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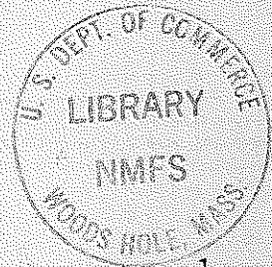


NORTHEAST FISHERIES CENTER

29 JUN 1981

NEWSLETTER

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"NORTHEAST FISHERIES CENTER NEWSLETTER"

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

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CENTER DIRECTORATE

Fishery Technology

Food irradiation, a process that was proposed over three decades ago and intensely studied during the 1960's, has a sine-curve record of approvals and near approvals at the peaks, and disapprovals and condemnation at the valleys. The last valley, occurring within the last 2 yr, saw an end to the US Army's investment in the program (the last federal activity), and both the people at the US Army's Natick Laboratories and our Gloucester Laboratory trying to find a repository for their respective cobalt sources (so far without success).

Now, we are told that the Food and Drug Administration has reevaluated its dogmatically negative stand and is considering blanket approval of a pasteurizing dose (100 kilorads) with a decidedly receptive attitude to higher doses with reasonable evidence of safety. The blanket dose would have a significant preservative effect for most seafoods.

Special Scientific and Technical Projects

Following is the status of some of our projects:

1. CAMAC data logger--The system has been installed aboard the NOAA R/V Albatross IV and is presently being debugged. It is expected that the system will be fully operational within 6 mo.
2. Trawl mensuration--The third-wire winch aboard the Albatross IV is being redesigned to improve its operation in the constant-tension mode.
3. Surf clam - ocean quahog survey--A paper describing the mechanical aspects of the electrohydraulic dredge is being written. Further improvements in dredge components and operation are being studied, especially in regard to manifold/nozzle configurations.
4. Sea scallop survey--Detailed drawings of the 8-ft scallop dredge are being prepared.
5. Bottom trawl survey--A trip was made aboard the first leg of the NOAA R/V Delaware II spring bottom trawl survey to observe and record possible problem areas regarding standard operating procedures. A memorandum was prepared for the Center Directorate.
6. Woods Hole Laboratory Main Building Study--This contract is in its third and final phase which entails recommended improvements to the building's roof and window-walls.
7. Mesh study--It is still in the Resource Assessment Division.
8. Wire spooler--It is completed and operational.

RESOURCE ASSESSMENT DIVISION

Fishery Statistics Investigation

Year-end data were completed and forwarded to the NMFS Central Office for inclusion in the Fishery Statistics of the U.S., 1980. Over 62 000 fishing trips were made from the ports regularly covered by port agents. A slight reduction in day trips combined with an increase in longer trips maintained the total trip ratio at the 1979 level in the Northeast Region. Both interview numbers and biological-sampling frequency (exclusive of contract work) increased from 1979 levels in spite of a reduced field staff.

New England landings (Maine, Massachusetts, and Rhode Island) in 1980 were 760 million pounds valued at 288 million dollars. Compared to 1979, landings increased 87 million pounds and value increased 23 million dollars. Middle Atlantic Bight and Chesapeake Bay landings in 1980 were an estimated 965 million pounds valued at 227 million dollars. This was an increase of 89 million pounds and 11 million dollars.

High winds and cold weather, particularly in New England, kept landings down and prices high during much of March. However, by the end of the month the weather began moderating, landings increased, and prices declined.

Resource Surveys Investigation

Early March marked a period of intense preparation for upcoming cruises. The Investigation will prepare for and conduct six major survey cruises from March to November. Included are the routine spring, summer, and autumn bottom trawl surveys, a sea scallop survey, and a surf clam - ocean quahog survey. A special cooperative survey with Canada to explore potential ocean quahog resources off the Nova Scotian coast is also scheduled.

The spring bottom trawl survey began on 17 March with Tom Azarovitz as Chief Scientist. Other Investigation personnel participating were Don Flescher, Linda Despres-Patanjo, and Liz Bevacqua. Two scientists from the Virginia Institute of Marine Science (VIMS), Eugene Burreson and Joseph Sypek, also participated on the cruise. They examined blood samples from young-of-the-year summer flounder for the presence of the hemoflagellate, Typanoplasma bullocki. The occurrence of the parasite was confirmed in many of the examined specimens, especially those south of the Virginia Capes. Preliminary studies have indicated high mortality in infected summer flounder.

Jim Crossen is doing a preliminary analysis of echosounder data collected aboard the Polish F/V's Admiral Arciszewski and Korwin during February and March. The vessels made the echosounder collections while fishing for Atlantic mackerel in the Middle Atlantic Bight.

Jack Suomala of the Charles Stark Draper Laboratories in Cambridge, Massachusetts, and Jim Crossen are preparing a paper on "Spherical Reference Targets for Hydroacoustic Equipment Calibration," for the May meeting of the International Council for the Exploration of the Sea's (ICES) Fishery Technology Committee.

Fishery Biology Investigation

Age and Growth

Vi Gifford completed the first aging for second, third, and fourth quarter 1973 commercial samples of redfish, and Kris Andrade completed aging and summarizing the fourth quarter 1980 commercial samples of haddock. Age summaries for pollock from 1980 commercial samples were completed, and age results from the 1980 autumn bottom trawl survey pollock samples were sent to the Woods Hole Laboratory's Automatic Data Processing (ADP) Unit for computer processing.

Melinda Grace sectioned 50 witch flounder otoliths for students at the University of Massachusetts working on a comparison of age structures for this species. Judy Penttila and Vi Gifford explained aging techniques to the students, as well as methods for preparing scales and otoliths for aging.

Judy Penttila checked first-audit listings of yellowtail flounder age data from the 1980 autumn bottom trawl survey and the 1981 winter survey; checked Atlantic cod aging by State of Massachusetts personnel on 1980 autumn survey, 1981 winter survey, and the 1977 commercial samples; and sent the survey data to the ADP Unit for computer processing.

Finfish

Sherry Sass continued rearing winter flounder for growth studies, worked with David Pyoas on dissection techniques for routine otolith preparation, and continued to learn techniques for aging surf clams from Maurice Crawford. In her capacity as Federal Women's Program (FWP) assistant liaison, Sherry initiated the search for a workshop on sexual harrassment to be held at the Woods Hole Laboratory.

Mark Costa and Alicia Kelly brought all silver and red hake sectioning up to date and began impressing recent summer flounder scale samples. Mark also assisted Sherry Sass with maintenance of algal and rotifer cultures for the young-of-the-year winter flounder age-and-growth project.

Louise Dery completed a second draft of her research results regarding the age and growth of yearling summer flounder for a Summer Flounder Workshop report. With the assistance of David Pyoas, about 600 Atlantic mackerel were aged from Polish commercial samples collected during January-March 1981. In addition, mackerel otoliths from survey and commercial samples collected in 1980 were aged. Louise also completed aging red hake from the 1980 spring and autumn bottom trawl surveys.

Shellfish

John Ropes made and tested preparations of the ventral portion of marked ocean quahog shells by embedding them in an epoxy, with variable results. Bubbles which formed near the shell margins in some samples distorted the acetate-peel image. Soaking pieces of other shells overnight in the epoxy solution without the hardening agent was somewhat more successful, although a few bubbles persisted. The use of a vacuum chamber may produce better results. Embedding, however, can significantly improve the image at the shell margins in acetate peels.

Photographic plates of whole marked valves, enlargement of the marked area before and after peeling off the periostracum, and acetate peels of the growth lines at the time of and after marking are being prepared. The finished plates are for photographic documentation of the periodicity of growth-line formation. This material is being prepared for a poster session at the ICES annual meeting to be held in Woods Hole in October.

A clear interruption of shell deposition from marked ocean quahogs was evident in all sizes prepared for examination by the acetate-peel method. In peels of 34 clams less than 80 mm in shell length recovered during August 1980, two growth lines were formed in 18 (53%), one had formed at or very soon after the marking operation in 1978, and a second occurred about midway to the tip of the shell; in 16 (47%) a third growth line had formed very near the inner shell margin. These observations clearly establish an annual periodicity of growth-line deposition. The formation of a third growth line in almost half of the clams is believed to be related to spawning activity, but cannot be substantiated in the absence of histological preparations of gonadal tissues to observe spawning condition. Special collections during the upcoming 1981 surf clam - ocean quahog survey have been proposed to provide shells and tissues for such observations.

Maurice Crawford continued to work with the computer logging of aging data from commercial samples of surf clams collected off the Delmarva Peninsula, and also aged surf clam samples from the 1980 survey and some scallop samples.

Mark Costa continued to cut surf clam shells for aging and learned how to develop photographic prints of the chondrophore. Mark and Maurice worked on aging techniques for processing 6-mo-old surf clams grown by Ron Goldberg at the Milford Laboratory. Mark and Sherry Sass, under Maurice's direction, aged some commercial samples of surf clams provided by the University of Maryland Eastern Shore.

Fishery Assessment Investigation

Members of the Investigation have been continuing stock assessment projects with Senior Assessment Scientists. A considerable amount of effort by Ralph Mayo, Anne Lange, and Steve Murawski has been devoted to the activities of Northeast Fishery Management Task Force Study Group on the Biological Effects of Management Options. A cluster analysis has been completed and the Task Force has begun to investigate the long-term trends in the species mix in commercial landings and survey catches. Anne wrote several specialized Fortran computer programs for the project. A report summarizing the data and trends in the defined fishery is in preparation.

Michael Fogarty completed a statistical analysis of summer flounder for the State/Federal Program's Summer Flounder Scientific and Statistical (S&S) Committee and reviewed a paper for the Fishery Bulletin.

Loretta O'Brien prepared and provided a series of yellowtail flounder length-frequency data summaries to Peter Berrien at the Sandy Hook Laboratory.

Senior Assessment Scientists

The major project for Brad Brown was budgetary problems and budget interpretation. Brad and Mike Sissenwine continued their oversight responsibilities for work

conducted by the Northeast Fishery Management Task Force. Progress was made with Joan Palmer towards simulating variable recruitment in prediction programs for the Task Force. Regional Fishery Management Council activities included a review of the Atlantic cod and haddock assessments.

Mike Sissenwine met with Anne Lange, Steve Murawski, and Ralph Mayo several times throughout the month to discuss the status and direction of the Task Force.

Fred Serchuk completed preparation of the 1981 Georges Bank and Gulf of Maine Atlantic cod assessment with Paul Wood, and submitted several laboratory reference documents.

Vaughn Anthony continued analysis (with Mike Fogarty and Gordon Waring) of Atlantic herring assessments and completed two assessment papers, including one for a New England Fishery Management Council (NEFMC) Ad-hoc Atlantic Herring Working Group meeting.

Emory Anderson, with assistance from Darryl Christensen, Fred Serchuk, Charles Byrne, and Tom Azarovitz, devoted considerable time to drafting material for a revised Program Development Plan for the Marine Resources Monitoring, Assessment, and Prediction Program (MARMAP) for FY 1981-82, focusing on activities and program development of the Division. In addition, Emory reviewed the final draft of the NMFS Stock Assessment Task Force's report.

Steve Clark continued stock assessment work for haddock, pollock, and yellow-tail flounder with assistance from Ralph Mayo, Loretta O'Brien, and Erika Faulk, completing analysis of the Georges Bank and Gulf of Maine haddock stocks and the yellowtail flounder stocks. Steve prepared US contributions to the ICES Shellfish Committee Administrative Report and Bibliography for 1980, with help from Michael Castagna (Virginia Institute of Marine Science) and Judith Brownlow.

Travel, Meetings, and Presentations

Ronnee L. Schultz and Marvin Boussu met with Bob Jones and Eric Smith from the Connecticut Department of Environmental Protection (CDEP) to review the CDEP fishing log and data processing system on 20 January. It was estimated that Connecticut's program requires \$25 000 a year to run. They are hoping to generate some State/Federal Program money to run their statistics program so they can use their Commercial Fisheries Research and Development Act funds for research and development.

On 2 March, Emory Anderson and Jim Crossen attended a debriefing meeting at the Foreign Fisheries Observer Office at Otis AFB for observers coming off the Polish fishing vessels involved in the experimental Atlantic mackerel fishery study.

During 2-4 March, Steve Clark, Ralph Mayo, Loretta O'Brien, Mike Sissenwine, and Vaughn Anthony attended the Gulf of Maine Workshop at the University of New Hampshire in Durham.

On 4 March, John Boreman and Vaughn Anthony met with state representatives from Massachusetts, Rhode Island, and New York at the Woods Hole Laboratory to discuss striped bass research and fishery monitoring activities.

On 11 March, Mike Sissenwine attended a NEFMC Herring Oversight Committee meeting in Peabody, Massachusetts.

On 16 and 17 March, Mike Sissenwine, Vaughn Anthony, and Gordon Waring participated in the NEFMC Ad-hoc Atlantic Herring Working Group meeting at Council headquarters in Saugus, Massachusetts.

On 17 March, Brad Brown attended the NEFC Molluscan Task Force meeting at the Milford Laboratory.

During 18-20 March, Stu Wilk attended the Sixth Annual Marine Recreational Fisheries Symposium held in Houston, Texas, and presented a paper titled, "Review of the Fisheries for Atlantic Croaker, Spot, and Weakfish, 1940-1979."

