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SCIENTIFIC COUNCIL MEETING - SEPTEMBER 1987

# Report of Scientific Council
Annual Meeting, Halifax, Nova Scotia, Canada
14-18 September 1987

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# REPORT OF SCIENTIFIC COUNCIL

Annual Meeting, September 1987

Chairman: J. Messtorff Rapporteur: V. M. Hodder

The Scientific Council and its Standing Committees on Fishery Science (STACFIS), Research Coordination (STACREC) and Publications (STACPUB) met at the Lord Nelson Hotel, Halifax, Nova Scotia, Canada, during 14-18 September 1987, to consider and report on various matters listed in the agenda (see Appendix V). Representatives attended from Canada, Cuba, Denmark (Greenland), European Economic Community (EEC), German Democratic Republic, Japan, and Union of Soviet Socialist Republics (USSR) (see Appendix VI).

That meeting was preceded by the Special Session on "Biology and Ecology of Demersal Resources of the North Atlantic Continental Slopes, with Emphasis on Greenland Halibut and Grenadiers", which was also held at the Lord Nelson Hotel during 9-11 September 1987, with participation by scientists from Canada, Denmark (Greenland), EEC, German Democratic Republic, Iceland, Japan, Norway, USSR and USA.

The reports of the Standing Committees, as adopted by the Council on 18 September 1987, are given in Appendix I (STACFIS), Appendix II (STACREC) and Appendix III (STACPUB). Brief summaries of these reports and other matters considered by the Council are given below, including the request of the Fisheries Commission regarding the establishment of a program to improve scientific knowledge on the fish stocks in the Regulatory Area (see Appendix IV). Lists of research and summary documents are given in Appendix VII.

## I. FISHERY SCIENCE (APP. I)

### 1. Special Session on Deepwater Resources

At the Special Session which was convened by W. R. Bowering (Canada), 25 scientific papers and 2 oral reports were presented. There were 3 presentations on oceanography, 14 on Greenland halibut , 6 on grenadiers, and 4 on other deepwater species. Most of the papers focused on the yield, distribution and various biological characteristics of the studied species. The Session concluded with a detailed discussion on identifying major gaps in biological knowledge of the species, with emphasis on Greenland halibut and grenadiers. The discussion ended with several recommendations for research, including collaboration among scientists working on similar issues.

The Council endorsed the recommendations for research and noted especially the proposed collaborative research on grenadiers by Canadian and USSR scientists.

### 2. Stock Assessments

The Council noted that STACFIS had considered a reevaluation of yield-per-recruit for the cod stock in Div. 3NO. It was agreed that a more detailed examination of the necessary parameters be undertaken before changes in species yield-per-recruit values are accepted. The results of the analysis were made available to the Fisheries Commission (SCS Doc. 87/24).

The Council concurred with STACFIS that, due to the lack of useful abundance indices, a mid-term meeting to assess the shrimp stocks in Subareas 0 and 1 and in Denmark Strait was unnecessary. It was also agreed that the management advice for 1988 should remain the same as that provided at the January 1987 Meeting for 1987, and that advice for 1989 will be provided at the June 1988 Meeting. The Council therefore advises that the TAC for 1988 on the offshore grounds in Subarea 1 south of 71°N and in the adjacent parts of Subarea 0 be maintained at 36,000 tons, as advised for 1987. The Council was still unable to advise on a TAC for shrimp in Denmark Strait.

### 3. Gear and Selectivity

The Council was grateful to Dr. H. Bohl (EEC gear expert) who responded to the request of the Scientific Council in June 1987 by providing some information regarding the effects of splitting straps, strengthening ropes and codend floats on the selectivity of trawls. The information was made available to the Fisheries Commission (SCS Doc. 87/26).

### 4. Topics for Future Special Sessions

The Council adopted the program that was outlined by STACFIS for the Special Session in September 1988 on "Impact of Changes in Environmental Conditions in the North Atlantic on Distribution, Availability and Abundance of Marine Species, with Particular Emphasis on the Northwest Atlantic

in the Early 1980's", noting that J. C. Rice (Canada) had been named Convener.

The Council also adopted the proposal by STACFIS that the theme for the Special Session in 1989 be "Changes in Biomass, Production and Species Composition of Fish Populations in the Northwest Atlantic Over the Last 30 Years, and Their Possible Causes".

5. Other Matters

The Council noted that STACFIS had deferred one paper (SCR Doc. 87/98) for consideration at the June 1988 Meeting.

## II. RESEARCH COORDINATION (APP. II)

1. Survey Design Procedures

The Council was pleased to note that some progress had been made by the working group which was established to evaluate the available information, provided by Canada, France, Federal Republic of Germany and USSR, on research vessel surveys in Subareas 2 and 3. A number of general and specific points were noted, and several recommendations were made, all of which were endorsed by the Council as being important aspects of future work on analysis of survey results.

2. Review of Information on Conversion Factors

The Council noted that the experiment by Canada to estimate conversion factors for salted cod provided valuable information, and there appeared to be no scientific objection to using the results of the experiment for enforcement purposes.

3. Survey Requirements for Greenland Halibut and Grenadiers

In response to the Canadian request for information on survey requirements to estimate biomass of Greenland halibut and grenadiers in Subareas 0 and 1, the Council concurred with the views of STACREC that a major research effort would be required for 3-5 years, with at least summer and late autumn surveys of possibly 45 operating days each by a large trawler. Depths from 200 m to at least 1,500 m would have to be covered, and the latter depth could still be a limitation for research on grenadiers. In addition, Greenland halibut abundance in West Greenland fjords north of 70°N and south of 61°N in Subarea 1 would need to be quantified. Design of survey procedures, however, would require future work.

## III. PUBLICATIONS (APP. III)

1. Editorial Matters

The Council agreed that the present arrangement, whereby Associate Editors have full responsibility for editing Journal papers, be continued at least until June 1988. It was noted that the second number of Journal Vol. 7 will likely be published before the end of 1987.

In June, the Council endorsed the views of STACPUB that certain invitational papers should be considered for the Journal, but no potential authors have as yet accepted the invitation to write such papers. To clarify the scope of the Journal regarding such papers, the Council endorsed STACPUB's proposal to revise the description of the scope on the inside front cover of Vol. 7(1) to read "Both practical and technical papers are eligible for consideration, as are review articles of particular relevance to the work of ICNAF and NAFO".

