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ANNUAL MEETING OF SCIENTIFIC COUNCIL - SEPTEMBER 1980

Provisional Report of the Scientific Council
St. John's, Newfoundland, 3-8 September 1980

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PROVISIONAL REPORT OF SCIENTIFIC COUNCIL

Annual Meeting, September 1980

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

The Scientific Council and its three Standing Committees met at St. John's, Newfoundland, Canada, during 3-8 September 1980 to consider and report on matters listed in its Agenda (Appendix IV), some of which were deferred from the June 1980 Meeting (SCS Doc. 80/VI/25). Representatives attended from Bulgaria, Canada, Cuba, European Economic Community (EEC), Japan, Poland and Union of Soviet Socialist Republics (USSR), and observers were present from United States of American (USA) and the International Council for the Exploration of the Sea (ICES) (see Appendix V).

The reports of the Standing Committees, as adopted by the Council at this meeting, are in Appendix I (STACFIS), Appendix II (STACREC) and Appendix III (STACPUB). Brief summaries of these reports and other matters considered by the Council are given below.

I. FISHERY SCIENCE (APP. I)

1. Georges Bank-Gulf of Maine Larval Herring Program

The Council noted that the Task Force on the Larval Herring Program, with Dr M. D. Grosslein (USA) as Convener, met during 3-4 September 1980, in accordance with a recommendation from the June 1980 Meeting (SCS Doc. 80/VI/25), and reviewed 20 papers covering a wide range of studies related to all stages of herring recruitment in the Georges Bank-Gulf of Maine area, including inventories of the 1971-78 data base and the status of data processing. Some new research results included (i) a growth model for larval herring based on increments in otolith size, (ii) analysis of stomach contents of 7,000 herring larvae relative to the composition of copepod populations on Georges Bank, (iii) an experiment on vertical distribution of herring larvae which showed wide distribution in the entire water column to a depth of 70 m (a significant factor in larval transport), (iv) comparison of two independent estimates of egg-production potential for the Georges Bank spawning stock based on virtual population analysis (VPA) estimates and larval production estimates from the time series of larval survey data, (v) the apparent absence of herring spawning on Georges Bank in 1979 as indicated by the lack of larval production, (vi) highly significant correlation between recruitment to the herring stock in Div. 4WX and two environmental variables (sea level and southwest winds), (vii) herring spawning as late as 15 November and migration into an estuary in the Gulf of Maine as late as February, and (viii) condition factors, and estimates of abundance and critical winter mortality for larval herring from 15 years of research in a Gulf of Maine estuary.

The Council noted the significant progress made in evaluating the results of the larval herring program, and endorsed the recommendations of STACFIS related to the work of the Task Force (Appendix I), including the publication of relevant data inventories and papers, future data analyses, and the ongoing research related to herring recruitment.

2. Analyses Related to the Flemish Cap Project

The Council noted that the *ad hoc* Working Group on the Flemish Cap Project, with Mr R. Wells (Canada) as Convener, met on 5 September 1980, and reviewed the results of research presented in 10 papers containing information relevant to the area. A summary of historical biological information and the oceanographic data accumulated by the Marine Environmental Data Service (MEDS) substantially form the historical data base for the area. Some new research results included (i) confirmation of the discreteness of the cod stock from a study of variation in vertebral averages, (ii) indication of a recent decrease in abundance of juvenile redfish based on their incidence in cod stomachs, (iii) low abundance of cod larvae and much higher abundance of redfish larvae in 1978 and 1979 with an indication of high mortality of redfish larvae between April and July 1979, (iv) coincidence of the zones of high chlorophyll α concentration in 1979 with the distribution of early stages of *Calanus finmarchicus*, (v) support for the existence of a weak anticyclonic gyre on Flemish Cap from analysis of data from drifting satellite-tracked buoys and moored current meters, with an apparent 4-day periodicity in the current pattern and a strong semi-diurnal tidal signal.

The Council noted that further analysis of the historical data base of biological and oceanographic information was required and that there was a need for an annual review of ongoing data collections. The Council accordingly endorsed the recommendation of STACFIS (Appendix I) that the *ad hoc* Working Group on the Flemish Cap Project should meet during the June 1981 Meeting to review further progress in data analysis and any forthcoming research results.

3. Guidelines for Cod Otolith Interpretation

The Council noted that Mr R. Wells had, in accordance with a recommendation from the June 1980 Meeting,

prepared a paper on the interpretation of ages from cod otoliths (SCR Doc. 80/IX/156) together with annotated photographs of 95 cod otoliths examined at the Cod Ageing Workshop held at St. John's, Newfoundland, in February 1977. The paper was referred to STACPUB for possible publication in the Council's "Studies" series.

II. RESEARCH AND COORDINATION (APP. II)

1. Fishery Statistics

The Council noted that STACREC had considered a proposed new format for Table 5 of the NAFO Statistical Bulletin and the proposed revisions to country abbreviations for use in future statistical tabulations, and agreed to endorse the two recommendations on these items. It was observed that the second recommendation referred to a proposal by the Coordinating Working Party on Atlantic Fishery Statistics (CWP) that all of its participating organizations should use standardized country abbreviations in their statistical tabulations when space is limited.

The Council was informed that a restructuring of the CWP as a truly international body of experts outside the aegis of FAO was proposed and that the new CWP would come into effect upon agreement to the new terms of reference by four of the participating organizations. Noting the recommendation of STACFIS on this matter, the Council agreed to the terms of reference for the Future Structure of the CWP, as set out in Annex 2 to Appendix II, and requested the Assistant Executive Secretary to inform the Secretary of the CWP (Mr L. P. D. Gertenbach) of this decision.

The Council noted the concern expressed by STACREC regarding deterioration in the national reporting of fishery statistics through the STATLANT system, particularly the STATLANT 21B reports which provide the basis for the Statistical Bulletin and much of the assessment work, and agreed to transmit to the Contracting Parties of NAFO, through the General Council, its grave concern about this matter (GC Doc. 80/IX/11).

2. Proposed Manual on Groundfish Surveys

The Council noted that the editor (Dr W. G. Doubleday) had finally been able to present a revised, but still incomplete, draft of the proposed manual (SCS Doc. 80/IX/31), and fully endorsed the recommendation of STACREC that the editor solicit from scientists comments for improving the draft and submit a completed draft manual to the Secretariat for distribution well in advance of the June 1981 Meeting.

3. Coordination of Squid Research

The Council noted that the *ad hoc* Working Group on Squid Research, with Mr T. Rowell (Canada) as Convener, met on 2 September 1980 and considered research objectives and vessel availability relating to surveys for larval and juvenile *Illex* in the first half of 1981. The Council strongly endorsed the proposal for coordinated squid research in 1981 as given in Annex 3 to Apprendix II.

The Council agreed that one day would be required, in addition to the three days already allocated for the special session on "Squid Biology and Distribution" at the June 1981 Meeting, to review the preliminary results of the 1981 surveys, and agreed that the Working Group should meet for four days in the week preceding the Scientific Council Meeting in June 1981, with Mr T. Rowell as Convener.

4. Environmental Studies

The Council noted that the major gap in the STACREC Report of the June 1980 Meeting (SCS Doc. 80/VI/25, page 39) was filled by the presentation of the MEDS progress report for 1979 (SCR Doc. 80/IX/149), a summary of which is given in Appendix II (section IV(1)). Some improvement was noted in the national reporting of current oceanographic data to MEDS, but the acquisition of historical data series from various national representatives was much slower than anticipated. The Council further notes that the section on environmental conditions in the NAFO Area during 1979, given in Appendix II of this report, supplements a similar summary in the STACREC Report of the June 1980 Meeting (SCS Doc. 80/IX/25, pages 38-39).

Because of the planned "review of environmental conditions in the Northwest Atlantic during the 1970-79 decade" at the September 1981 Meeting of the Council, the need to have the historical data base updated as soon as possible was emphasized, including data not only for 1970-79 but also for earlier years. The Council urges that national representatives for oceanographic data exchange should ensure that as much as possible of the outstanding data noted in the relevant tables of ICNAF Res. Doc. 79/VI/118 and SCR Doc. 80/IX/149 and any other outstanding historical data series are submitted to MEDS (or to the NAFO Secretariat) as soon as possible.

III. PUBLICATIONS (APP. III)

1. Publications and Editorial Policy

The Council noted that STACPUB had completed provisionally its consideration of editorial policy relating to its scientific publications and endorsed the proposal for the establishment of a primary scientific journal entitled "Journal of Northwest Atlantic Fishery Science", starting with Volume 1 to be issued in 1980. Subsequently, the number of issues per annual volume will depend on the number of suitable quality papers submitted, with two issues being planned for 1981. An editorial board will be established consisting of an editor and four associate editors to ensure that contributed papers are subjected to refereeing and quality editing prior to publication. The Assistant Executive Secretary was designated as Editor, and the four associate editors will be selected from a list of established scientists in the fields of biological oceanography, vertebrate fisheries biology, invertebrate fisheries biology, and biomathematics.

The Council also endorsed the proposal that a secondary scientific publication, entitled "Scientific Council Studies" (similar to the ICNAF Selected Papers series) will be issued annually or more frequently as needed. The series will contain papers selected from the Council's "research document" series and contributions covering special topics (e.g. symposia papers, manuals, etc.) initiated by the Scientific Council.

2. Other Matters

The Council endorsed the proposals of STACPUB (Appendix III) relating to the development of an ichthyoplankton identification manual for the Northwest Atlantic, the coordination of research information for the NAFO area as a whole, and a new format for NAFO Statistical Bulletin Table 5 to replace Tables 5 and 6 of the ICNAF Statistical Bulletin series. The Council also noted that eight papers, presented as research documents to this meeting, were nominated for possible publication in the Council's "Studies" series.

IV. COLLABORATION WITH OTHER ORGANIZATIONS

1. NAFO Participation in the Tenth Session of the CWP

The Council noted that the Tenth Session of the CWP was held at Madrid, Spain, during 22-29 July 1980, with the Assistant Executive Secretary (Mr V. M. Hodder) and two Canadian nominees (Dr W. G. Doubleday and Mr D. A. Tilley) participating on behlaf of the Council. Dr Doubleday was unanimously elected Chairman for the Session. Some matters of direct relevance to the Council (SCS Doc. 80/IX/29) were considered by STACREC, and agreement was reached on those requiring attention at this meeting (see Appendix II).

2. Proposed NAFO/ICES Research on Redfish in Subarea 1 and East Greenland

The Council was informed that the General Secretary of ICES had been contacted regarding the proposed NAFO/ICES study on redfish, initiated at the June 1980 Meeting (SCS Doc. 80/VI/25, page 8). A response received in late August 1980 indicated that the matter would be considered at the Statutory Meeting of ICES in October 1980, following which the NAFO Secretariat would be advised of the decision.

V. FUTURE SCIENTIFIC MEETINGS

1. Mid-term Meeting for Assessment of Seals and Shrimp

The Council noted the Canadian request for advice on the scientific basis for management in 1981 of the seal stocks within national fishery limits, and the EEC request for a meeting in early October 1980 to assess the status of the shrimp stocks in Subareas 0 and 1. Because data for most of 1980 are essential for the assessment of shrimp, it was strongly emphasized that a meeting earlier than mid-November 1980 would not be feasible. Consequently, the Council agreed to meet during 18-22 November 1980 at NAFO Headquarters, Dartmouth, Canada, to assess the status of the seal and shrimp stocks.

2. Mid-term Meeting for Assessment of Capelin and Cod

The Council noted that STACFIS had not been able to provide advice for management in 1981 of the capelin stocks in Div. 2+3K and 3LNO, and the cod stocks in Div. 3M and 3NO, and agreed to meet during 17-21 February 1981 at NAFO Headquarters, Dartmouth, Canada, to review the status of these stocks.

3. Regular Meeting in June 1981

The regular meeting of the Scientific Council and its Standing Committees (STACFIS, STACREC and STACPUB) will be held at NAFO Headquarters, Dartmouth, Canada during 9-20 June 1981. Preceding this meeting, a special session on "Squid Biology and Distribution", with Mr T. Rowell as convener, will be held during 3-6 June 1981 and the *ad hoc* Working Group on the Flemish Cap Project (convener to be appointed) will meet on 8 June 1981. Both of these groups will report to STACFIS.

