Northwest Atlantic Fisheries Organization

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SCIENTIFIC COUNCIL MEETING - SEPTEMBER 1997

Report of Scientific Council, Annual Meeting, 7-19 September 1997

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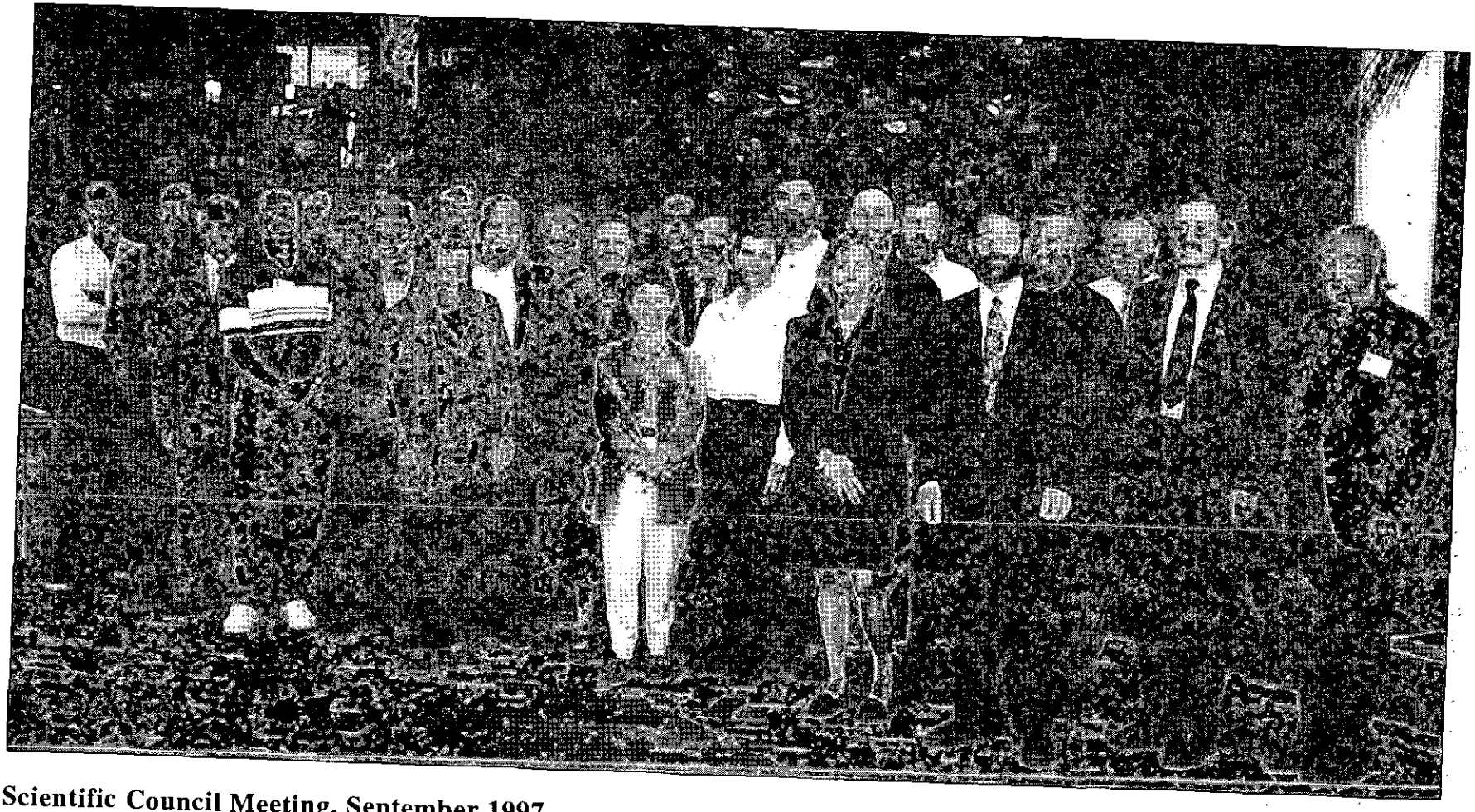


Scientific Council Meeting, September 1997

(*From left to right*): D. Parsons, W. R. Bowering, V. Rikhter, D. Power, D. Carlsson, D. Rivard, D. Briand, U. Skuladottir, H.-P. Cornus, E. deCardenas, B. Atkinson, M. L. Godinho, S. Junquera, A. Avila de Melo, A. Vazquez, J. Morgan, L. Motos, C. Jones, M. Showell, B. Brodie, F. Serchuk, M. Stein, A. Nicolajsen, V. Shibanov, R. Mayo

REPORT OF SCIENTIFIC COUNCIL

Annual Meeting, 7-19 September 1997

Chairman: W. R. Bowering Rapporteur: T. Amaratunga

I. PLENARY SESSIONS

The Scientific Council met at the Hotel Newfoundland, Cavendish Square, St. John's, Newfoundland, Canada, during 7-19 September 1997. Representatives attended from Canada, Denmark (in respect of Faroe Islands and Greenland), European Union (Germany, Portugal and Spain), Iceland, Japan, Norway, Russian Federation and the United States of America. The Assistant Executive Secretary was in attendance. The Scientific Council Special Session, the Symposium on 'What Future for Capture Fisheries' was held during 10-12 September 1997 at the Marine Institute of the Memorial University of Newfoundland, St. John's, Newfoundland.

The Executive Committee met briefly before the opening to discuss the plan of work.

The opening session of the Council was called to order at 1015 hr on 7 September 1997.

The Chairman welcomed everyone to Newfoundland, to this 19th Annual Meeting of NAFO. The Assistant Executive Secretary was appointed rapporteur.

In considering the agenda, it was noted that the meeting during 7-9 September 1997 will be devoted to considerations of shrimp in Div. 3M. STACFIS would then carry out the assessment and the Council would develop and adopt the advice and recommendations before adjourning for the Special Session of 10-12 September 1997 at the Marine Institute. Subject to availability of time, aspects of the Precautionary Approach with respect to shrimp in Div. 3M would also be undertaken. The Council noted all other agenda items would be undertaken during the 15-19 September 1997 sessions. The agenda was accordingly **adopted**.

The session was adjourned at 1030 hr on 7 September 1997.

The Council reconvened at 1530 hr on 9 September 1997 to consider the STACFIS assessment report and provide advice for shrimp in Div. 3M. The report was finalized and the session was adjourned at 1715 hr on 9 September 1997.

The Executive Committee met briefly on 15 September 1997 to review work progress and the work plan, before the Council convened at 1025 hr. The Chairman proposed that the Standing Committee reports be finalized on 17 September 1997. The Council then proceeded to consider outstanding agenda items, during this session and subsequent sessions convened through 16-18 September 1997, along with special requests from the concurrent General Council and Fisheries Commission sessions.

The concluding session was called to order at 0915 hr on 19 September 1997. Noting the Council had considered and **adopted** the Reports of the Standing Committees STACFIS and STACREC on 18 September 1997, the Council considered and **adopted** the STACPUB Report (STACFEN had no agenda at this meeting). The Council then **adopted** the Scientific Council Report of this meeting.

The meeting was adjourned at 1015 hr on 19 September 1997.

The reports of the Standing Committees are appended as follows: Appendix I - Report of Standing Committee on Fishery Science (STACFIS), Appendix II - Report of Standing Committee on Research and Coordination (STACREC), Appendix III - Report of Standing Committee on Publications (STACPUB). The report of the 1997 Symposium on 'What Future for Capture Fisheries' is presented at Annex 1 of the Scientific Council Report, while Annex 2 gives the announcement of the 1998 Special Session, the Symposium on 'Variations in

Maturation, Growth, Condition and Spawning Stock Biomass Production in Groundfish'.

Brief summaries of the Standing Committee Reports and other matters considered by the Scientific Council are given below in Sections II-X. The Agenda, List of Research (SCR) and Summary (SCS) Documents, and the List of Participants of this meeting are given in Appendix IV, V and VI, respectively.

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

1. Opening

The Council accepted the report of STACFIS as presented by the Chairman, R. K. Mayo (USA). The Council noted that the Committee addressed the assessment of shrimp in Div. 3M and other requests referred to it by the Council.

2. Matters Related to Stock Assessments

a) Assessment of Shrimp in Division 3M

The Council noted that STACFIS evaluated the status of shrimp in Div. 3M as reported in the STACFIS Report in Appendix I. The agreed Council summary and conclusions are presented in Section V of this report.

3. Arrangements for Conducting Stock Assessments in 1998

a) Update list of Designated Experts

The Council concurred with the changes proposed by STACFIS to the list of Designated Experts, and requested the Secretariat to confirm the availability of the nominees as proposed by STACFIS.

4. Other Matters

a) Review of SCR and SCS Documents

The Council noted the review of one SCR Document deferred from the June 1997 Meeting dealing with closed areas as a management tool, one SCR Document describing biomass of shrimp in Div. 3L, and one SCR Document evaluating the reproductive potential of shrimp in Div. 3M. One SCS Document, describing trends in biomass of 14 important commercial species in Subareas 5 and 6 was also reviewed.

b) Non-traditional Resources

The Council noted that the Committee reviewed information on non-traditional resources and endorsed the STACFIS **recommendation** that the data regarding non-traditional species derived from research vessel surveys should be examined, and that analyses be undertaken to evaluate trends in biomass and distribution of these species, and that these results be reported at the June 1998 Meeting of the Scientific Council.

c) Other Business

The Council noted that the Committee discussed arrangements for coordinated exchange of length composition data for shrimp in Div. 3M, and endorsed the STACFIS **recommendation** that the information on catch and length composition data with respect to shrimp in Div. 3M be sent from each national laboratory to the Designated Expert in an agreed format at least 15 days before the next assessment meeting.

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

1. **Opening**

The Chairman welcomed the report of STACREC as presented by the Chairman, D. Power (Canada), observing that all matters referred to it by the Council were addressed.

2. **Fisheries Statistics**

a) **Progress Report on Secretariat Activities in 1997**

With respect to concerns over delays in reporting of STATLANT 21A and 21B data, the Council was pleased Contracting Party heads of delegations were advised through the 24-26 June 1996 Meeting of STACTIC. The Council agreed that it was timely to take a direct approach in requesting data from national offices. The Council endorsed the STACREC **recommendation** that each Contracting Party select a representative at the Scientific Council who will ensure their respective national statistical agencies are notified to submit STATLANT data as outlined in the Rules of Procedure, and that the Secretariat be informed of this choice.

The Council noted that the USA STATLANT 21B data for 1993 had recently been submitted, but data from the Faroes Islands were still not available. As this was the only remaining outstanding submission for 1993, the Council agreed that in the event the Faroe Islands data cannot be obtained in the near future, the Secretariat proceed with the publication of the 1993 Statistical Bulletin.

b) **Update on the Establishment of NAFO Internet Website**

The Council was pleased that a preliminary NAFO website has been established by the Secretariat. The Council agreed that financial and technical support for these developments and their associated upkeep could be considerable, and, accordingly endorsed the STACREC **recommendation** that the Secretariat prepare a report for the June 1998 Meeting outlining further development of the website, including any anticipated resource requirements for development and maintenance of the web site. The Council also agreed a demonstration of the website be provided to the General Council so that delegates can be fully informed as to the potential use of this website. The Council concurred that after consideration of user requirements by STACFEN, STACPUB and STACREC, as well as the financial constraints, policies for future expansion of website contents would have to be developed.

c) **Definitions of Fishing Effort**

The Council noted that no submissions had been received to revise or update current definitions of fishing effort and agreed that a more direct contact with experts be undertaken to ascertain the suitability of the current definitions for inclusion in the *FAO handbook of fisheries statistics*. The Council, however, recognized the potential implications of changes in the definition of fishing effort to the users.

3. **Review of SCR and SCS Documents**

The Council noted that STACREC reviewed and reported on two documents.

4. **Other Matters**

a) **Division 3M Shrimp Survey - Coordination for 1998 and Onwards**

The Council agreed with STACFIS and STACREC on the importance of directed, annual surveys

for shrimp in Div. 3M, and accordingly endorsed the **recommendation** that the following proposal be forwarded to the Fisheries Commission as it relates to logistics, coordination and standardization:

(i) The survey should be carried out with the joint effort of shrimp biologists.

(ii) The survey would require 10-12 fishing days, preferably in July, and conduct 60 daytime stations that would cover a depth range from 150-600 m using a Campelen 1800 trawl with a 13 mm liner.

b) **Enhancement of Data Summaries**

The Council noted the discussion of STACREC related to the possibility of the Secretariat recording additional data summaries and maintaining basic data from stock assessments in a manner similar to ICES, and that an *ad hoc* Working Group had been set up to discuss the various issues and present a report to STACREC when finalized.

c) **Review of Survey Activities in 1996 and Surveys Planned for 1997**

The Council noted the inventory of USA surveys conducted in 1996 and planned for 1997 was presented.

d) **CWP Intersessional Report**

The Council noted there had been progress on planning an intersessional meeting for early-1998 related to reconciling NAFO Statistical data with those of other international agencies and, accordingly, endorsed the **recommendation** that the Assistant Executive Secretary attend this CWP Intersessional meeting to address all issues of interagency harmonization of data, and that the results be made available at the June 1998 Meeting of the Scientific Council.

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

1. **Opening**

The Council welcomed the STACPUB report as presented by the Chairman, H. P. Cornus (EU-Germany), and made specific note of the following items.

2. **Review of Scientific Publications**

a) **Status of Papers from September 1997 Symposium**

The Council was pleased with the success of the Symposium on 'What Future for Capture Fisheries'. The Council agreed with STACPUB that the proceedings be published very shortly as a hard covered book volume of the NAFO Journal with the Convener H. Lassen (EU-Denmark) and Assistant Executive Secretary, T. Amaratunga, as editors.

b) **Status of Publication on Div. 3M Shrimp**

The Council was pleased with the progress on this invited scientific report on shrimp in Div. 3M.

c) **Other Publications**

The Council encouraged the publication of the proceedings of the 1995 Symposium on 'The Role of Marine Mammals in the Ecosystem' as soon as possible.

