

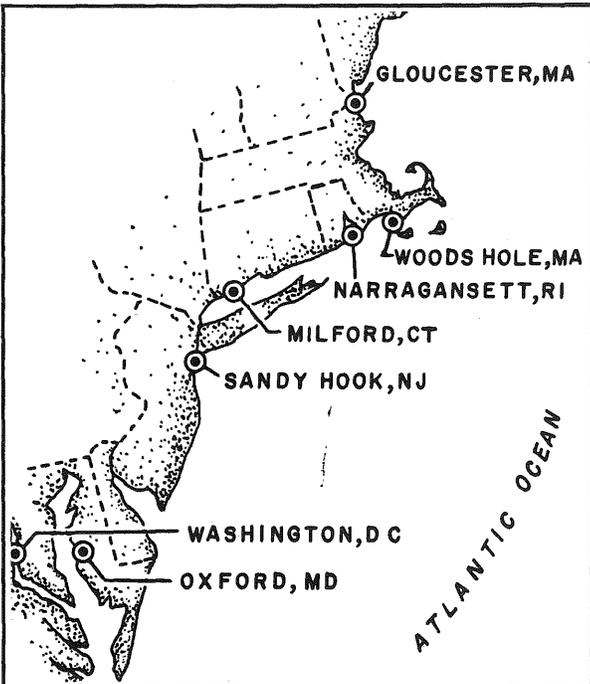
*y. Brownlow*

# NEFC

Northeast Fisheries Center

# NEWS

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APRIL 1980

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



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## CENTER DIRECTORATE

### Fisheries Utilization Office

Don Gadbois of the Gloucester Laboratory is collaborating in an International Council for the Exploration of the Sea (ICES) intercalibration exercise for polychlorinated biphenyls (PCB's). Don has already completed his analyses of fish oils which are being used for the exercise and has submitted a report including the chromatograms and calculations to Dr. Musial of Fisheries and Oceans Canada, Resource Branch, who is collating and evaluating the data from the participating laboratories.

### Special Scientific and Technical Projects Office

Bernard Skud attended a meeting of the ICES Working Group on Atlantic Salmon in Copenhagen from 15 to 18 April.

Under the guidance of Ron Smolowitz, the Woods Hole pier project has moved along. A meeting was held with the Small Business Administration (SBA) contractor and a negotiated price could not be arrived at. The SBA released us so we can now go competitive. A pre-bid conference will be held on 13 May with bids to be opened on 30 May. We received all necessary clearances from the Town of Falmouth and are waiting for final approval from the State of Massachusetts.

The scallop gear trials video tape was shown at the Second Annual NEFC Research Conference, the New England Fisheries Steering Committee meeting, the Benthos, Inc., symposium on underwater photography, and numerous smaller gatherings.

The CAMAC (computer-automated measurement and control) data logger system for the NOAA R/V Albatross IV has been completely assembled and software is being written by a subcontractor. Work is continuing on modifications to the electro-hydraulic clam dredge system, design and testing of a scallop survey trawl, and Woods Hole facility requirements. Technical support was provided to a number of fishermen and organizations.

### Publications

Skud, B. E. Soaktime and the catch per pot in an offshore fishery for lobsters (Homarus americanus). In: Population assessments of shellfish stocks. ICES, Rapp. et Proces-Verb. des Reun. 175: 190-196;1979. (P)

## RESOURCE ASSESSMENT DIVISION

### Fishery Biology Investigation

#### Age and Growth

Vi Gifford completed coding redfish data for computer keypunching in the age validation study. She picked out otolith sections with different edge conditions for photographs.

Kris Andrade completed aging commercial pollock samples from the third quarter of 1979. She also completed the final audit for haddock samples from Albatross IV Cruise No. AL 79-12 and NOAA R/V Delaware II Cruise No. DE 79-10 (fall bottom trawl survey).

Judy Penttila completed aging 989 commercial yellowtail flounder samples from January and February 1980. She also audited the listing of Atlantic cod age data for the 1979 spring bottom trawl survey cruise (Albatross IV Cruise No. AL 79-03 and Delaware II Cruise No. DE 79-04). She and Ambrose Jearld participated in the most recent meeting at Cambridge-IMANCO in Monsey, NY, to review results of the software they developed for the automatic aging of haddock scales.

### Finfish

Cathy Rearden completed aging about 1500 of 2000 scale samples from 1979 Sandy Hook recreational bluefish catches. Brenda Fields began aging 1976 summer flounder research survey samples and assisted Louise Dery with the preparation of special summer flounder scale impressions for the 20-21 May 1980 Summer Flounder Age/Growth Workshop.

Louise Dery completed a segment of the red hake age validation study, but was largely concerned with planning and preparations for the aforementioned workshop. A major attempt was made to consolidate all silver and red hake age-length data on tape, and age determinations were begun for silver hake samples from the 1979 fall bottom trawl survey.

Ambrose Jearld and Louise Dery went to Philadelphia, PA, to meet with Paul G. Scarlett from the New Jersey Division of Fish, Game, and Shellfisheries, and Ronald Smith from the Delaware Department of Natural Resources and Environmental Control. The purpose of the meeting was to plan an agenda for the 20-21 May 1980 Summer Flounder Age/Growth Workshop.

### Shellfish

Loretta O'Brien continued aging sea scallops and has been making preparations to sample scallops off Chatham, MA. Loretta also attended a meeting at the Woods Hole Laboratory addressing the problems of age and growth of sea scallops in the Gulf of Maine. Attendance at the meeting included representatives from the States of Maine and Massachusetts. A proposal was made to hold a workshop on aging sea scallops in Maine in May.

Maurice Crawford began preparing slides of surf clam chondrophores from Delaware II Cruise No. DE 79-08. Preparation of photographs of chondrophores from earlier cruises has been delayed until the darkroom renovation is completed. Maurice has undertaken a special project of trying to age soft shell clams. Shells of clams known to have set at a particular time are available. After some initial trials, a methodology has been worked out for these very fragile shells. It involves imbedding the shells in epoxy auto-body filler for cutting. These sections viewed under a microscope with transmitted light have revealed some apparent age marks.

John Ropes has continued analyses of data for a study of size and age at sexual maturity in ocean quahogs. A manuscript, "Size and Age at Sexual Maturity of Ocean Quahogs, Arctica islandica, Linnaeus, From a Deep Oceanic Site," is in preparation. An abstract on the subject has been forwarded to the Program Chairman of the National Shellfisheries Association for consideration as a presentation at the 8-12 June meeting in Hyannis, MA.

Dr. Ida Thompson from Princeton University visited briefly while in Woods Hole for a meeting. She seemed impressed with our progress in aging young ocean quahogs and the marked clams which we have recovered from the field. Her manuscripts on aging ocean quahogs are to be published in Marine Biology.

Two new "Stay-in-School" students, Mark Costa and Clarence Andrade, joined the Shellfish Group at the beginning of the month. They have been doing preparation work in the lab: scrubbing scallop shells, logging in samples, impressing scales for members of the Finfish and Age and Growth Groups, and cutting and sectioning surf clams.

### Sandy Hook Investigation

Wally Morse participated in two 1980 spring bottom trawl survey cruises aboard the Delaware II and Albatross IV.

John Clifford continued the analysis of the 1975-77 party and charter boat survey data. Collection of Atlantic mackerel from the recreational fishery was initiated.

### Fishery Assessment Investigation

Paul Wood reviewed a pre-proposal to the New England Fisheries Development Program for the "Assessment of the Jonah Crab (Cancer borealis) Resource in Southern New England" submitted by the Rhode Island Division of Fish and Wildlife.

Steve Murawski developed computer programs for the analysis of age-growth data on summer flounder. He also completed a draft of a manuscript on growth of ocean quahogs.

Emma Henderson participated in the Division's review of the Environmental Defense Fund petition to amend the guidelines in the Fishery Conservation and Management Act of 1976. She also worked with Ambrose Jearld on summer flounder age and growth material for Dr. Jearld's talk which was given at the 36th Annual Northeast Fish and Wildlife Conference during 27-30 April in Ellenville, NY. Emma also completed her analysis section of a paper on confidence limits for virtual population analysis estimates.

Anne Lange demonstrated squid sex and maturity determination procedures to two foreign fishery observers, and discussed results and procedures of a squid mesh comparability study with them. Anne reviewed statement papers from the NMFS International Organizations and Agreements Division in preparation for Senate hearings on American-Canadian East Coast fishery negotiations. On 18 April, Anne was detailed to Washington, DC, for a 4-6 mo assignment as Project Coordinator on the staff of the Assistant Administrator for Fisheries.

Gordon Waring reviewed two project completion reports for the NMFS Federal Aid Branch in the Northeast Regional Office in Gloucester, MA, dealing with hard clam resources in New Jersey and New York.

Kathi Rodrigues assisted Anne Lange with a mesh comparability study involving two Spanish fishing vessels, Pescapuerta Segundo and Pescapuerta Tercero.

Thurston Burns continued working on the biological section of the new American lobster draft fishery management plan.

Ralph Mayo chaired and coordinated the Second Annual NEFC Research Conference during 1-3 April in Woods Hole.

Margaret McBride and Steven Murawski participated in the third leg of the 1980 spring bottom trawl survey on Georges Bank aboard the Delaware II during 15-25 April. Gordon Waring and Margaret McBride participated in the Albatross IV Southern New England bottom trawl survey during 7-12 April. This survey was initiated for more intense sampling of yellowtail flounder relative abundance.

#### Senior Assessment Scientists

During the last week of April, Brad Brown participated in informal discussions with scientists attending the Northwest Atlantic Fisheries Organization (NAFO) larval Atlantic herring meetings. Brad also worked on adjustments to survey schedules influenced by potential budget cutbacks and actual vessel progress to date, reviewed potential changes in fee structures for foreign fishing relevant to assessment input, and commented for the NMFS Office of Utilization and Development pending fishery development legislation from a resource assessment standpoint.

Emory Anderson assembled data necessary for updating the Atlantic mackerel assessment. He provided Canadian scientists with 1979 USA commercial Atlantic mackerel catch data (numbers at age) and 1968-79 numbers-at-age from USA spring bottom trawl survey Atlantic mackerel catch-per-tow data.

Fred Serchuk continued his analysis of commercial samples of Gulf of Maine sea scallops to derive basic biological parameters on growth rates and shell height - meat count relationships. He and Paul Wood participated in planning the sea scallop survey to be conducted during May-June 1980.

Steve Clark completed work on a manuscript titled "Review and Assessment of the Georges Bank and Gulf of Maine Haddock Fishery" to be coauthored by Bill Overholtz and Dick Hennemuth.

Vaughn Anthony and Gordon Waring completed a manuscript titled "A Review of the Atlantic Herring Fisheries, Their Assessment, and Management in the Georges Bank - Gulf of Maine Area." This paper will be published in the proceedings of a symposium on world herring fisheries held in Alaska in February 1980.

#### University and Research Institute Relations and Activities

On 4 April, Brad Brown and Tom Azarovitz met with Mr. Hedgepeth, Marine Science Coordinator of Hampton Institute, to discuss volunteer participation of Hampton Institute students in bottom trawl surveys.

On 12 and 13 April, Ambrose Jearld and Brad Brown, at the invitation of the Conference Chairperson, attended the Annual National Association for Equal Opportunity in Higher Education Conference for Blacks in Higher Education. This organization is composed of the presidents of the predominantly black colleges. Attendance at this conference provided the opportunity to meet and talk with representative staff and faculty in these institutions as well as other non-minority academic, private, and government institutions. On 16 April, Brad met in Washington, DC, with Dr. Earl C. Droessler to discuss general university relationships and potential university involvement with the NEFC, and contracts with black colleges as pursuant to President Carter's directive.

Steve Clark provided haddock assessment data to the President's Council on Environmental Quality in Washington, DC.

Fred Serchuk participated as part of the scientific party on 11 April aboard the Delaware II to acquaint Yale University students in marine fisheries with research activities and techniques related to survey operations. Fred Serchuk reviewed a Sea Grant proposal relating to research activities on shellfish population dynamics.

Steven Murawski initiated a project with Dr. Michael Ross of the Department of Forestry and Wildlife Management at the University of Massachusetts on population biology of witch flounder off the New England Coast.

Vaughn Anthony talked to Chris Martin of the University of Massachusetts Marine Station at Rockport concerning plankton that cause the bioluminescence used to spot Atlantic herring schools. Vaughn Anthony discussed with Dr. Ian Fletcher (University of Washington) possible cooperative research during the summer of 1980. Vaughn and Fred Serchuk met with Dan Schick (Maine Department of Marine Resources) to review possibilities for scallop research to be conducted by Maine. Vaughn also discussed several research topics with Clem Walton of the Maine Department of Marine Resources.

Emma Henderson consulted with two students from Rutgers University on fitting growth curves, and also discussed summer flounder overwintering areas with a Boston University student.

#### Meetings, Talks, Visitors, and Publicity

Brad Brown attended portions of the Second Annual NEFC Research Conference held at Woods Hole during 1-3 April; Fred Serchuk served as chairperson of one of the technical sessions. On 3 April, Brad Brown attended a US Department of Housing and Urban Development conference on fair housing for the 1980's. During 7-9 April, Brad and Mike Sissenwine attended the Center Board of Directors meeting at the Milford Laboratory. On 11 April, Brad met in Washington, DC, with Robert Hutton and staff of the NMFS Recreational Fisheries Division and with William Gordon of the NMFS Office of Conservation and Management concerning development of the Marine Section of the American Fisheries Society. On 16 April, Brad, Robert Edwards, and Dick Hennemuth met with Terry Leitzell (NOAA Assistant Administrator for Fisheries), Dick Gutting (NOAA Assistant General Counsel for Fisheries), William Gordon, and legal staff concerning fishing problems in the Northeast, with additional prior time spent in preparation for that meeting. During 21-25 April, Brad attended the Technical Consultation of the Allocation of Fishery Resources held in Vichy, France, and discussed papers prepared by Dr. Edwards and by Stuart Wilk and Brad.

Brad, Margaret McBride, and Mike Sissenwine attended the Center EEO Committee meeting held at the Woods Hole Laboratory on 3 and 4 April, which was chaired by Mike. Margaret McBride is working to coordinate the NEFC Co-op Recruitment Workshop planned for autumn 1980.