2. Papers for Possible Publication

The Council was encouraged to learn that the Secretariat has already received 5 of the 11 papers which had been presented at the June 1987 Meeting and was identified by STACPUB as potential contributions for the Council's Journal or Studies. Examination of 27 papers which had been presented at the present meeting (mostly at the Special Session) resulted in 15 being so identified.

## IV. FUTURE SCIENTIFIC MEETINGS

1. Scientific Meeting in June 1988

The Council reviewed its earlier tentative decision on dates of the June 1988 Meeting and agreed to meet, together with its Standing Committees and Subcommittee, at NAFO Headquarters in

Dartmouth, Nova Scotia, during 8-23 June 1988. This meeting will deal with the usual requests for scientific advice on fisheries management and other fishery-related research and statistical activities.

2. Special Session and Annual Meeting in September 1988

The Council will meet in conjunction with the Annual Meeting of NAFO in Ottawa, Ontario, Canada, during 6-10 September 1988. That meeting will be followed on 12-14 September by the Special Session (also in Ottawa) on "Impact of Changes in Environmental Conditions in the North Atlantic on Distribution, Availability and Abundance of Marine Species, with Particular Emphasis on the Northwest Atlantic in the Early 1980's".

[Subsequent to the Council's decision on the time of the Special Session, the dates for the Annual Meeting were changed to 12-16 September 1988. Consequently, the Special Session will now precede the Annual Meeting and be held on 7-9 September 1988.]

3. Scientific Meeting in June 1989

The Council tentatively agreed to meet during 7-21 June 1989 to deal with fishery science and statistical matters.

4. Special Session and Annual Meeting in September 1989

Considering that the Annual Meeting is scheduled for 11-15 September 1989, the Council agreed to hold its Special Session on 6-8 September.

## V. OTHER MATTERS

1. Provisional Report of June 1987 Meeting

The Council formally approved, with minor amendments, the summary report of its meeting on 3-17 June 1987 (see SCS Doc. 87/21). Some corrections to the Appendices (Committee reports) were noted for incorporation prior to publication.

2. STACPUB Membership

The Council noted that Sv. Aa. Horsted, who becomes Vice-chairman of the Council at the end of this meeting, also becomes ex officio Chairman of STACPUB. His position as a member-at-large of STACPUB thus becomes vacant, and the Council appointed J. Messtorff to fill the vacancy. STACPUB membership was confirmed as follows:

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|---|---|
| Sv. Aa. Horsted (Chairman) | M. G. Larrañeta (EEC) |
| R. G. Halliday (Canada) | J. Messtorff (EEC) |
| S. Kawahara (Japan) | V. A. Rikhter (USSR) |

3. Oceanographic Analysis Charts

The Chairman informed the Council of a reply which he had received from the USA regarding the Council's concern about reducing the coverage in the Northwest Atlantic from 50°N to 47°N and from 44°W to 47°W. It was indicated that the original northern (50°N) and eastern (44°W) limits have been retained with a southward extension to the Bermuda area. The Chairman was requested to convey the Council's gratitude to the appropriate USA authorities for their very positive response to the Council's request.

4. Deficiencies in Research and Statistical Information on Stocks in the Regulatory Area

The Council was informed that a request on this matter would be forthcoming from the Fisheries Commission, but the request had not been received before the last session of the Council was adjourned. It was decided, therefore, to defer consideration of the request to the June 1988 Meeting but to append it to the report of the present meeting for advance information (see Appendix IV).

5. Role of Scientific Council in Filling Vacant Position of Assistant Executive Secretary

The General Council was requested by the Chairman of the Scientific Council (J. Messtorff) to establish the involvement of the Scientific Council in the candidate assessment, with reference to Article XV(3) of the NAFO Convention. The following points were particularly emphasized: It is essential that the new incumbent have the proper scientific qualifications, experience, and reputation to effectively fulfill those duties relating to those of the Scientific Council. Judgement of these qualific-

ations can only be properly exercised by professional scientists who are themselves experts. It will, therefore, be satisfactory to the Scientific Council only if it has the authority to establish which candidates meet the scientific standards required for the position.

At its meeting on 18 September 1987, the General Council adopted the following Resolution relating to the appointment of the New Assistant Executive Secretary: "The General Council, noting that the position of Assistant Executive of NAFO has become vacant and that candidates have been invited to submit their applications, and noting Article XV(3) of the Convention, requests the Chairman of the Scientific Council to convene, in conjunction with the present Annual Meeting, a small advisory group to assist the Executive Secretary in assessing the scientific qualifications of the applicants in order for the Executive Secretary to appoint the new Assistant Executive Secretary taking into consideration the overall qualifications of the different applicants".

The Scientific Council established the advisory group, consisting of J. S. Beckett (Incoming Chairman), J. Messtorff (Outgoing Chairman) and W. R. Bowering (Outgoing Chairman of STACFIS). The group met briefly to develop guidelines for the assessment process and anticipates that copies of the applications of all candidates will be dispatched to each participant as soon as possible by the Executive Secretary.

## VI. ADJOURNMENT

There being no further business and this meeting being the end of his term in office, the Chairman expressed his appreciation and thanks to the chairmen of the Standing Committees (W. R. Bowering, R. Dominguez and J. S. Beckett) and Environmental Subcommittee (M. Stein), to the convener of the Working Group on Survey Procedures (W. Brodie), to the various rapporteurs and to all other participants for their cooperation and contribution to the success of Scientific Council meetings during the last 2 years. On behalf of the Council, he thanked the Assistant Executive Secretary (V. M. Hodder) and other Secretariat staff for their continuous and excellent assistance and efficiency in organizing and servicing the meetings. The final session was adjourned at 1245 hr on 18 September 1987.

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

Chairman: W. R. Bowering Rapporteurs: Various

The Committee met at the Lord Nelson Hotel, Halifax, Nova Scotia, Canada, during 14-17 September 1987, to consider and report on various fishery-science matters that were referred to it by the Scientific Council (see Appendix V for agenda). Representatives attended from Canada, Cuba, Denmark (Greenland), EEC, German Democratic Republic, Japan, and USSR.