4. Annual Meeting in September 1981

The following topics were noted for consideration at the Annual Meeting of the Council to be held at NAFO Headquarters during 9-14 September 1981:

a) Review of environmental conditions in the Northwest Atlantic during the 1970-79 decade, Mr E. J. Sandeman as Convener.

b) Remote sensing methods and their possible application to fisheries science, with Dr R. W. Trites as Convener.

c) Further analysis of the Georges Bank-Gulf of Maine larval herring program, with Dr M. D. Grosslein as the Task Force Convener.

VI. OTHER MATTERS

1. Provisional Report of the June 1980 Meeting

The Council reviewed the report of its meeting at Dartmouth, Canada during 3-13 June 1980 (SCS Doc. 80/VI/25, + Revised addendum). The report was formally approved after several amendments, the most significant being the addition of the sentence "such a paper or papers must be submitted to the NAFO Secretariat at least 30 days before the commencement of the Scientific Council meeting during which the paper(s) would be expected to be considered" to paragraph c(i) of the section entitled "Guidelines for the Application of Rule 1.2 in the Event of a Request for an Invitation to Attend a Meeting of the Scientific Observer". All amendments will be incorporated into the Report of the June 1980 Meeting prior to its publication in the Council's "Report" series.

2. Possible Need for Amendment to Rule 5.1 of the Rules of Procedure (SCS Doc. 80/VI/25, Appendix IV)

Some members of the Council noted that there is some confusion regarding the Standing Committees to which the existing *ad hoc* Working Groups and the Larval Herring Task Force should report, as they usually discuss matters which overlap the objectives set out in Rule 5.1 for STACFIS and STACREC, namely, reviews of research results and coordination of research activities. The Council agreed that this matter should be considered by the Executive Committee and discussed at the June 1981 Meeting. Meanwhile, it was agreed as a temporary measure that the Task Force on the Larval Herring Program, the *ad hoc* Working Group on the Flemish Cap Project and the *ad hoc* Working Group on Squid Research should operate under the aegis of STACFIS.

VII. ADJOURNMENT

The Chairman expressed his appreciation to the scientists of the Northwest Atlantic Fisheries Center and the Canadian Government for the excellent meeting facilities, to the NAFO Secretariat for their usual efficiency in preparing for and servicing this meeting, to the chairmen and rapporteurs of the Standing Committees and the conveners of Working Groups including the Larval Herring Task Force, and to all participants for their cooperation and contributions. The meeting adjourned at 1630 hours on 8 September 1980.

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

Chairman: G. H. Winters Rapporteurs: Various

The Committee met at St. John's, Newfoundland, Canada, on 6 September 1980 to consider and report on matters referred to it by the Scientific Council (Agenda section B), relating specifically to the work of the Task Force on the Georges Bank-Gulf of Maine Larval Herring Program and the *ad hoc* Working Group on the Flemish Cap Project. The Committee also reviewed a variety of scientific papers not directly relevant to stock assessment advice. It was agreed that the Task Force and Working Group reports be incorporated as part of this STACFIS report to avoid duplication in summarization of the discussions. Scientists attended from Canada, EEC, Japan, USA and USSR (see Appendix IV).

I. GEORGES BANK-GULF OF MAINE LARVAL HERRING PROGRAM

1. Introduction

In accordance with a June 1980 recommendation of the Scientific Council (SCS Doc. 80/VI/25), the Task Force on the Georges Bank-Gulf of Maine Larval Herring Program was convened by Dr M. D. Grosslein (USA) on 3-4 September 1980, with Dr D. M. Ware (Canada) and Mr E. L. Dalley (Canada) as rapporteurs. Although the principal focus of the Task Force was on completion of analyses of the data from the ICNAF larval herring surveys in 1971-78, with emphasis on factors affecting the recruitment process in herring, discussions also included other relevant research. Thirteen papers were presented on various aspects of the larval herring data base, and 7 other papers related to herring recruitment in the Gulf of Maine were considered. The papers covered a wide range of studies on all life-history stages of herring, as well as inventories of the 1971-78 data base and the status of data-processing. The Task Force evaluated the new material in relation to testing hypotheses about factors controlling recruitment, and considered (i) further data analysis required, (ii) publication of data inventories and papers, and (iii) ongoing and future research related to herring recruitment. The results of the discussions are briefly summarized below and recommendations for future work are emphasized.

2. Review Papers and Progress Reports

Because of the size and scope of the data base and the scattering of published information throughout the literature, it has been difficult to keep track of progress in analysis of the data from the larval herring program. Attention was drawn to several progress reports which provide general summaries of the status of data-processing and analysis and fairly complete bibliographies. The results of larval herring studies in the Georges Bank area, based on data from the 0.505-mm mesh Bongo net samples in 1968-77, are summarized in ICNAF Res. Doc. 79/VI/112, which has a reasonably complete bibliography on larval herring studies up to that time. Another paper (Northeast Fishery Center, Woods Hole, Lab. Ref. Doc. No. 79/60, 230 p.) contains a description of the basic sampling protocols for the ICNAF larval herring surveys and plots of the larval herring catch data (0.505-mm mesh samples) for the entire time series by individual cruises. It was noted that the report of the previous meeting (28 April-1 May 1980) of the Task Force (SCS Doc. 80/IX/30) contains a summary of the status of processing and analysis of data, together with the previously unpublished report of the workshop on larval herring studies held at Gdynia, Poland, in June 1977. The Task Force reviewed a progress report on the 1978 Georges Bank larval herring patch study (SCR Doc. 80/IX/125), which includes information on the status of data-processing and papers in progress. Finally, it was noted that a recent review paper on herring in the Georges Bank-Gulf of Maine region, containing a large bibliography (about 800 references), is available from Dr C. Sindermann, Northeast Fishery Center, Sandy Hook Laboratory, Highlands, New Jersey, 07732, USA (Tech. Series Report 23, 449 p.). STACFIS noted that the Scientific Council may wish to consider publication of this paper in one of its series.

3. Inventories of Larval Herring Data Base

Several papers, outlining the status and location of the available data from the 1971-78 ICNAF larval herring time series, were presented. A general inventory of all physical-chemical-biological data was prepared by MEDS (Marine Environmental Data Service, Canada), including separate station plots for each type of data from each survey (SCR Doc. 80/IX/148). More detailed, but preliminary, inventories of biological data for the ICNAF time series were presented in SCR Doc. 80/IX/140 and 80/IX/141. It was agreed that a format similar to that of the MEDS inventory would be very useful, and the Task Force convener agreed to try to complete a comprehensive biological inventory in the coming year. An inventory of physical oceanographic data from the 1978 larval herring patch study on Georges Bank was presented in SCR Doc. 80/IX/126, and a preliminary inventory of larval herring surveys of the Bay of Fundy and western Nova Scotia areas, listing 90 cruises during 1960-80, was presented in SCR Doc. 80/IX/137. In order to promote wider use of these valuable data sets, STACFIS

recommends

i) that NAFO distribute the MEDS inventory of data from the ICNAF larval herring program (SCR Doc. 80/IX/148) after a final search for some outstanding hydrographic data; and

ii) that MEDS explore the possibility of producing an inventory of the western Nova Scotia larval herring series in the same format as that used for the ICNAF series from the Georges Bank-Gulf of Maine region.

4. Growth and Feeding of Larvae and Abundance of Prey

A mean growth curve was described for herring larvae (SCR Doc. 80/IX/131) from hatching to near metamorphosis, utilizing otolith increments in relation to size and age of larvae from both laboratory and field samples. Although there is some uncertainty about the rate of deposition of otolith increments for early larval stages and the variability in the age of larvae with a given number of increments, the resulting curve closely matches growth estimates derived from analysis of length frequency modes. It was noted that larval growth increments based on otoliths appear to be more precise and that otolith data may be particularly useful in detecting length specific mortality differences (e.g. Lee's phenomenon).

Dominant prey and feeding incidence of herring larvae by season and time of day were described from analysis of gut contents of more than 7,000 larvae from the Georges Bank-Gulf of Maine region in 1974-76 (SCR Doc. 80/IX/134). Morphological condition indices of larvae were also recorded. The data are considered adequate for description of the relative importance and composition of prey but not for absolute estimates of food consumption because of regurgitation. The adequacy of abundance estimates of larval herring prey in the ecosystem was evaluated from the 0.333 mm and 0.165 mm mesh Bongo net samples (SCR Doc. 80/IX/130, 132). The 0.165-mm zooplankton samples contain all but the nauplii and smallest copepodite stages of small copepod species found in the diet of larval herring and, therefore, can provide useful indices of density of larval prey for all but the smallest larvae. However, the 0.333 mm samples can only be used for estimates of prey abundance for larger larvae. Because only a small number of the 0.165-mm zooplankton samples have been analyzed, it was noted that more complete sorting would be required to evaluate seasonal and annual differences in larval prey densities. A review of literature on copepod length-weight relationships was presented (SCR Doc. 80/IX/124) and methods for estimating biomass of dominant copepods in the Georges Bank area were described.

5. Distribution of Herring Larvae and Associated Zooplankton

Partial analysis of data from a 1978 study of the vertical distribution of herring larvae off Cape Cod revealed that the larvae were widely distributed throughout the water column from near surface to bottom at 70 m (SCR Doc. 80/IX/133), a factor critical to hypotheses about larval transport by currents. There is relatively little information on vertical distribution of larvae in the Gulf of Maine region, but it is believed that such distribution may vary with area and season as well as size of larvae. Consequently, STACFIS urges that scientists publish all available data on this subject as soon as possible. Dr J. Graham agreed to summarize his findings in the western Gulf of Maine during the coming year.

STACFIS was informed that the geographic distribution of herring larvae in the entire Gulf of Maine region has been monitored on the US MARMAP surveys since 1977. The survey in the autumn of 1979 again showed no evidence of herring spawning on Georges Bank.

Dr M. D. Grosslein showed sample plots of zooplankton in the 0.333-mm mesh Bongo net samples from the ICNAF series for Georges Bank and from the US MARMAP series for the entire region from Cape Hatteras to western Nova Scotia. It was noted that these data will be useful in following major seasonal and annual shifts in zooplankton composition and abundance on Georges Bank and will help in the evaluation of feeding conditions for herring larvae, both for the ICNAF time series and in future studies.

6. Spawning of Georges Bank-Gulf of Maine Herring

Preliminary results of a study by Stefan Grimm (Sea Fisheries Institute, Gdynia, Poland) were briefly discussed. He analyzed bottom water temperatures only in those parts of Georges Bank and Nantucket Shoals where small larvae (<8 mm long) were found in an attempt to determine whether timing of spawning was related to temperature. No clear relationship emerged from the analysis, but it was noted that all major spawning sites in the area are near temperature fronts characterized by cold water, suggesting that a more comprehensive analysis of the available data on temperature and spawning times for the entire Georges Bank-Gulf of Maine region should be attempted to provide a more definitive evaluation of the role of temperature.

The size and structure of the herring spawning stocks (at 1 October) on Georges Bank and in western Gulf of Maine during the 1960's and 1970's were derived from VPA stock estimates and all available data on age-at-maturity (SCR Doc. 80/IX/135). Significant increases in growth, maturation rate and fecundity occurred with decrease in stock biomass, and these density-dependent changes were taken into account in estimating the potential annual egg production of the Georges Bank stock in 1962-77 and the Gulf of Maine stock in 1968-79. There was some question about the adequacy of the fecundity data, and

it was noted that gonad weights should be looked at to help confirm measures of absolute change in egg production potential. Also, it was noted that some further refinements in VPA estimates might be desirable (e.g. use of a vector of increasing natural mortality coefficient with age). However, the paper was considered to be a very significant contribution and should be published as soon as possible, pending a final search for all existing data on growth, maturity and fecundity in relation to population abundance. When compared with the larval production data, these data will provide a quantitative basis for evaluating major changes in egg mortality and hatching success. STACFIS noted that a similar analysis of changes in spawning stock and egg production potential for the western Nova Scotia stock would be very useful for comparison with the other two stocks.

7. Pre-recruit Abundance and Mortality Relative to Spawning Stock Size and Recruitment

Analysis of larval production, growth rates and mortality rates for the 1971-77 spawning seasons in the Georges Bank-Nantucket Shoals area is presented in SCR Doc. 80/IX/129. This analysis used data from the 0.333-mm mesh Bongo net samples and incorporated corrections to mortality estimates based on the growth curve reported in SCR Doc. 80/IX/131. Ratios of egg production estimates from VPA data to estimates of numbers of larvae at hatching ranged from about 1 to 14 over the 1971-76 period, suggesting large variation in egg survival, but it is not possible to confirm this without actual estimates of egg mortality. These data indicate that larval surveys can only be expected to detect relatively large changes in herring spawning stocks with any high degree of certainty. Estimates of initial larval abundance were compared with subsequent year-class strength (recruitment at age 3), but no firm inferences could be drawn in view of the short time series due to the collapse of the herring stock on Georges Bank.

