys for scallops in Subdiv. 3Ps. A new stratified-random survey for squid in Div. 4VWX was carried out. Survey activity by Denmark in 1980 included a new marine mammals survey (whales) but there were no other major changes in relation to 1979 survey activities. The USA carried out a new survey for clams and a new ichthyoplankton survey in Div. 4X. USSR carried out new saury surveys in Div. 4VWX. No information was received from Poland and German Democratic Republic.

2. Survey Plans for 1981

Survey plans for 1981 and early 1982 are listed in Table 2. Attention was drawn to changes in 1981 plans from those carried out in 1980. Canada (M) will increase survey activity on silver hake in Div. 4VWX, on argentine in Div. 4VWX and Subarea 5, a new 0-group gadoid survey in Div. 4WX and several new invertebrate cruises. Canada (N) has plans for a new fall stratified-random groundfish survey on the Grand Bank, comparative trawling experiments between *A. T. Cameron* and the new research vessel *W. Templeman* when the latter becomes available, combination of two groundfish surveys in Div. 2J and 3KL into one survey to cover both shallow and deep strata, a groundfish survey in Div. 2GH using lines or transects, and a new juvenile flatfish survey on Grand Bank. Denmark has carried out a new aerial survey for marine mammals in 1981. There are no major changes for the Federal Republic of Germany, except that the groundfish surveys in Subarea 1 will be conducted according to the stratified-random survey design, and a special cruise in the Northeast Atlantic is planned for calibration of standard survey trawls including those used in the NAFO area. French groundfish surveys in Janary-February 1981 in the Gulf of St. Lawrence (Div. 4R) and off Labrador (Div. 2J+3KL) used stratified-random survey designs for the first time. Japan plans a major survey in Subareas 3-6 from January to March 1982, using a 2,500 GRT research vessel, the objectives being observations on squid distribution and abundance (larvae, juveniles and adults) and collection of oceanographic data. There are no major changes in the USA research vessel program. The USSR has carried out a new juvenile squid survey in early 1981.

3. Review of Draft Manual on Groundfish Surveys in NAFO Area

As recommended by the Scientific Council at the September 1980 Meeting, a revised draft of the survey manual was circulated to members of the Scientific Council. This draft incorporated comments received in the 1980 draft. Historical information on USSR and German Democratic Republic surveys will be included in the final draft. New material on "Coordination of Joint International Surveys", provided by Mr R. Wells, was presented and approved for inclusion in the manual. Dr Messtorff provided a detailed diagram of the sediment sampler used by Federal Republic of Germany, and it was agreed that this diagram should also be included.

Table 1. Inventory of biological surveys conducted in the NAFO Area during 1980.

Sub-area	Div.	Country	Months	Type of survey	No. of sets
A. Stratified-random surveys					
2	J	CAN-N	10	Groundfish	53
		"	11-12	"	63
		DEU	10-11	"	68
3	K	CAN-N	10	Groundfish	78
		"	11-12	"	81
	L	CAN-N	4-5	"	107
		"	5-6	"	77
		"	10	"	8
		"	11-12	"	8
	M	CAN-N	1	"	132
	N	CAN-N	4-5	"	82
	O	CAN-N	4	"	61
	Pn	CAN-N	3-4	"	7
	Ps	CAN-N	3-4	"	83
		FRA	3	"	40
		"	10	"	106
4	RST	CAN-N	1-2	Groundfish	133
		"	9	"	48
	T	CAN-M	9	"	74
	VWX	CAN-M	3	"	114
		"	7	"	140
		"	9-10	"	145
		FRA	9	Squid	75
		USSR	9-10	Groundfish	100
	W	USSR	12	"	20
	X	USA	5	"	37
		"	10-11	"	28
5	YZ	USA	4-5	Groundfish	198
		"	7-8	"	160
		"	10-11	"	204
	Ze	USSR	9-10	"	53
6	ABC	USA	3-4	Groundfish	153
		"	7-8	"	160
		"	10-11	"	204
B. Other Surveys					
1	A	GRL	2,6	Shrimp (commercial)	43
		"	7-9	Shrimp and groundfish	17
		"	8	Shrimp (photo)	5
		"	7,9	Plankton	17
	B	CAN-N	8	Salmon	-
		GRL	1-5,7	Shrimp (commercial)	149
		"	8	Shrimp and groundfish	14
		"	8	Shrimp (photo)	15
		"	7	Plankton	11
	B-F	DEU	6-7	Groundfish	71
		"	11-12	"	50
	C	GRL	2-3,8	Shrimp and groundfish	9
		"	4-5	Shrimp (commercial)	41
		"	4	Plankton	6
	C-F	DEU	4-5	Groundfish	45
	D	GRL	3-4,9,12	Shrimp and groundfish	15
		"	4,8	Shrimp (commercial)	5
		"	7	Plankton	6
		"	8-11	Salmon	125
	D-E	GRL	7	Cod (acoustics)	-
	E	GRL	4	Shrimp and groundfish	3
		"	8	Shrimp (commercial)	1
	E-F	DEU	9-10	Groundfish	8
	F	DEU	8-10	"	30
2	G	CAN-N	9-10	G. halibut, tagging	6
	GHJ	"	8	Salmon and Arctic char	-
	GH	USSR	8-11	Capelin, groundfish	240[1]
		"	8-11	G. halibut selectivity	32
	H	CAN-N	7-8	Shrimp	117
		"	9-10	G. halibut, tagging	57
	J	CAN-N	7-8	Shrimp	87
		"	9-10	G. halibut, tagging	36
		"	10-11	Capelin	-
		"	11-12	Squid	-
2	J	FRA	2	Cod	20
		USSR	8-11	Groundfish	...[1]
		"	10	Redfish, G. halibut	42[2]
3	K	CAN-N	3	Cod, tagging	107
		"	6-7	Salmon	-
		"	6-7	G. halibut, tagging	111
		"	9-10	" "	4
		"	10-11	Herring, capelin	-
		"	11-12	Squid	-
		FRA	2	Cod	22
		USSR	8-11	Groundfish	...[1]
		"	10	Redfish, G. halibut	...[2]
	KLNO	USSR	4-8	Groundfish	305
	L	CAN-N	1	Groundfish, feeding	27
		"	2-3	Capelin	-
		"	3	Fish ecosystem studies	-
		"	3	Cod, tagging	32
		"	3-5	Crab	-
		"	4-5	Groundfish (deepwater)	66
		"	5-6	Herring, capelin	-
		"	7-11	Crab	-
		"	9-10	G. halibut, tagging	4
		"	10	Cod, tagging	46
		"	10-11	Capelin	-
		"	11-12	Squid	-
		FRA	2	Cod	22
	LNO	CAN-M	8-9	Swordfish	-
		CAN-N	6-7	Capelin	-
		USSR	5-6	Capelin (acoustic)	-
	M	CAN-N	4-6	Fish ecosystem studies	-
		USSR	3,5,6,8	Ichthyoplankton	515
	N	CAN-N	1,5-6	Fish ecosystem studies	-
		"	4-5	Groundfish (deepwater)	44
		"	5-6	Salmon	-
		"	6	Squid	47
	O	CAN-N	4-5	Groundfish (deepwater)	23
		"	6	Squid	131
	P	CAN-N	5	Pollution survey	-
	Pn	"	6	Squid	43
	Ps	"	2	Cod tagging	27
		"	1-3	Herring	-
		"	5-6	Herring, capelin	-
		"	8-12	Herring	-
		FRA	10	Cod tagging	18
		"	11	Scallops	116
4	R	CAN-N	4-5	Herring	-
		"	7	Scallops	-
	RST	CAN-N	2	Shrimp	57
		"	6	Juvenile flatfish	83
		"	7-8	Shrimp, redfish	185
		"	8	Groundfish (acoustics)	-
		"	11	Shrimp	21
	T	CAN-M	4-5	Scallops	135
		"	5	Herring (larvae,migration)	-
		"	5-6	Cod migration	22
		"	6-7	Mackerel (eggs)	207
		"	7,9	Scallops	79
		"	9-11	Herring (larvae,juveniles)	51
		"	11-12	Cod migration	-
	Vn	CAN-N	3	Squid	21
	V	CAN-M	1	Herring migration	-
		"	9-10	Cod migration	-
	VWX	CAN-M	2	Ichthyoplankton	118
		"	5-7	"	378
		"	11-12	"	100
		"	7	Comparative fishing	138
		"	8	Squid	41
		"	9	Swordfish	7
		"	10-11	IYGPT gear test	49
		USSR	8-10	Ichthyoplankton	378
	W	CAN-M	1	Trawl gear tests	10
		"	6	Pollock migration	-
		"	9	Silver hake patch study	211
		"	11-12	Redfish (acoustics)	-
		USSR	8-9	Ichthyoplankton	264
	WX	CAN-M	9	Lobster (offshore)	68
		"	9-10	Crab	82

