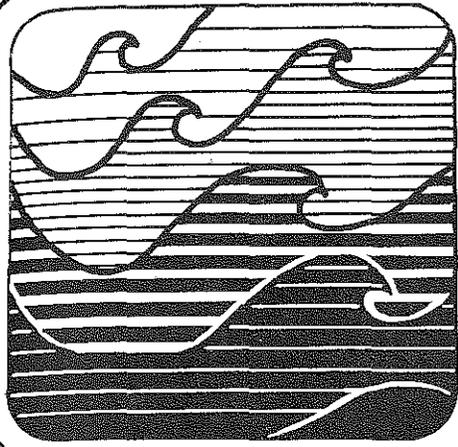


ALL JANUARY DEC '81

84  
517



# NORTHEAST FISHERIES CENTER

## NEWSLETTER

JANUARY 1981

CENTER DIRECTORATE. . . . .	1
RESOURCE ASSESSMENT DIVISION. . . . .	1
MANNED UNDERSEA RESEARCH AND TECHNOLOGY PROGRAM . . . . .	7
MARINE ECOSYSTEMS DIVISION. . . . .	9
RESOURCE UTILIZATION DIVISION . . . . .	15
DIVISION OF ENVIRONMENTAL ASSESSMENT. . . . .	20
AQUACULTURE DIVISION. . . . .	27
PATHOBIOLOGY DIVISION . . . . .	29
NATIONAL SYSTEMATICS LABORATORY . . . . .	34
ATLANTIC ENVIRONMENTAL GROUP. . . . .	35



US DEPARTMENT OF COMMERCE  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION  
NATIONAL MARINE FISHERIES SERVICE



NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION  
NATIONAL MARINE FISHERIES SERVICE  
NORTHEAST FISHERIES CENTER

RESEARCH ADMINISTRATION

CENTER DIRECTOR . . . . . ROBERT L. EDWARDS

ASSISTANT CENTER DIRECTOR FOR FISHERIES MANAGEMENT/  
WOODS HOLE LABORATORY DIRECTOR . . . . . RICHARD C. HENNEMUTH

ASSISTANT CENTER DIRECTOR FOR ENVIRONMENTAL MANAGEMENT/  
SANDY HOOK LABORATORY DIRECTOR . . . . . CARL J. SINDERMANN

CENTER OPERATIONS OFFICER . . . . . HERBERT STERN, JR.

CENTER PLANNING OFFICER . . . . . GEORGE J. RIDGWAY

RESOURCE ASSESSMENT DIVISION CHIEF . . . . . BRADFORD E. BROWN

MANNED UNDERSEA RESEARCH AND TECHNOLOGY PROGRAM CHIEF . . . . . RICHARD A. COOPER

MARINE ECOSYSTEMS DIVISION CHIEF/  
NARRAGANSETT LABORATORY DIRECTOR . . . . . KENNETH SHERMAN

RESOURCE UTILIZATION DIVISION CHIEF/  
GLOUCESTER LABORATORY DIRECTOR . . . . . LOUIS J. RONSIVALLI

DIVISION OF ENVIRONMENTAL ASSESSMENT CHIEF . . . . . JOHN B. PEARCE

AQUACULTURE DIVISION CHIEF/  
MILFORD LABORATORY DIRECTOR . . . . . JAMES E. HANKS

PATHOBIOLOGY DIVISION CHIEF/  
OXFORD LABORATORY DIRECTOR . . . . . AARON ROSENFELD

NATIONAL SYSTEMATICS LABORATORY DIRECTOR . . . . . DANIEL M. COHEN

ATLANTIC ENVIRONMENTAL GROUP DIRECTOR . . . . . MERTON C. INGHAM

"NORTHEAST FISHERIES CENTER NEWSLETTER"

THE "NORTHEAST FISHERIES CENTER NEWSLETTER" IS A MONTHLY NARRATIVE REPORT ON THE RESEARCH AND DEVELOPMENT ACTIVITIES OF THE NORTHEAST FISHERIES CENTER (NEFC). SUBMISSIONS TO THIS REPORT ARE PREPARED BY THE ABOVE RESEARCH ADMINISTRATORS, AND COMPILED AND EDITED BY JON A. GIBSON, TECHNICAL WRITER-EDITOR, NEFC.

THIS REPORT DOES NOT CONSTITUTE A PUBLICATION AND IS FOR INFORMATION ONLY. ALL DATA HEREIN ARE CONSIDERED TO BE PROVISIONAL. REFERENCE TO TRADE NAMES IN THIS REPORT DOES NOT IMPLY ENDORSEMENT BY THE NATIONAL MARINE FISHERIES SERVICE, NOAA.

TO CANCEL DELIVERY OF THIS REPORT IN THE EVENT YOU NO LONGER NEED TO RECEIVE IT, OR TO CHANGE THE DELIVERY ADDRESS IF YOU ARE MOVING BUT STILL NEED TO RECEIVE IT, PLEASE NOTIFY US BY WRITING: JON A. GIBSON, "NORTHEAST FISHERIES CENTER NEWSLETTER," NORTHEAST FISHERIES CENTER, NATIONAL MARINE FISHERIES SERVICE, NOAA, WATER ST., WOODS HOLE, MA 02543.

## CENTER DIRECTORATE

### Fishery Technology

At a recent meeting of the New England Fisheries Development Foundation, Bob Learson, Deputy Director of the Gloucester Laboratory, was appointed to the Source Evaluation Committee. Bob will provide technical direction to the Foundation members in the field of processing technology.

### Publications

Gibson, J. A. Hydroacoustical studies of alewife depth distribution, temperature preference, and schooling behavior in Cayuga Lake, New York. Ithaca, N.Y.: Cornell Univ.;1981. Thesis. 101 p.

Mustafa, H. New England organizes regional remote sensing system. Reflections 3(1):2-3. (P)

## RESOURCE ASSESSMENT DIVISION

### Resource Surveys Investigation

During January we initiated a new time series of winter bottom trawl surveys. The survey, aboard the NOAA R/V Delaware II, had two parts; Part I ran from 6 to 16 January, and Part II ran from 19 to 22 January and from 24 to 28 January. Henry Jensen was chief scientist on both parts. Other investigation personnel participating on either one or both parts included Eva Montiero, Elizabeth Bevacqua, Dennis Hansford, Andrew Thoms, Evelyn Howe, and John Nicolas. Workers from Colgate University, Hunter College, and the University of New Hampshire also participated in the survey. Samples were collected for: NMFS scientists; the State University of New York at Stony Brook; Marine Biological Laboratory; Museum of Geology and Mineralogy in Lieden, Netherlands; Woods Hole Oceanographic Institution; and the Massachusetts Division of Marine Fisheries. The survey, designed to cover offshore sampling strata from Cape Hatteras through Southern New England achieved only partial coverage due to unusually inclement weather.

Tom Azarovitz, Linda Despres-Patanjo, and Eva Montiero continued to work on the final draft of a report to the Bureau of Land Management (BLM). This report will be submitted to BLM for review in early February.

Preparations are underway for the surf clam and ocean quahog surveys this summer. Andy Thoms is coordinating our efforts with the Resource Utilization Division's Fisheries Engineering Investigation which is designing a new dredge and making modifications to existing gear. Jim Crossen is preparing specifications for the purchase of a new electromechanical cable and a new controller for the electric pump. Jim has also begun preparing for these cruises.

Pat Twohig completed repairs and frequency modifications to the Sandy Hook Laboratory's radiotelephone communications system.

## Fishery Biology Investigation

Wally Morse completed the analysis of summer flounder length-at-maturity data at the request of Mike Fogarty for presentation at the February meeting of the State-Federal Program's Summer Flounder Scientific and Statistical (S&S) Committee. Wally also completed final editing on a summer flounder manuscript and returned it to the editor of the Journal of Marine Biology. Toni Morris computerized approximately 10 000 maturity observations from the fall 1980 bottom trawl survey in preparation for analysis.

### Finfish

Sherry Sass processed Atlantic herring and Atlantic mackerel otolith samples from the 1980 fall bottom trawl survey and updated the scup aging. Sherry also prepared for a winter flounder larval age and growth study, and arranged a 2-day tour of the Woods Hole Laboratory for Morse Pond School (Falmouth, Massachusetts) children.

Louise Dery continued age and growth studies on the European hake (Merluccius merluccius) with Sergio Iglesias of Spain, and continued age determinations of silver hake from the 1980 fall bottom trawl survey.

David Pyoas, a cooperative education employee from South Carolina State College began his appointment with the Finfish Group on 7 January. His basic responsibilities include preparation of red and silver hake otoliths for aging. In addition, he participated in the last leg of the winter bottom trawl survey aboard the Delaware II.

### Shellfish

From 5 to 23 January Leslie Bitman, an undergraduate student on an internship program from Smith College, worked under John Ropes' supervision on two projects related to age and growth of bivalves. On one project, Leslie prepared and aged 25 ocean quahog shells as part of a mark-and-recapture study. She also assisted in a project relating shell size and meat weight of ocean quahogs and surf clams which were sampled to sex during Delaware II Cruise No. DE 80-06. Records were compiled from about 750 surf clams and 850 ocean quahogs and from 29 and 39 sample stations, respectively.

Maurice Crawford checked age samples of surf clams shipped from the University of Maryland Eastern Shore. Maurice aged 140 sea scallop shells used in meat-weight analysis and 50 shells from fourth priority sampling on a 1979 cruise. He also began training Sherry Sass and Mark Costa in techniques for aging surf clams.

Mark Costa participated in the winter bottom trawl survey aboard the Delaware II. He also continued to prepare sea scallop shells (collected during the 1980 sea scallop survey) for aging.

### Age and Growth

The following age samples were completed during January: redfish from the 1972 commercial fishery -- all quarters aged and summarized; redfish from the 1973 commercial fishery -- first quarter aged for first time; pollock from the 1979 summer

bottom trawl survey -- data approved for computer input; haddock from the 1980 fall bottom trawl survey -- aged and sent to the Woods Hole Laboratory's Automatic Data Processing (ADP) Unit; Atlantic cod from the 1980 summer bottom trawl survey -- ages checked and sent to the ADP Unit; Atlantic cod from the State of Massachusetts' bottom trawl surveys for 1978-80 -- ages checked and summarized; and yellowtail flounder from the 1980 fall bottom trawl survey -- aged and sent to the ADP Unit.

### Fishery Statistics Investigation

The transformation of the Northeast Regional Office's Statistics Branch into NEFC's Fishery Statistics Investigation became finalized when Paul Swain was promoted to Massachusetts State Supervisor. Jim Towns and Greg Powers filled vacancies at Gloucester and Boston, respectively. Work on end-of-the-year surveys and reports for the Fisheries of the United States, 1980 was the major effort by state supervisors during the month. Port agents throughout the region reported that heavy harbor ice conditions hampered fishing efforts by much of the fleet, resulting in reduced landings and high fish prices, particularly in more northern areas.

### Fishery Assessment Investigation

Administrative efforts of senior scientists during January dealt extensively with completion of merit pay performance plans. Research efforts included the participation of Mike Sissenwine (as leader) and Brad Brown, Anne Lange, Steve Murawski, Ralph Mayo, and Rhett Lewis in the Northeast Fishery Management Task Force's Study Group on Biological Effects of Management Options. This effort represents a new initiative within the Division. The study group will examine the biological effects of fishery management options by first defining the major fisheries of the region.

Brad Brown met with Mr. Daniel Vaucot, a French mathematical biologist, who hopes to spend time at the NEFC next year with support by the French equivalent of our National Science Foundation.

Mike Sissenwine worked on a review paper with Tom Azarovitz, titled "Determining the Abundance of Fish," to be published in Experimental Biology at Sea (Academic Press).

Steve Clark initiated studies on haddock growth with Maureen Flynn, a Smith College student participating in an internship program. Steve, Emory Anderson, and Vaughn Anthony met with Edward Lesser, a Peace Corps Volunteer in Columbia, to discuss stock assessment techniques and the shrimp and mackerel situation in that country.

Steve also initiated work on a review of affirmative action implementation with other Woods Hole Laboratory Equal Employment Opportunity (EEO) Committee members. Emory Anderson and Vaughn Anthony spent part of January preparing for and handling logistics of a data collection program aboard two Polish vessels to be involved in a directed fishery for Atlantic mackerel. Emory, along with Jim Crossen, Jack Suomala, and two foreign fishery observers, participated in discussions concerning this program with members of the Polish fishing vessel Admiral Arciszewski in Philadelphia on 26 January.

Emory also spent some time providing information to and discussing the status of bluefish, weakfish, and other species, with Stewart Tweed, a New Jersey marine extension agent, and Robert Meyers, an employee of Sea Harvest Industrial Park in Cape May, NJ.

Stu Wilk revised a manuscript titled, "A Review of the Fisheries for Atlantic Croaker, Spot, and Weakfish, 1940-1979." This paper will be presented at the Sixth Annual Marine Recreational Fisheries Symposium in Houston, Texas, on 19 and 20 March 1981, and subsequently be a chapter in the proceedings of the symposium. In addition, along with Emory Anderson and Steven Turner, he prepared a review of the tilefish fishery for release to the Mid-Atlantic Fishery Management Council (MAFMC).

John Boreman completed a draft plan of research for the Emergency Striped Bass Study. He submitted the plan to the Planning and Coordinating Committee for approval.

Vaughn Anthony spent part of the month planning activities associated with a joint American-Canadian-Russian squid research project. He also met at the Woods Hole Laboratory with Ken Beal and Pete Colosi of the Fisheries Management Division of the Northeast Regional Office, Darryl Christenson and Ronnee Schultz of the Fishery Statistics Investigation, and Gordon Waring, to discuss the need for more timely reporting of Atlantic herring catch statistics and predicting when the catch quotas will be taken.

