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SCIENTIFIC COUNCIL MEETING - JUNE 1980

Report of Ad hoc Working Group on the Flemish Cap Project, January 1980

Convener: R. Wells

Rapporteur: J. T. Anderson

The Working Group met at St. John's, Newfoundland, Canada, during 18-22 January 1980 in response to the recommendation of ICNAF'S Standing Committee on Research and Statistics (ICNAF Redbook 1979, page 54) and the Scientific Council of NAFO (NAFO Proc. 1979, page 118) at their respective Annual Meetings in May-June 1979, namely "that the Convener of the ad hoc Working Group on the Flemish Cap Project convene a meeting of a small group of scientists working on the project to undertake an in-depth examination of the data obtained in 1978 and 1979, and, using these results and following the general strategies developed at the meeting in Murmansk (ICNAF Redbook 1977, pages 83-86) and the plans considered at the meeting of the Working Group in Bonn (Res. Doc. 78/VI/80), to assemble a detailed plan for a well-coordinated sampling scheme for 1980. The agenda and the list of participants are at Appendices I and II.

Reviews were presented of research cruises and data collected by countries participating in the Flemish Cap Project, including material not yet published. A complete listing of these data collections will be compiled by J. Anderson and A. Chumakov. New material on oceanography, chlorophyll, zooplankton and ichthyoplankton was extensively reviewed in relation to previously published information and concepts. Also, new information concerning the status of the cod and redfish stocks were examined in detail.

Summary of Information Presented

Oceanography

Two papers were presented concerning oceanographic data collected in 1978 and 1979. It was noted that geostrophic calculations, the movements of 5 satellite-tracked buoys, and observations from moored current meters are not inconsistent with the presence of a weak, variable anticyclonic gyre in the surface layers. Semi-diurnal variation was apparent from the moored current meter readings, as well as a characteristic 4-6 day cycle. It was pointed out that such variations need to be considered in the analysis of oceanographic results from discrete locations at particular times.

Phytoplankton

A paper on chlorophyll *a* and primary production indicated that Flemish Cap is an area of enhanced production and biomass, comparable to the shelf-break waters off Nova Scotia but less than that of Georges Bank. The data indicated a central area, with low chlorophyll *a* values and low variability between samples, surrounded by a larger area of higher values and greater variability. A boundary area between high and low production areas was outlined, with the highest production occurring to the north and west of the central area.

Zooplankton

Two papers were presented on zooplankton, both indicating abundance and production to be greater in the waters surrounding Flemish Cap than in the central area of the bank. In general, abundance corresponded approximately with the boundary (or frontal) area outlined from the chlorophyll *a* samples.

However, it was pointed out that sampling adequate to define zooplankton distributions may have to be carried out on a finer scale. Zooplankton abundance appeared to be lower in 1978 than in 1979. The spawning time of *Calanus* in both 1978 and 1979 was about the same as the long-term average.

Ichthyoplankton

Four papers were presented on larval fish from samples taken in April-July 1978 and July 1979. The data indicated that larval cod were at a very low level of abundance in both years. Larval redfish were the most abundant of all species taken, being distributed throughout the sampling area. Comparison of Polish, USSR and Canadian data sampled in April-July 1978 indicated that larvae were most abundant near the edges of the Flemish Cap sampling grid. However, from May to July, they were more abundant towards the central area, indicating possible entrainment through convergent circulation. The July samples in 1978 and 1979 indicated that larval redfish were concentrated near the boundary of high phytoplankton and zooplankton production areas reported north and west of Flemish Cap (see above). Frequency distributions of larval redfish were bimodal in 1978 (5-6 mm and 18-20 mm) but unimodal in 1979 (5-6 mm). Possible explanations for this difference were advanced. Evidence was presented indicating possible larval drift away from Flemish Cap, but the possibility of oceanic redfish spawning over great depths was not ruled out. Some data were presented on American plaice larvae.

Preliminary analysis of larval redfish otolith ageing was presented, indicating that growth increments are not laid down in the otolith until extrusion. Estimates from growth increments indicated an average growth rate of 0.16 mm/day in 1978, which agreed with independent estimates of growth in 5-mm larvae from June to July 1978.

Changes in abundance of cod and redfish

Bottom trawl surveys by Canada and USSR, analysis of cod abundance by the aerial expansion method incorporating a catchability coefficient, and preliminary cohort analysis for cod indicate that the abundance and biomass of cod declined from 1977 to 1979. Preliminary analysis of data for *mentella*-type redfish indicated a decrease in abundance and biomass from 1978 to 1979, while *marinus*-type redfish abundance and biomass increased over the same period. The Working Group will use the results of the stock assessments for indications of quantitative changes in these stocks.

Examination of Hypotheses

Indices of "success" of year-classes were reviewed for both cod and redfish. Recruitment of 4-year-old cod to the commercial fishery was still considered to be the best index for determining cod year-class fluctuations. For redfish, the Working Group concluded that the recruitment of 10-year-old redfish (about 25 cm total length) to the fishery was the best index of success.

A detailed review by the Working Group of the strategies and hypotheses previously considered (ICNAF Redbook 1977, pages 83-86; Res. Doc. 78/VI/80) indicated that no major differences in approach were required. The central hypothesis to be considered is that "the year-class strength of Flemish Cap fish stocks, specifically cod and redfish, varies as a result of specific biological and environmental conditions".

A summary of the hypotheses relevant to the Working Group's study is presented in Table 1. Differences in study emphasis for these hypotheses were minimal, thus confirming the sampling strategies previously adopted.

Table 1. Summary of information relevant to hypotheses pertaining to year-class strength of the Flemish Cap fish stocks¹.