Table 1. (Continued)

Sub-area	Div.	Country	Months	Type of survey	No. of sets
4	X	CAN-M	3	Herring larvae, zooplank.	238
		"	6	Scallops	100
		"	7	Herring migration	-
		"	8	Herring larvae, zooplank.	160
		"	8	Herring (acoustics)	-
		"	8	Scallops	74
		"	10	Redfish, pollock	17
		"	10	Scallops	26
		"	11	Herring larvae, zooplank.	131
		USA	4	Ichthyoplankton	10
		"	9	Clams	23
		"	10	Ichthyoplankton	4
		"	12	"	4
5	YZ	USA	6	Ichthyoplankton	77
		"	9-10	"	92
	Z	CAN-M	5-7	Scallops	372
		"	9-10	Swordfish	7
		USA	2	Clams	16
		"	2-4	Ichthyoplankton	76
		"	4	Yellowtail flounder	42
		"	5	Red crab	25
		"	6	Scallops	84
		"	6-8	Ichthyoplankton	194
		"	9	Clams	22
		"	12	Ichthyoplankton	64
		USSR	4-5	MARMAP	156[3]
		"	7-8	"	156[4]
6	ABC	CAN-M	8	Swordfish	9
		USA	2-4	Ichthyoplankton	72
		"	5-6	"	72
		"	5-6	Scallops	293
		"	9-10	Ichthyoplankton	72
		"	10-12	"	70
		USSR	4-5	MARMAP	...[3]
		"	7-8	"	...[4]

NOTE: The footnoted numbers indicate situations where the number of sets given overlapped subareas; The number of sets is entered on one subarea and the symbol "..." followed by the corresponding footnoted digit indicates the other subarea to which the overall number of sets also applies.

Table 2. Biological surveys planned for the NAFO Area in 1981 and early 1982.

Country	Area	Type of survey	Dates
A. Surveys planned for 1981			
CAN-M	4RST	Seals (aerial survey)	Jan
	4T	Groundfish	Sep 3-Oct 2
		Mackerel (eggs)	Jun 15-26
		Queen crab	May 4-Jun 5
		" "	Oct
		Scallops	May 11-22
		"	Jun 1-13
		"	Jul
	4V	Cod migration	Apr 27-May 8
	4VW	0-group gadoid survey	May 11-22
		Shrimp	Oct 5-16
	4VWX	Groundfish	Feb 23-Mar 20
		"	Jul 2-24
		"	Oct 5-30
		Silver hake (adult)	Sep 14-Oct 2
		" " (")	Nov 16-Dec 11
		Mackerel (eggs)	Feb
		Multi-species studies	Feb
		Comparative fishing	Jul 2-24
		Red crab	Jul,Oct
		Shrimp	Mar 30-Apr 10
		"	Aug 31-Sep 11
		Squid	Jun 1-12
		"	Aug 17-28
		Disease and parasites	Apr 21-24
		" " "	Nov 16-27
		Hydroacoustics	Nov 2-13
		Ichthyoplankton	Jan 19-Feb 20
		"	Mar 23-Apr 16
		"	Jun 15-26
		"	Nov 2-13
	4W	Silver hake (juvenile)	Jan 5-16
		Herring	Jan 19-Feb 27
		Cod migration	Sep 8-18
	4X	Herring (larvae)	Mar 2-20
		" (")	Jul 27-Aug 14
		" (")	Nov 9-27
		" (juveniles)	Jun 29-Jul 10
		" (adults)	Jul 13-24
		Lobster-Jonah crab (offshore)	Jul,Sep
		Lobster (offshore)	Jul,Aug,Oct
		Scallops	Jun 15-27
	4	IYGPT gear trials	Apr 21-24
	4VWX-5Z	Argentine	Sep 21-Oct 2
	4X,5Z	Scallops	Jul 27-Aug 21
CAN-M	5Z	Lobster (offshore)	Jun 1-12
CAN-N	2GH	Salmon and Arctic char	Aug 3-31
		Groundfish (random)	Oct 23-Nov 11
	2GHJ	Cod sampling and tagging	Jul 15-Sep 15
		Capelin survey	Sep 30-Oct 21
	2HJ+3K	Squid survey	Nov 26-Dec 11
	2J+3K	Groundfish (strat. random)	Nov 13-Dec 14
	2+3K	Shrimp survey	Jul 1-30
	2+3	Seals	Apr 15-29
	3K	Salmon tagging	May 25-Jun 19
		Herring	Sep 28-Oct 21
	3KL	Capelin survey	Sep 2-21
	3L	Cod (food and feeding)	Apr 1-8
		Crab tagging	Mar 23-Apr 15
		" survey	May 5-19
		" "	Jul 24-29
		" "	Sep 4-9
		" "	Sep 25-30
		" "	Nov 9-14
		Shrimp survey	Apr 21-May 1
		Herring survey	May 11-27
	3LMNO	Fisheries ecosystems	Apr 23-May 11
	3LNO	Groundfish (strat. random)	Apr 2-May 29
		Capelin and sand lance	Jun 3-29
		Groundfish (deepwater)	Sep 10-28
		Groundfish (strat. random)	Sep 1-Nov 20
	3LPs	Capelin	Jun 16-Jul 14
	3M	Fisheries ecosystems	May 13-Jun 1
		" "	Jun 23-Jul 10
	3NO	Juvenile flatfishes	Aug 13-31
	3NOP	Squid survey	Jun 4-23
		" tagging	Jul 21-27
	3Ps	Herring survey	Jun 24-Jul 3
		" "	Aug 11-31
		" "	Sep 4-21
		" "	Oct 23-Nov 3
		" "	Nov 26-Dec 11
		Juvenile flatfish	Oct 5-19
	4R	Herring survey	Apr 13-May 5
		Scallops	Jun 1-11
		"	Jul 20-Aug 7
		Herring	Nov 10-27
	4RS	Capelin acoustics	Apr 27-May 29
	4RST	Shrimp-redfish survey	Jul 14-Aug 24
		Groundfish acoustics	Aug 26-Sep 8

Table 2. (Continued)

Country	Area	Type of survey	Dates
CAN-Q	4S	Salmon and eels	Jul 6-16
		Herring survey	Jul-Aug
		Capelin survey	Oct 5-16
		Queen crab studies	May,Oct
		Capelin survey	May 18-29
		Herring juveniles	Aug
		Eel migrations	Sep 26-Oct 2
		Herring survey	Oct 19-Nov 6
GRL	0+1	Marine mammals (aerial)	Apr
	1A	Plankton	Jul-Nov
	1AB	Groundfish and shrimp	Jul-Nov
		Shrimp (photo)	Jul-Aug
	1B	Shrimp (commercial)	Jan-Nov
	1BD	Plankton	Jul
	1CDE	Groundfish and shrimp	Jan-Dec
	1CDEF	Cod (commercial)	Jan-May
	1	Whales (sightings)	Jul-Sep
FRA	2J+3KL	Cod (strat. random)	Jan 8-Mar 3
	3P+4R	" (" ")	
	3Ps	Groundfish (strat. random)	Mar 5-Apr 1
		" (" ")	Oct 5-Nov 1
		Scallops	Nov 1-10
	4VWX	Squid (strat. random)	Aug 22-Sep 22
DEU	1C-1F	Groundfish	Feb 22-Apr 2
		" (strat. random)	Nov 9-Dec 18
	2GHJ	" (" ")	Nov 7-Dec 18
	E. Grl.	Groundfish	Feb 22-Apr 2
		" (strat. random)	Jun 23-Jul 24
		" (" ")	Nov 9-Dec 18
	NE Atl.	Calibration of trawls (including standard survey trawl used in NAFO Area)	Aug 8-Sep 9
USSR	3K	Groundfish	Jun-Jul
	3KLNO	"	Aug-Sep
	3LNO	Capelin (acoustics)	May-Jun,Nov
	3M	Ichthyoplankton	Apr-May
	4VWX	Silver hake, ichthyoplankton	Aug-Oct
	4+5	Squid-*Illex*, ichthyoplankton	Feb-Mar
USA	4X	Groundfish survey	May 4-15
		" "	Nov 2-18
	5YZ	" "	Jan 5-23
		" "	Apr 6-May 15
		" "	Jul 7-24
		" "	Oct 5-Nov 13
USA	5Z	Gear test (bottom trawl)	Jun 29-Jul 2
		" " (" ")	Nov 2-13
		" " (" ")	Dec 7-18
	5Z+6	Clam assessment	Aug 3-Sep 11
		Scallop assessment	Jun 9-Jul 2
	4-6	Ichthyoplankton	Feb 17-Mar 26
		"	Mar 17-Apr 12
		"	May 20-Jun 26
		"	Sep 21-30
		"	Nov 16-Dec 22
	6ABC	Groundfish survey	Jan 5-23
		" "	Mar 17-Apr 17
		" "	Jun 22-Jul 24
		" "	Sep 16-Oct 16