Fred Serchuk organized and chaired a meeting on 10 April in Woods Hole on Gulf of Maine sea scallops. Personnel from Maine and Massachusetts attended the meeting to better coordinate sampling activities and analyses of scallop samples taken from the Gulf of Maine. Fred participated in the International Council for the Exploration of the Sea's North Sea Roundfish Working Group meeting held during 14-18 April in Copenhagen, Denmark. During 22-24 April, Fred attended the joint meeting of the South Atlantic and Mid-Atlantic Fishery Management Councils held in Orlando, FL. Fred also served as a panelist in a general meeting on "AFS Society Membership Concerns" and gave a presentation on the establishment of a new Marine Fisheries Section within the American Fisheries Society. Fred and Gordon Waring attended the Woods Hole Laboratory EEO Training and Promotion Subcommittee meeting on 25 April at the Woods Hole Laboratory.

On 17 April, Stuart Wilk lectured at the Advanced Saltwater Anglers Course sponsored by the Watchung Anglers Club in Kenilworth, NJ. On 23 and 24 April, he attended the State/Federal Program's Striped Bass Management Project's Scientific and Statistical (S&S) Committee meeting in Windsor Locks, CT.

Ambrose Jearld assisted Mr. James R. Patterson, Executive Director of the Massachusetts Pre-Engineering Program for Minority Students at the Wentworth Institute of Technology in Boston, in coordinating a 2-day field trip to the Woods Hole scientific community. They visited the Woods Hole Laboratory, Marine Biological Laboratory, US Geological Survey, and Woods Hole Oceanographic Institution. The 25 participating students were from four exam high schools in Boston and one in Cambridge and were in grades 7 to 10. The students were housed by host families mostly from the Woods Hole Laboratory.

Vaughn Anthony and Emory Anderson discussed Atlantic herring and Atlantic mackerel fishery potential with Alexander Reid, Roger Green, and Jim Ostengard, all herring fishermen working for Zypata Corporation. Vaughn attended a meeting at the Woods Hole Laboratory of the Transition Committee to discuss the transfer of the NMFS Northeast Regional Office fisheries statistics functions to the NEFC. Vaughn and Emory Anderson attended a meeting of the New England Fisheries Steering Committee in Boston on 12 April where Vaughn presented a talk on assessment methods and problems and Emory discussed the quality of the assessments data base, particularly biological sampling of catches, and also reviewed the status of Atlantic cod, haddock, and yellowtail flounder stocks. Vaughn also attended the NAFO larval Atlantic herring workshop during 28-30 April at the Woods Hole Laboratory.

Mike Sissenwine participated in the Scientific Workshop on Management of the Living Resources of the Southern Ocean held 31 March - 2 April in Washington, DC, sponsored by the International Union for the Conservation of Nature and Natural Resources, the Center for Law and Social Policy, the Ocean Society, the Center for Environmental Education, and the Carnegie Endowment for International Peace. Mike attended the Commercial Fisheries Conference on 15 and 16 April held in Falmouth, MA, which was sponsored by the Production Credit Associations. Mike presented a talk titled "Trends and Status of Fisheries Resources." Mike attended the Northeast Fisheries Management Task Force meeting on 28 and 29 April at the Woods Hole Laboratory and on 2 May in Providence, RI. On 23 April, Mike attended the New England Fishery Council S&S Committee meeting in Boston, and on 30 April in Salem, MA.

Steve Clark met with members of the State-Federal Program's Northern Shrimp Scientific Committee on 10 April to plan research vessel survey activity and related work during the summer of 1980.

Emory Anderson, Stuart Wilk, and Anne Lange attended a Mid-Atlantic Fishery Management Council S&S Committee meeting in Philadelphia on 3 April. During 14-16 April at the Northwest and Alaska Fisheries Center, Emory worked with the writing group of the NMFS Stock Assessment Task Force in Seattle, WA. The group completed redrafting the original report on assessment activities in NMFS, incorporating comments received from each Center. They also developed a series of matrices for displaying assessment methods, data elements, etc., for evaluating the present level of assessment capability throughout NMFS and the applicability and adequacy of the assessments. These matrices will comprise an integral part of the discussion/recommendation portion of the Task Force report. On 28 April, Emory was at the Sandy Hook Laboratory to sample the recreational Atlantic mackerel catch aboard a party boat, but severe weather curtailed fishing activity. Emory Anderson is serving as a member of the committee to select a recipient of the "Judy Brennan-Hoskins Memorial Award" for 1980.

The following Division personnel presented papers or posters (as indicated) at the Second Annual NEFC Research Conference in Woods Hole during 1-3 April: Frank Almeida ("Silver Hake: On the Question of Stock Identification"), Thurston Burns ("Review and Assessment of the USA Offshore Lobster Fishery"), Anne Lange ("Background and Present Status of Fishery Negotiations in the USA-Canadian East Coast Boundary Dispute"), Ralph Mayo ("The NMFS Foreign Fishery Observer Program: A Review"), Margaret McBride ("Current Status of New England Yellowtail Flounder"), Loretta O'Brien ("A Unique Method of Aging Surf Clams"), Gordon Waring ("Seasonal Migration of Herring Tagged in the Gulf of Maine and Adjacent Waters"-- poster only), and Paul Wood ("The Status of the Northeast Atlantic Sea Scallop Resource and Fishery").

The following Division personnel presented papers at the 36th Annual Northeast Fish and Wildlife Conference in Ellenville, NY, during 27-30 April: Ambrose Jearld ("The Age and Growth of Summer Flounder, Paralichthys dentatus (Linnaeus), in the Middle Atlantic Bight"), Darryl Christensen (a poster on the 1975-77 party and charter boat fishery off New Jersey), Ralph Mayo ("Current Exploitation of the Redfish in the Gulf of Maine, With Special Attention to the 1971 Year Class"), Margaret McBride and Brad Brown ("The Status of Marine Fishery Resources of the Northeastern United States"), Fredric Serchuk and Paul Wood ("Get 'em Out of the Lab and Onto Our Boats So They Can Really See What Is Happening in the Fisheries": Cooperation Between Scientists and Fishermen in Sea Sampling Activities in the Northwest Atlantic"), Stephen Turner (--with Churchill B. Grimes and Kenneth W. Able of Rutgers University--"Age and Growth of Tilefish in the Middle Atlantic Bight and Southern New England Waters"), and Gordon Waring ("A Preliminary Stock Assessment of the Little Skate in the Northwest Atlantic").

Stuart Wilk and Brad Brown presented a paper in Vichy, France, during 21-25 April at the Technical Consultation on the Allocation of Fishery Resources titled "A Description of Those Fisheries Which Take Place in the Western North Atlantic Between the U.S.-Canadian Border and North Carolina, Which Presently Have or Potentially Could Have User Group Allocation Conflicts."

#### Publications

Hennemuth, R. C.; Palmer, J. E.; Brown, B. E. A statistical description of recruitment in 18 selected fish stocks. NAFO Res. Bull. (S)

#### Reports

Lange, A. M. T. Status of the squid (Loligo pealei and Illex illecebrosus) populations off the northeastern USA, March 1980. Woods Hole Lab. Ref. Doc. No. 80-12;1980.

#### MANNED UNDERSEA RESEARCH AND TECHNOLOGY PROGRAM

No report received. The April report will be included in the May issue.

## MARINE ECOSYSTEMS DIVISION

### Ecosystem Dynamics Investigation

Mike Pennington worked on an exponential growth model for Atlantic herring larvae utilizing field sample data. Larvae with seven growth rings on the otolith were estimated to be at least 25-days old which is consistent with available lab data on growth of herring larvae. Mike also began final analysis of the haddock fecundity data following quality control and update of the computer file, and attended an Ocean Pulse workshop at the Sandy Hook Laboratory and the NAFO larval Atlantic herring workshop in Woods Hole. Marv Grosslein chaired the NAFO workshop (see next section for report) and began new duties as Deputy Chief of the Marine Ecosystems Division with focus on evaluation of ecosystem research in the NEFC. A preliminary review of benthic studies in the NEFC was presented at the April Center Board of Directors meeting and work is continuing on this problem, particularly with the needs of the Georges Bank Biological Monitoring Task Force in mind.

Wendell Hahm continued work on GEORGE, the ecosystem model for Georges Bank. Subroutines were tacked onto WHTIME, the feeding chronology program. These subroutines provided information concerning the distribution of length classes, and the distribution of daily rations, on an hourly basis. Drs. Ann and Ted Durbin of the University of Rhode Island's (URI) Graduate School of Oceanography are reviewing the WHTIME data summaries. On another front, work resumed on WHLOTKA, a modeling system designed to analyze the responses of Lotka-Volterra types of differential equations to random or periodic perturbations. Dr. Geof Evans, Woods Hole Oceanographic Institution (WHOI), and Marv Grosslein assessed WHLOTKA's utility for future analytical work on GEORGE. A preliminary inventory of verified data sets was completed at the US Environmental Protection Agency's Marine Environmental Research Laboratory in Narragansett, RI, in preparation for development of MERLIN, a simulation model of nutrient cycling in the coastal marine microcosm.

### Recruitment Processes

Members of the Recruitment Processes Task completed data analysis of the International Commission for the Northwest Atlantic Fisheries (ICNAF) larval Atlantic herring time series to prepare key summaries in time for the NAFO larval herring workshop held in Woods Hole during 28 April-1 May 1980. This larval task force has convened to review progress on the larval herring data base, evaluate the methods of analysis made to date, and make recommendations for further processing and analysis of the time series. Twenty-five scientists from four countries participated and reviewed the status of biological and physical data relevant to the question of factors controlling year-class success in Atlantic herring primarily in the Georges Bank - Gulf of Maine region. Existing knowledge of the location and timing of spawning, and the distribution of larvae were summarized for all major stocks. Preliminary analyses of larval dispersal based on 0.505-mm mesh samples versus physical data on wind and water mass movements were presented for the ICNAF time series of 1971-78 as well as for the 1978 larval Atlantic herring patch study. Also, preliminary estimates of larval growth, feeding, and mortality, as well as larval production versus spawning stock estimates, were reviewed for the Georges Bank series. Progress in analysis of both physical and biological experiments during the 1978 patch study was also reviewed. Sources of bias and sampling variability among the various data sets were considered. Further processing and

analysis of the backlog of plankton samples and hydrographic data were discussed for all relevant biological and environmental data primarily for the period from 1971 to 1978, in relation to various hypotheses about factors controlling year-class success in Atlantic herring. Specific data sets and analyses were identified which should get high priority and which should be reported on at the September meeting. Finally, the value of possible physical and biological data reports or atlases was considered.

Earlier in the month, George Bolz presented a talk at the Second Annual NEFC Research Conference during 1-3 April in Woods Hole on the "Autumn and Winter Abundance and Distribution of Ichthyoplankton on Georges Bank and Nantucket Shoals, 1971-76, with Special Emphasis on Dominant Species." Dave Potter and Ira Palmer demonstrated plankton sampling techniques for visiting Yale University students on a 1-day cruise aboard the Delaware II on 18 April. Greg Lough, George Bolz, and Dave Potter attended a meeting with members of the Narragansett Laboratory on 15 April to discuss research strategy regarding larval fish microdistribution studies on the Soviet R/V Evrika during 16-29 May. Dave Potter has been following up on some of the gear requirements.

Roz Cohen and Dave Potter provided a short presentation of plankton sampling techniques and lab processing of samples by our Task for student groups from a Massachusetts prep school and the New England Aquarium on 22 April. Robert Halpin is participating on the Marine Resources Monitoring, Assessment, and Prediction Program (MARMAP) ichthyoplankton, zooplankton, oceanographic, and primary productivity survey from Cape Hatteras to the Scotian Shelf aboard Evrika during 14 April-15 May. Ira Palmer, (Co-op student) initiated his first research cruise with us on the Albatross IV bottom trawl survey during 23 April-2 May. Roz Cohen attended a Federal Women's Program meeting on 7 April at the Woods Hole Laboratory and spent some time working on a survey form for the group.

#### Larval Physiology and Biochemistry Investigation

Experimental work with winter flounder and haddock larvae was completed. The "Donut," a semi-open environmental chamber, was refitted with 0.333-mm nylon mesh, deployed in Rhode Island's Pettaquamscutt Estuary, and stocked with 1000 first-feeding winter flounder larvae. Zooplankton prey concentrations, temperature, salinity, and dissolved oxygen were monitored daily. Daily mortality experiments with larvae from the same spawn were run concurrently in funnel aquaria.

Biochemical studies of haddock and winter flounder eggs and larvae reared at four temperatures were completed. This work should help to clarify the relations between temperature, growth rate, and RNA-DNA ratio in these species, and provide more information about the efficiency of conversion of egg components to larval tissue and the effect of temperature on these processes.

Preparations were completed for the arrival of the first shipments of striped bass which came at the end of the month. Research on the effects of environmental contaminants on the early life stages of striped bass is currently underway in cooperation with the US Fish and Wildlife Service's Columbia National Fishery Research Laboratory. We are monitoring daily mortality in addition to some biochemical parameters including RNA-DNA ratio and protein content. Samples are being taken for residue analysis and further biochemical studies by the Columbia Laboratory.

Four environmental rooms and a 150-kW generator for standby power were obtained as surplus equipment from the US Environmental Protection Agency laboratory in West Kingston, RI. A grant proposal was reviewed for the Office of Sea Grant as well as a manuscript for the journal Estuaries. Larry Buckley attended an Ocean Pulse meeting at the Sandy Hook Laboratory and Geoff Laurence attended a meeting at the Woods Hole Laboratory to discuss joint research with Brookhaven National Laboratory and NASA.