3. **Promotion and Distribution of Scientific Publications**

a) **Invitational Papers**

The Council noted STACPUB discussion on invitational papers, and encouraged this approach for the promotion of the Journal.

b) **Considerations of ASFA Abstracts**

The Council was pleased to note some steps were being taken to place SCR Document abstracts in the ASFA series.

c) **NAFO Website Status Report**

The Council was pleased at the quality of the new NAFO website and the short time-frame in which it was achieved. The Council was pleased the inaugural presentation was made at the 10-12 September 1997 Symposium on 'What Future for Capture Fisheries'. The Council welcomed the steps being taken by STACPUB (and STACREC) to develop the present (preliminary) NAFO website to suit the Scientific Council requirements.

d) **Possibilities of Using New Technologies for Publications and Distribution**

The Council endorsed the STACPUB recommendation that poster displays should be set up during the Annual Meetings as a method of providing current scientific information to the delegates.

4. **Review of Papers for Possible Publication**

The Council noted STACPUB reviewed and nominated 1997 papers for consideration for the Journal and Studies.

5. **Other Matters**

The Council agreed authors of papers on Precautionary Approach presented at the June 1997 Meeting should be invited to submit their papers for publication consideration.

The Council encouraged the proposal to publish STACFEN invited lectures. It was also agreed that other Standing Committees should be encouraged to have invited speakers.

The Council was pleased with the response to STACPUB nominated papers of June 1997.

The Council endorsed the STACPUB recommendation that incoming Chairmen should attend STACPUB meetings before taking office.

The Council noted that ICES has planned an environmental meeting for the year 2001 and endorsed the STACPUB view that NAFO Scientific Council participation is important, and should be encouraged.

V. MANAGEMENT ADVICE AND RESPONSES TO SPECIAL REQUESTS

1. Fisheries Commission

Further to the scientific advice and recommendation provided by the Council during its 4-19 June 1997 Meeting, the Council had agreed to conduct the assessment of shrimp in Div. 3M during this meeting.

a) **Advice for 1998, Shrimp in Division 3M**

The agreed Council recommendation for shrimp in Div. 3M are presented in the following summary.

Shrimp in Division 3M

Background: The fishery for shrimp on Flemish Cap began in April, 1993, although occurrence of shrimp in the area has been known for many years.

Fishery and Catches: This multi-national fishery produced provisional catches as follows:

Year	Catch (tons)
1993	28 000
1994	24 000
1995	33 000
1996	51 000
1997 (to August)	17 000

The estimate of catch to the end of 1997 is about 25 000 tons.

The proportion of males in the catches increased such that they dominated the catches since 1994.

The fishery was unregulated in 1993. Sorting grates and a related by-catch regulation were introduced in 1994. Effort regulations were implemented in 1996 and continued in 1997.

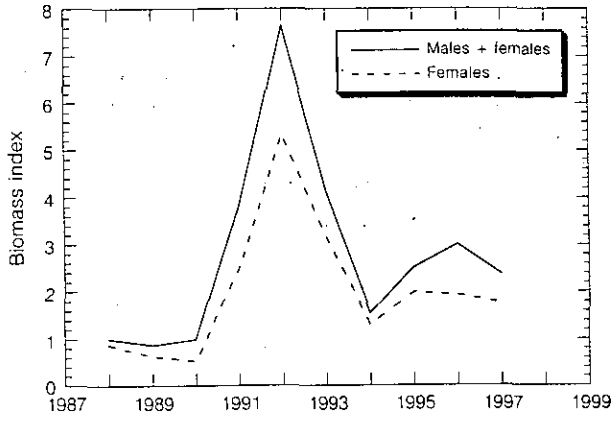
Data: Catch, effort and biological sampling data were available from the trawlers of several nations. A time series of biomass estimates was produced from catches of shrimp taken in EU groundfish surveys in Div. 3M from 1988 to 1997. Directed surveys for shrimp also were conducted in 1996 (Canada) and 1997 (Faroe Islands). Biological samples of shrimp were obtained during all surveys. Oceanographic data were obtained from Canadian surveys on Flemish Cap in the summers of 1993, 1995, 1996 and 1997.

Assessment: No analytical assessment was available and the fishing mortality is unknown. Evaluation of the status of the stock was based on the interpretation of commercial fishery data (catch, effort and catch rates), the time series of research biomass indices and biological data from both sources.

Commercial CPUE: The catch-rate data for the female component of the commercial catches indicate a decline between 1993 and 1997 by as much as 65%, despite a decrease in the size/age at sex change.

Recruitment: The 1988 year-class was strong, dominating in the surveys of the early-1990s and yielding high catch rates in the first year of the fishery. All year-classes produced since 1988 which have entered the fishery, except the 1993 year-class, have been much weaker. The 1993 year-class contributed substantially to the 1995 catches, dominated the fishery in 1996 and occurred in catches during the first half of 1997. The 1994 year-class was present in the catches taken in the second half of 1996 and in the autumn 1996 Canadian research survey. It also occurred in the 1997 catches and in the 1997 surveys by EU and Faroe Islands.

Biomass: Only indices of biomass were available from the EU surveys for the 1988-97 period. It is believed that these indices reflect the general changes in the age 3+ and female components of the stock over time.



State of the Stock: The 1988 year-class no longer contributes to the fishery which, in 1995, was largely dependent on the 1993 year-class. The continuation of a fishery which targets male shrimp as young as age 2 is undesirable because the harvest of males reduces future spawning potential. Data from both the fishery and research surveys in 1996 and 1997 showed that the 1993 year-class was much stronger than was evident in the 1995 assessment. Further, the 1994 year-class was stronger than expected in the 1996 assessment. The decline in catch rates of female shrimp from 1993 to 1997 is consistent with the results of the EU survey covering the same period. Both sources are considered representative of the trend in the spawning stock biomass.

Recommendations: Despite the strength of the 1993 year-class and the appearance of the 1994 year-class in late-1996 and 1997, concerns first expressed in 1995 for the continued decline of the spawning stock are still valid. Therefore, any fishing permitted in 1998 will likely be directed at what remains of the 1993 year-class and additional recruitment of the 1994 year-class. No projections of the remaining biomass for these year-classes in 1998 or recruitment of the 1995 year-class are available. A significant reduction in fishing intensity is necessary to arrest the apparent continued decline in the female component of the stock and to conserve males. Therefore, if a fishery is permitted in 1998, catches should be kept at the lowest possible level. Catches at the level projected for 1997 (less than half the 1996 catch) might not be low enough to halt the observed decline in the stock.

Special Comments: The substantial decrease in effort (and catch) between 1996 and 1997 is largely due to the Icelandic self-imposed quota of 6 800 tons in 1997 and possibly due to economic factors (low catch rates, small size of shrimp and low prices) for all fleets.

Redfish by-catches, which were high in 1993 and 1994, were reported to be very low in 1995, 1996 and 1997. It is not clear, however, if the reduction was due entirely to changes in bar spacing of sorting grates or to a reduction in redfish abundance.

In the absence of a time-series of directed research trawl surveys for shrimp, assessing the recruitment and predicting the exploitable stock is not possible.

Sources of information: SCR Doc. 97/2, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 95.

2. **Special Requests from Concurrent General Council and Fisheries Commission Meetings**

a) **Special Request from General Council**

The Council was requested by the General Council to advise on the following:

"Is it possible to catch any non-regulated species in the NAFO Regulatory Area without by-catch of regulated species? If the answer to this question is yes, the Scientific Council is asked to identify such fisheries.

To help guide the Scientific Council in this requests, the Committee notes that Annex I to the NAFO Convention and STACFAC Working Paper 97/7 indicates several species in the NAFO Regulatory Area which are not regulated.

Regulated species are considered here as those species managed by NAFO through moratoria, TACs or effort limitation".

With respect to the request, the Scientific Council advised that, in general, it would normally not be possible to conduct a directed fishery for non-regulated species in the NAFO Regulatory Area without a by-catch of some regulated species. The amount of by-catch will depend on species, abundance, gear and season of the fishery. The Scientific Council is not in a position to evaluate a more detailed reply.

b) **Special Request from Fisheries Commission**

With respect to STACTIC Agenda Item 8(a) on Compatibility and Applicability of Discard/Retention Rules, a question was raised regarding *"whether or not the Scientific Council currently takes discards into account when developing scientific advice. Specifically, STACTIC wishes to know whether, in the process of setting TACs, the Scientific Council estimates the amount of fish that is discarded and takes into account the mortality resulting from this practice , i.e. if discards in a fishery are likely to be 200 tons, is that number considered when setting the TAC?"*

When assessing resources and providing advice on TACs, the Scientific Council is concerned about total fishing mortality. In other words, all sources of fishing mortality including both retained and discarded fish are of importance. In the past, our ability to deal with all sources of fishing mortality was limited due to incomplete data. However, the situation has improved in recent years. This information is important for assessing the current status of the various resources. In addition, when advising on TACs, the Scientific Council is in essence advising on an acceptable level of fishing mortality. Thus, any advised TAC includes both retained and discarded fish.

The Scientific Council notes that the lack of information on discards could undermine its ability to estimate population size which is the basis to recommended TACs.

VI. REVIEW OF FUTURE MEETING ARRANGEMENTS

1. **Scientific Council Meeting on Northern Shrimp, November 1997**

The Council reconfirmed that the meeting on northern shrimp for the assessments of shrimp in Subareas 0+1 and shrimp in Denmark Strait, will be held during 14-18 November 1997 at NAFO Headquarters, 2 Morris Drive, Dartmouth, Nova Scotia, Canada.

The Council noted that the provisional agenda was circulated to Contracting Parties in accordance with Scientific Council Rules of Procedure, during this Annual Meeting.

2. **Workshop on Precautionary Measures**

The Council confirmed the agreed schedule for its 'Workshop on the Precautionary Approach to Fisheries Management' for 17-27 March 1998. The meeting will be held at NAFO Headquarters, 2 Morris Drive, Dartmouth, Nova Scotia, Canada. This meeting will include work on Saturday, 21 March 1998.

3. **Scientific Council Meeting, June 1998**

The Council agreed to schedule this meeting for 3-18 June 1998.

4. **Special Session and Annual Meeting, September 1998**

The Council noted it would meet during the Annual Meeting scheduled for 14-18 September 1998. This would be preceded by the Scientific Council Meeting during 6-8 September 1997, which includes Sunday, 6 September 1998, to address the assessment of shrimp in Div. 3M and the Symposium on 'Variations in Maturation, Growth, Condition and Spawning Stock Biomass Production in Groundfish', during 9-11 September 1998. The Council noted these meetings will be held in Lisbon, Portugal.

5. **Scientific Council Meeting, June 1999**

The Council at it meeting of 4-18 June 1997 set tentative dates of 2-17 June 1999 for this meeting.

VII. FUTURE SPECIAL SESSIONS

1. **Progress Report on Symposium of September 1998**

The Council was informed that the arrangement for the Symposium on 'Variations in Maturation, Growth, Condition and Spawning Stock Biomass Production in Groundfish' with co-conveners E. Aro (Finland), J. Burnett (USA) and M. J. Morgan (Canada), was continuing with the aim of issuing a second announcement in October 1997. This second announcement is expected to contain a list of invited speakers and a description of the structure of the Symposium and its theme sessions. The announcement will also serve as a call for papers from the scientific community.

2. **Review of Proposal for Special Session in 1999**

The Council had no update on the progress for the proposed international Symposium on Pandalid shrimp.

Considering that the proposal presented to the Council in June 1997 was comprehensive, the Council anticipates progress is as planned.

VIII. OTHER MATTERS

1. **Update on Precautionary Approach**

No new information was presented to the Council on the Precautionary Approach for discussion. However, upon the request of the Chairman of the Fisheries Commission, a detailed presentation using computer visual aids was made to the Fisheries Commission by the Vice-Chairman of Scientific Council, H.-P.Cornus (EU-Germany), based on the conclusions and recommendations from the Scientific Council Meeting of June 1997. The Council noted that the Fisheries Commission Report may reflect on further activities on the Precautionary Approach.

2. **Other Business**

a) **Report of Joint ICES/NAFO Working Group on Harp and Hooded Seals**

The Council was pleased to receive the Chairman's summary of the '*Report of the Joint ICES/NAFO Working Group on Harp and Hooded Seals*', held at ICES Headquarters 28 August-3 September 1997. Noting the complete report is of significant interest to the Council, and that the meeting schedule at this Annual Meeting did not permit adequate time for the review of the report, the Scientific Council agreed the report would be issued as a 1997 SCS Document, and be reviewed during the 3-18 June 1998 Meeting of the Council. The Chairman of the Scientific Council agreed to request the Chairmen of the Working Group to make the report presentation at the June 1998 Meeting.

b) **Council Observer to FAO Regional Shark Management Workshop**

The Head of Delegation of USA forwarded a letter received by him from the Center for Marine Conservation, inviting an observer from the Scientific Council to attend the FAO Northwest Atlantic/Gulf/Caribbean Regional Shark Management Workshop to be held in Sarasota, Florida, USA in December 1997. The Council supported the proposal that F. M. Serchuk, or another USA Member to the NAFO Scientific Council, attend the meeting as an observer. The Council looks forward to a report from the observer.

c) **Effort Information in Shrimp Fisheries**

The Council noted that two papers (STACTIC Working Paper 96/10 and 96/11) dealing with shrimp twin trawl dimensions and effort information from them, were brought to the attention of the Scientific Council by the Fisheries Commission from it September 1997 Meeting. The Council considered the matter in light of standardizing effort data. The Council reviewed the proposed guidelines for the measurements of the circumference of the shrimp trawls, and it was agreed that the method was valid and can be used to provide additional information for the standardization of effort in the shrimp fisheries.

