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Progress report on the status of data and sample processing from the 1978 Georges Bank Larval Heering Patch Study

by

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Participants from the Fall 1978 Georges Bank Larval Herring Patch Study held a series of informal meetings December 10/11, 1979, at the Bedford Institute of Oceanography, Dartmouth, N.S. The objective of these meetings were to: (1) review the status of the various data bases from the Larval Herring Patch Study, (2) define and prioritize specific analysis to be made by key scientists, (3) consider a time table for plankton sorting, data processing, analysis and probable reports, and (4) formalize an organizational structure for the data analysis and conduct of future meetings of the "patch group." Participants attending the main meetings included the following:

G. Lough	NEFC, Woods Hole
R. Wright	" " "
R. Schlitz	" " "
R. Langton	" " "
S. Ramp	" " "
R. Trites	BIO, MEL
D. Sameoto	" "
D. Ware	" "
R. O'Boyle	BIO, MFD
K. Waiwood	St. Andrews, MFD
H. Hill	Lowestoft, on sabbatical BIO

G. Lough served as Chairman and R. Wright as Rapporteur for the meetings.

Monday, Dec. 10

The NEFC delegation (Lough, Lawrence, Langton, Ramp, Schiltz, Wright) checked in at the motel in Dartmouth around 3:30, and promptly went on to BIO for preliminary discussions. Present from BIO were Trites, Ware and O'Boyle. We agreed upon an agenda as proposed by Lough and format for the meetings, then dispersed.

Tuesday, Dec. 11

I. Introduction. We convened at 0900 and got directly to business. The same group was present as on Monday, plus Sameoto of BIO. Later Ken Waiwood of St. Andrews arrived and in the afternoon we were joined by Harry Hill of Lowestoft. No one appeared from Brookhaven.

Lough presented an overview (appended) of the entire exercise, with three main categories: 1) The standatd large-scale plankton/hydrography survey of the area; 2) The concentrated study in the frontal region on Northeast Georges Bank; and 3) The larval herring patch study north of Nantucket Shoals.

II. Status of data. We were brought up to date on quantity and status of data as follows:

A. Physical Oceanography

1. Dawson (Trites)

a. STD: about 540 casts were taken in the patch region. Processing was distrupted by computer changeover but now back on track. Tapes have been edited and should be ready to use by January.

b. XBT: about 60 casts were made, mostly to fill in holes in STD coverage, but there is one section across the front.

c. Drogues: 34 deployments in 7 experiments. Tracks have been plotted for all, seperation into tidal and residual components has been completed for half.

d. Dye - one 24-hour experiment. Have spent a few man-weeks on it and will produce 3 surface maps of dye distribution, maybe 10-m map, but expect it to be of limited use because of problem of matching observations in time and place.

e. Anchored Current Meter Lowerings-had one 25-hour station and one 13-hour station. Some problems in water >50 m but otherwise good data.

f. Moored Current Meters-Standard data package was ready in January 1979 but no processing since. Tape has just been sent to Woods Hole so U.S. and Canadian data can be processed together. (Note: Schlitz and Ramp spent some time during our visit with Liam Petrie at BIO to sort out questions about the Canadian format. All should go smoothly now.)

2. ALBATROSS IV (Ramp, Schlitz, Wright, Lough)

a. STDs-Derek Sutton has been processing the tapes; There was lots of operator error but most of the data were good. Profiles and plots will be produced shortly.

b. XBTs-around 260 observations, including 7 transects across the front and 3 24-hour series. Data should be re-plotted.

c. Drogues-6 deployments should be plotted. ALBATROSS has some positions for DAWSON drogues.

d. Moored Current Meters-Basic processing of U.S. data, including statistical analysis and intercomparisons, is complete. It will take a couple of months to translate Canadian tape to U.S. (WHOI) format, then intercomparisons can be done.

e. Meteorological Data. Ramp is converting data from Monster Buoy on Georges Bank to WHOI format. Will provide wind speed and direction, barometric pressure, air and sea surface temperature, some wave data. Also available are 6-hourly weather maps, data from U.S. shore stations, and shipboard observations. (Trites can provide data from DAWSON deck log and Yarmouth, N.S. weather station.)

B. Biology

1. Ichthyo/Zoo-Plankton (Lough)

a. Poland. Patch Study is alloted 1200 smaples/year at Polish sorting center (one sort for ichthyo, one for zoo, counts as two samples. Priority list for first year shown in handout. All laboratory processing of the first years samples now complete; except computer listings of the standardized data within the next 3 months.

