Northwest Atlantic Fisheries Organization

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SCIENTIFIC COUNCIL MEETING - SEPTEMBER 1991

# REPORT OF SCIENTIFIC COUNCIL

Annual Meeting, September 1991

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# REPORT OF SCIENTIFIC COUNCIL

Annual Meeting, September 1991

## I. PLENARY SESSIONS

Chairman: B. W. Jones Rapporteur: T. Amaratunga

The Scientific Council met at the Holiday Inn, Dartmouth, Nova Scotia, Canada, during 9-13 September 1991. Representatives attended from Canada, Denmark (Greenland), European Economic Community (EEC), Japan and the Union of Soviet Socialist Republics (USSR). The Assistant Executive Secretary was in attendance.

The meeting was preceded by the Symposium on "Changes in Abundance and Biology of Cod Stocks and Their Possible Causes", which was held at NAFO Headquarters, Dartmouth, Nova Scotia, Canada, during 4-6 September 1991 with H. Hovgård (Denmark/Greenland) as Convener and participation by scientists from Canada, Denmark (Greenland), EEC, Japan, Norway, USA and USSR.

The opening meeting was called to order on 9 September 1991 at 1020 hr.

The Chairman welcomed representatives to the 13th Annual Meeting. The Assistant Executive Secretary was appointed rapporteur. The Council adopted the agenda (Appendix IV) recognizing that the General Council or the Fisheries Commission might have specific requests that the Council would have to address.

Although the Report of the June 1991 Scientific Council Meeting had been adopted at the June meeting, the Chairman requested that he be notified of any errors.

The Chairman noted that an *Executive Summary* of the June 1991 Meeting Report had been prepared by the Secretariat. Since this was the first time an *Executive Summary* had been prepared, the Chairman informed the Council that any comments on the document would be welcomed.

The session was adjourned at 1035 hr.

The Council reconvened at 1220 hr on 11 September 1991 to briefly discuss some questions posed to the Chairman during the Fisheries Commission Meeting of that morning. It was noted that the responses from the Council which would be verbally presented by the Chairman to the Fisheries Commission would be reflected in the minutes of the Fisheries Commission Meeting.

The session was adjourned at 1245 hr.

The concluding session was called to order at 0945 hr on 12 September 1991 and the Council adopted the reports of the Standing Committee on Fishery Science (STACFIS), Standing Committee on Research Coordination (STACREC), and the Standing Committee on Publications (STACPUB). The meeting was adjourned at 1200 hr, however, the Council briefly met again on 13 September 1991 at 1030 hr to address further questions posed by the Fisheries Commission. It was noted again that the verbal responses conveyed by the Chairman would be reflected in the minutes of the Fisheries Commission.

Brief summaries of the Standing Committee Reports and other matters considered by the Scientific Council are given below in Sections II-VI.

## II. FISHERY SCIENCE (see STACFIS Report, App. I)

1. Stock Assessments

The Council at the June 1991 Meeting had postponed the assessment of Div. 3L capelin because ice conditions in the area had affected the acoustic surveys. STACFIS at this meeting had received the results of subsequent surveys and the Council endorsed the assessments conducted at this meeting. Details of the assessments are given in the Report of STACFIS in Appendix I while the Summary Sheet is given below.

In view of the uncertainty about the status of the capelin stock in Div. 3L, and noting that both Canada and USSR will be conducting surveys in Div. 2J and 3KL in late 1991, the Council endorsed the recommendation that *a Scientific Council Meeting be held to examine additional data in late February or early March 1992.*

# SUMMARY SHEET - Capelin in Division 3L

Source of Information:

| Year | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|---|---|---|
| Recommended TAC | 38 | 60 | 130 | 283 | 90 | 335 | 350 | -[1] |
| Agreed TAC | 26 | 26 | 55 | 25 | 45 | 46 | 56 | 56 |
| Reported landings | 33 | 25 | 48 | 19 | 53 | 52[2] | 47[2] | |
| Non-reported catches | | | | | | | | |
| Actual landings | 33 | 25 | 48 | 19 | 53 | 52[2] | 47[2] | |
| Sp. stock biomass | 382 | 596 | 1300 | 2830 | 900 | 3345 | 3500 | - |
| Recruitment[3] (age 2) | 73.2 | 73.2 | 63.7 | 87.8 | 380.4 | 314.8 | 353.2 | |
| Mean F | | | Not available | | | | | |

Weights in '000 tons

[1] STACFIS concluded that a catch of 50,000 tons as in recent years would be well below a 10% exploitation rate.
[2] Provisional.
[3] Recruitment at age 2 in the year shown. Recruitment 1982-85 were projections from acoustic surveys. From 1986 to present, measured directly from acoustic surveys.

**Catches:** All catches are inshore and determined by market. The dominant market is Japanese roe market.

**Stock size indicators :** Acoustic surveys on recruiting year-classes and 0-group surveys. Indices of mature biomass inshore from catch rates and aerial survey.

**Data and Assessment:** Projections from acoustic survey estimates of recruiting year-classes.

**Fishing Mortality:** Not estimated but very low. Recommended TACs based on exploitation rate of 10%. Catches were much lower than recommended TAC in recent years.

**Recruitment:** Estimated from acoustic surveys. 0-group surveys indicated good recruitment for 1988 and 1989 year-classes. Most recent acoustic estimates indicate low abundance of these year-classes.

**State of Stock:** Uncertain. Decline in 1991 acoustic estimates was unexpected given previous indicators of year-class strength.

**Forecast for 1992:** Preliminary projections indicate a severe decline but STACFIS unable to identify whether decline is indicative of stock status.

| Option Basis | Predicted catch (1992) | Predicted SSB (1.1.1993) |
|---|---|---|
| $F_{0.1}$ = | | |
| $F_{90}$ = | | |
| $F_{max}$ = | | |

**Recommendation:** Special meeting late-February or early-March 1992 to re-assess the stock.

**Special Comments:** The low 1991 acoustic estimates were unexpected based on previous indications of the strength of the relevant year-classes (1988 and 1989). STACFIS could not evaluate whether these low estimates were indicative of stock status and recommended a special meeting in late-February or early March 1992 to re-assess the stock.

The Council agreed that the meeting would be held at the Northwest Atlantic Fisheries Centre, St. John's, Newfoundland. Further details will be announced by circular letter from the Secretariat.

2. Symposium on Changes in Abundance and Biology of Cod

The Council endorsed the general discussions and conclusions on the Symposium on "Changes in Abundance and Biology of Cod Stocks and Their Possible Causes" presented to STACFIS by the convener, H. Hovgård (Denmark-Greenland). The Council agreed with STACFIS that the papers be considered by STACPUB for publication in a special issue of *NAFO Scientific Council Studies*.

3. Review of Current Arrangements for Conducting Stock Assessments

a) Updating list of Designated Experts

The Council noted that STACFIS had agreed on the list of assigned laboratories responsible for providing Designated Experts, and that the Assistant Executive Secretary would communicate with the respective laboratories to confirm the nominations of individual scientists.

b) Documentation of Assessments

The Council noted that assessment documentation in SCR Document series appear to have proceeded well after the June 1991 Meeting.

c) Format of Scientific Council Reports

The Council was pleased that the *Executive Summary* was well received by the Fisheries Commission. The Council took note of the request by the Fisheries Commission to include a summary table of estimated catches, and an attempt would be made to standardize the catch tables in the Summary Sheets.

The Council also took note that the use of a wider range of assessment methods and models would be explored by STACFIS.

4. Future Special Sessions

a) Special Session in September 1992

The Council noted the STACFIS discussion on the Special Session on "State-of-the-Art in Fish Stock Assessments: a Tutorial/Workshop on Calibration Methods and Their Practical Use". Council agreed it would be desirable that participants be instructed on how to use available assessment tools at a fundamental level, with hands-on experience.