On 19 March, Brad Brown, Steve Clark, Fred Serchuk, John Boreman, Vaughn Anthony, Mike Fogarty, Emory Anderson, Emma Henderson, Thurston Burns, Ambrose Jearld and other members of the Resource Assessment Division participated in a meeting at the Woods Hole Laboratory between the Resource Assessment Division and the Northeast Regional Office's Fisheries Management Division to discuss the improvement of interactions with each other.

Darryl Christensen and Ronnee Schultz met at the Woods Hole Laboratory on 19 March with members of Northeast Regional Office's Fisheries Management Division and other members of our Resource Assessment Division to discuss various topics of mutual concern. Darryl and Ronnee also met with Phil Coates, Director of the Massachusetts Division of Marine Fisheries (MDMF) and members of his staff in Boston on 20 March to discuss future plans for statistical collection by MDMF personnel.

During 22-24 March, Brad Brown, Dick Hennemuth, and Joan Palmer attended the Eastern North American Regional Workshop of the Biometrics Society in Richmond, Virginia.

On 24 March, Ambrose Jearld visited the University of Maryland Eastern Shore to monitor aging activities supported by a contract from us.

On 25 and 26 March, Brad Brown, Vaughn Anthony, and Ambrose Jearld attended the first Marine Section meeting of the American Fisheries Society in Washington, DC. Brad presided at the meeting and presented a paper by Tom Azarovitz on survey cruise activities from a joint state-federal perspective.

On 26 March, Vaughn Anthony met with the Program Advisory Committee of the American Fisheries Society in Washington, DC, to plan a multispecies marine session at the 1982 annual meeting in South Carolina.

On 27 March, Brad Brown presented a seminar to the NMFS Central Office staff on the proposed three-tier statistics-gathering system in the Northeast Region.

During 29 March-1 April, Mike Sissenwine participated in a workshop on marine mammal/fishery interactions, sponsored by the International Union for the Conservation of Nature and Natural Resources, held in LaJolla, California.

On 31 March and 1 April, Mike Fogarty and Stu Wilk attended a State-Federal Program Summer Flounder S&S Committee meeting in Philadelphia, Pennsylvania.

On 31 March, Brad Brown, through the initiative of Louis Ronsivalli of the Gloucester Laboratory, met with Mr. Foley of the M. F. Foley Company concerning cooperative efforts in which aspects of Resource Assessment Division work would be discussed in their quality control workshops for fish dealers.

University Affairs

On 3 March, Brad Brown met with Karen Tench, a cooperative education student liaison with Lincoln University.

On 3 March, Mike Sissenwine presented a lecture on multispecies fisheries models at the University of Rhode Island (URI) in Kingston.

On 6 March, Fred Serchuk served on the Dissertation Committee of Stuart Buckner, a Ph.D. candidate at the Marine Sciences Research Center of the State University of New York at Stony Brook on Long Island.

On 10 March, Mike Sissenwine and John Boreman met with Geoff Evans of the Woods Hole Oceanographic Institution (WHOI) to review his research on fishery modeling.

On 10 March, Brad Brown presented a guest lecture to graduate students on multi-species fishery management at URI in Kingston.

On 12 March, Steve Murawski met with Dr. Michael Ross and a student from the University of Massachusetts in Amherst, to discuss the age and growth aspects of cooperative witch flounder research.

On 19 March, Mike Sissenwine participated in the WHOI Georges Bank Study Group meeting in Woods Hole.

On 23 March, Fred Serchuk met at the Woods Hole Laboratory with Mark Lussier, an undergraduate student from the University of Massachusetts, to discuss an internship program in the Resource Assessment Division during autumn 1981.

On 23 and 24 March, Brad Brown, Joan Palmer, and Dick Hennemuth, while attending the aforementioned Biometrics Society workshop, reviewed in considerable detail the current progress and future plans for contract work with G. P. Patil, C. Taille, and M. Boswell at Pennsylvania State University. Their contract efforts will concentrate on analyses of survey data and on recruitment-generating functions.

On 30 March, John Boreman spoke to visiting students from Glassboro (New Jersey) State College on striped bass research at the NEFC.

Emory Anderson received a revised budget for the proposed tilefish research by Rutgers University (Drs. Churchill Grimes and Ken Able are principal investigators). A \$21 000 contract which will be supported by funds transferred from the Mid-Atlantic Fishery Management Council to the NEFC has been approved.

Steve Clark, Kay Paine, and Otis Jackson initiated work to provide the URI Graduate School of Oceanography with a series of survey and stock assessment programs and documentation from the NEFC library.

Public Affairs

On 26 March, Stu Wilk gave a lecture titled, "Biology and Ecology of Bluefish, Weakfish, and Striped Bass," at the Watchung (New Jersey) Saltwater Fishing Club.

Personnel

On 3 March, Emory Anderson met with other members of the Center Incentive Awards Committee at the Woods Hole Laboratory.

On 27 March, Mike Sissenwine attended a Center Factor IV Committee meeting at the Milford Laboratory.

EEO Activities

Emory Anderson had several meetings with Dave Pyoas, a cooperative education student in the Division, to provide information on programs at the Woods Hole Laboratory and insight into data analysis and assessment programs, for Dave's educational experience at the Laboratory.

On 3 March, Fred Serchuk, Steve Clark, Louise Dery, and Sherry Sass attended a Woods Hole Laboratory Equal Employment Opportunity (EEO) Committee meeting.

On 16 March, Sherry Sass attended a Woods Hole Laboratory EEO Committee budget meeting.

On 20 and 21 March, Brad Brown and Ambrose Jearld attended National Association for Equal Opportunity in Higher Education meetings in Washington, DC.

On 24 March, Steve Clark and Sherry Sass attended a Woods Hole Laboratory EEO Committee meeting.

On 28 March, Brad Brown and Ambrose Jearld attended a conference on affirmative action at Northeastern University in Boston, Massachusetts.

Publications

Anthony, V. C.; Waring, G. T. A review of the herring fisheries, their assessment and management in the Georges Bank-Gulf of Maine area. Melteff, B. E.; Westerman, V. G. eds. Proc. Alaska Herring Symp.; 19-21 February 1980; Anchorage, Alaska. Fairbanks, Alaska; Univ. Alaska; Alaska Sea Grant Rep. 80-4:115-178;1980. (P)

Clark, S. H. Use of trawl survey data in assessments. Can. Tech. Rep. Fish. Aquat. Sci. (A)

Conover, D. O.; Murawski, S. A. Seaward winter migrations of the Atlantic silverside export of biomass from saltmarsh to offshore communities. Fish. Bull. (US).

Lange, A. M. T. Yield per recruit analysis for squid, Loligo pealei and Illex illecebrosus, from the Northwest Atlantic. Proc. Nat. Shellfish. Assoc. (A)

Reports

Anthony, V. C.; Waring, G. T. Basic herring assessment data for the March 16-17, 1980 Ad Hoc Herring Assessment Working Group. Woods Hole Lab. Ref. Doc. No. 81-07;1981.

Clark, S. H.; Mayo, R. K; Faulk, E. Georges Bank and Gulf of Maine haddock stock status - 1981. Woods Hole Lab. Ref. Doc. No. 81-05;1981. 47 p.

Serchuk, F. M.; Clark, S. H.; Brown, B. E. Implications of the 1981 Georges Bank and Gulf of Maine cod and haddock assessments for future management strategies. Woods Hole Lab. Ref. Doc. No. 81-09;1981. 7 p.

Serchuk, F. M.; Wood, P. W., Jr. Assessments and status of the Georges Bank and Gulf of Maine Atlantic cod stocks - 1981. Woods Hole Lab. Ref. Doc. No. 81-06; 1981. 67 p.

Turner, S. C.; Anderson, E. D.; Wilk, S. J. A preliminary analysis of the status of the tilefish population in the Southern New England - Middle Atlantic region. Woods Hole Lab. Ref. Doc. No. 81-03;1981. 18 p.

MANNED UNDERSEA RESEARCH AND TECHNOLOGY PROGRAM

No report received. The February and March reports will be included in the April issue.

MARINE ECOSYSTEMS DIVISION

Ecosystem Dynamics Investigation

Work continued on summary and analysis of fish food habits data for estimating daily rations. Mike Pennington completed development on a procedure for estimating daily rations from our field data and John Hauser wrote another computer program for listing the required time/size-specific data in a more efficient format; John also began production runs of the food habits listings for the major fish species. Wendell Hamm set up a feeding interaction matrix based on empirical coefficients from the Hamm and Langton (1980) ICES report. Wendell also wrote a program to put a flow analysis routine into the Sigma-7 computer system at WHOI to assist with analysis of output from the multispecies model GEORGE.

Ed Cohen and Marv Grosslein participated in the Third Gulf of Maine Workshop at the University of New Hampshire. Ed presented a paper on the high primary productivity on Georges Bank, coauthored with W. R. Wright and R. Schlitz. Marv Grosslein and Ed Cohen served as chairman and rapporteur, respectively, of a summary discussion at the end of the Workshop on the possible linkages between fish production, lower trophic levels, and the physical environment. One outcome of the discussion was a concensus among both biological and physical oceanographers that a better estimate of remineralization rates of nitrogen on Georges Bank would contribute most to clarifications of nutrient flux on the Bank. In addition, Ed Cohen and Ron Schlitz began working on a nutrient budget for the entire Gulf of Maine and Georges Bank region using new information and suggestions which arose at the Workshop.

Mike Pennington completed final revisions to the paper on "Abundance Estimates Based on Stratified Random Trawl Surveys" to be published in the Canadian Fisheries and Marine Service Technical Report series. Also, the paper on bivalve tubule types which Mike Pennington coauthored with William Robinson and Rich Langton, was accepted for publication in the Journal of Experimental Marine Biology and Ecology.

Marv Grosslein attended several meetings of the editorial committee for the book on Georges Bank, dealing with general guidelines on format, scope and style, team writing, and possible publishers. These topics were also considered by the Georges Bank study committee on 19 March. As soon as some specific examples of appropriate format, scope, and style are chosen, the editors of each section will begin organizing writing teams and refining section and chapter outlines. Status of the overall plan for the book will be summarized in a general memorandum to NEFC personnel in April.

Marv Grosslein and Ed Cohen worked on the MARMAP program planning document, including a status-of-knowledge chart on recruitment processes.

Fishery Oceanography Investigation

Six members of the Investigation attended the Gulf of Maine Workshop at the University of New Hampshire from 2 to 5 March. Ron Schlitz, Steve Ramp, Arthur Allen, Red Wright, and Dan Patanjo contributed reports describing the results of current and hydrographic measurements made by the Investigation and their implications to the mass transport and nutrient budgets of the Gulf of Maine and Georges Bank. At the meeting, Ron Schlitz and David Mountain took part in discussions with Robert Houghton of the Lamont-Doherty Geological Observatory concerning his analysis of temperature changes in the cold pool during 1979-80 which suggest a very low advection rate. Chris Nadeau is now reviewing MARMAP hydrographic data during this time to provide better temporal and spatial resolution of the temperature changes.

The second and third legs of a MARMAP survey on Albatross IV Cruise No. AL 81-0 were completed in March. Tom Laughton and Dana Densmore made hydrographic observations on the second leg, while Dana, Dan Patanjo, and Chris Nadeau were on the third leg. The first leg of a MARMAP survey was also completed on a cruise of the NOAA R/V Kelez with Tom Laughton and Derek Sutton making the hydrographic measurements. Sam Nickerson, with assistance from Karen Lennon, processed the hydrographic data and salinity samples from Albatross IV Cruise No. AL 81-01.

Arthur Allen continued the analysis of the current-meter data from the 1978 larval Atlantic herring patch study. A 40-50 hr wave-like fluctuation in the current is of particular interest. Arthur discussed this phenomenon with Chris Garrett of Dalhousie University and John Loder of WHOI, and is reviewing possible shelf wave mechanisms as a source of the fluctuation.

Dave Mountain and Ron Schlitz attended a planning conference for principal investigators of a National Science Foundation (NSF)-funded study of warm-core rings. The NEFC will participate cooperatively with the NSF study, concentrating on the entrainment of shelf water and shelf organisms into the slope water that is induced by the ring. An initial cruise is planned for September-October 1981 with at least three additional cruises in 1982.

Ichthyoplankton Investigation

We were involved in MARMAP I plankton surveys on three ships during March. Our traditional winter survey on Albatross IV ended off Virginia on 26 March, after completing 153, or 87%, of the 175 scheduled stations. Sand lance larvae again totally dominated the ichthyoplankton and it appears from preliminary observations that their abundance levels increased over those of 1980, especially on Georges Bank. Myron Silverman and Annette Pratt departed on the Kelez from Norfolk, Virginia, on 18 March to begin the early spring survey off Cape Hatteras. Myron will be replaced as Chief Scientist by Joe Kane midway through the cruise. Jerry Prezioso will participate on Part II to assist Joe with plankton sampling. Finally, John Sibunka and John Antonellis joined the scientific party on the final leg of the spring bottom trawl survey to collect ichthyoplankton and zooplankton samples. They departed Woods Hole on 17 March and will return on 4 April.