IX. ADOPTION OF REPORTS

1. **Consideration of Report from the Symposium of 10-12 September 1997**

The Scientific Council Special Session, the Symposium on 'What Future for Capture Fisheries' with H. Lassen as convener (EU-Denmark), held at the Marine Institute of Memorial University of Newfoundland, St. John's, Newfoundland, was well attended with 112 participants, and generated stimulating thoughts toward the future. The Council endorsed the **recommendation** of the Symposium that the proceedings be published in a book form.

The Council reviewed and **adopted** the Report of the Symposium as presented. The report is given in Annex 1 of this report.

The Council extend a special appreciation to the convener, H. Lassen, and the Marine Institute's Hugh Miller (previous Associate Executive Director) and Gerald Anderson (Development and Planning Coordinators) and the various Department personnel who assisted in making this Symposium the success it was.

2. **Committee Reports of Present Meeting**

The Council at its session on 18 September 1997 considered and **adopted** the reports of its Standing Committee on Fishery Science (STACFIS) and Standing Committee on Research Coordination (STACREC). The Council at its concluding session on 19 September 1997, **adopted** the report of its Standing Committee on Publication (STACPUB). These reports are given in Appendix I, II and III, respectively. It then **adopted** its own Report of Scientific Council, 7-19 September 1997 Meeting.

X. ADJOURNMENT

There being no further business and noting that this meeting will end his term as Chairman, the Chairman thanked the participants for their support during his term and in particular during this meeting. He was particularly thankful to the Executives of the Standing Committees for their able assistance and support during the past 2 years. After thanking the Secretariat for their help, the meeting was adjourned.

NAFO Symposium 1997 in session at the Marine Institute of Memorial University

ANNEX 1. REPORT OF THE SYMPOSIUM

WHAT FUTURE FOR CAPTURE FISHERIES
A Shift in Paradigm: Visioning Sustainable Harvests from the Northwest Atlantic in the Twenty-first Century

The Symposium on 'What Future for Capture Fisheries', with Mr. H. Lassen (EU-Denmark) as convenor, was held during 10-12 September 1997 at the Marine Institute of the Memorial University of Newfoundland, St. John's, Newfoundland, Canada. There were 112 participants from Belgium, Canada, Denmark, Faroe Islands, Germany, Greenland, Italy, Iceland, Japan, Norway, Portugal, Republic of Korea, Russia Federation, Spain, United Kingdom and United States of America.

The meeting was opened by W. R. Bowering (Canada) Chairman of the Scientific Council. The following report prepared by the convenor was presented to the Scientific Council.

Introduction

The Symposium considered the historic and present state of fisheries from several angles with a view to what is in store for the future. There was general concern for the state of the stocks, as has been reported in many other fora, and a recognition that the fisheries management policies need to be changed. The expectation was that exploitation pressure and fleet capacity will decline in response both to the internal restraints in the fishing sector and the external political pressures, for example those exerted by environmentalist groups. There was, however, a general optimistic expectation that the fishing industry will be able to adapt to these changed conditions and that an economically viable fishing sector will continue into the future. The exploitation pressure should be within sustainable limits.

The Symposium was structured into three key-note presentations and five theme sessions followed by a concluding discussion (see attached program).

Keynote 1: L. S. Parsons (Canada) reviewed the NAFO model of international collaborative research, management and cooperation. He noted that the recent introductions of international conventions which guide the exploitation of marine resources have placed new challenges to NAFO, but in his review of the history emphasized that NAFO (and its predecessor ICNAF) had been able to adapt to a constantly changing world of fisheries management. He also noted that NAFO's efficiency had varied through its life time, and concluded on an optimistic note that the last few years had seen progress towards more effective management, control and enforcement.

Keynote 2: M. B. West (USA) presented a review of the recent changes in the international legal structure for fisheries management of marine resources. The basis for these were the revised policies of the UN agreement of the conservation and management of straddling fish stocks and highly migratory fish stocks and the agreement to promote compliance with international conservation and management measures by fishing vessels. She emphasized the impact these conventions will have on high seas fishing in the future, and recognized a definitive need and a political willingness to change the present fisheries management policies.

She expected a decrease in the exploitation pressure as these conventions are adopted by a sufficient number of nations in order to become binding and hence implemented by international communities. She highlighted the political requirement for a more holistic approach to fisheries management including ecosystem considerations.

She emphasized the role NAFO will have in this process, not only in respect to management of stocks in the Convention Area but also as a platform for political signals. These signals include in particular the responsibilities of being a member of a regional fisheries management body and the need for both transparency and equity in the decision process.

Keynote 3: H. Lassen (EU-Denmark) presented an overview of the elements in the decision making process and discussed the interplay between these elements and the four sub-systems (biology, economy, social structures and technology) of fisheries. Like the two previous speakers, he recognised the influence of political forces outside fisheries on the future development of the fishing sector, in particular the constraints on future exploitation levels. He presented some trends he found to be significant for the understanding of the future fisheries. These trends included technological developments towards more selective gears, social and economic changes in the sector as a result of similar changes in other parts of the society, e.g. trends of vertical and horizontal aggregation of enterprises. In particular he recognised the effects of political pressure of the environmentalist on changes in fisheries.

Session 1: **History of Fishing the Northwest Atlantic** This session consisted of two presentations. First, the 500 years of history in the Northwest Atlantic were traced showing how the fishery had developed in different areas. The period after WW2 saw many drastic changes and the yield reached levels which apparently could not be sustained in the longer run, although the history of fishing suggested a fairly stable ecosystem in the area. A number of historical crises were identified but these seemed to be local compared to the situation of today. The history also revealed the diversification strategy (from cod to other species) used in the fisheries to live through these crises.

The historic review of the fishery was continued with an account of the management in the Northwest Atlantic after WW2, particularly referring to the establishment of ICNAF in 1949 which was replaced by NAFO in 1979. The discussion highlighted the phases of effectiveness and periods with significant problems of the two organizations. The question was raised whether the present fisheries discussions and organization of the co-ordination of research was adequate to deal with the present problems.

Session 2: **Management Approaches - Caring for Future Resources** This session on management approaches consisted of two presentations. The trends in international co-operation in fisheries - monitoring, surveillance and control, and their future implementation were discussed particularly in the light of the introduction of the precautionary approach in the management decisions to come. It was noted there are a number of provisions which NAFO would have to implement in the near future. In comparison to its predecessor ICNAF, NAFO was only responsible for managing a relatively small portion of the stocks existing within the Convention Area, these being stocks in the Regulatory Area (i.e. outside the Canadian EEZ, those straddling the Coastal and Regulatory Areas and those within the EEZ for which Coastal States request advice). The NAFO enforcement and inspection measures being applied in the Regulatory Area are faced with problems similar to those being experienced elsewhere in the world. The view that there is a particular need to enlarge the scientific basis for management decisions with economic and social studies was expressed.

Noting that NAFO enforcement had been improved in recent years, attention was drawn to the insufficient scientific data being provided for stock assessment purposes. It was stated that cost-effective ways would have to be found to improve the scientific database and ensure wider member-country participation in the NAFO enforcement and inspection scheme. Solving both of these problems would be easier through continued international cooperation.

In one presentation it was predicted that future fisheries would be characterised by 1) reduced level of fishing capacity, 2) higher value of fishery products, 3) greatly diversified fisheries worldwide, 4) very low tolerance for violation of rules, and 5) low maintenance management systems. This expectation was based on the changed political situation as discussed in the Keynote presentation by M. B. West. The trends were illustrated by a review of the New England groundfish fisheries.

Session 3: **Fisheries Research - Perspectives for the Twenty-first Century** Four presentations were made on fisheries research. Reviewing the future fisheries research, a number of trends were identified particularly in future technologies including improved survey methods and their precision, improved genetic technology leading to a detailed understanding of stock structure and integrating environmental signals in the assessment procedure. There was a special plea for better understanding of the stock productivity and it was implied that the models used at present were lacking in precision. It was suggested that the technologies developed for scientific purposes would have a wider application, e.g. genetic identification of the stock origin of a fish could be used in control of closed areas. It was recognized that environmental and climate changes have obvious impacts on the productivity of the fish stocks. The availability of long-term time series of environmental data could possibly be used directly in stating expected good and bad recruitment periods.

The proposed concurrent session on case studies was considered as a sub-session 3A. This session dealt with six case studies on New England stocks and fisheries (see program), from a USA Sea Grant Project.

Session 4: Sustainable Livelihood for the Coastal Community This session considered three presentations on sustainable livelihood. It was recognized the fishery dependent communities are under pressure everywhere, particularly around the North Atlantic. This was exemplified by a review of the situation in Galicia, Spain. The impact from increases in world demand for particularly fresh fish on the fishing communities was reviewed. Further the role of the community in the decision making process in administrating the marine resources was discussed. It was recognised that the communities have a definite need for obtaining better control as the basis for their livelihood and that this need can only be met through organizational changes both outside and inside the management systems.

In reviewing the potentials of increased aquaculture production, it was recognised that these were limited and would not present a threat to the capture fisheries but rather a supplement or opportunity to the coastal communities. There are problems associated with aquaculture production, such as pollution, but it was considered that technology to deal with these problems would be available. It was concluded that while aquaculture can offer important advantages of controllability - thereby reducing the variability associated with capture fishing - and not the least by market adaptation, the future may see greater integration of aquaculture and marine fisheries sector and greater appreciation of their comparative roles.

Session 5: The Future for Capture Fisheries This session of six presentations took a look into the future from different angles. It was shown that the world demand for fish products is increasing while the future fish supplies are uncertain - estimates were presented ranging from about 74 to 114 million tons from capture fisheries. One of the presentations looked into such estimations in geographic detail. However, it could not identify any major areas with very high unused potentials. It was stated that the increased demand for fish will be most for high value products. This increased demand will lead to increased prices and this may lead to a point where it results in a decrease of fish consumption per capita in the world's most important fish market - Japan. Taking the year 2010 as a projection year, the world supply deficiency was estimated to be 10-40 million tons under current demand situation. Therefore fish could be expected to become a luxury item fetching high prices. It was emphasized that such analyses of changes in the demand for fish and elasticity of price cannot be discussed in isolation because fish as a commodity competes with other products such as chicken and meat.

Starting from a market oriented point of view, it was clear that the increased demand for high value products and the shortage of fish supplies would be met by food technological improvements making better use of the fish, and using more of the fish for high value products than is the case today. It was illustrated how such improvements required management of the entire chain from catches to dinner table. There was a short introduction to such systems already established. Also the globalisation of the world fish trade was emphasized, and along with the diversification of the interests in the processing industry, the vertical integration would be more difficult.

A view to the future fisheries for the next 25 years was presented. It was pointed out that the Biodiversity Treaty was being overlooked although it was likely to have a major impact on the development of the political climate. It was suggested that the UN conference in the year 2010 would once more revisit the use of the sea bed resources, and a trend indicator may be the number of marine nature reserves which had already become an integral part of fisheries management. Finally, the Symposium was told about the class of highly efficient small vessels which had been developed with very selective gears and, how this had allowed new species to be part of the human food.

It was also suggested that the future management systems need to be reviewed in the light of the need for the fishing communities to ensure their livelihoods. There could be a need for economic efficiency in the industry and political pressure to attain sustainable exploitation. A review showed the possibilities for use of co-management in fisheries. It also emphasized the need for more transparency in the decision process.

Concluding Discussion

The Chairmen of each session summarized the presentations and the conclusions. This was followed by a number of comments which essentially impressed the need for a reduction in the present exploitation pressure to ensure viable fish stocks for the future. It was realized that the picture included many trends, several of which were conflicting and that several future scenarios could be constructed. Particularly the possibilities of using right based fisheries management systems were raised. It was recognised that this had, to date, met with opposition from the industry.

The Convener concluded the Symposium by suggesting a number of trends which could be elements of the future fisheries:

Reduced exploitation pressure,

More transparency in all elements of the management process including the stock assessments,

Increased supplements in fish supply from aquaculture,

Improved fish capture technology leading to more selective gears and possibly to pre-catch estimation of species and size composition,

Taking climate fluctuation into account in the assessments of stocks,

Much more efficient vessels (large vessel with large ranges, small highly efficient vessels),

A need for a fisheries management science allowing predictions of fleet reactions to restrictions and to biological changes.

Other Symposium Events

The tour of the Marine Institute, particularly to the ship-bridge simulator and the food technology laboratory were of interest to the participants. The demonstration of research and development of gear technology in the flume tank was especially informative. Special thanks were extended to the Marine Institute for providing excellent facilities and personal attention.

The participants were also pleased to see the videos of some interesting historic fisheries activities in the Northwest Atlantic. Thanks were extended to the Fisheries Museum of the Atlantic, Nova Scotia, Canada for these.

There was also the special event of the inaugural presentation of the NAFO Website. This and other websites from institutes in Canada, Europe and USA, and poster displays provided an extension to the activities of the Symposium.

