

# NORTHEAST FISHERIES CENTER

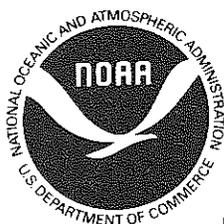
## NEWSLETTER

FEBRUARY 1981

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



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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

On 11 February, Mr. Joseph Slavin (who recently retired as a Special Assistant to the NOAA Assistant Administrator for Fisheries) was the guest speaker at a Gloucester Laboratory technical seminar. Representatives from the NMFS Northeast Regional Office and the USDC Inspection Service, as well as some industry representatives attended. Mr. Slavin, now a Technical Consultant and North American Representative of the United Kingdom's prestigious White Fish Authority (WFA), presented a film on the WFA and conducted a lively session following the film. The WFA is a multidisciplinary group that provides a comprehensive range of services from resource assessment to marketing & distribution much as the NMFS does. Unlike the NMFS, it is only partly federally subsidized. It augments its income by charging consulting fees for its services to clients in over 40 countries, including governments.

## RESOURCE ASSESSMENT DIVISION

### Resource Surveys Investigation

Malcolm Silverman, Evelyn Howe, and Eva Montiero continued processing of various bottom trawl survey log data. The autumn 1980 survey data were completed with the following strata sets now on tape: inshore north of Cape Hatteras (Code 808), inshore south of Cape Hatteras (Code 680), and offshore south of Cape Hatteras (Code 880). Work continues on processing the 1981 winter survey and autumn 1980 gear comparison cruise data.

Charles Byrne participated in the joint NMFS/Rhode Island Division of Fisheries and Wildlife/commercial fishing industry yellowtail flounder bottom trawl study (14-18 February) aboard the F/V Forager (John Dykstra, Captain) out of Jerusalem, Rhode Island.

Dennis Hansford continued digitizing survey strata boundaries to make possible the computerized random selection and plotting of stations.

Andrew Thoms continued to prepare for the August surf clam-ocean quahog survey. Andrew and Jim Crossen visited the Walco Corp. (Providence, Rhode Island) to review problems and possible solutions related to insuring the watertight integrity of the submersible electric pump used during these surveys.

Elizabeth Bevacqua completed a set of computer-plotted position charts for Martin Newman of the Oxford Laboratory.

Donald Flescher initiated a project to organize cruise/vessel information for the 1948-79 time series of NEFC cruise activities into a computer-based information file equivalent to Woods Hole Laboratory Reference Document No. 80-02 ("Research Vessel Cruises, 1948-1979").

Linda Despres-Patanjo continued her joint research on fish pathology with Dr. Robert Murchelano of the Oxford Laboratory. Linda met with Dr. Murchelano on 23 February to discuss a draft of a manuscript tentatively titled "Health of Marine Fish in the Northwest Atlantic."

Tom Azarovitz and various Canadian scientists discussed final arrangements for another cooperative study of ocean quahog resources on the Nova Scotian shelf.

Charles Byrne and John Nicolas visited Trawl Works, Inc., (Narragansett, Rhode Island) and Hope Fish Netting Mills (Hope, Rhode Island) to discuss quality control in the manufacture of twine and webbing for trawl nets.

Donald Flescher sent photographs of fishes from summer and autumn bottom trawl surveys to the archive collection of the American Fisheries Society, at the US Fish & Wildlife Service's National Fisheries Center (Leetown, West Virginia).

Charles Byrne and Warren Handwork attended the Massachusetts Fisherman's Forum, held at the Massachusetts Maritime Academy, on 21 February. Discussions centered on improving fishing techniques/gear as well as fuel economy.

### Fishery Biology Investigation

#### Shellfish

Mark Costa completed preparing more than half of the winter 1980 surf clam samples for aging, and cleaned summer 1980 sea scallop shells for aging.

Maurice Crawford worked on the aforementioned projects and he and Mark aged surf clam commercial sample #31 collected off Delmarva. Statistical analysis of surf clam (commercial samples) aging data was begun by Maurice and Ambrose Jearld. Maurice also continued to train Sherry Sass to age surf clams.