### Ichthyoplankton Investigation

The first ichthyoplankton survey of the winter-spring period was conducted on Albatross IV; the survey was ended in the Gulf of Maine on 5 April, five days ahead of schedule, in order to provide additional time for the spring bottom trawl survey. Pete Berrien and Don McMillan were part of the US field party conducting a MARMAP I survey in cooperation with USSR scientists on the Evrika. They surveyed coastal waters off the Middle Atlantic and Southern New England States where ichthyoplankton catches were reported as unusually light. Wally Smith and Myron Silverman joined in at the close of the month to participate in the second leg of the survey which will include Georges Bank and the Gulf of Maine. John Sibunka is making preparations for the next survey which will begin a week after the Evrika cruise ends in mid-May. This intensive coverage during late winter and spring will provide us with an excellent series of plankton samples during the spawning seasons of Atlantic cod, haddock, yellowtail flounder, Atlantic mackerel, and the sand lance, a species of no direct or immediate economic significance, but one that has become extremely abundant in the past 4 yr.

Mike and Cindy Fahay and Chris Powell are working on papers they will present at the annual meeting of the American Society of Ichthyologists and Herpetologists, scheduled for June in Fort Worth, TX. Several members of the Investigation are involved in the preparation of papers for the fall ICES meeting in Copenhagen. Tom McKenney spent 2 wk at the Sandy Hook Laboratory working with Anne Naplin on identification of fish eggs.

### Benthic Dynamics Investigation

Six manuscripts were submitted for publication, accepted for publication, or published during this month. Rough drafts of three other manuscripts were also completed in April: (1) "Variability of Tubule Types within the Digestive Glands of Mercenaria mercenaria (L.), Ostrea edulis L., and Mytilus edulis L.," by W. Robinson, M. Pennington, and R. Langton; (2) "Laboratory Feeding and Digestion Rates in the Winter Flounder Pseudopleuronectes americanus," by J. Huebner and R. Langton; and (3) "Distribution of East Coast Bivalve Mollusks," by R. Theroux and R. Wigley.

Rich Langton continued to work on the analysis of the yellowtail flounder food habit data from 1973-76. He also attended a 1-day meeting at the Woods Hole Laboratory with scientists from Brookhaven National Laboratory and continued to work on a Center plan for benthic studies. Finally, Rich Langton was a co-principal investigator on a pre-proposal with Ted and Ann Durbin (URI) which was submitted to URI Sea Grant for studying digestion in fish.

Ray Bowman continued the analysis of fish feeding chronology data collected on a 1978 Soviet R/V Belogorsk cruise. He also prepared the sailing orders for

another feeding chronology cruise on the Evrika in July. The draft of Ray's master's thesis on the food of juvenile haddock was reviewed by his thesis committee and was found to be acceptable with some minor revisions. Ray also presented two talks at the Second Annual NEFC Research Conference at the beginning of the month.

Roger Theroux attended the First International Symposium on the Scientific and Engineering Application of Underwater Photography, held in Woods Hole during 21-24 April, where he presented a paper. Roger continued to work on the bivalve report and on the northern biomass report which includes the benthic data on Georges Bank.

A number of requests for data and information on the benthic data base were received this month: (1) John Hathaway and Joe Botbol (US Geological Survey) requested the benthic data which corresponds to geological data from the Continental Margin Program; (2) Pat Hughes (Georges Bank Biological Monitoring Task Force) met with Roger Theroux to discuss the availability of Georges Bank benthic data for the NOAA Office of Coastal Zone Management; (3) Dr. Ken Critchlow (Dames and Moore) requested a data set for oil drilling sites on Georges Bank (data from 95 stations were requested and are being prepared by the Automatic Data Processing (ADP) Unit); (4) Cara Cushman (NOAA Environmental Research Laboratories in Boulder, CO) requested biological information on the sea urchin Echinocardium; and (5) Charles Brown (Naval Underwater Systems Center in New London, CT) requested information on the sediments in Wilkinson Basin.

## Plankton Ecology Investigation

### Image Analysis

Renata Lipska (Polish Sorting Center) completed a time analysis of manual zooplankton processing, following a specially designed protocol. The same samples will be processed with the Image Analysis System in order to compare the relative efficiency of the two methods.

Ray Maurer attended a symposium on applications of underwater photography held in Woods Hole during 22-24 April. Session topics included towed systems, survey techniques, in situ (time-lapse) applications, submersible photography, and special applications. The latter session included a paper by Edgerton, Moffitt, and Youngbluth on "High Speed Silhouette Photography of Live Plankton." Drs. H. P. Jeffries and A. Poularikas (URI) attended an in situ biological sampling workshop hosted by the US Environmental Protection Agency laboratory in Gulf Breeze, FL. They presented a paper titled "Processing of Zooplankton Samples by Electronic Image Analysis," by H. P. Jeffries, A. Poularikas, K. Sherman, R. Maurer, C. Katsinis, and I. Melas. Tim Lambert (Bedford Institute of Oceanography, Canada) spent a day at the Narragansett Laboratory discussing applications and methods for image analysis. His laboratory has just purchased a small image scanner which they hope to use to identify fish eggs and larvae.

Correspondence received from Dr. Wulf Greve indicates that the Meerestation Helgoland group is also interested in cooperative pattern recognition research.

### Biostatistics

A program to calculate indices of dominance was written and debugged with the Statistical Analysis System. This replaces a Fortran program which has continued to plague us with bugs. Julien Goulet is presenting an evening course

on "Techniques of Data Portrayal." A disk data set of zooplankton taxonomic codes was provided to Roz Cohen.

The processing of zooplankton data into master files for cruises prior to 1978 has continued. All 1979 data received to date have been processed into master files. Hand plotting and contouring of zooplankton abundance for major taxa of 1978 and 1979 were begun. These contours will be done for both "No./10m<sup>2</sup>" and "No./100 m<sup>3</sup>" data. A comparison of the patterns generated from each variable can be made.

Julien Goulet traveled to the Woods Hole Laboratory on 1 April to discuss automatic data processing matters, and on 3 April he attended a remote sensing meeting at URI. Dr. J. Berry (Yale University) presented a workshop at the Narragansett Laboratory on geographic information analysis on 23 April. Tom Plichta attended a job control language course in Boston, MA, from 28 April to 2 May. Julien Goulet attended the NAFO larval Atlantic herring workshop from 28 April to 1 May. Lorrie Sullivan and Cindy Jones attended the Second Annual NEFC Research Conference in Woods Hole on 1 April where Lorrie presented a poster paper. Karen Johnson participated on Albatross IV Cruise No. AL 80-02, Part 3.

### Surveys and Coordination

Bob Marak attended a meeting at the Woods Hole Laboratory with Soviet scientists from the Evrika to discuss requirements for the upcoming cruise to study productivity, nutrients, and microscale zooplankton distributions in relation to gadoid larvae. Bob presented a description of the sorting and identification protocols used by the Polish Sorting Center for samples collected on the ICNAF larval Atlantic herring cruises to the NAFO workshop held in late April at the Woods Hole Laboratory. Collation of the basic data collected on the five legs of the Gulf and Atlantic Survey (petroleum hydrocarbons in fish) is being completed. A report on the entire survey is in preparation.

During April, Carolyn Griswold supplied Marv Grosslein with a summary of soft zooplankton observations and codes for the larval herring meeting. Some of the problems in sampling and sorting protocol were discussed and general suggestions made for changes necessary to sample adequately this segment of the plankton community. A literature search is being conducted. On 8 April, Carolyn attended a meeting of the Georges Bank Biological Monitoring Task Force in East Boston, MA. Distribution of the short-term monitoring program for review was decided. The problem of areas of special biological significance was discussed. Current literature bibliographies of the Georges Bank area were distributed to attendees. Work is continuing on a draft of an oil spill plan for the NEFC. From 24 April to 2 May, Carolyn participated in a bottom trawl survey cruise on the Albatross IV. In addition to the trawl stations, several MARMAP plankton stations were occupied in the disputed zone of Georges Bank where the Soviet R/V Evrika was not allowed to sample.

Donna Busch and Jack Green presented a poster on "U.S.-U.S.S.R. Research at NEFC," at the Second Annual NEFC Research Conference in Woods Hole during 1-3 April. Donna prepared an inventory of chlorophyll-a, <sup>14</sup>C primary productivity, and nutrient data from NEFC cruises, and presented it at a NAFO meeting on 29 April at the Woods Hole Laboratory. Donna Busch participated in a demonstration cruise aboard Delaware II on 11 April as part of a graduate course Dr. Edwards is giving at Yale University.

On 18 April, Chris Powell met with Mike Fahay and Nancy Nazar from the Sandy Hook Laboratory to discuss progress on their Urophycis work. Chris Powell attended the Northeast Fish and Wildlife Conference in Ellenville, NY, from 27 to 30 April.

Jack Green, Joe Kane, and Jerry Prezioso have been preparing for a cruise to study the distribution of gadid larvae and larval prey organisms on Georges Bank aboard Evrika. Several meetings with members of the Recruitment Processes Task have resulted in the design of a series of useful and interesting "experiments" using specially adapted sampling gear which should provide needed experience for upcoming process studies on Georges Bank.

### Fishery Oceanography Investigation

The Nantucket Shoals Flux Experiment field program came to an end in April with recovery of equipment at five of the six instrument arrays south of Nantucket. (The sixth, property of the US Geological Survey, will remain in place until October.) The flux experiment began in March 1979 when a group from NEFC, Woods Hole Oceanographic Institution, and University of New Hampshire (UNH) deployed four subsurface current meter moorings, five instrumented surface floats, three subsurface pressure gauges, and four surface marker floats from the URI R/V Oceanus on a line from Nantucket Shoals across the continental shelf to the 800-m curve. The purpose of the experiment was to measure the alongshelf transport and its variation over a full year and to relate the measurements to changes in hydrography, atmospheric conditions, and the movements of warm-core Gulf Stream rings. Since then, more than 30 hydrographic sections have been made along the flux line and the entire set of instruments was successfully recovered and replaced last September.

The final recovery cruise was Albatross IV Cruise No. AL 80-04 from 15 to 20 April, with Steve Ramp as Chief Scientist. Also on board were Gil Dering, Ron Schlitz, Derek Sutton, Art Allen, Dan Patanjo, and Red Wright of NEFC, Bob Beardsley and John Vermersch of WHOI, and Wendell Brown and Jim Irish of UNH. All three NEFC subsurface moorings released on command, and were recovered without incident. The marker floats with current meters underneath at positions N3, N4, and N6 were also recovered. However, the instrumented marker floats at N1 and N5 were missing although they had been reported present by the Polish R/V Wieczno about a month earlier. Also missing was the noninstrumented surface float at N5. The subsurface mooring at N5, prepared by WHOI, did not respond to our acoustic signals, and we were unable to locate it on the surface in 16 hr of searching the area. However, the main float and four of the five current meters from that mooring were recovered the following week when they drifted past an oil drilling rig near Hudson Canyon. One of the UNH pressure gauges came up on signal, two were recovered by trawling after they failed to surface after release, and the fourth was picked up the following week from the M/V Whitefoot when the backup timed release fired on schedule. In all, 13 of 16 current meters were recovered. Of the nine NEFC instruments recovered, six appear to have provided complete records for the 7-mo deployment and three have partial records. Special credit is due Gil Dering, who prepared the instruments, and Steve Ramp, who planned the moorings and directed the deployment and recovery operations.

In other cruises during April, Roger Hernandez, Art Allen, and Dana Densmore sailed on the final leg of the MARMAP Albatross IV Cruise No. AL 80-02 until it was cut short for a gear comparison cruise, and Roger also went out on Delaware II for the spring bottom trawl survey. At the end of the month, Red Wright, Ron Schlitz,

Steve Ramp, and Art Allen participated in a meeting of the NAFO task force on larval Atlantic herring held in Woods Hole during 28 April-2 May. Art presented an inventory on physical-chemical data from the 1978 Georges Bank larval Atlantic herring patch study, Red arranged with representatives for preparation of a data catalog for the full series of larval herring cruises during 1971-78, and plans were made for the next task force meeting to be held during 3-5 September in St. John's, NF. At a reception for the NAFO delegates, Dan Patanjo showed slides of the recovery operations on Albatross IV Cruise No. AL 80-04. Red Wright participated in a Marine Ecosystems Division meeting with scientists from Brookhaven National Laboratory on 15 April.

### Apex Predators Investigation

April recaptures of tagged sharks were highlighted by six exceptional recoveries, two of them transAtlantic. A blue shark tagged on a 1978 Wieczno cruise off Cape Hatteras was recaptured 110 mi E of Cabo São Vicente, Portugal, after 557 days at liberty. A second blue shark tagged off Long Island was recaptured off Spain. We are waiting for the translation to disclose details. Another blue traveled from Block Island, RI, to St. Lucia in the British West Indies in 964 days. Three additional recaptures showed movements from the Atlantic into the Gulf of Mexico. A mako tagged by a NMFS observer on a Japanese longliner off Cape Hatteras was captured 184 days later off the Dry Tortugas. An oceanic white-tiptagged near the Dry Tortugas was recaptured near Cape Canaveral, FL, and a dusky/sandbar traveled from Shinnecock, NY, to Cape Catoche, Mexico. Samples and data from the March Wieczno cruise were organized and filed for processing. The manuscript, "Observations on Two Large White Sharks, Carcharodon carcharius, Off Long Island, N. Y.," is in its third revision and should be ready for in-house review soon. Ann Erskine, a volunteer from St. Georges School in Newport, RI, joined us for a month to help inventory and update our reference collection of shark skin patches. Wes Pratt lectured to the "Jersey Coast Sharkers" on 9 April on tagging, shark identification, and shark research at the Narragansett Laboratory. He met with club officers to plan their June shark tournament. John Hoey gave a seminar on 25 April on elasmobranch sensory physiology for the URI Zoology Department. Wes Pratt attended the Narragansett Bay Research Conference at URI on 24 and 25 April.

Jack Casey met with biologists from Sea World Corporation to plan cooperative longline fishing cruises in the Middle Atlantic Bight to revisit stations fished during the mid-1960's. Liver samples from blue, sandbar, and mako sharks were sent to Frank Steimle at the Sandy Hook Laboratory for determination of caloric values as part of the bioenergetic studies being conducted on apex predators. Additional samples will be sent in the coming months to enable us to characterize changes in liver energy levels with season. Food habits data for the blue sharks collected through summer 1979 have been keypunched. Preliminary analysis of the data will include summarized tables of food organisms by number, volume, and frequency of occurrence for both sexes from inshore and offshore sampling areas. Statistical Analysis System programs will be used for this initial analysis. Liver samples from sandbar, blue, and scalloped hammerhead sharks were given to Dr. Charles Apffel of the Ira T. Nathanson Research Laboratories at Walpole, MA. Dr. Apffel is involved in cancer research and has found that certain microconstituents in the cell walls of shark liver tissue show promise as anticarcinogenic barriers.