B. Surveys in early 1982

Country	Area	Type of survey	Dates
CAN-M	4VWX	Ichthyoplankton	Jan 5-Mar 26
		Hydroacoustics	Feb 15-26
		Parasites and diseases	Mar 1-5
		Groundfish	Mar 1-26
	4WX	Squid (larvae and juveniles)	Feb 2-26
	4W	Herring	Jan 5-29
	4X	Herring (larvae)	Mar 8-26
	4VWX+5Z	Mackerel (offshore)	Jan 5-29
CAN-N	2J+3KL	Cod tagging	Mar 12-31
	3L	Herring	Mar 16-31
	3LNO	Groundfish	Jan 5-Mar 25
	3M	Groundfish (strat. random)	Jan 28-Feb 16
	3Ps	Juvenile flatfish	Jan 18-Feb 3
		Herring	Jan 5-Feb 16
		"	Feb 9-26
	3+4VW	Squid survey	Feb 18-Mar 10
	4RST	Capelin and herring	Jan 7-26
CAN-Q	4T	Herring (larvae, juveniles)	Feb-Mar
JPN	3-6	Squid (larvae to adults)	Jan 16-Mar 5
USA	4X+5+6	Groundfish survey	Mar 9-May 7
		" "	Jun 15-Jul 16
	5Z	Gear tests (bottom trawl)	Jan 4-29
	5Z+6	Scallop assessment	Jul 14-Aug 5
		Clam assessment	Jul 27-Sep 7
	4-6	Ichthyoplankton	Feb 16-Mar 25
		"	May 17-Jun 11

It was noted that the 1975 draft international standard for drawings of fishing nets had not been published by ISO due to inaccuracies in the diagrams. This standard is very relevant to fishing gears used in bottom trawl surveys, and STACREC therefore

recommends

that the NAFO Secretariat write to ISO requesting that the international standard for specification of fishing nets be expedited.

In the absence of an agreed ISO standard, it was agreed that the 1975 draft should be included in the manual. Subject to final editing and the above modifications, STACREC

recommends

that STACPUB consider the publication of the Manual on Groundfish Surveys in one of the Scientific Council's publication series.

4. Other Matters

The Committee noted that existing time series of groundfish surveys with fixed stations have not been calibrated with more recently introduced stratified-random surveys. It was also noted that biomass estimates from surveys are highly dependent on catchability coefficients. STACREC therefore

recommends

a) *that calibration of fixed-station and stratified-random surveys should be carried out, beginning with USSR groundfish surveys in Div. 3M; and*

b) *that reports of biomass estimates from surveys should include the catchability coefficients used in calculating these estimates.*

There was further discussion of research vessel trawl performance. The United States is routinely monitoring head rope height during surveys using a third wire. More emphasis is being put on gear testing now and in the forseeable future. This program complements research planned by Federal Republic of Germany mentioned above. Attention was also drawn to the effect of variable trawl performance on research vessel catches at a trawl survey workshop held in Canada in 1980. STACREC considered such studies to be extremely valuable in improving survey methods.

III. ENVIRONMENTAL STUDIES

1. MEDS Progress Report for 1980

Highlights of the information in the progress report for 1980 (SCR Doc. 81/VI/82) are given below.

a) Inventory of reported data collections in 1980

The Committee noted that MEDS had identified 28 cruises from 6 countries totalling upwards of 7,000 stations for which data had not yet reached MEDS. The list identifying the cruises is presented in table 1 of SCR Doc. 81/VI/82. The information was extracted from cruise reports, NAFO documents and personal communications; no inventory forms were received this year. The representative of MEDS suggested that national representatives could send the required cruise information to MEDS in any convenient form as an alternative to compiling all of the information on the inventory form. Federal Republic of Germany supplied information about the 5 cruises noted in table 1. The Denmark (G) representative noted that the cruises described in NAFO SCS Doc. 81/VI/12 were absent from table 1 of SCR Doc. 81/VI/82.

b) Data received and processed for 1980

An inventory of oceanographic data received and processed for 1980 is given in table 2 of SCR Doc. 81/VI/82. Fifty-six cruises were reported, comprising approximately 6,000 stations. Only data from Canada and the USSR was received. A large portion of these data had not yet been fully processed. The French data sent through IGOSS messages did not reach MEDS. It was agreed that national representatives should try to improve the speed of data submission to MEDS and that MEDS should attempt to deal with these data more quickly as well.

c) Historical data acquisition

MEDS noted that, of the 3,000 stations identified as outstanding from 1979 in last year's report (SCR Doc. 80/IX/149), only approximately 150 were received. Approximately 3,000 stations were

received from data collections prior to 1979.

The Committee was informed of a new cruise information management system under development by MEDS. Plans are underway to review all of the ICNAF and NAFO documents for cruise information for input to this system. The MEDS representative suggested that by the time of the June 1982 Meeting he should be in a better position to assess the extent of MEDS data holdings in comparison with historical data collections.

d) IGOSS messages

MEDS reported receiving approximately 1,200 BATHY and TESAC messages from 72 ships in 1980. Messages from ships transmitting information from the area of the Flemish Cap were compiled into a single document (SCR Doc. 81/VI/83). MEDS noted that there are still difficulties associated with messages reaching it, and it was agreed that information about the dates, areas and number of messages transmitted be sent directly to MEDS by the originator. In this way, MEDS will be able to identify any losses and possibly pinpoint the major deficiencies in the system.

2. Environmental Conditions in the NAFO Area in 1980

The Committee noted that MEDS has again provided a summary of environmental conditions from the available data. Other reports presented at the meeting are also relevant and are summarized here.

a) Subarea 0 (SCR Doc. 81/VI/79)

Work reported by the USSR noted that the geostrophic flows in this subarea were consistent with the usually observed patterns along the Baffin Island coastline south of Davis Strait.

b) Subarea 1 (SCR Doc. 81/VI/50, SCS Doc. 81/VI/12)

Work by Denmark and Federal Republic of Germany showed that water temperatures were slightly above normal but not by an exceptional degree. This was reflected in limited amounts of cold water evident along the Fylla Bank section and relatively light ice conditions in 1980. A suggestion was made of a positive correlation between the mean temperature in the uppermost 40 m on the Fylla Bank section and cod recruitment. This was based on a non-continuous data record going back to the 1880's.

c) Subarea 2 (SCR Doc. 81/VI/19, 51, 78, 79)

USSR and Federal Republic of Germany surveys showed that the surface water was slightly warmer and saltier than in previous years. This correlation between temperature and salinity has been noted in past years as well. In the waters of the Labrador Current, it was noted that temperatures were cooler than in 1979 and approached long-term mean values. A great deal of small-scale spatial variability was noted. This was reflected in local streams and reversals along some of the sections sampled. It was noted that the volume transport in the more northerly areas were slightly lower than usual.

d) Subarea 3 (SCR Doc. 81/VI/19, 45, 79, 82; SCS Doc. 81/VI/13, 18)

Investigations by the USSR, France, and Canada indicated slightly cooler and fresher surface water compared to previous years. Calculations of mean conditions by both the USSR and Canada indicate that water temperatures are approaching the mean values after a couple of years of above normal conditions. Analyses of the dynamic topography show complex patterns of small size. Volume transports in this area appear to be lower than the mean.

e) Subarea 4 (SCR Doc. 81/VI/38, 82)

Bottom temperatures were sampled all along the Scotian Shelf in conjunction with the squid program. It was noted that warm Slope Water intruded onto the shelf in the Emerald Basin region and this was associated with high catches of squid.

f) Subarea 5 and 6

There were no available documents from which environmental summaries could be made for this area.

3. National Representatives

The Committee was informed of only one change in national representatives: H. Hatanaka replaces F. Nagasaki as the representative for Japan but the mailing address remains the same. The updated list is as follows: Canada (J. R. Keeley), Cuba (J. Gomez), Denmark (P. Kanneworff), France (G. Stanislas), Federal Republic of Germany (D. Kohnke), German Democratic Republic (B. Schreiber), Japan (H. Hatanaka),

Norway (R. Leinebo), Poland (S. Grimm), USSR (V. Ponomarenko), UK (P. Edwards) and USA (R. Ochinero).

The Committee noted that MEDS expressed its willingness to accept submissions in any form from which the data could be reasonably extracted. In this way, they hope to assist the acceleration of data submissions. It was noted by some representatives that much of the delay in both data submission and processing was the result of manpower problems. MEDS encouraged all countries to try to improve on promptness of data submission and MEDS would also try to improve its processing time.

It was noted that MEDS produces a number of reports of particular interest to NAFO and it was suggested that future annual reports to NAFO by MEDS should include a listing of these.