Tom McKenney completed a first draft of a manuscript on fishes taken in plankton and neuston tows at Deepwater Dumpsite (DWD) 106 on four seasonal cruises in 1978. Larvae of shelf species occurred on all four cruises, which indicates that transport off the shelf occurs throughout the year. Pete Berrien completed an assessment of adult spawning biomass of yellowtail flounder, based on the distribution and abundance of their eggs. Nearly all eggs from surveys completed in 1979 have been identified and we are proceeding with biomass estimates for silver hake, bluefish, and haddock.

Wally Smith traveled to the Narragansett Laboratory to meet with the staff from the Narragansett and Woods Hole Laboratories and with Saul Saila and others from URI, to discuss progress on their cooperative work with larvae of yellowtail flounder, Atlantic herring, haddock, and Atlantic cod.

Larval Fish Dynamics Investigation

Population Processes

Greg Lough, Dave Potter, George Bolz, and Cabell Davis participated in the Third Gulf of Maine Workshop at the University of New Hampshire during 2-5 March. Reports were given concerning the vertical distribution of Atlantic herring larvae and chaetognaths, and the interaction of a copepod population with the mean circulation on Georges Bank (see "Publications" section for titles). Following the meeting, Greg Lough spent a day (12 March) at a meeting in Woods Hole with members of the Fishery Oceanography and Plankton Ecology Investigations to finalize the sampling strategy for the larval fish - prey microdistribution studies aboard Albatross IV Cruises No. AL 81-03 and AL 81-05, during April and May.

Roz Cohen calibrated the HIAC particle-size analyzer with premeasured single species and mixed plankton samples. The samples were taken with the fine-meshed, 0.25-m multiple opening-closing net and environmental sensing system (MOCNESS) on board Albatross IV Cruise No. AL 80-11, and were previously sorted by microscope to relate size spectral peaks with identifiable species. These calibrations need to be resolved prior to our spring cruises so that we can assess microplankton distributions in real time. In this regard, Hal Merry returned from a trip to California where he visited the HIAC Corporation in Menlo Park for technical training in the operation of our HIAC unit and to see about the feasibility of using the HIAC sensors in a remote mode for in-situ profiling. He also visited the NMFS Southwest Fisheries

Center in LaJolla, California, to talk with a number of scientists and technicians developing particle-counting equipment and other related gear, as well as to visit their Remote Sensing Center.

George Bolz completed an extensive report on the ichthyoplankton distributions from the 7-yr series of International Commission for the Northwest Atlantic Fisheries (ICNAF) larval Atlantic herring surveys; he is now involved with the "community" analysis of the data. Dave Potter continued analysis of West German R/V Anton Dohrn Cruise No. 77-03 for MOCNESS data on larval Atlantic herring to see if their vertical distributions could be segregated by various size groupings. The latter part of the month was devoted to cruise preparation. Dave has designed and constructed a net-bar locking mechanism which should prevent the MOCNESS net bars from opening once the sample has been taken and thus prevent contamination of the net sample. Dave Potter also attended three meetings on 10 March of the Woods Hole Laboratory Space Committee and chaired a meeting of the solar projects managers, architectural and engineering (A&E) firm engineers, and the contracting officer (Tony Bucelle), to finalize a contract for the NEFC's multilaboratory solar system designs.

Peter Donnelly, Randy Goodlett, and Alicia Mann completed processing the larval Atlantic herring gut-content and morphological-condition-index samples collected by MOCNESS on the 1978 larval Atlantic herring patch study. Bill Michaels (Benthic Dynamics Investigation) continued work on the chaetognath vertical distribution data collected by MOCNESS during the 1978 patch study. Results of the chaetognath study were available in time for presentation at the Third Gulf of Maine Workshop.

Experimental Studies

Work with winter flounder was continued, including a study of the effects of water temperature during gonad maturation on growth, yolk absorption, and first feeding.

Preparations are continuing for the second spawning season of the joint NOAA - US Fish and Wildlife Service study of the effects of contaminants on the early life stages of striped bass. Larvae from the Chesapeake Bay region are expected to arrive at the Narragansett Laboratory during the middle of April. To minimize any crowding effects, larvae will be reared in 10 and 20-gal divided tanks instead of the 1-gal jars used last year. Design and construction of a swim speed/stamina testing apparatus is currently underway. We are beginning to receive data on the contaminant levels in striped bass adult and egg tissue collected last year. These data are being correlated with data on growth rate, survival, and biochemical composition. Sorting and counting of plankton samples from Soviet R/V Evrika Cruise No. 80-02 were continued. Geoff Laurence attended the Fifth Annual Larval Fish Conference at Louisiana State University in Baton Rouge.

Benthic Dynamics Investigation

Roger Theroux continued work on the northern macrobenthic invertebrate biomass report; he completed the reference list and began compilation of the species list based on listings generated from the computer file by John Hauser. Roger also provided information to a number of people: Pat Gerrior (NMFS Northeast Regional Office) -- provided her with red crab photographs for her thesis; Page Valentine (US Geological Survey in Woods Hole) -- provided information on the distribution of certain bivalves

as derived from samples taken during a paleontological study of the Sankaty Head region; and Rick Price (WHOI Marine Policy and Ocean Management Program) -- provided him with reports and manuscripts in preparation by Benthic Dynamics personnel pertinent to his Georges Bank bibliography. Bruce Higgins, involved in the Georges Bank monitoring efforts for the Northeast Regional Office, requested that Roger Theroux consult with Brad Butman of the US Geological Survey in Woods Hole, regarding station placement and benthic sampling strategies for the monitoring program.

Ray Bowman formulated a new food habits sampling protocol in an attempt to obtain quantitative data on food habits of fishes from observation and recording of gut contents at sea. The new method was tried on the first leg of the spring bottom trawl survey and appears to work fairly well for larger fishes whose prey are large enough for identification by eye. Following evaluation this spring, the plan may become a standard sampling protocol for future MARMAP II surveys to avoid the high cost of processing fish stomachs ashore. However, for special study areas, such as Georges Bank and Southern New England, more quantitative sampling will be maintained to provide estimates of daily rations for the model GEORGE.

Ray Bowman and William Michaels began a general summary of the food habits of 17 fish species collected during the 1973-76 series which represents the most detailed data available on size of predator and variability among individual fish. Also, a summary is underway of food habits of fishes caught at BIOME (Massachusetts Bay) stations from 1972 to 1978. John Hauser trained William Michaels in the use of the food habits computer program package, and together they completed a series of standard runs on haddock. Tom Morris continued his literature review on predator-prey linkages involving fish. He also began preparation of a table documenting sizes of common prey species for comparison with mouth sizes of major fish species.

Apex Predators Investigation

Work continues on aging shortfin mako sharks with the preparation of 42 vertebrae for staining. Refinements were made and the entire sample was reread using them. Fifty more solid vertebrae were cut, stained, and mounted for the aging project on carcharhinid sharks by Alan Lintala and Helen Cottrell.

Chuck Stillwell and Nancy Kohler began ADP-generated analysis of the blue shark food habits data base in preparation for an ICES document on "Food Habits of the Blue Shark in the Western North Atlantic."

Plankton Ecology Investigation

Bob Marak participated in Leg 7 of the Vulcan Expedition to the Antarctic aboard the Scripps Institute of Oceanography's R/V Melville from 22 February to 3 April. One of the principal objectives was to investigate the physical and biological factors affecting the distribution and abundance of krill. The cruise was multidisciplinary. A superswarm of krill was located hydroacoustically close to Elephant Island. A preliminary estimate of the amount of krill present in this swarm was 10 million metric tons. The size of the swarm was about 6 mi x 3 mi x 100 m. It is interesting to note that at least 28 large Soviet trawlers were fishing in this area. It appeared that the catch was being reduced to meal. The net tow data collected will be analyzed to provide sea truth for the hydroacoustic sampling and for biomass estimates.

Carolyn Griswold participated in a MARMAP I cruise on Albatross IV from 2 to 13 March. She collected some special samples for wet-volume displacement comparisons. On 31 March, Carolyn attended a meeting of the Georges Bank Biological Task Force (BTF) in Somerville, Massachusetts. The final draft of the Georges Bank Monitoring Program was discussed and approved with minor revisions to be sent to the US Geological Survey's North Atlantic Oil and Gas Supervisor for approval and possible implementation. Dr. Peter DeWitt of the Bureau of Land Management was elected the new presiding officer of the BTF, succeeding Allen Peterson, Director of the NMFS Northeast Regional Office.

Biostatistics

A subset of the Northeast Data Element and Software Catalog's (NEDESC) Data Dictionary/Directory System was implemented on the Narragansett Laboratory's account of the ADPNET computer. Generic element definitions for MARMAP Information System (MIS) data will be entered into NEDESC. Commonality of generic element definitions will be sought for all components of the Northeast Regional Fisheries Information System.

Lorrie Sullivan set up and debugged a parameter file to reformat ichthyoplankton total counts for MIS master files to unit record formats. She began pulling 1977 data for eventual archiving and transferring to the MARMAP Ecosystem Data Base and Information Management (MEDBIM) System, the eventual replacement of the MIS.

Karen Johnson continued pulling 1977 station information for eventual archiving and transferring to the MEDBIM System.

Tom Plichta, Robert Sand, and Steve Eldridge accomplished the following: (1) updated 10 cruises with calibration factors; (2) continued updating the zoo-plankton-counts definition field; (3) wrote a program to update flowmeter numbers; (4) generated logged correlations and plots of Atlantic herring versus Atlantic mackerel for Bernie Skud; (5) searched the data base for Brachyura information; (6) generated 1978 indexes of ichthyoplankton dominance; (7) ran Statistical Analysis System programs for Jack Colton, Jack Casey, and Kenneth Sherman; and (8) searched master file generations on tape to allow our contractor--Input-Output Computer Services, Inc.--to clean up little-used data tapes.

The following actions were taken on the following master files/data sets:

Master file	Data set	Action
AL 8012	Station	Merged
AL 8012	Net	Merged
DL 7806	Station	Merged
DL 7806	Net	Merged
EK 8001	Larvae	Edited
YV 7702	Larvae	Edited
EK 8001	Volumes	Edited

Travel, Meetings, and Presentations

During 1-4 March, Geoff Laurence attended the Fifth Annual Larval Fish Conference at Louisiana State University in Baton Rouge.

During 2-5 March, Arthur Allen, George Bolz, Donna Busch, Ed Cohen, Jack Colton, Cabell Davis, Jack Green, Marv Grosslein, Greg Lough, William Michaels, David Mountain, Dan Patanjo, Dave Potter, Steve Ramp, Ron Schlitz, Ken Sherman, and Red Wright participated in the Third Gulf of Maine Workshop at the University of New Hampshire. A list of the papers presented is in the "Publications" section.

On 10 March, Dave Potter chaired a meeting of the solar projects managers, A&E firm engineers, and our contracting officer (Tony Bucelle) to finalize a contract for the NEFC multilaboratory solar systems design. He also attended three other meetings of the Woods Hole Laboratory Space Committee.

During 9-13 March, Kenneth Sherman served on a review panel for "National Experts" at the US Environmental Protection Agency's Narragansett Laboratory.

Bob Marak participated on an Antarctic cruise aboard the Melville for the month.

On 11 March, Julien Goulet attended the Eastern Regional Remote Sensing Applications Conference in Danvers, Massachusetts, and Lorrie Sullivan presented an in-house seminar on American plaice in the Gulf of Maine, discussing life history and the development of the fishery.

On 14 March, Wes Pratt gave a presentation at the Annual Sea Rover's Convention in Boston, Massachusetts.

On 16 March, Lorrie Sullivan gave her American plaice lecture to the URI Graduate School of Oceanography.

On 16 March, Fred M. Vukovich of Triangle Park, North Carolina, gave a talk at the Narragansett Laboratory on the application of remote sensing to fisheries research.

On 17 March, Julien Goulet, Tom Plichta, and Sandy Lundin (AEG) visited Jim Sargent, Jean Hopson, and Kay Paine (Woods Hole Laboratory) to discuss our Data Dictionary/Directory System requirements.

On 25 March, Saul Saila (URI) and Cindy Jones (URI) met with Ken Sherman, Jack Colton, Julien Goulet, Marv Grosslein, Wally Smith, and Dave Mountain regarding joint effort in evaluating the probable impacts of a large oil spill on the growth and survival of fish eggs and larvae on Georges Bank. Also, on the 25th, there was a Marine Ecosystems Division meeting at the Narragansett Laboratory to develop input for revising the MARMAP Program Development Plan.

On 28 March, Jack Casey lectured on sharks to the American Littoral Society Symposium at the American Museum of Natural History. Wes Pratt and Chuck Stillwell also attended the symposium.