Nancy Kohler presented a talk titled "The Food Habits of the Blue Shark in the Northwest Atlantic" on 1 April, and Alan Lintala lectured on "Techniques for Histological Staining of Shark Spermatozoa" on 2 April, at the Second Annual NEFC Research Conference. Copies of the manuscript, "Food and Feeding Habits of the Shortfin Mako (Isurus oxyrinchus) in the Northwest Atlantic," have been returned following initial reviews. A first revision is in progress.

#### Meetings, Talks, Visitors, and Publicity

From 31 March through 2 April, Ken Sherman was in Washington, DC, for a workshop at the Center for Law and Social Policy on "Management of Southern Ocean Organisms." He gave two papers: "BIOMASS: Organization of a Large-Scale Ecosystem Study," and "Status of the Stocks in the Southern Ocean."

On 3 April, Ken Sherman attended a meeting at URI with representatives from the Government Services Administration and NMFS regarding the Synoptic Oceanographic Institute. Ken presented a talk on the MARMAP Program of NEFC.

During 7-9 April, Ken Sherman attended the Center Board of Directors meeting at the Milford Laboratory. On 11 April, Ken and Robert Marak attended meetings at the Woods Hole Laboratory with Soviet scientists to review plans for cooperative MARMAP research. On 15 April, Ken Sherman traveled to the Woods Hole Laboratory for discussions on joint ecosystem work with staff of the Brookhaven National Laboratory. On 17 April, Ted and Ann Durbin met with Ken Sherman at the Narragansett Laboratory to discuss joint research between NEFC and URI in fish metabolism studies. On 18 April, the Narragansett Laboratory held an Open House for the URI Bay Campus and US Environmental Protection Agency scientific community. On 28 April, Ken Sherman traveled to Idyllwild, CA, to attend the International Micronekton Workshop (SCOR Working Group 52) which lasted through 30 April.

#### Publications

Bowman, R. Food habits of ten Northwest Atlantic juvenile groundfish. Fish. Bull., US. (S)

Colton, J. B., Jr.; Green, J. R.; Byron, R. R.; Frisella, J. L. Bongo net retention rates as effected by towing speed and mesh size. Can. J. Fish. Aquat. Sci. 37(4):606-623;1980. (P)

Griswold, C. (ed.) The Ocean 250 gasoline spill. NOAA Tech. Rep. NMFS SSRF. (A)

Griswold, C. A.; Prezioso, J. In situ observations on reproductive behavior of the long-finned squid, Loligo pealei. Fish. Bull., US 78(4). (In press). (A)

Howells, R.; Karp, C.; Langton, R. Occurrence of a rare mantis shrimp, Platysquilla enodis (Manning 1962), in the Middle Atlantic Bight Region (Stomatopoda). Crustaceana 38(1):101-104. (P)

Langton, R.; Bowman, R. Food of eight Northwest Atlantic pleuronectiform fishes. NOAA Tech. Rep. NMFS SSRF. (S)

Langton, R., Bowman, R. Food of fifteen Northwest Atlantic gadiform fishes. NOAA Tech. Rep. NMFS SSRF-740;1980. (P)

Robinson, W.; Langton, R. Digestion in a subtidal population of Mercenaria mercenaria (Linn.) (Bivalvia). Mar. Biol. (A)

Theroux, R. Photographic systems utilized in the study of sea-bottom populations. Proc. First. Inter. Symp. on Sci. and Engin. Applic. of Underwater Photog.; Woods Hole: Benthos, Inc. (S)

### Reports

Griswold, C. A. Oil and gas development on Georges Bank: the responsibility of federal agencies for assessment and mitigation of potential impacts on the ecosystem. Narragansett Lab. Ref. Doc. No. 80-32;1980.

### RESOURCE UTILIZATION DIVISION

#### Fisheries Engineering Investigation

Fisheries Engineering Investigation personnel were involved with three presentations during 1-3 April at the Second Annual NEFC Research Conference -- the Isaacs-Kidd mid-water trawl, scallop gear studies, and Atlantic menhaden purse seining.

The final design of the prototype scallop dredge is nearly completed. Construction is expected to take place next month with testing to occur in June.

Dan Baker has built and successfully tested a prototype squid ring cutter. A new feed roller has been designed and will be constructed so the machine can be demonstrated.

Steve Cook of the Atlantic Environmental Group familiarized the members of the Investigation with expendable bathythermograph (XBT) and water sampling procedures for our proposed collaboration on the Gulf of Maine ferry runs.

Vern Nulk attended an underwater photography symposium presented by Benthos, Inc., of North Falmouth, MA.

Tom Connors is assisting Dr. Amaria with the construction of prototype tools which will make hand filleting of fresh fish quicker and more effective.

We are continuing to help members of the Woods Hole Laboratory prepare for the August clam survey cruise. The design of the new upper ramp for the Delaware II dredge-handling system is continuing.

We assisted Don Anderson of WHOI in the collection of bottom samples in Ipswich Bay and around Cape Ann for his "red tide" (paralytic shellfish poisoning) studies.

Electrical service in the Gloucester Laboratory's compressor room is being rebuilt for safety reasons, and work continues on providing for waste chemical storage.

Al Blott submitted a proposed agenda to Essex Agricultural and Technical Institute for a course on fishing gear to be given next year.

The paper "The Handling of Seafood from Processor to Consumer" by Ronsivalli and Baker is under review.

Dan Baker traveled to the Narragansett Laboratory for a meeting on the asbestos problem there.

## Resource Development and Improvement Investigation

Our tests have corroborated the findings of others that the storage life of tray-packed Atlantic cod fillets, when held in an atmosphere of carbon dioxide, is doubled as compared with that of similar samples held in air. The pH of the samples stored in carbon dioxide was much lower than that of the samples stored in air.

Kate Wiggin displayed her poster on "Forensic phocusing" at the Second Annual NEFC Research Conference. It was very well received and generated numerous questions.

Our collaborative study design for the method of crab species identification by thin-layer polyacrylamide-gel isoelectric focusing was approved by the Association of Official Analytical Chemists (AOAC). Samples and reagents are now being assembled for the study.

As cochairperson for the National Seafood Nutrition Symposium to be held in Charleston, SC, J. Krzynowek has been coordinating and securing commitments for demonstrators at the Symposium.

Cholesterol recovery continues to be baffling. A new capillary column is on order for fatty acid separation.

A study to determine the storage stability of pasteurized blue crab meat is continuing. To date, meats frozen for 3 mo and then held at refrigerated temperature for 4 mo are all acceptable in quality. In another experiment, pasteurized roller-extracted blue crab meat formed into lumpmeats by steaming in a mold or by the use of an alginate binder is being compared to pasteurized back-fin meat. After 5 mo of refrigerated storage, the alginate sample was below acceptable quality in flavor and texture, while the steam-formed lumpmeats were better than the control in all quality attributes.

## Product Quality, Safety, and Standards Investigation

### Product Quality

We are attempting to develop a simple rapid method that can be used in this country for monitoring ammonia in dogfish that are slated for export to countries which have specifications for ammonia content. Preliminary colorimetric tests have not produced satisfactory results thus far, but we are continuing to explore for this type of test. Preliminary trials are being conducted using a substitute bottle just to become familiar with the technique. The range in intensity of the yellow color produced over the range of ammonia levels for which the method can be applied has thus far been too slight for an estimation of the ammonia content to be made visually. It was originally hoped that a visual colorimetric estimation of ammonia might be possible using a color comparator block with known standards.

The accelerated storage study of canned Atlantic mackerel at 100°F, a test which was conducted cooperatively with Dr. Sudip Jhaveri of the Department of Nutrition and Food Science at URI, has been terminated. After 8.5 mo, there was only a slight visual change (darkening) in the color of the samples. The flavor, which was rated "good" to "fair" at the start of the storage test, scored "fair" to "borderline" at the end of the test, and texture had deteriorated from an initial "good" to a final "fair." It is generally considered that if a canned product remains acceptable in quality during a 6-mo storage at 100°F, its storage stability should be satisfactory for commercial practice.

Members of the Product Quality Group met with Professor Joe Regenstein of Cornell University and Professor Herb Hultin and two graduate students from the University of Massachusetts to report on progress to date and to discuss future research on our joint red hake texture study sponsored by the New England Fisheries Development Program. The University of Massachusetts commitment in this cooperative investigation is to determine the effect of certain preprocessing factors. The Cornell University effort is directed toward searching for an additive that will stabilize texture during frozen storage, and the Gloucester Laboratory is concerned with the influence of freezing rate and temperature of storage, and also isolation and characterization of the dimethylamine-formaldehyde producing enzyme which plays a major role in the textural deterioration. Gel filtration has indicated that this enzyme (or factor) has a molecular weight in excess of 1.5 million.

The identity of 20 samples of frozen fillets was confirmed by the AOAC isoelectric focusing species identification method for the edibility characteristic study by the US Army's North American Research and Development Command (NARADCOM) laboratory in Natick, MA.

At the request of the NMFS Pascagoula Laboratory, we identified four 5-lb boxes of individually quick-frozen fillets by the AOAC isoelectric focusing method. Two of the boxes contained ocean catfish as labeled, while the other two boxes contained a mixture of white hake and cusk even though they were labeled ocean catfish.

Preliminary investigations into the identification of larval fish via polyacrylamide-gel and agarose-gel isoelectric focusing have been initiated. The methodology for the agarose technique is still under development, but preliminary results look promising. Past efforts were thwarted due to unavailability of sample, but this situation has changed since the NOAA R/V Rorqual has obtained an Isaacs-Kidd trawl. Samples may now be collected on a routine basis. Al Smigielski from the Narragansett Laboratory has kindly donated haddock and flounder larvae from his aquarium stock which will enable us to compare unknown specimens with authenticated ones.

Kurt Wilhelm is working out an empirical method for characterizing the texture of foods with the Instron Universal Tester. The objective is to use smaller samples of fish per test without decreasing the precision of the measurements. The present unit sample size is about 150 g, and each test requires six replicates.

Mike Allsup presented a slide show on his trip to Antarctica aboard the Polish R/V Professor Siedlecki at the Second Annual NEFC Research Conference at Woods Hole. Fred Correia presented a paper on "TMO-ase, Purifying a Perplexing Protein." Kurt Wilhelm gave a talk on "From Rigor to Rubber: Textural Change in Frozen Hake." All presentations were well received.

#### Product Standardization

The commercial item description for canned salmon was revised in accordance with comments received from the US Department of Agriculture (USDA). The revision has been forwarded to our Washington Office and to the USDA.

The USDA Institutional Meat Purchase Specifications for: (1) General Requirements, and (2) Fresh Pork were reviewed for the USDA's Food Quality Assurance Division. Also reviewed was the USDA's Federal Food Standardization Document Handbook. This latter document will become the "bible" for federal specification work.

We have drafted US comments on two Codex proposed draft standards. One is for fish blocks and the other is for fish sticks and fish portions. These comments were based on a review of results obtained from a joint industry-NOAA examination of products. They were also based on a discussion of a previous draft in St. Petersburg, FL. The latest draft has been sent to the Chairman of the Codex Committee on Fish and Fishery Products in preparation for the next meeting of the Committee in Bergen, Norway, during May.

On 1 April, we participated in a joint industry-NMFS review of the US Department of Commerce Inspection Service's experience in using the Codex Recommended International Standard for Lobster and Lobster Tails. The meeting was held in St. Petersburg, FL. As a result of this review, a proposed rule-making document was prepared. It describes a U.S. general standard with one level of quality based on the Codex standard.

With the coming of better weather, activity in NARADCOM's nomenclature project has returned to "full steam." We are continuing to assist in selection of species in a pristine condition of freshness. We also participated in a seminar at NARADCOM on 8 April on "Instrumental and Sensory Measurements of the Edibility Characteristics of Fin Fish Species."

Mr. George Schwartzman, Assistant Executive Director of the AOAC, has confirmed the appointment of Fred J. King as an Associate Referee to test and study analytical methods for drained weight of frozen shrimp blocks.

Mr. Merton Singer, Executive Secretary of the Research & Development Associates for Military Food and Packaging System, Inc., has asked Dr. King to chair its Subcommittee on Canned Seafoods. Other members of this subcommittee are Henry Dymza, URI; C. F. Niven, Del Monte, Inc.; and Paul Buck, Cornell University.

Mr. Abraham Bakel and Ms. Mary Andrews, ABIC International Consultants, Inc., spent 11 April at the Gloucester Laboratory discussing development of quality requirements for eight species of interest to them: mullet, croaker, spot, cutlassfish, Spanish mackerel, Spanish sardines, thread herring, and sand seatrout.

### Product Safety

Workup and analysis for PCB's in fish oils received from ICES have been completed. A report, chromatograms, and post-run calculations have been forwarded to Dr. Musial of Fisheries and Oceans Canada, Resource Branch, for evaluation. The deadline for this intercalibration exercise was extended to 30 June. Unfortunately, we were not made aware of this until all the work and report had been completed.

A contract was awarded to the Texas A&M University Research Foundation for the collection of targeted marine finfishes from the Galveston, TX, environs. We are expecting a shipment of samples shortly. A certified letter was sent to Dr. Landry detailing the exact protocol to be followed for collection and shipment of samples.

All samples received from Montclair State College, Gulf Coast Research Laboratory, and the NMFS Tiburon Laboratory are in the process of being composited and homogenized for later PCB analysis.

Some of the winter samples received are in the process of being worked up for eventual PCB analysis.

Fifteen samples have been shipped to John G. Ruetter Associates for PCB workup and analysis. We plan to send another shipment of samples this week.