4. Other Relevant Papers (SCR Doc. 80/IX/121, 136; 81/VI/28, 34, 41, 42, 45, 50, 78)

The Committee briefly reviewed available papers analysing environmental conditions for years other than 1980. A number of these relate to conditions over several years. The Chairman noted that they were appropriate for the upcoming September 1981 Symposium on "Environmental Conditions in the Northwest Atlantic during the 1970-79 Decade", and urged that the authors be encouraged to present them at the Symposium. Other papers containing information on environmental conditions observed in early 1981 were reviewed (SCR Doc. 81/VI/41, 45).

5. Other Matters

The MEDS representative noted that the review of environmental conditions for the previous year is based on only a portion of the data taken during the period. He noted that a much better review would be possible if the report was delayed until the September meeting of the Council, since both the Research Documents printed at the June meeting plus the additional data in MEDS could be incorporated. The Committee noted that June is the preferred time from the point of view of participants present (both biologists and physical oceanographers) as well as use of environmental information for other aspects of the spring meeting. It was agreed that, for the present, the review of the environmental conditions should continue to be prepared in June. However, greater efforts should be made to improve on speed of data submission to MEDS and its subsequent processing and reporting.

IV. OTHER MATTERS

1. Request by the Fisheries Commission for Review of Gear Definitions Relevant to NAFO Fishery Regulations

In accordance with NAFO/FC Doc. 81/IV/3 (revised), the terms and definitions presented in FC Working Paper 80/IX/3 (revised) were discussed in conjunction with FC Working Paper 81/III/2 (revised) and in the list of FC Working Paper 80/IX/5 (2nd revision) and 81/III/1. The Committee was advised that definitions for only those terms presented in FC Working Paper 80/IX/3 required review at this time.

After due consideration, the Committee agreed that the definitions given in Annex 1 are the most appropriate and that a supplementary illustration showing the various trawl components would aid comprehension of the definitions.

2. Adjournment

The Chairman expressed appreciation to Dr R. W. Trites and Dr W. G. Doubleday for presiding over the sessions dealing with environmental studies and biological surveys, and to Mr P. J. G. Carrothers for his contribution on gear definitions. He thanked the rapporteurs and all participants for their co-operation during the meeting, and the Secretariat for their usual efficient work.

ANNEX 1. DEFINITION FOR THE VARIOUS COMPONENTS OF A TRAWL

The following definitions, supplemented by a labelled illustration, are considered to be appropriate for the various components of a trawl:

1. Topside component is (a) in a 2-seam trawl that portion of the net between the two seams or rib-lines and nearest the sea surface while the trawl is in tow, and (b) in a 4-seam trawl that portion of the net between those two seams or rib-lines which are nearest to the sea surface while the trawl is in tow.

2. Bottomside component is (a) in a 2-seam trawl that portion of the net between the two seams and nearest the sea bed while the trawl is in tow, and (b) in a 4-seam trawl that portion of the net opposite the topside component and between those two seams which are nearest the sea bed while the trawl is in tow.

3. Side components, in a 4-seam trawl, are those two other portions between the respective pairs of side seams while the trawl is in tow.

4. Square is that part of the topside component which is connected aft to the belly and forward (a) to the beam in a beam trawl and (b) to the headline or headrope in any other trawl net.

5. Bellies are panels of trawl netting (a) in a trawl with a square, starting from the square on the topside and from the lower wings on the bottom side and extending aft to the belly extension, lengthener or codend whichever comes first; or (b) in a trawl with no square, starting from the wings and extending aft to the belly extension, lengthener or codend whichever comes first.

6. Belly extension is a tapered piece of netting sometimes attached to the after end of the belly so that the effective length of the belly is extended. It is usually characterized by smaller mesh and heavier twine (sometimes double yarn) than in the bellies.

7. Codend lengthener is netting, untapered at least in the net plan, sometimes inserted between the belly or belly extension and the codend to increase catch capacity. It is usually characterized by larger mesh and lighter twine (sometimes single yarn) than in the codend but equal or heavier twine and equal or smaller mesh than in the belly or belly extension.

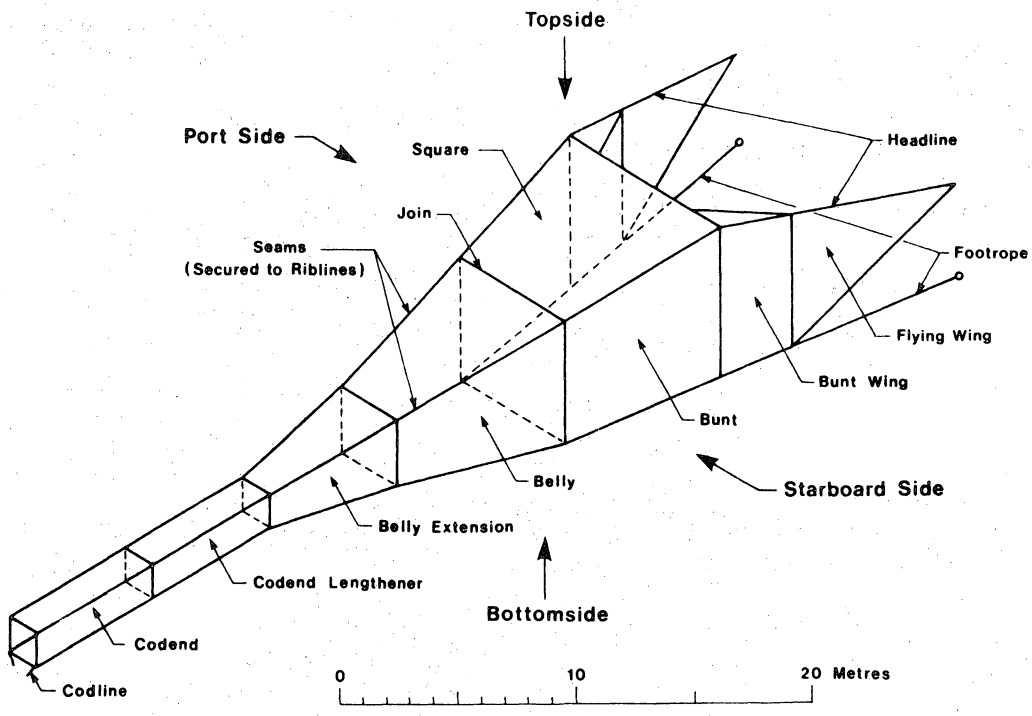
8. Codend is the after portion of the trawl net, untapered at least in the net plan, with mesh usually of the smallest allowable size, attached to the after end of the bellies (or belly extension or lengthener, if present), secured to form a bag by means of a cod-line or codend clip reaved through the after or terminal meshes (or rings attached thereto) to retain the catch until released on board the trawler.

   The topside of the codend, in a 2-seam trawl, is that half of the perimeter of the codend which is nearest the sea surface, and the bottomside of the codend is that half of the perimeter which is nearest the sea bed while the trawl is in tow.

9. Chafing gear or chafers are attachments to the trawl net designed to protect the codend: (a) topside chafing gear or topside chafer is an attachment affixed to the topside of the codend in a 2-seam trawl or to the topside and sides of the codend in a 4-seam trawl, and (b) bottom chafing gear or bottom chafer is an attachment to the bottomside only of the codend.

10. Panel, in the case of midwater trawls, refers to the total area of netting, irrespective of mesh size, between each pair of adjacent seams of the trawl forward of the codend (e.g. top panel, bottom panel, side panel). The term panel, as applied to bottom trawls, usually refers to each discrete piece of netting tailored for the trawl, i.e. each section of netting between successive transverse joins and between adjacent longitudinal seams.

(See overleaf for illustration)



Atlantic IIA Standard Groundfish Survey Trawl (4 - seam)

APPENDIX III. REPORT OF STANDING COMMITTEE ON PUBLICATIONS (STACPUB)

Chairman: R. G. Halliday Rapporteur: V. M. Hodder

The Committee met at Dartmouth, Nova Scotia, Canada, in three sessions during 10-18 June 1981, to consider and report on matters referred to it by the Scientific Council (Agenda Item IV). The members in attendance were R. G. Halliday (Chairman), J. Messtorff (EEC), J. P. Minet (EEC), A. T. Pinhorn (Canada), V. A. Rikhter (USSR), and H. Hatanaka (Japan) was appointed to replace A. Paciorkowski (Poland) who was not present. The Chairman of the Scientific Council (R. H. Letaconnoux) also attended the sessions. The Assistant Executive Secretary was appointed rapporteur.