The Council agreed that the Tutorial/Workshop would be held at NAFO Headquarters, Dartmouth, Nova Scotia, beginning on 8 September 1992, but the duration of 3-5 days was subject to the conveners' decisions.

b) Proposed Theme for Special Session in September 1993

The Council noted that three topic proposals were discussed, and agreed that 1993 may be too early to hold any of those symposia.

5. Other Matters

a) Review of Scientific Papers

The Council noted that 3 papers submitted during the meeting were deferred for consideration at the June 1992 Meeting.

b) Ageing Workshop

The Council noted that the Age Determination Workshop on Greenland halibut and American plaice was scheduled to be held in St. John's, Newfoundland during 3-12 December 1991, and an announcement will be made by letter from the Secretariat.

## III. RESEARCH COORDINATION (see STACREC Report, App. II)

1. Fisheries Statistics

The Council noted with concern that the situation with STATLANT 21A and 21B report submissions had not changed since the June 1991 Meeting, with several 21B reports for 1989 and 1990 outstanding and also the 21A reports for EEC-France and France-SP for 1990 still outstanding.

2. Review of Sampling Information

The Council agreed with the decision by STACREC that in view of the relatively few requests for these data from the Secretariat, it would be adequate for the Secretariat to receive and compile lists of sampling data, and that the publication of the *List of Sampling Data* by the Secretariat was important.

## IV. PUBLICATIONS (see STACPUB Report, App. III)

1. Review of Editorial Board

The Council concurred with the decision by STACPUB to invite R. K. Misra to replace R. K. Mohn, Associate Editor for Biomathematics, and invite Sv. Aa. Horsted to serve as Associate Editor for Vertebrate Fishery Biology in the Editorial Board.

2. Invitational Papers

The Council was pleased with the progress being made to attract more invitational papers.

3. Review of Papers

The Council concurred with the view of STACPUB that papers presented at the Symposium, which was held prior to this meeting of the Council, highlighted very important observations regarding cod biology and abundance, and endorsed the recommendation that the papers be published in a single issue of *NAFO Scientific Council Studies*.

## V. FUTURE MEETING ARRANGEMENTS

1. Early-1992 Meeting of Scientific Council on Capelin

The Council confirmed that the Scientific Council would meet in February or early-March 1992 at the Northwest Atlantic Fisheries Centre, St. John's, Newfoundland, Canada, to examine new data on capelin.

A Circular Letter from the Secretariat will announce further details when available.

2. June 1992 Meeting of Scientific Council

The Council confirmed that the Scientific Council together with its Standing Committees and Subcommittee would meet during 3-17 June 1992 at NAFO Headquarters in Dartmouth, Nova Scotia, Canada.

3. Special Session and Annual Meeting, September 1992

The Council confirmed that the Annual Meeting of the Scientific Council would be held during 14-18 September 1992. The meeting would be preceded by the Special Tutorial/Workshop at NAFO Headquarters in Dartmouth, Nova Scotia, Canada, beginning on 8 September 1992. The duration of the Tutorial/Workshop would be between 3-5 days, as determined by the conveners.

## VI. OTHER BUSINESS

1. Collaboration with Other Organizations

The Council noted that on the subject of Joint ICES/NAFO Working Group on Harp and Hooded Seals, the Report of the June 1991 Meeting of the Scientific Council stated that there were no requests for a meeting to date. However, ICES had scheduled a meeting of the Working Group during its last Statutory Meeting in 1990. The NAFO Secretariat had recently received the agenda for the meeting which had been scheduled for October 1991.

2. Research Surveys

The Council was informed that the USSR research survey program may be reduced in 1992 because of budgetary restraints in the USSR. It was noted, however, that the USSR vessels may be available if other Contracting Parties were able to fund some surveys. The Council noted that it depended very heavily on research vessel survey data and any reductions in the survey programs will be regrettable. The Council hoped that every effort be made to maintain, and if possible extend, the current survey coverage. Particular reference was made regarding the proposed joint EEC work with USSR on Greenland halibut for which USSR provides a vessel, and it was hoped this program will not be jeopardized.

3. Adoption of Council Report

There being no further business, the Chairman proposed that the Council's report be adopted as presented. Recognizing that minor modifications would be made by the Chairman and the Assistant Executive Secretary, the Council adopted the report of this meeting.

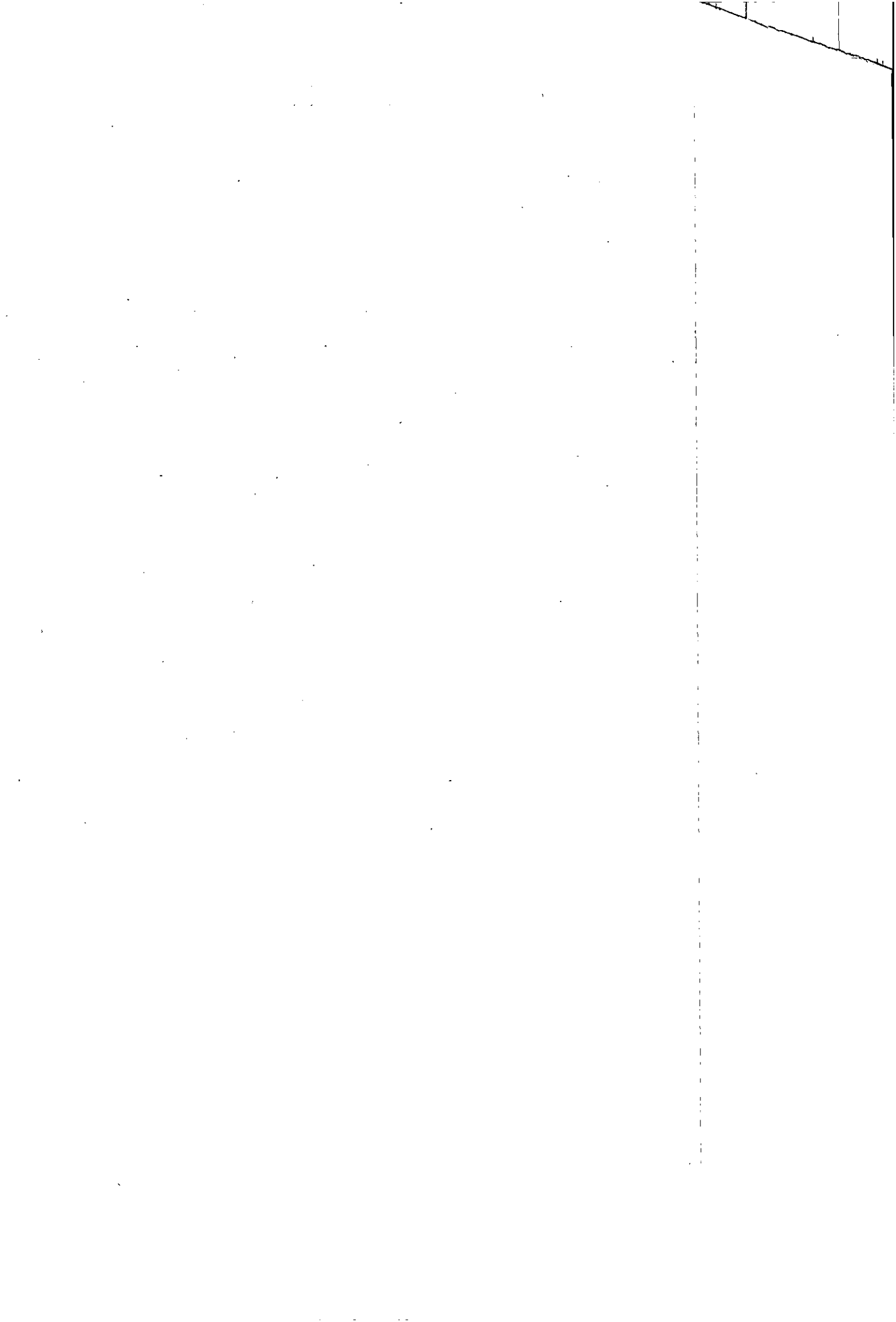
## VII. ADJOURNMENT

The Chairman thanked everybody for the very enjoyable meeting.