Fred Serchuk met with Charles Sheldon of Developmental Sciences, Inc., on 22 and 29 January, concerning a biological sampling design for evaluating catch per unit of effort, size selectivity, and other biological aspects, relative to a Saltonstall-Kennedy Act-funded project on automated long-lining operations.

As part of the Study Group on the Biological Effects of Management Options, Anne Lange and Steve Murawski spent much of the month preparing data files, initiating preliminary analysis, and determining appropriate analytical techniques for commercial catch data, in an effort to define better the fisheries off the Northeast. Rhett Lewis prepared survey data for concurrent analysis.

Provisional analysis of summer flounder morphometric data which we collected at a State-Federal Program workshop, was completed through the joint efforts of Mike Fogarty, Dan Ralph, and Stu Wilk. This information will be presented at the February meeting of the State-Federal Program's Summer Flounder S&S Committee meeting in Norfolk, Virginia.

Stu Wilk began editing a surf clam manuscript by Bill Brey for inclusion in the NOAA Technical Memorandum NMFS-F/NEC series.

Division staff prepared individual "task statements" for use by NMFS in identifying task elements and standards of a fishery biologist's job, based on the Civil Service Reform Act of 1978.

#### Fishery Socioeconomics Investigation

During January this investigation researched bioeconomic production relations. We drafted two papers: (1) "Productivity in Fisheries," and (2) "Biological Objectives

in Fisheries Management: Myths or Realities." We also completed preliminary estimates of expenditure equations to be used in a fisheries simulator model.

## Meetings, Training, and University and Public Relations

### Meetings

On 7 January Emory Anderson attended the MAFMC's S&S Committee meeting in Philadelphia.

On 7 January Steve Clark chaired and Fred Serchuk attended a meeting of the Woods Hole Laboratory's EEO Affirmative Action Review Subcommittee.

On 13 January Gordon Waring attended a public hearing in Gloucester on the proposed spawning area closures for the Gulf of Maine's Atlantic herring fisheries.

On 14 January Brad Brown and Jim Kirkley attended a meeting to discuss joint bioeconomic research with the University of Rhode Island (URI) Sea Grant Program.

On 15 and 16 January William Kelley met in Washington, DC, with B. G. Thompson and Dick Schween to discuss and plan for delays in computer runs of monthly landings caused by a changeover in computer systems in Washington, DC.

On 19 and 20 January Ronnee Schultz met in Connecticut with Bob Jones and Eric Smith from the State of Connecticut and Marvin Bosseau of the Northeast Regional Office to discuss P.L. 88-309 and State-Federal Program funding of Connecticut's fishery statistics program.

During 19-23 January Brad Brown participated in a panel review of the Northwest and Alaska Fisheries Center's Resource Assessment and Conservation Engineering Division in Seattle.

On 21 January Jim Crossen, Jack Suomala (Charles Stark Draper Laboratory, Inc.), and Emory Anderson met with Polish scientists aboard the Admiral Arciszewski in Philadelphia to evaluate their hydroacoustic equipment prior to the collection of echosounding data on Atlantic mackerel.

On 22 January Tom Azarovitz attended a meeting with other Resource Assessment Division staff and State of Rhode Island fishery biologists to discuss the upcoming NMFS-Rhode Island-commercial fishing industry yellowtail flounder survey. The meeting was held at the Woods Hole Laboratory and the survey is scheduled to be conducted during February.

On 22 January Steve Clark and Fred Serchuk participated in a meeting to discuss State of Massachusetts bottom trawl survey findings with Arnie Howe and other Massachusetts Division of Marine Fisheries personnel.

On 22 January Vaughn Anthony attended a New England Fishery Management Council (NEFMC) briefing meeting at the Northeast Regional Office in Gloucester.

On 23 January Mike Sissenwine chaired and Brad Brown, Anne Lange, Steve Murawski, Ralph Mayo, and Rhett Lewis participated in a meeting of the Study Group on Biological Effects of Management Options, a part of the Northeast Fishery Management Task Force.

On 23 January Fred Serchuk attended a meeting of the Executive Subcommittee of the Woods Hole Laboratory EEO Committee.

On 26 January Vaughn Anthony and Gordon Waring attended an NEFMC Herring Oversight Committee meeting in Gloucester.

On 27 January Mike Sissenwine attended an IYABA meeting at the Narragansett Laboratory.

On 27 and 28 January Vaughn Anthony attended the NEFMC meeting in Danvers, Massachusetts.

On 28 January Steve Clark, Tom Azarovitz, Mike Sissenwine, Ralph Mayo, Mike Fogarty, and Loretta O'Brien attended a meeting with David Borden of the Rhode Island Division of Fisheries and Wildlife to plan the February yellowtail flounder survey off Southern New England.

From 28 to 30 January Jim Kirkley met with Ivar Strand and Terry Smith at the University of Maryland to discuss bioeconomic production research and striped bass socioeconomic information.

On 29 January Brad Brown attended a joint meeting of the Regional Committees for the Dealer and Vessel Reporting System.

#### Training

Louise Dery completed a basic training course in preparation for her duties as an EEO counselor.

#### University and Public Relations

Fred Serchuk served as the laboratory coordinator for the Woods Hole Laboratory Smith College January Internship Program. Three undergraduate students, Leslie Bit Maureen Flynn, and Amy Tuttle, participated as volunteer interns in the Resource Assessment Division. This program is designed to permit undergraduates to gain exposure to career opportunities in marine science and to obtain job-related experience relevant to career goals.

Fred met on 8 January at the Woods Hole Laboratory with Loretta Sullivan, a master's degree candidate at URI, to discuss research activities on American plaice. Frank Almeida provided silver hake distribution plots to Andrea Newman, a graduate student at Rutgers University, who is investigating the marketing of silver hake in New Jersey. Brad Brown, Dick Hennemuth, Bob Edwards, and Helen Mustafa met with Dr. William Bossert of Harvard University to discuss joint research possibilities. Emory Anderson talked with Clarence Button, a graduate student at the URI Graduate School of Oceanography, on acquisition of computerized assessment programs currently operating on our system. Steve Murawski provided catch data on Atlantic silversides for a cooperative project with David Conover of the University of Massachusetts, and met with Dr. Jack Finn, a modeler from that school, to discuss cooperative research. Vaughn Anthony continued to provide information to Dr. Colin Clark of the University of British Columbia, who is planning to conduct research on New England fisheries

during the coming year. On 20 January, John Ropes worked with Cheryl Cloasen, a student from the Department of Anthropology at Harvard University. She observed our methods of preparing shells and aging hard clams, and prepared some of her own shells for her ongoing research.

Numerous written and telephone requests for information relative to the biology, ecology, and fisheries for bluefish, summer flounder, weakfish, and striped bass were provided to interested groups (e.g., news media, recreational fishing groups, state agencies, and university groups) by Stu Wilk.

### Publications

Ropes, J. W.; Serchuk, F. M.; Murawski, S. A. Size, age and sexual maturity in the ocean quahog, Arctica islandica. Coast. Oceanogr. Climatol. News. (S)

### Reports

Turner, S. T.; Anderson, E. D.; Wilk, S. A preliminary analysis of the status of the tilefish population in the Southern New England - Middle Atlantic region. Woods Hole Lab. Ref. Doc. No. 81-03.

### MANNED UNDERSEA RESEARCH AND TECHNOLOGY PROGRAM

This report covers MURT activities from September 1980 through January 1981.

### Pigeon Hill

We completed analysis of the percent cover of major species groups and the indicator species densities from the study transect photographs taken during our summer cruise. Additionally, Cambridge Analytical Associates completed pollutant analysis on our samples.

We submitted an Ocean Pulse Program report detailing our 1980 results to Dr. John Pearce for inclusion in a Northeast Monitoring Program report. Our report summarized and discussed:

1. additions to the 1978 baseline disruptive-sample data (i.e., biomass, new species, taxonomic codes);
2. a current species list for baseline disruptive samples;
3. density measurements on key indicators for 1978, 1979, and 1980 from quantitative photographs;
4. information on key species from growth colonization studies;
5. changes in algal cover of two permanent 1.0-m<sup>2</sup> study quadrats;
6. salinities and bottom temperatures for 1980; and
7. pollutant levels in key indicator species [i.e., heavy metals, hydrocarbons, and polychlorinated biphenyls (PCB's)].

## Georges Bank and Submarine Canyons

We completed, as part of our Northeast Monitoring Program work, a report titled, "Georges Bank and Submarine Canyon Living Resources and Habitat Baselines." This report is the first comprehensive baseline summary of the offshore areas based on observations from both shallow-water and deepwater submersibles. Information for the report came from two cruises with a chartered dive system, R/V Johnson and submersible Johnson-Sea-Link, in July and August 1980, and one cruise with a chartered dive system, R/V Lulu and submersible Alvin, in August 1980.

We established four long-term monitoring stations, two in the center of the proposed offshore drilling area and two in Lydonia Canyon (head of canyon and west wall). We took between 450 and 900 bottom pictures at each station along 600-yd transects. We also collected substrate, Cancer sp. crabs, sea scallops, and tilefish for pollutant analysis.

## Submersible Diving Proposals

A proposal for 2 wk of Johnson-Sea-Link dive time for 1981 was submitted and accepted. Dives will occur on Georges Bank and at our monitoring stations during July.

A second proposal for Lulu dive time in 1982 was submitted and accepted.

Dick Cooper helped in the preparation of a shallow-water submersible proposal submitted by the Southeast Fisheries Center. This proposal has also been accepted.

## Miscellaneous Diving Activities

Cliff Newell participated as instructor in two variable-volume dive-suit and dive-master training sessions, the first in Norfolk, Virginia, and the second in Seattle, Washington.

## Meetings, Personnel, and Manuscripts

We have held two meetings with Dr. Jim Sears of Southeastern Massachusetts University (SMU) to complete our plans and objectives for this year's dive cruise at Pigeon Hill as part of our Northeast Monitoring Program work. Two 10-day cruises will carry on our studies at this site.

Dr. Alan Hulbert, a research scientist on an intergovernmental personnel assignment from the University of New Hampshire, has joined the dive team to work on Northeast Monitoring Program objectives.

Work continues on papers covering: "The Biology and Geology of Veatch Canyon," "The Heads of the Georges Bank Offshore Canyons," and "Tilefish Behavior and Ecology."

## Reports

Cooper, R. A.; Uzman, J. R.; Pecci, K. J.; Hulbert, A. Jeffreys Ledge, Gulf of Maine, Georges Bank, and submarine canyon living resources and habitat baselines in pristine and/or proposed drilling areas. Contribution to Ocean Pulse Program Annual Report. 1981.

## MARINE ECOSYSTEMS DIVISION

### Ecosystem Dynamics Investigation

Ed Cohen and Wendell Hahm completed a review of the RAND Corporation's ecosystem model for The Netherlands' Rijkwaterstast, noting many deficiencies in the model, particularly in the simplistic assumptions about biological processes. A copy of their review is available upon request. Ed and Wendell also completed a draft of a paper specifying the methods, assumptions, and data requirements for GEORGE, our multispecies model of Georges Bank.

Ed returned from Seattle where he attended the joint scientific meetings of the American Society of Limnology and Oceanography, the American Society of Zoologists, the Ecological Society of America, and others. He will shortly circulate a description of the meetings and a listing of the papers presented at them.

Mike Pennington revised his paper on "Abundance Estimators Based on Stratified Random Trawl Surveys," which will appear in a Canadian Technical Report of Fisheries and Aquatic Sciences, along with other papers from a workshop on survey methods held in Canada last November. Mike also worked with Greg Lough on a manuscript summarizing the basic results of the International Commission for the Northwest Atlantic's (ICNAF) larval herring program as they pertain to mortality estimates for larval Atlantic herring.

Marv Grosslein presented three lectures on the Georges Bank ecosystem--each covering such topics as the energy budget, changes in biomass and structure of the finfish community since the 1960's, and predator-prey interactions--at the Marine Biological Laboratory, Dalhousie University, and URI's Graduate School of Oceanography Seminar Series. Marv also completed a report, together with Mike Fogarty and Thurston Burns of the Resource Assessment Division, on biological data requirements and statistical data collection systems for American lobsters. They forwarded the report to the NEFMC's S&S Committee. The S&S Committee approved the report on 14 January.

### Larval Fish Dynamics Investigation

#### Experimental Studies

We have designed and constructed several new two-compartment larval rearing aquaria. The system allows comparisons between two groups of larvae in the same tank under identical conditions of water chemistry. Depending upon the mesh size used, the system can confine prey items to one compartment or allow them to pass freely between compartments. We can also change mesh size during the course of an experiment. Studies of the effects of starvation and refeeding on the RNA-DNA ratio in larval summer flounder are in progress, using the divided-tank system.

Adult winter flounder are acclimatizing to 2° and 7°C temperature regimes in the lab. Upon acclimatization at these temperatures, we will induce the adults to spawn by hormone injection, and rear the eggs and larvae at 4°, 7°, and 10°C. The study should reveal the effects of water temperature, during gonad maturation and during embryonic and larval development, upon the timing of yolk-sac absorption and first feeding. We will also study the effects on survival, growth rate, and the relation between growth rate and RNA-DNA ratio.

Geoffrey Laurence chaired a meeting on the sampling strategy for upcoming spring cruises on Georges Bank using a process-oriented approach to study larval haddock survival.