Publications

- Allen, A. A.; Schlitz, R. J. The Atlantic larval herring patch study of 1978: further results from the current observations on northern Georges Bank. Third Informal Workshop on the Oceanography of the Gulf of Maine and Adjacent Seas; 1981 March 2-5; University of New Hampshire, Durham, N.H. (Abstract in press.)
- Buckley, L. J.; Dillman, D. W. Nitrogen utilization by larval summer flounder (Paralichthys dentatus) (Linnaeus). J. Exp. Mar. Biol. Ecol. (S)
- Bush, K. A.; Schlitz, R. J. Gulf of Maine/Georges Bank water transports into the Middle Atlantic Bight determined from a box model and from current meter records. Third Informal Workshop on the Oceanography of the Gulf of Maine and Adjacent Seas; 1981 March 2-5; University of New Hampshire, Durham, N.H. (Abstract in press.)
- Cohen, E.; Wright, W. R.; Schlitz, R. J. Primary productivity on Georges Bank with an explanation of why it is so high. Third Informal Workshop on the Oceanography of the Gulf of Maine and Adjacent Seas; 1981 March 2-5; University of New Hampshire, Durham, N.H. (Abstract in press.)
- Cohen, R. E.; Lough, R. G. Comparison of reported length-weight relationships for the dominant copepod prey of larval sea herring in the Georges Bank-Gulf of Maine area. J. Northw. Atl. Fish. Sci. (S)
- Colton, J. Advective processes and the recruitment of fishes. Third Informal Workshop on the Oceanography of the Gulf of Maine and Adjacent Seas; 1981 March 2-5; University of New Hampshire, Durham, N.H. (Abstract in press.)
- Davis, C. Interaction of a copepod population with the mean circulation on Georges Bank. Third Informal Workshop on the Oceanography of the Gulf of Maine and Adjacent Seas; 1981 March 2-5; University of New Hampshire, Durham, N.H. (Abstract in press.)
- Langton, R. W.; Hurst, J. W.; Yentsch, C. M. Red tide: natural oceanic pollution. Third Informal Workshop on the Oceanography of the Gulf of Maine and Adjacent Seas; 1981 March 2-5; University of New Hampshire, Durham, N.H. (Abstract in press.)
- Lough, R. G.; Michaels, W. L. The vertical distribution and biology of the chaetognath Sagitta elegans on northeast Georges Bank. Third Informal Workshop on the Oceanography of the Gulf of Maine and Adjacent Seas; 1981 March 2-5; University of New Hampshire, Durham, N.H. (Abstract in press.)
- O'Reilly, J. E.; Evans, C. A.; Busch, D. A. Distribution of phytoplankton biomass (chlorophyll-a) and primary productivity in shelf water between Cape Hatteras and Nova Scotia. Third Informal Workshop on the Oceanography of the Gulf of Maine and Adjacent Seas; 1981 March 2-5; University of New Hampshire, Durham, N.H. (Abstract in press.)

- Patanjo, D.; Pastuszak, M. Seasonal variation of nutrients in the Georges Bank region. Third Informal Workshop on the Oceanography of the Gulf of Maine and Adjacent Seas; 1981 March 2-5; University of New Hampshire, Durham, N.H. (Abstract in press.)
- Pennington, M. Abundance estimates based on stratified random trawl surveys. Can. Fish. Mar. Serv. Tech. Rep. (S)
- Potter, D. C.; Lough, R. G. Vertical distribution of herring larvae (Clupea harengus L.) on Nantucket Shoals, November 1977, collected by MOCNESS aboard Anton Dohrn 77-03. Third Informal Workshop on the Oceanography of the Gulf of Maine and Adjacent Seas; 1981 March 2-5; University of New Hampshire, Durham, N.H. (Abstract in press.)
- Ramp, S. R.; Schlitz, R. J.; Wright, W. R. Northeast Channel flow and the Gulf of Maine heat and nutrient budget. Third Informal Workshop on the Oceanography of the Gulf of Maine and Adjacent Seas; 1981 March 2-5; University of New Hampshire, Durham, N.H. (Abstract in press.)
- Roberts-Goodwin, S. Biological and fisheries data on striped searobin, Prionotus evolans (Linnaeus). Sandy Hook Lab. Tech. Ser. Rep. No. 25; 1981. 50 p.
- Robinson, W.; Pennington, M.; Langton, R. Variability of tubule types within the digestive glands of Mercenaria mercenaria (L.), Ostrea edulis L., and Mytilus edulis L. J. Exp. Mar. Biol. Ecol. (S)
- Schlitz, R. J.; Allen, A. A. Geostrophic transports east of Cape Cod in November 1980. Third Informal Workshop on the Oceanography of the Gulf of Maine and Adjacent Seas; 1981 March 2-5; University of New Hampshire, Durham, N.H. (Abstract in press.)
- Sherman, K. Zooplankton of Georges Bank and adjacent waters in relation to fishery ecosystem studies. Third Informal Workshop on the Oceanography of the Gulf of Maine and Adjacent Seas; 1981 March 2-5; University of New Hampshire, Durham, N.H. (Abstract in press.)
- Sibunka, J. D.; Pacheco, A. Biological and fisheries data on northern puffer, Sphoeroides maculatus (Bloch and Schneider). Sandy Hook Lab. Tech. Ser. Rep. No. 26; 1981. 56 p.

Reports

- Bolz, G. R.; Lough, R. G. Ichthyoplankton distribution and abundance for species collected on ICNAF larval herring surveys, September 1971-February 1977. Woods Hole Lab. Ref. Doc. No. 81-08; 1981. 446 p.

RESOURCE UTILIZATION DIVISION

Fisheries Engineering Investigation

Research Vessel Activity

Renovations of the Gloucester Laboratory's R/V Gloria Michelle are speeding up as preparations are being made for the Nantucket Shoals experiment in May. Some of the new steel doors and insulation have been installed in the pilot house, new windows have been placed in the deck house, and a new electrical system is also being installed.

The Gloucester Laboratory's other research vessel, the Rorqual, made a couple of day trips to transport Center divers to their study area at Pigeon Hill.

Engineering Assistance to Other Center Programs

Redesigning and drafting plans for the Center's surf clam - ocean quahog survey dredge have been completed and are ready for bid. The fixed ramp has had more modifications made to it. Load calculations were made on the supporting columns and the whole assembly redrafted. Detailed drawings of components are nearly complete.

Vern Nulk and Ron Smolowitz are writing a paper on the design of an electro-hydraulic dredge for surf clam - ocean quahog surveys.

Jack Moakley completed the March trip on the ship of opportunity, M/V Marine Evangeline, for AEG.

A special vending machine that is expected to save energy and reduce the incidence of spoilage of fish fillets is undergoing performance tests.

Tom Connors evaluated changes in energy consumption at the Gloucester Laboratory as a result of the facility's alternative work schedule experiment.

Jack Moakley and Al Blott inspected a confiscated fishing vessel in Boston for the NMFS Central Office.

Facilities and Safety

Renovations are underway to freezer room #6. All walls and floors have been torn out and new insulation installed. Floor insulation was set and a new concrete floor poured. The cold plates have been removed in order to have access to the ceiling.

A contract for the design of the solar heating system has been let to Solar Design Associates of Lincoln, Massachusetts.

Resource Development and Improvement Investigation

Storage Studies

An experiment on the preservative effect of a potassium sorbate dip on fish fillets was completed. Skinless Atlantic cod fillets cut from 1-day-old iced fish

(not brine-dipped at the plant) were dipped in 2.5 and 5.0% cold potassium sorbate, packaged in polyethylene (O₂ permeable) and Mylar (O₂ impermeable) pouches, and stored at 33°F.

The shelf life of the fillets packed in polyethylene pouches was 6 days for the nondipped control, 8 days for the fillets dipped in 2.5% potassium sorbate, and 15 days for those dipped in 5.0% sorbate. The shelf life of the fillets packed in Mylar pouches was 8 days for the nondipped control, 15 days for the fillets dipped in 2.5% sorbate, and 18 days for those dipped in 5.0% sorbate.

These results indicate that a potassium sorbate dip does extend the shelf life of fillets cut from 1-day-old fish. Shelf life is also influenced by the type of packaging used -- being generally lower when the fillets were packaged in film which was highly permeable to oxygen, such as 0.001-0.002 inch polyethylene. This experiment will be repeated.

Frozen Fish Quality Studies

We made a trip to the supermarket chain in Albany, New York, selling the "U.S. Grade A" frozen fish. Purpose of the trip was to monitor the temperature of the frozen fish in the frozen food cases and to bring back samples to be graded by USDC inspectors and Gloucester Laboratory panelists. The temperature readings on the surface of the fish varied from 15° to 30°F. The highest temperatures were recorded on the top of the open well-type cases as opposed to the tier-type cases. Since these temperatures are much too high to store good quality frozen fish, the processor was notified. He was to notify the fish buyer for the supermarket chain who in turn was to inform the meat managers. The USDC inspectors certified all samples as "U.S. Grade A." However, our taste testers graded the fish samples between borderline and good. These high storage temperatures and the rise in temperatures as the freezer chests go through their defrost cycles appear to reduce the quality of the frozen fish very quickly.

Preliminary sales data for the "U.S. Grade A" frozen fish show an upward trend. This is especially significant because of their high retail cost.

As an offshoot of the frozen fish study, we are looking at some of the characteristics of packaging films for fresh fish and at the energy requirements and temperature control capabilities of a special frozen food vending machine.

Nutrition

Duties have been rearranged to continue the nutrition and species identification studies, but also to take on the added responsibility of helping the Ocean Pulse Program. Our nutrition program is becoming more widely known. Phone inquiries on seafood nutrition are coming from several different states. Initially, referrals were coming solely from the Massachusetts Nutrition Resource Center.

Manuscripts in Progress

1. "Variation in Cholesterol and Fatty Acid Content Among Four Species of Crabs."
2. "Food Value" for Marine Angler's Guide to Fish as Food.

Product Quality, Safety, and Standards Investigation

Product Quality

Samples of dogfish from a frozen storage study being conducted at 0°F were analyzed after 10 wk of storage. Prior to frozen storage, these samples had been held either 3 days in the round or 3 days in the round plus 8 days headed and gutted on ice. For frozen storage, fillets and belly flaps were packaged separately either in 0.002-inch polyethylene (air permeable) or in nylon bags under vacuum. It may be premature at this point to detect definite trends; however, it appears that the extractable protein nitrogen is decreasing more rapidly in the air-packed samples for both fillets and belly flaps. The thiobarbituric acid values have risen most sharply in the air-packed belly flaps and taste panelists have detected the occurrence of rancidity in these samples. No changes in pH, ammonia, and amine values are noticeable at this stage of the study.

A preliminary experiment was completed in which the dimethylamine/formaldehyde producing enzyme (TMAO-ase) isolated from red hake muscle was made to function in admixture with minced American plaice, a flounder species not normally capable of producing dimethylamine and formaldehyde. Storage was under anaerobic conditions at 32°F. The TMAO-ase fraction contained molecular species of 300 000 Daltons or larger and was shown to be functional in-vivo utilizing the flounder's endogenous substrate and cofactors. A low-molecular-weight (<300 000) fraction produced only traces of dimethylamine and formaldehyde when mixed with the minced flounder, while a water control produced none. This experiment is being repeated.

The collaborative study sponsored by the Association of Official Analytical Chemists of the agarose gel isoelectric focusing method is continuing. All samples reached their destinations intact. Three collaborating laboratories have completed the study thus far, each with 100% correct identifications. Two collaborators have reported problems with agarose gels coming off the plate during the staining procedure and suggestions were made to overcome the problem.

After trying numerous procedures, we have settled on a standard method for extraction of sarcoplasmic proteins from larval fish. Thus far, we have obtained clear, distinct, species-specific protein patterns for the larvae of three species of fish -- "swordtails" from the lab's aquarium, sheepshead minnow, and Atlantic silverside. The next step will be to observe changes, if any, in the protein pattern at various growth stages of the larvae and also to examine as many larval species as we can obtain. Our ultimate goal is to differentiate the larvae of the Urophycis spp. hakes.

A progress report, "An Investigation into the Proper Handling Methods for Dogfish Post-Mortem and the Development of a Simple Rapid Method for Measuring the Ammonia Content," was prepared and submitted to the New England Fishery Development Program (headed by Warren Rathjen) to account for their funding of this project.

Two manuscripts have been written for the August meeting of the International Institute of Refrigeration; these will be submitted for publication in the meeting proceedings:

1. Licciardello, J. J.; Ravesi, E. M.; Lundstrom, R. C.; Wilhelm, K. A.; Correia, F. F.; Allsup, M. G. Frozen storage stability of red hake fillet blocks.
2. Lundstrom, R. C.; Correia, F. F.; Wilhelm, K. A. Dimethylamine and formaldehyde production in fresh red hake (Urophycis chuss): the effect of packaging material, oxygen permeability and cellular damage.

Product Safety

Fall samples collected from Los Angeles harbor and Catalina have been worked up and analyzed for polychlorinated biphenyls (PCB) by gas-liquid chromatography. Samples of mackerel, white croaker, Pacific sanddab, halfmoon, sculpin, surf perch, and kelp bass were the species composited from these areas.

A shipment of florisisil and silica-gel extracts of striped bass muscle, testes, and ovaries has been sent to Mr. Bows of the University of California's Department of Environmental Toxicology, for PCB confirmation analysis by gas chromatography - mass spectrometry.

The Electron Capture Ni⁶³ Detector is malfunctioning due to electronic difficulties. The AS-100 Autosampler is experiencing software problems. Both units will be repaired as soon as the proper parts arrive.

Product Standardization

A revised draft of a "U.S. Standards for Grades of Fresh and Frozen Fish Steaks" is being reviewed by the USDC Inspection Service and by industry.