The meeting was preceded on 9-11 September 1987 by the Special Session on deepwater resources of the North Atlantic, which attracted scientists from Canada, Denmark, EEC, German Democratic Republic, Iceland, Japan, Norway, USA and USSR.

The matters which were considered at both meetings are outlined below. Various participants contributed to the preparation of initial drafts of the different sections of this report.

### I. SPECIAL SESSION ON DEEPWATER RESOURCES

1. Introduction

The Special Session on "Biology of Demersal Resources of the North Atlantic Continental Slopes, with Emphasis on Greenland Halibut and Grenadiers", convened by W.R. Bowering (Canada), was held at the Lord Nelson Hotel, Halifax, Nova Scotia, Canada, during 9-11 September 1987, and attracted a total of 31 scientists who are conducting research in the Northwest and Northeast Atlantic and the North Pacific Oceans. A total of 25 papers (SCR Doc. 87/72 to 87/96 inclusive) and two oral presentations were given by participants from Canada, Federal Republic of Germany, German Democratic Republic, Greenland, Iceland, Norway, USA and USSR.

2. Specific Topics

a) Oceanography

There were three presentations on oceanographic conditions in the Northwest Atlantic as an area of major interest. Specific discussions were centered around the Arctic outflow in the Northwest Atlantic, and the processes controlling the seasonal and interannual changes in near-bottom temperatures over the Labrador Shelf as well as shelf edge processes. These features were considered in the light of the distribution of deepwater species in the Northwest Atlantic. It was noted, however, that very little oceanographic information is, in fact, available regarding depths of 500-1,500 m, where these deepwater resources are mainly distributed. It was agreed that the Environmental Subcommittee should solicit information on oceanographic conditions in this depth range for consideration at the June 1988 Meeting.

b) Greenland halibut

There were 14 presentations on Greenland halibut. These included major review papers on the biology and fisheries of the species in the North Pacific, West Greenland, Labrador-eastern Newfoundland, Gulf of St. Lawrence, and Norwegian-Barents Sea areas. An oral account of the biology and fishery of Greenland halbiut in the East Greenland-Iceland area was also presented. Studies on various biological features were also reported, such as stock identification, age and growth, and distribution in relation to depth and temperature. On the last day of the Session, there was a detailed discussion regarding future research activity, research priorities and collaborative scientific ventures on Greenland halibut, as follows:

i) In the North Pacific, little experience in ageing Greenland halibut has been gained although ageing material has been collected. It was felt that, as a next step in investigating the biology of Greenland halibut in the North Pacific, age and growth studies should be conducted. It was recommended that scientists at the USA laboratory in Seattle, Washington, and scientists at the Canadian laboratory in St. John's, Newfoundland, collaborate on this matter, because the Canadian scientists have many years of experience in ageing the species. Depending upon the success of such collaboration, other collaborative studies could be explored.

ii) It was further noted that ageing techniques, in the Northwest Atlantic, should be standardized for the Gulf of St. Lawrence, Labrador-eastern Newfoundland and West Greenland areas. It was suggested that an exchange of photographic material on otoliths would be a good approach to this matter. It was pointed out that delineation

of Greenland halibut stocks throughout this region has yet to be fully resolved, and studies of this nature are considered of high priority, particularly in the Gulf of St. Lawrence and in West Greenland areas. One of the major gaps in the life history of Greenland halibut in the Labrador-West Greenland region has been the lack of knowledge of the specific location of the spawning stock, the time of spawning, the the biology of egg and larval stages. It was recommended that studies designed to resolve this major gap in knowledge of the life history should be initiated, particularly ichthyoplankton and 0-group studies. In fact, it was pointed out the a pilot project of 0-group surveys as part of this initiative has already been started in southwestern Greenland waters.

iii) Research activity on the general biology and stock assessment of Greenland halibut was reported to be ongoing in the Icelandic area. However, it was felt that additional activity should focus on the distribution and abundance of Greenland halibut larvae at East Greenland and the possible relationship with West Greenland.

iv) In the Northeast Atlantic, research priorities on Greenland halibut are being directed towards the development of recruitment indices, investigation of the reproductive cycle, and predation studies on young stages. It was felt that the results of these research activities may enable scientists to better evaluate the life history of the species in this area and may be extrapolated to other areas as well.

c) Grenadiers

Six papers were presented on grenadiers, primarily roundnose and roughhead grenadiers. The papers dealt with the biology and fishery of the species throughout the North Atlantic. Many gaps in the knowledge of the biology of grenadiers were identified, such as stock delineation, reproductive cycles, and status of the stocks. These were highlighted as being of particular concern in the Northwest Atlantic, where there is major fishery for grenadiers by countries such as German Democratic Republic and USSR. It was noted that these countries have large grenadier databases which should be examined in order to form the basis for future research. It was recommended that collaborative research efforts between Canadian scientists and USSR scientists working in the Northwest Atlantic be considered along the lines of that presently conducted on Greenland halibut. Such a combined effort would likely allow for a better understanding of the distribution and biology of these species, as well as stock identification.

d) Other species

There were four papers on species other than Greenland halibut and grenadiers, these being primarily Atlantic halibut and blue hake, and the deepwater resources off Norway. Research activity on Atlantic halibut is expanding, but research activity on species such as blue hake will likely continue on an opportunistic basis.

## II. STOCK ASSESSMENTS

1. Yield-per-recruit of Cod in Divisions 3N and 3O (SCR Doc. 87/97)

A new yield-per-recruit analysis was not possible at the June 1987 Meeting because average weight-at-age data were not then available for cod older than age 12 years. Following a recommendation of the Scientific Council, average weights for age-groups 13-20 were calculated from research vessel data. Length-at-age values were calculated from the data sources cited in SCR Doc. 87/97. Weight-at-age values were then estimated by applying a length-weight relationship to the average length-at-age values. These average weights and the values from the commercial fishery for ages 3-12 years, were included in a yield-per-recruit analysis.