### Recruitment Processes

Greg Lough made final revisions on research documents [to be submitted to the Northwest Atlantic Fisheries Organization (NAFO)] on: (1) the abundance and mortality estimates for the 1971-78 ICNAF larval Atlantic herring data (SCR Document No. 80/IX/129), and (2) with Dave Potter as coauthor, the vertical distribution of larval Atlantic herring (SCR Document No. 80/IX/133). They also prepared two abstracts of talks to be presented at the Third Gulf of Maine Workshop in March. Topics of the talks are the vertical distribution of Atlantic herring larvae collected in the Nantucket Shoals area during 1977, and of chaetognaths collected on north-eastern Georges Bank during the 1978 larval Atlantic herring patch study. Greg Lough spent considerable time formulating a sampling program for our spring cruises to study larval fish - prey microdistribution, which included a meeting at the Narragansett Laboratory on 20 January. Dave Potter, George Bolz, and Roz Cohen also attended this latter meeting. Dave Potter reviewed the qualification statements of 60 architectural and engineering firms for contract consideration for the Center's solar heating and hot-water system additions, and attended two other meetings in this regard.

George Bolz has nearly completed a data report on the basic data from the ICNAF time series of ichthyoplankton abundance and distribution on Georges Bank and Nantucket Shoals. Roz Cohen has been processing (with the HIAC particle-size analyzer) 0.25-m fine-meshed MOCNESS (multiple opening-closing net and environmental sensing system) samples collected last November, in an attempt to develop sorting protocols and categorize various plankton species - life stages into characteristic and equivalent spherical diameters that are sensed by the HIAC. She has found a high degree of correspondence and repeatability between the HIAC sample-size frequencies and the sample processed in the standard laboratory manner by eye. Roz also has been revising a copepod length-weight regression paper (to be submitted as NAFO SCR Document No. 80/IX/124, and for possible inclusion in NAFO's Journal of Northwest Atlantic Fisheries Science). She is also continuing to organize the study on larval Atlantic herring prey selection and ICNAF zooplankton which are in various stages of completion. Peter Donnelly, Randy Goodlett, and Alicia Mann continued to process the 1978 larval Atlantic herring patch study - MOCNESS samples.

Hal Merry researched specifications and ordered new cable for the General Oceanics meter block, repaired the NEFC's videotape system, studied the Aiken-type fluorometer for compatibility with the Neil Brown CTD (conductivity-temperature-depth) system and with MOCNESS, worked on the design of a data-recording system for the Aiken-type fluorometer, and worked on the design and ordered parts to convert the McKissick vessel block to a meter-recording block for use in the deployment of MOCNESS.

Roz Cohen attended a Woods Hole Laboratory EEO Committee meeting on 6 January, and a Federal Women's Program (FWP) meeting at the Woods Hole Laboratory on 12 January.

Hal Merry met on 12 January with Grayson Wood of the AEG to evaluate the Aiken-type fluorometer.

## Benthic Dynamics Investigation

Roger Theroux continued preparation of final tables and figures for the northern benthic biomass report. Summary charts of percentage composition of major taxa in numbers and weight are now complete and ready for final drafting. Roger translated parts of a two-volume French treatise on marine bivalve larvae, and reviewed and edited two other manuscripts including a data report on macrobenthos of the "mud-patch" area by Maurer and Wigley. He also participated in several meetings with Woods Hole Oceanographic Institution (WHOI) personnel regarding our joint benthic studies of the Georges Bank region.

John Hauser and Jackie Murray inventoried our benthic data files and documented our standard benthic data output programs. They also produced a variety of new data outputs, including diet-overlap runs for finfish (Rich Langton's studies), zooplankton density tables (Roz Cohen's studies), and size-frequency plots of predators and prey (Ed Cohen's and Wendell Hahn's studies).

Ray Bowman has summarized the distribution of juvenile fishes from the 1975-79 bottom trawl surveys and is preparing a Woods Hole Laboratory Reference Document (No. 81-02) with plots of relative abundance by sampling strata. Ray also worked on the design of a new protocol for monitoring food habits of finfish, beginning with the spring 1981 bottom trawl survey.

Tom Morris completed a draft paper on feeding strategies of Northwest Atlantic fish species. William Michaels, a University of Massachusetts cooperative education employee, has replaced Jim Towns; Bill will work with Ray Bowman on the fish food habits studies. Ray, Tom, and Bill participated in the winter bottom trawl survey (Delaware II Cruise No. DE 81-01) which represents the only winter collection of quantitative food habits data so far.

## Ichthyoplankton Investigation

January is traditionally a quiet month for field work, but some members of the group have been busy with field-related duties by preparing for late-winter and spring surveys. Research emphasized identification of fish eggs, which we are using to derive biomass estimates for adult spawning stocks of haddock, yellowtail flounder, silver hake, and bluefish. Pete Berrien has nearly completed work with yellowtail flounder eggs. His estimated egg mortality of 19% per day is considerably higher than the 12% per day which he computed for Atlantic mackerel.

Wally Smith, Donald McMillan, and Alyce Wells completed a brief report summarizing the distribution and abundance of Atlantic herring larvae in the Georges Bank - Gulf of Maine region during autumn and winter months of 1977-78, 1978-79, and 1979-80. Most of the young herring occurred along the western part of the Gulf of Maine, but results indicate that larval production was low during the three seasons, especially on Georges Bank, the principal spawning grounds during the 1960's.

Mike Fahay departed for Punta Arenas, Chile, in January to participate on a 30-day FIBEX (First International Biomass Experiment) cruise in the eastern Scotian Sea. Wally Smith attended a meeting at the Narragansett Laboratory to discuss and review progress on ongoing joint research with URI staff members. He and Cindy Fahay

subsequently attended a presentation by Dr. Joe Berry from Yale University on a computer-generated mapping program he is developing for the NEFC.

### Fishery Oceanography Investigation

Two new people joined the Investigation during January. David Mountain is the new Investigation Chief and Chris Nedeau is a new cooperative education employee from Northeastern University. David was previously with the US Coast Guard's Oceanographic Unit in Washington, DC. Red Wright has remained with the Investigation in a part-time status.

The Investigation made progress in many areas during January. Sam Nickerson processed the salinity samples and temperature data from NOAA R/V Albatross IV Cruises No's. AL 80-10 and AL 80-12, and Delaware II Cruise No. DE 80-07. Dan Patanjo completed the 1980 update of cruise summaries and equipment lists. Marianna Pastuszak, with help from Dan, nearly completed her analysis of nutrient and hydrographic data from nine cruises in the Georges Bank area between July 1975 and October 1976. Analysis also continued on the current-meter data from the larval Atlantic herring patch study (Art Allen), Northeast Channel study (Steve Ramp), and the Nantucket Shoals flux experiment (Ron Schlitz and Tom Laughton). These investigations led to the submission of five abstracts to the Gulf of Maine Symposium to be held during 2-5 March in Durham, New Hampshire.

### Oceanic Gamefish: Apex Predators Investigation

In January we received information on the recapture of a longfin mako and a swordfish. Both fish had been tagged by NMFS observers aboard Japanese long-liners operating off North Carolina and Virginia, respectively. The swordfish was recaptured by a Canadian long-liner off Nova Scotia, while the longfin mako was recaptured by a Korean long-liner 148 mi east of its tagging location. We computer-coded the data on these recaptures and added them to the 1980 data base. We also completed final verification and preliminary summaries for our 1980 newsletter, "The Shark Tagger."

Alan Lintala and Helen Cottrell inventoried all past accessions of vertebrae and began preparing a selected few from carcharhinid sharks for age work.

Wes Pratt and Jack Casey, with help from Chuck Stillwell, John Hoey, and Nancy Kohler, prepared text, figures, and photographs for our annual newsletter which we shall send to 2500 volunteer taggers.

We updated the food habits data base for the shortfin mako to include all information collected through 1980.

Chuck Stillwell began summarizing data and assembling available literature for a future publication on the night shark.

### Plankton Ecology Investigation

Joe Kane completed a final draft of his report on wet-volume, dry-weight relationships of zooplankton for survey work. Paul Fofonoff is continuing to look at pump samples in his efforts to clear up taxonomic problems in the naupliar stage of common Georges Bank copepod species. Jack Green is working with vertical distribution data for copepods and fish larvae collected on Soviet R/V Evrika Cruise No. 80-02.

a Donna Busch and Ray Maurer spent 2 days reviewing information from solar design firms wishing to be considered for the job of designing installations at the Gloucester, Narragansett, and Woods Hole Laboratories.

is  
employe  
Ocean  
on in  
Donna began planning for the chlorophyll-related aspects of the larval fish dynamics cruises scheduled for April and May. She also sent a shipment of phytoplankton samples to Gdynia, Poland, for taxonomic analysis as part of NEFC's cooperative research commitments with Poland. Samples will be collected next on the February-March cruise aboard Albatross IV.

### Image Analysis

We held a progress review meeting on 13 January at the Narragansett Laboratory. Dr. Alex Poularikas of URI presented recent advances towards computer classification; several image-processing functions (including erosion, dialation, and smoothing) are being tested. Another researcher compared moment invariants and Fourier descriptors for use in classification of zooplankton groups. The moment invariant descriptors were more sensitive (a 6.5% mean error) when processing identical test samples.

A prototype system, utilizing a video digitizer, a small main-frame Eclipse computer, and three peripheral Nova minicomputers, was proposed as the next step in the evolution of the Automated Zooplankton Processing System. We would assign each minicomputer to a single phase of the processing task--image processing, feature extraction, or classification.

Dr. Marc Berman of URI and Ray Maurer demonstrated the data-link and analysis capabilities for count and size information generated by the B&L QMS image system. The prime computer at URI's Graduate School of Oceanography automatically archives the data, then "talks" with the IBM 370 computer on URI's main campus, requesting appropriate "SAS" routines.

Graphic and tabular printouts of length-frequency data by a designated taxonomic group or of the entire sample require less than 10 min for a 500-organism aliquot.

### Biostatistics

We have drafted and are now finalizing a task order to cover programming by the IOCS, Inc., staff from February through April. The deliverables will include documentation on the revised net-tow-derived value generator and a revised ichthyoplankton summary report writer.

We selected ichthyoplankton length-frequency data from the MARMAP (Marine Resources Monitoring, Assessment, and Prediction Program) Information System (MIS) data base for Saul Saila of URI who is working under a Bureau of Land Management research grant.

### Meetings, Talks, and Visitors

During 5-6 January Julien Goulet met with Andy Kemmerer and staff at the Southeast Fisheries Center's Fisheries Engineering Laboratory in Bay St. Louis, Mississippi, to discuss the project plan for the MACH-I (mensuration and assessment of coastal habitat) study.

On 13 January Robert Marak traveled to New York City to organize Lon Chili Airline cargo shipment of samples to be returned with Bob on completion of the FIB cruise on the Scripps Institute of Oceanography's R/V Melville.

On 13 January Ken Sherman, Alex Poularikas, Perry Jeffries, Lou Bivins, C. Katsinis, I. Melas, and Ray Maurer reviewed the image scanner program at the Narragansett Laboratory.

On 14 January Ken Sherman met with Brad Brown and Dick Hennemuth regarding the merit pay program, and with Bud Nixon and Brad Brown regarding joint studies between the Resource Assessment/Marine Ecosystems Divisions and URI on socioeconomic ecosystems relationships for a total ecosystems management regime.

On 14 January Dave Potter, Ray Maurer, Donna Busch, and Al Blott met at the Woods Hole Laboratory (in preparation for the preselection meeting in February) to discuss the top 10 architectural and engineering firms bidding for the NEFC Solar Energy System.

On 19 January Julien Goulet met with Gene Heyerdahl at the Woods Hole Laboratory to discuss ADP funding and data-base conversion during the current fiscal year.

On 20 January Robert Marak and Donna Busch attended a meeting at the Narragansett Laboratory conducted by Geoff Laurence to plan the spring larval fish dynamics cruise on Georges Bank.

Dave Potter, Jack Green, and Ray Maurer met with personnel from "Sun-Works" on 22 January at Avon, Massachusetts, for an informal presentation of different solar systems for the NEFC Solar Energy System.

On 28 January Julien Goulet attended a research review meeting between Saul Saila's group at URI and members of the Marine Ecosystems Division.

On 28 January Dr. Joseph Berry of Yale University presented a seminar as a draft final report of his work demonstrating capability of co-analyzing remotely sensed data and ship-collected data.

On 28 January Donna Busch and Reed Armstrong (AEG) hosted an IYABA meeting at the Narragansett Laboratory.

Donna Busch met with Daniel Vaultot, a graduate student from Montpellier, France to explain the kinds of phytoplankton work in progress at the NEFC.

### Reports

Allen, A. A.; Schlitz, R. J. The Atlantic larval patch study of 1978 -- further results from the current observations on northern Georges Bank. Abstract prepared for the Third Gulf of Maine Workshop; 1981 March 2-5; Durham, N.H.

Bolz, G. Basic data from ICNAF time series of ichthyoplankton abundance distribution on Georges Bank and Nantucket Shoals. Woods Hole Lab. Data Rep.