1. Review of Scientific Council Publications, 1980/81

The Committee noted that the Secretariat had issued several scientific publications since the June 1980 Meeting of the Council, as follows:

a) Journal of Northwest Atlantic Fishery Science, Vol. 1

Following the proposal of STACPUB at the September 1980 Meeting, three cover designs were prepared and circulated to STACPUB members, whose various choices, when evaluated, resulted in the selection of the yellow and black design used for Vol. 1. This volume, containing 10 scientific papers (111 pages), was printed in December 1980 and distributed in January 1981.

The Editor reported that six papers had been accepted to date for Vol. 2, the first number of which is planned for printing in July or August 1981 (about 60 pages). The second number of Vol. 2 is planned for December 1981 or January 1982, if sufficient papers are available.

b) NAFO Scientific Council Reports, 1979-80

In accordance with the proposal of STACPUB that the reports of the Scientific Council be published on a calendar year basis, the 1979-80 issue (189 pages) was finalized in December 1980 and distributed in January 1981. This volume contains the reports of Scientific Council meetings held in March, May-June and November 1979, and in February, June, September and November 1980. Also included are the agenda, list of recommendations, list of summary and research documents, and list of participants for the various meetings held during 1979 and 1980.

c) NAFO Scientific Council Studies, No. 1

The first issue of this series, containing 11 edited but non-refereed scientific contributions (101 pages) which initially appeared as research documents, was printed in March and distributed in April 1981.

d) Provisional Index and List of Titles, 1979-80

Continuing the procedure followed during the last few years of the ICNAF regime, the provisional index and list of titles of Scientific Council meeting documents for 1979 and 1980 was prepared and distributed in March 1981. The intent is that a provisional index will be prepared annually and that the information will be compiled and published in a single volume at 5-year intervals.

e) NAFO Statistical Bulletin, Vol. 29 for 1979

Publication of this first NAFO issue is anticipated during July-August 1981. The 8-month delay is due to late reporting and verification of the 1979 fishery statistics. The Committee noted that the final issue of ICNAF Statistical Bulletin (Vol. 28 for 1978) was published in November 1980.

2. Consideration of Need for Special Issues of Studies

It was recognized that the special sessions to be held at the September 1981 Meeting would probably produce a substantial amount of material suitable for publication. It was agreed that STACPUB should meet toward the end of the September 1981 Meeting to recommend on how the material should be handled in the Journal and/or Studies issues.

It was agreed that the NAFO Manual for Groundfish Surveys, approved by the Scientific Council, should be published in a special issue of Studies. The title should appear on both the front cover and the spine.

3. Coordination of Research Information for the NAFO Area

The Committee noted that, on the basis of the research documents available to date in 1981, there is a substantial amount of research information relevant to the NAFO Convention Area being generated which is not directly available to the Scientific Council. Success in attracting general material, particularly through the use of special sessions, should be evaluated by STACPUB at the end of the September 1981 Meeting to determine what steps might be required to encourage such contributions. It was agreed that this agenda item should be addressed each year to continually monitor progress. Meanwhile STACPUB

recommends

that countries producing analyses of general biological, ecological and methodological interest be encouraged to submit these to the Scientific Council.

4. Proposed Ichthyoplankton Identification Manual

This matter was initially considered at the September 1980 Meeting and discussed further at the present meeting. STACPUB

recommends

that the Scientific Council establish a working group of ichthyoplankton systematic experts at the September 1981 Meeting to review the state of knowledge on ichthyoplankton identification and to recommend whether the production of an ichthyoplankton identification manual for the Northwest Atlantic at this time is a practical and worthwhile venture.

If the answer is affirmative, the working group should propose mechanisms for production of such a manual. In preparation for a meeting of the working group, the Secretariat is asked to obtain (a) a Northwest Atlantic species list, b) an index and examples of ICES plankton identification sheets, and (c) copies of manuals available and in use in the laboratories of member countries, and to make these available to participants at the proposed meeting of the working group.

5. Publication and Editorial Policy

a) Editorial board for the Journal

Names submitted to STACPUB as prospective associate editors were reviewed and approved lists were drawn up in each of the four subject areas - biological oceanography, vertebrate fisheries biology, invertebrate fisheries biology and bio-mathematics. The Chairman of STACPUB and the Editor will solicit acceptance from the nominees and report on the results at the September Meeting. A statement on the structure and function of the Editorial Board (Annex 1) was agreed.

The Secretariat is asked to investigate the possibility for, and the implications of, paying miscellaneous costs (postage, telephone, etc.) of editors, not covered by national governments, and to report on this to the September 1981 meeting.

b) Terms of reference for Journal editors

A set of terms of reference for editors were drawn up and approved (Annex 2).

c) Fate of rejected Journal papers

It was noted that papers submitted directly to the Journal have not gone through the STACPUB selection process for Studies. Hence, those papers not suitable for the Journal could not be considered for Studies without substantial delay. It was agreed to give the Editor authority to consider these papers for Studies. All such cases are, however, to be reported to STACPUB annually.

d) Upgrading of Journal reprints

A preliminary report on ways of folding and stitching reprints rather than stapling, as is present practice, and associated costs was received from the Secretariat. However, it was decided to allow more time for investigation of alternatives which may be of lower cost, and decision was deferred to the September 1981 Meeting. The Secretariat was requested to provide a detailed report at that time which documented, to the extent possible, present costs and income from sales associated with the Journal as well as potential incremental costs.

6. Documents for Possible Publication

The members of STACPUB reviewed the research documents presented to the November 1980 and the February and June 1981 Meetings of the Scientific Council and requested the Secretariat to invite the authors of the following documents to submit suitably revised manuscripts for possible publication in one of the Scientific Council series: SCR Doc. 80/IX/158, 160, 166, 168, 170; 81/II/7+8; 81/VI/22, 28, 29, 40, 46, 47, 70+80, 75, 76, 78. The Committee noted that 3 papers selected at the June 1980 Meeting were also expected for the next issue of Studies.

7. Adjournment

The Chairman thanked the Committee members for their interest and cooperation and expressed his appreciation for the support rendered by the Secretariat.

ANNEX 1. STRUCTURE AND FUNCTION OF THE EDITORIAL BOARD

The Editorial Board for the Journal of Northwest Atlantic Fishery Science shall consist of an Editor and Associate Editors, none of whom will be remunerated. The editors are appointed by the Scientific Council on the recommendation of STACPUB. The Editor will be responsible to STACPUB for implementation of Scientific Council publications policy. The Associate Editors are selected from established scientists in the four fields of biological oceanography, vertebrate fisheries biology, invertebrate fisheries biology and bio-mathematics. The editors need not be members of the Scientific Council.

ANNEX 2. TERMS OF REFERENCE FOR JOURNAL EDITORS

Appointments to the Editorial Board will be subject to annual review by STACPUB, but there are no restrictions on term of appointment. Associate Editors are responsible for recommending to the Editor acceptance or rejection of papers based on their scientific quality in relation to Journal standards. Papers recommended for acceptance are to be submitted to the Editor edited with regard to language usage, format and style as set out by the Editor. It is the responsibility of the Associate Editors to select appropriate referees when these are required and to conduct all necessary communication with the referees and with authors regarding revisions to the content or form of manuscripts until such time as the Associate Editor can decide on the suitability of the manuscript for publication. The Editor has over-riding authority on all decisions regarding acceptance of manuscripts and in resolving disagreements between Associate Editors. Associate Editors can propose manuscripts for inclusion in the Journal and are expected to encourage submission of manuscripts suitable for publication in the Journal.