The values of $F_{0.1}$ and $F_{max}$ derived from this analysis were somewhat different from the values (0.18 and 0.22 respectively) used in previous years. It was noted that such calculated values tend to vary, since they reflect the normal variability in the estimated weight-at-age values and the estimated proportions of the fishing mortality acting upon the younger (and smaller) cod, which are not fully recruited to the fishery. Current estimates of average weights for cod older than 16 years were highly variable, perhaps due to infrequent occurrences of these ages in the survey catches.

STACFIS concluded that a more detailed examination of the necessary parameters should be undertaken before changes in specific yield-per-recruit values are accepted. It was noted that the yield-per-recruit function should be calculated from values consistent with those observed in the stock when it was at an appropriate size. STACFIS accordingly recommends that the appropriate laboratories in Canada and USSR which have series of research vessel surveys in this area provide the data and perform the necessary yield-per-recruit analyses for presentation at

the June 1988 Meeting. Relevant data from the commercial fisheries of all nations for cod in Div. 3NO should also be provided.

2. Shrimp Stocks in Subareas 0 and 1 and in Denmark Strait

STACFIS considered whether a special meeting in January 1988 was necessary to provide advice on the shrimp stocks. It was pointed out that shrimp (Pandalus borealis) is a relatively short-lived species, compared to some finfish, and that the fishery is dependent on only 3 or 4 year-classes. Also, recruitment and stock size are difficult to predict, especially when ageing problems are still to be resolved. In the past, it has been accepted that, in order to adequately assess these stocks, the most recent fishery and research data should be available for consideration. However, the usefulness of mid-term meetings has been increasingly questioned because of deficiencies in the data. In 1986, the Scientific Council still considered that a mid-term meeting to assess shrimp was appropriate, at least until quantitative recruitment estiamtes are available. An assessment in June would utilize data which were a year older than an assessment in the following January, and any adjustments to the TAC to take account of sudden changes in abundance, as has been observed elsewhere for other shrimp stocks, would only be possible 2 years after the changes. Furthermore, since data from the fishery in July-September are important, it is not appropriate to assess the stock until January (NAFO Sci. Coun. Rep., 1986, page 9).

Assessment of shrimp stocks, in the past, has been based on CPUE indices and, for the West Greenland stock, biomass estimates from the photographic survey supplemented by ancillary biological data. In January 1987, STACFIS was unable to interpret the CPUE series as an index of stock size. Also, due to problems with the interpretation of the data, the photographic survey was not conducted in 1986 and STACFIS was advised that such surveys would not be continued in the future. Therefore, there was no basis to advise a change in TAC.

Under these circumstances, in June 1987, the Scientific Council reexamined the need for a special meeting in January 1988 and suggested that the assessments be conducted at the regular June meeting. It was preferred that advice for 1988 be provided at the September 1987 Meeting and advice for 1989 at the June 1988 Meeting. It was also noted that, if stock abundance should decline rapidly, the Chairman of the Scientific Council has the authority to convene a special meeting at any time upon the request of the coastal state.

STACFIS was informed at the present meeting that problems with the interpretation of the CPUE series remain and that these will not be resolved by January 1988. Even if a decrease in CPUE were observed in 1987, it would be very difficult to quantify an appropriate reduction in TAC. Points raised at the June meeting (i.e. provision of advice in June, and the possibility of a special meeting at any time if a rapid decline in stock becomes evident) were reiterated. It was agreed that, under present circumstances, a special meeting in January 1988 was not necessary. It was further agreed that, if it is established that a significant improvement in the accuracy of advice can be obtained, a return to mid-term meetings would be appropriate.

It was recognized that, because no new data on either the Subareas 0+1 or Denmark strait stocks were available for this meeting, advice on TACs for 1988 must be the same as that provided in January 1987 for 1987 and that advice will be provided for 1989 at the June 1988 Meeting. STACFIS therefore advises that the TAC for 1988 for the offshore grounds in Subarea 1 south of 71°N and the adjacent parts of Subarea 0 be maintained at 36,000 tons, as advised for 1987. STACFIS was still unable to advise a TAC for shrimp in Denmark Strait.

## III. GEAR AND SELECTIVITY

1. Escapement and Selectivity Problems Associated With Use of Strengthening Ropes, Splitting Straps and Codend Floats

In compliance with an expressed need for information on this matter by the Fisheries Commission, the Scientific Council, at its meeting in September 1986, recommended that all available information on the subject be presented at the June 1987 Meeting (NAFO Sci. Coun. Rep., 1986, page 110). No new information on the subject came forward at the June 1987 Meeting, and the only relevant material was compiled for the present meeting by Dr. H. Bohl (gear research expert, EEC), as follows:

a) Strengthening ropes

In the most comprehensive sense, these are load-bearing ropes which are attached to the lestridges and/or any other part of the trawl. When fixed to the lestridges, they are commonly designated as "selvage (selvedge) ropes". The technical terms used here were defined by Bridger et al. (1981).

Properly rigged selvage ropes have been shown to improve the selectivity of trawls to a great extent (Bohl, MS 1960). Covered-codend experiments in the Baltic Sea yielded selection factors of 2.1 for cod and 2.5 for whiting, when a bottom trawl without these ropes was used. During the same experiments, the lestridges of the trawl were strengthened from the wing tips to the codline meshes by means of manila ropes. This gear modification led to much higher selection factors (3.1 for cod and 4.2 for whiting). These results demonstrate that strengthening ropes enable the meshes of towed codends to be open. An inverse effect, however, may be expected when the ropes are fastened on lengthwise stretched netting, because the meshes would remain closed during towing. In EC waters, it is prohibited to attach strengthening ropes inside the codend (Commission Regulation (EEC) No. 3440/87 of 6 December 1984).

b) Splitting straps

Although the effects of splitting straps have not been studied in detail, it can be taken for granted that these devices impede the selectivity of trawls to some extent. Nevertheless, the use of splitting straps has to be tolerated, because, otherwise, side trawlers and stern trawlers without ramps would not be able to haul big catches on board. For "round straps" (another type of circular strap with a completely different function), it is known that they do not reduce the selectivity, if their length is not less than 45% of the circumference of the codend (Beltestad, MS 1977). Despite the fact that the length of splitting straps very often corresponds to 40% or less of the codend girth, it would be irrational to introudce a minimum length for them. Relatively short splitting straps are absolutely necessary to lift full codends over the ship's bulwark in case the pulley used for this purpose cannot be placed to a sufficient height. However, regulatory measures are required with respect to the wristband-shaped chafing pieces which are commonly used in conjunction with splitting straps. These cylindrical pieces of netting, which prevent the straps from cutting the codends, are thought to reduce selectivity to a higher degree than the splitting straps themselves.