- Cohen, E.; Wright, W. R.; Schlitz, R. J. Primary productivity on Georges Bank with an explanation of why it is so high. Abstract prepared for the Third Gulf of Maine Workshop;1981 March 2-5; Durham, N.H.
- Laurence, G. C.; Howell, W. H. Descriptive embryology and the influence of temperature and salinity on early development and survival of yellowtail flounder (Limanda ferruginea). Mar. Ecol. Progr. Ser.
- Lough, G. Abundance and mortality estimates for the 1971-78 ICNAF larval herring data. NAFO SCR Doc. No. 80/IX/129.
- Lough, G.; Potter, D. Chaetognaths on northeast Georges Bank from the 1978 patch study. Abstract prepared for the Third Gulf of Maine Workshop;1981 March 2-5; Durham, N.H.
- Lough, G.; Potter, D. Vertical distribution of herring larvae collected in the Nantucket Shoals area, 1977. Abstract prepared for the Third Gulf of Maine Workshop;1981 March 2-5; Durham, N.H.
- Patanjo, D.; Pastuszak, M. Seasonal variation of nutrients in the Georges Bank region. Abstract prepared for the Third Gulf of Maine Workshop;1981 March 2-5; Durham, N.H.
- Ramp, S. R.; Schlitz, R. J.; Wright, W. R. Northeast Channel flow and the Gulf of Maine heat and nutrient budget. Abstract prepared for the Third Gulf of Maine Workshop;1981 March 2-5; Durham, N.H.
- Schlitz, R. J.; Allen, A. A. Geostrophic transport east of Cape Cod. Abstract prepared for the Third Gulf of Maine Workshop;1981 March 2-5; Durham, N.H.
- Smith, W.; McMillan, D. G.; Wells, A. The distribution and abundance of Atlantic herring larvae in the Gulf of Maine region as determined from MARMAP surveys, 1979-80. NAFO SCR Doc. No. 80/IX/146.

#### RESOURCE UTILIZATION DIVISION

##### Fisheries Engineering Investigation

Progress continues on developing an agreement to set up a cooperative National Marine Fisheries Service - University of Rhode Island fisheries engineering research unit. We are now preparing a paper on the Isaacs-Kidd midwater trawl study. We also submitted a conservation gear research proposal to the NMFS Central Office for funding under the Saltonstall-Kennedy Act.

##### Research Vessel Activity

Refurbishment continues for the Gloucester Laboratory's R/V Gloria Michelle. We have partially completed the heating system. We are rebuilding the interior of the deck house. We have also acquired a trawl winch from the Sandy Hook Laboratory's previous research vessel, the Dolphin, and are readying it for installation on the Gloria Michelle.

### Engineering Assistance to Other Center Programs

We are completing the designs for changes to the Center's surf clam - ocean quahog survey dredge and ramp. Dan Baker and Bob Van Twuyver participated in the January Ship of Opportunity Program trip on the ferry Marine Evangeline for transect sampling of temperature and plankton across the northern Gulf of Maine. We have received a replacement frozen-food vending machine which will be tested as an energy saving display case.

### Facilities and Safety

After receiving new insulating materials for Freezer No. 4, we have begun renovations to the freezer, beginning with the removal of the existing cork insulation. The architectural and engineering selection process for the Gloucester Laboratory's solar project is continuing. We have invited nine firms to a preselection meeting during the first week in February. Dan Baker and Mike Allsup completed reports on safety inspections of all Center facilities.

### Resource Development and Improvement Investigation

A manuscript is under preparation; it compares the lipid content of four commercially available crabs in New England.

Samples of rock shrimp, white shrimp, and spiny lobster which were submitted by the Florida Department of Natural Resources are being analyzed for fatty acid and sterol contents. We have also begun an experiment on the effects of canning and canned storage on fatty acid and sterol contents in blue mussels. Specimens from Falmouth, Massachusetts, were analyzed for their fatty acid and sterol contents and were packaged for frozen storage for later comparison with mussels harvested from Duxbury, Massachusetts.

### Isoelectric Focusing

We are focusing tuna and bonito samples from the Southeast Fisheries Center's Pascagoula Laboratory on polyacrylamide gels, using different pH ranges. So far, the 7-9 range shows the greatest differences among protein banding patterns.

We are participating in a collaborative study for fish species identification by agarose isoelectric focusing.

### New Product Development

We have begun the experiment to determine the economic feasibility of assuring the quality of frozen fish fillets at point of sale. The supermarkets are planning a marketing campaign to acquaint consumers with the availability of high quality guaranteed frozen fish. In connection with this experiment, we are investigating the use of chemical time-temperature quality indicators. Since the color change is gradual, we need to be sure that such indicators can be used with reliability.

Two representatives from Topco Associates, Inc., in Skokie, Illinois, a frozen food brokerage company, visited the Gloucester Laboratory. They were especially impressed with most of the new fish and shellfish products which have been made

possible as an outgrowth of innovative processing methods developed here. The number of fish products which they now sell is quite small, but they feel there is a market for more fishery items.

### Blue Crabs

We are presently testing the feasibility of pasteurizing crab meat in plastic films. Films tested so far include nylon, mylar, scotchpac (a mylar-polyethylene laminate), low-density polyethylene, and Saran. Except for Saran, results thus far are promising.

### Squids

We have set up a squid slicer (designed to cut intact squid mantles into rings) in a commercial fish plant where it will be tested under commercial conditions as part of a cost-benefit study on the economics of producing squid rings.

### Atlantic cod

We are continuing the study to quantify the preservative and organoleptic effects of dipping fish fillets in dips having various sorbate concentrations.

## Product Quality, Safety, and Standards Investigation

### Product Quality

We studied the storage characteristics of iced, headed, and gutted dogfish over a 23-day period. At the end of 23 days, the fillets were marginal in eating quality, whereas the belly flap portions were unacceptable after 18 days. The limiting quality factor was the texture which became progressively softer during storage. However, a few taste panelists reported rancid flavors in the fatty strip along the lateral line as early as the 16th day, even though the lean muscle was devoid of rancid flavor throughout the entire storage. The TBA (thiobarbituric acid) numbers increased during storage in both fillet portions and belly flap sections, but higher values occurred in the belly flaps. The fat content, as determined by the Bligh-Dyer procedure, averaged 11.2% for the fillets and 22.6% for the belly flaps. Very good correlation ( $r = 0.93$ ) occurred between fat content and moisture content. Thus, we could probably obtain a quick estimate of the fat content using a rapid moisture determination method.

The pH also increased from 6.13 to 6.75. This final pH was not as high as the final pH recorded in an iced dogfish study conducted last July; however, in that study more ammonia was organoleptically evident during the final days of storage compared to the present study.

The aerobic plate count decreased slightly during the first 12 days and then rose sharply during the following 11 days to a final average count of 300 million per gram. Throughout storage the percentage of the bacterial population (urease positive) that could split urea into ammonia remained relatively constant, ranging from 3 to 20%; however, as the total bacterial population increased so did the number of urease-positive bacteria, which after 23 days was about 31 million per gram. Time and

resources have not allowed for the chemical analyses for ammonia content yet, but the samples have been frozen and will be analyzed at the first opportunity.

We also monitored quality loss during iced storage with the Torrymeter. Torrymeter readings dropped steadily during storage from an initial (3-day) average reading of 11 to a final average reading of about 6 after 23 days. A Torrymeter reading of about 6-7 is what we have obtained in previous studies for marginal quality Atlantic cod, haddock, etc.

On the basis of the two experiments, headed and gutted dogfish appear to have a significantly longer shelf life than headed and gutted groundfish. This does not mean that the same would be true for their respective fillets.

We made final preparations to initiate the Association of Official Analytical Chemists-sponsored collaborative study of a rapid method to identify fish species by agarose gel isoelectric focusing of sarcoplasmic proteins. We will send the test kits to the collaborators starting the last week in January. Fourteen laboratories will be participating in the study.

Joe Licciardello reviewed a research proposal at the request of Dr. R. G. Brock, Head of the Department of Food Science and Nutrition at the University of Massachusetts.

Mr. Jeff Cohen of the Instron Corporation took photographs of our texture-measuring apparatus for inclusion in the Instron annual report concerning novel uses of their equipment.

#### Product Safety

The Hewlett-Packard Model 5992-B GC-MS is now operational and being used in our PCB analyses.

We have worked up 50% of summer and fall samples from the Galveston Bay area and have analyzed florasil and silica gel extracts by gas-liquid chromatography. Total PCB results indicate that there are only low levels of PCB's in the muscles of the species analyzed thus far. The winter samples will be collected in the next 2 wk, but shipment will not be received before the first week of March.

We have worked up and analyzed samples of red hake, American lobster, and rock crab collected from various stations in the New York Bight area. All samples were below the 1-ppm level.

The last shipment of winter samples from the University of Southern California has not arrived. Because their personnel have been sick with the flu, we do not expect shipment before the middle of February. Thus, we had to extend this contract beyond the cutoff date of 15 December.

#### Product Standardization

We have a revised draft of a "U.S. Standard for Grades of Fresh and Frozen Fish Steaks" based upon comments received from the USDC Inspection Service.

We are assisting in the selection of species for US Army's Natick Laboratory nomenclature project. Samples of snappers (Lutjanidae) from the Gulf Coast area, rockfish (Scorpaenidae) from the Pacific Coast area, and Pacific ocean perch were supplied.

We received over 20 comments on the "Advance Notice of Proposed Rulemaking" of the "U.S. General Standards for Grades of Shrimp." After resolving these comments, we shall prepare a new draft for publication in the Federal Register as a "Proposed Rulemaking."

We also prepared and forwarded to the Central Office our recommendations for a uniform approach to classifying flavor and odor in USDC Quality Standards.

The USDC and USDA consummated a "Memorandum of Understanding" (MOU) concerning fishery specifications. By the MOU, we now have full authority for developing and maintaining federal fishery specifications. For the past several years, the USDD held this authority. The responsibility for the new NMFS commitment will fall largely on our Gloucester Laboratory.

At the request of the USDA's Food Quality Assurance Division, we are investigating the need to conduct a market research and analysis on canned salmon. Such an investigation should reveal whether or not government user agencies are satisfied with canned salmon as presently available on either the wholesale or retail markets.

#### Technical Assistance

The Resource Utilization Division provided information and technical assistance in the following areas: advice on packaging of salted fish; evaluation of potential for a new glazing method; explanation of the effect of temperature on seafood quality; explanation of the adverse effects of struggling on the quality and storage life of fish; packaging of fish to avoid botulism; the relationships among the development of botulism toxin, oxygen concentration, and redox potential; obtaining assistance for a proposed paralytic shellfish poison study; packaging and freezing mussels; copies of an article on fish plant sanitation; disposal of dogfish processing waste; ocean quahog processing; Greenland turbot; labeling shellfish; processing methods for groundfish; longlining; four-seam trawls; new fishery products; sturgeon; krill; the Torrymeter and its use; dogfish utilization and marketing; and contacts for potential participants in a frozen fish study.

#### Meetings, Talks, and Visitors

Mr. Woodman Harris of Saltwater Farm, located in Coscob, Connecticut, visited us and expressed a special concern that seafood retailers do not have adequate nutritional information for distribution to their customers.

Al Blott attended a meeting at the Woods Hole Laboratory to review the bidders for installation of the NEFC Solar Energy System.

John Ryan and Joseph Carver participated in an Armed Forces Product Evaluation Committee meeting at the Natick Laboratories on 15 January.

Members of the Standards Program participated in a meeting with James Brooker of the Central Office to discuss schedules for the standardization and specifications efforts.

Perry Lane attended meetings of the Executive Committee and the Long-range Planning Committee of the New England Marine Advisory Service. He also attended an Executive Committee meeting of the New England Shellfish Sanitation Association.

Louis Ronsivalli was the speaker at an industry workshop sponsored by the M. F. Foley Company in Dorchester, Massachusetts.

### Reports

Blott, A. J.; Nulk, V. E. Scallop drag tests and development. Int. Counc. Explor. Sea Comm. Mem. 1980/B:2;1980.

## DIVISION OF ENVIRONMENTAL ASSESSMENT

### Biological Oceanography of Stressed Ecosystems Investigation

#### Remote Sensing

A Superflux Symposium concerning joint NOAA and NASA remote sensing - oceanographic studies of the Chesapeake Bay plume occurred during 21-23 January at Williamsburg, Virginia. About 100 individuals participated and presented 36 papers including those on the physical, geochemical, and biological aspects of the Chesapeake Bay mouth and plume, and on the development of remote sensing technology. Major conclusions of the symposium were:

1. The outwelling plume waters of the bay generally are more enriched than shelf waters. Inorganic matter in the form of turbidity generally is higher in the plume as indicated by Landsat and Ocean Color Scanner satellite imagery as well as by shipboard measurements. Contaminants, particularly hydrocarbons associated with total suspended matter, are elevated in the plume. (Ninety percent of the hydrocarbons in the water column seem to be associated with suspended particulate material.) Bio-stimulants, particularly those involved in primary production, are higher in the plume. (According to one meeting participant, the plume with its enriched nutrients may be the dominant factor in sustaining primary production in the shelf waters off the bay during the summer.) Organic material in the form of bacteria, chlorophyll, and phytoplankton is higher in the plume. Elevated also is biological activity as total plankton respiration and heterotrophic potential, both indicators of biological mineralization rates which are relevant to the processing of organic material (including wastes), regenerating of nutrients for primary production, and determining dissolved oxygen concentrations within the water column, particularly below the pycnocline.
2. This enriched area is definable, based upon Landsat and other remote sensing imagery as well as on hydrographic survey data.
3. Based upon shipboard survey information, we see evidence of particulate material "raining out" of the water column to the benthos along the length of the plume. However, we are unsure whether the enrichment is caused by sinking or resuspension. If sinking or settling of materials is the major factor, then the benthic area under the plume should be enriched in terms of organic matter available to support benthic populations. This same area should also receive the stresses of any contaminant materials also deposited from the plume.