Polish Sorting Center provides species list, numbers of individuals and volumes. In U.S. this information has to be key-punched, edited and put into computer.

b. MOCNESS. All MOCNESS samples to date have been kept in Woods Hole. All 10 hauls from the chaetognath patch study have been sorted, including data on stages of maturity.

c. Cabell Davis. He is studying the population dynamics of the copepods (Pseudo-paracalanus) as a Ph. D. research topic through B.U.M.P.

2. Phytoplankton etc. (O'Boyle)

Chlorophyll, fluorescence and particle size were obtained in 3 passes over the standard grid on NE Georges and in the Nantucket shoals patch. Most data were lost in BIO fire except what was recorded on shipboard or sent to Woods Hole. An effort is underway to reconstruct the original logs. All particle data and 20-m chlorophyll from Georges survived and have been computerized. A technical report (with Ray Sheldon) is in the works.

3. BIONESS, Acoustic data (Sameoto)

Twelve BIONESS stations were made, each with 10 depths. Samples have all been sorted to total wet weight, copepod weight, chaetognath weight, with mean lengths for some samples. No herring were found. Difference between on-bank and off-bank samples was dramatic. Sorting should be complete by spring. Report on acoustic data should be ready by March ICNAF meeting. Scattering was weak but chaetognaths could be distinguished. (Lough reported some scattering

observed at 38 kHz on ALBATROSS. Sameoto thinks it was not chaetognaths themselves, probably euphausiids or small fish that could be associated with chaetognaths.)

4. Food Habits (Waiwood, Langton)
   a. Feeding chronology. CANSO CONDOR did a trawl study just north of the "Traditional" herring spawning grounds. Herring eggs were found in only 8 of 120 fish (haddock and flounder) examined on board. In addition, 60 stomachs of winter flounder have been examined at Woods Hole, from a region a little west of the spawning grounds, and herring eggs were found in 9 or 10.

   b. Chaetognaths. Three mid-water tows were made through the chaetognath patch; it should be possible to determine what animals were preying on the chaetognaths. No larval fish were found in stomachs examined at sea.

III. Possible Papers. Up to 15 possible papers and probable authors were identified as resulting from the U.S. and Canadian data, in three general areas: 1) Northeast Georges Bank biology and biological-physical interactions; 2) Nantucket Shoals Larval Herring Patch; 3) physical oceanography. It was agreed also that:

- There should be one descriptive "overview" paper covering the entire Patch Study.
- Authors should feel free to publish when and where they wish.
- An informal numbering system should be set up to identify all papers, and reports arising from the patch study.

A. Overview Paper. This could be a revised and expanded version of the I.C.E.S. report (C.M. 1979/L:36) by Wright and Lough (Appendix I). It would serve as a general description for those unfamiliar with the project (and would relieve Patch Study authors from having to re-describe the same material over and over again.) Probable co-authors: Lough, Trites, Wright.

B. Northeast Georges Bank
   1. Chaetognath patch retention model (Ware, Trites, Lough, Schlitz)
   2. Distribution of chlorophyll, particle size, microplankton (O'Boyle, R. Cohen, C. Davis).
   3. Distribution, abundance, community analysis of larger zooplankton (R. Cohen, G. Lough)
   4. Biology in relation to the dynamics of circulation. (Lough, Trites, Wright.)
   5. Chaetognath Patch Description: including MOCNESS, BIONESS, bongo, grid series, predators. (Lough, R. Cohen O'Boyle, Ware, Sameoto, Langton)
   6. Feeding chronology of cod, haddock, winter flounder and longhorn sculpin. (Waiwood, Langton)
   7. Nutrient and productivity linkages in relation to tides and winds (BNL? Trites? Schlitz?)

8. Population dynamics of Pseudo-paracalanus. (Davis)

9. Population dynamics of Centropages (R. Cohen)

C. Nantucket Shoals Larval Herring Patch
1. External patch structure and dispersal in relation to wind and currents (Lough, Wright, Bolz)

2. Internal patch structure, including growth and mortality, vertical and horizontal distributions, predators and the larger zooplankton community (Lough, Ware, Bolz, Potter, R. Cohen, O'Boyle, FRG?)

D. Physical Oceanography
1. Circulation in relation to distribution of properties (Trites, Schlitz, Wright, Ramp)

2. Current meter intercomparisons, Eulerian/Lagrangian comparisons. (Trites, Schlitz, Ramp)

3. Tides (Ramp, Schlitz)

IV. Subgroup meetings

A. Physical Oceanography. (Trites, Schlitz, Wright, Ramp)
1. Data inventory. It was agreed to try to produce a physical oceanography data inventory, at least in manuscript form, before the March meeting. Trites will be responsible for DAWSON material, Wright for ALBATROSS IV and all other ships.