## Technical Assistance

Technical assistance was given to Dr. Haluk Turgut, Marmara Scientific and Industrial Research Institute, Kocaeli, Turkey (information on new fish products); Mr. Paul Sawyer and Mr. Michael Perreault, Sea King, Inc., Hallandale, FL (packaging and storage conditions for fresh and frozen fish); Ms. Karen Swift, Slade Gorton Co., Boston, MA (specific questions on the various smoked products now available in the market); NARADCOM (objective tests for the textural properties of squid); Henry Brown, Commodore Foods, Westford, MA (squid technology); Food Technology Laboratory, Essex Agricultural Institute, Hathorne, MA (underutilized marine resources found in Massachusetts waters); Shawn McCafferty, State University of New York (methods for species identification); Professor Frank Thomas, North Carolina State University (advice on setting up a seafood seminar); Ms. Louise Wicker, Louisiana State University (advice regarding the incorporation of minced fish in meat products); National Research Council, Washington, DC, (participation in a meeting on the use of fish protein as a meat extender); Mr. Neil Murphy, Massachusetts Division of Marine Fisheries, Boston, MA (fish blocks made from dogfish); Mr. James Corbin, Danvers, MA (hydraulics); Mr. Fran Morey, Rockport, MA, (licensing a sailing fishing boat); Mr. Joseph Sinagra, Gloucester, MA (ocean quahog fishing); Mr. Robert Rubin, Ann Arbor, MI (brine and cryogenic freezing); and Mr. Fred Wathne, Seattle, WA (trawl mensuration system).

We responded to other inquiries on: water affinity (moisture migration) in frozen-stored seafoods; fish species of Australia and New Zealand; fish species of Chile, Argentina, and the Falkland Islands; marketing of fresh fishery products; characteristics of tilefish; use of label cleared for shrimp not deveined; justification for additional computer terminals; clarification on breaded shrimp standard; and grading surveys conduction.

## Publications

Ryan, J. J. The cod family and its utilization. Mar. Fish. Rev. 41(11): 25-36;1979. (P)

## DIVISION OF ENVIRONMENTAL ASSESSMENT

### Behavior of Marine Fishes and Invertebrates Investigation

Laboratory studies are continuing on various aspects of the feeding behavior of juvenile red hake (50-100 mm TL). Currently, experiments are underway to determine the daily consumption of two natural prey items, sand shrimp and amphipods. To some extent, meal size appears to depend upon the length of the deprivation period although there is a maximum limit beyond which further deprivation exerts no influence. Searching behavior, as measured by the length of time that the chemo-sensitive modified pelvic fins are extended in front of a juvenile hake also appears to increase with deprivation period. In addition, density of prey items affects consumption since capture success rises as a function of the number of prey available. When juvenile hake are presented with prey in an ad libitum situation, the amount consumed ranges between 5 and 10% of their body weight. Such observations are important in establishing normal behavior patterns which can later be used to assess how contaminants might interfere with feeding processes and other behavior patterns.

## Biological Oceanography of Stressed Ecosystems Investigation

Craig Robertson and Jim Thomas presented a poster, "A Northeast Fisheries Center Remote Sensing Program" at the Second Annual NEFC Research Conference in Woods Hole during 1-3 April. Jim Thomas participated in a site visit of the College of Marine Studies of the University of Delaware as a member of the Sea Grant Review Team. During this site visit he discussed possibilities of joint interaction between the NEFC and certain of the University of Delaware's programs, remote sensing, and a proposed study of the entire Delaware Bay estuary.

On 16 April, Jim Thomas visited Old Dominion University to talk with Drs. Harold Marshall, George Oertel, Terry Wade, and George Wong about anticipated interaction with the remote sensing studies of the Chesapeake Bay and plume area. Based on these discussions, phytoplankton species composition and hydrocarbons associated with total suspended matter would be added to the list of "Superflux" activities. On 17 April, Jim Thomas chaired a planning meeting for the 16-27 June 1980 Chesapeake/Delaware Bay and Plume Remote Sensing Experiment. Twenty-six individuals participated and represented the following institutions or agencies: Chesapeake Research Consortium, Chesapeake Bay Institute, Maryland Department of Natural Resources, Virginia Institute of Marine Science (VIMS), Old Dominion University, University of Delaware, NOAA Environmental Research Laboratories, National Ocean Survey (NOS), NMFS, and NASA Langley Research Center. At this meeting, Mona Janopaul (NOAA Environmental Research Laboratories' Wave Propagation Laboratory) enthusiastically presented and discussed CODAR, a system to measure current and wave speeds and direction, as well as wave heights. The Wave Propagation Laboratory would like to set it up as part of the Chesapeake/Delaware Bay and Plume Remote Sensing Experiment, but probably not before next fiscal year.

Cathy Warsh (NOS) visited the Sandy Hook Laboratory on 30 April to discuss with Jack Pearce and Jim Thomas the possibilities of additional funding and the kinds of projects that might be added to the Chesapeake/Delaware Bay and Plume Remote Sensing Studies.

### Total Plankton Respiration

During the March 1980 Chesapeake Bay and Plume Remote Sensing Experiment, 24 stations defining the vertical and horizontal structure of the plume were investigated for total plankton respiration. These data have been computerized and the results are being plotted. Early results demonstrate that the Chesapeake Plume is an area of elevated total plankton respiration indicating that the estuarine "outwelling" does stimulate activity in the plankton community.

### Phytoplankton Species Composition

Mrs. Myra Cohn and Dr. Harold Marshall (Old Dominion University) met in Norfolk, VA, on 14 April to discuss plans for the phytoplankton collections they have been analyzing in the MARMAP and Ocean Pulse Program. The purpose of the meeting was to identify the past cruises to be analyzed by Dr. Marshall and Mrs. Cohn that together would provide the most worthwhile data and to outline the preferred sampling stations in the Ocean Pulse Program for 1980. The purpose of their joint efforts is to obtain a data base for a long-term study of the phytoplankton composition and distribution pattern in northeastern US shelf waters. Collections from eight of fifteen cruises have been selected for analysis. These cruises occurred between October 1978 and March 1980 and will provide seasonal representation

of two cruises per season. The cruises are: Belogorsk Cruises No. 78-03 (October 1978), 78-04 (November 1978), and 79-01 (August 1979); Delaware II Cruises No. DE 79-03 (March 1979), DE 79-05 (May 1979), and DE 79-11 (December 1979); and Albatross IV Cruises No. AL 79-06 (June 1979) and AL 80-02 (February 1980).

Seven additional cruises are processed and available for later analysis. These will receive subsequent analysis and attention in reference to seasonal components with the option that Dr. Marshall's graduate students may work on them and add appropriate information to the data bank.

Five areas were identified as monitoring sites in the Ocean Pulse (OP) and MARMAP Programs for 1980-81. Specific stations in each area would be used for initial scanning of phytoplankton composition directly after being received from each cruise. Subsequent full analysis of each sample would follow for seasonal cruises throughout the year. Site locations are: (1) Chesapeake Bay area (Stations are along a transect from the Bay entrance seaward and along a transect toward Cape Hatteras), (2) Delaware Bay area (Stations are along a transect from the Bay entrance seaward and along another transect south to the Chesapeake Bay entrance), (3) New York Bight (Stations are along a transect from near shore seaward and along another transect south), (4) Georges Bank south (Stations are along a transect from the southern portion of Georges Bank to Narragansett Bay and along another transect east of Long Island), and (5) Georges Bank north (Stations are along a transect from the northern portion of Georges Bank into the Gulf of Maine).

These collections would be made on combined MARMAP/OP cruises. Monitoring of these samples is to begin in the early fall. The development of this plan should represent the basis of a long-term monitoring program over an extensive area and network of stations.

### Superflux

The analysis of samples from three cruises each during 1980 and 1981 in the Superflux Program will be performed.

Technical reports for each of the eight MARMAP/OP cruises listed above will be prepared jointly by Dr. Marshall and Mrs. Cohn concerning the results of the phytoplankton analysis. The Sandy Hook Laboratory ADP Unit has completed analysis on Belogorsk Cruise No. 78-03 for Mrs. Cohn's stations.

Several scientific articles for publication in professional journals would be anticipated from data from the eight MARMAP/OP cruises and would be jointly published by Dr. Marshall and Mrs. Cohn.

Other technical reports and publications would be anticipated from data obtained in MARMAP/OP collections.

Dr. Marshall will also publish separately from his data base of the eight MARMAP/OP cruises with emphasis placed on comparing the present base data on phytoplankton to populations earlier studied by Dr. Marshall in the area. Additional work would include results on volume relationships.

Additional reports will be produced by Dr. Marshall regarding Superflux studies based on collections for 1980 and 1981.

Myra Cohn and Christine Evans are planning an article in the next issue of Underwater Naturalist, the American Littoral Society's journal, on phytoplankton hot spots in relation to chlorophyll densities during the fall and winter of 1979-80. Because of the abnormally mild winter weather, a close watch was kept on possible phytoplankton bloom development such as was associated with the anoxic event in the New York Bight after the mild winter of 1976.

## Algal Bioassay and Blooms

John Mahoney carried out tests on the toxic or growth stimulatory effects of 18 metals, in concentrations reported for Lower New York Bay, on the bloom phytoflagellates Olisthodiscus luteus and Katodinium rotundatum. These tests expand some work initiated several years ago and suspended in the interim. The information was developed at this time for presentation at the 1-2 May 1980 Water Conference at Ramapo College.

## Seabed Oxygen Consumption

Bill Phoel participated in the March-April Ocean Pulse cruise (NOAA R/V Kelez Cruise No. KE 80-04) in the capacity of Chief Scientist and with the assistance of Steve Spina was able to obtain and incubate 203 cores (50 stations) for seabed oxygen consumption measurements. Bill and Lisa Wirth (Colgate University) presented a poster at the Second Annual NEFC Research Conference and he coauthored a paper with Andy Draxler, "In Situ Metabolism Determination of Stress in Asterias vulgaris and Porania insignis at the Pigeon Hill, Jeffreys Ledge, Gulf of Maine Ocean Pulse Stations" presented at the same meeting.

Bill attended the First International Symposium on the Scientific and Engineering Application of Underwater Photography in Woods Hole, MA, and spoke with users experienced in the field regarding the possibility of mounting a camera system on the multiple corer to document the community composition of epifauna and the corer's operation in different sediment types.

## Coastal Ecosystems Investigation

### Benthic Communities

Clyde MacKenzie and Dave Radosh continued their diving studies of factors affecting surf clam populations off Rockaway, NY. Clyde has designed trays to be filled with relatively clean or contaminated sediments and deployed in several areas of the New York Bight to examine effects of water and sediment quality on larval surf clam settlement. Dave presented a paper on benthic recolonization of the 1976 anoxia area off New Jersey, and worked with the AEG Ocean Dumping Studies Task on methods to be used in tracking radio buoys which will be deployed at Deepwater Dumpsite (DWD) 106 in May.

Ann Frame worked on descriptions of new polychaete species occurring in our benthic samples. She identified organisms found in cores collected by the seabed oxygen consumption project. Ann helped train Phyllis Johnson and Linda Ann Dorigatti of the Oxford Laboratory in identifying amphipod species which may be used in examining incidence of pathology at several Northeast Monitoring Program (NEMP) stations.

Bob Reid revised the Technical Development Plan for NEMP. He continued working with the contractors (University of Delaware and University of New Hampshire) to integrate their NEMP benthic studies with our in-house program. Bob began an assessment (requested by the New Jersey Department of Environmental Protection) of our historical data on benthic communities of Romer Shoal, a popular fishing ground in lower New York Bay which may be mined for sand and gravel. He reviewed a manuscript on impacts of exploratory drilling in the Baltimore Canyon Trough, which indicated that detectable effects (increases in clay contents of sediments, reductions in some benthic populations, and enhancement in others) were limited to within ~800 m of drilling. Bob and Frank Steimle planned for further integration of NEFC benthic

programs, and for an intensive summer sampling of the New York Bight, to be carried out in conjunction with NOAA's Marine Ecosystems Analysis Program (MESA).

### Benthic Energetics

This month we mainly worked on several manuscripts which are in various stages of completion and on cruise plans and reports for NEMP. We also worked on an outline of how the various benthic programs within the NEFC are integrated. We prepared a package of material summarizing the sediment and hydrologic data in Ocean Pulse and other Sandy Hook Laboratory data files on an area south of Long Island; these data were requested by the US Navy Underwater Systems Laboratory in New London, CT. This month we also initiated a cooperative study with the New Jersey Marine Sciences Consortium which is examining energy fluxes and pools in a local salt marsh. Russ Terranova participated in a 5-day water column characterization cruise in the New York Bight during 21-25 April. He assisted in the dissolved oxygen measurements being made as part of NEMP monitoring of oxygen levels in the Bight to predict any reoccurrences of anoxia off the New Jersey shore. We completed plotting, and submitted to the Marine Ecosystems Division's Fishery Oceanography Investigation, the final dissolved oxygen measurements from 1978 MARMAP cruises, for a cooperative atlas series.

### Environmental Chemistry Investigation

In April, Steve Fromm and Annette Pratt measured chlorophyll-a concentrations at 91 stations sampled during the cooperative US-USSR MARMAP survey aboard the Evrika. Mike Hurd measured rates of primary production at 25 stations occupied during the first leg of the Evrika survey.

Average water column concentrations of chlorophyll-a in March 1980 (Albatross IV Cruise No. AL 80-02) in inshore New Jersey waters were considerably lower (0.5-2.0 mg/m<sup>3</sup>) than values (4.0-6.0 mg/m<sup>3</sup>) measured for this area in March 1978 and 1979.

Ruth Waldhauer and Al Matte analyzed ammonium-nutrient concentrations in seawater samples collected during the MARMAP survey (Albatross IV Cruise No. AL 80-02). Andy Draxler, working with ADP, developed computer formats and programs which will be used to archive all of the nutrient data collected during Ocean Pulse and MARMAP surveys conducted in 1979 and 1980.

Al Matte and Ruth Waldhauer presented a poster at the Ramapo College Water Conference. The poster depicted cross-shelf profiles of ammonium concentrations measured along Hudson Canyon transects during seven surveys in 1979.