The results of a 15-year study of larval herring in an estuary and near-shore areas of the western Gulf of Maine suggested that herring larvae went through a density-dependent phase of mortality in the autumn and a density-independent phase in the winter, indicating that these factors represented major determinants of year-class survival (SCR Doc. 80/IX/123). However, changes in the temporal pattern of spawning, and the occurrence of several distinct groups of larvae late in the season in recent years, appear to have altered the relationships between larval abundance and mortality indices and subsequent recruitment. The recent appearance of late-spawned larvae in western Maine estuaries as late as January and even February may be related to the unusual dispersal of larvae from other spawning areas and warrants further careful study. No relationship was apparent between relative condition factors of larvae and subsequent recruitment. It was suggested that a simple (absolute) index of condition might provide a better basis for comparing results of different years.

Several pre-recruit abundance indices and environmental variables, considered relevant to larval dispersal, were examined in relation to year-class estimates derived from cohort analyses of the herring stock in Div. 4WX in the 1963-75 period (SCR Doc. 80/IX/139). The pre-recruit indices included the results of spring larval herring surveys in the Bay of Fundy and weir catch rates in coastal waters of New Brunswick and Nova Scotia. The weir catch rates are correlated with year-class indices, but the spring larval survey indices do not appear to be promising because the strong 1976 year-class was associated with only average larval abundance. However, a highly significant statistical relationship was found between year-class strength and two environmental variables (sea level and southwest winds). Further study is needed to clarify the possible cause-and-effect relationships between the variables and to ensure that it is not a spurious correlation. Some insight into the problem may be gained from a comparison of over-winter mortality indices for larvae of the Nova Scotia stock and environmental data.

There was general discussion on the need for detailed comparisons of the time series of data for the 3 major herring stocks in the Georges Bank-Gulf of Maine region, in terms of spawning areas and timing, growth, maturity, gonad weight, fecundity, spawning biomass, egg production potential, larval production and growth-mortality-condition indices. Such comparisons may enhance interpretation of the complex array of possible variables with a view to sorting out those which are most consistently related to recruitment. Much of the data for the Nova Scotia stock already exist in various reports, and it was agreed that a paper containing detailed analyses similar to those for the Georges Bank and western Gulf of Maine areas (SCR Doc. 80/IX/135) would greatly facilitate the comparisons. Therefore STACFIS

recommends

that significant efforts be made by Canadian scientists to prepare, for consideration at the September 1981 Meeting, a summary of changes in spawning stock size and structure, egg and larval production, and overwinter larval mortality for the western Nova Scotia herring stock during the 1960's and 1970's, for comparison with similar data now available for the Georges Bank and western Gulf of Maine stocks.

8. Recent Oceanographic Studies on Georges Bank

Dr R. Schlitz reported briefly on estimates of mean advection on Georges Bank, noting that current meter studies since 1975 have shown strong evidence of a persistent clockwise circulation on the bank. A closed gyre has not been confirmed, especially at the eastern part of the bank, but steady currents

have been observed flowing easterly on the northern side and southwesterly on the southern side of the bank. Some drifting buoys have moved rapidly off the shelf to the southeast while others have gone southwest. Dr R. Trites noted that, while a gyre may enhance retention of larvae on the bank, larval transport did not appear to be closely related to residual currents. Also, it was noted that short-term events (e.g. storms or warm-core eddies) may be more important insofar as transport losses of larvae are concerned. Evidence of movement of shelf water from the bank, based on satellite photographs, should be examined in relation to larval density and distribution for the ICNAF data series. However, in view of the scarcity of herring larvae on Georges Bank during the 1978 patch study, further experiments at sea may be required to adequately test hypotheses about larval drift and currents and, in particular, to determine the extent to which herring larvae are passive drifters.

A two-year study of flow through the northeast channel separating Georges Bank and Browns Bank (SCR Doc. 80/IX/138) indicated a steady inflow into the Gulf of Maine in summer, large fluctuations with a net inflow in winter, and low transport in spring. These results pertain to large-scale, long-term variations in water exchange, which may influence fish recruitment through effects on plankton production.

9. Hypotheses on Recruitment Mechanisms

A proposed meta-theory for a study of herring recruitment, involving the biological nature of herring stocks and the factors determining their absolute abundance (SCR Doc. 80/IX/142), was not sufficiently elaborated at this meeting to provide a basis for critical evaluation. However, it was noted that historical shifts in spawning throughout the Gulf of Maine should be examined more carefully from the standpoint of possible insight into the role of natural factors controlling distribution and abundance.

10. Further Analyses of Existing Data

The status of additional existing data was discussed, with the objective of further evaluation of those data sets which offer the greatest potential for achieving insight into the herring recruitment process. It was noted that a great deal of recent tagging data was available and that a review and summary analysis of these data should be completed as soon as possible to clarify the possible effects on recruitment estimates of mixing between stocks. Accordingly, STACFIS

recommends

that Canadian and USA scientists review the results of the ICNAF International Herring Tagging Program and prepare a suitable summary for consideration at the September 1981 Meeting.

It was pointed out that some additional synthesis of published data on herring stock identity would be desirable, such as parasite incidence, biochemical indices, growth patterns and meristics. STACFIS therefore

recommends

that efforts be made to summarize, for consideration at the September 1981 Meeting, all relevant data on herring stock separation for the entire Gulf of Maine region, using information on parasites, biochemical analyses, growth and meristics.

The general point was emphasized that synthesis and publication of all available data on the herring stocks of the Gulf of Maine region would enable comparisons of the characteristics of the 3 stocks (e.g. unusually strong or weak year-classes in the same year), and thus provide some insight into migratory patterns and other characteristics which may enhance interpretation of incomplete data for the stocks in some parts of the region.

11. Need for Continuing Research

The ongoing field studies were briefly reviewed. It was noted that the monitoring of larval production and over-winter mortality was continuing for all 3 stocks to follow major changes in larval production and dispersal. Therefore, STACFIS

recommends

that the ongoing monitoring programs (US MARMAP on Georges Bank and offshore Gulf of Maine waters, State of Maine autumn and spring surveys in inshore waters, and Canadian autumn and spring surveys in the Bay of Fundy and southwest Nova Scotia areas) should be maintained, and the results reported on an annual basis to enhance the ability to follow changes in larval herring production and dispersal.

It was agreed that the monitoring of certain biological characteristics of the stocks should be continued to expedite the study of density-dependent effects. STACFIS therefore

recommends

that maturity, growth and fecundity be examined in the coming year to investigate the question of density-dependence of these factors for herring stocks of the Gulf of Maine region.

The importance of tagging experiments for elucidating migratory patterns and stock interrelationships was emphasized, and STACFIS

reccomends

that tagging studies on the Gulf of Maine herring stocks should be continued.

In the preparation of documents for consideration at future meetings, scientists are urged to summarize their results in as near final form as possible to expedite the development of general inferences and conclusions by the Task Force.

II. FLEMISH CAP PROJECT

1. Introduction

As agreed at the June 1980 Meeting of the Scientific Council (SCS Doc. 80/VI/25), the *ad hoc* Working Group on the Flemish Cap Project was convened by Mr R. Wells (Canada) on 5 Septmeber 1980, with Mr J. T. Anderson (Canada) as rapporteur, to evaluate the results of research activities by participants in the Flemish Cap Project. It was noted that 26 research documents, issued to date in 1980, were pertinent to the Flemish Cap region, but many of these were reviewed at the two previous meetings of STACFIS in 1980 (SCS Doc. 80/II/1, and 80/VI/25) and as working papers at the January 1980 Meeting of the *ad hoc* Working Group, and are not considered further at this time. Emphasis was placed on results presented in the following 10 papers: SCR Doc. 80/IX/127, 128, 143, 145, 150, 151, 152, 153, 154 and 157.

2. Historical Data Inventory

A historical data summary, comprising lists of data on hydrography, plankton, ichthyoplankton and adult fish collected since 1949 by participants in the Flemish Cap Project, was presented (SCR Doc. 80/IX/152). The usefulness of this inventory as an aid in planning and development of research priorities on Flemish Cap was emphasized. The existence of detailed historical data on adult cod and redfish was noted, including the availability of data on age and growth of cod from Canadian research vessel surveys prior to 1970. It was pointed out that historical data for cod collected by USSR would be useful in filling data gaps presently existing in the Flemish Cap time series.

3. Adult Fish

From observations on 21 year-classes of cod produced during 1940-68 on Flemish Cap (SCR Doc. 80/IX/145), the small fluctuations in vertebral averages indicated small variation in the factors responsible for determining vertebral number during the egg and larval stages. The incidence of juvenile redfish (<10 cm long) observed in cod stomachs from Flemish Cap was low in 1978, high in 1979 and extremely low in 1980 (SCR Doc. 80/IX/143). Juvenile redfish appeared to be most abundant at 200-300 m, and the importance of monitoring the early juvenile stages was emphasized. Presently, the only index of juvenile redfish abundance being used is derived from analysis of predation by cod, and the continuation of this work was recommended. Predation by redfish on juvenile cod was also considered to be an important aspect of the study on factors affecting year-class strength, and it was noted that information on this aspect is forthcoming. A brief report of USSR investigations on Flemish Cap during the last half of 1979 and the first half of 1980 indicated that cod abundance was low and the abundance of beaked redfish was at a satisfactory level.

4. Ichthyoplankton

A study on ageing of redfish larvae from Flemish Cap by otoliths (SCR Doc. 80/IX/153) indicated daily growth increments of 0.14-0.17 mm per day for larvae of 11.0-24.5 mm in length, the larger larvae having larger daily increments. A study on distribution and abundance of cod and redfish larvae on Flemish Cap (SCR Doc. 80/IX/150) indicated a low level of cod abundance, with redfish larvae being the most abundanct larvae in the 1979 ichthyoplankton samples. Abundance estimates for redfish larvae in April 1979 were virtually identical to those for April 1978 (SCR Doc. 80/VI/62). The results indicated that the spawning of redfish larvae begins in late March, mostly over the southwestern slopes of the bank. Peak spawning occurs all around the Flemish Cap in late April and early May, with maximum concentration in the area to the north of the bank. Differences in abundance estimates of redfish larvae from surveys in July 1978 and July 1979 indicate possible high mortality of larvae spawned in April 1979. It was noted that detailed analysis of USSR ichthyological research activity on Flemish Cap during the last half of 1979 and the first half of 1980 will be presented in the near future.

With regard to the identification of fish larvae, attention was drawn to the many illustrations of eggs and larvae in SCR Doc. 80/IX/90, which was endorsed as a useful reference in larval fish studies.

5. Phytoplankton and Zooplankton

Analysis of chlorophyll α and primary production data collected in April-May 1979 (SCR Doc. 80/IX/154) indicated the Flemish Cap to be an area of enhanced production. Maximum production was apparent in a large area surrounding much of the bank generally over depths greater than 200 m, with low production over the central part of the bank. Preliminary studies on *Calanus finmarchicus* in 1979 (SCR Doc. 80/IX/151) indicated that early copepodite abundance was coincident with the zones of high chlorophyll α concentration.

6. Hydrography

Preliminary analyses of drifting satellite-tracked buoys (SCR Doc. 80/IX/127) and moored current meter data (SCR Doc. 80/IX/128) support the hypothesis of a weak anticyclonic gyre on Flemish Cap. There was noticeable existence of a 4-day periodicity in the current pattern and indication of a strong semi-diurnal tidal signal. All six buoys placed on the Flemish Cap in 1979 drifted from the area in a southeasterly direction.

7. Future Work

STACFIS noted that detailed examination of hypotheses and study objectives was undertaken by the Working Group at its meeting in January 1980 (SCS Doc. 80/VI/9), and that further review was unnecessary at this time. It was noted that the historical time series still lacked a review of physical hydrography on Flemish Cap, and it was agreed that Mr S. Akenhead will coordinate a compilation and review of existing hydrographic data for consideration at the June 1981 Meeting. It was pointed out that full evaluation of the Flemish Cap Project required analysis of all outstanding data since the commencement of the program, and STACFIS strongly

recommends

that high priority should be placed on the analysis of all existing biological and hydrographic data, relevant to the objectives of the Flemish Cap project, for consideration at the June 1981 Meeting.