APPENDIX IV - AGENDA

Scientific Council Meeting - June 1981

I. Opening (Chairman: Mr. R. H. Letaconnoux)

1. Appointment of rapporteur
2. Adoption of Agenda
3. Plan of work

II. Fishery Science (STACFIS Chairman: Dr. G. H. Winters)

1. General review of catches and fishing activity in 1980
2. Stock assessments
   a) Stocks lying completely outside the Canadian 200-mile fishery zone in Subarea 3, as required by the Fisheries Commission
      i) Cod (3M)
      ii) Redfish (3M)
      iii) American plaice (3M)
   b) Stocks lying within or partly within the Canadian 200-mile fishery zone in Subareas 2, 3 and 4, for which scientific advice on conservation measures in 1982 was requested by Canada (Annex 1):
      i) Cod (2J+3KL, 3NO)
      ii) Redfish (3LN)
      iii) Silver hake (4VWX)
      iv) American plaice (3LNO)
      v) Witch flounder (2J+3KL, 3NO)
      vi) Yellowtail flounder (3LNO)
      vii) Greenland halibut (2+3KL)
      viii) Roundnose grenadier (2+3)
      ix) Argentine (4VWX)
      x) Capelin (2+3K, 3LNO)
      xi) Squid-*Illex* (3+4)
   c) Stocks within the EEC fishery zone in Subarea 1, for which scientific advice on conservation measures in 1982 was requested by the EEC (Annex 2):
      i) Cod (1)
      ii) Redfish (1)
      iii) Wolffishes (1)
   d) Stocks overlapping the Canadian and EEC fishery zones in Subareas 0 and 1, for which scientific advice on conservation measures in 1982 was requested by Canada and the EEC (Annexes 1 and 2):
      i) Greenland halibut (0+1)
      ii) Roundnose grenadier (0+1)
      iii) Shrimp (*Pandalus*) (0+1)
   e) Shrimp (*Pandalus*) stock at East Greenland (Annex 2)
3. Mesh assessment (maximization of yield per recruit at $F_{0.1}$ for cod and redfish in Div. 3M (FC Doc 80/IX/16, Revised).
4. Review of Working Group reports
   a) Squid biology and distribution (Convener: Mr. T. Rowell)
      i) Preliminary results of 1981 coordinated surveys
      ii) Trends in abundance and fishery characteristics
      iii) Patterns of distribution and migration and environmental influences
      iv) Biological characteristics
      v) Coordination of research
      vi) Future research needs
5. Gear and selectivity studies (*Sci. Coun. Rep.* 1979-80, page 87)
   a) Selection studies on Greenland halibut
   b) Selection studies on Silver hake and Squid
   c) Other studies
6. Ageing techniques and validation studies (*Sci. Coun. Rep.* 1979-80, page 88)
   a) Redfish age determination and validation
   b) Roundnose grenadier age determination and validation
   c) Further progress on ageing squid
   d) Progress report on shrimp ageing workshop (SCS Doc. 81/VI/14)
   e) Other studies

7. Review of relevant fishery science papers not considered under the above items
8. Other matters

III. Research Coordination (STACREC Chairman: Dr. V. A. Rikhter)

1. Statistics and sampling (SCS Doc 81/VI/17)
   a) CWP activities relevant to NAFO (SCS Doc 81/VI/3,11)
   b) Fishery statistics (requirements and adequacy of national reporting)
   c) Sampling program (acquisition and processing of data) (SCS Doc 81/VI/16)
   d) Review of scientific observer program in 1980
   e) List of fishing vessels for 1980-progress report
   f) Other matters
2. Biological surveys
   a) Review of survey activity in 1980 and plans for 1981
   b) Review of draft manual on groundfish surveys (SCS Doc 81/VI/7)
   c) Review of stratification schemes
   d) Other matters
3. Environmental studies
   a) MEDS progress report for 1980 (SCR Doc 81/VI/82)
   b) Review of environmental studies in 1980
   c) Other matters
4. Review of tagging activities reported in 1980 (SCS Doc 81/VI/6)
5. Other Matters
   a) Request by Fisheries Commission for review of gear definitions relevant to NAFO Fishery Regulations

IV. Publications (STACPUB Chairman: Dr. R. G. Halliday)

1. Publications and editorial policy
2. Proposed ichthyoplankton manual
3. Coordination of research information for the NAFO Area
4. Papers nominated for possible publication
5. Possible need for special issues of Studies
6. Other matters

V. Collaboration with Other Organizations

1. Eleventh Session of CWP in July 1982
2. Proposed NAFO/ICES study on redfish at Greenland

VI. Adoption of reports

1. Report of Standing Committee on Fishery Science (STACFIS)
2. Report of Standing Committee on Research Coordination (STACREC)
3. Report of Standing Committee on Publications (STACPUB)
4. Provisional Report of Scientific Council, February 1981 (SCS Doc 81/II/2)

VII. Proposed Amendment to Rules of Procedure (Annex 3)

VIII. Election of Officers

IX. Future Scientific Council Meetings, 1981/82

X. Other Business

XI. Adjournment

NOTE - 1. Consideration of the topic "Evaluation of Scientific Advise Provided for Management of the Northwest Atlantic Fish Stocks, with Particular Reference to Cod", previously scheduled for the June 1981 Meeting, has been deferred to the September 1981 Meeting.

2. The meeting of the *ad hoc* Working Group on the Flemish Cap Project, previously proposed to take place during the June 1981 Meeting, has been deferred to the September 1981 Meeting. In accordance with the request of STACFIS at the February 1981 Meeting (SCS Doc 81/II/2), Canada has appointed Dr. J. T. Anderson, Northwest Atlantic Fisheries Center, St. John's, Newfoundland, as convener of this working group.

ANNEX 1. CANADIAN REQUEST FOR ADVICE ON THE SCIENTIFIC BASIS FOR MANAGEMENT IN 1982 OF CERTAIN STOCKS IN SUBAREAS 0 TO 4

Canada requests that the Scientific Council, at its meeting in advance of the 1981 NAFO Annual Meeting, provide advice on the scientific basis for management of the following stocks in 1982:

Cod (Div. 2J and 3KL; Div. 3N and 3O)
Redfish (Div. 3L and 3N)
American plaice (Div. 3L, 3N and 3O)
Witch flounder (Div. 3N and 3O)
Yellowtail flounder (Div. 3L, 3N and 3O)
Greenland halibut (Subarea 2 and Div. 3KL)
Roundnose grenadier (Subareas 2 and 3)
Silver hake (Div. 4V, 4W and 4X)
Capelin (Subarea 2 and Div. 3K; Div. 3LNO)
Squid (Subareas 3 and 4)

It is further suggested that, subject to the concurrence of the other coastal state concerned, the Scientific Council, prior to the 1981 Annual Meeting of NAFO, provide advice on the scientific basis for management in 1982 of the following stocks:

Shrimp (Subareas 0 and 1)
Greenland halibut (Subareas 0 and 1)
Roundnose grenadier (Subareas 0 and 1)

Although capelin (Subarea 2 and Div. 3K; Div. 3LNO) stocks were considered at the February 1981 Meeting of the Scientific Council, it is requested that the Standing Committee on Fisheries Science, at its June 1981 Meeting, consider whether the analyses conducted in February are sufficient to provide the basis for advice on management in 1982 and whether reconsideration of the status of these stocks after completion of the 1981 fishery, but in advance of the 1982 fishery, would provide significant improvements in the basis for advice on management.

Canada requests the Scientific Council to consider the following options in assessing and projecting future stock levels for those stocks listed above and for the Flemish Cap (Div. 3M) stocks:

a) For those stocks subject to analytical dynamic-pool type assessments, the status of the stock should be reviewed and management options evaluated in terms of their implications of fishable stock size in both the short and long term. In those cases where present spawning stock size is a matter of scientific concern in relation to the continuing productive potential of the stock, management options should be evaluated in relation to spawning stock size. As a general reference point, the implications of continuing to fish at $F_{0.1}$ in 1982 and subsequent years should be evaluated. The present stock size should be described in relation to those observed historically and to those expected at the $F_{0.1}$ level. Management options for arriving at the latter stock size on a shorter time scale should be developed. Opinions of the Scientific Council should be expressed in regard to stock sizes, catch rates, and TACs implied by these management strategies for 1982 and the long term.

b) For those stocks subject to general production-type assessments, the status of the stock should be reviewed and management options evaluated in the way described above to the extent possible. In this case, the general reference point should be the level of fishing effort ($\equiv F$) which is two-thirds that calculated to be required to take the MSY catch in the long term.

c) For those resources on which only general biological and/or catch data are available, no standard criteria on which to base advice can be established. The evidence on stock status should, however, be weighed against a strategy of optimum yield management and maintenance of stock biomass at levels of about two-thirds that of the virgin stock.

Dr A. W. May
Assistant Deputy-Minister for Atlantic Fisheries
Department of Fisheries and Oceans
Ottawa, Canada

ANNEX 2. EEC REQUEST FOR ADVICE ON THE SCIENTIFIC BASIS FOR MANAGEMENT IN 1982 OF CERTAIN STOCKS IN SUBAREAS 0 AND 1

The EEC requests the Scientific Council to provide advice for the following stocks, subject to the agreement of the other coastal state concerned in the case of joint stocks:

a) Stocks occurring both in the EEC and Canadian fihsery zones: Greenland halibut, Roundnose grenadier, and shrimp in Subareas 0 and 1.

b) Stocks occurring in the EEC fishery zone: cod, redfish and catfish (wolffish) in Subarea 1.

For the above-mentioned stocks, the present state of exploitation should be reviewed and options for management in 1982 given. Where possible, these should be expressed graphically in terms of catch in 1982 and the size of the spawning stock biomass on 1 January 1983, for a range of values of F which covers at least -50% to +25% of F in 1980.

For cod in Subarea 1, it is requested that catches for each year up to and including 1984 and spawning stock biomasses for each year up to and including 1985 are calculated for maintaining F at the following levels from 1982 onwards: $F = 0.1$, $F = 0.2$, $F = F_{0.1}$, $F = F_{Max}$ and $F = 0.6$. For 1981, F will be that value needed to take the TAC of 50,000 tons. All values of F refer to that on the most heavily exploited age-groups. What will be the effects on the stock of maintaining a TAC of 50,000 tons for the period 1981-1985? Up-to-date mesh assessments should be made for an increase from the present minimum 120 mm alternatively to 130 mm, 140 mm and 160 mm mesh sizes.