When splitting straps and their accessories are used in EC waters, certain rules must be observed, and these are given in Articles 7 and 9 of Commission Regulation (EEC) No. 3440/87.

c) Codend floats

Especially in coastal fisheries, a single codend float is frequently used to mark the position of the trawl at the surface. Since, in general, such a marker buoy is tethered to the rearmost end of one of the selvage ropes, its influence on trawl selectivity may be considered negligible. Occasionally, codend floats are used as lifting devices, but their effects on selectivity are unknown.

d) References cited above

BELTESTAD, A. K. MS 1977. Selectivty experiments with topside chafers and round straps. ICES C.M. Doc., No. B:38 (Gear and Behaviour Committee).

BOHL, H. MS 1960. Note on the influence of net design on selectivity of trawls. ICES C.M. Doc., No. 162 (Comparative Fishing Committee).

BRIDGER, J. P., J. J. FOSTER, A. R. MARGETTS, and E. S. STRANGE. 1981. Glossary of United Kingdom Fishing Gear Terms. Fishing News Books Ltd., Farnham, Surrey, England.

## IV. TOPICS FOR FUTURE SPECIAL SESSIONS

1. Outline for Special Session in September 1988

Further consideration of the theme for the Special Session in September 1988, which was adopted at the Annual Meeting in September 1986, resulted in agreement to expand coverage from the Newfoundland and Labrador regions (Subareas 3 and 2) northward to include Baffin Island and West Greenland regions (Subareas 0 and 1). Thus, the revised theme of the Special Session in September 1988 is "Impact of Changes in Environmental Conditions in the North Atlantic on Marine Species, with Particular Emphasis on the Northwest Atlantic in the Early 1980's". The session will be convened by J. C. Rice (Canada). The following outline was adopted:

a) General theme

The primary intent of the session is to provide a greater understanding of the influence of the extreme oceanographic conditions in the Northwest Atlantic in the early 1980's on

the distribution and abundance of fish populations in those waters and their impact on survey and commercial abundance indices. Although the principal areas of interest are the Northwest Atlantic regions, studies in other areas will be considered. Analyses of data from commercial fisheries, research surveys, and special directed studies in this field will be welcomed.

b) Specific topics

i) Historical reviews of oceanographic conditions in selected areas, particularly with emphasis on periods of anomalous conditions. Rigorous empirical comparisons of oceanographic conditions in the early 1980's with long-term conditions in the Northwest Atlantic are of special interest.

ii) Examination of process-oriented explanations of why oceanographic conditions in the Northwest Atlantic were extreme in the 1980's.

iii) Comparisons of the distribution and abundance of fish populations in the 1980's with long-term patterns of distribution and abundance as reflected in research vessel and commercial fishery data.

iv) Examination of relationships between patterns of distribution and abundance of fish populations and anomalies in oceanographic conditions. Analyses of synchronous variation over large areas, temporal variation in restricted areas, or variations in both space and time will be important.

v) Consideration of mechanisms through which the anomalous environmental conditions affect the fish populations, through changes in availability, catchability, and other factors.

vi) Examination of mathematical-statistical tools for reducing large data sets on oceanographic attributes or fish populations to concise representative data series, and for relating variables from the two types of data sets.

2. Proposed Theme for Special Session in September 1989

STACFIS confirmed its view that a special session on the general topic that was suggested at the June 1987 Meeting would be appropriate and proposed the following title:

"Changes in Biomass, Production and Species Composition of the Fish Populations in the Northwest Atlantic Over the Last 30 Years, and Their Possible Causes."

It was agreed that the scope of the theme will be considered and defined when the convener for the Session is appointed at the June 1988 Meeting.

## V. OTHER MATTERS

1. Review of Scientific Papers

Of 27 papers which had been documented for consideration by STACFIS at this meeting, 26 were reviewed and one (SCR Doc. 87/98) was deferred to the June 1988 Meeting.

2. Acknowledgements

There being no further business, the Chairman thanked the participants for their assistance and the NAFO Secretariat for their efficient service during the course of this meeting and the preceding special session.

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

Chairman: R. Dominguez Rapporteurs: W. B. Brodie and W. R. Bowering

The Committee met at the Lord Nelson Hotel, Halifax, Nova Scotia, Canada, on 15-16 September 1987 to consider and report on various matters referred to it by the Scientific Council (see Appendix V for agenda), dealing mainly with survey design procedures, salt fish conversion factors, and survey requirements for Greenland halibut and grenadiers in Subareas 0 and 1. Representatives attended from Canada, Cuba, Denmark (Greenland), EEC, Japan and USSR.

1. Working Group on Survey Design Procedures

STACREC noted that the Working Group had met on 11 September 1987, with W. B. Brodie as Convener and representatives from Canada (D. Power), EEC (J. Bertrand, J. Messtorff) and USSR (V. A. Rikhter), and reviewed the available information on research vessel groundfish surveys conducted in Subareas 2 and 3 by Canada, Federal Republic of Germany, France and USSR. The following general points were noted from the Working Group's summary of survey documentation:

- Survey coverage was lower, often considerably so, both in terms of number of sets and strata fished, in the earlier years of many survey series compared to later years. Techniques such as multiplicative analyses are encouraged to maximize the amount of survey data which can be incorporated into abundance indices.

- The timing of surveys within a series often differed by as much as 5 months in some years. Such differences could have significant effects on the abundance indices for some species but these effects are virtually impossible to quantify.

- Users of research vessel survey data should be aware of changes or peculiarities in series and their potential effects on abundance indices.