On behalf of the Council, he extended special thanks to H. Hovgård for the successful Symposium he convened. For the good organization by the Secretariat, he extended thanks to the Assistant Executive Secretary and also requested him to convey it to the Secretariat Staff.

Noting that the Chairman of STACREC and STACPUB were retiring at the end of this meeting, he thanked W. B. Brodie and V. P. Serebryakov for their contributions and very good work, and also thanks were due to the Chairman of STACFIS, D. B. Atkinson, for conducting this meeting efficiently.

The Chairman welcomed V. P. Serebryakov who takes over the Chairmanship after this meeting. He then expressed his appreciation to all for the cooperation, support and friendliness extended to him during his 2 years in office. V. P. Serebryakov in return expressed mutual feelings of gratitude and extended thanks from all for the good work done as Chairman.



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

Chairman: D. B. Atkinson Rapporteur: Various

The Committee met at the Holiday Inn, Dartmouth, Nova Scotia, Canada, during 9-12 September 1991 to consider and report on various matters referred to it by the Scientific Council. Representatives from Canada, Denmark (Greenland), EEC, Japan and USSR were present.

The meeting was preceded by the Symposium on "Changes in Abundance and Biology of Cod Stocks and Their Possible Causes" which was held 4-6 September, and STACFIS received the report of the Symposium from the convener H. Hovgård (Denmark-Greenland) (Annex 1 of this report).

Matters considered at both meetings are outlined below.

## I. STOCK ASSESSMENTS

### 1. Capelin in Division 3L (SCR Doc. 91/9, 10, 37, 43, 122, 123)

#### a) Introduction

Nominal catches of capelin in this Division were less than 4,000 tons between 1970 and 1973, then increased to 58,000 tons in 1974 and declined to 12,000 tons in 1979. No offshore fishing has occurred since 1978. Provisional statistics for 1990 indicated a total catch of 47,000 tons in the inshore fishery by purse seines, traps and beach seines during June and July. In recent years, the final TAC has been based on the market forecast for roe capelin.

Recent TAC's and catches ('000 tons) are as follows:

| | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Advised TAC | 30 | -[1] | 60 | 38 | 60 | 130 | 283 | 90 | 335 | 350 | -[2] |
| TAC | 30 | 30 | 30 | 26 | 26 | 55 | 25 | 45 | 46 | 56 | 56 |
| Nominal landings | 24 | 27 | 25 | 33 | 25 | 48 | 19 | 53 | 52[3] | 47[3] | |

[1] No STACFIS advice.
[2] STACFIS concluded that a catch of 50,000 tons as in recent years would be well below a 10% exploitation rate.
[3] Provisional data.

#### b) Input Data

##### i) Commercial fishery

A logbook survey of the inshore capelin fishery in Div. 3L, designed to provide estimates of catch-per-unit-effort, was initiated in 1981. Trapnets and purse seines (where catches were derived from the addition of the quantities actually landed and the quantities of discards recorded from logbooks) show relatively high catch rates in recent years. Both 1990 indices were the second-highest in the series with the trap-rate index increasing and the purse seine catch rate declining between 1989 and 1990.

| | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 |
|---|---|---|---|---|---|---|---|---|---|---|
| Trapnets (tons/day) | 2.9 | 3.1 | 3.4 | 2.9 | 4.6 | 4.6 | 8.8 | 6.2 | 6.7 | 8.6 |
| Purse seines (tons/day) | 9.4 | 16.4 | 18.8 | 14.3 | 16.4 | 19.0 | 18.1 | 20.7 | 24.3 | 21.4 |

Discarding rates (which included dumping of dead capelin as well as releasing fish alive) in 1990 were 38% for purse seines and 32% for trapnets. These were higher than the 21% and 23% respectively in 1989 and were approximately double the 1988 estimates of 14% and 17% respectively. The main reasons for discarding in 1990 were, trip

limits for purse seiners and for trapnets and more stringent market requirements.

The 1986 and 1987 year-classes accounted for 53% and 43% of the 1990 commercial catch (by numbers) respectively.

ii) Research data

Canadian scientists applied approximately 57,000 external tags to mature capelin during 1983 to 1988 along the southeast and east coasts of Newfoundland. The recapture data indicated that tagged capelin released in a particular bay were recaptured either in the same bay or in locations further north including Div. 3K.

During 1988 to 1990, approximately 23,000 capelin were tagged offshore in Div. 3L and Div. 3O. The general results of these tagging experiments were discussed in the June 1991 assessment report of capelin in Div. 3NO (SCS Doc 91/19, p. 78).

STACFIS again recommended continuation of such tagging experiments and analysis of the data to clarify the stock structure of capelin in the NAFO area.

The USSR conducted an acoustic survey for capelin in Div. 3LNO during 16-29 May 1990. The total estimated biomass was 3.75 million tons with 2.76 million tons occurring in Div. 3L. The total biomass in 1990 was about 1.3 million tons larger than estimated in 1989 and only 200,000 tons smaller than the 1988 estimate which was the largest during the period 1986-90. The 1988, 1987 and 1986 year-classes accounted for 52%, 35% and 12% of the estimate by numbers.

A Canadian acoustic survey, conducted during 11-27 May 1990, resulted in a biomass estimate of 6.96 million tons. The survey area was entirely within Div. 3L but was enlarged by about 3,000 sq. km. in the northeast of the survey area compared to previous years. The 1990 estimate was the largest in the series; for example, the next largest estimate was 4.55 million tons in 1988 while the 1989 estimate was 3.83 million tons. The 1988, 1987 and 1986 year-classes accounted for 59%, 28% and 9% by numbers of the estimate.

Larval (0-group) surveys have been conducted by the USSR since 1983 and the results of these surveys were discussed in the June 1991 assessment report of capelin in Div. 3NO (SCS Doc. 91/19, p. 78). There has been no indication that there has been any decline in the 0-group index and in fact, recent year-classes were abundant as 0-group and similar to the large 1983 year-class.

Two acoustic surveys in Div. 3L were conducted by Canada during 1991. The first was conducted during 7-26 May and was incomplete due to ice in the northern part of the proposed survey area. The biomass estimate from this survey was 116,000 tons. Capelin of the 1990, 1989 and 1988 year-classes accounted for 62%, 26% and 11% of the estimate by numbers. The second survey, conducted during 25 June-12 July resulted in a biomass estimate of 147,000 tons. The 1990, 1989 and 1988 year-classes accounted for 80%, 16% and 3% of the estimate by numbers. Most of the biomass was estimated in the southern two survey blocks between 46° and 47°N in contrast to previous years when young immature capelin were most often found in the northern portions of the survey area. Both 1991 surveys were extended further east between 47° and 48°N than in previous surveys because capelin were encountered at the eastern extremities of the proposed survey strata.

In summary, the 1991 Canadian biomass estimates for the stock were about 2% of the 1990 Canadian acoustic estimate. Furthermore, the estimates of the 1988 and 1989 year-classes which will comprise the bulk of the 1992 spawning stock were lower than expected from earlier evidence. Both year-classes had been abundant and comparable to the strong 1983 year-class in the 0-group surveys. The 1990 Canadian acoustic survey indicated that the 1988 year-class at age 2 was comparable in abundance to the 1983 and 1986 year-classes (1983 = 370 billion, 1986 = 380 billion and 1988 = 353 billion) but this year-

class was estimated at only 3.2 billion fish at age 3 during the second 1991 Canadian acoustic survey.