In conclusion, the Symposium was considered a success and it was **recommended** that *the proceedings of the Symposium be shortly published in a book form.*

Symposium Schedule

Wednesday, 10 September 1997

09:30-10:00	Welcome Opening comments by convener **Hans Lassen (Denmark)**	

OPENING SESSION

10:00-11:00	Keynote 1:	**Parsons, L. S.** *The NAFO model of international collaborative research, management and cooperation.*
11:00-11:15	Coffee/Tea	
11:15-12:15	Keynote 2:	**West, M. B.** *The legal frame within which capture fisheries will operate in the future - Development of UNCLOS 1982, Agenda 21 and FAO Code of conduct of responsible fishing.*
12:15-13:00	Keynote 3:	**Lassen, H.** *Sustainability - ecological impact from fisheries - the political environmental issue and how this may affect the future of capture fisheries.*
13:00-14:30	Lunch	

SESSION 1: History of Fishing the Northwest Atlantic

Chair: E. J. Sandeman (Canada)

14:30-15:05	1.1	**Lear, H.** *History of fisheries in the Northwest Atlantic - the 500 year perspective.*
15:10-15:45	1.2	**Anderson, E.** *The history of fisheries management and the scientific advice - the ICNAF/NAFO history from the end of World War II to the present.*
15:50-16:00		Session Discussion
16:00-16:30		Coffee/Tea

SESSION 2: Management Approaches - Caring for the Future Resources

Chair: E. Anderson (USA)

16:30-17:05	2.1	**Koster, H.** *Trends in international cooperation in fisheries - monitoring, surveillance and control.*
17:10-17:45	2.2	**Rosenberg, A.** *Controlling marine fisheries 50 years from now - satellite surveillance or a changed regime - can economy and biology cooperate.*
17:45-17:55		Session Discussion
18:00-19:30		Tour of Marine Institute including the ship-bridge simulator and the food technology laboratory.

Thursday, 11 September 1997

SESSION 3: Fisheries Research - Perspectives for the Twenty-first Century

Chair: W. R. Bowering (Canada)

08:30-09:05	3.1	**Godø, O.** *What can technology offer the future fisheries scientist - possibilities for obtaining better estimates of fish stock abundance by observations from the sea.*
09:10-09:45	3.2	**Taggart, C.** *What can technology offer the future fisheries scientist - laboratory and aquaria technology - possibilities for obtaining better understanding of the stock structure (eg DNA technology).*
09:50-10:25	3.3	**Ulltang, O.** *Where is fisheries science heading - special emphasis on fish stock assessment work.*
10:30-11:05	3.4	**Stein, M.** *Integrating fisheries observations with environmental data - towards a better understanding of the conditions for fish in the sea.*
11:05-11:25		Coffee/Tea

SESSION 3A: Chair: J. T. DeAlteris (USA)[+]

11:25-11:45	C-1	**Spencer*, P. D., and J. S. Collie.** *The effect of nonlinear predation rates on rebuilding the Georges Bank haddock (Melanogrammus aeglefinus) stock.*
11:45-12:05	C-2	**Kinani*, A., and J. T. DeAlteris.** *An analysis of catchability by gear, area and time in the New England groundfish fishery.*
12:05-12:25	C-3	**Lazar*, N., and J. T. DeAlteris.** *Indirect estimation of gillnet selectivity: case study of the New England groundfish gillnet fishery.*
12:25-12:45	C-4	**Grogan*, C. S., and J. T. DeAlteris.** *An analysis of yield and spawning stock biomass per recruit for eight groundfish species in the New England waters as a function of fishing mortality and gear selection processes.*
12:45-14:00	Lunch	
14:00-14:20	C-5	**Sutinen*, J. G., and J. Agar.** *Species selection and economic performance in the New England groundfish fishery.*
14:20-14:40	C-6	**Hennessey*, T. M., and M. Healy.** *The collapse of fisheries resources in the United States and Canada: The case of New England and Nova Scotia.*
14:40-14:50		Session Discussion
14:50-15:05		Coffee/Tea

* Speaker

[+] Presentations denoted with C number (C-1 to C-7) were originally slated for a concurrent session.

SESSION 4: Sustainable Livelihood for the Coastal Community

Chair: **J. F. Caddy (FAO, Rome)**

15:10-15:45 4.1 **Muir, J.** *Aquaculture and marine fisheries - will capture fisheries remain competitive.*

15:50-16:25 4.2 **Felt, L.** *Impact on coastal livelihood from future changes in production and demand for fish.*

16:30-17:05 4.3 **Vazquez Seijas, V.** *The future for fishery dependent communities - fishery dependent regions of Galicia.*

17:05-17:30 Session Discussion

18:00-19:30 Demonstration of Flume Tank and gear technology area, Marine Institute.

Friday, 12 September 1997

SESSION 5: The Future for Capture Fisheries

Chair: J. S. Campbell (Canada)

08:30- 5.1 **Ikeda, H.** *The future economy of capture fisheries - which sectors will be economically viable.*

09:30 5.2 **Ikeda. H.** *The future consumer market for fish - will there be a place for capture fisheries.*

09:35-10:10 5.3 **Caddy, J. F.** *Capture fisheries and the environment issue - implications for the viability of future capture fisheries.*

10:15-10:50 5.4 **Beckett, J. S.** *The capture technology of the future - large trawlers with sea going factories or small vessels of the Coastal State.*

10:50-11:10 Coffee/Tea

11:15-11:35 C-7[+] **He, P.** *Biology and technology: future development in fishing gear and harvesting methods.*

11:40-12:15 5.5 **Valdimarson, G.** *Development in fish food technology - implications for capture fisheries.*

12:20-12:55 5.6 **Lane, D. E.** *Fisheries co-management: organization, process and decision support.*

12:55-13:15 Session Discussion

13:15-14:30 Lunch

Concluding Discussion

Chair: H. Lassen (Denmark)

14:30-16:30 **Concluding Discussion -** *What future for fisheries in the North Atlantic (summary presentations by session, Session Chairmen followed by discussion).*

Other Symposium events

Marine Institute Presentations

Wednesday, 10 September 1997

18:00-19:30 Tour of the Marine Institute

Groups of interested participants will be shown ship-bridge simulator and other technological demonstrations including modern research and educational facilities at the Marine Institute of Memorial University.

Thursday, 11 September 1997

18:00-19:30 Group demonstration of the Marine Fisheries Institute Flume Tank.

Wednesday-Friday, 10-12 September 1997

Videos, World Wide Web sites and posters: Presentations of the rich history of the Atlantic fisheries and visioning into the Twenty-first Century will be set up.

List of Participants

Session Chairmen are in bold.

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ANNEX 2

SYMPOSIUM

Variations in Maturation , Growth, Condition and Spawning Stock Biomass Production in Groundfish

FIRST ANNOUNCEMENT

Hosted by the Scientific Council of the
Northwest Atlantic Fisheries Organization (NAFO)
9-11 September 1988
Lisbon, Portugal

The Scientific Council of NAFO is pleased to announce this Symposium to be held in conjunction with the NAFO 20th Annual Meeting, in Lisbon, Portugal. The Symposium will be co-convened by E. Aro (Finland), J. Burnett (USA) and J. Morgan (Canada), and organized by the NAFO Secretariat.

Changes in maturation, growth and condition, duration of spawning season and the spatial distribution of spawning stock have been observed in several groundfish stocks, particularly in the North Atlantic. These variations have direct implications for spawner biomass production per recruit and management strategies that incorporate these parameters.

The purpose of this Symposium will be to discuss the causes and consequences of such variations, particularly addressing questions such as:

What causes these changes in age and size at maturity, growth and condition?
Is there evidence of environmental effects?
Is there evidence of density-dependent effects?
Is there evidence of predation effects?
Is there evidence of effects caused by size selective fishing?
Are some of these apparent changes artifacts, how do these arise and how can they be removed?
How do these variations influence spawner biomass per recruit and population growth rate?
What are the implications of these changes on fecundity, egg quality, spawning season, spawning frequency and larval survival?
What are the implications on management strategies? Are some strategies more robust to these changes than others?

A second announcement and "Call for Papers" will be issued shortly for contributed papers and posters. Papers will be selected on the basis of their relevance to the topic and scientific suitability. It is anticipated that the proceedings of this Symposium will be published in the *Journal of Northwest Atlantic Fishery Science*.

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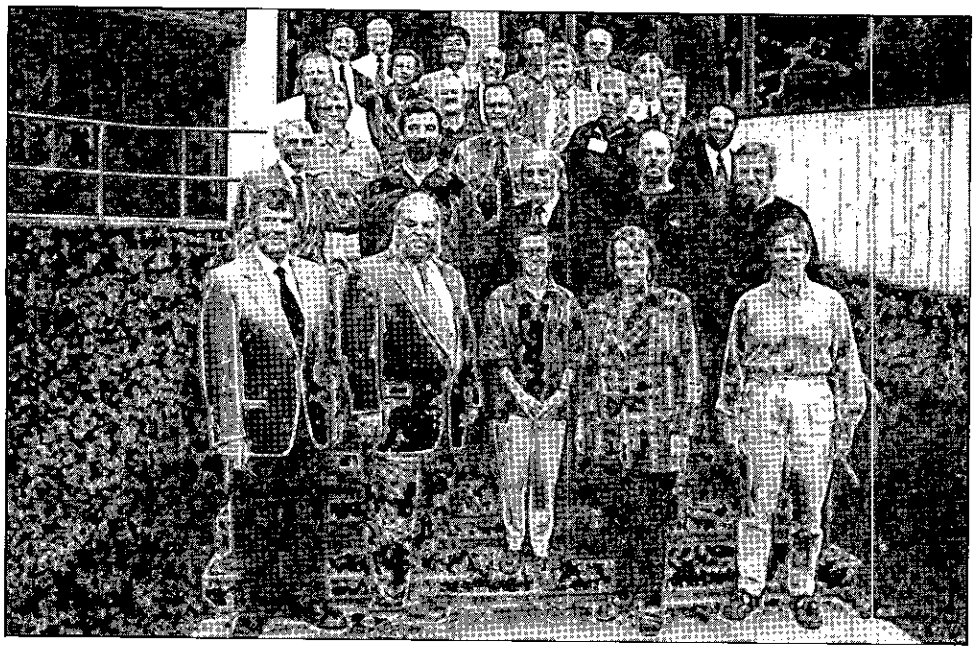
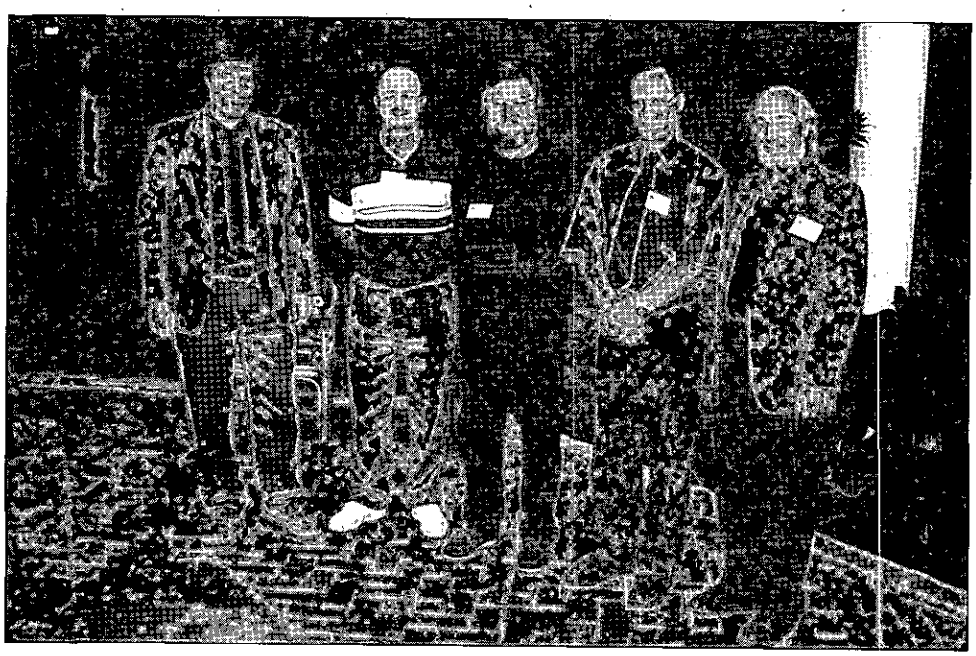


Committee participants (*left to right*):

Front Row:	A. Vazquez, E. de Cardenas, S. Junquera, U. Skuladottir, J. Morgan
2nd Row:	V. Rikhter, L. Motos, R. Mayo, M. Showell, M. Stein
3rd Row:	D. Carlsson, D. Power, R. Bowering, O. Godo, D. Rivard, F. Serchuk
4th Row:	A. Nicolajsen, M. L. Godinho, T. Amaratunga, H.-P. Cornus, C. Jones
Back Row:	V. Shibanov, B. Atkinson, S. Kawahara, A. Avila de Melo, D. Briand



Council and Standing Committee Chairmen (*left to right*):

H. P. Cornus (Scientific Council Vice-Chairman and STACPUB), D. Power (STACREC), M. Stein (STACFEN), W. R. Bowering (Scientific Council Chairman), R. Mayo (STACFIS)

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

Chairman: R. K. Mayo Rapporteurs: Various

The Committee met at the Hotel Newfoundland, St. John's, Newfoundland, Canada at various times during 7-19 September, 1997 to consider and report on matters referred to it by the Scientific Council, particularly those pertaining to the provision of scientific advice on certain finfish and invertebrate marine stocks. Representatives attended from Canada, Denmark (in respect of Faroe Islands and Greenland), European Union (Germany, Portugal, Spain), Iceland, Japan, Norway, Russian Federation and the United States of America. The Assistant Executive Secretary was in attendance.

I. OPENING

The Chairman opened the meeting by welcoming the participants. The agenda was adopted and the plan of work developed for the meeting.

II. STOCK ASSESSMENTS

1. **Shrimp in Division 3M** (SCR Doc. 97/2, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 95)

a) **Introduction**

The shrimp fishery in Div. 3M began in late-April, 1993, when two Canadian offshore vessels were granted exploratory permits to fish for *Pandalus borealis* in the area. Initial catch rates were favourable and, shortly thereafter, vessels from several Scandinavian countries joined. Fishing activity (monitored by Canada) increased to include about 50 vessels in early-July but subsequently declined over the remainder of the year. Only 4 vessels were reported fishing shrimp at the end of December. Fishing continued into 1994 at low intensity. Activity increased over winter to include 17 vessels by late-February and remained near that level until late-March, decreasing thereafter. From early-April to mid-June, the number of vessels increased from 7 to 47 and then decreased steadily to 3 at the end of 1994.