### Physiological Effects of Pollutant Stress Investigation

#### Physioecology

The long-term exposure of the slipper limpet (Crepidula fornicata) to silver continued this reporting period. The tank temperatures at the beginning of the month were 3-4°C, but are now 11-12°C. This increase in temperature has caused adults to produce egg masses. Four controls now have light brown eggs.

Three more American oyster egg experiments have been conducted, using mercury as the pollutant. Trouble has been encountered in attaining fertilization of control oyster eggs. The control oyster eggs undergo the same treatment as the experimental

eggs, but 25-50% of the control eggs are not being fertilized. Experiments are planned to determine how long oyster sperm can remain in culture before losing the ability to fertilize eggs. Galtsoff has stated that sperm show no detectable decrease in viability within 4-5 hr at room temperature.

Heavy-metal body burdens of oysters collected from the Quinnipiac and Housatonic Rivers in Connecticut and from waters off Greenport, NY, were determined. Copper levels in oysters from the Quinnipiac and Housatonic Rivers were three times as high as those from Greenport. Base on this, we performed a 48-hr copper toxicity test on oyster eggs spawned by each of the three groups. Preliminary analysis indicates that there were no significant differences between the three groups in tolerance to copper ( $LC_{50} = 15-25$  ppb Cu).

A second 48-hr bioassay to determine the effects of mercury, copper, silver, zinc, lead, and nickel on embryos of the blue mussel was performed this month and the data are now being evaluated. The first one conducted last month was a failure because of high abnormalities in the controls (>15%).

Analyses of heavy metal levels in rock crab gills collected in January 1980 as part of a cooperative study with Dr. Thomas at the Oxford Laboratory were completed this month.

Metals analyses of windowpane (flounder) liver samples collected in our mini-Ocean Pulse survey of Long Island Sound were nearly completed and should be finished shortly.

Work continues on developing methods for metals analyses in seawater, with particular attention to copper.

### Physiological Effects

Considerable time and effort this month were spent participating in the spring Ocean Pulse cruise. Sea scallops exposed to silver for 60 days were sampled for gill-tissue oxygen consumption and hemolymph sodium, potassium, and calcium concentrations. Hemolymph samples from scallops exposed earlier to silver and cadmium have been analyzed for ions and osmolality. Work continued on analysis of plasma samples collected on earlier Ocean Pulse cruises. Data from windowpane collected at three stations in Long Island Sound during 4 mo of 1979 and from mercury exposure of windowpane were tabulated for presentation at the Second Annual NEFC Research Conference.

### Anaerobic Bacteriology/Metabolism

Ocean Pulse activities this month concentrated on participation in two legs of Kelez Cruises No. KE 80-03 and KE 80-04. Some 33 sediment, 16 water, and 15 scallop samples were obtained for bacteriological analysis. Bacterial counts in water were as low as observed in our previous winter sampling periods. Sediment counts were also low, especially for the Vibrio group. Clostridial forms were observed in all enrichment cultures obtained from 15 scallop samples. Although the supernatants have been nontoxic for mice so far, C. perfringen seems to be present in several of the cultures. Isolation and identification are continuing.

### Meetings, Talks, Visitors, and Publicity

Frank Steimle and Bob Reid participated in a NEMP Technical Development Plan workshop on 2 April at the Sandy Hook Laboratory.

During 7-9 April, Drs. John Pearce and Carl Sindermann participated in the Center Board of Directors meetings. Dr. Pearce presented an overview of the Ocean Pulse and Northeast Monitoring Programs, indicating the current status of these programs.

On 14 April, Dr. Pearce met with CPT R. L. Swanson, Mr. Charles Gunnerson, Dr. Jerry Schubel, and Dr. Joel O'Connor to discuss the upcoming workshop on monitoring to be held at Stony Brook, NY, in September 1980.

On 15 and 16 April, Dr. Pearce, Mr. Bob Reid, Mr. Frank Steimle, and Dr. John Graikoski attended the Ocean Dumping Symposium held in Woods Hole, MA. During this period Dr. Pearce had an opportunity to meet with Dr. Alasdair McIntyre of Aberdeen, Scotland, in regard to ICES Marine Environmental Quality Committee business and an upcoming appointment of Dr. Pearce to the Group of Experts on the Scientific Aspects of Marine Pollution Working Group.

Frank Steimle met with members of a committee from Ocean City, NJ, on 7 April. The committee sought advice on artificial reef construction. Frank has also been advising some students from Ramapo College (NJ) on the same subject for a paper they are writing.

Bob Reid visited Dr. Larry Harris of the University of New Hampshire on 16 April to deliver benthic samples for contract processing, and to discuss requirements of the contract.

On 17 and 18 April, several Division personnel participated in a special work session concerned with the development of statistics, work units, and plans for the ADP activities which will be important to the Northeast Monitoring Program. It was decided that NEMP requires the immediate appointment of a systems analyst who will work with the program to finalize matters in regard to multivariate analysis of multifactorial data that are being developed as part of the program.

During 21-23 April, Dr. Pearce chaired the ICES Working Group on Charting of Marine Resources. The ad hoc Working Group included persons from seven European nations, as well as the US. A report from the Working Group indicates that there is a paucity of data on living marine resources which can be mapped in conjunction with physical/chemical factors such as sediment type, degree of contamination, etc. Nevertheless, ICES feels that it is important to continue this project and the matter will be brought up at a mid-May meeting of ICES.

On Monday, 28 April, Dr. Pearce met with Dr. Jerry Schubel, State University of New York, and representatives of several state and federal agencies as well as the academic community, in relation to planning for a NOAA regional meeting to be held at the University of New Hampshire in June. This meeting will be concerned with the status of pollution and monitoring studies in the northeastern region of the US and will attempt to determine the needs of various federal and state agencies in relation to pollution monitoring and research.

Dr. Fred Thurberg and Miss Edith Gould participated in the Second Interagency Workshop on In Situ Water Quality Sensing: Biological Sensors, held in Pensacola, FL, during 28-30 April.

Frank Steimle helped plan and participated in a NEMP meeting at Sandy Hook Laboratory on 29 April that brought together researchers and program managers from various state and federal agencies and universities in the Middle Atlantic region (Delaware to Connecticut) to review the various pollution monitoring programs, active or planned, in the greater New York Bight and some user needs.

## Publications

- O'Reilly, J.; Esser, S.; Busch, D. The distribution and abundance of Ceratium tripos in coastal-shelf water between Cape Hatteras and Nova Scotia. Coast. Oceanogr. Climatol. News. (S)
- Pearce, J. A report on a new environmental assessment and monitoring program, Ocean Pulse. Adams, J. K.; Leahy, R. F.; Lynch, P. R., eds. Man and the sea: proceedings of the annual Man and the Sea Conference; 1978; Philadelphia, PA. 1980:96-107. (P)
- Pearce, J. Problems in the Middle Atlantic coastal environment. Adams, J. K.; Leahy, R. F.; Lynch, P. R., eds. Man and the sea: proceedings of the annual Man and the Sea Conference; 1978; Philadelphia, PA. 1980:123-124. (P)
- Pearce, J.; Steimle, F. W., Jr. Ongoing environmental assessment, monitoring, and research under the Ocean Pulse Program. Adams, J. K.; Leahy, R. F.; Lynch, P. R., eds. Man and the sea: proceedings of the annual Man and the Sea Conference; 1978; Philadelphia, PA. 1980:108-122. (P)
- Tucker, R. K.; Matte, A. In vitro effects of cadmium and lead on ATPases in the gill of the rock crab, Cancer irroratus. Bull. Environ. Contam. Toxicol. (A)

## AQUACULTURE DIVISION

### Aspects of Nutritional Requirements of Mollusks Investigation

An extensive experiment in which young American oysters (1-2 cm) were fed lyophilized micro-algae is nearing completion. Previous work, in which oyster larvae were fed the dried food, suggested that the response of older animals to this dried food might be more favorable than that of the larvae.

Oysters were maintained in basins of filtered seawater and were fed and washed daily. The food was kept in suspension by magnetic mixers. Animals were weighed every week. For the first 18 wk of the experiment, animals that received the live algal food cells (Monochrysis lutheri and Isochrysis galbana) demonstrated a slow but steady increase in size and no mortality was observed. Oysters receiving the freeze-dried M. lutheri and I. galbana showed no increase in weight and the mortality of one animal. To determine if metabolism in this latter group of animals was impaired, the feeding regimes in both groups of animals were reversed. Immediately upon feeding of living algae to the oysters that had previously been on a diet of dried cells, the oysters began increasing in weight; a parallel event occurred when oysters that were growing nicely on a diet of living algae received the dried material, the increase in weight ceased. These observations remained similar for 5 wk. Recently, the dosage of dried food was increased because of the possibility that an insufficient number of cells was available for nutrition. This strategy did not change the growth response of the oysters and resulted in mortality of three animals. The tentative conclusion of this work is that the dried food is being ingested but not digested. The interesting question remains as to how the lyophilization process is altering the algal cells so they become nutritionally inadequate.

Experiments were conducted to determine the influence of salinity in the growth medium on the population increase of several algal species. Experiments were conducted in open basins so that during the period of the experiment, 10 days, there was some increase in salinity due to evaporation. Nevertheless, initial salinity values between 14 and 32 o/oo (eventually between 17 and 36 o/oo) were studied. Results with three species, Monochrysis lutheri, Dunaliella euchlora, and Phaeodactylum tricornutum, show a clear benefit of media with the higher salinities; results with the fourth species, Dicrateria sp., were not clear.

Dr. Ukeles attended a Center Factor IV Committee meeting at the Milford Laboratory and evaluated numerous applications to the Committee. Mr. Gary Wikfors presented a paper at the Second Annual NEFC Research Conference at Woods Hole, MA, during 1-3 April. Dr. Ukeles reviewed four Sea Grant proposals and spent considerable time on manuscript preparation.

### Spawning and Rearing of Mollusks Investigation

Our planned spring production of bay scallop seed for use in late spring through winter grow-out experiments is on schedule. The three scallop populations started in April have survived and grown well; the oldest group now averages 2 mm in shell length and will be ready for transplantation to our raceway system by mid-May. Our seasonal growth experiment will require about a one-quarter million 10-mm seed and this is the goal of our spring production effort.

E. Rhodes, R. Goldberg, and J. Widman made a trip to Beaufort, SC; Charleston, SC; and Wachapreague, VA, to observe some commercial and experimental grow-out facilities for hard clams, surf clams, and bay scallops. On the trip we observed surf clams that had been reared at the Milford Laboratory and then provided to commercial growers as seed clams. One group of clams, planted in Virginia, grew from 15 mm to 50 mm from November through June. The growth decreased significantly during December and January, but resumed by late winter. Summer temperatures in excess of 30°C proved lethal for the clams. The growing season at this latitude appears to be about opposite to the main growing season in Connecticut.

Two groups of surf clams planted last November in Long Island Sound, within wire-mesh cages, were found to have survived the winter. The recovered clams have a distinct ring of new growth which is believed to have commenced around mid-April as the water temperatures rose about 8°C.

Initial observations this spring on the overwintering of bay scallops in mesh enclosures in Long Island Sound indicated poor survival. Scallops of various sizes in both lantern nets and bottom cages appear to have suffered extensive mortalities. Accurate counts will be made in May when we can be sure of the viability of the survivors. On the positive side, all of the gear survived the winter in good shape.

R. Goldberg attended a Career Day Exposition at a local high school and spoke to an eight-grade class about careers in marine science.

### Aquacultural Genetics Investigation

#### Mass Selection of Oysters

The 1979 year-class oysters have been sorted from the excess cultch material (crushed oyster shell). This year class is a progeny from two separate selection experiments and is the F<sub>1</sub> generation in both cases. One experiment is selection for increased meat yield. In this experiment, 16 950 progeny were produced in 1979. Of these, 6056 oysters from 10 distinct families comprise the high line;

10 894 oysters from seven separate families make up the low line. These family groups will be tested for meat yield during the winter of 1981.

The second selection experiment propagated in 1979 was selection for increased larval growth rate and early setting. In this experiment 2416 oysters comprise the F<sub>1</sub> generation; 110 oysters from five families make up the high line, and the low line consists of 2306 oysters from five different families. Because of the low number of F<sub>1</sub> oysters in the high line, we are spawning the parental generation again this year to increase the genetic base of the experiment and be able to increase the selection intensity for the next generation.

#### Experimental Hybridization and Inbreeding of Oysters

Geographic hybrid larvae of oysters from a Massachusetts and Connecticut cross have survived to metamorphosis. In a geographic hybrid cross between Texas and local Connecticut/Long Island Sound oysters, larvae have been obtained. Development was compared in a high-temperature (35°C) experiment utilizing eggs and embryos from four types of crosses: local females x Texas males; local females x local males, Texas females x local males, and Texas females x Texas males. Preliminary results indicated a differential effect with maternal contribution. There was virtually no development in crosses when Texas animals were used as the females. There was some development, though poor, when local oysters were the females in both the hybrid and control crosses.

Additional emphasis this month was on making inbred crosses in F<sub>1</sub> full-sib families to obtain more F<sub>2</sub> progeny. Several outcrosses were made. A pattern may be developing among the families for sex ratio as some families have had an unequal number of spawners of one sex over the other. A genetic model of three gene loci for sex determination based on such differences in the sex ratio of families has been proposed for oysters by a Canadian researcher. The number and sex of spawners available in a particular family would influence the number of crosses which could be made for inbreeding studies in that family.

#### Cytology and Cytogenetics of Fish

The gonads of some 50 Atlantic cod were sampled in different stages of maturation aboard a recent bottom trawl survey cruise. These are being used to develop methodologic procedures for appraising the somatic and meiotic mutation rate, and general quality of the ripe and ripening gametes of fish in relation to their body burden of contaminants. The gametogenesis of even laboratory fish has been little studied at the cellular-chromosome level. No prior effort has been made to study such in commercial species in relation to any practical problem of either fisheries or environmental management.

Dr. Kihlo Park of NOAA's Ocean Dumping and Monitoring Division was a visitor to this investigation.

S. Stiles and J. Choromanski attended the Second Annual NEFC Research Conference during 1-3 April at Woods Hole, MA, and presented talks respectively on "Experimental Hybridization of the Commercial American Oyster, Crassostrea virginica," and "The Use of a Recirculating Seawater System for the Grow-Out of Nonindigenous Oyster Species."