The 1990 USSR acoustic survey estimated the 1988 year-class at age 2 to be 156 billion fish, second only to the 1986 year-class in the USSR series (1984-88 year-classes). No estimate of this year-class at age 3 from the 1991 USSR survey was available. The 1989 year-class was estimated at 7.7 billion fish during the second 1991 Canadian survey, an estimate that is about 13% of the lowest previous estimate for two year-olds (1983-89 year-classes).

c) Prognosis

Because of the importance of capelin as a forage species, STACFIS is concerned about the apparent rapid decline of the capelin stock in Div. 3L. The low biomass estimates in 1991 were unexpected given the indications of high abundance of the 1988 and 1989 year-classes from 0-group surveys and of the confirmed high abundance of the 1988 year-class at age 2 from acoustic surveys. STACFIS was unable to determine whether the large decline in the acoustic estimates between 1990 and 1991 was indicative of stock status although several possible explanations for the decline in the estimates were considered. If the acoustic estimates do reflect stock status, then mortality must have been unusually high during 1990-91. The inshore catch rates remained high in 1990 and catches were not high in relation to population estimates. These catches were about 13% of the advised level which in turn is based on the conservative exploitation rate of 10% of the spawning stock size. Consequently, STACFIS concluded that a high mortality rate was not fishery induced. STACFIS further concluded that a higher predation mortality was also unlikely since predator stocks in the area have not increased significantly. Preliminary data for 1991 indicated that water temperatures have been exceptionally cold, however, STACFIS was unable to evaluate the possibility that unusual conditions induced a high mortality on Div. 3L capelin. STACFIS also could not eliminate the possibility that the low biomass estimates in 1991 were an artifact of unusual capelin distribution induced by the exceptionally cold water temperatures.

In previous years, STACFIS has advised that a 10% exploitation rate was conservative and appropriate for capelin and this was confirmed for Div. 3LNO capelin during the June 1991 Meeting (SCS Doc. 91/19, p. 92). The application of this same exploitation rate in 1992 together with projections calculated in the same manner as in previous years would imply a catch of 5,000 tons of mature capelin in Div. 3L.

Because of the uncertainty about the stock status and the importance of capelin as a forage species, STACFIS wishes to defer providing advice and recommends that *additional data be examined in late-February or early-March 1992 in an attempt to resolve the uncertainty.* STACFIS noted that both Canada and USSR will be conducting acoustic surveys in Div. 2J and 3K (and possibly Div. 3L) in late 1991 and recommends that *the results of these surveys be made available for this special meeting.* Parallelism in year-class strengths in adjacent capelin stocks in the Northwest Atlantic has been observed and therefore, the Div. 2J and 3K acoustic surveys should provide insight into the relative strengths of recruiting year-classes. STACFIS recommended that *several other sources of data be analyzed for this special meeting: capelin by-catch in groundfish bottom trawl surveys, all relevant research data as well as commercial data from inshore and offshore fisheries during 1991, hydrographic data from 1991 in comparison to other years, predation by cod and other major predators including historical comparisons, cod condition factors, Soviet acoustic data from the 1991 Div. 3L acoustic survey and any other new data available at that time.*

2. Capelin in Divisions 3NO

STACFIS noted that its advice in June 1991 (SCS Doc. 91/19, p. 79) on Div. 3NO capelin was heavily dependent on the prognoses of recruiting year-classes based largely on 0-group surveys. This prognosis for Div. 3NO may be too optimistic based on the uncertainty surrounding recruiting year-classes and STACFIS recommends that *the status of capelin in Div. 3NO also be reconsidered at the Special Meeting early in 1992.*

## II. REPORT OF SYMPOSIUM (see Annex 1)

1. STACFIS reviewed the report of the 4-6 September Symposium titled "Changes in Abundance and Biology of Cod Stocks and Their Possible Causes" presented by the convenor H. Hovgård (Denmark-Greenland). Five topic areas had been discussed (complete report in Annex 1) and STACFIS was pleased with the presentations and discussion summations. The convener's recommendation, that *papers presented should be published either in full, or as extended abstracts for papers to be published elsewhere, in a special volume of the NAFO Scientific Council Studies* was endorsed by STACFIS, and STACPUB was requested to consider the recommendation as well as the appropriate review procedures.

## III. REVIEW OF CURRENT ARRANGEMENTS FOR CONDUCTING STOCK ASSESSMENTS

1. Updating List of Designated Experts

The following Designated Experts were tentatively identified for the June 1992 assessments:

- From the Science Branch, Northwest Atlantic Fisheries Centre, Department of Fisheries and Oceans, P. O. Box 5667, St. John's, Newfoundland, Canada, A1C 5X1 [Telefax: (709) 772-2156],

| | | |
|---|---|---|
| for | Cod in Div. 3NO | C. A. Bishop |
| | Redfish in Div. 3LN | D. Power |
| | American plaice in Div. 3LNO | W. B. Brodie |
| | Witch flounder in Div. 3NO | W. B. Brodie |
| | Yellowtail flounder in Div. 3LNO | W. B. Brodie |
| | Greenland halibut in SA 2 + Div. 3KL | W. B. Brodie |
| | Roundnose grenadier in SA 2+3 | D. B. Atkinson |
| | Capelin in Div. 3L | J. E. Carscadden |
| | Capelin in Div. 3NO | J. E. Carscadden |
| | Squid in SA 3+4 | G. H. Winters |

- From the Instituto Investigaciones Marinas, Muelle de Bouzas, Vigo, Spain [Telefax: 34-86292762],

| | | |
|---|---|---|
| for | Cod in Div. 3M | A. Vazquez |
| | American plaice in Div. 3M | J. Zamarro |

- From the Polar Research Institute of Marine Fisheries and Oceanography (PINRO), 6 Knipovich Street, Murmansk, 183763, USSR [Telex: 64-126357] or Murmansk Marine Biological Institute, 6, Vladimirskaya Str., Murmansk 193002, USSR (or c/o V. P. Serebryakov, All-Union Research Institute of Marine Fisheries and Oceanography (VNIRO), 17, V. Krasnoselskaya, Moscow B-140, 107140, USSR [Telefax: 095-2649187]

| | | |
|---|---|---|
| for | Redfish in Div. 3M | A. K. Chumakov |

- From the Greenland Fisheries Research Institute, Tagensvej 135, 1, DK-2200, Copenhagen, Denmark [Telefax: 45-31850166],

| | | |
|---|---|---|
| for | Northern shrimp in SA 0+1 | D. Carlsson |
| | Cod in SA 1 | H. Hovgård |
| | Roundnose grenadier in SA 0+1 | S. A. Pedersen |
| | Wolffish in SA 1 | H. Hovgård |
| | Greenland halibut in SA 0+1 | H. Hovgård |

- From the Institut fur Seefischerei, Palmaille 9, D-2000 Hamburg 50, Federal Republic of Germany [Telefax: 49-4038905129],

| | | |
|---|---|---|
| for | Redfish in SA 1 | H. P. Cornus |

- From the Bedford Institute of Oceanography, Marine Fish Division, P. O. Box 1006, Dartmouth, Nova Scotia, Canada, B2Y 4A2 [Telefax: (902) 426-7827]

  for Silver hake in Div. 4VWX — D. Waldron

- From the Marine Research Institute, Skulagata 4, P. O. Box 1390, 121 - Reykjavik, Iceland [Telefax: 354-1623790],

  for Northern shrimp in Denmark Strait — U. Skuladottir

The Secretariat was requested to solicit confirmation of the designates through communication with the various laboratories.

2. Status of Revision of SCR Documents Dealing with Preliminary Assessments

The Secretariat informed STACFIS that there did not appear to be any outstanding revisions to the assessment documents not yet submitted. There were possible revisions to some non-assessment related documents however, and participants were requested to check with the Secretariat on these.

3. Format and Contents of Scientific Council Reports

It was noted that the *Executive Summary*, produced for the first time this year, had been well received by the Fisheries Commission. It was requested by the Commission, that in future a summary table of estimated catches be included in this summary and that the catch table on the summary sheets be standardized across all stocks.