STACFIS expressed its appreciation to Mr R. Wells, who indicated a desire to be relieved of the convenership of the Working Group, and reluctantly agreed that consideration be given to the appointment of a new convener at the June 1981 Meeting.

III. OTHER MATTERS

1. Review of Guidelines for Cod Otolith Interpretation

STACFIS noted that Mr R. Wells had complied with a recommendation from the June 1980 Meeting (SCS Doc. 80/IX/25) in presenting a paper on the ageing of cod based on photographs of otolith sections examined at the ageing workshop on cod in February 1977. It was suggested that the otoliths and photographs might be placed in the care of the Secretariat for examination by interested laboratories. STACFIS agreed that this paper should be included in the list of contributions intended for publication in the Scientific Council's Studies series. To be of maximum benefit the reproduction of the photographs should be of a quality adequate to discriminate ageing details.

2. Review of Other Relevant Papers

A paper on juvenile cod in eastern Newfoundland waters (SCR Doc. 80/IX/144) related abundance indices of age 0+ and 1+ cod from inshore areas surveyed during 1959-64 to estimates of numbers of ages 4 and 5 cod from cohort analysis of the stock in Div. 2J+3KL and to catches of age 3 cod in USSR small-fish trawl surveys in Div. 3K and 3L. Some positive correlations were found between the inshore abundance indices and subsequent recruitment to the fishery in the offshore areas. Some points for future surveys were noted.

A paper on size selective predation by Atlantic cod in the Newfoundland area (SCR Doc. 80/IX/155) indicated that the length range of cod preying intensively on adult capelin and sand lance is approximately 40-70 cm, the minimum length being 35 cm and the upper limit being imprecise. The intensity of predation was noted to be highly variable. Discussion centered on the possible effect of regurgitation on the results for fish caught in gillnets, and on the appropriateness of the particular stomach fullness index used.

A paper on the drift of yellowtail eggs and larvae in the Northwest Atlantic (SCR Doc. 80/IX/118), based on general water circulation patterns and ichthyoplankton surveys, indicated major spawning

localities on Grand Bank, Scotian Shelf and Georges Bank with lesser spawning on St. Pierre Bank and Browns Bank. It was noted that variation in current strength around these locations influence year-class strength of the species.

In view of the limited time available for further discussion of scientific contributions, the following papers dealing mostly with stock assessment advice were deferred for consideration at future meetings of STACFIS in 1981: SCR Doc. 80/IX/114, 115, 116, 117, 119, 120, and 122.

3. Future Meetings of STACFIS

The Committee noted the requests by coastal Contracting Parties for scientific advice on harp and hooded seals and on shrimp in Subareas 0 and 1 for 1981. It was emphasized that the earliest time when scientific advice can be provided for shrimp in Subareas 0 and 1 is mid-November 1980 and that deferrals beyond this time would be very conducive to better analyses of the accumulated data. It was also noted that mid-November would be an appropriate time to consider advice on harp and hooded seals for 1981.

With regard to the 4 stocks for which the provision of advice was deferred by the Scientific Council at its June 1980 Meeting, namely, cod in Div. 3M and 3NO and capelin in Div. 2+3K and 3LNO, STACFIS considered that mid-February 1981 would be the earliest time when scientific advice for 1981 can be provided.

4. Adjournment

The Chairman expressed his appreciation to Dr M. D. Grosslein who convened the Task Force on the Larval Herring Program, to Mr R. Wells who convened the *ad hoc* Working Group on the Flemish Cap Project, to the rapporteurs and participants for their cooperation during the meeting, and to the Secretariat for their usual efficient work.

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

Chairman: V. A. Rikhter Rapporteur: V. M. Hodder

The Committee met at St. John's, Newfoundland, Canada, on 6 September 1980 to consider and report on matters referred to it by the Scientific Council (Agenda section C), relating to the work of the *ad hoc* Working Group on Coordination of Squid Research and various matters deferred from the June 1980 Meeting. It was agreed that the report of the Working Group be incorporated as part of this STACREC report to avoid duplication in summarization of the discussions. Scientists attended from Canada, Cuba, EEC (Denmark, Federal Republic of Germany, and France), Japan, Poland, USA and USSR (see Appendix IV).

I. FISHERY STATISTICS

1. Proposed Format of Statistical Bulletin Table 5

In accordance with a recommendation from the June 1980 Meeting (SCS Doc. 80/VI/25), the Secretariat surveyed the Scientific Council members concerning their preference for a new Table 5 format based on three sample listings of catch and effort data: (A) data sets sorted by division, gear, tonnage, country and main species; (B) data sets sorted by division, country, gear, tonnage and main species; and (C) data sets for each country sorted by division, gear, tonnage and main species. The results of the survey, based on 15 replies from Bulgaria, Canada, Cuba, Denmark, France, Federal Republic of Germany, Japan, Poland, UK, USSR and USA indicated that 27% preferred (A), 54% prefereed (B), and only 20% preferred (C). STACREC therefore

recommends

that the Secretariat use format (B), with the data sets sorted by division, country, gear, tonnage and main species (see Annex 1), in the first NAFO Statistical Bulletin as the replacement for Table 5 format in the ICNAF Statistical Bulletin.

2. Proposed Revision to Country Abbreviations (SCS Doc. 80/IX/29)

The Committee noted that the CWP, at its Tenth Session in July 1980 (FAO Fish. Rept. No. 242), recommended that regional organizations producing statistical bulletins should, for uniformity, adopt a standard set of abbreviations for countries and proposed that the ISO (International Organization of Standards) list be used (ISO 3166, Second Edition, 1980). The country abbreviations currently relevant to the NAFO Area are as follows:

Country name	Proposed abbreviation
Bulgaria	BGR
Canada (Maritimes)	CAN-M
Canada (Quebec)	CAN-Q
Canada (Newfoundland)	CAN-N
Cuba	CUB
Denmark	DNK
Faroe Islands	FRO
France	FRA
German Democratic Republic	DDR
Germany, Federal Republic of	DEU
Greenland	GRL
Iceland	ISL
Ireland	IRL
Italy	ITA
Japan	JPN
Norway	NOR
Poland	POL
Portugal	PRT
Romania	ROM
St. Pierre and Miquelon	SPM
Spain	ESP
Union of Soviet Socialist Republics	SUN
United Kingdom	GBR
United States of America	USA

It was noted that the recent changes in the status of some country components (e.g. St. Pierre and Miquelon) may necessitate changes in the abbreviations to be used, and that the Secretariat should obtain confirmation regarding use of the abbreviations. STACREC accordingly

recommends

that the Secretariat, in all future statistical tabulations, where space is limited, use the ISO list of standard country abbreviations, subject to confirmation by the states concerned.

3. Classification of Fishing Gear for Statistical Purposes (SCS Doc. 80/IX/29)

The Committee noted that the CWP had made some amendments to the International Standard Statistical Classification of Fishing Gear (ISSCFG) but that none of the revisions affected those currently used by NAFO. The Committee agreed that this matter be considered at its June 1981 Meeting.

4. Allocation of Catches by Nationality (SCS Doc. 80/IX/29)

The Committee noted the recommendation of the CWP regarding the principle of allocation of catches by nationality for fishing statistics accruing from cooperative arrangements between coastal states and other countries, and agreed that this matter be considered at its June 1981 Meeting when the complete report of the CWP would be available.

5. Future of the CWP (SCS Doc. 80/IX/29)

The Committee was informed by the Chairman of the CWP's Tenth Session (Dr W. G. Doubleday) that a reorganization of the structure of the CWP as a truly inter-agency body of experts was proposed and that the new terms of reference for the future inter-agency organization had been developed (see Annex 2). It was pointed out that the new CWP would come into effect upon ratification of the term of reference by four of the participating organizations. STACREC accordingly

recommends

that the Scientific Council agree to the terms of reference for the Future Structure of the CWP, as set out in Annex 2.

6. Deterioration in National Reporting of Fishery Statistics

The Committee noted that the Secretariat had produced the advance release of annual nominal catches in 1979 (SCS Doc. 80/IX/27) about a month after the June 1980 Meeting. Normally, this document should be issued in advance of or at the time of the June Meeting, based on the submission of STATLANT 21A statistics with a deadline of 15 April. The Committee also noted that STATLANT 21B reports (detailed catch and effort data) of several countries were still outstanding despite the 30 June deadline. These data are urgently required so that the Secretariat can proceed with the production of NAFO Statistical Bulletin, Vol. 29 for 1979. STACREC

recommends

that the Scientific Council transmit to the Contracting Parties of NAFO, through the General Council, its concern about the deterioration in national reporting of fishery statistics through the STATLANT system, particularly with regard to the STATLANT 21B returns which provide the basis for the Statistical Bulletin and much of the assessment work.

II. BIOLOGICAL SURVEYS

1. Review of Proposed Manual on Groundfish Surveys (SCS Doc. 80/IX/31)

In presenting the revised draft of the groundfish surveys manual, Dr W. G. Doubleday, as Editor, informed the Committee that he was unable to finalize the draft due to the lack of response to the Council's request at the June 1980 Meeting that member countries provide the Editor by 30 July 1980 with a list of survey manuals now existing in laboratories of member countries, a brief description of the history of groundfish surveys carried out in the Northwest Atlantic, and a description of methods on intercalibrating survey abundance indices with cohort analysis for estimating catchability at age. The Editor indicated that some information on these topics might be obtained from the papers to be presented at a Canadian workshop on surveys in November 1980.

In brief discussion on certain sections of the proposed manual, it was pointed out that a better rationale for choosing stratified-random surveys over the traditional fixed-station surveys might be required, as the former may not be the best method in all cases. Some flexibility in station-selection procedures within strata might be needed, because the percentage of trawlable bottom decreases greatly

from south to north. In view of the limited time available for further discussion, STACREC

recommends

that the Editor contact appropriate scientists in the various laboratories requesting comments for improving the draft manual on groundfish surveys, and, taking into consideration any relevant information from the Canadian workshop on surveys to be held in November 1980, prepare a revised draft for further consideration at the June 1981 Meeting of the Committee.

It was agreed that the revised draft should be submitted to the Secretariat for distribution well in advance of the June 1981 Meeting.

III. COORDINATION OF SQUID RESEARCH

1. Introduction

In accordance with a recommendation of the Scientific Council (SCS Doc. 80/VI/25, page 7), the *ad hoc* Working Group on Coordination of Squid Research was convened by T. W. Rowell (Canada) on 2 September 1980 to consider final vessel availability and program planning relative to surveys for larval and juvenile *Illex illecebrosus* in early 1981. Scientists attended from Canada (T. Amaratunga, E. G. Dawe, R. K. Mohn, T. W. Rowell, H. J. Squires, R. W. Trites, D. Waldron, D. M. Ware), EEC (J. P. Minet, France), Japan (H. Hatanaka), USSR (V. A. Rikhter, G. V. Goussev), and USA (V. C. Anthony, M. D. Grosslein). As the basis for discussion, the Group considered the following items: (i) background information, (ii) development of hypotheses and research objectives, (iii) definition of biological and oceanographic research components, (iv) definition of availability of vessels, specialized gear, and scientific personnel, and (v) development of a cooperative research proposal for 1981, involving studies to be conducted, periods and areas of study, national involvements, data collection and analysis responsibilities, and coordination of research review and reporting mechanisms.

2. Background Information

Previously reported information on the distribution, migration and life cycle of *Illex illecebrosus* indicated the following:

a) *Illex* are widely distributed in the Northwest Atlantic, their distribution on the continental shelf being limited to the warmest period of the year. During their residency on the continental shelf, they range from late juvenile to maturing adult stages.

b) *Illex* occuring on the Scotian Shelf and in more northern waters are believed to live approximately one year, starting from a single protracted spawning period in late winter.

c) Spawning areas of *Illex* are presumed to be in waters beyond the continental shelf, with the possibilities of demersal and pelagic spawning being noted. Since the buoyancy of egg masses is unknown, it is impossible to infer vertical distribution.

d) Rhynchoteuthion larvae transform into the juvenile form at a mantle length of about 6 mm, and large numbers of this stage and larger juveniles were found in slope water bordering the Gulf Stream during the Canada-USSR surveys by the *R/V Belogorsk* in February-May 1979.