4. The size and shape of the area influenced by the plume are affected by such factors as freshwater runoff, wind, tides, longshore drift, and shelf-edge upwelling. The predominant area of influence is from the bay mouth eastward for 10-20 km and southward for 20-50 km. In some cases, the plume is next to the beach; in other cases, it is not. The plume also may move 10-20 km northeast of the bay mouth. During 1973, Hurricane Agnes produced a salinity plume at least as far south as Oregon Inlet, North Carolina, some 90-100 km south of the bay mouth. Drought conditions occurred during 1980 and reduced freshwater runoff to a 10-yr low. Consequently, the major area of influence was much reduced, not extending south of the Virginia-North Carolina border. Based on Landsat data, we know that wind changes the direction, shape, and size of the plume and therefore its area of influence. Likewise, longshore drift and upwelling may modify the plume and its area of influence.
5. With only limited historical perspective, we suspect that Chesapeake Bay is a chronic contributor of contaminants, particularly hydrocarbons and biostimulants, to shelf waters. We have no evidence, but suspect that the increasing human population around the bay may increase the loading of shelf waters. Such chronic and possibly increasing loading of shelf waters should have an impact on living marine resources.

#### Seabed Metabolism

Bill Phoel and Steve Spina completed reducing and began analyzing the chemical component of seabed oxygen consumption measurements obtained since 1975. The results show that uptake of oxygen by reduced sediments (a rough indicator of anaerobic metabolism) was usually either constant or followed changes in total oxygen consumption at a much lower rate.

Bill presented a paper on "NOAA's Requirements and Capabilities for Diving in Polluted Waters" at the Workshop on Microbial Hazards Encountered by Divers in Polluted Waters, held in Bethesda, Maryland. The proceedings will be published by the Undersea Medical Society.

#### Total Plankton Respiration

Craig Robertson presented data from Superflux I, II, and III at the aforementioned Superflux Symposium. The principal conclusions of his presentation were:

1. The principal area of plume influence is from the mouth of the bay southward to about the Virginia - North Carolina State border and eastward only 12 - 40 km. The most dramatic effects occur within 10 km of Cape Henry.
2. The plume is enriched in chlorophyll-a and phaeopigments and has higher concentrations of total suspended matter than receiving waters. The plume generally has higher rates of total plankton respiration, decomposition of organic matter, and regeneration of nutrients required for phytoplankton than adjacent shelf waters.

3. South of Virginia Beach, Virginia, the highest concentrations of chlorophyll-a, phaeopigments, and total suspended matter are found in waters below the plume. This suggests a "raining out" of particulate material and associated contaminants from the plume waters to the seabed along the length of the plume. The statement is supported by observations of lowered dissolved oxygen concentrations and elevated total plankton respiration rates beneath plume waters off Virginia Beach.

#### Phytoplankton Community Structure

We prepared a number of sample bottles for an Albatross IV cruise leaving on February. The three legs of the cruise are to be 17-27 February, 2-13 March, and 12-26 March. Personnel from Jay O'Reilly's nutrient analysis section will obtain the samples for determination of phytoplankton community structure by Dr. Harold G. Marshall of Old Dominion University and Mrs. Myra Cohn of the Sandy Hook Laboratory.

We have submitted the manuscript on the October 1978 cruise data and results to the NMFS Scientific Editor for publication as a NOAA Technical Report, following its review by Dr. E. M. Hulbert of WHOI. Myra Cohn and Dr. Harold Marshall are now completing the 15-30 November 1978 cruise data results. Samples and data from six more cruises from Cape Hatteras to Nova Scotia are in various stages of workup from sample examination to final text and figure preparation.

#### Phytoplankton Growth Potential

We prepared for a bioassay, drafted a paper on "Effects of Metals on Growth of a Phytoflagellate, Olisthodiscus luteus, Which Blooms in Lower Newark Bay" (prepared for the Proceedings of the Water Conference, Ramapo College), and worked on two other papers.

#### Coastal Ecosystems Investigation

##### Community Structure

We worked on our contribution to the Northeast Monitoring Program (NEMP) annual report. Dave Radosh and Steve Fromm worked on computerizing all benthic macrofauna data prior to running routines for calculating mean densities and species diversities and performing cluster analysis. Ann Frame continued verifying species identifications and coordinating inhouse taxonomy with that of a number of authorities who are working on specimens from the contracted macrofauna processing. Bob Reid completed reports synthesizing information on sediment composition and benthic macrofauna from all NEMP participants working on these projects. During 27-30 January, Bob and Frank Steimle traveled to the Narragansett Laboratory to synthesize further reports from the NEMP disciplines into a single statement on the health of fishery habitats in Northeast marine waters. Our major contributions to this report were:

1. Numbers of species generally correlated with physical oceanographic features of a given area, except in New York Bight dumpsite areas.

2. No alarming trends in numbers of species were seen over the 2 yr of NEMP sampling (or up to 10 yr at stations for which historical data were available).
3. Populations of sensitive amphipods, being monitored in several areas where impacts from oil or dumping activities are possible, have been stable.
4. In field experiments, surf clams burrowed less readily into contaminated than uncontaminated sediments. Clam settlement densities were lower off northern New Jersey than off western Long Island, where water pollution is presumably higher, although a cause-effect relationship has not been demonstrated.
5. Total organic carbon (TOC) in sediments strongly correlated with depth and sediment type; TOC had no major fluctuations at any NEMP station over the 2 yr of sampling. Comparison of 1980 concentrations in the New York Bight apex to 1971 levels also indicated no great changes in distribution and concentration over that period.
6. We have now established baselines for faunal biomass, community structure, and sediment parameters against which future impacts can be measured.

Dave Radosh also assembled benthic data for Romer Shoal, located at the eastern end of Raritan Bay, for presentation to a committee evaluating use of this popular fishing ground for sand mining. Clyde MacKenzie drafted a paper on revitalizing oyster beds, and continued analyzing samples collected by divers from the surf clam beds off Rockaway, Long Island.

#### Benthic Energetics

Frank Steimle worked on drafts or revisions of several manuscripts and continued to develop cruise plans for spring and summer Ocean Pulse Program (OPP) monitoring. He also spent more-than-normal time on duties as an EEO counselor. Jan Ward worked on final revisions of the New York Bight benthic fauna monograph and on an update of the polychaete section of our benthic invertebrate life history file (which now contains reviews of 82 species). Dot Jeffress completed her ADP course and continued to determine biomass data for New York Bight apex benthic samples. Russ Terranova made replicate caloric determinations for 14 species this month and filled several requests for information from our files on hydrographic and bridge log data from OPP cruises.

#### Environmental Chemistry Investigation

We made considerable progress on analyses of nutrients in seawater samples collected during OPP and MARMAP monitoring surveys. We analyzed over 500 samples from the December MARMAP survey for ammonium concentration. We measured 961 seawater samples for nitrate, nitrite, silicate, and phosphate, and 600 samples for dissolved organic phosphorous. We submitted nutrient data from Delaware II Cruise No. DE 79-05 (a MARMAP survey) to the Sandy Hook Laboratory's ADP Unit for keypunching. We sent nutrient data from the above survey to M. Pastuszak, a visiting Polish scientist who is developing a report on nutrient distributions over Georges Bank.

We completed analyzing trace metals (Ag, Cu, Cr, Cu, Ni, Pb, and Zn) in invertebrate and fish tissue composites collected during the August NEMP survey (NOAA R/V Kelez Cruise No. KE 80-07/08). We also began analyses of trace metals in sediment from an OPP survey (Delaware II Cruise No. DE 80-09). A mercury analyzer, ordered 6 mo ago, finally arrived. We calibrated the mercury analyzer and revised methods analyzing mercury in tissue samples.

Investigation technicians calibrated fluorometers and repaired and rebuilt field equipment for use on our intensive monitoring surveys this spring.

Mr. A. Draxler worked with Mr. B. Picawowski (with IOCS, Inc., and assigned to the ADP Unit at the Sandy Hook Laboratory) to produce a program which converts latitude and longitude to Cartesian coordinates in inches on a Lambert conformal conical projection. We expect to use this routine along with environmental data on chlorophyll, nutrients, primary productivity, and trace metal concentrations, to produce SYMAP-contoured cross-shelf maps.

We revised and distributed our contribution to the first NEMP annual report, "Baseline Studies on the Distribution of Phytoplankton Biomass Organic Production, Seawater Nutrients, and Trace Metals in Coastal Water Between Cape Hatteras and North Carolina" (Sandy Hook Laboratory Report No. SHL 80-24).

Jay O'Reilly developed a "Level 2" report for NEMP entitled "Nutrients C, N, P" (Sandy Hook Laboratory Report No. SHL 81-07).

### Physiological Effects of Pollutant Stress Investigation

#### Physioecology

Experiments continued with lab-reared blue mussels exposed to either copper or silver. We measured the animals for growth and selected some for chemical and histological analysis.

Bay scallops and surf clams exposed to 10 ppb of Cu in our diluter system have experienced high mortality, 86 and 80%, respectively. For scallops exposed to 5 ppb of Cu, 71% have died.

Mortality of bay scallops exposed to 10 ppb of Ag in the diluter system is 50% for those exposed to 5 ppb it is 26%. Surf clams exposed in the same system have had no mortalities. Adult and juvenile blue mussels exposed to 0, 5, 25 and 50 ppb of Ag continue to do well.

Blue mussels underwent a 96-hr bioassay to Hg, Ag, Cu, and Cd. Results look very promising.

#### Physiological Effects

We sacrificed 20 blue mussels which had been exposed to 0 and 10 ppb of Ag for 18 mo, measuring them for body and shell weights and gill-tissue respiration.

We measured gill-tissue respiration and took blood samples from sea scallops which had been exposed for 30 days to 0 or 10 ppb of Ag.

We sampled windowpane which had been exposed to 0, 5, and 10 ppb of Cd for 60 days. We completed a variety of hematological tests, measured gill-tissue respiration, and preserved gill tissue for examination by scanning electron microscopy (SEM). In addition, the Aquacultural Genetics Investigation took blood and kidney samples, and we further froze tissue samples for later metal-uptake analysis.

An SEM examination of tissues continued; this month major emphasis was on American lobster gills exposed to Cd.

### Biochemical Effects

We sampled the first group of sea scallops, which had been exposed for 30 days to 10 ppb of Ag, for physiological, chemical, and biochemical testing. We sampled adductor muscle, kidney, and gill, making homogenates of the gill tissues before freeze-storing them at 80°C for later analysis. Biochemical testing concluded on these gill homogenates, as well as on the kidneys taken during a recent OPP cruise (Delaware II Cruise No. DE 80-09), and work continued on the backlog of adductor muscle samples from the same cruise. We also tested the pooled kidney tissue taken during that cruise, half of which was homogenized and frozen and the other half (from the same animals) frozen as whole tissue. Unfortunately, the homogenates made in the lab from the frozen whole-tissue kidney pools (using the same procedure as at sea) produced supernatants with only half the biuret protein found in supernatants from the frozen homogenates, thereby strongly biasing calculated activities, which are based on the amount of biuret protein. The difference in soluble protein between the frozen homogenates and the homogenates made from frozen tissue may be due to the "salting-in" phenomenon that has been observed in frozen fish flesh, or to possible physiochemical differences between the two lobes of the kidney (the ventral lobe is thought to be less functional), or to inadvertent variation in technique. At any rate, we will repeat the whole exercise in the lab under controlled conditions as soon as we can get 15 live sea scallops.

Northeastern University's Marine Laboratory (located in Nahant, Massachusetts) has no immediate plans (unfunded) for further studies of adult sea scallops exposed to drilling muds. They do, however, plan to work with larval sea scallops in September; we have passed along that information to Larry Buckley at the Narragansett Laboratory who can do RNA:DNA ratio determinations on the tissue samples.

We also synthesized physiology and biochemistry sections of the NEMP/OPP annual report.

### Anaerobic Bacteriology/Metabolism

Activities this month included completion of various reports on past activities. Lab work included the identification of bacterial isolates obtained from samples of waters and sediments from OPP surveys (Kelez Cruise No. KE 11-80, Delaware II Cruise No. DE 80-09, and Long Island Sound Mini-Pulse cruises). We have identified some 250 isolates to date. Vibrio cholerae NAG has appeared in bottom waters and sediment samples from stations off Delaware Bay and Rhode Island. V. parahaemolyticus has appeared in water and sediment samples off New Jersey and Delaware Bay. A large number of the isolates, 35 to date, are Aeromonas hydrophilia, and have appeared in samples from scattered inshore stations. As has been observed in the past, a large number of our isolates are not contained in our profile index, that is, not yet identifiable.

We also spent some time in planning for projected OPP cruises.

### Analytical Chemistry

We tested a new procedure for copper analysis, obtained from our URI colleague for potential use with seawater. Only distilled water blanks were analyzed in this study, as we wished first to become familiar with the procedure, and to determine whether the method would give acceptable "background" values. The procedure is relatively trouble-free, and the background levels were acceptable. We hope to analyze dilutor samples next month.

We received a new electron-capture detector for installation in our glass-capillary gas chromatograph. This will give us the capability for separating and identifying isomers of PCB's. Actual installation of this detector must wait until funds become available, however.

### Behavior of Marine Fishes and Invertebrates Investigation

As part of our ongoing NEMP activities, we have initiated a study of the responses of juvenile red hake and sea scallops to reduced concentrations of dissolved oxygen (DO). During the past month we modified the low DO experimental system to provide the necessary environmental requirements for these animals. Using quantitative criteria developed in our US Environmental Protection Agency (EPA)-supported studies on the behavior and ecological requirements of juvenile red hake, we are currently making observations to establish normal behavioral baselines.

### Meetings and Assignments

During 7-9 January Andy Draxler attended the American Chemical Society's 15th Annual Meeting in Washington, DC; it included a special symposium on marine chemistry. Mr. Draxler also met with Dr. John Moody of the National Bureau of Standards (NBS) to discuss and visit the NBS clean-room facilities.

Dr. A. Calabrese participated in a peer review of ongoing programs at the EPA Gulf Breeze (Florida) Laboratory.