An initial draft of a "U.S. Standards for Grades of Frozen Fish Portions and Fish Sticks" has been prepared. This draft covers products described in four published U.S. standards for grades and other products that are commercially available.

We are assisting in the review of a draft final report from the US Army Natick Laboratories' nomenclature project. This draft represents 2 yr of work on a contract titled "Consumer and Instrumental Edibility Measures for Grouping of Fish Species."

A revised draft of the "Proposed U.S. General Standards for Grades of Shrimp" is being typed. It will be transmitted to the NMFS Central Office for publication in the Federal Register as a "Proposed Rulemaking." Over 65 pages of comments have been reviewed and resolved in the preparation of this draft. All forms of shrimp except breaded are included.

Three official methods of determining drained weight of shrimp are being tested with the cooperation of a large processor. Additionally, net weight losses during the distribution chain are being studied.

In accordance with the USDC Memorandum of Understanding with the USDA concerning fishery specifications, the USDA has requested the Natick Laboratories to transfer all fishery standardization documents to the NMFS. We are still awaiting a formal communication from the USDA transferring specification responsibility to the NMFS. It is our understanding that the lead for this program will be assigned to our Gloucester Laboratory/Resource Utilization Division.

A market research questionnaire on the use of fish sticks and portions was prepared and submitted to the USDA for their approval. An extensive list of private and government users was prepared for use in these market research studies.

Technical Assistance

Information and technical assistance were provided in the following areas: preserving crab specimens; aquaculture; American eels; four-panel trawls and beam trawls; species identification; processing silver hake; salting, curing, and smoking fish; processing Atlantic herring; collection of Atlantic herring scales for pearl essence; agarose gel isoelectric focusing; preparation of specifications; canning Atlantic mackerel; acid hydrolysis of fish materials; fisheries development; Japanese requirements for imported fish; smoking of trout; fish processing and preservation; shelf life of fish; fishing on Lake Erie; fish flesh loss during the processing of fried breaded portions; cutting losses during production of fish portions; underutilized fish; and anaerobic packaging of unfrozen fish and the potential of botulism hazard.

Travel, Meetings, and Presentations

Judi Krzynowek attended the first meeting of the Northeast Regional Fisheries Information System at the Woods Hole Laboratory.

Al Blott attended the Rhode Island Fishermen's Forum.

Fred King attended a meeting of the New England Fisheries Institute in Beverly, Massachusetts, on 26 February.

Perry Lane attended the monthly meeting of the New England Fisheries Steering Committee, a workshop on marketing fish in Japan, and the Hyannis Fishermen's Forum.

University Affairs

Mary Zabik from Michigan State University's Department of Food Science and Human Nutrition sought seafood nutrition data from us.

Ron Lundstrom met with Dr. Tom Gill of the Technical University of Nova Scotia to discuss mutual research on TMAO-ase and textural deterioration in red hake.

Al Blott met with URI Marine Advisory Service staff to discuss the future of the Cooperative Fisheries Engineering Unit.

Louis Ronsivalli attended a meeting of the Curriculum Advisory Board Chairmen at Essex Agricultural and Technical Institute.

Personnel

Fred King participated in a meeting of the Center Incentive Awards Committee, held on 3 March.

DIVISION OF ENVIRONMENTAL ASSESSMENT

Coastal Ecosystems Investigation

Community Structure

Clyde MacKenzie and Dave Radosh worked on their in-situ experiments to determine: (1) effects of sediments from areas with various degrees of contamination on burrowing rates of surf clams, and (2) trace metal uptake by clams from "control" areas versus clams transferred to more polluted conditions.

Dave and Steve Fromm continued sampling in Raritan Bay and environs to study effects of the prolonged drought on sediment contaminant levels and on macrofauna. They also provided polychaetes from the New York Bight dumpsites to Judy Grassle of WHOI for electrophoretic analysis of genetic characteristics. Bob Reid planned and chaired a meeting of principal investigators for all Northeast Monitoring Program (NEMP) benthic ecology projects. The meeting covered status of each project, standardization of sampling methodologies and data presentation, new types of studies and data analyses, funding, and future directions. Ann Frame nearly completed the identification/confirmation work on macrofauna collected on the summer 1980 New York Bight benthic contaminants cruise. We are preparing a report on the findings of the several disciplines involved in this cruise. Preparations are underway for the summer 1981 cruise. We provided information on: (1) NEMP Georges Bank sampling and overall studies to Bruce Higgins of the Northeast Regional Office's Habitat Protection Branch in Gloucester; (2) species present in the New York Bight and levels of trace metals and their bioaccumulation, to US Army Corps of Engineers (COE) personnel developing an impact statement on spoil disposal in the Bight; (3) our macrofauna studies in the Bight to John Lang of the COE's Waterways Experiment Station; and (4) fates and effects of metals and hydrocarbons to EG&G Consultants, Inc.

Benthic Energetics

We continued developing cruise plans for the upcoming spring survey. We also continued work on loose ends for the annual NEMP report, preparing seemingly endless charts and tables, as well as some final rewriting. We began analyzing benthic biomass data by cleaning up the files, and worked with the Sandy Hook Laboratory ADP Unit to develop procedures for sorting and compiling data for further analysis.

Behavior of Marine Fishes and Invertebrates Investigation

We are completing data analysis on a series of studies which examine prey consumption and feeding motivation in adult bluefish as related to fish size and food deprivation periods. Examination of consumption rates in two schools of fish with mean weights of 5.3 kg and 1.7 kg showed that for both schools, meal size increased as the deprivation period increased from 1 to 5 days. Consumption rates (grams of prey per fish) also increased as a function of fish size. However, when the consumption rate is examined on the basis of grams of prey per kilogram of fish, there is no apparent size difference in the daily consumption rate which averaged about 60 g/kg. When completed, these results should provide valuable information for assessing the impact of bluefish predation on prey populations.

Environmental Chemistry Investigation

Several members of this Investigation participated in the spring MARMAP I survey (Albatross IV Cruise No. AL 81-01). Al Matte, Hank Rota, and Ingro Revouges collected 1206 seawater samples for nutrient analyses. Kathy Workman, Bob Fitzgerald and Jim Duggan made 1780 estimates of chlorophyll-a at 100 stations. Ralph Bruno measured ^{14}C primary productivity at 39 stations. Additional samples of the large netphytoplankton retained in a 53-micron-mesh bongo net are currently being examined to determine the spring abundance of Ceratium tripos throughout the shelf.

Ruth Waldhauer and Ingro Revouges completed 3160 analyses of inorganic nutrients (nitrate, nitrite, silicate, and phosphate) for seawater using the Technicon Auto-analyzer. Salinity measurements on 625 seawater samples collected during two Ocean Pulse Program (OPP) surveys (Kelez Cruise No. KE 80-11 and Delaware II Cruise No. DE 80-09) were also completed.

Andrew Draxler served as Chief Scientist aboard the Sandy Hook Laboratory's R/V Kyma during three 1-2 day surveys of the Hudson-Raritan estuary and estuarine plume which were designed to evaluate the influence of the drought and low water runoff on nutrient distributions, and on benthic contaminant (trace metal) distributions.

We received samples of sediments and particulate material caught in floating and stationary sediment traps by members of the Brookhaven National Laboratory and W. Phoel of Sandy Hook Laboratory during their recent Hudson plume study aboard the WHOI R/V Knorr. We failed to calibrate our recently acquired mercury analyzer. Additional noncontaminating hot plates and fume hoods were constructed to increase sample handling capabilities. Analyses of metals in tissues of sea scallop and winter flounder (collected during the OPP survey on Albatross IV Cruise No. AL 79-07) were begun. We developed a format for entering the trace metal data collected during NEMP surveys into our computer.

Andrew Draxler, working with Bob Pickanowski of the Sandy Hook Laboratory ADP Unit, completed work on the development of a Lambert conformal conical projection of the New York Bight area. This computer program is a subset of the shelfwide (Cape Hatteras to Canada) program which we developed for the purpose of plotting and contouring (SYMAB) MARMAP and OPP data directly from the chlorophyll-nutrient-productivity data matrix.

Biological Oceanography Investigation

Bill Phoel and Steve Spina participated in the Brookhaven National Laboratory cruise on the Knorr from 4 to 21 March. We incubated 101 sediment cores from 18 stations in the New York Bight to determine rates of oxygen consumption by the seabed. Fifty-four cores were incubated to determine inorganic nutrient flux rates between the seabed and bottom water. Replicate core samples from each station were frozen for metal, total organic carbon, total Kjeldahl nitrogen, and grain-size analyses. Cores from selected stations were analysed on board to provide profiles of pore-water nutrients, as well as chlorophyll and phaeopigment concentrations, with depth in the sediment. A split core from the continental slope area and split samples of material obtained from floating sediment traps were provided to Vincent Zdanowicz of the Environmental Chemistry Investigation for metal analyses.

These data will be integrated with those collected by the other investigators on the cruise. The reduction of data, started on the cruises, is continuing.

Data reduction, graphing, and drafting of the entire FY1980 Superflux data set continued. In addition, effort continued on three of four papers to be included in the proceedings of the Superflux Symposium. Jim Thomas presented an invited seminar at Suffolk University in Boston, Massachusetts, on "Superflux and New Technology for Monitoring Coastal Waters."

Revisions on a paper, "Effects of Trace Metals on Growth of a Phytoflagellate, *Olisthodiscus luteus*, Which Blooms in Lower New York Bay," were completed. Some data workup was done on the effects of light intensity, photoperiod, and temperature on *O. luteus* and two other phytoplankton species which cause "red tides" in New York-New Jersey waters. This is the last major data set on the bloom studies in file. Ongoing work on algal bioassay of northeastern shelf waters was continued. In the latest assay run, nutrient additions were facilitated by the use of standardized splice volumes and automatic precision pipettes. The new model ZBI coulter counter has been recalibrated for a simpler electrolyte.

Work continued on phytoplankton community structure in northeastern US waters by Myra S. Cohn and Harold G. Marshall (Old Dominion University). Five separate data reports will be issued to cover each of the four seasons plus an overview summary.

Environmental Statistics Investigation

The Environmental Statistics Investigation performed statistical analysis on the prevalence of vertebral anomalies in *Ammodytes* sp./spp. which had been determined by the Pathobiology Division. A hypothesis that there is no significant temporal and spatial differences in prevalence was tested. We found there was a difference ($p < 0.005$) among regions, namely north of Nantucket Shoals, from Nantucket Shoals to the mouth of Delaware Bay, and south of the mouth of Delaware Bay. The difference may be attributed to different spawning stocks as mentioned by Richards and Kendall (Fishery Bulletin (US) 71(2):371-383;1973). However, the possible determining factors such as temperature, sediment, food, and genetic makeup could not be properly assessed due to insufficient data. Inshore/offshore as well as clean/contaminated water differences in these samples are now being analyzed.

The first draft of a manual titled "User's Guide to NEMP Data Entry and Manipulation by Computer" was completed. It describes the procedural steps for sorting, retrieving, and processing data files on an interactive basis. Terminal-use demonstration sessions are being arranged for the Milford and Oxford Laboratories within the next month.

A paper, "Species Sensitivity Study for Heavy Metal Load Monitoring Via a Canonical Variable Approach," for presentation at the "Environments 81" meeting in April is being prepared. In the paper we attempt to determine an indicator species or group of species for heavy metal monitoring in the New York Bight. Results of species interactive correlations based on heavy metal trace samples demonstrate a strong interaction with dietary linkages and habitat selection among species. The refinement of methodology for analysis is achieved by a changing (not fixed) number of principal components (axes) selection for each species instead of using a fixed number of components. For example, if the expressed variability for the heavy metal load is high enough for the analysis with the first or second component, the selection of components for that particular species is done without searching further.

An environmental data monitoring scheme for NEMP has been prepared. It would be a supplement to the biometric guidebook. It describes the criteria for selection of indicator species, key parameters, and their sampling requirements. The scheme also explains a general description of functional strata, a device not only useful as a sampling-frame unit, but also for use as a basic investigative water-mass unit. A statistical base for monitoring systems using grid configuration is also discussed. Furthermore, the linkage among functional strata would be one of several goals to be achieved for biological and environmental monitoring in NEMP.

Physiological Effects of Pollutant Stress Investigation

Physioecology

Surf clam and bay scallop exposure to either copper or silver in a diluter system continues. Dead animals are being removed and recorded daily.

One American oyster embryo experiment was conducted this month. Unfortunately, only 10% of the embryos developed normally in the controls, so the data could not be used.

Exposure of lab-reared blue mussels to either silver or copper in a diluter system continues. The animals continue to be measured for growth on a monthly basis.

The remainder of the reporting period was spent rewiring the existing diluter systems to make them safer. One diluter is being modified to a newer and more efficient design.

Chemistry

Sampling of windowpane in Long Island Sound for analysis of metals and PCB's in tissue samples continues. Results thus far show no significant difference in levels of these pollutants in livers of fish collected at three locations -- clean, moderately contaminated, and highly contaminated. Samples of kidney tissues are now being collected and analyzed for the presence of these pollutants.

Our work on a procedure for copper analysis in seawater continues. Recent modifications of a procedure reported earlier looks promising and this methodology will be rigorously tested over the next several weeks.