Parameter	Eggs and Larvae	Juveniles	Adults
Environmental effects	Very high	Low	Low
Predation	High	Redfish(moderate to high) Cod (low to moderate)	Low Low
Food supply	Very high	Moderate to high	Moderate
Spawning stock size	-	-	Low
Spawning stock condition	-	-	Low

¹ It was noted that sampling information necessary for some hypotheses (e.g. effects on adults of environment, predation and food supply) is collected routinely and is available.

Sampling Plans for 1980

The Working Group is grateful for and fully endorsed the oceanographic support work by MEDS and acknowledged the value of the immediate production and distribution of oceanographic data summaries from real-time transmissions. Furthermore, it was recommended that all participants in the Flemish Cap Project continue the real-time transmission of oceanographic data and that data summaries for each cruise continue to be distributed to all participants by MEDS as soon as they become available.

Previously, the northwest/southeast hydrographic section traversing Flemish Cap had been included as a part of the sampling program (*ICNAF Redbook* 1978, page 93). The Working Group has now endorsed replacing this section with a north/south line traversing the Flemish Cap along 45° west longitude and extending from 49° to 46° north latitude, with stations spaced every 20' of latitude.

New IGOSS and TESAC radio message forms were tabled. It was pointed out that these forms should minimize errors associated with the recording and transmission of oceanographic data. In addition, a manual is now available to aid scientists in radio transmission of oceanographic data, using BATHY/TESAC formats (Gagnon, 1979, MEDS 7900101 UE). It was also agreed that copies of all MEDS summary reports be forwarded to the St. John's laboratory, where they will be made available to all participating scientists on research vessels calling at this port.

Sampling schedules for 1980 participants in the Flemish Cap Project are summarized in Table 2. It was noted that Polish scientists will be unable to undertake work on Flemish Cap in 1980 due to logistic problems in the scheduling of research vessel time.

Table 2. Summary of sampling schedules by participants in the Flemish Cap Project, 1980.

Research vessel	Dates of survey	Type of survey
Canada (St. John's Laboratory)		
<i>Gadus</i>	Jan 4-23, 1980	Annual groundfish survey
<i>Gadus</i>	Apr 2-13, 1980	Plankton; oceanography
<i>Gadus</i>	May 17-Jun 9, 1980	Plankton; oceanography
<i>Zagreb</i>	Jul 18-Aug 11, 1980	Hydrography (47°N + grid): plankton
<i>Gadus</i>	Jan 28-Feb 18, 1981	Annual groundfish survey

Table 2. (continued)

Research vessel	Dates of survey	Type of survey
<u>Canada (Bedford Institute of Oceanography)</u>		
<i>Hudson</i>	Jan 2-10, 1980	Oceanography
<i>Dawson</i>	Jun 18-Jul 3, 1980	Oceanography (partly in Flemish Cap area)
<u>USSR (PINRO)</u>		
<i>Kononov</i>	Mar 1, 1980	(120 days)
<i>Protsion</i>	Apr 1, 1980	(120 days)
<i>Protsion</i>	Aug 1, 1980	(120 days)
<i>Persey III</i>	Oct 1, 1980	(120 days)

(Schedules include work in the Flemish Cap area)

For 1980, Canadian and USSR scientists agreed to proceed with joint research on the calibration of zooplankton sampling equipment used in the different investigations, and to carry out a joint sampling program to determine the extent of larval fish distribution on Flemish Cap during May 1980. It was agreed that details of these projects would be worked out between Canadian and USSR scientists when the USSR research vessel *Protsion* arrives in St. John's in April 1980.

Timetable for Analysis of Data

The Working Group agreed that scientists involved in the Flemish Cap Project should make a special effort to prepare the following data and/or analyses for presentation at the September 1980 Meeting of the Scientific Council:

- Canada: Cod. All data collected since 1949 but not yet presented.
Redfish. A listing of all data from Canadian bottom trawl surveys and plans for subsequent analysis.
Plankton. All data that have been collected and analyzed.
Oceanography. Summarization of meteorological data covering the drifting buoy periods, and analysis of current meter and drifting buoy data.
Hydrography. Analysis by MEDS of all data for 1954-79 from the 47°N hydrographic section.
- USSR: The 5 papers presented to the Working Group will be available as research documents, and data from the 1979 surveys will be presented.

Next Meeting

It was agreed that the next meeting of the *ad hoc* Working Group on the Flemish Cap Project should be held during the September 1980 Meeting of the Scientific Council. Participation in the project by other members of NAFO is invited.

Acknowledgement

The Chairman expressed the appreciation of the Working Group to Mrs. Smoljanova (USSR) for her excellent translation service.

Provisional Agenda

1. Review of data base
 - a) In-depth examination of data obtained in 1978 and 1979
 - b) Review of data prior to 1978
 - c) Listing of relevant data collections including material not yet analyzed, the listing of oceanographic and biological data to be in the form:

YEAR	MONTH	VESSEL	DATA TYPE	NO. OF OBSERVATIONS
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2. Formulation of most likely hypotheses to explain observed variation in year-class strength of the major commercial species, especially cod. *ICNAF Redbook* 1977 (pages 83-86) and *Res. Doc. 78/VI/80* are to be used as guides.
3. Formulation of a detailed plan for a well coordinated sampling scheme for 1980
 - a) Goals for 1980
 - b) Ships and resources available
 - c) Assignment of ship tasks including timing of cruises and intercalibration of gear
 - d) Timetable for analysis of data collected up to 1980.
4. Future plans, including next meeting.
5. Other matters.

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