STACFIS took note of the comments of the Fisheries Commission that a wider range of assessment methods and models is available than is currently being applied and that their use should be explored. STACFIS agreed with this and reminded Designated Experts that they should consider the use of a variety of techniques when preparing the assessments.

## IV. FUTURE SPECIAL SESSIONS

1. Special Session in September 1992

The Canadian co-convener R. K. Mohn sent his regrets that he was unable to personally present a progress report due to prior commitments. He did however, prepare a report indicating that to date 25-30 people had expressed interest in attending and 6 instructors had been tentatively identified. As participation will be limited, it was requested that Contracting Parties submit finalized lists of participants and instructors prior to the end of this meeting so that conveners can begin formulating more detailed plans as soon as possible.

R. K. Mohn expressed some concerns as to the level of instruction sought by participants. It was emphasized by STACFIS that participants were looking for instruction on how to use available tools in their ongoing work and therefore lectures at a fairly fundamental level, with hands-on application, were desirable. Overall, participants are not looking for information on advanced or ground breaking techniques.

STACFIS agreed it is desirable that a manual/workbook be available to participants, and that this should be prepared prior to the workshop itself, preferably in time for circulation during the June 1992 Scientific Council Meeting.

It was agreed that the 1992 Workshop would be held at NAFO Headquarters during the week preceding the Annual Meeting. It was also agreed that if the conveners desire, the duration of the workshop could be increased from the usual 3 days to 4 or even 5 days. As such the starting date should be Tuesday, 8 September 1992.

2. Proposed Theme for Special Session in September 1993

STACFIS discussed three topics.

a) A Symposium hosted by NAFO Scientific Council titled "Impact of Marine Mammals on Commercial Fisheries in the North Atlantic".

b) A Symposium hosted by NAFO Scientific Council titled "Impact of Changes in Environmental Conditions in the North Atlantic: a Decadal Review".

c) A Symposium hosted by NAFO Scientific Council dealing with the biology and oceanography of Flemish Cap.

The first two of these had been first proposed in 1990.

After discussion, STACFIS agreed that 1993 may be too early to hold a symposium on any of these topics. The joint ICES/NAFO Working Group on Harp and Hooded Seals will be meeting in October 1991 and it was considered important to consult with this group concerning any topic relating to marine mammals. As such, the Chairman of STACFIS will write the Chairman of the joint Working Group on this matter.

Environmental conditions in the early-1990s have been extreme and are the focus of much current debate on observed changes in fish behaviour during the same period. STACFIS concluded that although a symposium on the environment is important, it would be preferable to delay this until such time as the present anomalies could be more fully described.

STACFIS also considered that 1993 would be too early for a review of Flemish Cap since the EEC studies in this area will not conclude before 1992 and a longer period would be necessary for data analysis. It was also pointed out that only the EEC and USSR are conducting research on Flemish Cap at present so contributions to a symposium may be limited.

After discussion, STACFIS concluded that it is not necessary to hold a symposium each year. As such, no symposium was proposed for September 1993.

## V. OTHER MATTERS

1. Review of Scientific Papers

Three papers were submitted to STACFIS:

a) ALBIKOVSKAYA, L. K., O. V. GEROSIMOVA, and S. M. KOTLYAROV. Estimates of consumption of major food objects by cod in Grand Bank areas in Spring-Summer 1990. (SCR Doc. 91/121, Serial No. N2014)

b) KUZMIN, S. A., and I. I. TEVS. Distribution of various age-groups of cod in the Newfoundland area by the 1988-1990 survey results. (SCR Doc. 91/124, Serial No. N2017)

c) GERASIMOVA, O. V., L. K. ALBIKOVSKAYA, and S. P. MELNIKOV. Preliminary results from feeding analysis for abundant commercial fishes on the Newfoundland Bank in April-May 1991. (SCR Doc. 91/125, Serial No. N2018)

It was originally intended that the first two of these would be presented at the Symposium but they arrived too late.

STACFIS agreed to defer review of these documents until the June 1992 Meeting.

2. Update of Proposed Ageing Workshop

STACFIS agreed the workshop on the age determination of Greenland halibut and American plaice will be held in St. John's, Newfoundland from 3-12 December 1991. P. Ernst (FRG-EEC) and W. B. Brodie (Canada) will act as co-conveners. More detailed information on the workshop will be forthcoming in a NAFO information letter.

3. Acknowledgements

There being no further business, the Chairman thanked all of the participants for their contributions during the meeting. Special thanks were extended to the Secretariat for their continued valuable support and assistance.

# ANNEX 1. REPORT OF THE SYMPOSIUM ON CHANGES IN ABUNDANCE AND BIOLOGY OF COD STOCKS AND THEIR POSSIBLE CAUSES

## 1. Introduction

The Symposium on "Changes in abundance and biology of cod stocks and their possible causes", hosted by the Scientific Council with H. Hovgård (Denmark-Greenland) as convener, was held at NAFO headquarters in Dartmouth Nova Scotia, Canada, during 4-6 September 1991. The Symposium was dedicated in memory of Richard Wells (Canada) who was initially invited to convene the symposium. A total of 24 presentations were made (SCR Doc. 91/97- 91/120), in five sections concerned with reproduction and recruitment, case studies, distribution, migration and growth and feeding. The sections were chaired by K. Brander (UK), C. Bishop (Canada), H. Hovgård (Denmark/Greenland) and A. Sinclair (Canada). The Symposium was attended by scientists from Canada, Denmark (Greenland), EEC, Japan, Norway, USA and USSR (see list below).

## 2. Reproduction and Recruitment

Seven papers were presented in this section covering a range of very different studies. Two contributions looked at morphology and anatomy: a) the gross anatomy and histology of the reproductive stages of cod (SCR Doc. 91/106), and b) the development of the digestive tract during and after the yolk-sac stage (SCR Doc. 91/105). Both studies have been published or are being prepared for inclusion in an atlas. The detailed studies of anatomy and histology of the reproductive stages show how they could help to define the maturity stages used in fieldwork and population studies, but also bring out some of the difficulties in applying such stages. For example, in detailed studies some fish were classified as spent-ripening because they had empty follicles as well as oocytes starting vitellogenesis. The time scale over which they would once again be ripe was not known. The development of the digestive tract reflected changes in nutrition during the early life, including the switch from endogenous (yolk sac) to exogenous (plankton) nutrition.

A paper analyzed a thirteen year data series on maturity for cod in Div. 2J+3KL collected during fall research surveys (SCR Doc. 91/112). The length and age at 50% maturity was greater in the south (Div. 3L) than further north and the length at 50% maturity also showed a declining temporal trend in all three Divisions. Temperature seemed to have a two-year lagged effect on maturity. Biomass had a one-year lagged positive effect on age at 50% maturity, when temperature was high.

A contribution on the timing of spawning throughout the North Atlantic, obtained as part of the ICES checklists of information on spawning characteristics, was presented (SCR Doc. 91/108). A more detailed look at spawning timing on the Scotian Shelf and around the British Isles showed considerable variability in timing at finer scales, and the possible effects of latitude, temperature and production timing were discussed.

A study of fluctuations of cod year-class strength in the North Atlantic in relation to the spawning stock biomass and survival conditions (SCR Doc. 91/116) used stock biomass as an index of survival (in recruits-per-SSB tons). Greatest variability in this index was observed at West Greenland and Northeast Arctic, whereas the variability at Iceland, Faroe Islands and Subdiv. 3Ps was quite low. The wide variability for West Greenland and for Northeast Arctic cod pointed to extreme environmental factors demanding species specific adaptations during early life.

Recruitment variability for a large number of stocks in the North Atlantic was characterized by examining: a) variability of recruitment, b) distributional characteristics of recruitment variability, c) density-dependent mortality within and between year-classes, and d) the role of environmental factors (SCR Doc. 91/113). Results from several published studies were discussed including the conclusions that density dependence probably occurred between adjacent year-classes and that recruitment was more variable for stocks at the northern and southern limits of their range.