Physiological Effects

We have completed another sampling of windowpane at three stations in Long Island Sound. Analysis of the blood samples is in progress.

Sea scallops exposed to silver for 90 days were sampled this month. Measurements of gill-tissue respiration and hemolymph sodium, potassium, calcium, and osmolality have been completed.

Scanning electron microscope examination of the gills of windowpane exposed to cadmium continued.

Biochemical Effects

Bench work this month finished off all the adductor muscle samples from sea scallops collected on OPP surveys (during Albatross IV Cruises No.'s AL 80-07 and AL 80-09), and work continued on the large backlog of Resource Survey Investigation-provided samples. We've made a priority list for these on our testing schedule, based on cruise date and station coordinates; Don Flescher supplies us with the pertinent computer printouts for each cruise. Resource Surveys has sent us many deepwater sea scallop adductor muscle samples from the bottom trawl surveys (Henry Jensen interested us in this anomalous population), and others that we hope are near enough the "Mud Patch" (south of Martha's Vineyard) to show some detectable metabolic stress, since Mud Patch sediments have been shown by Jay O'Reilly's group to be high in heavy metals and other pollutants. Both scallop populations are especially valuable in establishing baseline ranges and in assessing field stress.

The glycogen test, worked out last month, has been added to the testing schedule (the nonregulatory enzyme AK was dropped to make room), with the first results coming from a deepwater station (155 m, 6.0°C) on Albatross IV Cruise No. AL 80-09, from its control -- Fippennies Ledge (68 m, 7.3°C), from central Georges Bank (65 m, 14.0°C), and from the sea scallop station below the Delaware transect -- SS #2 (58 m, 7.5°C). Glycogen reserves in the adductor muscle of deepwater animals were found to be only one-third of those at the control station (with the same population and same size animal); the control animals, in turn, had only slightly more than one-half the adductor muscle glycogen found in central Georges Bank animals (at the same depth but 7°C warmer) and considerably less than one-half that of the southern population (at a similar depth and temperature). Nutrient analysis of the digestive mass seems to be in order. The low energy charge indicated in the deepwater animals (cf. February narrative report for high GlutDH and low PK), combined with the abnormally low glycogen, all in animals collected in mid-September (normal spawning season), suggests poor reproductive potential.

Analyses were also completed on sea scallop kidneys collected during last December's OPP survey on Delaware II Cruise No. DE 80-09, and included our first samples from the allegedly anomalous Block Island Sound population. Our six specimens had brownish gonads and one had a small, tough adductor muscle. The kidneys of these animals, compared to kidneys of animals from other stations, had very significantly lower activity in redox (MDH), citric acid cycle (IDH), and biosynthetic (G6PDH) activities, especially the animal with the small adductor muscle. These were the first unhealthy looking scallops collected in the field, and show considerably greater stress than we have been able to produce in our long-term sublethal exposure studies. This Block Island Sound population, first brought to our attention by the Resource Surveys staff, seems to be small in proportion to shell size, and to have small, tough adductor muscle; it also lies north-by-northwest of the Mud Patch. These two observations probably have some connection.

In preparation for the upcoming cooperative field study with the EPA relative to the seven monthly samplings over their blue mussels in Narragansett Bay, we determined optimal protocols for IDH and GlutDH measurements in posterior adductor muscle and gills. GlutDH apparently exists in a different form in each of the two tissues, since we found that the posterior adductor muscle enzyme is even more active with pyruvate than with α -ketoglutarate, the normal keto-acid substrate, whereas the gill

enzyme is inactive with pyruvate. It seems a logical metabolic ploy, since pyruvate is the major precursor of alanine, one of the major end products in anaerobiosis.

With the Physiological Effects and Chemistry Subtasks, we took down the final group of silver-exposed sea scallops (90 days at 10 ppb). Analysis has been completed on kidney and gills, with the adductor muscle archived at -80°C for later testing.

We received the first tissue collection from what we hope will be monthly samplings of a single scallop population off New Jersey's coast. In this effort we are strongly abetted by Sandy Hook Laboratory personnel; Bill Steiner collects the animals and Vinnie Zdanowicz dissects out, packages, labels, and freezes the kidneys and adductor muscles for us, as well as preserving a bit of gonad tissue from six male and six female scallops, all ca. 10 cm. The kidney analyses are finished and we'll work the adductor muscles in soon.

Another cooperative venture involves Stuart Sherburne and Dan Schick of the Maine Department of Marine Resources. They have already supplied us with 100 live sea scallops (diver-collected) for our exposure studies; they have promised to sample a shallow upriver colony in the Damariscotta, living at salinities in the low 20 ‰ at best (this in response to my search for stressed, field-collected scallops); and, if they are able to continue what has been an annual August sampling cruise, they will take deepwater scallops for me, with special attention to gonad condition. No one seems to know when, or even if, they spawn. From the 100 live animals received, which varied in size from 6 to 16 cm, we sampled the smallest and the largest for kidney and adductor muscle tissue, for future examination into possible size-related differences in the metabolic patterns we're currently using to detect early stress.

We submitted a paper title to the National Shellfisheries Association for their joint annual meeting with the Shellfish Institute of North America--"Enzyme Patterns in the Sea Scallop, Placopecten magellanicus, with Respect to Environmental Variables: Animal Size, and Cadmium Exposure."

Anaerobic Bacteriology/Metabolism

During the past month the biochemical identification of bacterial isolates obtained from past OPP cruises has continued. Clostridium perfringens continues to be the predominant clostridial type present in sediments from inshore waters. Some additional 30 isolates from the Vibrio group have been screened. The results are as observed previously; many of the bacterial isolates are not identified with our present schemata, but the index of organisms is being detected: V. cholerae, V. parahaemolyticus, aeromonas ssp, and lactose-positive Vibrio's. The lactose-positive group has been given a name, V. vulnificus, based on information obtained at a recent microbiology meeting. In addition, another of the V. cholerae group has been named V. mimicus (mimics V. cholerae). No doubt, additional species will be designated because of the interest being generated in this area. Our data base on unidentified bacterial isolates thus becomes of significance.

Sampling of our Long Island Sound OPP stations has continued. Isolates are being identified.

Sediment samples collected on a recent cruise in Raritan Bay were processed for bacteriological analysis. Bacterial counts in sediments were high: approximately 10^6

cells per gram for C. perfringens and 10^2 per gram for the Vibrio's. As an index, C. perfringens counts in sediments from the New York Bight sewage dumpsite amount to about 10^5 per gram. Identification of isolates from clostridial plates showed them to be all C. perfringens. These results will provide a data base for future work.

Lab-held striped bass with characteristics of tail fin (caudal) erosion were examined for bacteria. Several different isolates were obtained from the lesions and blood of the fish. The cannibalistic lesions (i.e., eyes removed) may have resulted in the systemic invasion of bacteria from the tank water itself. Scanning electron micrographs of the tail lesions showed the presence of cocci, cocco-bacilli, and bacilli on the surface of the tail lesions. These were essentially the same morphological types observed in gram-stain preparations of the material.

Travel, Meetings, and Presentations

Dr. John Graikoski attended the 81st Annual Meeting of the American Society of Microbiology at Dallas, Texas, during 1-6 March and presented a poster session on the "Distribution of Clostridium perfringens in Bottom Sediments from the Western Atlantic Ocean."

On 10 and 11 March, Frank Steimle, Robert Reid, Jay O'Reilly, and other members of the NEMP management team continued to finish drafting the NEMP annual report at the Milford Laboratory.

On 28 March, Frank Steimle and Dave Radosh participated with other principal investigators involved in benthic studies in a benthic workshop at the Sandy Hook Laboratory to discuss progress and problems in NEMP benthic monitoring.

On 28 and 29 March, Frank Steimle, Dot Jeffress, Anne Frame, and Bob Reid attended the Annual East Coast Benthic Meeting at Yale University in New Haven, Connecticut, where Bob gave a paper on the benthic studies of NEMP.

On 28 March, Russ Terranova presented a short paper at the Annual Meeting of the New Jersey Academy of Sciences held at Atlantic County Community College. The paper was on our preliminary study of the caloric content and condition indexes of shark livers. Steve Fromm gave a paper on "Chemistry and Fishes of the Coastal Waters of Monmouth County" at the same conference.

On Tuesday, 17 March, Dr. John Pearce participated in a New Jersey Department of Environmental Protection's (NJDEP) "New Jersey Toxic Substances Symposium." This meeting, held in Princeton, New Jersey, brought together federal and state personnel, as well as academic personnel from the New York Metropolitan Area. The principal purpose was to inform the participants about the ongoing activities within the NJDEP Toxic Substances Office. Important findings suggest far greater levels of toxic substances in various ground waters and reservoirs than had been heretofore anticipated. From a research point of view, it is interesting that NJDEP personnel hold a significant amount of data that may be important in terms of sources of contaminants to estuarine and marine waters. One investigator reported upon a program which is quite similar to OPP and emphasizes biological-effects monitoring in freshwater, riverine, and reservoir systems.

On Friday, 20 March, Dr. Pearce met with Dr. Robert Lippson of the Northeast Regional Office's Habitat Protection Branch to discuss further how OPP and NEMP

monitoring data can be used by the Branch. Also discussed was the matter of preparing review and synthesis papers on topics such as PCB's, impacts of dredging, and offshore petroleum development. A number of syntheses or reviews prepared for the ICES Group of Experts on the Scientific Aspects of Marine Pollution, as well as other international organizations, have already been furnished to Dr. Lippson for his use.

On Tuesday, 24 March, Dr. Pearce met with Herb Stern and Mary Laird of the Center Directorate to discuss funding for Division research and monitoring activities including OPP. This important activity is essential to developing plans for the remainder of FY 1981, especially in terms of providing contract funds to OPP participants.

From 30 March through 4 April, Dr. Pearce participated in the ICES Advisory Committee on Marine Pollution meeting. The principal topic discussed during the meeting, which was held in Copenhagen, Denmark, included the results of the last 6 years of intercalibration activities concerned with heavy metals and later with PCB's, petroleum hydrocarbons, and other organic substances. Also discussed were current plans and directions to be taken by ICES in regard to biological-effects monitoring and further studies concerned with sources, fates, and effects of contaminants in marine estuarine and coastal ecosystems. Plans were made for activities of the ICES ocean water baseline and intercalibration activities in regard to selected contaminants. Participants were also responsible for reviewing a report concerned with trend monitoring and trend assessment using statistical techniques on data that have been collected as part of the ICES coordinated monitoring program. Several statistical techniques applied to the same data resulted in similar findings. The conclusion was that future coordinated monitoring activities should involve the collection of larger samples (25-60 fish per sample). The review of the coordinated monitoring data collected to date would suggest that it is possible to detect changes in body burdens of contaminants from one area to another.

Vincent Zdanowicz attended the Pittsburgh Conference in Analytical Chemistry during 9-13 March. He also attended a course offered by Perkin Elmer on the P.E. atomic absorption spectrometer, held during 30 March - 1 April.

Seminars

Clyde MacKenzie described his surf clam studies at the monthly seminar series on 4 March.

University Affairs

The Physiological Effects of Pollutant Stress Investigation at the Milford Laboratory hosted a graduate student class from the State University of New York at Stony Brook on 6 March.

Public Affairs

On 19 March, Bob Reid described types of NMFS jobs and environmental monitoring studies to several eighth grade classes at the Manasquan (New Jersey) Elementary School.

Personnel

Dr. F. Thurberg continued his temporary assignment at the NMFS Central Office.

Publications

MacInnes, J. R. Response of embryos of the American oyster Crassostrea virginica, to heavy metal mixtures. Mar. Environ. Res. J. 4(3):217-228; 1981. (P)

Pearce, J. B. The effects of pollution and the need for long-term monitoring. Helgol. Wiss. Meeresunters. 34:207-220;1980. (P)

Steimle, F. W., Jr. The benthic macroinvertebrates of Block Island Sound. Estuar. Coast. Mar. Sci. (S)

AQUACULTURE DIVISION

Aspects of Nutritional Requirements of Mollusks Investigation

Stock cultures and special strains of algae were subcultured, but somewhat behind schedule due to pressure of other work. Additional data were collected on the previous study of a paper-culture technique (Ukeles, R.; Bishop, J. An unusual method for the culture of unicellular marine algae. Journal of Phycology 12:332-335;1976). In 1978, 30 paper cultures were stored at 5°C to determine the potential of paper cultures for long-term storage. The strains in paper culture were immersed in an enriched seawater growth medium and after 3 wk, evidence of viability appeared in 17 cultures. In some flagellate species, motility was questionable, but Carteria sp. was an actively motile and rapidly reproducing flagellate. Observations on these strains will be continued.

Experiments were continued with small adult American oysters held in the rearing chamber to evaluate certain algal diets. Confirming results of the previous experiments, it was observed that Tetraselmis maculata yielded the most rapid growth in one group of oysters (15 mm). Slightly less growth, in decreasing order of magnitude, was observed in oysters fed with Pyramimonas sp. and Pseudoisochrysis paradoxa; no growth at all was observed in the unfed oysters. Two groups of oysters fed with diatom cultures suffered excessive mortalities and were removed from the experiment. It was speculated that mortality may have been due to contamination with the toxic red Pseudomonas since red stain was observed on the support screens of the chambers. However, Dr. Carolyn Brown has not isolated the toxic bacterium itself from the oyster samples.