2. Hydrographic Data reports. It was agreed that there is no point trying to force Canadian and U.S. STD data into identical formats. Instead, one report will be issued for DAWSON (Trites) and one for ALBATROSS and other participating vessels (Wright to coordinate. It was suggested that the reports should contain similar material, i.e., station positions, sections, time sequences where available, and horizontal plots at least at 0,30,40 meters and the bottom.

3. Current meter data report. As all data are to be handled identically at W.H.O.I., it makes sense to issue a single report covering all six moorings (Ramp, Schlitz).

4. Patch Study Numbering System. It was felt that all relevant documents (published papers, abstracts, ICES and ICNAF documents, technical reports, data reports, etc.) arising from the Patch Study should be numbered for the sake of completeness; reports to date are listed in Appendix II.

B. Food Habits (Waiwood, Langton)

In addition to the feeding chronology paper, it was agreed to attempt

1. to shed a little more light on herring bed predation, possibly in the form of a Canadian Technical Report, and

2. to look briefly at chaetognath predation in relation to the chaetognath patch.

By March it should be possible to decide whether these objectives are realistic.

C. Zoo-ichthyoplankton (Lough, Ware, O'Boyle, Laurence).

1. The chaetognath retention model paper (III. 3.1.) should be published as soon as the patch definition and vertical distribution as determined by at-sea volumetric measurements are validated by part of the laboratory processed data. All the chaetognath patch samples probably should be replotted and contoured to preclude any initial bias.

2. Sorting priority. We felt that we should attempt to complete processing of the Patch Study plankton samples with the next 1200 samples sent to Poland to include all the major elements of the Study. Although some work may continue on various parts of the remaining samples for several years, new initiatives by our institutions will redirect the major focus of our attentions. Therefore we will have to be very selective in those samples still to be processed.

a. The larval herring patch should receive first priority as it has the prime objective of the study. The vertical bongo hauls (.053 mesh) collected in the larval herring patch should receive high priority for sorting as they represent the major component of food organism for the larvae.

b. The remaining samples on northeastern Georges requiring sorting by Poland to define the chaetognath patch should only be sorted for chaetognath to speed up sorting.

c. MOCNESS plankton hauls to receive a complete zooplankton sort, other than the one series in the patch center presently being sorted in Woods Hole, should be sent to Poland and receive a lower priority than item 2 b..

d. Only selected 20 cm., .165 mesh samples from the Georges Bank study grid should be processed to supplement the 60 cm/.333 mesh grid series. These 165 samples are low priority and perhaps sorting time may be reduced by processing them using a HIAC particle counter.

e. The major responsiblity for seeing that the plankton samples are processed, quality controlled, and initial computer listings made, resides with Lough. He will select the second set of 1200 priority samples to be processed by April 1980 for the working groups review.

V. Concluding Comments

We all felt that substantial progress was made at this meeting to define the major components of the Patch Study data base and partition various elements of the analysis among the participating scientist. Renewed enthusiasm was generated with the prospect of publishing significant new information on the biology and hydrography of the Georges Bank region. A brief view of the Larval Herring Patch Study was held in Woods Hole, 28 April - 2 May, as part of the Larval Herring Task Force, and is summarized in the report of that meeting.

APPENDIX I

OVERVIEW OF THE GEORGES BANK LARVAL HERRING PATCH STUDY OF 1978.

I. Standard Plankton-Hydrography survey of entire Georges Bank - Nantucket Shoals area.

4-surveys between Oct-Dec.

II. Northeast Georges Frontal Study (10 Oct - 2 Nov)
- A. Physical Oceanography
  1. Moored current meter meas. (6) Can. 11 Oct - 4 Nov; USA 14 Sept - 14 Nov
  2. Spatial & Temporal T, S meas.
  3. Drogue meas. of drift
  4. Current profiles with ship drifting or anchored
  5. Dye diffusion meas.
  6. Meterological Obs.
- B. Biological Oceanography
  1. Standard Grid (49 + Stations) Study
     5-Surveys 14 Oct - 10 Nov, 8-Survey 14 Oct - 12 Dec.
     a. Bongo (60 + 20 cm, 505, 333, 253, 165 mesh)
     b. Particle size
     c. Chlorophyll
     d. Nutrients, C/N
     e. Primary productivity
     f. Vertical Bongo Fine Mesh (102, 53 mesh)
     g. Water Bottle & Pump Microplankton
     h. Vertical Distribution of Larger Zooplankton
        (1) Bioness
        (2) MOCNESS
        (3) Pump
        (4) Hydroacoustics
     i. Midwater-Bottom Predators
     j. Copepod Feeding Experiments
  2. Transect Study IA (ALB IV, L. HAMMOND)
  3. Simulated "Patch" Study (DAWSON, L. HAMMOND, ALB IV), Tidal Scale.
  4. Chaetognath Patch Study (DAWSON, ALB IV, C. CONDOR, A. DOHRN)
  5. Lateral Homogeneity Study-MOCNESS (DAWSON, ALB IV)
  6. Surface Diffusion Study - Dye, Drogues, Bongos (DAWSON, ALB IV), Tidal Scale.