This pattern of increasing activity to June-July followed by a decrease to the end of the year continued in subsequent years. The maximum number of vessels observed equalled 71 in July 1995, 91 in July 1996 and 35 in June 1997. Also in 1997, the number of vessels remained stable between 30 to 35 vessels during the May-July period.

STACFIS (preliminary) estimated catches were approximately 28 000 tons in 1993, 24 000 tons in 1994, 33 000 tons in 1995 and 51 000 tons in 1996. Catch statistics to August 1997 indicate removals of about 17 000 tons. This likely will result in a total catch of about 25 000 tons by the end of the year. Vessels from as many as 14 nations have participated since 1993. Preliminary catches (tons) by nation and year are given below.

	1993	1994	1995	1996	1997[1]
Canada	3 724	1 041	970	906	793
EU/Denmark	800	400	200		
EU/Portugal			150		164
EU/Spain	240	300	158	50	38
Estonia		1 081	2 092	1 900	1 500
Faroe Islands	8 545	6 567	5 987	8 677	5 409
Greenland	3 788	2 275	2 400	1 107	100
Iceland	2 243	2 300	7 623	21 077	4 285
Latvia		300	350	1 940	1 000
Lithuania		1 225	675	2 900	1 600
Norway	7 183	8 460	9 534	8 150	1 000
Russia	300	300	2 838	4 446	675
Honduras	1 265				
St. Vincent		75			
Total	28 088	24 324	32 977	51 163	16 564

[1] STACFIS estimate to August not including joint-venture arrangements.

It was acknowledged that overpack (i.e. actual weight > nominal package weight) has likely existed in the shrimp fishery on Flemish Cap, since its beginning in 1993. Estimates of the overpack vary with product type but are believed to range between 10 and 20%. Most catches in the above table are, therefore, underestimated. It was agreed that, by including the overpack, better estimates of total removals would be obtained but, in the calculation of CPUE, estimates of overpack would have to be applied to the whole time series to facilitate annual comparisons and interpret trends. Accurate estimates of the overpack are needed to provide for better estimates of annual catch.

b) **Input Data**

i) **Commercial fishery data** (SCR Doc. 97/2, 83, 85, 86, 89)

Information from the fleets of several nations showed that the spatial distribution of effort differed among years. Fishing effort shifted to the west and southwest portions of the Flemish Cap in 1994 and 1995, compared to 1993 but returned to the eastern slope in 1996. Further, fishing effort occurred in much shallower depths in both 1995 and 1996. In 1997, the Icelandic fleet showed an overall shift in effort back to the deeper water.

A standardized catch and effort data set was constructed from the logbooks of Canadian, Greenlandic, Icelandic and Norwegian vessels and was used to monitor trends in catch, effort and CPUE. For the calculation of CPUE, the data were selected for single trawls only and Norwegian data were omitted.

Total fishing effort (hours fished) was calculated by dividing the total catch in each year by the unstandardized CPUE for the Icelandic fleet (January-July) and the standardized CPUE for Canada, Greenland and Iceland.

	1993	1994	1995	1996	1997[1]
Catch (tons)	28 000	24 000	33 000	51 000	25 000
Iceland CPUE (kg/hr)	355	239	235	196	156
Effort (hours)	79 000	100 000	140 000	260 000	160 000

	1993	1994	1995	1996	1997[1]
Catch (tons)	28 000	24 000	33 000	51 000	25 000
Standardized CPUE (kg/hr)	333	187	230	184	201
Effort (hours)	84 000	128 000	143 000	277 000	124 000

[1] Estimated catch to end of 1997.

Data from nations which provided both catch and effort estimates showed that unstandardized catch rates were substantially lower in 1994 than in 1993. There was a stabilization or slight increase in the 1995 CPUEs over the 1994 values but they remained lower than those of 1993. The 1996 rates decreased for all nations while those for 1997 showed either slight increases or decreases. Standardized CPUEs from the integrated data set, addressing differences due to seasonality, area and fishing power, showed trends similar to those of the unstandardized estimates, i.e. a large decrease from 1993 to 1994 followed by fluctuations around a lower level from 1994 to 1997. STACFIS noted the value of constructing a standardized data set but indicated that input, in the specified format, is required from all nations.

Size composition data from commercial sampling by Canada, Faroe Islands and Iceland in 1993 showed that large, female shrimp dominated the catches by number and weight but, in 1994, the proportion of females was considerably less. Canadian, Norwegian and Greenlandic data for 1995 showed a further reduction in the proportion of females. Sampling data for the 1996 fishery indicated the predominance of a single size group of male shrimp in the first half of the year and the emergence of a smaller size group of males in the second half. In 1997, Icelandic catches were composed of several size groups of males and females up to June but, in July and August, were again dominated by a single size group of males. Russian catches for May and June were also dominated by this size group as were April catches by Canada. Spanish catches in spring 1997 showed stronger representation of female shrimp than those from other nations.

Sampling data indicated the occurrence of three size groups of males in both 1993 and 1994 but only two in 1995 and 1996. An additional size group of small female shrimp was evident in the latter two years and it was concluded that a reduction in the age at sex inversion had occurred. Also, it was evident that about one-half of the dominant male group in 1996 changed sex between 1996 and 1997.

Data on shrimp discarding from the Canadian and Greenlandic fisheries in 1997 showed that discard levels remained low, as in previous years, indicating that shrimp of all sizes were being kept.

Data on catch composition from several nations showed that redfish (*Sebastes* spp.) occurred most frequently as by-catch. Other commercially valuable species, such as cod and Greenland halibut were taken only in small quantities. In 1993 and 1994 redfish by-catch was high but declined substantially in 1995 and 1996. Several nations reported little

or no redfish by-catch in 1997.

Although redfish by-catch was much lower during the 1995-1997 period, it is not clear whether this was due to the reduction of maximum bar spacings from 28 mm in 1994 to 22 mm in 1995 or to the absence of strong redfish recruitment.
STACFIS addressed the by-catch issue at its June 1997 Meeting and concluded that the probability of recovery of the redfish stocks on Flemish Cap will increase if the by-catch in the shrimp fishery is kept low in future years (NAFO SCS Doc. 97/14, pages 82-87).

ii) **Research survey data**

Environmental data (SCR Doc. 97/84). Canadian oceanographic data from the summer of 1997 on the Flemish Cap were examined and compared to the long-term (1961-90) average and to conditions during the summer of 1996. The cold near-surface temperatures (0.5 to 2.0°C below normal) experienced during 1993, 1995 and 1996 had warmed to 0.5 to 1.5°C above normal in July of 1997. In water depths below 50 m, temperatures ranged from 0.25°C above normal on the east side of the Flemish Cap to 0.25°C below normal on the west side. Upper layer (top 50 m) salinities were above the long-term mean (by 0.2-0.5 PSU) during the last three years from 1995 to 1997, but were otherwise about normal. The colder than normal temperatures experienced over the Flemish Cap since the late-1980s continued into 1993 and 1995, began to moderate by the summer of 1996 and continued to increase during 1997. As in previous years, the chlorophyll measurements showed higher summer values in the upper 50 m of the water column over the Cap compared to the adjacent Grand Bank. Dissolved oxygen levels indicate a well oxygenated water column over the Cap in 1997 similar to values in 1993, 1995 and 1996. Additionally, current estimated from direct ADCP measurements and from geostrophic calculations clearly show the presence of a general anticyclonic circulation around the Flemish Cap. Current speeds however, were much weaker in July 1997 than those measured during the same time period in 1996.

EU surveys (SCR Doc. 97/87, 88). EU groundfish surveys were conducted on Flemish Cap in July from 1988 to 1997. Minimum trawlable biomass estimates of shrimp were calculated from the catches obtained using a groundfish bottom trawl. Relative shrimp biomass from 1991 to 1993 was substantially higher than during the 1988-90 and 1994-97 periods. The 1994 estimate is likely biased downward due to a larger meshed liner in the codend of the trawl. The recent biomass level (1994-97) is 2 to 3 times higher than the level observed during the 1988-90 period.

Year	Biomass Index (t)	Average catch per mille (kg)	Standard Error	Female Biomass Index (t)
1988	2 164	1.54	± 0.28	1 874
1989	1 872	1.33	± 0.24	1 340
1990	2 139	1.53	± 0.21	1 132
1991	8 211	5.83	± 0.71	5 362
1992	16 531	11.75	± 1.86	11 509
1993	8 952	5.73	± 0.91	6 839
1994	3 338	2.37	± 0.35	2 823
1995	5 413	3.85	± 0.44	4 286
1996	6 502	4.62	± 0.34	4 149
1997	5 096	3.62	± 0.25	3 807

Female biomass increased sharply from 1990 to 1992 but declined, thereafter, through 1997.

The surveys also showed that biomass in most years was highest in the western, northern and northeastern parts of the Flemish Cap and in depths ranging from about 250 to 550 m. In 1994 and 1995, proportionately more biomass was found in western and southwestern areas while catch-per-tow in some eastern strata declined substantially, consistent with the westward shift in commercial fishing effort. Fishing effort by some fleets in 1996 returned to the eastern slopes where the survey showed an improvement of shrimp catch rates over the previous two years. In 1997, a large area of low density was observed in the north which was more extensive than in previous years.

Age interpretation of the size distributions from the 1988 to 1994 surveys and the 1993 and 1994 commercial fishery samples identified the 1988 year-class as strong. This year-class contributed substantially to the fishery in 1993 and 1994 but was less important in 1994. The recruitment of the 1991 year-class helped maintain catch rates in the 1994 fishery. By 1995, the 1988 year-class was no longer important to the fishery and, although catch numbers were dominated by the 1992 and 1993 year-classes, the latter was not well represented in the survey. The 1993 year-class was dominant throughout area surveyed in 1996 and in commercial fishery catches during the first half of that year. The 1996 survey did not detect the 1994 year-class which appeared in the fishery during the second half of 1996. In 1997, samples from the survey showed the same size/age groups of males and females that were evident in the fishery during the first half of the year.

Canadian survey (SCR Doc. 97/81). A stratified-random bottom trawl survey on Flemish Cap for demersal fish species, conducted by Canada in autumn 1996, also covered most of the shrimp stock area. The survey gear was a Campelen 1800 shrimp trawl with a 40 mm codend mesh and a 13 mm liner. Two methods were used for calculating estimates of minimum trawlable biomass (about 22 000 tons) and abundance (about 4 billion) and results were in good agreement. Size distributions showed primarily males at ages 1, 2 and 3 at carapace lengths of 11 mm, 15 mm, and 20 mm, respectively, and females (ages 3+) at sizes greater than 20 mm. Especially noteworthy was the presence of the 1994 year-class, which was assumed to be weak in the 1996 assessment. Males of all ages represented 76% of the estimated abundance and 63% of the biomass. It was recognized that the Canadian survey provided valuable information on the distribution, size and demographic structure of the shrimp stock on Flemish Cap and that, if conducted annually, such surveys will represent a major step forward in the assessment of the resource. Canadian participants indicated, however, that a survey in Div. 3M was not planned for 1997 or beyond.

Faroese survey (SCR Doc. 97/90). A survey was conducted in June 1997 by a Faroese shrimp trawler with stations selected as in a stratified random design. Single and double Angmassallik 3000 shrimp trawls with 40 mm codend mesh size were used and results were standardized for area swept. Ages 1 through 5 were present in the length frequency data. The minim trawlable biomass, estimated by areal expansion, was about 16 000 tons. It was agreed that the results of this survey were not directly comparable to the Canadian survey in 1996 and no conclusion was reached regarding a change in biomass between the two years.

STACFIS noted that the catchability of research trawls for shrimp is unknown. Therefore, biomass and abundance estimates from surveys are used only as indices and not as absolute measures of stock size.

iii) **Comparison of Surveys and Commercial CPUE** (SCR Doc. 97/91)

As recommended at the *ad hoc* Working Group Meeting of November 1996, a comparison of research vessel survey results and commercial CPUE data from the Barents Sea/Svalbard area was conducted to explore the possibility of applying links between this area and Div. 3M to improve the assessment of the stock in the latter. CPUEs were similar in the two areas except that the seasonal pattern was more pronounced in the Barents Sea where survey and CPUE data were also in good agreement. They showed, however, that under decreasing survey density, the commercial CPUE is maintained and, thus, CPUE may be misleading in a critical situation. The preliminary study indicated that, with more thorough and detailed analyses, valuable information might emerge when comparable CPUE and survey results are available.

c) **Assessment Results**

The research and commercial fishery data of recent years show that several changes have occurred on Flemish Cap related to the distribution, abundance and demographic structure of the shrimp resource. Catches have been maintained at a high level and increased to about 51 000 tons in 1996 due to increasing effort and an expansion of the fishing grounds to target smaller shrimp in shallower water. The projected catch for 1997 is about 25 000 tons. The aggregated CPUE data, described above are difficult to interpret as an index of abundance due to major changes in fishing patterns between years (i.e. targeting small shrimp in shallow water or larger in deeper water.)

The composition of the shrimp catch has also changed over time. The percentage of males (numbers) increased from about 44% in 1993 to 63% in 1994 and 72% in 1995, and decreased slightly to 63% in 1996. In 1996, 59% of the catch in numbers was due to males of the 1993 year-class which was also heavily fished in 1995. In 1997, about 56% of shrimp caught were males of the 1993 and 1994 year classes.

The large females caught in 1994 were the remains of the 1988 year-class which did not contribute significantly to the fishery in subsequent years. The decline in catch rates of female shrimp from 1993 to 1997 is considered to be a reasonable reflection of the trend in the spawning biomass.