Several survey series conducted by France, Canada, Federal Republic of Germany and the USSR were examined. The following specific points were noted by STACREC:

- Surveys by France in Subdiv. 3Ps and Federal Republic of Germany in Div. 2J underwent little change over time. Both used a 12-hour (approximate daylight) fishing plan, which differs from the 24-hour operations used by Canada and the USSR. The two vessels used in the Federal Republic of Germany surveys are considered comparable in terms of the survey results which they provided. The Federal Republic of Germany surveys have been discontinued because the research vessel Anton Dohrn is no longer available.

- Some survey series conducted by Canada were affected by a change in vessel/gear from the side trawler A. T. Cameron up to the end of 1982 to the stern trawlers Wilfred Templemen and Alfred Needler from 1983 onward. Conversion factors exist only for catches of American plaice and yellowtail flounder, while cod catches were determined to be equal by both vessel/gear types. The survey series involved are Div. 3LNO (spring), Div. 3L (fall) and Subdiv. 3Ps.

- Two new strata were added to the Canadian surveys in Div. 3K from 1984 onward, covering the near-shore areas in the 101-200 m depth range.

- No surveys were done in Div. 3LNO by Canada in spring 1983, and coverage of certain divison was minimal or non-existant in 1974, 1981 and 1984.

- Canadian surveys on the Flemish Cap (Div. 3M) during 1978-85 were done by the stern trawler Gadus Atlantica and are much more extensive than the 1977 survey carried out with the A. T. Cameron. These surveys were discontinued after 1985.

- Three series of USSR surveys, covering the 1961-70, 1971-82 and 1983-85 periods are distinctly different in terms of objectives, design, vessel/gear and operating procedures.

- The design and timing of the USSR young fish surveys of 1961-70 changed in 1967 and therefore the data for 1961-66 are not considered at this time to be comparable with the data for subsequent years. Abundance indices (number-per-tow only) are available for cod, haddock and redfish aged 1 to 3 years from the 1967-70 surveys, which were done with similar side trawlers.

- The 1971-82 USSR surveys, conducted by similar stern trawlers, operated on the same grid of fixed stations used in 1967-70. With comparative fishing indicating that the

stern-trawler gear caught 1.4 times more fish than was caught by the side-trawler gear, the results from 1967-70 should be comparable with those for young fish in 1971-82. However, further examination of the distribution of sets in these years is necessary before specific conclusions can be reached concerning the comparability of the young fish estimates in each division surveyed. Data, including catch weights, from fish other than young cod, haddock and redfish were collected in the 1971-82 USSR surveys. Thus, abundance estimates in the form of number-per-tow and weight-per-tow only are available for several groundfish species from these surveys. However, no information on survey coverage by location was available to determine the comparability of the abundance estimates over the series.

- Stratified-random surveys in Subarea 3 were begun by the USSR in 1983, using the same class of vessel/gear used in the 1971-82 period. Tows were 1 hour in 1983 and 30 minutes in 1984-85. A smaller vessel, but with the same gear, was used in 1985 and the effect on catches was not considered to be significant, although no comparative fishing data exist. Comparability of these surveys with the fixed-station surveys of 1967-82 was not established.

- The USSR survey directed at Greenland halibut in Subareas 0 and 2 during 1980-85 were done using a stratification by depth zone (100 m intervals) rather than with a standard stratification scheme. The effects of this design on abundance and variance estimates are not known, although the indices for Greenland halibut from this series are affected significantly by annual variations in survey coverage.

In the light of the preceding points, STACREC makes the following recommendations:

a) Techniques such as multiplicative analyses should be used to establish comparability among all years in abundance indices from a particular survey series.

b) Since changes in design, timing, coverage, vessel/gear, etc., in survey series can have significant effects on abundance indices, the documented information on survey design procedures should be included for future reference in a summary (SCS) document.

c) Comparative fishing results which exist for some survey series should be used on the appropriate species where necessary.

d) Recent results from comparative fishing experiments between Federal Republic of Germany research vessels fishing at random in a small suitable area should be examined by researchers planning comparative fishing tests. These results will be available in a paper from the 1987 ICES Meeting.

e) Because comparability of the three USSR time series has not been satisfactorily established, more information on the distribution of sets as well as investigations into the comparability of fixed-station and stratified-random surveys are required. However, the surveys in 1961-66 are not considered to be comparable with other USSR surveys because of changes in design and timing.

f) Additional USSR survey data should be made available for consideration. For the 1967-82 period, this information should consist of a listing of the fixed stations by division and depth, indicating which stations were successfully surveyed in each of the years from 1967 to 1982. For the stratified-random surveys in 1983-85, tables of survey coverage by division and stratum, identical to those of other survey series reviewed by the working group, are required. For the Greenland halibut surveys of 1980-85, similar tables of coverage by division and depth zone are necessary. If possible, this information should be sent to the Convener of the Working Group so that analysis can begin sometime before the June 1988 Meeting.

2. Review of Information on Conversion Factors

Results of an experiment carried out by Canada to determine split codfish weight (kg) from a volume of salt codfish in bulk (cubic metres) were presented to STACREC (SCR Doc. 87/71). Variables considered in the analysis were the ratio of salt used to split fish weight, the height to which the bulk cod was stored, and the rate at which the split fish was placed into salt. The experiment was conducted on land but simulated conditions in the fishery as closely as possible.

The experimental results indicated that the equilibrium conversion factor was greater for lower salt-to-fish weight ratios, increasing from about 1,200 kg/m$^3$ for 70% salt to about 1,500 kg/m$^3$ for 50% salt. Effects of compression (bulk fish height) on the conversion factor were not included in the model as the factor was only about 5% higher for a 1.5 m-high pile than for a 0.85 m pile. After final salting, the conversion factor reached about 95% of its maximum value within a week. However, the conversion factor increased sharply over the first few days after salting.

To apply this methodology at sea, observers need to know what salt-to-fish ratio was used, and the proportion of fish salted on a daily basis. These variables, together with several constants can be used to derive the split-fish equivalent from volumes of salt bulk. The range of experimental values for the conversion factor was 600 to 1,500 kg/$m^3$, largely depending on the time span that fish were in salt bulk.