These observations brought to focus the possible effects of environmental conditions on the distribution of larvae and juveniles. It was noted that, since the slope and Gulf Stream water masses are highly mobile, they were important in the rapid transport of larvae and juveniles. It was also noted that warm-core eddies, which commonly exist for 4-6 months with their vertical influence extending to depths exceeding 300 m, may play a role in larval and juvenile distribution. The present information indicates that larvae and juveniles are associated with the slope water bordering the northwestern edge of the Gulf Stream. It was suggested that Gulf Stream and Sargasso Sea waters should also be sampled in future surveys.

3. Hypotheses

In view of the dynamics of the water masses, it was realized that many factors could influence the distribution and abundance of *Illex* larvae and juveniles. Consequently, several hypotheses were generated regarding possible spawning locations and distribution of larvae and juveniles, based on the behavior of these water masses and the known biology of *Illex*.

a) Adults move to the edge of the continental shelf and spawn demersally in deep water. Larvae are transported at depth or undergo vertical migration and are then transported in near-surface layers to the northwestern border of the Gulf Stream. Juveniles later migrate to the continental shelf.

b) Adults move offshore to spawn pelagically near the northwestern border of the Gulf Stream. Larvae remain in the region and juveniles migrate to the continental shelf at unknown depths.

c) Adults move offshore through or under the Gulf Stream and spawn in the Sargasso Sea. Larvae and juveniles move shoreward through or under the Gulf Stream or by warm-core eddy transport, with the juveniles eventually reaching the continental shelf.

d) Adults move offshore to spawn pelagically in the Gulf Stream, with subsequent migration of juveniles to the continental shelf.

e) Adults move to deep water at the edge of the continental shelf in Subareas 5 and 6 and spawn demersally. Larvae move outward to the northwestern edge of the Gulf Stream either at depth or in the surface layers. A portion of the larvae and juveniles are transported northward to areas bordering the Scotian Shelf and Grand Bank from which they migrate shoreward.

4. Research Objectives

Discussion centered on the basic research requirements necessary for better long-term management of the squid resource, and two primary objectives were emphasized:

a) To elaborate that portion of the life cycle of *Illex* from maturity to spawning and through larval and juvenile stages to recruitment, with emphasis on (i) timing and location of spawning and its possible relationship to physical and biological factors, and (ii) distribution and abundance of larvae and juveniles in relation to the same factors.

b) To develop an estimate of pre-recruit abundance as a necessary step toward the definition of a recruitment index.

Since the factors associated with spawning and the distribution of larvae and juveniles are poorly understood, it was agreed that empahsis should be placed on surveys aimed at realization of the first objective noted above. The detailed proposal, developed by the Working Group for research in early 1981, is given in Annex 3. Although the proposal is limited to studies in 1981, continuation of similar research in subsequent years will be necessary in order to achieve the established objectives.

5. Data Collection, Analysis and Review

Because the data being collected will be shared by the various participants in the program, it is necessary to establish protocols to ensure compatibility. While data collection formats will be standardized, it was agreed that data analyses will be the responsibility of participating scientists. Although the research proposal relates specifically to 1981, there is a commitment, in principle, on the part of participating countries to continue research according to the established objectives beyond 1981. However, finer definition of research requirements for 1982 and subsequent years is dependent on an early review of the results of the 1981 program. To facilitate this, it is considered essential that a full exchange of data and a preliminary discussion of results take place immediately after the completion of the 1981 surveys. STACREC therefore

recommends

i) that the 3-day special session on "squid biology and distribution", planned for the June 1981 Meeting, be extended by one day to facilitate preliminary consideration of the results of the 1981 squid surveys; and

ii) that participating countries should ensure that scientists involved in the program be available to attend this meeting.

The Committee agreed that a more complete review of the results of the 1981 surveys and the development of the program for 1982 should be undertaken later in 1981, possibly at the time of the September 1981 Meeting of the Scientific Council.

IV. ENVIRONMENTAL STUDIES

1. MEDS Progress Report for 1979

The Committee noted that consideration of this item was deferred from the June 1980 Meeting because MEDS was unable to complete its report for presentation at that time. Highlights of the information in the progress report for 1979 (SCR Doc. 80/IX/149) are given below.

a) Inventory of reported data collections in 1979

The Committee noted that the Marine Environmental Data Service has been active in acquiring,

processing and archiving oceanographic data collected in the NAFO Area in 1979. Inventory forms listing data collections were received from Denmark, Poland, Federal Republic of Germany and USSR. Information on other data collections were found in national research reports, Canadian cruise reports and through personal communications. A list of data collections, reported for 1979 but not yet received by MEDS, is given in SCR Doc. 80/IX/149 (table 1), indicating that data for more than 3,100 stations in 1979 are still outstanding.

b) Data received and processed for 1979

An inventory of oceanographic data received and processed for 1979 is given in SCR Doc. 80/IX/149 (table 2). The data for 114 cruises comprise 3,031 hydrographic stations and 4,543 BT stations. The bulk of these data were collected by Canadian vessels, but data for about 1,000 hydrographic stations were received from USSR. If the information noted in (a) above represents the bulk of the outstanding data, it is apparent that MEDS has received about 70% of the data collected in the NAFO Area in 1979, compared with less than 30% of the 1978 data reported by MEDS at the June 1979 Meeting (ICNAF Res. Doc. 79/VI/118).

c) Acquisition of 1978 data

In *ICNAF Redbook* 1979 (page 103), there is a listing of data reported as being collected in 1978 but not received by MEDS up to June 1979. A review of MEDS holdings for 1978 indicates that only the Danish data have been processed since June 1979, although a small quantity of outstanding 1978 data was in hand but not fully processed. It appears that some of the national representatives are not being prompt in submitting their data to MEDS, and that this lack of promptness in preparing the data for submission within a reasonable period after the end of each cruise makes the historical data more difficult to acquire.

d) Progress in acquiring historical data

In its report to the 1979 Annual Meeting (ICNAF Res. Doc. 79/VI/118, table 4), MEDS listed known historical data collections in 1959 to 1977 not yet in its files. Since then, data from cruises by *Knipovich* in May 1962, *Persius III* in October-December 1972 and June-September 1973, and *Protsion* in April-June 1973 (about 1,000 stations) have been received. USSR scientists reported at this meeting that data from cruises of *Protsion, Persius III, Ayaks* and *Odyssey* in 1975 (see *ICNAF Redbook* 1979, page 105) have recently been dispatched to the NAFO Secretariat. However, data for about 70 cruises remain outstanding.

Considerable progress was reported by USSR in compiling and submitting outstanding data to World Data Center B, but the major task of unifying the data format is very time-consuming and it is difficult to forecast when the job would be completed. In situations where data are being routed to MEDS via other data centers, it was agreed that the national representatives will, at the time of submission to their data center, dispatch a letter to MEDS or the NAFO Secretariat indicating this action. The letter of information should contain the cruise number, name of vessel, dates of cruise, and type of data. This will enable MEDS to acquire the data quickly, since experience has shown that the world data centers can best provide data in response to specific requests.

The Committee noted the need to have the MEDS data base as complete as possible prior to the special session on "Environmental Conditions in the Northwest Atlantic during the 1970-79 Decade", scheduled for September 1981, in order that the best possible analysis can be undertaken. Consequently, it was agreed that, in the preparation of outstanding data sets for submission, highest priority be given to data for standard sections as far as possible in the past, and that second highest priority be given to ensuring that the 1970-79 data base is as complete as possible.

e) The Flemish Cap Project and IGOSS

The Committee noted that the data products discussed at the June 1979 Meeting (*ICNAF Redbook* 1979, page 105) have been compiled by J. Gagnon in a paper entitled "Real-time oceanographic data transmitted during the 1979 Flemish Cap international experiment" (SCR Doc. 80/IX/157). This document displays cruise tracks in microfiche and lists the messages received from the cruises.

2. Environmental Conditions in the NAFO Area in 1979

The Committee noted that MEDS has again attempted to provide a summary of environmental conditions in 1979. The late receipt of some data and the absence of others for 1979 has hampered the work of MEDS in being able to provide fuller coverage of the area. The following highlights are based on data available for the 9 sections listed in Table 1. Machine-contoured diagrams of these sections are given in appendix B of SCR Doc. 80/IX/149.

a) Subarea 1

The data for one Fyllas Bank section received by MEDS for 1979 has not yet been fully processed.

Table 1. Standard sections sampled in 1979.

Section	Dates	MEDS ID	SCR Doc. 80/IX/149 Track	Figure
Seal Island	Aug 4-5	180579007	24	B1-3
	Nov 1-2	90SU79003	41	B4-6
	" 2-3	90SU79003	41	B7-9
	" 23-24	180579012	29	B10-12
White Bay	May 23-24	90GE79017	37	B13-15
	Aug 6-7	180579007	24	B16-18
N. Bonavista	May 21-22	90GE79017	37	B19-21
	Jul 31-Aug 1	180579007	24	B22-24
W. Bonavista	May 26-27	90GE79017	37	B25-27
E. Bonavista	May 19-21	90GE79017	37	B28-30
USSR-7A	Apr 30	180579020	31	B31-33
	Aug 8-9	180579007	24	B34-36
Flemish Cap	Mar 16-19	180579019	30	B37
	Apr 21-22	180579020	31	B38
	May 3-5	180579021	32	B39
	May 27-Jun 2	90GE79017	37	B40-42
	Jul 27-30	180579007	24	B43-45
SW Grand Bank	Aug 10-11	90GE79017	37	B46-48
USCG-3	Apr 21-25	90GE79017	37	B49-51
	Aug 12-13	180579007	24	B52-54

b) Subarea 2

Seal Island. This section was occupied four times in 1979. There was a slightly larger volume of cold water (<-1°C) than the average conditions reported by Templeman in ICNAF Special Publication No. 10 (pages 17-31). In contrast to the average, this cold water was not continuous across the shelf in 1979, but otherwise temperature conditions were not substantially different from the average. The November data for this section in 1979 can only be compared with data for 1978. There appears to be little difference apart from the presence of more water colder than 0°C in 1979. Data for this section, occupied about a day apart in early November 1979, show substantial changes in the colder water, thus indicating considerable short-term variability.

c) Subarea 3

White Bay. This section was sampled in May 1979, but there are no published data collected in May of previous years for comparison. The section was sampled at about the same time in August of 1978 and 1979, but no striking differences are apparent between the two years.

USSR-7A. This section is not a standard NAFO section, but it was sampled twice in 1979 and frequently in previous years. Although considerable data exist for comparisons, neither Templeman nor the MEDS report of last year presents or discusses data from this section.

W. Bonavista. This section was sampled in May 1979, whereas in 1978 it was sampled in August. The strong stratification observed in the August section is not apparent in the May section.

E. Bonavista. In May 1979, water from the inshore branch of the Labrador Current is evident at about 100 m on the shelf. The warm water present at about 200 m in 1978 was absent in 1979.

N. Bonavista. This section was sampled in May 1979 but there are no other published data for this period. The inshore branch of the Labrador current is clearly visible at about 100 m on the shelf. Data for this section in August 1979 indicate no striking departures from the average conditions reported by Templeman or from those in 1978, except for slightly cooler than average surface conditions.

Flemish Cap. This section was sampled on five occasions in 1979 but no historical data for four of the sections sampled in March to May are available for comparison. Data for the section in late July indicate temperature conditions on the Grand Bank similar to the average conditions reported by Templeman, but bottom temperatures on Flemish Cap in 1979 were about 0.5°C higher than average and also higher than those in 1978.

USCG-3. This section was sampled in April and August 1979 but only the August sample can be compared with historical data. Very little difference can be seen except that the colder water on the shelf slope does not penetrate as deeply in 1979 as shown by Templeman.

SW Grand Bank. Bottom temperatures in August 1979 were about 1°C higher than in 1978, but surface temperatures appear to have been about the same in both years.

3. National Representatives Responsible for Data Exchange

The Committee was informed of two changes in the list of national representatives responsible for reporting to MEDS the oceanographic data collected within the Northwest Atlantic. The updated list is as follows: Canada (J. R. Keeley), Cuba (J. Gomez), Denmark (P. Kanneworff), France (G. Stanislas), Federal Republic of Germany (D. Kohnke), German Democratic Republic (B. Schreiber), Japan (F. Nagasaki), Norway (R. Leinebo), Poland (S. Grimm), USSR (V. Ponomorenko), UK (P. Edwards), and USA (R. Ochinero).