John Ropes initiated preliminary tests for staining thin-sectioned chondrophore slide preparations of surf clams with Alizarin Red S and Feigl's solution. The Alizarin stain formed a red color in areas between growth lines, a reaction for the presence of four types of calcium carbonate; Feigl's solution formed a black color in the same areas, a reaction specifically identifying aragonite and one of the four types of calcium carbonate. These tests indicated that the latter solution may be useful in clearly delineating zones of aragonite deposition and may enhance separation of growth lines in photographic prints.

John continued to work on enhancing the images of acetate peels of marked ocean quahogs (recaptured 1 yr after their release) by enlarging them on a Dewson scale projector and photographing them. Prints of 35-mm, black-and-white negatives clearly showed the effects of notching, growth-line formation, and shell deposition during the release period at the ventral edge of the shells. Prints of the growth lines in the hinge tooth of very old clams (ca. 90-100 yr) were less successful, in part because of the small negative size and very fine detail of growth lines.

## Age and Growth

Vi Gifford and Kris Andrade completed aging, coding, and summarizing the first quarter 1973 redfish samples (264 fish).

Kris Andrade checked Doris Jimenez's aging for 153 pollock from NOAA R/V Delaware II Cruise No. DE 80-07 (autumn 1980 bottom trawl survey). She also checked, and corrected where necessary, the age sheets and summaries for the survey. Kris also completed checking Doris's ages for third and fourth quarter 1980 commercial pollock samples (98 and 131 fish, respectively).

Judy Penttila and Melinda Grace checked the first audit listing of Atlantic cod age data for the following summer bottom trawl surveys: 1978 (494 fish), 1979 (504 fish), and 1980 (530 fish). They also checked the first audit listing of yellowtail flounder age data for the summer 1980 bottom trawl survey (381 fish). Judy also checked second audit listings and cleared for putting on the computer tape, the yellowtail flounder age data for the following bottom trawl surveys: spring 1980 (1745 fish) and summer 1980 (381 fish). Judy completed aging the fourth quarter 1980 commercial yellowtail flounder samples (691 fish) and sent the coded age sheets to Fishery Assessment Investigation personnel. Judy also aged and put on data sheets, data from 320 yellowtail flounder from the 1981 winter bottom trawl survey. She completed aging, putting on data sheets, and summarizing yellowtail flounder samples from the following six Massachusetts Division of Marine Fisheries' inshore spring and autumn bottom trawl surveys for 1978, 1979, and 1980: 001 (229 fish); 002 (94 fish); 003 (185 fish); 004 (55 fish); 925 (180 fish); and 926 (102 fish). Judy spent several days working with Sergio Iglesias and Louise Dery on determining growth curves for the European hake (Merluccius merluccius).

## Finfish

Sherry Sass, with Ambrose Jearld, completed the first draft of a proposal to study ring deposition and growth of young-of-the-year summer flounder. Cultures of algae and rotifers were established and larval rearing was begun with fertilized eggs procured from personnel at the NMFS and US Environmental Protection Agency (EPA) Narragansett Laboratories. Ms. Sass learned aging methods for surf clams from Maurice Crawford and in turn taught him methods for aging scup. Ms. Sass also became assistant Federal Women's Program liaison for the Woods Hole Laboratory.

Louise Dery, with Sergio Iglesias (a visiting Spanish biologist), completed age-length keys based upon 1979 samples for European hake and calculated first estimates of growth rates. A rough outline was prepared for an age-and-growth paper to be completed in 1981. Ms. Dery also completed age determinations for silver hake from the 1980 autumn bottom trawl survey and attended a week-long course in Washington, DC, on "EEO for Counselors." David Pyoas assisted Ms. Dery and Sass with data summaries and analysis and also with the summer flounder project. Mark Costa and Alicia Kelly completed sectioning silver hake and red hake otoliths from 1980 bottom trawl surveys.