Additional oyster feeding experiments were conducted with larger oysters (2-3 inches) to determine if the feeding schedule, using Tetraselmis maculata in two concentrations as the algal food, influenced oyster growth. After 5 wk of feeding and determining changes in weight, it became evident that either a single or a split feeding schedule affected growth in an identical manner. However, results showed that overfeeding can have a very detrimental effect on oysters as the higher concentration of food resulted in a considerable decrease in oyster growth in both feeding schedules.

Spawning and Rearing of Mollusks Investigation

A third set of histological preparations has been completed in an experiment to monitor gametogenic activity in young surf clams held at different temperatures and nutritional regimes. In the March sample, evidence of early development in both

male and female clams has been detected. No activity was recognized in previous samples in any of the treatments. Sample shells of the experimental clams are being preserved for study of the relationship between shell deposition and reproductive activity. The level of naturally occurring phytoplankton has increased this month, initiated by a late winter diatom bloom. After the increase, shell growth was observed in several groups of 8-mm clams held at 6°C ambient temperatures.

A series of mathematical expressions has been derived from experimental data which relate length versus weight and length versus volumetric biomass for young scallop clams between 1 and 60 mm. In addition, the dry weight of several species of cultured algae has been determined. This information will be useful in planned feeding and growth studies.

We have begun analysis of bay scallop overwintering in various types of cages and in various locations. Lantern nets appear to hold up better than rectangular wire cages under normal winter conditions; most cages were displaced, overturned, or missing. One estuarine scallop population examined so far exhibited very encouraging high winter survival.

Bay scallop larval feeding experiments to determine optimal algal concentration for efficient growth are nearly complete. The optimal concentration is about 10 000 cells/ml. Our concurrent tests to determine larval grazing rates indicate a consumption rate of around 100 cells/hr/larva for medium-sized animals. If both of these values hold in a more critical evaluation, a continuous feeding strategy maintaining about 10 000 cells/ml in larval cultures would require only 35% of the algae now used in the culture process, without reducing growth rate.

Aquacultural Genetics Investigation

A second generation of full-sib crosses was begun this month in a continuing effort to measure the effects and uses of intense inbreeding in the American oyster. One of the lines under study has persistently shown a disproportionately higher number of females than males. A second generation of oysters was also bred in the selection experiment comparing the results of selection for fast and slow growth of American oyster spat.

In a poster presentation for the North American Oyster Workshop and World Mariculture Society meeting (6-10 March), S. Stiles gave examples of the historical movement of oyster populations with commercial significance. Purposes of translocation included seeding of natural beds to enhance existing populations or to restock barren areas. Growing, fattening, and depuration areas are common also. Genetic implications of such transplant activities would depend upon genotypes, environmental influences and interactions, population size, adaptability, natural selection, and likelihood of transplanted populations crossing with endemic spawning populations. Lab studies on geographic populations of American oysters, including widely separated groups from Connecticut and Texas, revealed good crossability. Crossbred progeny grew and survived well in the Connecticut environment.

Preparations are being made for the first meeting of the ICES Working Group on Genetics to be held in Copenhagen in May.

S. Halvonik resigned from her temporary position.

Travel, Meetings, and Presentations

Ronald Goldberg presented a poster titled, "A Biological Assessment of the Surf Clam, Spisula solidissima, as a Species for Mariculture," at a meeting of the World Mariculture Society in Seattle, Washington.

Ed Rhodes attended the annual workshop of the Massachusetts Shellfish Officers Association in Salem, Massachusetts.

Visitors

Visitors to the Milford Laboratory included Dr. Patricia Morse of Northeastern University; Dr. A. Attisani and Mario Perry from New Rochelle, New York; Anthony Corazzini from Framingham, Massachusetts; Andrew MacDonald from Narragansett, Rhode Island; Steve Melanowski of the University of Connecticut; Jim Kent of Columbia University; and Glynnis Nauritter of the State University of New York at Stony Brook.

PATHOBIOLOGY DIVISION

Comparative Invertebrate Pathology Investigation

Deparaffinized histologic sections of European oysters were embedded in plastic, sectioned in thick and thin slices, and examined for the presence of microcell infections. Microcells were found in both light and electron microscopic examinations. Microcells were intracellular, measured about 1-2 nm, and contained electron-dense organelles resembling haplosporosomes. Nucleoli were peripherally located and mitochondria were swollen and degenerate. These organisms resemble closely those which are associated with the recent French oyster mortalities and "Denman Island disease" in Japanese oysters from the Northwest Pacific coast.

Over 50 thick sections (plastic embedments) of Japanese oysters from Denman Island, British Columbia, were extensively examined at high magnification for the presence of microcell infections. About 10 were trimmed, ultrasectioned, and examined by electron microscopy for microcells. So far none have been identified (infections diagnosed histologically from the same animals are very sparse). Ultrasections were of poor quality because of extensive chatter due to soft resin. An embedment experiment was performed using an Epon-Araldite mixture recommended for high humidity situations. Additional tissues from Denman Island oysters were postfixed and embedded with this procedure. Preliminary results indicate that the soft block problem may be solved.

Data from the now completed cooperative parasite and disease study of Korean oysters are being reviewed and correlated for publication. Over 2900 oysters were examined since the study began in 1970. The Minchinia sp. parasite that was discovered and reported on in the original samples continued to be present in subsequent samples. It is evident now that this parasite is endemic in the oyster population from the Chungmu area of the Republic of Korea.

Personnel at the Northwest and Alaska Fisheries Center's Kodiak facility are examining ovarian cysts and spawning times of the blue king crab, Paralithodes platypus. Their investigations suggested a 2-yr spawning cycle, but some females spawned annually. Further, macroscopic examination of the ovaries showed certain

anomalies in development. Dr. Johnson was asked to evaluate histologically samples of ovaries in various conditions and taken at different seasons of the year. Degenerate ova were often present in the ovaries. Some of them were mature ova that had not been extruded at the time of spawning. Degenerate immature ova found must have resulted from a different cause. There is a possibility that maturation of some classes of ova might have been out of phase with the molt cycle. Study of further material will be necessary to support or reject this hypothesis.

Further tissues from amphipods collected on 1980 OPP surveys have been sectioned and stained to augment our prior observations on these collections. Especially, we wished to look for different stages of Hematodinium-like protistans in species known to be parasitized by this organism. Examinations are not yet complete, but it appears that most if not all of our specimens contain only one stage of the parasite, which occupies the hemocoel.

The Histological Services Unit sectioned over 1100 sections and prepared approximately 500 slides of various marine animal tissues. They assisted staff pathologists in statistical analyses of skeletal anomalies in Ammodytes sp./spp., and in developing new electron microscopic embedding techniques and staining procedures.

Fish Pathology Investigation

As yet, it has not been possible to obtain red hake from the New York Bight for lab study. On 10 March, trawl collections from 180-ft depths in the "mud hole" yielded only small hake (12-21 cm) without cutaneous ulcers. Bottom temperatures were approximately 4°C. Other trawl collections made on 13 and 16 March in Raritan again were unproductive. Only one red hake was caught (38 cm). On 24 March, small disease-free red hake were obtained in trawls made at the sewage sludge dumpsite near the Ambrose Tower. Interviews with commercial fishermen on the central New Jersey coast have revealed that few red hake are being caught, but that fishermen are aware of the ulcer condition and its gross appearance in hake. Several fishermen have noted such fish in trawl collections made during the summer at the northern end of the "mud hole".

Bent-finned winter flounder were obtained from Raritan Bay on 13 March for radiographic and biochemical studies. Standard curves for hemoglobin and glucose determinations are being prepared.

Preparations are being made for the conduct of experimental transmission studies with the larval nematode Eustrongylides sp. This parasite has been found in American eels from Chesapeake Bay. Its presence has aborted the export of Chesapeake Bay eels to northern European countries. Attempts will be made to infect avian hosts with larval worms which, hopefully, will metamorphose into adults in the appropriate host. Adult worms will be identified to determine if the Eustrongylides sp. found in the American eels is the same one known to occur in European eels.

Assembly continues in the second edition of the Catalog of Accessions to the Registry of Marine Pathology. Approximately 600 histologic slides have been examined and brief descriptions written of the most significant aspects of the lesion/parasite present. Over 100 slides from Dr. Toshihiko Matsusato in Japan and 50 slides from Dr. Donald Lightner of the Environmental Research Laboratory of the University of Arizona were accessioned. Dr. Matsusato's slides represent lesions/parasites of cultured marine fish and shellfish; Dr. Lightner's slides represent a valuable collection on diseases of cultured shrimp.

Freeze-etch electron microscope studies were conducted during the last month on olfactory epithelium in the mummichog. It now is evident that the lateroapical borders of the supporting and receptor cells of this organ have a junctional relationship which consists of a continuous tight-junctional band which could effectively preclude the entrance of all substances from the external environment into the more proximal intercellular space. The junctions are typical of those for vertebrate olfactory epithelia, and their presence in these locations may provide a barrier to the entrance of stimulatory molecules which would disrupt the summated generator potentials initiated by receptor sites on the apical dendrites. Cellular tight junctions of this type, although appearing to be rigid, can be modified experimentally through the use of ionophores, altered Ca^{++} concentrations, and by certain diseases (e.g., celiac sprue of the intestinal epithelium). It has not been reported whether heavy metals have a comparable effect on junctions of this type; however, we hope to examine this possibility in future experiments on Fundulus spp. exposed to low concentrations of copper ions.

Diseases of Larval Mollusks Investigation

In our bacterial toxin studies, recently accumulated data suggest that 10^8 cells of a pathogenic Vibrio sp. in a 1-liter culture of larval oysters will produce enough toxin to inhibit larval development beyond the straight-hinge stage. Our past attempts to determine molecular weight of the toxin, using electrophoretic methods, have been unsuccessful; no bands were visible after staining using the procedure described by Weber and Osborn (Journal of Biological Chemistry 214:4406-4412;1969). A modification of that procedure has resulted in the demonstration of at least five faint bands. It appears that the presence of B-mercaptoethanol in a protein incubation solution was responsible for the previous failures.

Pathogenic bacteria, after serial passage through larval oyster cultures to measure and increase their virulence, were again used in experiments to examine the bacterial activation of larval oyster phagocytes. These experiments are necessary to increase the statistical reliability of data prior to publication.

In cooperative projects with the shellfish industry, 20 isolates taken from plates received from Maine Bioservices in South Bristol, Maine, have been used to challenge American oyster larvae. Samples are being evaluated now and a report on results will be issued soon.

Larval cultures of mollusks reared in water that has been filtered through 10- μ m filters and then irradiated with ultraviolet light continue to do more poorly than those reared in water that has also been charcoal-filtered prior to the above treatments. The latter cultures have a greater percentage of survival.

The monthly Mini Pulse cruise in Long Island Sound was successfully accomplished over a 2-day period. Eighteen isolates were obtained and will be subjected to biochemical testing and larval oyster challenge. An additional 18 isolates were also picked from the February sampling cruise and will be tested in a similar fashion.

On 2 March, a live shipment of softshell clams containing paralytic shellfish poison (PSP) arrived from eastern Canada. An ozone-detoxification test was started to determine the rate at which PSP was removed. Mouse bioassays, run with this clam extract, indicated some initial success in ozone detoxification of the living clams.

However, the experiment was cut short because of problems with the seawater system. It will be repeated at a later date when additional toxic clams are available.

Travel, Meetings, and Presentations

Dr. Rosenfield and Mr. Kern attended a meeting of the Joint Subcommittee on Aquaculture in Washington, DC, on 13 March. Dr. Rosenfield presided over a workshop with members of the Gulf States Marine Fisheries Commission Technical Coordinating Committee in Brownsville, Texas, during 17-20 March to address problems associated with the international, national, and regional transfers and introductions of nonindigenous marine and estuarine animals and disease, parasite, and predator control.

On 6 March, as a member of the Editorial Board of Ozone: Science and Engineering, Dr. Blogoslawski met with Robert Miranda of Pergamon Press at Elmsford, New York.

Dr. Sawyer attended the Atlantic Estuarine Research Society meeting at Wrightsville Beach, North Carolina, during 13-15 March, and presented a paper on "Pathogenic Amoebae (Amoebida: Acanthamoebidae) as Indicators of Bacterial Loading in Ocean Sediments."

Mr. Farley attended a symposium on water and biota research projects at the New Jersey Department of Environmental Protection's Office of Cancer and Toxic Substances Research, in Trenton on 17 March.

Dr. Robohm attended a meeting of the Center Task Force on Stock Enhancement and Environmental Management held at the Milford Laboratory on 17 March.

Visitors

Visitors to the Oxford Laboratory during March included participants of the 91st Enforcement Conference held on 27 March: LCDR James Dunmyer (Deputy District Engineer), Jake Findora, Tom Filip, Alex Dolgos, Irwin Garskaf, Robert E. Edwards, James Brogdon, Herb Green, David Reid, and Rita Mroczek of the US Army Corps of Engineers; Milt McCarthy of the US Fish and Wildlife Service; Randy Pomponro and Richard Sumner of the EPA; John B. Griffith and J. L. Hern of the Maryland Department of Natural Resources; and Ed Norton of the US Attorney's Office.