III. Nantucket Shoals Larval Herring Patch Study
- A. Physical Oceanography
  1. Spatial & Temporal T,S
  2. Drogue meas. of drift
  3. Meterological Obs.
- B. Biological
  1. Mapped Larval Patch 5-times, 3-8 Nov.
     Mapped Larval Patch 7-times, Nov-Dec.
     a. Bongo Zooplankton
     b. MOCNESS

c. Vertical Bongo fine mesh
d. Water bottle Microplankton
e. Water bottle Chlorophyll
f. Water bottle Particle size
g. Water bottle C/N
h. Larval Herring preserved for condition factor meas., Otolith ageing
i. Larval Herring lab feeding exps. - (Laurence, Buckley)
j. Predator-Prey Studies-Limited information

1978 LARVAL HERRING PATCH STUDY

SAMPLE PROCESSING STATUS SHEET

Vessel	Cruise No.	Dates	# Samples	Sampler-mesh	Poland	Sort	Complete
Priority I: Standard ICNAF LHS Stations (ICHTHYO)							
WIECZNO	78-04	14Oct-01Nov	38	6B3	✓	✓(All Stas)	✓
A. DOHRN	78-03	26Oct-26Nov	63	6B3	✓	✓	✓
ALB IV	78-15	29Nov-12Dec	53	6B3	✓	✓	✓
			STOT 154				
Priority II: NE Georges Grid (Zooplk)							
WIECZNO	78-04	14Oct-01Nov	9	6B3	✓	✓	✓
L. HAM.	78-08	17Oct-19Oct	48	6B3	✓	✓	✓
		20OCT-22Oct	48	6B3	✓	✓	✓
		24Oct-26Oct	48	6B3	✓	✓	✓
ALB IV	78-13	16Oct-10Nov	9	6B3	✓	✓	✓
A. DOHRN	78-03	26Oct-17Nov	48	6B3	✓	✓	✓
ALB IV	78-15	29Nov-12Dec	9	6B3	✓	✓	✓
Priority III: Nantucket Shoals Larval Herring Patch (ICHTHYO)							
L. HAM.	78-08	03Nov-04Nov	32	6B3	✓	✓	✓
		04Nov	35	6B3	✓	✓	✓
		05Nov-06Nov	49	6B3	✓	✓	✓
		06Nov-07Nov	23	6B3	✓	✓	✓
		07Nov-08Nov	30	6B3	✓	✓	✓
ALB IV	78-13	03Nov-04Nov	30	6B3	✓	✓	✓
		04Nov	12	6B3	✓	✓	✓
		05Nov-06Nov	22	6B3	✓	✓	✓
		06Nov-07Nov	30	6B3	✓	✓	✓
		07Nov-08Nov	48	6B3	✓	✓	✓
ALB IV	78-14	18Nov-22Nov	57	6B3	✓	✓	✓
ALB IV	78-15	29Nov-12Dec	68	6B3	✓	✓	✓
			STOT 436				
Priority IV: Nantucket Shoals Larval Herring Patch (Zooplk)							
L. HAM	78-08	03Nov-04Nov	10	6B3	✓	✓	✓
		04Nov	15	6B3	✓	✓	✓
		05Nov-06Nov	10	6B3	✓	✓	✓
		06Nov-07Nov	10	6B3	✓	✓	✓
		07Nov-08Nov	5	6B3	✓	✓	✓
ALB IV	78-13	03Nov-04Nov	13	6B3	✓	✓	✓
		05Nov-06Nov	2	6B3	✓	✓	✓
		06Nov-07Nov	11	6B3	✓	✓	✓
		07Nov-08Nov	30	6B3	✓	✓	✓
ALB IV	78-14	19Nov-20Nov	20	6B3	✓	✓	✓
ALB IV	78-15	12Nov-14Dec	24	6B3	✓	✓	✓
			STOT 150	GTOT 1010			

APPENDIX II

Numbered Series of Reports, Documents, Papers.