A paper discussed the use of non-parametric methods to estimate recruitment and concluded that a fixed interval algorithm was the only suitable non-parametric method to estimate recruitment for the cod stock in Div. 3NO for the period 1958-82 (SCR Doc. 91/98). A Markowian approach was found to be inadequate because the transition probabilities was apparently not constant and did not depend only on the previous state.

3. Case Studies

A total of 6 presentations provided background information on seven cod stocks occurring in the North Atlantic. Emphasis was placed on providing summaries of historical and current annual catch levels in conjunction with corresponding annual changes in stock status. Some of the possible causes for stock fluctuation were presented which included management strategies and recruitment variation. It was generally recognized that our ability to assess stock status has improved and we are potentially capable of preventing the over exploitations that have occurred in the past. It was agreed that more emphasis should be placed on understanding the processes that influence recruitment levels as well as some of the biological changes that have been observed.

Summaries of the presentations are as follows:

a) Georges Bank cod (SCR Doc. 91/107). Prior to the 1980s this stock had remained relatively stable in spite of periods of heavy exploitation. Recent high exploitation levels from 1980 to 1986 reduced the stock size in spite of good recruitment. The decline of the stock was related mainly to an unsuccessful joint management program between Canada and the USA.

b) Cod stocks in the Newfoundland area (SCR Doc. 91/115). In general, landings were highest in the late-1960s followed by a decline to the mid- to late-1970s because of high exploitation levels. Subsequent stock declines led to reduced catches until the late-1970s when there was some increase. With the exception of that for Subdiv. 3Ps cod, recruitment levels have not returned to levels observed in the 1960s and, as well, there appears to be recruitment failure in the 3NO stock in recent years. Reasons for the recruitment decline were not known but were most likely related to environmental conditions.

c) Baltic cod (SCR Doc. 91/97). Landings in this area have fluctuated due to varying fishing effort and to varying year-class strengths. Stock abundance and landings peaked in the mid-1980s but were followed by a drastic decline. Spawning success and subsequent recruitment were closely related to the salinity and oxygen conditions in the area where spawning occurred. These conditions were dependent on inflow from the North Sea which also increased the availability of bottom nutrients. It was pointed out that limited inflows have occurred in recent years and conditions for egg survival are currently poor.

d) Barents Sea (SCR Doc. 91/117). The stock had been historically productive but variation in catches had always been large. During the 1980s, landings and stock abundance declined to the lowest level on record. Three major causes of variation were considered to be:- stock reduction through exploitation, environmental influence on recruitment, species interaction effects on maturation and growth and, as well, interactions between the three factors. Environmental conditions were considered to be important directly or indirectly in determining recruitment levels. Determination of long-term effects of environmental conditions were considered important in determining reasons for stock changes.

e) Cod in Subdivision 3Ps. ( SCR Doc.91/114). Variability in stock abundance has been observed since the late-1970s and was related to a combination of biological factors and fishing activity. These biological factors included variability of recruitment, stock distribution, and migrations from neighbouring areas. These were considered to be variable because of variable environmental conditions. Stock levels, especially the spawning biomass, were influenced by variable exploitation levels in the late-1980s along with restrictions of specific zones resulting from international (Canada and France) management activities in the area.

f) West Greenland cod. (SCR Doc. 91/118). Large variations in abundance and distribution have been observed since the 1920s and, as well, stock structure is believed to have changed significantly. The stock consists of three components: an offshore component of West Greenland origin, a similar component of Icelandic origin, and the fjord stocks. A combination of overfishing, deterioration of climate and low recruitment levels have severely reduced the West Greenland offshore component with landings from this area being obtained from random good year-classes of eastern origin. The fjord stocks are self sustaining but small, and potentially can produce only a small proportion of previously observed large catches.

4. Distribution

Five papers concerned with distribution were presented in this section.

The age specific distribution in the North Sea as inferred from autumn/winter surveys showed a gradual northern shift in distribution between age 1 to age 3+ cod (SCR Doc. 91/109). This pattern was found consistently in the period studied (1971-91). The youngest age groups were in general found in more shallow and colder waters than older cod. A series of quarterly surveys has been initiated to follow the changes in distribution relative to depth, temperature and salinity over the full course of the year.

A study in Subdiv. 4Vs and Div. 4W (SCR Doc. 91/103) showed that older cod were found at progressively greater depths over the entire age range studied (age 1-12). The temperature where most of the catch was taken was highest for age 1 cod and decreased to age 5 after which it remained stable. The depth and temperature distribution of the cod catches did not correspond with those observed in the total survey area, hence indicating that cod sought areas with specific conditions. From a management point of view it was pointed out that the depth segregation of ages enables a possible mechanism for year-class targeting in the commercial fishery.

The age specific distribution of cod in the southern Gulf of St. Lawrence was analyzed with respect to depth, temperature and by regions using Poisson regression models. Depth distribution was age dependent with older cod occurring at greater depth whereas distribution by age was independent of temperature in most years. The abundance and distribution by area changed significantly between the 1971-78 and the 1979-90 periods with the age depth relationship being significantly steeper in the period of high abundance. The change in areal distribution observed was not well understood as it could have been caused by density dependence, differences in migration timing, change in prey abundance or other environmental changes.

In the eastern part of the Gulf of St. Lawrence (Subdiv. 3Pn and Div. 4RS) cod have shown significant variations in depth distribution in winter surveys since 1978 (SCR Doc. 91/110). Highest survey catches were observed at bottom temperatures between 4.7 and 6.3°C. The temperature in the deeper waters fluctuated within this range whereas the temperature in more shallow water (0-180 m) showed annual variations between 2 and 4°C. Years with high catches in the shallow waters were restricted to years with high temperatures. The period since 1987 had been characterized by low temperatures and this had led to movement of the trawler fleet to deeper waters. The effect on the small boat fixed gear fleet had been very significant as it was confined to depths less than 180 m. Catches in winter had dropped from a level of 5,000 tons prior to 1987 to almost nil in 1991.

The conflict between trawlers and longliners was discussed for the Subdiv. 4Vn cod (SCR. Doc. 91/109). It was concluded that the spatio-temporal distribution of the trawler fleet to the areas of the longline fishery was not affecting the longliner fleet significantly. It was of more importance that the trawlers exploited the year-classes before they become available to the longliners, hence affecting the potential yield of the latter fleet.

In the discussion following the session it was noted that factors such as depth, temperature, salinity and areal units may have confounded effects and that this poses difficulties in drawing strict conclusions on the importance of the individual factors.

5. Migration

A model designed to study the migration of cod, and thus its availability to the fisheries in Div. 2J+3KL was presented (SCR Doc. 91/119). The approach used was to describe the movement of cod in relation to theory based on fisheries

oceanography (closed loop migration), behavioral ecology (predation) and physiological (thermal) responses. Model predictions were being tested with physical oceanography, fisheries acoustics, trawling and tagging data. Two migratory channels have been identified and the movements of cod over two years have been observed. Preliminary results indicate consistent migratory pathways, and that the movements are indicated, but not necessarily determined, by water temperature. The program was in the second of a planned five-year study.

The immigration of cod from Greenland to Iceland was estimated by examination of fishing mortalities for specific year-classes (SCR Doc. 91/102). The immigration was indicated by apparent abnormal low fishing mortalities on certain year-classes in a VPA. The extent of the immigration was estimated by re-running the VPA with fishery mortalities estimated for adjacent year-classes and taking the differences between the two estimates of year-class strength.

6. Growth and Feeding

Three approaches for estimating environmental effects on growth, from either growth increments or size-at-age data, were compared (SCR Doc. 91/99). The behaviour of the estimation procedures was tested using simulated data which incorporated different environmental effect levels and data errors. It was pointed out that growth increments calculated by differing size-at-age are auto-correlated and thus statistical procedures should be modified accordingly. The preferred approach was to fit von Bertalanffy curves, allowing for environmental effects either on $L_\infty$ or K.