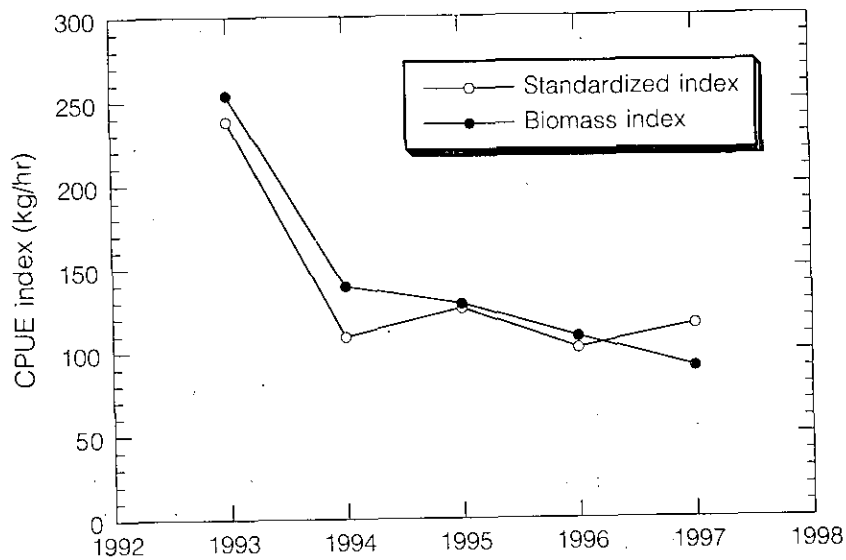


Fig. 1. Shrimp in Div 3M: female biomass index from Icelandic CPUE data and standardized CPUE index.

The catch rate-at-age data suggest that the 1997 spawning stock is between 35% and 48% of the level observed in 1993, despite a decrease in the size/age at sex change. In addition, population fecundity was further reduced due to a decrease in mean size and age of females (i.e. smaller females are less fecund). This was first noted in 1995 with the appearance of primiparous females at 22 mm. In 1997, it was concluded that about one-half of the 1993 year-class changed sex between 1996 and 1997. Indications of earlier sex change might be a reflection of reduced female abundance. Also, a decline in female biomass was evident from the EU survey data for the same period. The decrease in the age/size at sex reversal, noted above, is clearly evident in the research samples.

It was concluded that female biomass, since the obvious decline between 1993 and 1994, continued to decline slightly or is, at best, stable.

Recruitment is difficult, if not impossible, to quantify with the current data. CPUEs for the different ages are more likely a reflection of changing market conditions than they are indicators of year-class strength, and the EU survey results have been useful only to reflect the older ages in the stock.

The 1993 year-class was much stronger than anticipated, appearing first at age 2 in 1995, dominating the fishery in 1996 and still contributing significantly as males and females in 1997. The 1994 year-class, assumed to be very weak in September 1996, appeared subsequently in the late-1996 catches and in the Canadian autumn survey. Research and commercial data from 1997 suggest that contributions from this year-class to the fishery might also be significant.

Although catches will likely be reduced substantially from 1996 to 1997, it is not known if this reduced level is sufficient to halt stock decline. STACFIS was not able to predict the remaining biomass of the 1993 and 1994 year-classes in 1998, and it was agreed that a fishery based on one or two recruiting year-classes increases the risk of causing further reduction in the spawning stock. STACFIS also noted the high level of uncertainty associated with the assessment of the shrimp stock on Flemish Cap. Uncertainty in recruitment prediction has become evident since there was no indication of the 1993 year-class before it entered the fishery in 1995 and initial indications in 1996 that the 1994 year-class was weak. Lacking estimates of stock size, there is uncertainty regarding the exploitation rate on the 1993 year-class and the total stock. Also, there is uncertainty regarding the stock recruitment relationship and the origin of recruitment in this area. STACFIS stressed that assessing this stock with any degree of certainty is unlikely without a time-series of directed research surveys to estimate the recruitment.

d) **Research Recommendations**

STACFIS was pleased to note progress with some of the recommendations from 1996, including development of a standardized catch and effort data set, estimation of catch numbers and weight by sex and age, and the completion of 2 directed research surveys in Div. 3M.

From this meeting STACFIS **recommended** that, *for shrimp in Div. 3M:*

- *Because there are no plans for the directed surveys in 1996 and 1997 to be continued, the recommendation from 1996 for the initiation of surveys to obtain a reliable recruitment index needs to be repeated;*[1]

[1] Note: The 1996 recommendation (see Scientific Council Reports, 1996, p.166) is as follows:
"A directed research survey for shrimp on Flemish Cap should be initiated with a primary goal of obtaining a reliable recruitment index, given that the EU survey dos not provide reliable estimates of shrimp at age 2. The survey should also provide extensive data on the distribution and demography of the shrimp stock throughout the area. Hydrographic information should be collected, including data on currents, in conjunction with the survey."

- *Stomach content data from the 10 main groundfish species on Flemish Cap should be investigated for consumption of shrimp and possible development of a recruitment index.*
- *Age composition of the EU survey results should be estimated to provide insights into mortality and year-class strengths.*
- *Contracting Parties contribute to the catch and effort dataset according to the format specified in SCS Doc. 96/19. A standardized database for biological samples should be considered, as well.*
- *Estimates of overpack should be obtained for all nations fishing for shrimp in Div. 3M and these estimates be included in the catch statistics.*

III. ARRANGEMENTS FOR STOCK ASSESSMENTS IN 1998

1. Update List of Designated Experts

The list of Designated Experts for 1997 was reviewed and the following were tentatively identified for the 1998 assessments:

- From the Science Branch, Northwest Atlantic Fisheries Centre, Department of Fisheries and Oceans, P. O. Box 5667, St. John's, Newfoundland A1C 5X1, Canada
[Telefax: +709 772-4188 - Tel. No. : see list of participants - E-mail: Surname@athena.nwafc.nf.ca]

for	Cod in Div. 3NO	M. B. Davis
	Redfish in Div. 3LN	D. Power
	American plaice in Div. 3LNO	M. J. Morgan
	Witch flounder in Div. 3NO	W. R. Bowering
	Yellowtail flounder in Div. 3LNO	S. J. Walsh
	Greenland halibut in SA 2 + Div. 3KL	W. B. Brodie
	Roundnose grenadier in SA 2+3	D. B. Atkinson

- From the Instituto de Investigaciones Marinas, Muelle de Bouzas, 36208 Vigo, Spain
[Telefax: +34 86 292762 - Tel No.: +34 86 231930 - E-mail: avazquez@iim.csic.es]

for	Cod in Div. 3M	A. Vazquez

- From the Instituto Espanol de Oceanografia, Centro Oceanografico de Cantabria, Aptdo 240, 39080 Santander, Spain [Telefax: +34 42 275072 - Tel. No.: +34 42 275033 - E-mail: cendrero@ccaix3.unican.es]

for	American plaice in Div. 3M	E. de Cárdenas

- From the Institute de Investigacao das e do Mar (IPIMAR), Av. Brasilia, 1400 Lisbon, Portugal
[Phone: +3511 301 7361/0814 - Fax: +351 1301 5948 - E-mail: amelo@ipimar.pt]

for	Redfish in Div. 3M	A. Avila de Melo

- From the Greenland Institute of Natural Resources, P. O. Box 570, DK-3900 Nuuk, Greenland
[Telefax: +299 25957 - Tel No.: +299 21095 - E-mail: helle@natur.gh.gl]

for	Northern shrimp in SA 0+1	H. Siegstad

- From the Greenland Institute of Natural Resources, Box 2151, DK-1016, Copenhagen K, Denmark (Telefax: +45 33 13 4250 - Tel No.: +45 33 13 4224 - E-mail: grfioaj@inet.uni-c.dk]

for	Roundnose grenadier in SA 0+1	O. Jørgensen
	Wolffish in SA 1	O. Jørgensen
	Greenland halibut in SA 0+1	O. Jørgensen

- From the Greenland Institute of Natural Resources, P. O. Box 570, DK-3900 Nuuk, Greenland [Telefax: +299 25957 - Tel No.: +299 21095 - E-mail: claus@natur.gh.gl]

for	Greenland halibut in Div. 1A	C. Simonsen

- From the Institut fur Seefischerei, Fischkai 35, D-27572 Bremerhaven, Germany [Telefax: +49 471 73127 - Tel No.: +49 471 73473 - E-mail: hajoraetz@msn.com]

for	Redfish in SA 1	H. J. Rätz

- From the Marine Fish Division, Department of Fisheries and Oceans, Bedford Institute of Oceanography, P. O. Box 1006, Dartmouth, Nova Scotia B2Y 4A2, Canada [Telefax: +902 426-7750 - Tel No.: +902 426-3501 - E-mail: showell@bionet.bio.dfo.ca]

for	Silver hake in Div. 4VWX	M. A. Showell

- From the Marine Research Institute, Skulagata 4, P. O. Box 1390, 121 - Reykjavik, Iceland [Telefax: +354 562 3790 - Tel No.: +354 552 0240- E-mail: unnur@hafro.is]

for	Northern shrimp in Denmark Strait	U. Skúladóttir
	Shrimp in Div. 3M	U. Skúladóttir

- for Squid in SA 3+4 — To be announced

- From Polar Research Institute of Marine Fisheries and Oceanography (PINRO), 6 Knipovich Street, Murmansk, 183763, Russia [Telefax: +47 789 10518 - Tel No.: +47 789 10423 - E-mail: inter@pinro.murmansk.ru]

for	Capelin in Div. 3NO	V. Shibanov

The Secretariat was requested to confirm the availability of the Designated Experts from their respective laboratories. Confirmation of Designated Experts is requested by 1 January 1998 and no response by that time will be taken to mean no objection to the nomination.

IV. OTHER MATTERS

1. Review of SCR and SCS Documents

Four documents were reviewed aside of the assessment related papers.

STACFIS examined two specific examples of the use of closed areas in the management of commercial fisheries (haddock on the Scotian Shelf and Georges Bank, and plaice in the North Sea) (SCR Doc. 97/32). Some limited success was indicated, depending on the objective, although in both cases, the area and season of closure, and the type and amount of permitted fishing activity changed over time, making evaluation of effectiveness more complex.

In discussing the issues of closed areas in general, it was noted that the apparent lack of success in achieving management goals for many commercial fish stocks has led to support for the use of protected areas. However, the use of closed areas should be viewed as an additional management tool instead of a replacement for existing management measures. Most of the rationale is intuitive, reflecting the potential benefits of protected areas, as there are few studies providing analytical support for the various objectives. As well, evaluation may be difficult because a relatively long time frame may be required or because all of the required data may not be available. Thus, it may not always be possible to provide proof of success of a protected area in dealing with a management problem. Where problems exist, despite the best traditional management practices, it may be prudent to use a precautionary approach, such as restricting fishing in some areas, until the uncertainties of existing procedures can be better understood.

STACFIS reviewed information concerning abundance and distribution of northern shrimp in Div. 3L (SCR Doc. 97/93). A shrimp survey was carried out in Div. 3L in the area outside of the Canadian EEZ (Nose of the Bank) by a Faroese commercial shrimp vessel making four 2-week trips over the period November 1996 to August 1997. Biomass estimates were derived by two methods: 1) area swept calculations based on stations selected from a stratified random design, and 2) spatial analysis (kriging) based on all stations fished by the vessel. Biomass estimates derived by the two methods were comparable, approximating 2 500-3 000 tons. There was some evidence of substantially reduced by-catches when a sorting grid was employed.

STACFIS reviewed a document which evaluated the reproductive potential of shrimp on the Flemish Cap based on the number of eggs deposited on the pleopods of mature females (SCR Doc. 97/94). Results showed that these numbers fluctuated between 40 and 2 290 eggs, averaging 1 428. The average number of eggs was considerably less than those observed in waters west of Spitzbergen, but was similar to observation from the Barents Sea.

STACFIS reviewed trends in biomass of 14 commercially important species in Subareas 5 and 6 based on spring and autumn NOAA/NMFS Northeast Fisheries Science Center research vessel surveys (SCS Doc. 97/16). Most stocks of demersal finfish, including cod, haddock and yellowtail flounder, have declined steadily over the 34-year autumn survey series extending back to 1963. Although fishing mortality on stocks of cod, haddock and yellowtail flounder on Georges Bank has been reduced substantially in 1995 and 1996, and biomass indices have increased slightly in recent years, the stocks continue to remain near their lowest recorded levels. Biomass indices for several species of flounders, including American plaice, summer flounder, witch flounder and winter flounder have also increased at various rates over the past 3-5 years.

The biomass of pelagic species (Atlantic herring and mackerel) had increased steadily during the 1980s and 1990s and continued to remain at or above levels observed during the 1960s.

2. Non-traditional Resources

STACFIS reviewed information on catches of skates, dogfish and other sharks prepared by the Secretariat in order to estimate the extent to which the most frequently occurring of the non-traditional species are harvested. Catches of some of these species (notably skates and dogfishes) exceeded 10 000 tons in some years. It was noted that it was possible that the catch statistics may reflect misreporting by some nations in order to mask true catches of other species under quota. Nevertheless, STACFIS concluded that even with these uncertainties catches of some species have been substantial.

STACFIS considered that further work describing changes in biomass and distribution over time would be required before any conclusions could be drawn regarding the status of these stocks. STACFIS, therefore, **recommended** that *the data regarding non-traditional species derived from research vessel surveys should be examined, and that analyses be undertaken to evaluate trends in biomass and distribution of these species and reported at the June 1998 Meeting.*

3. Other Business

a) Arrangements for Acquisition of Length Composition Information on Shrimp in Div. 3M by the Designated Expert

STACFIS discussed protocols for standardizing the exchange of length composition data for shrimp in Div. 3M with the aim of developing methods to summarize data obtained from various fleets in a comprehensive, and consistent manner. The initial exchange requires that length sample data divided into males, semiparous females and multiparous females, be pooled at the month level and that nominal catch per month be tabulated by national representatives for each fleet sector. This will enable the Designated Expert to acquire catch composition data from each country in a consistent form, allowing for easier summarization in a spreadsheet format. STACFIS, therefore, **recommended** that *information on catch and length composition data with respect to shrimp in Div. 3M be sent from each national laboratory to the Designated Expert in an agreed format at least 15 days before the next assessment meeting.*

b) Acknowledgements

There being no other business, the Chairman thanked the participants and the Secretariat for their work during the meeting, and adjourned the meeting.