The Committee noted that oceanographic activity by the various countries conducting research in the NAFO Area was sustained in 1979, but that MEDS continues to have some difficulties in fulfilling its role as a regional data center. It is clear that data collected in past years have not all been submitted to MEDS, although some improvement was noted between 1978 and 1979. The Committee noted that MEDS has continued to increase its awareness of oceanographic collections in order to determine the completeness of its files, and again urges that the national representatives forward to MEDS (or the NAFO Secretariat) data inventories and the actual data as promptly as possible after the termination of each cruise.

4. Other Relevant Papers

Oceanographic results presented in SCR Doc. 80/IX/121 and 136 will be considered at the June 1981 meeting of the Committee.

V. OTHER MATTERS

1. Future Meetings of STACREC

The Committee noted that its next meeting would probably be in June 1981, when major items for consideration include the report of the 10th Session of the CWP, the revised draft of the groundfish surveys manual, and the MEDS progress report for 1980.

2. Adjournment

The Chairman expressed his appreciation to Mr T. Rowell and members of his working group for their comprehensive report on coordination of squid research during the first half of 1981, to Dr R. Trites who kindly agreed on short notice to preside during consideration of the MEDS progress report for 1979, to Dr W. G. Doubleday as editor of the groundfish survey manual for preparing and introducing an almost-complete revised draft. He thanked the rapporteur and all participants for their cooperation during the meeting and the Secretariat for their usual efficient work.

ANNEX 1. FORMAT OF NEW TABLE 5 FOR NAFO STATISTICAL BULLETIN (SAMPLE B)

DIV	COUNTRY	GEAR	TON	MSP	SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	NK	TOTAL
1A	FAROES	OTB	4	PAN	N PRAWN	-	-	-	-	-	-	-	-	-	8	-	-	-	8
					TOTAL	-	-	-	-	-	-	-	-	-	8	-	-	-	8
					A. HOURS FISHED	-	-	-	-	-	-	-	-	-	83	-	-	-	83
1A	DEN-G	OTB2	3	PAN	N PRAWN	-	-	-	-	8	-	-	1	1	-	-	-	-	10
					TOTAL	-	-	-	-	8	-	-	1	1	-	-	-	-	10
					A. HOURS FISHED	-	-	-	-	21	-	-	3	4	-	-	-	-	28
					B. DAYS FISHED	-	-	-	-	2	-	-	1	2	-	-	-	-	5
1A	DEN-G	OTB2	4	PAN	N PRAWN	-	-	-	-	-	-	-	-	2	-	-	9	-	11
					TOTAL	-	-	-	-	-	-	-	-	2	-	-	9	-	11
					A. HOURS FISHED	-	-	-	-	-	-	-	-	46	-	-	27	-	73
					B. DAYS FISHED	-	-	-	-	-	-	-	-	6	-	-	3	-	9
1A	DEN-G	OTB2	5	PAN	N PRAWN	-	-	-	-	-	-	-	2	-	-	-	42	-	44
					TOTAL	-	-	-	-	-	-	-	2	-	-	-	42	-	44
					A. HOURS FISHED	-	-	-	-	-	-	-	10	-	-	-	100	-	110
					B. DAYS FISHED	-	-	-	-	-	-	-	1	-	-	-	10	-	11
1A	DEN-G	NK	2	MIX	COD	-	3	6	1	1	6	116	117	39	43	16	-	-	348
					G HALIBUT	128	385	329	239	263	660	783	437	312	120	56	83	-	3795
					A HALIBUT	-	-	-	-	-	-	4	3	2	-	-	-	-	9
					G COD	4	15	37	36	10	25	101	158	189	29	16	1	-	621
					R GRENADIER	-	2	6	8	6	3	4	2	1	-	-	-	-	32
					WOLFFISHES	-	-	1	4	1	1	62	143	185	56	7	-	-	460
					A SALMON	-	-	-	-	-	-	-	20	17	3	1	-	40	81
					CAPELIN	-	-	-	-	-	31	17	-	-	-	-	-	-	48
					CHARS(NS)	-	-	-	-	-	-	-	1	-	-	-	-	-	1
					N PRAWN	180	244	72	265	923	1067	1224	507	823	536	300	283	645	7069
					TOTAL	312	649	451	553	1204	1793	2311	1388	1568	787	396	367	685	12464
1A	DEN-M	OTB2	3	PAN	N PRAWN	-	-	-	-	-	-	-	10	-	-	-	-	-	10
					TOTAL	-	-	-	-	-	-	-	10	-	-	-	-	-	10
1A	DEN-M	OTB2	4	PAN	N PRAWN	-	-	-	-	-	-	65	12	-	-	-	-	-	77
					TOTAL	-	-	-	-	-	-	65	12	-	-	-	-	-	77
1A	DEN-M	OTB2	5	PAN	N PRAWN	-	-	-	-	-	-	134	24	-	-	-	-	-	158
					TOTAL	-	-	-	-	-	-	134	24	-	-	-	-	-	158
1A	FRA-M	OTB2	6	PAN	N PRAWN	-	-	-	-	-	-	-	-	-	34	33	-	-	67
					TOTAL	-	-	-	-	-	-	-	-	-	34	33	-	-	67
					B. DAYS FISHED	-	-	-	-	-	-	-	-	-	7	8	-	-	15
					C. DAYS GROUNDS	-	-	-	-	-	-	-	-	-	8	8	-	-	16
1B	FAROES	OTB	4	PAN	N PRAWN	569	437	751	718	1938	821	274	278	183	154	492	366	-	6981
					TOTAL	569	437	751	718	1938	821	274	278	183	154	492	366	-	6981
					A. HOURS FISHED	3246	2496	1654	2436	5885	4310	1154	772	1051	1406	3414	2811	-	30635
1B	DEN-G	OTB2	3	PAN	N PRAWN	24	37	1	52	45	63	67	57	51	27	-	-	-	424
					TOTAL	24	37	1	52	45	63	67	57	51	27	-	-	-	424
					A. HOURS FISHED	142	110	6	152	158	337	286	257	207	246	-	-	-	1901
					B. DAYS FISHED	10	13	1	14	16	21	21	20	17	20	-	-	-	153
1B	DEN-G	OTB2	4	PAN	N PRAWN	-	-	-	-	-	-	49	78	67	53	78	85	-	410
					TOTAL	-	-	-	-	-	-	49	78	67	53	78	85	-	410
					A. HOURS FISHED	-	-	-	-	-	-	106	212	128	167	391	244	-	1248
					B. DAYS FISHED	-	-	-	-	-	-	9	15	9	12	25	16	-	86
1B	DEN-G	OTB2	5	CAT	COD	-	-	-	-	-	-	-	-	-	-	1	-	-	1
					G COD	-	-	-	-	-	-	-	-	-	-	70	-	-	70
					WOLFFISHES	-	-	-	-	-	-	-	-	-	-	48	-	-	48
					TOTAL	-	-	-	-	-	-	-	-	-	-	119	-	-	119
					A. HOURS FISHED	-	-	-	-	-	-	-	-	-	-	69	-	-	69
					B. DAYS FISHED	-	-	-	-	-	-	-	-	-	-	5	-	-	5
1B	DEN-G	OTB2	5	PAN	COD	-	-	-	-	-	-	-	-	-	1	-	-	-	1
					REDFISHES	-	-	-	1	-	-	-	-	-	-	1	-	-	2
					G COD	-	-	-	-	-	-	-	-	-	1	2	-	-	3
					WOLFFISHES	-	-	-	-	1	-	-	-	-	1	5	1	-	8
					N PRAWN	78	-	-	7	645	738	641	630	456	364	360	266	-	4185
					TOTAL	78	-	-	8	646	738	641	630	456	367	368	267	-	4199
					A. HOURS FISHED	233	-	-	13	948	1209	1226	1326	894	1282	1199	626	-	8956
					B. DAYS FISHED	15	-	-	3	67	76	75	82	55	80	67	42	-	562

ANNEX 2. FUTURE STRUCTURE OF THE CWP[1]

1. Name

The group shall be known as the Coordinating Working Party on Atlantic Fishery Statistics (CWP).

2. Membership

The membership of the CWP shall be the following:

a) Food and Agriculture Organization of the United Nations (FAO)

b) International Commission for the Conservation of Atlantic Tunas (ICCAT)

c) International Council for the Exploration of the Sea (ICES)

d) International Commission for the Southeast Atlantic Fisheries (ICSEAF)

e) Northwest Atlantic Fisheries Organization (NAFO)

f) Commission for the Conservation of Antarctic Living Marine Resources (CCALMR)

g) Statistical Office of the European Communities (EUROSTAT)

h) Organization for Economic Cooperation and Development (OECD)

3. Representation

a) Each of ICCAT, ICES, ICSEAF, NAFO and CCALMR may nominate up to three participants, one of whom must be a member of the secretariat, one should be the chairman (or a designated member) of the appropriate statistics committee of the agency, and one may be a participant of a member state of the agency.

b) EUROSTAT and OECD may each be represented by one person. In the event that no participant of the member states of the European Economic Communities is included in the nominations of ICCAT, ICES, ICSEAF, NAFO and CCALMR, EUROSTAT may nominate a national participant, in addition to the participant from the Statistical Office.

c) FAO may nominate up to five participants to ensure representation of FAO itself and those inter-governmental agencies related to Atlantic fisheries under the aegis of FAO (e.g. GFCM, CARPAS, WECAF and CECAF).

d) The total number of participants in sessions of the CWP shall normally be limited to 25.

e) Each agency shall normally inform the Secretary of the CWP of the names and addresses of its nominees at least six months in advance of each session.

4. Meetings

a) Sessions of the CWP shall normally be held every two years, at times and places to be agreed by the secretariats of the participating agencies.

b) *Ad hoc* inter-agency consultation shall be held approximately one year before each session to draw up a provisional agenda and coordinate plans and participation for the session. This consultation may be by correspondence initiated by the CWP or may be a meeting.

5. CWP Secretariat

The CWP Secretariat should preferably be provided by FIDI of FAO, Rome. Should it become necessary to alter this arrangement, secretariat services for the CWP should alternate among those participating agencies with adequate resources to undertake the task.

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[1] Extract from Report of the Tenth Session of the Coordinating Working Party on Atlantic Fishery Statistics, Madrid, Spain, 22-29 July 1980 (FAO Fish. Rept. No. 242).

6. Officers

At the beginning of the session, the CWP Secretary shall call the meeting to order. In the absence of the CWP Secretary, the host agency will open the session. The participants shall from among their members elect a chairperson and vice-chairperson, who shall hold the offices for the duration of the session.

7. Documentation

Documents for each session should, if possible, be distributed to all nominated participants at least two months before the start of each session. However, documents prepared by one agency that may require the secretariat of another agency to consult with its statistics committee before a decision can be taken should be distributed at least four months before the start of the session. Each agency shall be responsible for the timely distribution of its documentation in accordance with the mailing list of participants supplied by the CWP Secretary.

8. Report

The CWP Secretary, in collaboration with the chairperson, shall, within three months of the end of the session, prepare for publication and distribute the adopted English version of the report with all relevant appendices as follows:

a) One copy to each participant in the session.

b) The number of copies specified by each participating agency before the end of the session.

French and Spanish versions of the report may be prepared by FAO, in consultation with other agencies requiring such versions, and distributed upon request in sufficient copies to meet the needs of the various agencies.

9. Effective Date

These terms of reference will come into force on approval by at least four member agencies.

ANNEX 3. PROPOSAL FOR COORDINATED SQUID RESEARCH IN 1981

INTRODUCTION

Based principally on the experience of the Canadian-USSR work on the *R/V Belogorsk* in 1979, it is proposed that more intensive efforts be made to locate spawning *Illex* and determine the distribution of larvae and juveniles as an essential requirement for the future management of the *Illex* resource. Because of the complex nature of the water masses, more intensive sampling is required than in earlier studies. Also, it was suggested that spawning may occur in waters more seaward than have been previously studied.

OBJECTIVE

The primary objective is to elaborate that portion of the life cycle of *Illex* from maturity and spawning through larval and juvenile stages to recruitment, with emphasis on (a) timing and location of spawning and its possible relationship to physical and biological properties, and (b) larval and juvenile distribution and abundance in relation to these same factors.

PROPOSED PROJECT

The project will involve two phases, an initial phase concentrated within selected geographical areas traversing the coastal-slope-Gulf Stream-Sargasso Sea water complex, and a second phase involving wide-ranging distribution and abundance studies. During the initial phase, two Canadian vessels are committed to participation and it is highly probable that one USSR vessel will also participate. For the second phase, one Canadian vessel is committed, a USSR vessel is highly probable, and a Japanese vessel may become available. In this proposal emphasis is placed on the initial phase which is timed to find spawning adults as well as the larval and early juvenile stages.