Data on the stomach fullness index-at-age of Flemish Cap cod, collected in 1989 and 1990, were analyzed in relation to year-class strength (SCR Doc. 91/111). Although the data were limited, they suggested a negative correlation between gut fullness and abundance.

A paper compared estimates of daily feeding rates of Newfoundland cod obtained by three different methods (SCR Doc. 91/100). Comparable results were found with the three methods.

7. Closing Discussion

Two main issues were raised at the final discussion. Firstly, it was asked whether common key processes affecting growth, recruitment, distribution or migration should be expected across the different cod stocks. The second main issue was the temporal and areal scales on which such processes were acting.

It was recognized that the main emphases in the study of cod stocks varied greatly between areas. For southern stocks much effort has been allocated to multispecies studies, whereas several programs have been initiated to try to link cod biology to climatic effects for northern stocks. For some stocks still other processes are important; migrations as seen off Greenland or changes in salinity and oxygen in the Baltic Sea. Between cod stocks living in similar types of environments, ecological similarities are observed viz. the cod/capelin linkage for some of the northern cod stocks. However, more detailed studies indicate that the systems are not identical. Despite these differences it was concluded that attempts should be made to develop general conceptual models applicable across the different cod stocks. Such models need to be flexible thus allowing for varying importance of key processes to the different cod stocks.

Much of the data available relevant to the study of cod stock dynamics has been compiled for fish stock assessment purposes, thus introducing a given level of aggregation in time and space. In an assessment context, a disagregation into small units may well increase the complexity and thereby impede interpretations. The study of biological processes may require data on a more deseggregated level, as an aggregation of sub-populations characterized by differences in biology may well lead to erroneous results.

8. Recommendations

The papers presented should be published either in full, or as extended abstracts for papers to be published elsewhere, in a special volume of the *NAFO Scientific Council Studies*.

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

Chairman: W. B. Brodie Rapporteur: W. B. Brodie

The Committee met at the Holiday Inn, Dartmouth, Nova Scotia, on 9 and 12 September 1991. Representatives attended from Canada, Denmark (Greenland), EEC, Japan, and USSR. The Assistant Executive Secretary was in attendance.

1. Acquisition of STATLANT 21A and 21B Reports

The situation with STATLANT 21A and 21B reports was basically unchanged from the June 1991 Meeting. Several 21B reports were outstanding for 1989 and 1990, as were 21A reports from EEC-France and France-SP for 1990. STACREC noted that the deadlines for the STATLANT 21B reports for 1989 and 1990 were 30 June of 1990 and 1991 respectively, and again noted the difficulties caused by the late submission of these reports.

2. Publication of Statistical Information

The publication of *NAFO Statistical Bulletin*, Vol. 39, has been delayed by the non-arrival of the STATLANT 21B reports as noted above. The *List of Fishing Vessels*, due to be published in 1990, continues to be delayed because of outstanding lists from several countries. STACREC reiterated its recommendation from June that representatives check with appropriate sources and have outstanding data forwarded to the Secretariat as soon as possible.

STACREC noted that Canada (G) and Canada (Q) had now submitted lists of sampling data for 1989. Thus the *List of Sampling Data* for 1985-89 is now complete and is scheduled to be published once all data have been verified.

3. Review of Requirements for Submission of Sampling Information

This item was raised at the June 1991 Meeting, specifically whether Contracting Parties should be requested to submit lists of sampling data or the actual data themselves. STACREC noted that both practices were currently being followed with some countries submitting the actual data, and that the number of requests to the Secretariat for biological sampling data was in fact quite low. If all Contracting Parties began submitting sampling data, the work required by the Secretariat to recode and computerize the information would be prohibitive. It was also recognized that most Contracting Parties have the data in computerized form, but that each was likely to have its own format for the data. Problems were also envisaged with the Secretariat having to create updated databases from revised sampling data submitted by Contracting Parties. STACREC also noted that sampling data are often routinely exchanged among scientists, without formally requesting such data from the Secretariat.

Given the difficulties outlined above, and noting that the sampling database maintained by the Secretariat was not widely used, STACREC concluded that it was not necessary to request Contracting Parties to submit the sampling data in full, and that submission of a list of such data was acceptable. Requests for the full sampling data would be directed to the appropriate Contracting Parties by the Secretariat. It was noted that the sampling lists were usually available from the Secretariat to users in computer diskette form. STACREC recognized that the publication of the *Lists of Sampling Data* by the Secretariat was both informative and helpful to the users.

4. Other Matters

a) Haddock catch in Div. 4W by USSR Vessels in 1989

STACREC noted that the USSR catch of haddock in Div. 4W in 1989 was reported as 1,754 tons in NAFO SCS Doc. 90/21 and only 470 tons in NAFO SCS Doc. 91/5. A check of the original catch data by USSR authorities confirmed that the former figure, which was officially reported to the Secretariat, is correct.

b) Reporting of Separate Catch Statistics for the NAFO Regulatory Area

STACREC noted that there had been some correspondence on this matter between the Assistant Executive Secretary and FAO, and that this issue was scheduled for discussion at the upcoming CWP Meeting.

c) Acknowledgements

There being no further business, the Chairman thanked all the participants for their contributions during the meeting. Special thanks were extended to the Secretariat for their support and assistance which was greatly appreciated. The Assistant Executive Secretary, on behalf of STACREC, thanked the outgoing Chairman for all the hard work he had put into making STACREC's work run effectively.

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

Chairman: V. P. Serebryakov Rapporteur: J. E. Carscadden

The Committee met at the Holiday Inn, Dartmouth, Nova Scotia, Canada, on 11 September 1991. In attendance were V. P. Serebryakov (Chairman, USSR), J. E. Carscadden (Canada), A. Vazquez (EEC), V. A. Rikhter (USSR) and the Assistant Executive Secretary (T. Amaratunga).

1. Review of Editorial Board

The Assistant Executive Secretary informed STACPUB that the progress on papers reviewed was at a satisfactory level for the single issue of the Journal with respect to papers presented at the 1989 Special Session, and the Studies issue containing the papers presented at the 1990 Special Session . STACPUB was also informed that papers submitted after the 1990 Soviet-Canadian Symposium on Capelin were being reviewed.

The Assistant Executive Secretary informed STACPUB that R. K. Mohn, Associate Editor for Biomathematics, had decided with regret to terminate his work in the Editorial Board within the year, due to other commitments. STACPUB recognizing R. K. Misra's (Associate Editor for Vertebrate Fisheries Biology) expressed interest, was pleased to invite him to replace R. K. Mohn. With respect to the vacancy this created in the Editorial Board, STACPUB agreed to invite Sv. Aa. Horsted, Greenland Fisheries Research Institute, Copenhagen, Denmark, to serve as Associate Editor for Vertebrate Fishery Biology in the Editorial Board.

2. Invitational Papers

STACPUB was informed that Sv. Aa. Horsted was still invited to prepare the invitational paper on cod in Greenland area, however, the present proposal from the Greenland Fisheries Research Institute was to collect a number of papers dealing with stocks in the area, which would be appropriate for a single issue of the Journal. Also, as agreed, M. D. Grosslein was invited to consider preparing an invitational paper.

3. Review of Papers

STACPUB considered the 24 papers of the Symposium titled "Changes in Abundance and Biology of Cod Stocks and Their Possible Causes" held prior to the 13th Annual Meeting. It was the collective opinion of STACPUB that the papers highlighted very important observations regarding cod abundance and biology changes in the North Atlantic and were of significant interest to many scientists. It was therefore recommended that *the papers presented should be published either in full, or as extended abstracts, in a special volume of the NAFO Scientific Council Studies.*

4. Other Matters

The Chairman expressed his gratitude to the Symposium convener, H. Hovgård, for presenting a review of the Symposium. The Chairman also thanked the Rapporteur, J. E. Carscadden, and the Assistant Executive Secretary and the Secretariat Staff for their excellent work in preparing working papers for the consideration of STACPUB. Special gratitude was expressed to the Secretariat Staff for the extensive work done in preparation and publishing the *Executive Summary*.