On 19 January, Dr. Fred Thurberg began a 10-wk assignment at the Central Office in Washington, DC.

Jack Pearce, Frank Steimle, Bob Reid, and Jay O'Reilly met with other Division personnel between 27 and 30 January at the Narragansett Laboratory to assist in generating a final synthesis annual report for NEMP.

### Publications

Anderson, M. L.; Steinberg, M. A.; King, F. J. Some physical effects of freezing fish muscle and their relation to protein-fatty acid interaction. Kreuzer, R. ed. Technology of fish utilization. London: Fishing News (Books) Ltd.;1980.

Steimle, F. W., Jr. NOAA's Northeast Monitoring Program. Coast. Ocean Poll. Assessment News 1(1):11;1980. (P)

## AQUACULTURE DIVISION

### Aspects of Nutritional Requirements of Mollusks Investigation

The 31 carboys in the semicontinuous algal culture system have been part of the operating system for various lengths of time. We are now rebuilding and replacing about two carboys each week that have recently become heavily contaminated from an unknown source. Until now the longest that a carboy has been in continuous production was 24 mo. However, we now have a carboy with a culture of Isochrysis galbana that is still producing after 30 mo in continuous culture. The total culture system has yielded 1540 liters of larval foods and 873 liters of juvenile foods. We distributed culture harvests to the various investigations as follows: Spawning and Rearing of Mollusks, 1117 liters; Aquacultural Genetics, 451 liters; Physiological Effects of Pollutant Stress, 221 liters; and Larval Diseases of Mollusks, 21 liters.

Inoculation of stock cultures and special strains is back on schedule. Upon request, we sent axenic starter cultures to Mark Leslie, a graduate student at South-eastern Massachusetts University, and to Long Island Oyster Farms, Inc.

We reared a population of fertilized oyster eggs for feeding studies. Unfortunately, a very high mortality (70% dead) at 48 hr forced us to abandon this plan. We saved the healthy larvae from the population and are collecting set from them, though.

To determine if a staggered feeding schedule could increase oyster growth, we conducted feeding experiments in the polyvinyl chloride rearing chambers. However, extremely cold weather reduced the seawater temperature below 0°C and the heating system could not raise the temperature of the seawater in the storage tank to a level satisfactory for oysters in the rearing chambers. Consequently, oysters did not grow in any of the feeding regimes. We have now added an additional heating unit to the seawater storage tank so that a temperature of 25-26°C can be achieved even in extremely cold weather. At present, an experiment is in progress to evaluate the nutritional benefit of previously untested algal species to juvenile oysters.

### Aquacultural Genetics Investigation

#### Hybrid and Selective Breeding

Icing in Milford Harbor damaged some oyster holding trays. We are conditioning stocks of American oysters for midwinter breeding in both the selection and inbreeding-hybridization studies. Small-scale recirculating water systems are proving to be beneficial for holding oyster spat otherwise kept in static systems.

#### Genetic Effects of Pollutants on Marine Organisms

Participation on a bottom trawl survey provided blood samples for the micro-nucleus test from 62 silver hake at eight stations, 19 red hake at two stations, 11 fourspot flounder at two stations, and at one station each, 3 Atlantic cod, 7 yellowtail flounder, 4 spotted hake, and 10 windowpane. These, along with other fish blood samples, bring the total sample size to about 1000 fish. Windowpane

(largely collected in Long Island Sound) appear to have very low incidences of micronuclei in circulating erythrocytes, indicating a very low mutation rate as calculated by this method. It remains to be seen whether this very low rate is exceeded by other species now under examination, which might or might not display areal differences corresponding to pollution levels.

Methods development for using the kidney hematopoietic system in applying the micronucleus test in the lab or field continues with increased expectation of success. Fish treated experimentally to measure the sensitivity of the test, as it would be applied in the field, currently have little hematopoietic activity because of cold water temperatures now being raised to hasten release of new erythrocytes into circulation. A further aspect of this work is examining hematopoiesis in embryonic and larval fish from the standpoint of applying the test (in the lab and field alike) to younger, more sensitive life stages. We are also looking into the likely influence of a little known disease of Atlantic cod, tentatively ascribed to a DNA virus, on the elevated micronuclear levels of a few cod sampled last spring. Viruses can have a clastogenic (chromosome-breaking) effect, as well as form cytoplasmic inclusion bodies.

Other methods work concerns means for assaying the chromosome apparatus of fish eggs during meiosis and fertilization. This is a delicate procedure, but one with which we have obtained some success. If feasible, such an assay could have numerous applications in toxicological assays and other research, as well as demonstrate a basic life process hitherto not well displayed in fish. We are also developing a method for the use of the yolk-sac membrane in cytologic assays.

Amphipod eggs of a single species collected on OPP cruises underwent examination using the same criteria as in our earlier field studies of Atlantic mackerel eggs from surface waters of the New York Bight. To date, 377 early stage eggs from 27 females collected at five sample sites have undergone analysis for mitotic-chromosome errors. An additional 60 females from another five sites are also available for study. There is considerable female-to-female variation, but eggs incubated by a single female show comparatively little variation. Sample sizes have so far provided no reliable information on site variation in error incidence. However, the ease with which the material can be assayed shows that it offers promise for measuring cytotoxic and cytogenetic effects on a reproductive stage of a benthic organism which is oil sensitive.

#### Spawning and Rearing of Mollusks Investigation

Lab-ripened bay scallops spawned three times in January; the resulting larvae have fostered numerous feeding studies. Early results show rapid larval growth at very low algal concentrations. In two completed tests larvae have grown 60% faster at low cell concentrations (5000 - 10 000 cells per milliliter) than at higher concentrations (20 000 - 200 000). We are also developing fluorometric techniques to determine algal consumption rates. When the data on growth versus concentration and consumption rate versus concentration are complete, a better strategy for larval feeding will be apparent.

We spent considerable effort analyzing the 1980 scallop grow-out data.

An experiment is underway to assess the effects of nutrition and temperature on the gametogenic development of young surf clams. We are maintaining groups of sibling clams of four distinct size classes at 20°C, and providing half of them with supplemental cultured algae. In addition, we are holding two size classes at ambient seawater temperature and at four other constant temperatures. Length and dry tissue weights of the clams are monitored. Histology and gonadal development will be periodically analyzed. Initial samples reveal undifferentiated gonadal tissue in 32-mm clams, the smallest being studied. Early results also indicate a measurable weight gain in the fed clams compared to the unfed ones. It is not known whether the quantity of supplemental algae can induce development. As the season progresses, the amount of naturally occurring phytoplankton in the seawater should fulfill the nutritional needs of the unfed clams. It is expected that gonadal development in the unfed clams will commence with the seasonal midwinter diatom bloom. We will try to establish an energy budget for young surf clams in their gametogenic development.

#### Visitors and Personnel

Visitors to the Milford Laboratory included Hugh Rule of Bridgeport, Connecticut, and Gib Chase of the US Army Corps of Engineers.

E. Losee terminated duty this month. Phillip McDermott, a cooperative education employee from Northeastern University, entered duty, replacing Joseph Callanan from Roger Williams College. Karen Ostman and Jean Pillo began student internships this month.

#### PATHOBIOLOGY DIVISION

##### Comparative Invertebrate Pathology Investigation

We examined American oysters collected in December 1980 from Johnsons Bay, Maryland, for parasites and pathogens. Minchinia nelsoni (MSX) occurred in 68% of the oysters and Perkinsus marinus (Dermo) in 8%. All infections were light and no oyster appeared seriously affected. The diseases may have influenced mortalities which occurred earlier in the year.

Linda Dorigatti completed preparation of amphipods collected during the September OPP cruise (Albatross IV Cruise No. AL 80-09), and is currently sectioning material from the December cruise (Albatross IV Cruise No. AL 80-12). Collation of data from the former cruise is not yet accomplished. Parasites similar to those in the July collection occurred also in the September collection. Parasites, intracellular in the epithelium of the midgut, occurred in one Monoculodes edwardsi that had "Hematodinium" in the hemocoel. Inspection of more material will be necessary before drawing conclusions about the relationship of the intracellular parasites to "Hematodinium." One specimen of Leptocherius pinguis had intracytoplasmic inclusions, suggestive of viral inclusions, in parts of the central nervous system and in skeletal muscle.

Dr. Frederick Bang of Johns Hopkins University is interested in euphausiid gill melanization as an example of a primitive response to cell death. Annually in January, Dr. Bang conducts a course on "Comparative Pathology of Marine Invertebrates" at the Marine Biological Laboratory in Woods Hole, Massachusetts. This year he included the topic of melanization in marine crustaceans. Dr. Ann Scarborough (an Oxford Laboratory

postdoctoral worker) assisted Dr. Bang in the course and presented a seminar on melanization in marine crustaceans which was based on literature, histologic slides, stained whole mounts, and whole specimens of planktonic crustaceans showing focal gill melanization which we provided. We hope that this mutually profitable interaction with Johns Hopkins will continue.

During the month the histology lab sectioned and stained approximately 400 blocks of tissue from a variety of fish, crustaceans, and mollusks. We also spent much time preparing the "Histology Procedures" manual.

### Fish Pathology Investigation

We spent considerable time collating and evaluating data on the prevalence of integumental lesions and pigmentation/skeletal anomalies of fishes sampled on bottom trawl surveys. Altogether, we examined 42 614 fish during 1979 and 1980 for the presence of lesions and anomalies. Linda Patanjo of the Resource Assessment Division will present the results of this ambitious survey at the joint meeting of the Sixth Annual Eastern Fish Health Workshop and Fish Health Section of the American Fisheries Society in July.

After almost 4 wk of being trapped in the ice at the Sandy Hook Laboratory on the R/V Kyma was freed by an icebreaker on 23 January. We were able to trawl on 27 January at the head of the Hudson Canyon in 160-ft depth. We captured 62 red hake and examined them for ulcers (TL--19.5 cm, range--17-24 cm). These smaller fish were disease free. Bottom temperature was 4.4°C. The larger red hake probably were in deeper, warmer waters of the canyon. On the same day, a tow at the sludge dumping location (where many ulcerated fish were obtained in December) yielded no red hake. Bottom temperature was 3.3°C at this colder, more inshore location.

A pattern is emerging in our investigation of the effects of the virus of infectious pancreatic necrosis on clupeid fishes. It appears that Atlantic menhaden cells must be used to isolate the virus from that species, whereas the chinook salmon embryo cell line or other cell lines not of menhaden origin must be used to isolate it from other clupeid fishes. This seems to hold true even though the same virus infects the several species being examined. No explanation for this viral behavior in culture is readily apparent. Because our interests lie primarily in using cell culture as a tool in investigating viral disease of wild fish populations, this anomaly does not concern us as long as the techniques adequately determine the presence or absence of the virus.

With the aid of student volunteer Paul Colletti of Colgate University, we are summarizing radiographic data on vertebral anomalies in 3000 Ammodytes sp. collected during 1979 and 1980. The form of the summaries will allow meaningful comparisons between different areas of the Northwest Atlantic. We hope enough information is now available to determine the utility of vertebral anomalies of Ammodytes sp. as a tool in monitoring marine environmental quality.

Light and electron microscopic studies on the olfactory organs of a 4-wk-old winter flounder that had been exposed to 500 ppb of Cu<sup>++</sup> for 18 hr showed that this brief exposure to excess copper disrupts the cellular organization of the tissue and causes moderate to severe cytologic lesions. There was frequent disruption of olfactory cells along their apical borders accompanied by an extrusion of their contents into the lumen of the organ. Intracellularly, the rough and smooth endoplasmic

reticular membrane systems were dilated to the point that vacuoles had formed. These observations are comparable to those made earlier on haddock larvae and illustrate the need for additional research on the effects of low levels of copper on the olfactory tissues of larval fish.

#### Microbial Ecology and Parasitology Investigation

We completed the analysis of bacteriological and protozoological data from a 2-yr study in the Philadelphia-Camden sewage disposal site and submitted a manuscript to the Journal of the Water Pollution Control Federation. The manuscript describes cooperative research between the EPA, FDA, and NMFS on the relationships between fecal coliforms, fecal streptococci, and hydrography with the frequency distribution of pathogenic amoebae (Acanthamoeba) in control and impacted sites. Three hundred fifteen stations were studied for the presence of sewage-associated bacteria and 147 of them were tested for the presence of the amoebae. Eleven percent of the stations had fecal coliforms, 8% had fecal streptococci, and 19% had amoebae. Control stations westward along a transect to Ocean City, Maryland, and northeast along the New Jersey coast to Asbury Park consistently were negative for either type of test organism. Among six species of Acanthamoeba isolated during the survey, two (A. culbertsoni and A. hatchetti) caused disease and death in laboratory mice. We are now analyzing data from a second study in the New York Bight apex for the preparation of a manuscript. Sediment samples taken from Asbury Park, New Jersey, to Long Island, New York, routinely yielded amoebae only at stations located near the New York sewage disposal site several miles east of Ambrose Light. We have analyzed results from both studies by routine statistical methods and there is a remarkably high correlation between results from both study sites.