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

Chairman: D. Power Rapporteur: M. A. Showell

The Committee met at the Hotel Newfoundland, St. John's, Newfoundland, Canada during 15-17 September, to discuss various matters pertaining to statistics and fisheries research, as referred to it by the Scientific Council. Representatives attended from Canada, Denmark (in respect of Faroe Islands and Greenland), European Union, Iceland, Japan, Norway, Russian Federation and the United States of America.

1. Opening

The Chairman opened the meeting by welcoming participants. M. A. Showell (Canada) was appointed rapporteur.

2. Fisheries Statistics

a) Progress Report on Secretariat Activities in 1997

i) Acquisition of STATLANT 21 data

Concern was again expressed over delays in reporting of STATLANT 21A and 21B data for 1994-96 by various countries. STACREC noted in accordance with the STACREC recommendation of June 1997 that the concerns of non-availability of statistical data had been conveyed to Contracting Party heads of delegation, and that the Council should now take any steps necessary to request the data from national offices. The Committee discussed and agreed that a more direct approach be taken in requesting data. Noting that a method similar to that recently adopted by STACFEN would be useful, STACREC **recommended** that *the Scientific Council nominate representatives of each Contracting Party to ensure their respective national statistical agencies be notified to submit STATLANT data as outlined in the Rules of Procedure.*

ii) Publication of statistical information

The Secretariat reported that data from the USA for 1993 had recently been submitted. However, no response had been received from the Faroes Islands regarding submission of 1993 data for the Statistical Bulletin. As this is the only remaining submission for 1993, STACREC agreed the Secretariat should investigate when these data will be forthcoming. In the event that the Faroe Islands data cannot be obtained in the near future, STACREC **recommended** that *the Secretariat proceed with publication of the 1993 Statistical Bulletin, and the Faroes Islands data be given as an addendum to a subsequent issue of the Bulletin upon receipt of data.*

b) Update on the Establishment of NAFO Internet Website

The Secretariat reported that a preliminary website has been established, based on recommendations from STACREC and STACPUB. It was noted that a demonstration of the site, www.nafo.ca, was provided at the 10-12 September 1997 NAFO Symposium and received favourable comments, and that the site will likely be accessible within a few days of this Meeting. The Committee complimented the Secretariat on the progress accomplished on this project over a short period of time.

Substantial discussion centred on future development of the website. It was noted that data access through FTP could be a main feature of the website. Enhancements such as access to various

summarized catch documents, summaries of current stock status, and links to other related sites were seen as desirable. However, it was recognized that financial and technical support for these developments and their associated upkeep could be considerable, and that cost factors must be taken into account. STACREC **recommended** that *the Secretariat prepare a report for the June 1998 Meeting outlining further development of the website, including any anticipated resource requirements for development and maintenance of the website.* In addition, it was suggested that as further development required funding, a demonstration of the website be provided to the General Council so delegates can be fully informed as to the potential use of this website. After consideration of user requirements by STACFEN, STACPUB and STACREC, as well as the financial constraints, policies for future expansion of website contents would have to be developed.

c) **Definitions of Fishing Effort**

STACREC noted that no submissions had been received to revise or update current definitions of fishing effort. It was proposed that a more direct approach be undertaken to ascertain the suitability of the current definitions, particularly as they apply to passive gear, by contacting individuals familiar with the analysis of these data. It was noted that any potential changes should be identified as quickly as possible, so the definitions can be made and forwarded to CWP for inclusion in the *FAO handbook of fishery statistics*. It was further noted that changes in the definition of fishing effort will have implications to the interpretation of historical data, and that clear explanation of the changes in definitions would be critical. The Committee also noted that in order to be useful, the new definitions should reflect information that can be realistically collected.

3. Review of SCR and SCS Documents

STACREC reviewed two documents.

The USA Research Report for 1996 (SCS Doc. 97/16) was submitted in time for this Annual Meeting. It was noted the USA conducted several environmental studies, including hydrographic, plankton, aquaculture and others, in waters off the Northeast coast. Biological studies included an analysis of bluefish feeding rates, and studies of growth and development of winter flounder and American lobster. Approximately 48 200 age determinations were completed for 19 species of finfish and shellfish in support of assessment analyses. Studies of trophic dynamics based on long-term monitoring and process-oriented predation studies was continued in 1996, and revision of the 33-year food habits database collected during the 33-year NEFSC autumn bottom trawl surveys continued.

Marine mammal studies included development of methodology to estimate abundance of harbour porpoise, and the completion of aerial surveys to document large-scale movements. Considerable research on right whales was also completed. A photo-identification catalog was updated as nearly 2 000 photo-identified sightings were entered into the catalog database. At least 21 calves were born in 1996, 10 of which had been photo-identified in northern waters to-date.

At-sea observations of fishing activities were continued in 1996 as the NEFSC placed scientific observers aboard vessels in 12 different fisheries operating in Subareas 5 and 6. Fisheries covered included New England and Mid-Atlantic gillnet, swordfish drift gillnet, otter trawl, sea scallop dredge, giant bluefin tuna purse seine and lobster pots.

A paper (SCR Doc. 97/92) on the diet and feeding of beaked redfish (*S. mentella*) in the Irminger Sea (ICES Div. XII and XIVb) and on the Flemish Cap (Div. 3M) was presented. An inverse relationship between feeding intensity and reproductive activity had been found. The prey spectrum was narrow in both areas, and diversity decreased in autumn and winter. Most prey items showed seasonal variations in occurrence. Crustacea (mainly copepods and euphausids) were the main component of the smaller redfish diet. The importance of fish in the diet increased in larger redfish. A remarkable frequency of offals in

the diet was observed associated with periods of intense fishing activity, especially in the largest redfish (>40 cm).

4. Other Matters

a) Division 3M Shrimp Survey - Coordination for 1998 and Onwards

STACREC noted the comments of STACFIS in the stock assessment of shrimp in Div. 3M that the Canadian research survey, which utilized a shrimp gear, provided valuable information for the assessment of shrimp in Div. 3M but that such a survey was not planned for 1997 or beyond. The Committee noted the recommendation of STACFIS regarding the initiation of annual surveys to obtain a reliable recruitment index for shrimp in Div. 3M, Accordingly, STACREC **recommended** that *with respect to surveys for shrimp in Div. 3M the following proposal be forwarded to the Fisheries Commission as it relates to logistics, coordination and standardization*:

(i) The survey should be carried out with the joint effort of shrimp biologists.

(ii) The survey would require 10-12 fishing days, preferably in July, and conduct 60 daytime stations that would cover a depth range from 150-600 m using a Campelen 1800 trawl with a 13 mm liner.

b) Enhancement of Data Summaries

The Committee discussed the possibility of the Secretariat maintaining a database and providing additional data summaries, in particular, (1) a list of fish tags and associated information on tag returns and (2) age-by-age information where possible on a stock-by-stock basis. It was pointed out that the original request from the Scientific Council to provide a list of fish tagged was simply to provide information to the scientific community and that it would be difficult and time consuming to track returns. It was also noted in reference to item (2) that under the ICES model the basic data from stock assessments are maintained at the ICES Secretariat. It was pointed out that the NAFO Secretariat maintains a list of sampling data and has a certain amount of sampling data in electronic form. The Committee agreed that an *ad hoc* Working Group chaired by E. de Cárdenas (EU-Spain) would meet at the June 1998 Meeting to discuss the matter further and present a report to STACREC when finalized.

c) Review of Survey Activities in 1996 and Surveys Planned for 1997

A report of the USA inventory of surveys conducted in 1996 and planned for 1997 was presented.

d) CWP Intersessional Meeting

At the June 1997 Meeting Scientific Council endorsed the STACREC and CWP recommendation that an exercise to reconcile NAFO data summaries with those of other international agencies be conducted. STACREC noted that a substantial number of discrepancies had been identified, and reiterated its concern that harmonization of the data sets be investigated. The Secretariat reported that discussion had taken place with the CWP Chairman and Secretariat since the June 1997 Meeting which focused on planning an intersessional meeting on this topic for early-1998. STACREC **recommended** that *the Assistant Executive Secretary attend the CWP Intersessional meeting in early 1998 to address all issues of interagency harmonization of data, and that the results be made available at the June 1998 Meeting.*

5. Acknowledgements

The outgoing Chairman expressed his thanks to the Secretariat for all assistance provided for the duration of his chairmanship and to the rapporteur and all participants for their assistance in compiling the information necessary for the meeting. As a final note, the Chairman welcomed incoming Chairman V. N. Shibanov (Russian Federation).

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

Chairman: H.P. Cornus Rapporteur: M. Stein

The Committee met at the Newfoundland Hotel, St. John's, Newfoundland on 16, 17 and 18 September 1997. In attendance were H.P. Cornus (EU-Germany, Chairman), J. Morgan (Canada), V.A. Rikhter (Russia), F.M. Serchuk (USA), M. Stein (EU-Germany), A. Vazquez (EU-Spain) and the Assistant Executive Secretary (T. Amaratunga).

1. Opening

The Chairman welcomed the Committee members and noted that, as usual during September Meetings, time allocation for the Committee meetings have to be very flexible.

2. Review of Scientific Publications

a) Status of Papers from September 1997 Symposium

The Committee noted that the Symposium was quite a success. The Committee felt that the contents of the Symposium papers were not completely scientific in nature and therefore did not require peer review. The Committee agreed that the Symposium proceedings be published in one hard cover volume of the *Journal of Northwest Atlantic Fisheries Science*, and the editorial review be done by the convener H. Lassen (EU-Denmark) and the Assistant Executive Secretary, T. Amaratunga. With respect to the papers from the concurrent session, STACPUB agreed they should be submitted for consideration for publication in the normal NAFO series apart from the Symposium Proceedings. The Committee recognized the workload connected with the editing of the Symposium contributions, and thanked the Assistant Executive Secretary in advance for doing this job. The Committee **recommended** that *the book on the 10-12 September 1997 Symposium Proceedings will contain an introduction page by the convener and a page on the editorial work by the Assistant Executive Secretary.*

b) Status of Publication on Division 3M shrimp

The Committee was informed that the Secretariat had received an internally reviewed paper from D. G. Parsons (Canada), and this paper is progressing through the publication process.

c) Other Publications

The Committee noted with concern that the publication process of the 1995 Symposium on 'The Role of Marine Mammals in the Ecosystem' was delayed by more than one year. The Committee was pleased to learn that the editors had agreed to expedite the reviews and finalize the publication urgently. The Committee **recommended** that *the Proceedings of the 1995 Symposium on 'The Role of Marine Mammals in the Ecosystem' be published in one single volume with the new deadline set for 15 December 1997.*

3. Promotion and Distribution of Scientific Publications

a) Invitational Papers

There was no new information on the status of the invitational paper by Sv. A. Horsted on an update and evaluation of catch statistics for West Greenland cod. The Committee agreed that M. Stein (EU-Germany) will contact the author to explore the present status of the paper.

The 5-year review paper of the Flemish Cap oceanography by E. B. Colbourne (Canada) is expected to be presented as planned during the 1998 June Meeting.

The Committee was informed by V. A. Rikhter (Russia) that his invited paper on silver hake has been written in Russian. However, translation of the paper requires one month more than previously anticipated. The paper is expected to be in its final stage by February 1998.

b) **Consideration of ASFA Abstracts**

The Committee noted that J. Morgan (Canada) had contacted the Canadian national ASFA representative to explore the possibilities of contributing the SCR Document abstracts into the ASFA database. As a result of these discussions, STACPUB agreed that it seems suitable to have one input center to ensure 100 percent coverage. The Committee was pleased to note that J. Morgan will take the necessary steps to finalize arrangements with ASFA.

c) **NAFO Website Status Report**

Noting that STACREC had covered this issue already to some extent during this meeting, the Committee decided to review the structure of the present NAFO Website. The Committee was pleased with the progress to date. STACPUB agreed its members will review the site and consider further improvements at discussions during the June 1998 Meeting.

d) **Possibilities of Using New Technologies for Publications and Distribution**

The Committee noted that it would be useful to have poster display facilities for sharing scientific information during the June Meeting and the Annual Meeting. After considerable discussion the Committee **recommended** that *posters displayed during the June meeting will be considered by STACPUB for further presentation at the Annual Meeting.* Authors of selected posters would be requested to suitably revise them for viewing by all delegates at the Annual Meeting. The Committee further **recommended** that *specific poster topics will be defined for Annual Meeting presentations, and that environmental results as well as assessment results be topics for display in a suitable form.*

4. **Review of Papers for Possible Publication**

a) **Papers Presented at the September 1997 Meeting**

The Committee reviewed and nominated the following papers for consideration for publication in *NAFO Scientific Council Studies*: SCR Doc. 97/87 and 88 combined, 91 and 92.

b) **Papers Not Considered at the June 1997 Meeting**

With respect to papers deferred from the June 1997 Meeting, the Committee nominated SCR Doc. 97/32 for consideration for publication in the Journal.

5. **Other Matters**

a) **Other Papers**

The Committee considered papers presented at the June 1997 Meeting with respect to the Precautionary Approach and agreed that the authors should be invited to submit their papers for immediate consideration for publication. The Assistant Executive Secretary was requested to communicate this to the authors concerned.

b) **STACFEN Invited Lectures**

The Council recognized the value of invited lectures brought to previous STACFEN Meetings upon STACFEN Chairman's initiative. STACPUB agreed that invited lecturers should submit such

papers to be considered for publication in the NAFO series.