On behalf of STACPUB members, the Assistant Executive Secretary extended special gratitude to the outgoing Chairman, V. P. Serebryakov, for the two years of hard work as Chairman.

There being no other business, the Chairman then adjourned the meeting.

# APPENDIX IV. AGENDA FOR SCIENTIFIC COUNCIL MEETING, SEPTEMBER 1991

I. Opening (Chairman: B. W. Jones)

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

II. Fishery Science (STACFIS Chairman: D. B. Atkinson)

1. Stock assessments

   a) Capelin (Div. 3L) (See SCS Doc. 91/19)

2. Report of Symposium on "Changes in Abundance and Biology of Cod Stocks and Their Possible Causes" (4-6 September 1991 with H. Hovgård as Convener)

3. Review of current arrangements for conducting stock assessments

   a) Updating list of Designated Experts

   b) Status of revision of SCR Documents dealing with preliminary assessments.

   c) Format and contents of Scientific Council Reports

4. Future Special Sessions

   a) Special Session in September, 1992 on "State-of-the-Art in Fish Stock Assessments: a Tutorial/Workshop on Calibration Methods and Their Practical Use"

   b) Proposed theme for Special Session in September 1993

5. Other matters

III. Research Coordination (STACREC Chairman: W. B. Brodie)

1. Acquisition of STATLANT 21A and 21B reports

2. Publication of statistical information

3. Review of requirements for submission of sampling information

4. Other matters

IV. Publications (STACPUB Chairman: V. P. Serebryakov)

1. Review of Editorial Board

2. Invitational papers

3. Review of papers for possible publication

   a) Review of proposals from past meetings
   b) Contributions to present meeting
   c) Other contributions

4. Other matters

V. Review of Future Meeting Arrangements

1. June 1992 Meeting of the Scientific Council

2. Special Session and Annual Meeting, September 1992

3. June 1993 Meeting of the Scientific Council

VI. Other Business

VII. Adoption of Reports

1. Committee Reports of present meeting (STACFIS, STACREC, STACPUB)

2. Report of Scientific Council, September 1991

VIII. Adjournment

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APPENDIX VI. LIST OF RESEARCH AND SUMMARY DOCUMENTS
(since the June 1991 Meeting)

RESEARCH DOCUMENTS (SCR)

| SCR # | Ser. # | |
|---|---|---|
| 91/97* | N1986 | BAGGE, O., E. STEFFENSEN, and J. BAY. The fluctuations in abundance of the stock of cod compared to environmental changes and the fishery. |
| 91/98* | N1990 | PAZ, J., and M. G. LARRAÑETA. Testing non-parametric methods to estimate cod recruitment in NAFO Div. 3NO. |
| 91/99* | N1991 | MILLAR, R. B. Modelling the effect of environment on growth of cod: fitting to growth increment data *versus* fitting to size-at-age data. |
| 91/100* | N1992 | ORLOVA, E. L., and A. K. CHUMAKOV. Comparison assessment of the intensity of feeding of cod of the southern Barents Sea and Newfoundland. |
| 91/101* | N1993 | KENCHINGTON, T. J. Some effects of bottom trawling on the availability of cod biomass to an inshore longline fishery: a discussion. |
| 91/102* | N1994 | SCHOPKA, S. A. The Greenland cod at Iceland 1941-1990 and its impact on assessment. |
| 91/103* | N1995 | SINCLAIR, A. Distribution of eastern Scotian Shelf cod with respect to age, depth and temperature. |
| 91/104* | N1996 | SWAIN, D. P. Annual variation in the distribution of cod (*Gadus morhua*) in the southern Gulf of St. Lawrence. |
| 91/105* | N1997 | MORRISON, C. The digestive tract of the cod eleutheroembryo ("yolk-sac larva") and larva. |
| 91/106* | N1998 | MORRISON, C. The reproductive stages of cod. Gross anatomy and histology. |
| 91/107* | N1999 | SERCHUK, F. M., and S. E. WIGLEY. Assessment and management of the Georges Bank cod fishery. |
| 91/108* | N2001 | BRANDER, K. Comparison of spawning characteristics of cod (*Gadus morhua*) stocks throughout the North Atlantic. |
| 91/109* | N2002 | HEESSEN, H. J. L. The distribution of cod in the North Sea. |
| 91/110* | N2003 | FRÉCHET, A., and P. GAGNON. Changes in distribution of the 3Pn, 4RS cod stock and the failure of the winter fixed gear fisheries off southwestern Newfoundland. |
| 91/111* | N2004 | PAZ, J., J. M. CASAS, and G. PEREZ-GÁNDARAS. Summer feeding of cod (*Gadus morhua*) and its relationship with other biological parameters on Flemish Cap. |
| 91/112* | N2005 | XU, X., J. BAIRD, C. BISHOP, and J. HOENIG. Temporal variability in cod maturity and spawning biomass in NAFO Divisions 2J+3KL. |
| 91/113* | N2006 | MYERS, R. A. Recruitment variability of cod stocks. |
| 91/114* | N2007 | MOGUEDET, Ph. Variation in cod stock abundance in NAFO Subdivision 3Ps on the period 1978-1990. |
| 91/115* | N2008 | BAIRD, J. W., and C. A. BISHOP. Changes in stock abundance for some cod stocks in Subareas 2 and 3. |

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|---|---|---|
| 91/116* | N2009 | BOROVKOV, V. A., and V. P. SEREBRYAKOV. Fluctuations of cod year-class strength in the North Atlantic in relation to the spawning stock biomass and survival conditions. |
| 91/117* | N2010 | GODØ, O. R., and H. R. SKJOLDAL. Fluctuations in abundance of the Barents Sea cod related with environmental and ecological changes. |
| 91/118* | N2011 | HOVGÅRD, H. Fluctuations in cod abundance off West Greenland in the 20th Century. |
| 91/119* | N2012 | ROSE, G. A., L. FAHRIG, S. NARAYANAN, B. DeYOUNG, and C. WALTERS. The migration pathways of Atlantic cod (*Gadus morhua*) on the NE Newfoundland Shelf: a model based on oceanography and fish behaviour. |
| 91/120* | N2013 | ANDERSON, C. An overview of the ocean production enhancement network (OPEN). |
| 91/121 | N2014 | ALBIKOVSKAYA, L. K., O. V. GERASIMOVA, and S. M. KOTLYAROV. Estimates of consumption of major food objects by cod in Grand Bank areas in Spring-Summer 1990. |
| 91/122 | N2015 | NAKASHIMA, B. S. The geographical distribution of capelin (*Mallotus villosus*) in the Northwest Atlantic based on tagging experiments. |
| 91/123 | N2016 | MILLER, D. S., and J. E. CARSCADDEN. Results of two acoustic surveys for capelin (*Mallotus villosus*) in NAFO Division 3L in 1991. |
| 91/124 | N2017 | KUZMIN, S. A., and I. I. TEVS. Distribution of various age-groups of cod in the Newfoundland area by the 1988-1990 survey results. |
| 91/125 | N2018 | GERASIMOVA, O. V., L. K. ALBIKOVSKAYA, and S. P. MELNIKOV. Preliminary results from feeding analysis for abundant commercial fishes on the Newfoundland Bank in April-May 1991. |

* Symposium Papers.

SUMMARY DOCUMENTS (SCS)

| SCS # | Ser # | |
|---|---|---|
| 91/20 | N2021 | NAFO. Report of Scientific Council, Annual Meeting, September 1991. |