We made an extensive literature search to determine the history, distribution, and significance of marine amoebae in the world's oceans. The review was preparatory for a NATO Advanced Workshop on Planktonic Marine Protozoa to be held in France in May 1981. The end product of the workshop will be the preparation of a handbook on methods of isolation, cultivation, and identification for all major groups of planktonic protozoa in the sea. The objective of the workshop is to provide a summation of lab methods, as recommended by the authors, for use by researchers throughout the world. The literature search revealed that in 1900 there was only one amoeba genus which had a type species of marine origin. The genus, Paramoeba Schaudinn, 1896, was described to accommodate Paramoeba eilhardi, isolated from a seawater aquarium and characterized by a peculiar second type of nucleus. The second nucleus is rich in DNA, but we do not know whether it is a normal organelle or whether it is a parasitic nucleus of unknown origin. In the 1960's researchers discovered that death in blue crabs caused by "gray crab" disease was due to amoebae which possessed the same type of DNA-rich body. That amoeba acquired the name Paramoeba perniciosus, and the genus shares with Acanthamoeba the dubious honor of accommodating both harmless free-living species and disease or death-causing species. The term "amphizoic" recently was proposed for such genera. The review also showed that of approximately 100 well described species of marine amoebae, about half have been described since 1970.

#### Diseases of Larval Mollusks Investigation

In continuing work to measure cytoplasmic release of malic dehydrogenase (MDH) as a marker for damage in oyster hemocytes, we found a spectrofluorometric assay to be about 30 times more sensitive than a spectrophotometric assay. The fluorometric technique, which is based upon the conversion of resazurin to highly fluorescent

resorufin by nicotinamide adenine dinucleotide-reduced (NADH), allows detection of MDH from 3000 cells. About 90 000 hemocytes are needed to detect MDH by a spectrophotometric method.

Initial work with fluorescamine, a nonspecific fluorogenic reagent for protein measurement, indicates that total protein from as few as 300 oyster hemocytes may be detected by a spectrofluorometric procedure. We hope this method can be used in counting oyster phagocytes in lieu of the tedious and time-consuming microscopic counts.

The monthly Mini-Pulse cruise ended later than expected due to severe ice conditions in January. We used a small boat on warm days. Very cold water temperatures ( $-0.5^{\circ}$  to  $-1.0^{\circ}\text{C}$ ) occurred at all Long Island Sound stations.

We received, counted, and made 22 isolations from 90 Petri dishes plated at Marine Bioservices, Inc., in South Bristol, Maine. The 22 isolates had morphologic and biochemical characters similar to previously isolated pathogens and were used to challenge American oyster larvae. We forwarded a report on the work to date to the owner of the company, Mr. John Sheldon.

In comparative tests on 15 bacterial oyster pathogens, 22 of 34 biochemical tests from the Minitek miniaturized, diagnostic system compared favorably with reactions produced in standard diagnostic media. However, we achieved this only after adding seawater and yeast extract to the Minitek base broth.

Samples of Gonyaulax "tamarensis complex" cysts received from the Maine Department of Marine Resources research laboratory in West Boothbay Harbor underwent treatment with ozone and became detoxified as measured by mouse bioassay. Other samples were ozone-treated to determine the inactivation rate of the cyst poison by varying time and maintaining ozone dose. We returned these samples for bioassay by Mr. John Hurst in Boothbay Harbor.

Dr. Robohm, in cooperation with Dr. Murchelano, prepared a preliminary proposal for a serological survey of bacterial pathogens of striped bass from East Coast estuaries.

### University Relations

Mr. Ralph Elston of Cornell University in Ithaca, New York, visited Drs. Blogoslawski and Robohm at the Milford Laboratory on 7 January. We gave him a CA-10 slant of a California shellfish pathogen for his research program.

### Meetings, Talks, Visitors, and Personnel

Dr. Rosenfield and Dr. Sindermann (Sandy Hook Laboratory) met with Dr. Dennis Taylor of the University of Maryland on 29 December to discuss and modify documents representing a proposal and an MOU to establish a cooperative agreement between the University's Horn Point Center for Environmental & Estuarine Studies at Cambridge, Maryland, and the NEFC's Oxford Laboratory; on 5 and 6 January Dr. Rosenfield attended the Center Board of Directors meeting at the Milford Laboratory; Mr. Owen Bricker and Mr. Rich Purdy of the EPA in Annapolis, Maryland, conferred with Dr. Rosenfield and Ms. Sally Otto of the Maryland Department of Natural Resources in

Oxford on shellfish pathology monitoring programs in Chesapeake Bay; Dr. Rosenfield and Dr. Beverly Corey conferred with Dr. Carl Sindermann at the Sandy Hook Laboratory on 15 January; Dr. Rosenfield presented a talk on "Aquaculture in the Peoples Republic of China (PRC)" to the Unitarian Church in Easton, Maryland, on 25 January; and on 28 January Dr. Rosenfield participated in an aquaculture discussion and update session with the US/PRC Working Group on Oceanography and Fisheries in Washington, DC.

Dr. Beverly Corey of the FDA's Bureau of Veterinary Medicine spent the first 2 wk of January on a research assignment conferring with staff members on various aspects of disease diagnosis and regulations affecting the import and export of finfish and shellfish.

Mr. Farley participated in the course on Comparative Pathology of Marine Invertebrates at the Marine Biological Laboratory in Woods Hole from 5 to 31 January and presented lectures in molluscan pathology.

Dr. Johnson attended a National Science Foundation-sponsored workshop on "The Role of Parasites in Marine Ecosystems" held at the Santa Barbara campus of the University of California from 19 to 21 January.

Ms. MacLean and Dr. Brown (Milford Laboratory) attended the IYABA meeting at the Narragansett Laboratory on 27 January.

Ms. Slater resigned on 8 January from her temporary appointment at the Oxford Laboratory to pursue graduate studies in microbiology at Old Dominion University; Mr. Richard Vacca of Roger Williams College in Bristol, Rhode Island, began a 5-mo cooperative education assignment at the Milford Laboratory; and Ms. Cynthia Love began work at the Milford Laboratory for 1 yr as a biological technician.

Visitors to the Oxford Laboratory during the month included Mr. Owen Bricker and Mr. Rich Purdy of the EPA in Annapolis, Maryland; and Mr. Tim Cole and Mr. T. Chai of the University of Maryland's Horn Point Center for Environmental & Estuarine Studies in Cambridge, Maryland.

### Publications

Combs, T.; Braun, P.; Blogoslawski, W. Morphological alterations of larvae of the American oyster, Crassostrea virginica, when challenged with Candida albicans and Candida tropicalis. Amer. Soc. Microbiol. (Abstract.) (A)

Robohm, R. A.; Sparrow, D. S. Evidence for genetic selection of high antibody responders in summer flounder, Paralichthys dentatus, from polluted areas. Fish Diagnostics Symp., Int. Assoc. Biol. Stand. (Abstract.) (A)

Sawyer, T. K.; Griffin, J. L. Planktonic marine amoebae - cultivation. NATO Advanced Workshop on Planktonic Mar. Protozoa. (Abstract.) (S)

Sawyer, T. K.; Griffin, J. L. Planktonic marine amoebae - methods. NATO Advanced Workshop on Planktonic Mar. Protozoa. (Abstract.) (S)

Sawyer, T. K., Griffin, J. L. Planktonic marine amoebae - taxonomic considerations. NATO Advanced Workshop on Planktonic Mar. Protozoa. (Abstract.) (S)

Sawyer, T. K.; Lewis, E. J.; Galasso, M.; Lear, D. W.; O'Malley, M. L.; Adams, W. Gaines, J. Distribution of pathogenic and nonpathogenic amoeba (Amoebida: Acanthamoebidae) in ocean sediments in an offshore sewage disposal site. Water Pollut. Contr. Fed. (S)

## NATIONAL SYSTEMATICS LABORATORY

### Penaeoid Shrimps Investigation

We completed a manuscript describing a new species of Solenocera from the Philippines; two other species of solenocerids, one undescribed, are undergoing st Progress continued on a revision of American Pacific rock shrimps, Sicyonia.

### Crustaceans Investigation

Preparation continued of the manuscript on the "Shrimps, Lobsters, and Crabs of the Temperate Eastern United States."

### Pelagic Fishes Investigation

We revised a draft of a paper (with R. Cressey of the Smithsonian Institution) on the host specificity of copepods parasitic on scombrids. Work continued on a revision of Spanish mackerels. We completed a section on needlefishes and began writing sections on halfbeaks and scombrids for Sea Fishes of South Africa.

### Benthic Fishes Investigation

We completed a draft of a manuscript describing a new ophidioid from the Philippines, worked on the description of a new reef-dwelling ophidioid from Western Australia, and continued preparation of a paper on ophidioids trawled from the Southeast Atlantic (including descriptions of three new species).

### Honors

Dr. Bruce Collette assumed the office of President of the American Society of Ichthyologists and Herpetologists.

### Visitors

Dr. Izumi Nakamura of Kyoto University will be working closely with Bruce Collette and Joe Russo on scombroid phylogeny during the tenure of his 12-mo Smithsonian postdoctoral fellowship. Dave Hardy of the National Oceanographic Data Center visited several times for information on scientific names of fishes and invertebrates.

### Publications

Collette, B. B. Needlefishes, family Belonidae. In Sea Fishes of Southern Africa.

Collette, B. B. A new species of freshwater halfbeak, genus Zenarchopterus, from New Guinea. Copeia. (S)

Perez Farfante, I. Solenocera alfonso, a new species of shrimp (Penaeodidea: Solenoceridae) from the Philippines. Proc. Biol. Soc. Wash. (A)

## ATLANTIC ENVIRONMENTAL GROUP

### Ocean Monitoring and Climatology Task

As part of his study of factors affecting mortality of Atlantic mackerel during the egg and larval stages, Talbot Murray developed precise estimates of arrival (spawning) times at points along the Virginia-to-New York coastline. These data came from reports by party boat operators, marinas, and other recreational fishing activities published in weekly issues of The Long Island Fisherman, The Fisherman: for the New Jersey/Delmarva/Hatteras Fisherman, and the Jersey Angler News, as well as sport fishing columns in the Baltimore Sun and Philadelphia Evening Bulletin, from 1969 to 1980. He divided the coastline into 18 intervals about 36 km long from Virginia Beach, Virginia, to Montauk Point, New York (Figure 1). He assigned mackerel catch reports to a single interval; each time and location constituted a single data point. Figure 2 summarizes the data, showing the progression of arrival times northward in the early spring months, beginning with March arrivals off Chesapeake Bay and ending with May arrivals off Montauk Point.

The cooperative Ship of Opportunity Program (SOOP) obtained five expendable bathythermograph (XBT) transects and one continuous plankton recorder (CPR) transect in January: one XBT transect in the Gulf of Maine, one XBT transect off Southern New England, two XBT and one CPR transect across the shelf and slope off New York, and one XBT transect across the Gulf of Mexico. Also, in January, the AEG cut back on sampling in the Gulf of Mexico by removing XBT equipment from two Delta steamship vessels and one US Coast Guard vessel. Monthly transects across the Gulf on the tanker Edgar M. Queeny, operating out of New Haven, Connecticut, will continue.

Recent late fall and early winter water temperatures on Georges Bank have been about 2°C below those recorded at the same time and place last year. Sea surface (1.5 m) temperatures measured with a thermistor mounted in the hull of NOAA data buoy 44003, moored at 40.8°N, 68.5°W, showed a negative departure from 1979 values beginning in mid-November. Figure 3, prepared from a listing of periodic (every 6 hr) surface observations from the buoy as produced weekly by the Ocean Services Group of the National Weather Service, shows the divergence of the 1979-80 and 1980-81 temperatures.

The buoy's location, 145 km southeast of Cape Cod in about 50 m of water, should make the temperature values reasonably representative of conditions on the western portion of Georges Bank. In winter the water on the bank is generally isothermal, so sea-surface temperatures are good indicators of the temperature of the entire water column. The average rate of change during the mid-November to mid-January period in 1980-81 was  $-0.10^{\circ}\text{C}\cdot\text{day}^{-1}$ , compared to  $-0.06^{\circ}\text{C}\cdot\text{day}^{-1}$  in 1979-80, but the curves in Figure 3 show that the greatest difference in cooling rates occurred in late November and early December, and that the rates were only slightly different after that.

The western portion of Georges Bank, only 140-180 km from Cape Cod, is well within range of the cold, dry continental air that has swept southeastward out of Canada over New England late this fall. The observed change in water column temperature undoubtedly is a consequence of these invasions of cold air, and a comparison of air temperature records (taken from "Local Climatological Data" released by the National Weather Service's National Climatic Data Center) at coastal weather stations support this contention. For example, the average November air temperatures at Portland, Maine, were 3.4°C cooler in 1980 than in 1979, and those in Boston, Massachusetts, were 4.1°C cooler.