1. Phase I

The survey design of phase I involves two operational modes: (i) an initial exploratory mode (low resolution transects) extending through the coastal-slope-Gulf Stream-Sargasso Sea water complex to provide preliminary data on water masses and *Illex* distribution, and (ii) a scientific definition mode (high resolution transects) extending through this water mass complex with finer definition of distributional determinants.

a) Vessels

Vessel availability and timing of participation in phase I are as follows:

Country	Vessel	Time of Participation
Canada	*A. T. Cameron*	January 16 to February 16
Canada	*Gadus Atlantica*	February 20 to March 1 (approx.)
USSR	Argus class	February and March

Although the USA cannot commit vessels to the project, it is possible that MARMAP transects may be extended to the water masses associated with this research, particularly in the area of Georges Bank. USA scientists also indicated the possible availability of personnel to assist in the research.

b) Area of operation (transects)

Sampling will be conducted along transects commencing in coastal waters and extending to Sargasso Sea waters. The Canadian vessels will follow transects within Subareas 3 and 4, and the USSR vessel will, if possible, carry out a parallel study in Subareas 5 and 6 during the same period.

i) *A. T. Cameron*

A transect will be run in the vicinity of 63°W longitude with stations at about 30-mile intervals until stations in the Sargasso Sea are sampled (about 15 stations are anticipated). A return transect will be run along approximately the same line with finer resolution to identify details of *Illex* distribution in relation to water masses (about 25 stations).

ii) *Gadus Atlantica*

A transect, similar to that for the *A. T. Cameron*, will be run in the vicinity of 56°W longitude, with low resolution sampling until *Illex* are encountered. At this point, the survey will shift to the second mode and continue with finer resolution until Sargasso Sea waters are sampled. The vessel will continue with transects to the east of the first transect.

iii) USSR vessel

Transects will be run from Georges Bank in the vicinity of 67°W longitude, with the same pattern of stations as that for the *A. T. Cameron*.

After the initial transects are completed, the *A. T. Cameron* and the USSR vessel will continue subsequent transects in the same areas tracking water masses of interest. After the initial detailed cooperative transects are completed, the *Gadus Atlantica* will sample transects to the eastward, investigating distribution and abundance in accordance with phase II.

c) Stations

Sampling at each station, estimated to require six hours, will be conducted as follows:

i) Trawling to capture adults (mature and spawning) and juveniles will be conducted using the Engel Midwater Trawl (EMT). Vessel speed will be standardized to the degree possible after vessel capabilities are known. Trawls will be fitted with time depth recorders (TDR) and, if operationally possible, with small Bongo nets (0.333 mm mesh). Fishing at each depth will be for 15 minutes. Sampling will be made at 50 m, 100 m, 300 m, 500 m, and 750 m. If the vessel is capable of fishing at greater depths, tows at maximum depth may be made at the discretion of the scientific staff. If a spawning population of *Illex* is encountered and a larger trawl than EMT is available, the larger trawl should be used to more effectively sample the population.

ii) Near-surface larval sampling will be conducted to 50 m by oblique Bongo tows (0.333 mm mesh). Operational procedures will be in accordance with standard MARMAP methodology.

iii) Deeper larval sampling will be conducted to 200 m by oblique Bongo tows (0.333 mm). MARMAP procedures will be followed and, where possible, a TDR will be used to determine the actual fishing depth.

d) Hydrography

Hydrographic sampling will be carried out at all stations, involving surface temperature and salinity, XBT, and water sampling at standard depths.

Further hydrographic operations will be conducted, where possible, as follows:

i) Since squid larvae and juveniles appear to be associated with particular water masses (probably slope water), based on present information, the T-S structure of the water masses must be observed at all places sampled for larvae and juveniles, either by standard Nansen cast or STD, with emphasis on more detailed sampling where larvae are found.

ii) Since the variables affecting the spawning stocks are not really known, variables other than temperature and salinity should be measured, particularly chlorophyll, and probably nutrients, dissolved oxygen and particle spectra.

iii) Satellite IR data and sea surface temperature maps (e.g. NESS charts produced three times a week) should be used as a guide in studying particular water masses.

iv) If large concentrations of larvae and juveniles are located in the upper part of the water column (<200 m), buoys such as satellite-tracked buoys should be launched as an aid in tracking and relocating the concentrations.

v) If large concentrations of larvae are located in deep water (>200 m), neutrally-buoyant floats should be launched as an aid in subsequent tracking in relation to water movement.

e) Data collection and formats

Because the data to be collected during phase I will be shared by the participants and must be compatible, protocol and formats will be established under the coordination of Mr T. W. Rowell (Canada).

2. Phase II

Two vessels, one Canadian (*Gadus Atlantica*) and one USSR (unnamed), are planning to conduct more wide-ranging distribution and abundance studies on *Illex*. The Canadian vessel will participate in these studies from late February to 11 March and the USSR vessel will participate from March through April. A Japanese stern trawler may also be available in April. Since the scope of the USSR proposal was very broad and without significant availability of other vessel time, there was little opportunity to coordinate this phase of the program or to specify the details of sampling. However, it is hoped that these studies will take account of the agreed objectives and that the coordinator will be kept advised of plans so as to maximize the possibility of useful cooperation.

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

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

The Committee met at St. John's, Newfoundland, Canada, in three sessions during 3-8 September 1980, to consider and report on matters referred to it by the Scientific Council (Agenda section D). The members in attendance were J. Messtorff (EEC), J. P. Minet (EEC), A. T. Pinhorn (Canada), and V. A. Rikhter (USSR). The Chairman of the Scientific Council (R. H. Letaconnoux) chaired the final session at the request of Dr Halliday who could not preside due to other commitments.

1. Scientific Publications and Editorial Policy

The Committee reviewed in detail the needs of the Council in relation to scientific publications and proposed the following policies to the Council regarding the establishment of a primary and a secondary publication:

a) Primary scientific journal

A primary scientific journal is required of a quality which will reflect favourably on the Council in the view of the international fisheries research community. The journal should be regional in scope, publishing papers on Northwest Atlantic fisheries science but papers of general applicability, methodological papers and review papers from other areas should be considered and included where relevant. Emphasis should be placed on environmental, biological, ecological and fishery aspects of living marine resources and ecosystems.

To develop and maintain author and subscriber support, more frequent issues are required than was the case with the ICNAF Research Bulletin (about one issue per year). It is proposed that Volume 1 be produced in 1980 as a single issue but that, in 1981, Volume 2 be produced in two issues in the spring and autumn of that year. It is foreseen that a desirable number of issues per annual volume could be three or four, but this is dependent on the volume of suitable quality material which can be attracted. In other terms, the long-term objective is to publish 30-35 acceptable papers per year.

It is proposed that the journal be entitled the NAFO "Journal of Northwest Atlantic Fishery Science". The size, production, quality, and format of the journal will be identical to that of the ICNAF Research Bulletin. However, it is proposed that the Secretariat (i) investigate the possibilities for improving the quality of reprints and report its findings to the next meeting of STACPUB, (ii) design several versions of a new cover in a colour and a design distinctly different from the ICNAF Research Bulletin, and (iii) circulate these cover designs to the members of STACPUB by airmail so that a decision can be made through correspondence with STACPUB members on the most appropriate design in sufficient time for its use in the production of Volume 1.

The Committee proposes that an Editorial Board be established, consisting of the Editor and four Associate Editors, none of whom will be remunerated. It is proposed that the Assistant Executive Secretary (Mr V. M. Hodder) be Editor and that the Associate Editors be selected from established scientists in the four fields of biological oceanography, vertebrate fisheries biology, invertebrate fisheries biology, and biomathematics. The Associate Editors need not be members of the Scientific Council. It is further proposed that the members of STACPUB submit lists of candidates in each of these fields to the Chairman of STACPUB, who will amalgamate them for presentation to the next meeting of the Committee for discussion and decision on qualified candidates. At that time, the Committee will also decide on the establishment of the Editorial Board and its terms of reference.

The Committee proposes that papers for the Journal be solicited from potential contributors through NAFO Scientific Council members, ICES, FAO, and other appropriate international bodies and through the present distribution list for the ICNAF Research Bulletin. Authors will be instructed to submit their papers directly to the Editor who will ensure that they are subjected to proper editing and refereeing processes. Provision will be made in the new Journal for the publication of "Letters to the Editor". The Editor will be responsible to STACPUB for implementation of Scientific Council publication policy. The Editor, in collaboration with the Chairman of STACPUB, will prepare an announcement of the new NAFO Journal and a solicitation of papers for distribution.

It is noted that the expenses which these proposals imply for 1980 and 1981 can possibly be accommodated within the budgets approved or proposed for these years. Matters relating to future budgets and any actions to be taken to promote wide distribution of the new Journal must await evaluation of costs in the light of experience.

b) Secondary scientific publication

A secondary scientific publication is required to promote the work of the Council. It is proposed that its scope would be papers of topical interest and importance to the current and future activities of the Council and its Standing Committees, including publication of manuals, contributions to special meetings and symposia, etc., initiated by the Scientific Council. The proposed title of this series is NAFO Scientific Council "Studies", which will be identical in presentation to the ICNAF Selected Papers series. Normally, one issue a year would be produced, but more than one issue might be required occasionally to meet the needs of the Council. The first issue, labelled "No. 1" will be produced in early 1981 and contain the papers selected by STACPUB for publication from the 1980 research document series.

Papers to be published in the "Studies" series will be subject to editing by the Assistant Executive Secretary as Editor but will not be subject to refereeing. Although distribution will be primarily to Scientific Council members, there will be no restrictions on distribution and subscriptions will be available to all interested individuals and organizations.

2. Other Business

a) Proposed ichthyoplankton identification manual

The Committee, in reviewing the list of papers nominated at the June 1980 Meeting for possible publication in the Scientific Council "Studies" series, agreed that the paper entitled "Fish eggs and larvae from the Flemish Cap Bank area", by V. P. Serebryakov (SCR Doc. 80/VI/90), could form the basis for the development of a manual on ichthyoplankton identification and distribution for the Northwest Atlantic as a whole. The Committee proposes that the Scientific Council promote the development of such a manual, preferably in loose-leaf format. The program could be initiated by identifying scientists, expert in the field of ichthyoplankton research, who would be willing to participate in the program by preparing the descriptions. Further consideration of this proposal will be dealt with at the June 1981 Meeting of the Council. The final publication of such identification sheets should have a standard format.

b) Coordination of research information for the NAFO Area

The Committee noted that a large amount of scientific information on Northwest Atlantic species is generated by national organizations and laboratories of the coastal states. Much of this information is not directly available to the Scientific Council. The Council, under its terms of reference and because of interrelationships between species in the whole of the NAFO Area, should encourage these organizations and laboratories to present papers of general biological, ecological and methodological interest for consideration at its various meetings.

c) Proposed new format for Statistical Bulletin Table 5

The Committee noted the recommendation of STACREC regarding a new format for Table 5 to be used in the first issue of the NAFO Statistical Bulletin. Discussion centered on the usefulness of continuing to include Table 6 as in the ICNAF Statistical Bulletin, in view of the general impression that it was seldom used. The Committee therefore

recommends

that the Scientific Council adopt the new format of Statistical Bulletin Table 5 as proposed by STACREC, and that Table 6 of the ICNAF Statistical Bulletin not be included in the NAFO publication.

d) Papers nominated for possible publication

The members of STACPUB reviewed the research documents presented to the September 1980 meeting of the Council, requested the Secretariat to invite the authors of the following documents to submit suitably revised manuscripts for possible publication in the Scientific Council Studies series: SCR Doc. 80/IX/123, 127, 135, 145, 150, 153, 155 and 156.

The Committee also considered for possible publication a paper by Carl J. Sindermann entitled "Status of the Northwest Atlantic Herring Stocks". Since time was insufficient to evaluate the suitability of this paper for primary publication, it was agreed that the Editor in consultation with 2 or 3 experts consider the possibility of inviting Dr Sindermann to submit the paper for possible publication in the Journal of Northwest Atlantic Fishery Science.

e) Adjournment

On behalf of the Chairman, Mr Letaconnoux thanked the Committee members for their interest and cooperation in concluding consideration of matters deferred from the June 1980 Meeting.