S. Stiles was a representative at a Career Awareness Program held 17 April at Cheyney State College in Pennsylvania.

Three Connecticut high school students spent part of a day observing and participating in Aquacultural Genetics Investigation's work as part of a School Career Awareness Project.

## PATHOBIOLOGY DIVISION

### Comparative Invertebrate Pathology Investigation

Sampling of blue mussel populations from Maine to Virginia was completed for the first quarter of 1980. Samples of 50 animals were processed from Searsport, ME; Damariscotta River, ME; Sandwich, MA; Falmouth, MA; Raritan Bay, NJ; Great Bay, NJ; two sites at Cape May, NJ; Cape Henlopen, DE; and Wachapreague, VA.

Hard clams and American oysters were also collected from Raritan Bay and Great Bay, and soft clams were received from one Falmouth site for experimental studies on viral neoplasia. Hematologic preparations were made from live clams in order to diagnose for neoplastic disease. The poly-L-lysine coating method was refined to improve the adherence of neoplastic cells so that permanent preparations could be made. Local clams were injected with neoplastic cells to learn if tumors could be transplanted in mollusks.

The pathologic and parasitologic numbering code system is being revised to include sets of 100 in each major category.

Considerable time was spent by the staff on preparation of illustrations for a manuscript on histological techniques.

Slides and tissues from sea scallops collected from Maine have been examined to determine the type of pathology and possible etiology of a disease affecting this species of mollusk. Multiple abscesses are the same as have been observed in sea scallops collected in New York State in 1978; however, no obvious causative agent has been detected. Tissues fixed specifically for study with the electron microscope have been processed and will be examined for the presence of pathogenic organisms.

The Division's Histology Unit prepared over 650 sections of fish and shellfish tissues for Ocean Pulse and related studies. They also prepared blood smears for counts and morphological study by resident pathologists.

A manuscript titled "Histopathology of Gaffkemia in the Lobster, Homarus americanus, and a Comparison with Histological Reactions to a Gram-Negative Species, Pseudomonas perolens" has been submitted for Oxford Laboratory review. The paper is coauthored by P. T. Johnson, J. E. Stewart, and B. Arie (Halifax Fisheries Laboratory, Environment Canada).

Ms. Linda Dorigatti reported for duty. Her main tasks will be identification and preparation for histological study of crustaceans collected on Ocean Pulse cruises. She is spending 28 April - 2 May at the Sandy Hook Laboratory, being trained in identification techniques by Ms. Ann Frame.

Ms. Jackie Swing, a recently hired temporary employee, has undertaken the task of identifying the euphausiids collected on DWD cruises. Contact has been made with the Smithsonian Institution for verification of the few uncertain identifications she has made. In the future, data will be collated on the types and frequency of parasites and pathologic conditions observed grossly and histologically in each of the euphausiid species examined.

### Fish Pathology Investigation

The Fish Pathology Investigation, with the assistance of staff of the Resource Surveys Investigation of the Resource Assessment Division, has initiated surveillance for fish diseases on the spring bottom trawl survey cruise. This is the initial implementation of an undertaking which has been planned for almost 2 yr. The frequency of occurrence of a specific number of integumental lesions (coded) will be

noted and recorded on the reverse side of envelopes used in the collection of scales and otoliths. The envelopes have been prestamped for ease of recording data. The number, size, and species of fish examined at each trawl station are based on the protocol for age and growth sampling. At the end of the cruise, data are collated with other Resource Surveys Investigation data. The Fish Pathology Investigation has assigned a temporary employee to the spring and summer bottom trawl survey cruises to assist the Resource Surveys Investigation and to make observations on disease for Ocean Pulse.

Despite repeated trawling in the New York Bight for red hake with ulcers, few fish have been obtained. All fish are small (less than 25 cm SL) and none have ulcers. Hopefully, it will be possible to obtain diseased red hake before the fish migrate offshore. Microbiologic studies of the lesions will be made with the cooperation of Dr. Thomas Cook of the University of Maryland.

A considerable amount of time has been spent in collecting alewife and blue-back herring from tributaries of Chesapeake Bay. These fish have been frozen for future virus isolation attempts. If IPN virus is found in either of these species, surveys will be extended to other areas.

Atlantic menhaden have also been collected on a weekly basis. These collections will continue up to and through the time of the annual epizootic. These fish will also be used for virus isolation studies. Information derived from these studies will provide some idea of whether the fish become infected shortly before the mortality occurs or whether the virus is present in the population at relatively constant levels and the annual epizootic is triggered by some environmental factor.

Thirty rainbow smelt were obtained from Cape Cod and are being maintained at the Oxford Laboratory. These will be used in experiments to determine if this group of fish (osmerids), closely related to the clupeids and salmonids, is also susceptible to IPN virus.

Ocean Pulse-related studies on the cytology of larval fish were continued during the month by completing the technical preparations necessary to examine both winter flounder and haddock larvae with the electron microscope (EM). As was explained in last month's report, the larvae had been exposed to approximately 500 ppb of  $Cu^{++}$  and demonstrated an unanticipated sensitivity to the contaminant with mortalities for both species occurring after 18 hr. That the exposure of the larvae to the toxicant was conducted at the desired concentrations was validated by atomic absorption spectrophotometry, with the analyses being performed by Mr. Richard Greig at the Milford Laboratory. Unfortunately, there is a considerable lag time between the final embedment of the larvae and when they can be sectioned for EM observation; therefore, we are presently directing our attention to cytological studies of previously prepared material and studies are in progress on development of the gut in striped bass larvae in relation to the beginning of active feeding during the period of yolk-sac resorption.

#### Microbial Ecology and Parasitology Investigation

Seventy-two rock crabs have been collected as part of an ongoing study to monitor benthic crustaceans for black gills. Field trips have coincided with the molt or postmolt season for adult males and, as indicated by historical data, approximately 95% of the specimens had clean, healthy appearing gills. Vessel problems aborted the April cruise and the number of crabs that were caught was insufficient for obtaining meaningful data on gill condition. Another collection is planned for May to increase the number of observations that are needed for statistical analyses. Field studies have shown that in addition to gill condition,

the carapace and appendages may be useful indicators of stress or disease. Several crabs were caught during the molting period that had erosion and blackening of the dorsal carapace and the anterior margin of the carapace bordering the eyestalks. An inked-sketch system has been developed for the carapace and areas of blackening to provide a record of observation for each affected crab. Data on black discoloration of gills, appendages, and carapace are expected to provide a more precise estimate of the health of rock crabs in coastal waters.

A field trip was made to New Orleans, LA, to consult with Dr. Stewart Bamforth of Tulane University on methods for quantitating protozoan populations in soils and sediments. At the same time, a field trip was made to the Sidel Marsh to collect amoebae in a sulphurous brackish ecosystem. The marsh was almost exclusively Spartina and was rich in organic substrates present at the base of rooted vegetation. The purpose of this trip was to determine whether or not species of Acanthamoeba could be isolated from coastal environments where large populations of bacteria are present in sediments which are undergoing natural decay and are rich in detritus. Acanthamoeba spp. were isolated from two or three collecting sites in the marsh. Results of the study support the hypothesis that Acanthamoeba is readily isolated from both natural and polluted sediments which have a high bacterial load. Preparations are now being made to evaluate the efficiency of several techniques for estimating the numbers of amoebae present in sediment samples.

#### Diseases of Larval Mollusks Investigation

A disinfection challenge test was completed to determine the efficiency of ozone to eliminate the microbial oyster pathogen "CA-10" from seawater and from developing American oyster embryos. Eggs (embryos) in seawater holding 10 000 pathogen cells per milliliter were exposed to 4.49 ppm of ozone. The concentrations of pathogen cells were reduced to 1000 per milliliter, but complete elimination of the pathogen was not achieved at the concentration of ozone and exposure period used. Interestingly, there was a slight increase to 42 000 pathogen cells per milliliter after 24 hr; similarly using 0.39 ppm of ozone, there was also a slight increase in cell abundance to the same concentration (42 000). Seawater free of embryos and treated with ozone prior to inoculation with 10 000 pathogen cells per milliliter showed no growth of the organism after 24 hr. Apparently, results of these experiments and others performed earlier (February) indicate that ozone is not effective in eliminating the CA-10 pathogen under the experimental conditions used.

Continued experiments to examine the early phagocytic cells of larval American oysters have shown that a spindle-shaped cell released from 9-day-old larvae can attach to plastic cell culture dishes and, upon incubation in seawater or cell culture fluid, can pass through several morphological changes over a period of 4 hr. In one or more of the forms (but not the spindle form), the cell is capable of engulfing bacteria. In order to determine whether bacterial exposure would activate phagocytosis in one or more of the morphological cell types, 7-day-old larvae were preexposed to several dose ranges of pathogenic Vibrio sp. and their cells challenged in vitro 2 days later with Formalin in killed vibrios. The ability of each morphological cell type to bind and engulf bacteria is being examined in Formalin-fixed cells. Results of the experiment have not as yet been tabulated.

A major portion of the month was devoted to manuscript preparation.

An attempt to duplicate the progression of a spontaneous disease which occurred among oyster larvae last summer at a Long Island shellfish hatchery has been successful. The daily addition of a combination of FH1 and FH3 bacterial isolates, using

less than one pathogenic cell of each per milliliter of culture water, had an overt effect only after the ninth day of larval development. The retractor muscles of larvae still surviving on the 10th day appeared to be physically impaired. No bacterial swarming could be found in or around moribund larvae, thus suggesting that the bacteria are producing a toxin.

#### Meetings, Talks, Visitors, and Publicity

Dr. Rosenfield attended the Center Board of Directors meeting at the Milford Laboratory during 7-9 April. He also attended the ICES Working Group meeting in Nantes, France, and visited laboratories in England and Wales from 12 to 28 April.

Ms. MacLean attended the Second Annual NEFC Research Conference during 1-3 April in Woods Hole, MA, which she helped organize as program chairperson. At this meeting, she presented a talk on "Some Parasites and Pathology of Planktonic Crustaceans." Ms. MacLean attended the Center EEO Committee meeting held at the Woods Hole Laboratory on 3 and 4 April and reported on current activities of the Oxford Laboratory EEO Committee. Ms. MacLean and Ms. Swing attended the Atlantic Estuarine Research Society meeting on 11 April in Annapolis, MD.

Mr. Kern attended the Second Annual NEFC Research Conference during 1-3 April in Woods Hole and presented a paper on "Oyster Mortalities in Todos os Santos Bay." Following this meeting, Mr. Kern attended the meeting of the Northeast States Ad Hoc Committee on Shellfish Transplants held in Hyannis, MA, on 3 and 4 April; he also attended the Workshop on Environmental Monitoring Systems on 17 and 18 April at Sandy Hook, NJ.

Mr. Rose attended the Second Annual NEFC Research Conference during 1-3 April at Woods Hole and presented a paper titled "Early Phagocyte Activation in a Larval Mollusk Exposed to Pathogenic Vibrio sp.; he also attended the Center EEO Committee meeting at the Woods Hole Laboratory on 3 and 4 April.

Mr. Newman visited the National Institute of Health facilities at Bethesda, MD, on 4 April to use a scanning electron microscope.

Dr. Murchelano attended the NEFC Board of Directors meeting at the Milford Laboratory on 9 and 10 April; he also attended the Workshop on Environmental Monitoring Systems on 17 and 18 April at Sandy Hook, NJ.

Ms. Brown participated in Careers Day at Foran High School on 11 April.

Dr. Blogoslawski and Mr. Tettelbach attended the Leo F. Rettger Society meeting (Connecticut Valley Branch of the American Society of Microbiologists) on 11 April. Mr. Tettelbach presented a student research paper titled "Isolation, Characterization, and Control of a Vibrio sp. Pathogenic to Crassostrea virginica and Ostrea edulis Larvae."

Drs. Blogoslawski and Robohm and Messrs. Rose and Tettelbach attended a seminar on Computer Terminal Operation presented at the Milford Laboratory by Dr. Eugene Heyerdahl.

Mr. Galasso collected rock crabs for marine monitoring at Sandy Hook, NJ, on 21 and 22 April.

Dr. Sawyer visited Tulane University during 8-10 April and presented a seminar on "Ecology of Marine Protozoa;" he also attended the annual meeting of the Northeast Shellfish Sanitation Association during 22-25 April at Davisville, RI, at which he presented a paper on "A Multidisciplinary Approach to the Identification of Larval Parasitic Nematodes in the Calico Scallop, Argopecten gibbus (Linn.) and the Surf Clam, Spisula solidissima (Dillwyn)."

Ms. Hines attended a training seminar on "EEO and the Committee" on 23 April in Rockville, MD.

Dr. Johnson spent 28 April conferring with Ms. Ann Frame and Drs. Steimle and Pearce at the Sandy Hook Laboratory concerning Ocean Pulse studies of amphipod crustaceans.

Mr. Philip McDermott entered on duty in the Pathobiology Division at the Milford Laboratory on 31 March as a cooperative student from Northeastern University.

Mr. Thomas G. Daniels, temporary biological laboratory technician, entered on duty 7 April with the Fish Pathology Investigation.

Ms. Linda Dorigatti, temporary biological laboratory technician, began a 1-yr appointment on 21 April.

Dr. Ann Scarborough, a postdoctoral fellow with Johns Hopkins University, is working with the Fish Pathology Investigation at the Oxford Laboratory where space has been provided for her to conduct her studies.

Visitors to the Oxford Laboratory during the month were Mr. and Mrs. Tom Kenefake, Arlington County Public Schools, Arlington, VA; Mr. David A. Fisher and biology class from St. Michaels High School, St. Michaels, MD; Capt. J. McLaughlin, Izaak Walton League, Easton, MD; and Dr. F. Bang and students from the Department of Pathobiology, Johns Hopkins University, Baltimore, MD.