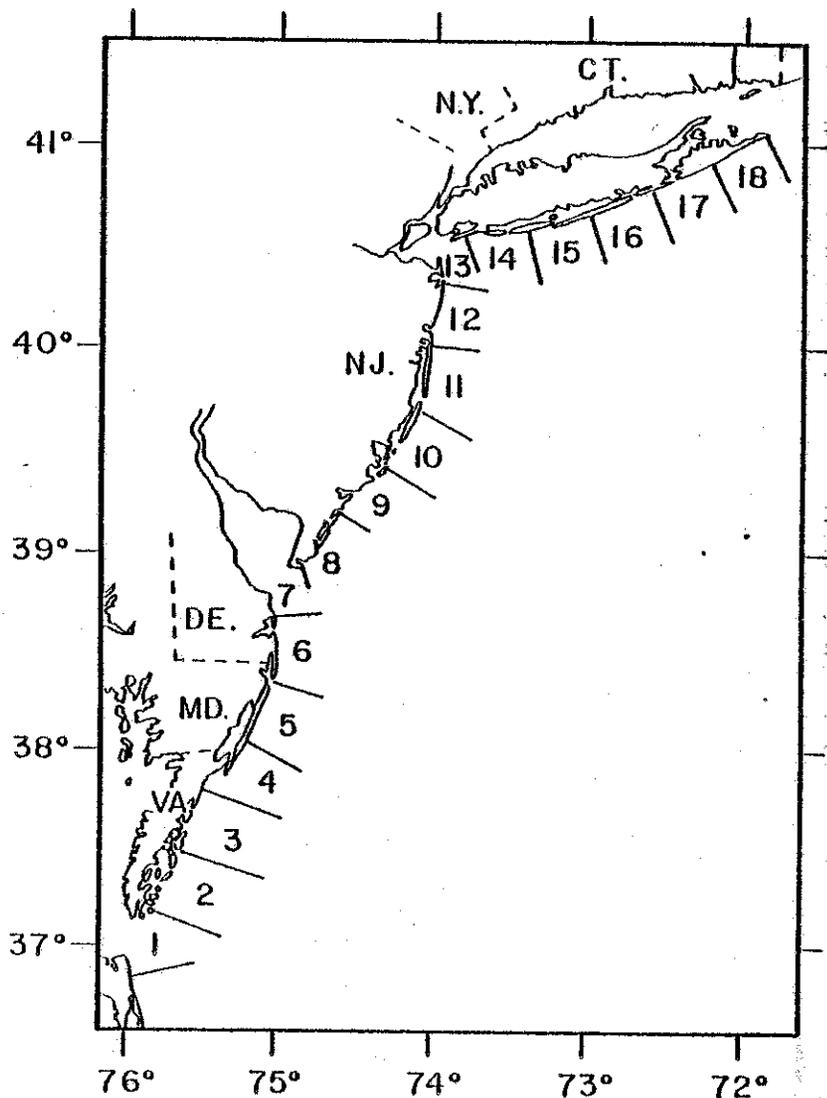


Figure 1.

MACKEREL PRESENCE BY INTERVALS  
 BASED ON SPORT FISHING REPORTS, 1969-80

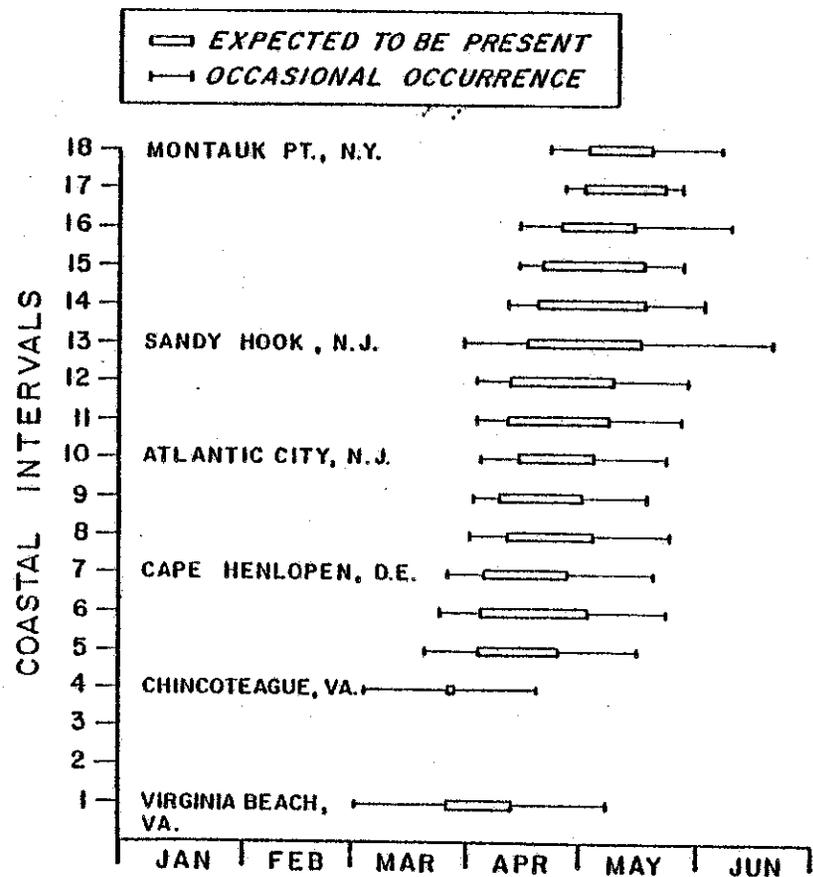
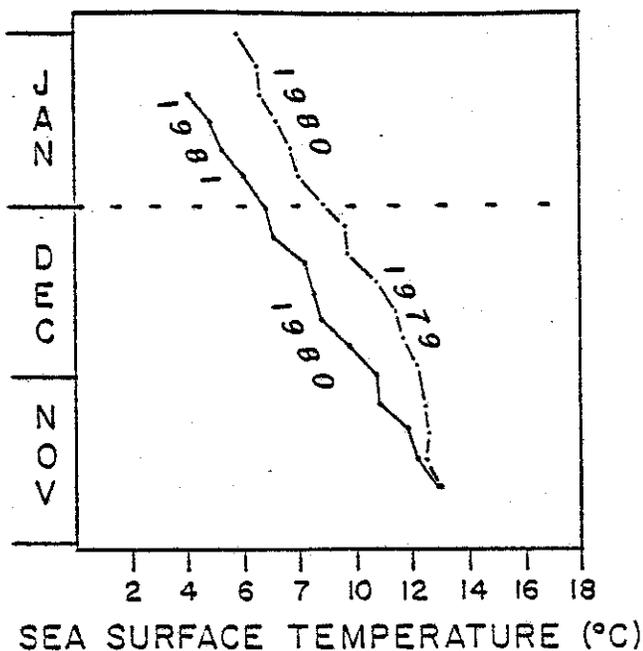


Figure 2.

Figure 3.



Assuming that the change in water-column temperature during November-January (80 days) was entirely due to in-situ heat losses to the atmosphere, the losses from the water column at the buoy's location were about  $3.8 \times 10^6$  cal·cm<sup>-2</sup> in 1980-81, compared to  $3.2 \times 10^6$  in 1979-80. Similarly, the average rate of loss was  $4.8 \times 10^4$  cal·cm<sup>-2</sup>·day<sup>-1</sup> in 1980-81, compared to  $4.0 \times 10^4$  in 1979-80.

The following announcement of eddy conditions in the Georges Bank - Middle Atlantic Bight area was sent to the Commander of the Atlantic Area for the US Coast Guard for publication in the February 1981 issue of Atlantic Notice to Fishermen:

AEG/January 14, 1981

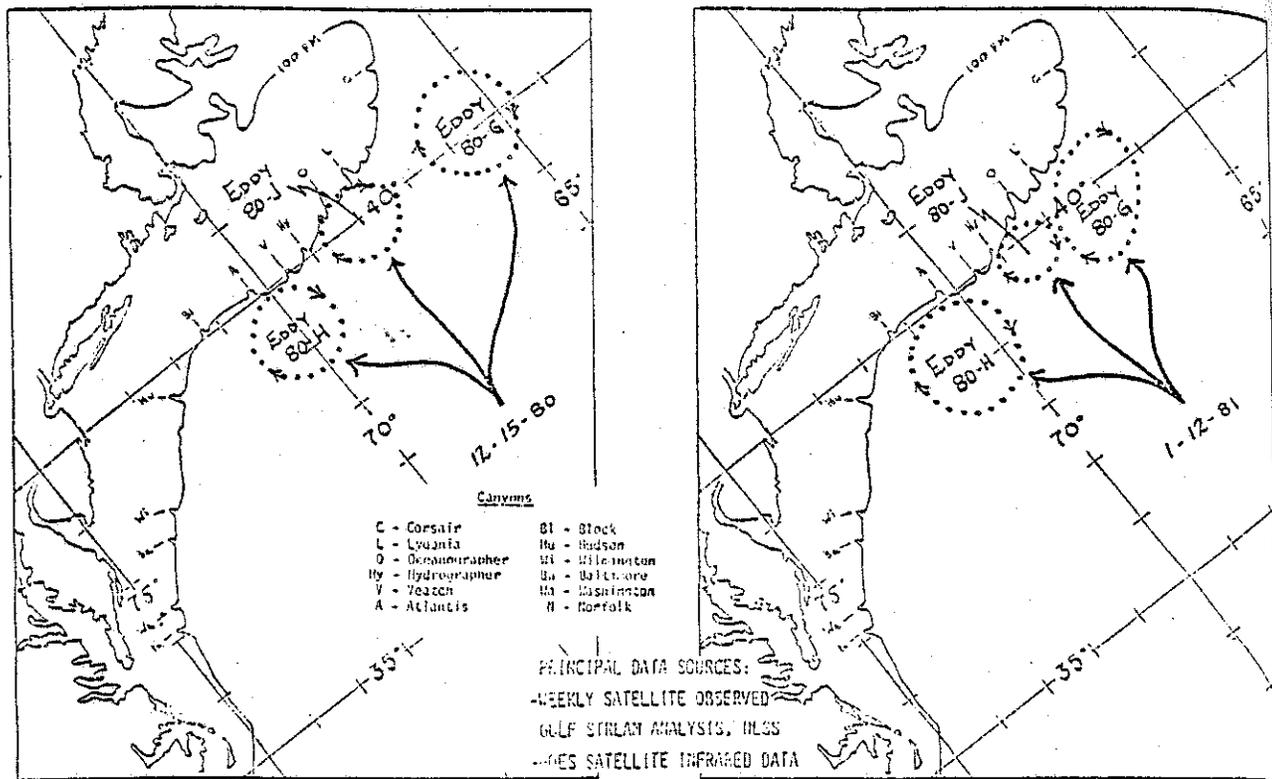
#### GULF STREAM EDDY LOCATIONS

The Atlantic Environmental Group of the National Marine Fisheries Service reports that three warm core Gulf Stream eddies were present off the northeast coast of the United States in mid-January.

Eddy 80-H moved about 50 km (27 nm) to the west and is now centered near 39.2°N, 70.6°W, southwest of Atlantis Canyon. Eddy 80-J travelled west about 60 km (32 nm) to a center position southeast of Hydrographer Canyon at 39.8°N, 68.6°W. Eddy 80-G advanced about 140 km (75 nm) to the west and is located near 39.8°N, 67.2°W, southeast of Lydonia Canyon.

During the next 30 days Eddy 80-H may travel to a center position east of Hudson Canyon; Eddy 80-J may move to a location south of Veatch Canyon and Eddy 80-G may move to a center position southwest of Oceanographer Canyon.

Fishermen are requested to report unusual conditions or catches occurring in the vicinity of these eddies to the Director, Atlantic Environmental Group, National Marine Fisheries Service, RR 7, South Ferry Road, Narragansett, Rhode Island 02882, by mail. Updates on eddy positions and general information on Gulf Stream eddies may be obtained by calling the Atlantic Environmental Group (401-789-9326)



### Ocean Dumping Task

We submitted the revised draft of our contribution to the NEMP annual report.

Analysis of circulation data from Deepwater Dumpsite (DWD) 106 continued with the creation of data files containing ARGOS satellite buoy data through 31 December 1980. A card deck containing these data will be sent to WHOI for further processing. Wind data were requested for five wind stations along the trajectories of buoys 03020 and 03021 released at DWD 106. Buoy trajectories will be compared to wind data along with plots of: (1) 2-day average sea-surface temperature versus Julian day, and (2) 2-day average buoy speed versus Julian day.

### Meetings and Visitors

A Center Board of Directors meeting, held on 5 and 6 January at the Milford Laboratory, was attended by Mert Ingham and Woody Chamberlin.

Steve Cook and Bob Benway traveled to Port Newark, New Jersey, on 15 January to discuss potential SOOP operations with the captain of the M/V Oleander.

On 14 January, Jim Bisagni attended a seminar on ocean dumping at Woods Hole, Massachusetts.

Woody Chamberlin and Janet Hess attended a remote sensing workshop planning meeting, held at the Government Services Administration, Boston, Massachusetts, on 14 January.

On 16 January Steve Cook traveled to Philadelphia where he boarded the E. M. Queeny and arrived in Jacksonville, Florida, on 22 January. From there he flew to Houston, Texas, and also visited Bay St. Louis, Missouri, to confer with personnel on SOOP operations.

Reed Armstrong hosted an IYABA meeting at the Narragansett Laboratory on 27 January.

David Mountain visited Mert Ingham on 20 January.

A NEMP management team meeting was held in Narragansett from 27 to 30 January to prepare a draft for the first annual report.

### Publications

Armstrong, R. S. Transport and dispersion of potential contaminants at the Buccaneer Oil Field. EXPOCHEM '80;1980 October; Houston, Tex. (A)

Crist, R. W.; Chamberlin, J. L. Bottom temperatures on the continental shelf and slope south of New England during 1979. Ann. Biol. 36. (A)

Fitzgerald, J. L.; Chamberlin, J. L. Anticyclonic warm core Gulf Stream eddies off the northeastern United States during 1979. Ann. Biol. 36. (A)

Hilland, J. E. Variation in the shelf water front position in 1979 from Georges Bank to Cape Romain. Ann. Biol. 36. (A)

Hughes, M. M.; Cook, S. K. Water column thermal structure across the shelf and slope southeast of Sandy Hook, New Jersey in 1979. Ann. Biol. 36. (A)

McLain, D. R.; Ingham, M. C. Sea surface temperatures in the northwestern Atlantic in 1979. Ann. Biol. 36. (A)

### Reports

Armstrong, R. S. Hydrodynamics of the Buccaneer Gas and Oil Field. Jackson, W. B. ed. Environmental assessment of an active oil field in the northwestern Gulf of Mexico. NOAA Final Report to EPA: Proj. No. EPA-IAG-D5-E693-E0;1980. 41 p.

Bisagni, J. J.; Kester, D. R. Physical variability at an East Coast United States offshore dumpsite. Proc. First Int. Ocean Dump. Symp.;1978 October.