University Affairs

Mr. Scott Wilson of Fairfield (Connecticut) University participated in the February 1981 cruise to Long Island shellfish beds. He obtained marine bacterial samples for Dr. Theodore Combs, with whom we are working in a cooperative project, to compare the total-plate-count method with the direct-count technique using fluorescent dyes.

On 4, 27, and 30 March, Dr. Blogoslawski met with Rev. Elder, S. J., and Dr. Julius Kuck of Fairfield University to discuss cooperative research for chemical identification of PSP.

On 11 March, Dr. Blogoslawski visited Dr. Rita Colwell of the University of Maryland in College Park. They discussed field-monitoring techniques for Vibrio sp. On 12 March, Dr. Blogoslawski visited Dr. George Helz on the same campus to discuss cooperative ozone research projects.

On 16 March, while on annual leave, Dr. Blogoslowski visited Dr. James Carpenter of the University of Miami in Key Biscayne to discuss ozone oxidant-seawater reactions.

Dr. Murchelano attended an Advisory Board meeting of the University of Maryland Sea Grant Program at Annapolis on 16 March.

On 24 March, Drs. Huang, Ling, Bang, and Ms. Leslie Leonard of the Johns Hopkins University Department of Pathobiology, visited the Oxford Laboratory to discuss collaborative research projects with the staff.

On 26 March, Dr. Rosenfield presented a seminar on "Aquaculture in the Peoples Republic of China" at the University of Delaware College of Marine Studies in Lewes, Delaware.

Personnel

Mr. Kern attended a meeting of the Center Incentive Awards Committee at the Woods Hole Laboratory on 3 March.

Dr. Murchelano chaired a meeting of the Center Factor IV Committee at the Milford Laboratory on 27 March.

NATIONAL SYSTEMATICS LABORATORY

Penaeoid Shrimp Investigation

Work continued on a revision of the rock shrimps, Sicyonia, found in the American Pacific. A new species of Mesopenaeus from the Indian Ocean was studied.

Crustacean Investigation

Preparation continued of the manuscript for "Shrimps, Lobsters and Crabs of the Temperate Eastern United States." Text has been composed on a word processor for 41 families; five families containing 23 species remain to be done, as do the introduction, literature cited, and figure legends.

Pelagic Fishes Investigation

Sections were written on distribution and material was examined for each of the 18 species of Scomberomorus. Tables of measurements were revised and printed out.

Benthic Fishes Investigation

Completed were sections on families Melanonidae, Merlucciidae, Moridae, and Gadidae for Sea Fishes of Southern Africa. Completed was work on a joint paper with B. Hutchins from West Australia on a new Australian reef-dwelling ophidioid. Work was done on a talk on Galapagos thermal vent fishes to be presented at the June meetings of the American Society of Ichthyologists and Herpetologists.

Travel, Meetings, and Presentations

Austin Williams traveled to Oregon for a program planning meeting and site visit

for the Estuarine Research Foundation meeting in November 1981. Bruce Collette attended a joint American Fisheries Society-International Association of Fish and Wildlife Administrators planning meeting, discussing sessions to be held on improved cooperation among coastal users.

Visitors

George C. Miller (retired from the Southeast Fisheries Center) studied fishes for several days.

Personnel

Bruce B. Collette was reappointed to the Fishery Bulletin Editorial Committee.

Publications

Cohen, D. M.; Nielsen, J. G. Spottobrotula amaculata, a new ophidiid fish from the Philippines. Copeia. (S)

Cohen, D. M. Argentinidae, Bathylagidae, Melanonidae, Gadidae, Merlucciidae, Moridae. In Sea fishes of Southern Africa. (S)

Collette, B. B. A new species of freshwater halfbeak (Pisces: Hemiramphidae, Zenarchopterus) from New Guinea. Copeia. (A)

Collette, B. B. Redescription of Hyporhamphus xanthopterus, a halfbeak endemic to Vembanad Lake, southern India. Matsya. (A)

Pérez-Farfante, I. A new species of shrimp of the genus Solenocera (Penaeoidea: Solenoceridae) from the Philippines. Proc. Biol. Soc. Wash. (A)

Small, G. A review of the bathyal fish genus Antimora (Moridae: Gadiformes). Proc. Calif. Acad. Sci. (A)

ATLANTIC ENVIRONMENTAL GROUP

Ocean Monitoring and Climatology Task

The cooperative Ship of Opportunity Program obtained six expendable bathythermograph (XBT) transects and three continuous plankton recorder (CPR) transects in March: three XBT and two CPR transects in the Gulf of Maine, one XBT transect off Southern New England, one XBT and one CPR transect across the shelf and slope off New York, and one XBT transect 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 1981 issue of Atlantic Notice to Fishermen:

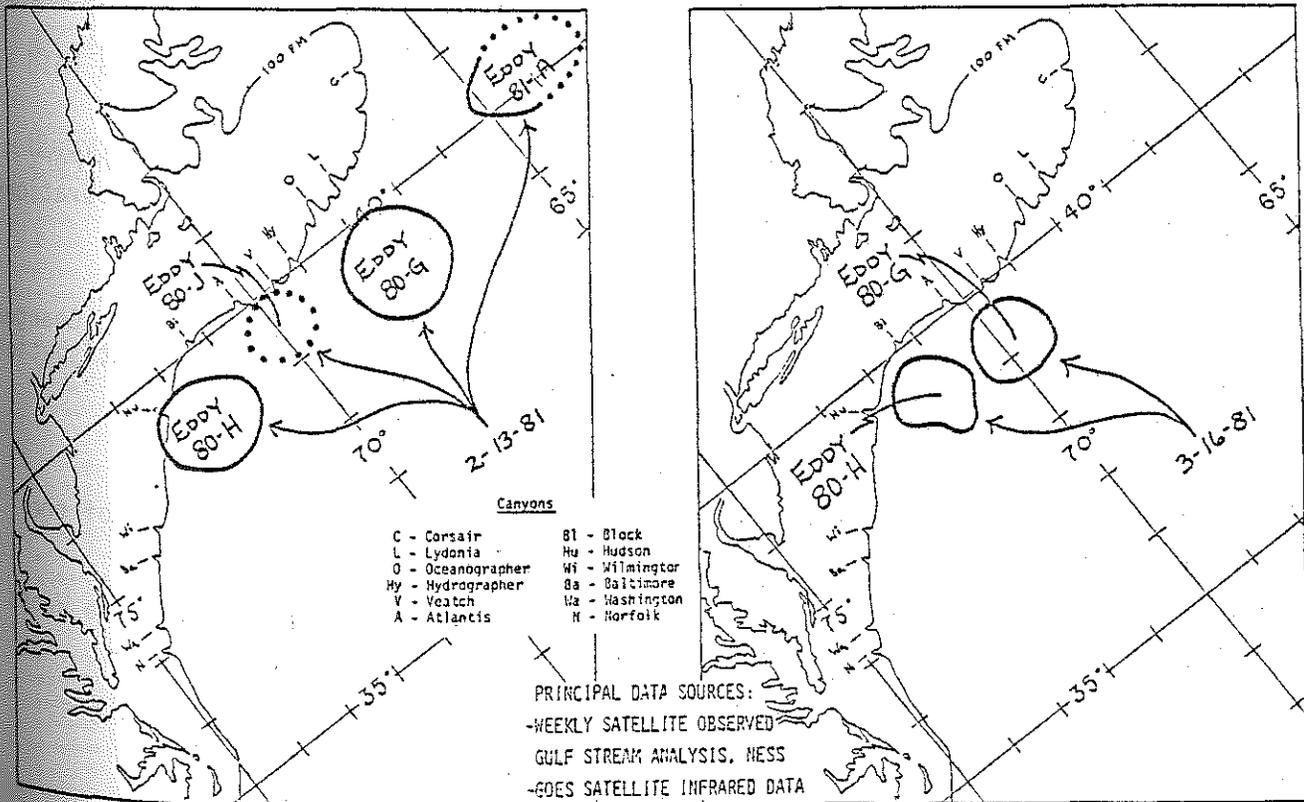
GULF STREAM EDDY LOCATIONS

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

Eddy 80-H moved erratically during the last 30 days while it remained south of Block Canyon. The eddy is now located about 43 km (23 nm) east of the mid-February position with a center position of 39.2°N, 71.3°W. Eddy 80-J was probably incorporated by Eddy-H in early March south of Atlantis Canyon. Eddy 80-G advanced about 180 km (97 nm) to the west and is now located at 39.2°N, 69.8°W, south of Veatch Canyon. Eddy 81-A was resorbed by a Gulf Stream meander in late February at about 40.5°N, 64.0°W.

During the next 30 days Eddy 80-H may move to a center position southeast of Hudson Canyon; Eddy 80-G may move west to a location south of Block Canyon.

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



Ocean Dumping Task

Greg Behie prepared a report on "A Summary of Waste Inputs to the 106-Mile Industrial Waste Dumpsite During 1979 and 1980," compiled from data provided by EPA Region II. The data show a decrease in all principal inputs in 1980 versus 1979 except for DuPont/Graselli wastes (caustic by-products of DMHA and Anisole production) which showed an increase of 51.9%. Overall, there was a reduction of 12.3% in inputs, which totaled 618 000 wet tons, in 1980.

Travel, Meetings, and Presentations

The Third Informal Workshop on the Oceanography of the Gulf of Maine and Adjacent Seas was held from 2 through 5 March 1981 at the University of New Hampshire in Durham. Attending from AEG were Mert Ingham, Woody Chamberlin, Jack Jossi, Steve Cook, Dan Smith, and Gretchen White. On 3 March, Woody Chamberlin presented a paper at the conference, titled "Some Observed and Predictable Influences of Gulf Stream Rings on Georges Bank." Steve Cook also made a presentation titled, "An XBT Time Series Analysis of the Northern Crowell Basin."

On Saturday, 7 March, a Fishermen's Forum was held at the Dutch Inn, Galilee, Rhode Island. It was attended by Woody Chamberlin who spoke on "Oceanographic Information from Satellites as an Aid to Fishing off the Northeast Coast."

On 10 March, Mert Ingham drove to the Milford Laboratory to attend a NEMP management team meeting.

Woody Chamberlin traveled to the Milford Laboratory on 17 March to attend the Center Molluscan Task Force meeting.

Woody Chamberlin visited the headquarters of NOAA's National Earth Satellite Service in the World Weather Building in Camp Springs, Maryland, on 23 and 24 March to discuss remote sensing.

Jim Bisagni attended a warm-core rings study group meeting which was held at WHOI on 26 and 27 March.

On 28 March, Steve Cook and Grayson Wood visited the M/V Oleander in Port Newark, New Jersey, to discuss the upcoming Ship of Opportunity Program operations.

University Affairs

On 17 March, Mert Ingham lectured on "The Influence of Oceanographic Changes on Fish Stocks" to a URI Graduate School of Oceanography class studying "Multispecies Fish Stock Assessments for Total Ecosystem Management."

Personnel

Grayson Wood went to the Woods Hole Laboratory to attend a meeting of the Center Incentive Awards Committee on 3 March.

Sandy Lundin attended a training and decision-making session with the Woods Hole Laboratory's ADP Unit on 17 March.

Publications

- Armstrong, R. S. Transport and dispersion of potential contaminants at the Buccaneer Oil Field. EXPOCHEM '80; 1980 October; Houston, Tex. (A)
- Bisagni, J. J. 1980. Circulation study at 106 mile dumpsite uses satellite to track drogued buoys. Coast. Oceanogr. Climatol. News 3(1):6-7. (P)
- Bisagni, J. J. Physical variability at an East Coast United States offshore dumpsite. In Ocean dumping of industrial wastes. New York: Plenum Press. (A)
- Crist, R. W.; Chamberlin, J. L. Bottom temperatures on the continental shelf and slope south of New England during 1979. Ann. Biol. 36. (A)
- Fitzgerald, J. L.; Chamberlin, J. L. Anticyclonic warm core Gulf Stream eddies off the northeastern United States during 1979. Ann. Biol. 36. (A)
- Bisagni, J. J. The movements of two satellite tracked drogued buoys deployed at the offshore 106 mile dumpsite. Coast. Ocean Pollut. Assess. News 1(2). (A)
- Hilland, J. E. Variation in the shelf water front position in 1979 from Georges Bank to Cape Romain. Ann. Biol. 36. (A)
- Hughes, M. M.; Cook, S. K. Water column thermal structure across the shelf and slope southeast of Sandy Hook, New Jersey in 1979. Ann. Biol. 36. (A)
- Ingham, M. C. Fall on Georges Bank is 2°C colder according to water temperature records. Coast. Oceanogr. Climatol. News 3(2):14. (P)
- Ingham, M. C. Water masses and dumping at the 106-mile site. Coast. Ocean Pollut. Assess. News 1(2). (A)
- McLain, D. R.; Ingham, M. C. Sea surface temperatures in the northwestern Atlantic in 1979. Ann. Biol. 36. (A)
- Murray, T. Timing of spring mackerel migration in Middle Atlantic Bight. Coast. Oceanogr. Climatol. News 3(2):21-22. (P)