1. Sullivan, L. 1978. Cruise Results, R/V WIECZNO Cruise No. 78-04, Larval Herring Patch Study. NEFC, Woods Hole, MA. 20 November 1978.

2. Lough, R.G. 1978. Larval Herring patch study - Press Release submitted to NOAA News. 22 November 1978.

3. Smith, W.G. 1978. Cruise Results, USSR R/V BELOGORSK Cruise No. BE-78-03, Ichthyoplankton- Zooplankton, Oceanographic and Primary Productivity Survey. NEFC, Sandy Hook, N.J. 28 November 1978.

4. Lough, R.G. 1978. Cruise Results, NOAA R/V ALBATROSS IV Cruise No. AL 78-13, Larval Herring Patch Study. NEFC, Woods Hole, MA., 6 December 1978.

5. Smith, W.G. 1978. Cruise Results, USSR R/V BELOGORSK Cruise No. 78-04, Ichthyoplankton-Zooplankton, Oceanographic and Primary Productivity Survey. NEFC, Sandy Hook, N.J. 18 December 1978.

6. Prezioso, J. 1978. Cruise Results FRG R/V ANTON DOHRN Cruise No. 78-03, Larval Herring Patch Study. NEFC, Woods Hole, MA. 19 December 1978.

7. Lough, R.G. 1978. Cruise Results NOAA R/V ALBATROSS IV Cruise No. AL 78-14, Nantucket Shoals Larval Herring Patch Study. NEFC, Woods Hole, MA. 20 December 1978.

8. Lough, R.G. 1978. Cruise Results, NOAA R/V ALBATROSS IV Cruise No. AL 78-15, Larval Atlantic Herring Survey. NEFC Woods Hole, MA. 21 December 1978.

9. Waiwood, K. 1978. Cruise Report No. CC 78-03, CANSO CONDOR 23 Oct- 10 Nov. 1978, to Georges Bank and Nantucket Shoals. Biological Station, St. Andrews, N.B.

10. Trites, R.W. 1978. Cruise Report 78-031, CSS DAWSON, 18 Oct-8 Nov. 1978, Marine Ecology Laboratory, B.I.O. Dartmouth, N.S.

11. Lough, R.G. 1979. Larval herring patch study completed. Coastal Ocean. Climatology News. 1(2): 20-21.

12. Schlitz, R.J., and R.W. Trites. 1979. Current observations on northern Georges Bank Survey fall 1978. Trans. AGU (EOS): 60(18): 292 (abstract only).

13. Lough, R.G. 1979. Larval herring patch Study. ICNAF Res. Doc. 79/VI/116.

Report of Second Informal Workshop on the Oceanography of the Gulf of Maine and Adjacent Seas, May 14-17 1979, Dalhousie University, Halifax, N.S. Co-convenors: Fournier, R.O., C.J.R. Garrett, P.C. Smith, R.W. Trites and J. Wrobleski.

Second Session on the Atlantic Larval Herring Patch Study of 1978:

14. Lough, R.G. Introduction and Overview (abstract only).

15. Trites, R.W. Some oceanographic features along the northern edge of Georges Bank (abstract only).

16. Schlitz, R.J. and R.W. Trites. Current observations on northern Georges Bank (abstract only).

17. Wright, W.R., R.G. Lough and R. O'Boyle. Plankton and water mass distribution on Georges Bank (abstract only).

18. Ware, D.M. Can chaetognaths use tidal currents as a retention mechanism? (abstract only).

19. O'Boyle, R., R. Sheldon and D. Sloan. Chlorophyll and partjcl size distribution on Georges Bank (abstract only).

20. Lough, R.G. The Nantucket Shoals larval herring patch (abstract only).

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21. Lough, R.G. and W.R. Wright. 1979. Preliminary observations on the interaction of the oceanographic front and plankton populations along the northeastern edge of Georges Bank during October 1978. A.S.L.O. 42 Annual Meeting, Stony Brook, N.Y. Symposium on Oceanographic Frontal Processes. (Abstract only).

22. Wright, W. Redwood and R. Gregory Lough. 1979. The Georges Bank larval Herring Patch Study of 1978; A Preliminary Report I.C.E.S. Doc. C.M. 1979/L:36.

23. Allen, A. A. 1980. An inventory of the physical oceanographic data collected during the 1978 larval herring patch study. NAFO Res. Doc. 80/IX/124.