Regarding the shrimp (*Pandalus*) stock at West Greenland, the consequences of a TAC of 30,000 tons for the EEC zone and 5,000 tons for the Canadian zone for the year 1982 should be assessed, together with other alternatives, such as 25,000 plus 5,000 tons and 35,000 plus 5,000 tons.

The shrimp stock at East Greenland should be assessed by the same NAFO assessment working group, in agreement with ICES Resolution 1980/2:6-19. The consequences of a TAC of 6,000, 8,000 and 10,000 tons in 1982 on the state of this stock for 1983 should be tentatively explored.

Mr M. Marcussen, Head of Division
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ANNEX 3. PROPOSED AMENDMENT TO RULES OF PROCEDURE FOR THE SCIENTIFIC COUNCIL

Rule 3.1, as adopted on 13 June 1980, is as follows: "The Chairman and Vice-Chairman shall take office at the conclusion of the annual meeting at which they are elected" (*Scientific Council Reports*, 1979-1980, page 109).

Canada proposes that Rule 3.1 should be replaced by the following: "The Chairman and Vice-Chairman shall take office at the conclusion of an annual meeting. Election of these officers shall take place either at such annual meeting or at a special meeting held previous to such annual meeting".

APPENDIX V. LIST OF PARTICIPANTS

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APPENDIX VI. LIST OF DOCUMENTS PRESENTED TO THE FEBRUARY AND JUNE 1980 MEETINGS OF THE SCIENTIFIC COUNCIL

A. RESEARCH DOCUMENTS

SCR Doc. No.	Serial No.	
81/II/1	N264	S. A. AKENHEAD, J. CARSCADDEN, H. LEAR, G. R. LILLY, and R. WELLS. On the cod-capelin interaction of northeast Newfoundland and Labrador
81/II/2	N265	R. WELLS. Effects of changes in mesh size upon yield per recruit of cod in Division 3M
81/II/3	N267	J. CARSCADDEN , G. H. WINTERS, and D. S. MILLER. Assessment of the Division 3L capelin stock, 1967-1980, using SCAM
81/II/4	N268	J. CARSCADDEN, and D. S. MILLER. Analytical assessment of the capelin stock in Subarea 2 + Division 3K using SCAM
81/II/5	N269	D. S. MILLER, and J. E. CARSCADDEN. Acoustic survey results for capelin (*Mallotus villosus*) in Divisions 2J+3K and 3LNO, 1980
81/II/6	N270	M. LARRANETA. Ecology and fishing of cod stocks in Divisions 3M and 3NO
81/II/7	N271	G. R. LILLY. Influence of the Labrador Current on predation by cod on capelin and sand lance off eastern Newfoundland
81/II/8	N272	G. R. LILLY, R. WELLS, and J. CARSCADDEN. Estimates of the possible consumption of capelin by the cod stocks in Divisions 2J+3KL and 3NO
81/II/9	N273	V. A. CHEKHOVA, and A. I. POSTOLAKY. Abundance and biomass of cod on the Grand Bank (Divisions 3NO) and Flemish Cap (Division 3M)
81/II/10	N274	V. S. BAKANEV. Results of Soviet investigations on capelin in the Northwest Atlantic in 1980
81/II/11	N275	C. A. BISHOP, and S. GAVARIS. Stock assessment of cod in Divisions 3NO (+Addendum)
81/II/12	N276	S. GAVARIS. Assessment of the cod stock in Division 3M (+Addendum)
81/II/13	N277	R. WELLS. Distribution and abundance of cod on the Flemish Cap in January 1981 and mortality in 1980
81/II/14	N278	B. S. NAKASHIMA. Sampling variation and survey design for capelin (*Mallotus villosus*) densities from an acoustic survey in Divisions 3LNO
81/II/15	N279	R. WELLS. The number of research vessel tows on the Flemish Cap is never enough
81/VI/16	N292	D. W. KULKA. Observed by-catch in the Flemish Cap cod and redfish fisheries in 1979 and 1980 by Canadian observers
81/VI/17 + Add.	N293	V. A. RIKHTER. Dynamics of optimum fishing intensity on fish with strong fluctuations in abundance
81/VI/18	N294	A. Yu. BULATOVA, V. M. KISELEVA, K. G. KONSTANTINOV, A. I. POSTOLAKY, and V. A. CHEKHOVA. Preliminary assessment of some demersal fish stocks in the Newfoundland and Labrador areas
81/VI/19	N295	V. V. BURMAKIN. Water temperature in the Labrador and Newfoundland areas in 1980
81/VI/20	N296	P. I. SAVVATIMSKY. On length measurements of roundnose grenadier (*Coryphaenoides rupestris*) in the Northwest Atlantic
81/VI/21	N288	P. A. KOELLER. Vertical distribution and optimum sampling strategy for 0-group silver hake (*Merluccius bilinearis*) surveys on the Scotian Shelf
81/VI/22	N290	D. B. ATKINSON, W. R. BOWERING, Sv. Aa. HORSTED, J. P. MINET, and D. G. PARSONS. A review of the biology and fisheries of roundnose grenadier (*Macrourus rupestris*), Greenland halibut (*Reinhardtius hippoglossoides*) and shrimp (*Pandalus borealis*) in Davis Strait (NAFO Subareas 0 and 1)

SCR Doc. No.	Serial No.	
81/VI/23	N302	E. G. DAWE, P. C. BECK, and H. J. DREW. Distribution and biological characteristics of young short-finned squid (Illex illecebrosus) in the Northwest Atlantic, February 20-March 11, 1981
81/VI/24	N303	E. G. DAWE, P. C. BECK, H. J. DREW, and G. H. WINTERS. Long-distance migration of a short-finned squid (Illex illecebrosus)
81/VI/25	N304	E. G. DAWE, G. R. LILLY, and J. A. MOORES. An examination of the influence of squid (Illex illecebrosus) on recruitment in several finfish stocks off eastern Newfoundland and Labrador
81/VI/26	N305	E. G. DAWE, and H. J. DREW. Historical records of mature female short-finned squid (Illex illecebrosus) from the Northwest Atlantic and the first record of a mature female captured inshore at Newfoundland
81/VI/27	N306	P. C. BECK, E. G. DAWE, and J. DREW. Breakdown of squid (Illex illecebrosus) catches in NAFO Subarea 3 and Division 4R 1980, with length and sex composition from Newfoundland inshore commercial samples and early season offshore areas
81/VI/28	N307	E. G. DAWE, and G. V. HURLEY. Forecasting inshore abundance of short-finned squid (Illex illecebrosus) at Newfoundland
81/VI/29	N308	R. K. O'DOR, N. BALCH, and T. AMARATUNGA. The embryonic development of the squid, Illex illecebrosus, in the laboratory
81/VI/30	N309	H. HATANAKA. Outline of Japanese squid fishery in NAFO Subareas 3 and 4 in 1980
81/VI/31	N310	H. HATANAKA. Estimation of abundance index of Illex squid on the southern edge of the Scotian Shelf in September 1980
81/VI/32	N311	P. P. FEDULOV, and T. AMARATUNGA. On dates of short-finned squid, Illex illecebrosus, immigration onto the Scotian Shelf
81/VI/33	N315	A. M. T. LANGE. Evidence of summer spawning of Illex illecebrosus (LeSueur), off the northeastern USA
81/VI/34	N316	R. K. MOHN. Abiotic factors relating to squid abundance as determined from groundfish curises, 1970-1980
81/VI/35	N317	T. AMARATUNGA, and M. ROBERGE. Summary of Illex illecebrosus fishery in Subarea 4 during 1980 in relation to 1977-79 data
81/VI/36	N318	T. AMARATUNGA. Biology and inshore distribution patterns for squid Illex illecebrosus
81/VI/37	N319	H. DUPOUY, and P. DERIBLE. Catch, effort and biological characteristics of squid (Illex illecebrosus) in the French fishery in Subareas 3 and 4, 1980
81/VI/38	N320	H. DUPOUY. Biological characteristics and biomass estimate of the squid, Illex illecebrosus, on Scotian Shelf (Div. 4VWX) in late summer of 1980
81/VI/39	N321	T. AMARATUNGA. Summary of larval juvenile surveys in November 1980 and January 1981 in Subarea 4
81/VI/40	N322	R. K. MOHN. Yield per recruit analysis of Div. 4VWX squid by simulation
81/VI/41	N323	Yu. M. FROERMAN, M. FEDULOV, V. V. KHALIUKOV, E. N. SHEVCHENKO, and T. AMARATUNGA. Preliminary results of the RV Atlant survey for short-finned squid, Illex illecebrosus, in Subarea 4, 3 March-4 May 1981
81/VI/42	N324	V. I. SAUSKAN, and P. P. FEDULOV. Some features of water masses and spatial distribution of nektonic species by group in the area between the Scotian Shelf and the Gulf Stream
81/VI/43	N325	Yu. M. FROERMAN, and E. M. SHEVCHENKO. Preliminary estimate of short-finned squid biomass in July-September 1981 in NAFO Subarea 4, calculated by data from the young short-finned squid counting survey