While encouraging STACFEN Chairman to continue the invited lectures series, STACPUB agreed that other Committees and Scientific Council should also consider invited lectures.

c) **Status of Nominations of June 1997**

Of the papers that STACPUB reviewed and nominated during its June 1997 Meeting, the Secretariat had received SCR Doc. 97/4, 13, 40 and 41 for Studies, while authors of SCR Doc. 97/5, 6, 17, 19 and 20 combined, 21 and 22 combined, 24, 66 and 77 have informed of plans to submit their papers.

d) **Scientific Citation Index**

Concern was raised that the NAFO Journal is not included in Scientific Citation Index (SCI). The Secretariat was requested to approach the authors of this index to have the Journal included.

e) **Incoming Chairman**

Noting that incoming Chairmen to STACPUB often have not had exposure to the working procedures of STACPUB, and in order to ensure some continuity to the usual procedures of the Committee, STACPUB **recommended** that *each incoming Chairman be invited to attend any STACPUB Meetings that take place prior to officially taking office.*

f) **Decadal Review of Environmental Conditions**

STACPUB noted that ICES had decided to hold a Symposium in Edinburgh, Scotland, in August 2001, on the physical and chemical observations in the ocean and related biological investigations. It was also noted that NAFO, since ICNAF times, has conducted decadal reviews, and accordingly hoped that the ICES Working Group planning this Symposium would include NAFO participation. STACPUB proposed that communications between STACFEN Chairman and the ICES Working Group should be maintained to encourage this participation.

6. **Acknowledgements**

The Chairman expressed his special thanks to the members of the Committee for their work and cooperation during the past two years of his term. He especially commended the work of the Secretariat and the Assistant Executive Secretary on the difficult and long work involved in the publication process. The meeting was then adjourned.

APPENDIX IV. AGENDA SCIENTIFIC COUNCIL MEETING - 7-19 SEPTEMBER 1997

I. Opening (Chairman: W. R. Bowering)

1. Appointment of rapporteur
2. Adoption of agenda
3. Attendance of observers
4. Plan of work

II. Fishery Science (STACFIS Chairman: R. Mayo)

1. Opening
2. Matters related to stock assessments

    a) Assessment of shrimp in Division 3M (see Annex 1) (see also Notes 1 and 2)

3. Arrangements for conducting stock assessments in 1998

    a) Update list of Designated Experts

4. Other matters

    a) Review of SCR and SCS Documents (see also Note 2)
    b) Non-traditional Resources
    c) Other business

III. Research Coordination (STACREC Chairman: D. Power)

1. Opening
2. Fisheries statistics

    a) Progress report on Secretariat activities in 1997

        i) Acquisition of STATLANT 21 data
        ii) Publication of statistical information

    b) Update on the establishment of NAFO Internet Website
    c) Definitions of fishing effort

3. Review of SCR and SCS Documents.
4. Other matters

IV. Publications (STACPUB Chairman: H.-P. Cornus)

1. Opening
2. Review of scientific publications

    a) Status of papers from September 1997 Symposium
    b) Status of publication on Div. 3M shrimp
    c) Other publications

3. Promotion and distribution of scientific publications

    a) Invitational papers

b) Considerations of ASFA Abstracts
c) NAFO Website status report
d) Possibilities of using new technologies for publications and distribution

4. Review of papers for possible publication

a) Papers presented at the September 1997 Meeting
b) Papers not considered at the June 1997 Meeting

5. Other matters

V. Management Advice and Responses to Special Requests

1. Shrimp in Division 3M
2. Special requests from concurrent Fisheries Commission meeting

VI. Review of Future Meeting Arrangements

1. Scientific Council Meeting on northern shrimp 14-18 November 1997
2. Workshop on Precautionary Measures, 17-27 March 1998
3. June 1998 Meeting of Scientific Council
4. Special Session and Annual Meeting, September 1998

VII. Future Special Sessions

1. Progress report on Symposium of September 1998
2. Progress report on Symposium in 1999

VIII. Other Matters

1. Update on Precautionary Approach
2. Other business

IX. Adoption of Reports

1. Consideration of report from the Symposium of 10-12 September 1997 [see Attachment 2]
2. Committee Reports of present meeting (STACFIS, STACREC, STACPUB)
3. Report of Scientific Council, 7-19 September 1997

X. Adjournment

NOTE 1. At its meeting of 4-19 June 1997, STACFIS noted that the method of presentation of redfish by-catch information from the shrimp fishery (in Div. 3M) continues to be variable, and recommended that *in future the estimated numbers caught as well as tables showing their size distribution be presented.* This will enable STACFIS to better evaluate possible impacts on a regulator basis.

NOTE 2. At its meeting of 4-19 June 1997, STACFIS deferred considerations of SCR Doc. 97/2 titled "Northern shrimp in Russian catches from Flemish Cap Bank (Div. 3M) in 1995-1996", and SCR Doc. 97/32 titled "Evaluations of offshore closed areas as a fisheries management tool, with emphasis on two case studies".

ANNEX 1. FISHERIES COMMISSION'S REQUEST FOR SCIENTIFIC ADVICE ON MANAGEMENT IN 1998 OF CERTAIN STOCKS IN SUBAREAS 3 AND 4

1. The Fisheries Commission with the concurrence of the Coastal State as regards the stocks below which occur within its jurisdiction, requests that the Scientific Council, at a meeting in advance of the 1997 Annual Meeting, provide advice on the scientific basis for the management of the following fish and invertebrate stocks or groups of stocks in 1998:

Cod (Div. 3NO; Div. 3M)
Redfish (Div. 3LN; Div. 3M)
American plaice (Div. 3LNO; Div. 3M)
Witch flounder (Div. 3NO)
Yellowtail flounder (Div. 3LNO)
Capelin (Div. 3NO)
Squid (Subareas 3 and 4)
Shrimp (Div. 3M)
Greenland halibut (Subareas 2 and 3)

2. The Commission and the Coastal State request the Scientific Council to consider the following options in assessing and projecting future stock levels for those stocks listed above:

a) For those stocks subject to analytical type assessments, the status of the stock should be reviewed and management options evaluated in terms of their implications for fishable stock size in both the short and long term. As general reference points the implications of fishing at $F_{0.1}$, F_{1996} and F_{max} in 1998 and subsequent years should be evaluated. The present stock size and spawning stock size should be described in relation to those observed historically and those expected in the longer term under this range of options.

Opinions of the Scientific Council should be expressed in regard to stock size, spawning stock sizes, recruitment prospects, catch rates and TACs implied by these management strategies for 1998 and the long term. Values of F corresponding to the reference points should be given. Uncertainty in the assessment should be evaluated.

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

c) For those resources of which only general biological and/or catch data are available, no standard criteria on which to base advice can be established. The evidence on the stock should be evaluated in the context of management requirements for the long-term sustainability.

d) Spawning stock biomass levels that might be considered necessary for maintenance of sustained recruitment should be recommended for each stock. In those cases where present spawning stock size is a matter of scientific concern in relation to the continuing productive potential of the stock, management options should be offered that specifically respond to such concerns.

e) Presentation of the results should include the following:

i) for stocks for which analytical type assessments are possible:

- a graph of yield and fishing mortality for at least the past 10 years.
- a graph of spawning stock biomass and recruitment levels for at least the past 10 years.
- a graph of catch options for the year 1998 over a range of fishing mortality rates (F) at least from $F_{0.1}$ to F_{max}.
- a graph showing spawning stock biomass at 1/1/1999 corresponding to each catch option.
- graphs showing the yield-per-recruit and spawning stock per-recruit values for a range of fishing mortality.

ii) for stocks for which advice is based on general production models, the relevant graph of production on fishing mortality rate or fishing effort.

In all cases the three reference points, actual F, F_{max} and $F_{0.1}$ should be shown.

3. The Fisheries Commission with the concurrence of the Coastal State requests that the Scientific Council continue to provide information, if available, on the stock separation in Div. 2J+3KL and the proportion of the biomass of the cod stock in Div. 3L in the Regulatory Area. Information is also requested on the age composition of that portion of the stock occurring in the Regulatory Area.

4. The Fisheries Commission requests that the Scientific Council comment on Article 6 and Annex II of the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks; and provide the following information for the 1997 Annual Meeting of the Fisheries Commission, a report that includes for all stocks under the responsibility of the Fisheries Commission (i.e. cod in 3M and 3NO, American plaice in 3M and 3LNO, yellowtail flounder in 3LNO, witch flounder in 3NO, redfish in 3M and 3LN, Greenland halibut in SA 2+ 3, capelin in 3NO, shrimp in 3M and squid in SA 3+4):

a) recommendation for the limit and target precautionary reference points described in Annex II indicating areas of uncertainty;

b) information including medium term consideration and associated risk or probabilities which will assist the Commission to develop the management strategies described in paragraphs 4 and 5 of Annex II in the Agreement;

c) information on the research and monitoring required to evaluate and refine the reference points described in paragraphs 1 and 3 in the Agreement Annex II; these research requirements should be set out in order of priority considered appropriate by the Scientific Council; and,

d) any other aspect of Article 6 and Annex II of the Agreement which the Scientific Council considers useful for the implementation of the Agreement's provisions regarding the precautionary approach to capture fisheries.

5. The Fisheries Commission requests that the Scientific Council develop criteria to be evaluated during any consideration of possible fisheries reopenings.

6. The Fisheries Commission requests that, in 1997, the Scientific Council carry out a thorough analysis of the time series of juvenile abundance and other relevant biological data of American plaice in 3LNO and 3M, with a view to assessing the possibility to reopen the fishery.

7. The Fisheries Commission requests that, in 1997, the Scientific Council will carry out a thorough analysis of all the relevant biological data of cod in Div. 3M with a view to the possible closure of this fishery.

8. The Fisheries Commission requests that Scientific Council review available information, including any Canadian assessment documentation, and provide advice on the status of the 2J3KL witch flounder resource. Any information pertaining to the relative distribution of the resource within the stock area, as well as changes in this distribution over time should also be provided.

9. The Scientific Council is requested to assess possible changes in yield and spawning stock biomass of Greenland halibut in Subarea 2 and Div. 3KLMNO based on the assumption of a dome-shaped exploitation pattern and a different age of maturity and mortality rates for males and females, for the following scenarios:

a) the current situation, and
b) a minimum landing size of 60 cm.

APPENDIX V. LIST OF RESEARCH DOCUMENTS AND SUMMARY DOCUMENTS - SEPTEMBER 1997

Doc. No.	Ser. No.	Author(s) and Title
97/81	N2927	**Parsons, D. G., D. W. Kulka, and P. J. Veitch.** Distribution, biomass, abundance and demography of shrimp (*Pandalus borealis*) on Flemish Cap (NAFO Division 3M) based on data obtained during a Canadian research trawl survey, September-October, 1996.
97/82	N2928	**Parsons, D. G.** The international fishery for shrimp (*Pandalus borealis*) in Division 3M (Flemish Cap), 1993-1997.
97/83	N2929	**Parsons, D. G, and P. J. Veitch.** The Canadian fishery for northern shrimp (*Pandalus borealis*) on Flemish Cap (NAFO Division 3M), 1993-1997.
97/84	N2930	**Colbourne, E.** Oceanographic conditions on the Flemish Cap during the summer of 1997, with comparisons to the previous year and the 1961-1990 average.
97/85	N2931	**Skúladóttir, U.** The Icelandic shrimp fishery (*Pandalus borealis* Kr.) at the Flemish Cap in 1993-1997.
97/86	N2932	**Carlsson, D. M., and P. Kanneworff.** The Greenland fishery for northern shrimp (*Pandalus borealis*) on Flemish Cap (NAFO Division 3M) in 1997.
97/87	N2933	**del Rio, J. L., and C. Sainza.** Northern shrimp stock on Flemish Cap according to 1988-1996 surveys.
97/88	N2934	**del Rio, J. L.** Northern shrimp (*Pandalus borealis*) on Flemish Cap in July-August 1997.
97/89	N2935	**Junquera, S., L. Bóveda, M. Alvarez, and J. L. del Rio.** Spanish shrimp *Pandalus borealis*) fishery in Flemish Cap in 1997.
97/90	N2937	**Nicolajsen, Å.** Biomass estimate length distribution and growth of the shrimp stock on Flemish Cap (Div. 3M) in June 1997.
97/91	N2938	**Aschan, M., and O. R. Godø.** Evaluation of state of stock and production potential of Division 3M shrimp based on area comparison.
97/92	N2939	**Gonzàlez, G., and I. Bruno.** Food and feeding of ocean redfish (*Sebastes mentella*, Travin) in the North Atlantic.
97/93	N2940	**Nicolajsen, Å.** Biomass estimate, length distribution and growth of the shrimp stock on the Nose of the Bank (Div. 3L) in May-June 1997.
97/94	N2941	**Burukovsky, R. N., and S. A. Sudnik.** On realized fecundity of northern shrimp (*Pandalus borealis*) at Flemish Cap during spring-summer 1996.
97/95	N2942	**Skúladóttir, U., and G. Stefánsson.** Indices of female biomass of shrimp (*Pandalus borealis* Kr.) at the Flemish Cap.

SUMMARY DOCUMENTS (SCS)

Doc. No.	Ser. No.	Author(s) and Title
97/16	N2936	**Anderson, E. D., and R. K. Mayo.** United States research report for 1996.
97/18	N2949	**NAFO.** Report of Scientific Council, 7-9 and 15-19 September 1997 Meetings.

APPENDIX VI. LIST OF REPRESENTATIVES, AND ADVISERS/EXPERTS, SEPTEMBER 1997

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