### Publications

- Blogoslawski, W.; Tettelbach, S.; Petti, L.; Nawoichik, B. Isolation, characterization, and control of a Vibrio sp. pathogenic to Crassostrea virginica and Ostrea edulis larvae. (Abstract). Proc. Natl. Shellfish. Assoc. (S)
- Johnson, P. T. Diagnosis of crustacean diseases. (Abstract). Eastern Fish Health Workshop. (S)
- Johnson, P. T. Diagnosis of crustacean diseases. (Abstract). Inter. Coun. Explor. Sea. (S)
- Johnson, P. T. The fixed phagocytes (macrophages) of decapod crustaceans. (Abstract). Soc. Invertebr. Pathol. (S)
- Murchelano, R. A.; Edwards, R. L. An erythroplasmid in ornamental carp, Cyprinus carpio. J. Fish Dis. (S)
- Nascimento, I. A.; Kern, F. G. Oyster mortalities in Todos os Santos Bay, Salvador, Bahia, Brazil. (Abstract). Soc. Invertebr. Pathol. (A)
- Robohm, R. A. Early phagocyte activation in a larval mollusk exposed to pathogenic Vibrio sp. (Abstract). Trans. Am. Microsc. Soc. (S)
- Robohm, R. A., Brown, C.; Cox, M. E.; Blogoslawski, W. J. An attempt to use two commercial, rapid bacterial differentiation systems to identify bacteria from lesions of marine fish and shellfish. (Abstract). Inter. Coun. Explor. Sea. (S)

Sawyer, T. K. A multidisciplinary approach to the identification of larval parasitic nematodes in the calico shrimp, Argopecten gibbus (Linn.), and the surf clam, Spisula solidissima (Dillwyn). Inter. Coun. Explor. Sea. (S)

## NATIONAL SYSTEMATICS LABORATORY

### Penaeoid Shrimp Investigation

Research continued on the systematics of the rock shrimp genus Sicyonia in American waters. These shrimps are being exploited at an increasing rate in Florida. The penaeoid shrimps collected by the Albatross during the Philippine expedition (1907-10) were studied. Help was given to Dr. Marea Hatzios Grant (Instituto Tecnológico de Monterrey, Mexico) with identification of penaeoid shrimps commercially exploited in the Gulf of California. A collection of shrimps from Brunei was identified for their fisheries officer.

### Crustacea Investigation

Preparation continued on a manual on temperate-water decapods of the eastern US.

### Pelagic Fishes Investigation

Begun were sections on Coryphaenidae, Pomatomidae, and Rachycentridae for the UN Food and Agriculture Organization Species Identification Sheets for the East Central Atlantic. Also begun were sections on Belonidae, Hemiramphidae, and Scombridae for the UN Educational, Scientific, and Cultural Organization (UNESCO) publication "Check-List of the Fishes of the East Tropical Atlantic." Compared were evolutionary relationships of the bonitos (Sarda) based on morphological evidence with the pattern derived from infestation with parasitic copepods. Some morphological differences were found between populations of Spanish mackerels in the Atlantic and the Gulf of Mexico. Work was done on manuscripts describing a new species of halfbeak from New Guinea, the rediscovery of an estuarine halfbeak from India, and an analysis of the mangrove swamp fishes of New Guinea.

### Benthic Fishes Investigation

Sections on the families Argentinidae, Bathylagidea, and Moridae were completed for the UNESCO publication "Check-List of the Fishes of the East Tropical Atlantic."

### Meetings, Talks, Visitors, and Publicity

Austin Williams was the dinner speaker at the Northeast Regional Convention, District 1, of Beta Beta Beta Biological Society, Hartwick College, Oneonta, NY. He talked on "Strange Animals of the Galapagos Rift Thermal Springs."

### Publications

Cohen, D. M. The deepsea fish genus Enchelybrotula (Ophidiidae): description of new species, notes on distribution, and osteology. Bull. Mar. Sci. (A)

Collette, B. B. Families Belonidae, Coryphaenidae, Hemiramphidae, and Scombridae. Chapter(s) in Fishes of the northeastern Atlantic and Mediterranean. (S)

ATLANTIC ENVIRONMENTAL GROUP

Ocean Monitoring and Climatology Task

The cooperative Ship of Opportunity Program obtained six XBT transects and one continuous plankton recorder (CPR) transect in April: two XBT and one CPR transects in the Gulf of Maine, one XBT transect off Southern New England, one XBT transect across the shelf and slope off New York, and two XBT transects across the Gulf of Mexico.

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 April issue of Atlantic Notice to Fishermen:

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AEG/April 18, 1980

GULF STREAM EDDY LOCATIONS

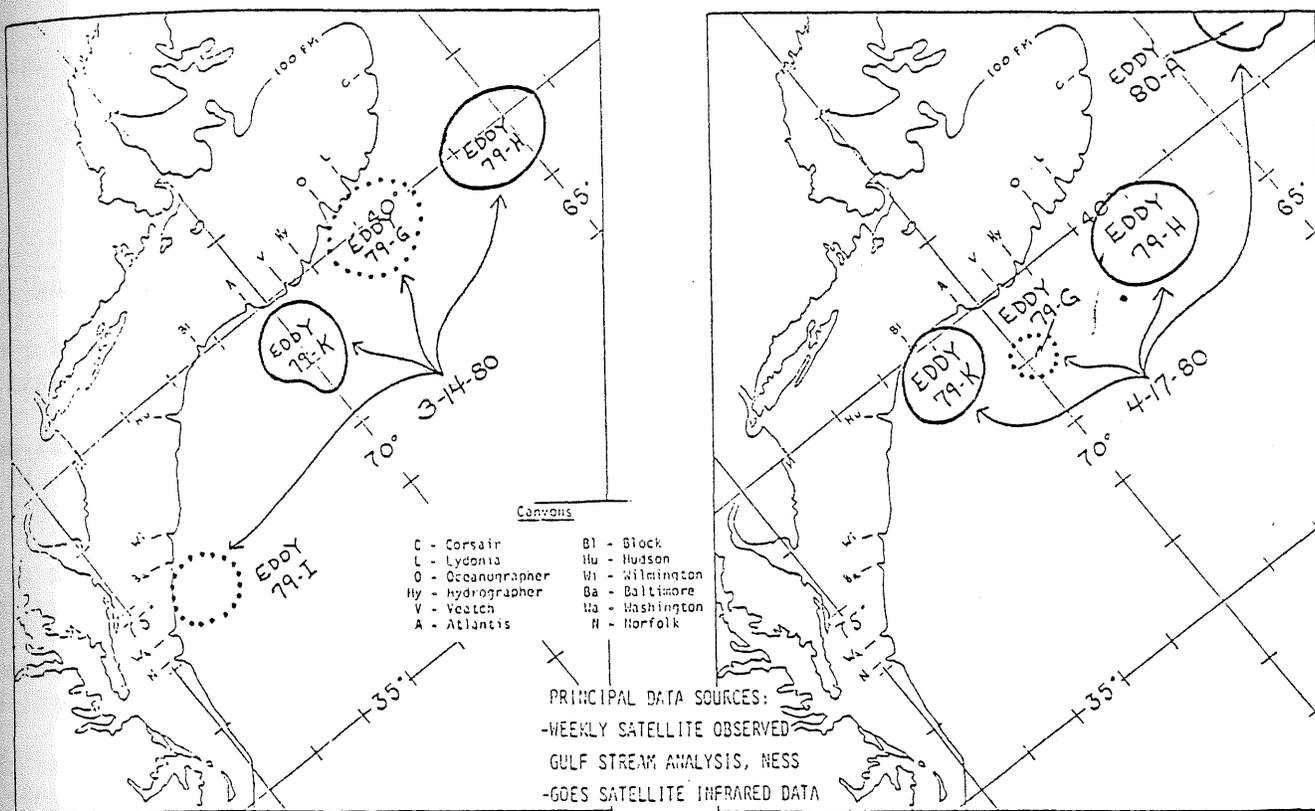
The Atlantic Environmental Group of the National Marine Fisheries Service reports that there were four warm core Gulf Stream eddies present off the northeast coast of the United States in mid-April.

The history of 1979 eddies was reviewed during the last thirty days, and the following eddies were re-labeled accordingly: 79-F to 79-I, 79-L to 79-K, 79-H to 79-G, and 79-I to 79-H.

Eddy 79-I moved southwest about 80 nm (150 km) until it was resorbed by the Gulf Stream at 37.6°N, 73.7°W, south of Baltimore Canyon during the second week of April. Eddy 79-K traveled about 55 nm (102 km) to the west and is centered at 39.5°N, 71.2°W, south of Block Canyon. Eddy 79-G moved about 103 nm (191 km) to the southwest to a position centered at 39.0°N, 69.8°W, south of Veatch Canyon. Eddy 79-H advanced westward about 83 nm (153 km) to a center position south of Lydonia Canyon at 39.4°N, 67.1°W. Eddy 80-A formed during the first week of April, and at mid-month was centered east of Corsair Canyon, at 40.8°N, 63.5°W.

During the next 30 days eddy 79-K may move southwest to a position south of Hudson Canyon; eddy 79-G west to Block Canyon; eddy 79-H west to south of Hydrographer Canyon, and 80-A southwest to south of Corsair 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, RI 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).



The Second Annual NEFC Research Conference, sponsored by IYABA, at Woods Hole during 1-3 April was attended by the following AEG employees: Reed Armstrong chaired one of the meeting sessions; Lee Crist spoke on "Bottom Temperatures From the Southern New England Continental Shelf Along 71°00'W, 1974-1978;" Jeff Hilland's topic was "Variability of the Shelf/Slope Front Between Cape Hatteras and Cape Cod;" Dan Smith spoke on "Continuous Plankton Records: Phytoplankton, Zooplankton, and Environmental Features in the Mid-Atlantic Bight, 1974-1979;" and Grayson Wood presented a talk titled "Current Status of the Undulating Oceanographic Recorder."

#### Ocean Dumping Studies Task

During the second week of April the URI R/V Schock was contracted to deploy two radio-direction finding (RDF) (4 MHz and 6 MHz) buoys for a test/calibration of the receiver systems. The Schock remained with the buoys taking LORAN fixes while line-of-bearings were taken from Pt. Judith, RI, using all three receivers. Comparisons between the line-of-bearings and LORAN fixes will be made and receiver accuracies determined.

Wind and wind-stress data plots from the 1979 RDF experiments have been received from the URI Data Projects Group. These will be analyzed with respect to Ekman motion and the RDF buoy drifts.

Two amphipod trap systems were completed and demonstrated to Drs. P. Kilho Park and Prithviraj Mukherji on 28 and 29 April. They were shipped to the United Kingdom during the first week of May.

Final preparations were made for the May 1980 cruise aboard the Kelez to DWD 106.

#### Meetings, Talks, Visitors, and Publicity

From 31 March to 2 April, Mert Ingham attended a working group meeting of the Northeast Monitoring Program held at the Sandy Hook Laboratory.

The Second Annual NEFC Research Conference, held at Woods Hole, MA, during 1-3 April, sponsored by IYABA, was attended by Reed Armstrong, Lee Crist, Jeff Hilland, Dan Smith, and Grayson Wood.

Steve Cook met with NOS's National Oceanographic Data Center personnel and with National Weather Service personnel on 3 and 4 April and then attended the "Supervision and Group Performance" training course at Rockville, MD, during the week of 7-11 April.

Mert Ingham attended a meeting on the Georges Bank Monitoring Program at the Woods Hole Laboratory on 7 April and then traveled to the Milford Laboratory for the Center Board of Directors meeting held during 7-10 April.

A meeting was held in the Challenger Room of the URI Pell Marine Science Library on 8 April on the schedule of events associated with yacht racing in Newport, RI, during the summer of 1980; Woody Chamberlin attended.

From 15 to 18 April, Mert Ingham and Jim Bisagni were in attendance at the Second International Ocean Dumping Symposium at Woods Hole, MA. Kathy Langone attended the sessions held during 16-18 April.

Woody Chamberlin was present at a meeting on cooperative marine ecosystem studies with Brookhaven National Laboratory and NEFC personnel which was held at the Woods Hole Laboratory on 15 April.

Mert Ingham met with Ocean Pulse staff members at the Sandy Hook Laboratory from 22 to 24 April.

On 22 April, Woody Chamberlin attended a Conference on Remote Sensing which was held at Hanscom Field in Lexington, MA.

Talbot Murray traveled to Long Island and Sandy Hook, NJ, on 24 and 25 April to collect data for a mackerel study.

On 29 April, Mert Ingham and Woody Chamberlin attended a Larval Herring Task Force meeting which was held at the Woods Hole Laboratory.

#### Publications

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

Celone, P. J.; Chamberlin, J. L. Anticyclonic (warm core) eddies off the northeastern United States during 1978. Annal. Biol. 35. (A)

- Cook, S. K.; Hughes, M. M. Water column thermal structure across the shelf and slope southeast of Sandy Hook, NJ. USA in 1978. *Annal. Biol.* 35. (A)
- Crist, R. W.; Chamberlin, J. L. Bottom temperatures on the continental shelf and slope south of New England during 1978. *Annal. Biol.* 35. (A)
- Crist, R. W.; Chamberlin, J. L. Bottom temperatures on the continental shelf and slope south of New England during 1979. *Annal. Biol.* 36. (S)
- Fitzgerald, J.; Chamberlin, J. L. Anticyclonic warm core Gulf Stream eddies off the northeastern United States during 1979. *Annal. Biol.* 36. (S)
- Hilland, J. E.; Armstrong, R. S. Variation in the shelf water front position in 1978 from Georges Bank to Cape Romain. *Annal. Biol.* 35. (A)
- Hilland, J. E. Variation in the shelf water front position in 1979 from Georges Bank to Cape Romain. *Annal. Biol.* 36. (S)
- Hughes, M. M.; Cook, S. K. Water column thermal structure across the shelf and slope southeast of Sandy Hook, New Jersey in 1979. *Annal. Biol.* 36. (S)
- Ingham, M. C.; McLain, D. R. Sea surface temperatures in the northwestern Atlantic in 1978. *Annal. Biol.* 35. (A)
- McLain, D. R.; Ingham, M. C. Sea-surface temperatures in the northwestern Atlantic in 1979. *Annal. Biol.* 36. (S)

#### Reports

- Ingham, M. C. Atlas of mean monthly water temperatures at 30 m - Atlantic and Gulf coastal waters. AEG Data Analy. Prod. No. 15;1980.