SCR Doc. No.	Serial No.	
81/VI/44	N326	E. VALDES, and E. I. FRAXEDAS. Redfish selectivity study on Flemish Cap, May 1981
81/VI/45	N327	A. FOREST, and J. C. POULARD. Water temperature distributions in NAFO Subdivision 3Ps in autumn 1980 and late winter 1981
81/VI/46	N328	A. V. ZUBCHENKO. Ecological-faunistic review of parasitic fauna of some Macrouridae in the Northwest Atlantic
81/VI/47	N329	L. K. ALBIKOVSKAYA. On distribution and biomass of wolffish of three species: Atlantic wolffish (Anarhichas lupus Linne), spotted wolffish (A. Minor Olafsen) northern wolffish (A. latifrons Steenstrup et Hallgrimsson) in the Newfoundland area
81/VI/48	N330	Sv. Aa. HORSTED. Subarea 1 cod: data for 1980 and estimate of stock and yield for 1980-84
81/VI/49	N331	V. A. RIKHTER, V. F. TUROK, and Yu. S. GRINKOV. The distribution of some groundfish species and short-finned squid on the Scotian Shelf during the 1980 fishing season from the data of the Soviet observers
81/VI/50	N332	M. STEIN. Transports of heat and volume in the West Greenland current during autumn 1979
81/VI/51	N333	M. STEIN. Temperature anomalies along the Seal Island section (Div. 2J) between 1969 and 1980
81/VI/52	N336	W. D. McKONE. Effects of changes in codend mesh size upon yield per recruit of redfish in Division 3M
81/VI/53	N337	C. A. GAVARIS. An assessment of redfish on the Flemish Cap
81/VI/54	N338	W. B. BRODIE, and T. K. PITT. An assessment of the yellowtail stock in Div. 3LNO
81/VI/55	N339	S. C. STEVENSON. Summary of discarding and estimates of total removals by Canadian trawlers during the 1980 Divisions 3LNO American Plaice fishery
81/VI/56	N340	M. E. GRUDTSEV, A. A. NESTEROV, and A. B. BENDIK. The studies of Scotian saury, Scomberesox saurus (Walbaum), in October-November 1980
81/VI/57	N341	T. L. NIKOLSKAYA. Isolation of deepwater redfish (Sebastes mentella) stocks on the Grand Newfoundland Bank
81/VI/58	N342	V. V. BLINOV. Method of estimating the effect on trawl catches of changes in trawl selectivity
81/VI/59	N343	D. B. ATKINSON, and C. A. GAVARIS. Divisions 3LN redfish stock assessment
81/VI/60	N344	D. B. ATKINSON. Assessment of roundnose grenadier in NAFO Subareas 2+3
81/VI/61	N345	T. K. PITT, and W. B. BRODIE. A stock assessment update of American plaice in NAFO Divisions 3L, 3N and 3O
81/VI/62	N346	G. E. BIDENKO, V. A. RIKHTER, and V. F. TUROK. Results of experimental fishing for silver hake on Scotian Shelf in July 1980
81/VI/63	N347	Yu. A. GRINKOV, and V. A. RIKHTER. Some data on distribution of groundfish and short-finned squid along the oceanic slopes of the Scotian Shelf (Div. 4WX) in spring 1979
81/VI/64	N348	W. R. BOWERING, and W. B. BRODIE. Stock assessment of Greenland halibut in NAFO Subarea 2 and Divisions 3KL with projected catches for 1982
81/VI/65	N349	S. GAVARIS. Surplus production analysis for the cod stock in NAFO Divisions 2J+3KL
81/VI/66	N350	R. WELLS. Status in 1980 of the cod stock in Divisions 2J+3KL
81/VI/67	N351	A. VAZQUEZ. On cod stocks in NAFO waters

SCR Doc. No.	Serial No.	
81/VI/68	N352	A. F. SINCLAIR. Juvenile Argentine (Argentina silus) on the Scotian Shelf
81/VI/69	N353	I-HSUN NI, and W. D. McKONE. The distribution and concentration of redfish species in Newfoundland and Labrador waters
81/VI/70	N354	I-H. NI. The use of vertebrae frequencies to indicate the distribution of sharp-beaked redfish, S. mentella and S. fasciatus
81/VI/71	N356	A. F. SINCLAIR. Recent trends in Argentine abundance on the Scotian Shelf
81/VI/72	N357	K. G. KONSTANTINOV. On some problems of selectivity of a commercial trawl
81/VI/73	N358	K. G. KONSTANTINOV. Methods and results of the total trawl survey of bottom fish in Subarea 3 in 1971-1980
81/VI/74	N359	D. E. WALDRON. An assessment of the Scotian Shelf silver hake (Merluccius bilinearis) population for 1980
81/VI/75	N360	G. V. GRIGOREV, and V. P. SEREBRYAKOV. Eggs of the rock grenadier, Coryphaenoides rupestris Gunnerus 1765
81/VI/76	N361	T. N. TURUK. Year-to-year and seasonal fluctuations in feeding and biological indices of the Flemish Cap Bank cod
81/VI/77	N362	K. G. KONSTANTINOV. Influence of water temperature on cod year classes strength on the Flemish Cap Bank
81/VI/78	N363	V. A. BOROVKOV. Variability of oceanographic conditions in the Hamilton Bank area in the autumn period
81/VI/79	N364	V. A. BOROVKOV, and B. P. KUDLO. Water circulation in the Baffin Land, Labrador, Newfoundland and Flemish Cap areas in 1980
81/VI/80	N365	I-HSUN NI. The use of anal fin ray frequencies to indicate the stock units of deepwater redfish, Sebastes mentella and rosefish, S. fasciatus
81/VI/81	N367	A. SINCLAIR, D. WALDRON, and B. WOOD. Comparative fishing for silver hake on the Scotian Shelf using 90 mm and 60 mm codends
81/VI/82	N370	J. R. KEELEY. Marine Environmental Data Service report for 1980-1981
81/VI/83	N273	J. R. KEELEY. Oceanographic data transmitted from the Flemish Cap area, September 1979 to December 1980: Data record No. 2

B. SUMMARY DOCUMENTS

SCS Doc. No.	Serial No.	
81/II/1	N266	NAFO Secretariat. Report to Scientific Council on inadequate response to specified data requirements for stock assessments
81/II/2	N280	NAFO. Provisional report of Scientific Council, Dartmouth, Canada, 17-20 February 1981
81/VI/3	N281	CWP Secretary. Report of the Tenth Session of the Coordinating Working Party on Atlantic Fishery Statistics (CWP), July 1980
81/VI/4	N291	MAXIM, C., and C. MAXIM. Romanian research report for 1980
81/VI/5	N287	NAFO Secretariat. Extracts from resolutions passed at the 68th Statutory Meeting of ICES, October 1980
81/VI/6	N289	NAFO Secretariat. Tagging activities reported for the Northwest Atlantic in 1980
81/VI/7	N297	DOUBLEDAY, W. G. (Editor). Manual on groundfish surveys in the NAFO Area (Revised)
81/VI/8	N298	NAFO Secretariat. National reports on collecting and processing fisheries statistics
81/VI/9	N299	H. HATANAKA. Japanese research report for 1980
81/VI/10	N300	NAFO. Historical catches of selected species by stock area and country for the period 1970-79
81/VI/11	N301	NAFO. CWP recommendations and proposals relevant to the work of the Scientific Council
81/VI/12	N334	E. SMIDT. Denmark (Greenland) research report for 1980
81/VI/13	N335	K. G. KONSTANTINOV. Report of USSR investigations in Subareas off Newfoundland, Labrador and Baffin Land in 1980
81/VI/14	N355	J. FRECHETTE. Summary report of shrimp (Pandalus borealis) ageing workshop, Quebec City, Quebec, Canada, 11-14 May 1981
81/VI/15	N366	NAFO Secretariat. Provisional nominal catches in the Northwest Atlantic, 1980
81/VI/16	N368	NAFO Secretariat. Provisional lists of samplind data for 1979
81/VI/17	N369	NAFO Secretariat. Notes on statistical activities and publications, 1980/81
81/VI/18	N371	J. P. MINET. France research report for 1980.
81/VI/19		Document not issued.
81/VI/20	N375	NAFO. Provisional report of Scientific Council, Dartmouth, Canada, 3-19 June 1981