The ratio of salt-fish weight to split-fish weight in the Canadian experiment, which was obtained in addition to the conversion factor for salt-bulk volume to split-fish weight, was in good agreement with preliminary results from a Spanish experiment reported to STACREC. The Spanish experiment, which also produced conversion factors for split to round and salt to round, measured only weights, and like the Canadian experiment, indicated that the size of the fish seems to be a negligible factor for the conversion of salt-fish weight to split-fish weight. However, the Spanish data indicated that fish size was important in split to round conversions.

STACREC noted that the salt-to-fish weight ratio was a crucial factor in determining the conversion factor and that this ratio often varied between fleets and on a seasonal basis. Although no value for this ratio is recorded in vessel logbooks, the ratio is available from the skipper's estimates, and could be obtained empirically with the cooperation of the vessel's crew. The importance of having accurate conversion factors in the determination of nominal catches was noted by STACREC, and there is no scientific objection to using the results of the Canadian experiment for enforcement purposes.

3. Response to Canadian Request for Analysis of Research Activities on Greenland Halibut and Roundnose Grenadier

Canada requested the Scientific Council, when reviewing the status of the Greenland halibut and roundnose grenadier stocks in Subareas 0 and 1, at its meeting in June 1987, to prepare an analysis of research activities that are necessary to allow estimation of (i) total biomass, and (ii) distribution of that biomass between the two subareas. This request was deferred to the September 1987 Meeting when some existing information on the distribution of these species in Subareas 0 and 1 would be available. These results were presented in SCR Doc. 87/86 and 87/94 for Greenland halibut and roundnose grenadier respectively.

It was reported in these papers that both species are extensively distributed throughout the Davis Strait region in both subareas at least between 61°N and 70°N where survey data were available. It was therefore concluded that any survey activity should involve coverage of both subareas at least between 61°N and 70°N. For practical purposes, both species could be surveyed together, provided that a depth range of at least 200-1,500 m is covered. Based upon the results of a Canadian survey in 1986 (SCR Doc. 87/22) using a recently developed stratification scheme (SCR Doc. 87/25), coverage of about 220 sets might be considered reasonable, giving 1 set per 350 square miles and allowing at least 2 sets per stratum. Considering an average of 7 sets per day, this would require approximately 32 fishing days (up to 45 operating days). A large offshore trawler would be necessary to undertake the work, with the capability to fish effectively to depths of 1,500 m. The latest techology in navigation and monitoring fishing performance would also be essential. Nine scientific staff would be needed to sort the catches, obtain samples and collect data on Greenland halibut and grenadiers as well as other by-catch species. Additional resources would be necessary for analysis of the collected data.

Ideally, at least two surveys should be conducted annually, one during summer when the Greenland halibut are widely distributed and the other in late autumn-early winter when spawning concentrations are believed to be formed in the deep waters of Davis Strait. It is emphasized, however, that such surveys would provide estimates of abundance only for the area surveyed and that obtaining satisfactory estimates during autumn-winter would be dependent upon ice conditions, which are highly variable at that time of year. STACREC also made the following observations: (a) Important commercial fisheries occur for Greenland halibut in the West Greenland fjords. (b) While no surveys have been conducted north of 70°N, recently developed shrimp fisheries in West Greenland as far north as 74°N have reported substantial by-catches of young Greenland halibut. (c) Greenland halibut also occur south of 61°N in Subarea 1. Whether Greenland halibut in these areas are part of the same biological resources as those between 61°N and 70°N is unknown. Also estimates of biomass of Greenland halibut in these areas are unavailable. It is therefore advised that investigations into these matters be considered before assuming that the estimates of abundance of Greenland halibut in the 61°N to 70°N region is truly reflective of most of this resource in the management zone of Subareas 0 and 1. (d) It was further noted that while the area north of 70°N may not be of much concern with regard to roundnose grenadier, so little is known of the distribution of the species that surveying only to a depth of 1,500 m may be an important limitation.

STACREC considered that, in order to resolve such questions, a major research effort would be required for at least 3-5 years and that a multinational approach should be pursued. STACREC

further noted that a research proposal for shrimp in these same areas was made at the January 1987 Meeting (SCS Doc. 87/01, page 20) and the possibility of combining aspects of these research efforts should be explored.

4. Acknowledgements

There being no further business, the Chairman thanked the rapporteurs and other participants for their assistance and cooperation and the NAFO Secretariat for their usual efficient service during the meeting.

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

Chairman: J. S. Beckett Rapporteur: R. G. Halliday

The Committee met at the Lord Nelson Hotel, Halifax, Nova Scotia, Canada, on 17 and 18 September 1987. In attendance were J. S. Beckett (Chairman), R. G. Halliday (Canada), S. Kawahara (Japan) and V. A. Rikhter (USSR). The Chairman of the Scientific Council (J. Messtorff) and the Assistant Executive Secretary (V. M. Hodder) also attended. M. G. Larraneta (EEC) attended the second session on 18 September.

1. Editorial Matters

a) Interim Editorial Arrangements

All Associate Editors have indicated that the present arragement whereby they take full responsibility for editing Journal papers is working satisfactorily. It was agreed that this can continue at least until June 1988.

b) Invitational Papers

The Chairman indicated that he was still in the process of contacting potential authors of reviews on topics suggested at the June 1987 Meeting. As yet, no commitments have been obtained. New new suggestions for reviews have been made but additional proposals would be welcomed.

c) Scope of the Journal

To meet concerns that the present description of Journal scope does not clearly allow for review papers to be published, STACPUB recommends that the description of Journal scope (as stated on the inside front cover of Vo. 7(1) be revised to read (in part) "Both practical and theoretical papers are eligible for consideration, as are review articles of particular relevance to the work of ICNAF and NAFO."

2. Review of Papers for Possible Publication

a) Review of porposals from past meetings

Additional papers have been received since June 1987 from among those selected for publication in 1985 and 1986, but authors' response for those years remains below earlier levels. A good response has occurred in relation to June 1987 Meeting selections, however, 5 of 11 papers having been received to date.

b) Proposals for publications

The Committee reviewed SCR documents that were submitted since June 1987 and proposed that the Assistant Executive Secretary contact authors of the following documents, expressing the Council's interest in having them submitted in suitable form for publication in the Journal or Studies: SCR Doc. 87/71, 72, 73, 74, 75, 79, 80, 81, 82, 86, 87, 88, 89, 93, 94 and the author of SCR Doc. 87/75 is encouraged to consider inclusion of the most important elements of Doc. 87/76 and 77 in his version for publication of Doc. 87/75. Consideration of SCR Doc. 87/98 was deferred until June 1988.