APPENDIX IV. AGENDA, ANNUAL MEETING, SEPTEMBER 1980

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

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

B. Fisheries Science (Chairman: Dr G. H. Winters)

1. Task Force on Larval Herring Program (Convener: Dr M. D. Grosslein)
2. Analyses related to Flemish Cap Project (Convener: Mr R. Wells)
3. Review of guidelines for cod otolith interpretation
4. Other matters

C. Research Coordination (Chairman: Dr V. A. Rikhter)

1. Consideration of format of Table 5 in first NAFO Statistical Bulletin
2. Review of proposed manual on groundfish surveys (Editor: Dr W. G. Doubleday)
3. Report of *ad hoc* Working Group on Squid Research (Convener: Mr T. Rowell)
4. Review of MEDS progress report for 1979
    a) Summary of environmental conditions during 1979
    b) Inventory of 1979 oceanographic data
    c) Data received and processed for 1979
    d) Progress in acquiring historical data
    e) Involvement with Flemish Cap Project
    f) National representatives for reporting oceanographic data to MEDS
5. Other matters.

D. Publications (Chairman: Dr R. G. Halliday)

1. Editorial policy relating to scientific publications
2. Format of primary and secondary scientific publications
3. Other matters

E. Collaboration with Other Organizations

1 Preliminary report on NAFO participation in the Tenth Session of the CWP (SCS Doc. 80/IX/29)

2. Collaboration with ICES regarding redfish research in Subarea 1 and East Greenland

F. Adoption of Reports

1. Provisional report of June 1980 Meeting of Scientific Council (SCS Doc. 80/VI/25 + Addenda 1 and 2)
2. Report of STACFIS, STACREC and STACPUB

G. Future Scientific Meetings (Annexes 1 and 2)

H. Other Business

I. Adjournment

ANNEX 1. CANADIAN REQUEST FOR ADVICE ON THE SCIENTIFIC BASIS FOR MANAGEMENT OF SEAL FISHERIES WITHIN NATIONAL FISHERIES LIMITS

At the request of Canada, the Scientific Council at a special meeting in November 1979 provided advice on the scientific basis for management in 1980 of stocks of harp seals and hooded seals within national fishery limits in NAFO Subareas 0, 1, 2, 3 and 4. Subject to the consent of the other contracting party involved, the Canadian Government considers it desirable that the Scientific Council similarly provide advice on the scientific basis for seal management in 1981.

For the stocks of both species, it is requested that the Council comment on the following aspects:

1. Current stock size and pup production and recent trends in these parameters.

2. Current replacement yield and sustainable yield at present stock size and in the long term, under varying options of age compositions in the catch, including that recently occurring.

3. Trends in population size based upon differing levels of total allowable catch which incorporate quota regulation of all removals except that by traditional hunting in the Canadian Arctic and at Greenland.

It is suggested that the Council meet and report during the autumn of 1980 with dates to be established through appropriate consultation.

ANNEX 2. EUROPEAN ECONOMIC COMMUNITY REQUEST FOR ADVICE ON THE SCIENTIFIC BASIS FOR MANAGEMENT OF SHRIMP IN SUBAREAS 0 AND 1

On behalf of the EEC, I kindly request the Scientific Council to take measures to make available the advice on shrimps in NAFO Subareas 0 and 1 by early October. I wish to point out that it is of great importance to the Community to dispose of this advice by early October.

If it would facilitate the work of the Scientific Council, the Commission of the European Communities is ready to make meeting room and secretarial assistance available in Brussels for a meeting of the Assessment Committee.

APPENDIX V. LIST OF PARTICIPANTS, ANNUAL MEETING, SEPTEMBER 1980

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E. L. Dalley	" "
E. G. Dawe	" "
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W. H. Lear	" "
G. R. Lilly	" "
W. D. McKone	" "
A. T. Pinhorn	" "
T. K. Pitt	" "
R. Radtke	" "
E. J. Sandeman	" "
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APPENDIX VI. LIST OF DOCUMENTS, ANNUAL MEETING, SEPTEMBER 1980

A. RESEARCH DOCUMENTS (SCR)[1]

SCR Doc. No.	Serial No.	Title	Author(s)
80/IX/114	N183	Assessment of the stock of beaked redfish in the Grand Bank area (Divisions 3L and 3N)	T. L. Nikolskaya, V. N. Petrov & I. S. Shafran
80/IX/115	N184	Investigations of the Georges Bank Atlantic saury *Scomberesox saurus* (Walb.), in November-December 1979	A. A. Nesterov & M. E. Grudtsev
80/IX/116	N185	Dynamics of the Grand Bank spawning haddock stock, its biological status and outlook for the 1979 year-class abundance	V. P. Shestov
80/IX/117 (Revised)	N186	Distribution, age and growth of silver hake (*Merluccius bilinearis*) on the Scotian Shelf	A. Mari
80/IX/118	N187	Drift of eggs and larvae of yellowtail flounder (*Limanda ferruginea* (Storer)) in the Northwest Atlantic	S. A. Evseenko & M. M. Nevinsky
80/IX/119	N188	Assessment of the stock of beaked redfish in the Flemish Cap area (Division 3M)	V. A. Chekhova, A. K. Chumakov, I. S. Shafran & V. G. Korytin
80/IX/120	N189	Abundance of young cod on the Labrador-Newfoundland shelf in March-June 1979	A. Yu. Vulatova
80/IX/121	N190	Hydrographic conditions off West Greenland during autumn 1979	M. Stein
80/IX/122 (Revised)	N191	Assessment of the commercial fish stocks migrating along the continental slopes and shelves	V. K. Zilanov & A. A. Stroganov
80/IX/123	N192	Production of larval herring, *Clupea harengus*, along coastal Maine (1964-1978) and its relation to recruitment mechanisms of the sardine fishery	J. J. Graham
80/IX/124	N196	Comparison of reported length-weight relationships for the dominant copepod prey of larval herring (*Clupea harengus*) in the Georges Bank-Gulf of Maine area	R. E. Cohen & R. G. Lough
80/IX/125	N197	Progress report on the status of data and sample processing from the 1978 Georges Bank larval herring patch study	R. G. Lough & W. R. Wright
80/IX/126	N198	An inventory of the physical oceanographic data collected during the 1978 larval herring patch study on Georges Bank	A. R. Allen
80/IX/127	N199	The drift of satellite-tracked buoys on Flemish Cap, 1979-80	C. K. Ross
80/IX/128	N200	Moored current meter data from Flemish Cap, January-July 1979	C. K. Ross
80/IX/129	N203	Abundance and mortality estimates for herring (*Clupea harengus* L.) larvae spawned in the Georges Bank-Nantucket Shoals area, 1971-1977 seasons, in relation to spawning stock size and recruitment	R. G. Lough, G. R. Bolz & M. R. Pennington

[1] SCR Doc. 80/II/1 to 80/II/49 were presented to the February 1980 Meeting of the Scientific Council, and SCR Doc. 80/VI/50 to 80/VI/113 were presented to the June 1980 Meeting, with full distribution after these meetings.

SCR Doc. No.	Serial No.	Title	Author(s)
80/IX/130	N204	Comparison of the composition of larval herring prey items selected by bongo nets in the standard array of samplers used on larval herring survey cruises	R. E. Cohen
80/IX/131	N205	A growth model for larval herring (*Clupea harengus* L.) in the Georges Bank-Gulf of Maine area based on otolith growth increments	R. G. Lough, M. R. Pennington, G. R. Bolz & A. S. Rosenberg
80/IX/132	N206	Preliminary estimates of copepod extrusion from 0.333 mm to 0.165 mm mesh plankton nets	C. Davis III
80/IX/133	N207	Vertical distribution of herring larvae (*Clupea harengus* L.) on Nantucket Shoals, November 1977, collected by MOCNESS aboard *Anton Dohrn* 77-03	D. C. Potter & R. G. Lough
80/IX/134	N208	Larval herring (*Clupea harengus* L.) gut content and morphological condition data from three spawning seasons (1974, 1975 and 1976) in the Georges Bank-Gulf of Maine area	R. E. Cohen, R. G. Lough & J. A. Murphy
80/IX/135	N209	Estimates of herring spawning stock biomass and egg production for the Georges Bank-Gulf of Maine region	V. C. Anthony & G. T. Waring
80/IX/136	N210	Review of hydrological observations in the Northwest Atlantic in 1970-1979	V. V. Burmakin
80/IX/137	N211	Inventory of larval herring data for Canadian surveys off Western Nova Scotia	T. D. Iles & G. A. P. Black
80/IX/138	N212	Northeast Channel flow and the Georges Bank nutrient budget	S. R. Ramp, R. J. Schlitz & W. R. Wright
80/IX/139	N213	Prediction of Divisions 4WX herring year-class strength	M. Sinclair, T. D. Iles & W. Sutcliffe
80/IX/140	N214	A summary of available data on nutrients, primary productivity, and chlorophyll α for the ICNAF larval herring research area, 1975-1978	E. B. Cohen
80/IX/141	N215	Current status of sorting and computer listing for ICNAF larval herring surveys, 1971-1978	G. Bolz
80/IX/142	N216	Unsolved and open questions concerning the recruitment of herring in the Northwest Atlantic	T. D. Iles
80/IX/143	N217	Distribution and relative abundance of juvenile redfish (*Sebastes* sp.) on the Flemish Cap in 1978-80 based on information from cod stomachs	G. R. Lilly
80/IX/144	N218	Results of small cod surveys in eastern Newfoundland during 1959-64	W. H. Lear, A. M. Fleming & R. Wells
80/IX/145	N219	Variations in vertebral averages of year-classes of cod from Flemish Cap	W. H. Lear, R. Wells & W. Templeman
80/IX/146		Withdrawn. To be revised for 1981	
80/IX/147		Withdrawn. To be revised for 1981	
80/IX/148	N222	An inventory of the physical/chemical data for the Georges Bank larval herring study 1971-1977	J. R. Keeley
80/IX/149	N223	Marine Environmental Data Service progress report for 1979/80	J. R. Keeley
80/IX/150	N226	Distribution and abundance of larval cod and redfish on Flemish Cap in 1978 and 1979	J. T. Anderson & S. A. Akenhead

SCR Doc. No.	Serial No.	Title	Author(s)
80/IX/151	N228	The development and distribution of *Calanus finmarchicus* on Flemish Cap in the spring of 1979	S. A. Akenhead
80/IX/152	N224	Historical data summary for the Flemish Cap Project (Division 3M)	J. T. Anderson & A. Chumakov
80/IX/153	N225	The formation and growth of otoliths from redfish (*Sebastes* spp.) larvae from the Flemish Cap (Division 3M)	R. L Radtke
80/IX/154	N227	The chlorophyll α regime on the Flemish Cap, April-May 1979	J. T. Anderson
80/IX/155	N230	Size relationship in the predation by Atlantic cod, *Gadus morhua* (L.) on capelin, *Mallotus villosus* (Müller), and sand lance, *Ammodytes dubius* Reinhardt	G. R. Lilly & A. M. Fleming
80/IX/156	N232	The determination of the ages of cod from otoliths collected in NAFO Divisions 2J, 3K and 3L	R. Wells
80/IX/157	N233	Real-time oceanographic data transmitted during the 1979 Flemish Cap (47°N, 45°W) international experiment	J. Gagnon

B. SUMMARY DOCUMENTS (SCS)[1]

SCS Doc. No.	Serial No.	Title	Author(s)
80/VI/25 (Rev.Add.)	N175	Revisions and addenda to Provisional Report of the Scientific Council, Dartmouth, Canada, 3-13 June 1980	
80/IX/26	N176	United States of America report on research in the Northwest Atlantic during 1979	J. A. Gibson & E. D. Anderson
80/IX/27	N177	Provisional nominal catches in the Northwest Atlantic, 1979	Assistant Executive Secretary
80/IX/28	N193	Canadian research report, 1979	E. J. Sandeman, J. S. Scott & J. Boulva
80/IX/29	N195	CWP recommendations of direct importance to the NAFO Scientific Council	Assistant Executive Secretary
80/IX/30	N202	Report of Larval Herring Task Force, April 1980	
80/IX/31	N229	Manual on groundfish surveys in the NAFO Area (draft)	W. G. Doubleday (Editor)
80/IX/32	N240	Provisional report of the Scientific Council, St. John's, Newfoundland, 3-8 September 1980	

[1] SCS Doc. 80/II/1 was issued following the February 1980 Meeting of the Scientific Council, and SCS Doc. 80/VI/2 to 80/VI/25 were presented to the June 1980 Meeting, with full distribution after the meeting.