3. Microfiche of NAFO Documents

The situation converning sales of ICNAF microfiche sets has not improved significantly since June 1987 and it was agreed to again defer the issue of microfiching NAFO documents.

4. Other Matters

a) Status of scientific publications

Volume 7(2) of the Journal of Northwest Atlantic Fishery Science still requires acceptance of several more papers before publication. A review of outstanding manuscripts indicates that 2-3 papers can be expected within about one month. It is proposed that the volume be published before the end of the calendar year prodided that at least 2 more papers are forthcoming.

Volume 12 of NAFO Scientific Council Studies is scheduled for publication in March-April 1988 and 5 papers are already available for inclusion.

Volume 35 (for 1985) of the Statistical Bulletin still awaits submission of the USA STATLANT 21B report, now 14 months late.

5. Acknowledgements

The Committee was grateful that Mr. Hodder could be available to assist in its work.

## APPENDIX IV. DECISION OF THE FISHERIES COMMISSION ON ESTABLISHMENT OF AN ANNUAL SCIENTIFIC PROGRAM

After considering the Report of the ad hoc Working Group which was established to prepare a proposal on the need for improving scientific knowledge of the fish stocks in the Regulatory Area, the Fisheries Commission adopted the following (see FC Doc. 87/13):

1. The Fisheries Commission has decided on the establishment of an Annual Scientific Program in order to improve scientific knowledge on the status of the fish stocks in the Regulatory Area. This Program, which shall be adopted by the Fisheries Commission on the basis of the recommendations from the Scientific Council, shall determine those stocks which require priority attention.

2. With a view to the establishment of the first Annual Scientific Program at the 1988 Annual Meeting, the Fisheries Commission hereby requests the Scientific Council to prepare a report for that meeting. This report should analyse the level of scientific information available on the stocks in the Regulatory Area, identifying the shortcomings in available data. This analysis should also include comments on how such information was collected for each fleet component and whether it meets the level required for the purposes of the assessment of the stocks. The report should furthermore review the means available for collecting the necessary data, including the implications involved in each approach.

3. A working group shall draw up, for the consideration of the Fisheries Commission at the 1988 Annual Meeting, the requirements for the implementation of the relevant scientific research and sampling activities.

4. The results of the Annual Scientific Program shall be evaluated by the Scientific Council which shall submit a report of its findings to the Fisheries Commission. This report shall incorporate the Scientific Council's recommendations for the subsequent Annual Scientific Programs.

APPENDIX V. AGENDA FOR SCIENTIFIC COUNCIL MEETING - SEPTEMBER 1987

I. Opening (Chairman: J. Messtorff)

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

II. Fishery Science (STACFIS Chairman: W. R. Bowering)

1. Report of Special Session on "Biology of Demersal Resources of the North Atlantic Continental Slopes, with Emphasis on Greenland Halibut and Grenadiers" (held on 9-11 September 1987 with W. R. Bowering as Convener), which involved the following topics:

   a) General Theme

   The primary intent of the Special Session is to elicit research papers on Greenland halibut and grenadiers, which have established commercial potential but about which relatively little is known. Although the principal area of interest is the North Atlantic Ocean, papers on Greenland halibut in the North Pacific Ocean are welcomed because the species is the same in both regions. The scope of the Special Session also includes unexploited species which occupy the same or greater depths on the continental slopes of the North Atlantic. They may include benthic invertebrates, but the well-studied species, such as Atlantic cod and the redfishes, are excluded even though they are distributed along the upper slope areas. Papers which deal with oceanographic and topographic features of the slope areas, especially in relation to the biology of deepwater species, are also invited.

   b) Specific Topics

   i) Oceanographic and topographic features of North Atlantic continental slopes.
   ii) Spatial and temporal distribution and abundance of deepwater species.
   iii) Biological characteristics (age and growth, sexual maturity, food and feeding, other relevant features).
   iv) Species interactions (predator-prey relationships among deepwater species).

2. Stock Assessments

   a) Yield-per-recruit of cod in Div. 3NO
   b) Shrimp stocks in Subareas 0+1 and off East Greenland (advice for 1988)

3. Gear and Selectivity

   a) Escapement and selectivity problems associated with use of strengthening ropes, splitting straps and codend floats.

4. Future Special Sessions

   a) Outline for Special Session in September 1988 (to be prepared by the Convener, J. C. Rice)
   b) Further consideration of proposed theme for Special Session in September 1989.

5. Other Matters

III. Research Coordination (STACREC Chairman: R. Dominquez)

1. Report of Working Group on Survey Design Procedures

2. Review of Information on Conversion Factors

3. Survey Requirements for Greenland Halibut and Roundnose Grenadier in Subareas 0+1 (SCS Doc. 87/21, App. IV, Annex 2)

4. Other Matters

IV. Publications (STACPUB Chairman: J. S. Beckett)

1. Editorial Matters (including invitational papers)

2. Review of Papers for Possible Publication

   a) Review of proposals from past meetings
   b) Contribution to present meeting

3. Microfiche of NAFO Documents

4. Other Matters

V. Adoption of Reports

1. Provisional Report of Scientific Council, June 1987

2. Committee Reports of Present Meeting

VI. Review of Future Meeting Arrangements

1. Mid-term Meeting for Shrimp (if needed)

2. June 1988 Meeting (confirmed dates are 1-16 June 1988)

3. Annual Meeting (6-10 September 1988)

4. Special Session on Changes in Environmental Conditions (12-14 September 1988)

5. Tentative dates for June 1989 Meeting (7-20 June 1989)

VII. Other Business

1. Review of STACPUB Membership

2. Role of Assistant Executive Secretary in the Work of the Scientific Council

3. Identification of Deficiencies in Fisheries Data for the Regulatory Area and Suggestions on the Means for Collecting the Necessary Additional Data.

VIII. Adjournment