## Senior Assessment Scientists

Major scientific involvements of Brad Brown and Mike Sissenwine concerned oversight responsibility for work in progress by the Northeast Fishery Management

Task Force Study Group on the Biological Effects of Fishery Management Options. Task Force activities to date have focused on defining discrete fishery units based on the similarity of species composition in otter trawl landings from various areas, depths, and months. Nine major fisheries and 29 subfisheries (components) have thus been tentatively defined. Analyses of trends in catch, effort, and catch per unit of effort for the major units are now proceeding.

Emory Anderson's major activity in February was monitoring the specially authorized Polish Atlantic mackerel fishery. Two stern trawlers, with US observers and Polish scientists aboard, fished from 28 January until 18 February outside of the normal foreign fishing "windows," primarily in the Hudson Canyon area. During that time, 2000 metric tons of mackerel were caught along with miscellaneous other species comprising about 1% of the mackerel catch. Detailed catch-and-effort, length-and-age, and hydroacoustic data were collected for incorporation into the assessment data base. A detailed report on this special fishery will be prepared and available within several months. Emory also participated in assessment meetings on large sharks held at the NMFS Southeast Fisheries Center (SEFC) in Miami, to review and agree on various data bases used in estimating maximum sustainable yield (MSY) for sharks in the Northwest Atlantic and Gulf of Mexico. All previous work done by NEFC and SEFC was reviewed; deficiencies in all various data bases were identified; and previous criticisms of data points, analyses, etc., were addressed. A report will be prepared by the SEFC which reviews the previous work and the various data bases used, stressing the general inadequacies of the data and MSY estimates generated therefrom.

In addition, Emory drafted correspondence to Canadian assessment groups in Dartmouth-Halifax, Nova Scotia, outlining the extent of ongoing US - Canada data exchange, and prepared the NEFC response to a request from the NMFS Office of International Fisheries Affairs for information on the identification and status of US - Canada transboundary stocks.

The US contributions to administrative reports for the International Council for the Exploration of the Sea (ICES) were drafted by Steve Clark (Shellfish Committee) and Vaughn Anthony (Pelagic Fish Committee).

Fred Serchuk began preparing 1981 Georges Bank and Gulf of Maine Atlantic cod assessment documents, and began analyzing, with Paul Wood, 1980 surf clam-ocean quahog logbook records to derive trends in recent catch and effort in the commercial fishery. Fred also prepared review comments on Draft Amendment No. 3 of the Surf Clam/Ocean Quahog Fishery Management Plan, and forwarded them to the NMFS Northeast Regional Office's Surf Clam/Ocean Quahog FMP Review Team.

Steve Clark completed, with Ralph Mayo and Erika Faulk, a draft document updating Georges Bank and Gulf of Maine haddock assessments.

Vaughn Anthony continued analyses, with Gordon Waring and Mike Fogarty, for updating Atlantic herring assessments.

Various Senior Assessment Scientists reviewed manuscripts and progress reports, including: John Boreman, two manuscripts for the Canadian Journal of Fisheries and Aquatic Science; Emory Anderson, a manuscript submitted to the Transactions of the American Fisheries Society, and two papers relating to Atlantic mackerel authored

by NEFC personnel; and Fred Serchuk, a completion report submitted (under the Commercial Fisheries Research and Development Act of 1964) to the Northeast Regional Office's Federal Aid Branch.

### Fishery Assessment Investigation

Most of the Investigation's personnel were devoted to continuing analyses in support of the Northeast Fishery Management Task Force Study Group on Biological Effects of Fishery Management Options (see "Senior Assessment Scientists"). Anne Lange designed and implemented computer software for analysis of catch-and-effort data for each of the fishery units. Steve Murawski set up a large-scale cluster analysis experiment to aid in the definition of fishery units. Ralph Mayo and Rhett Lewis initiated studies aimed at deriving a first-order approximation of discards associated with commercial fleet activities within the fishery units.

Frank Almeida (with the help of Ruth Gutjar and Jeff Floyd) updated and/or compiled historical catch data and completed standard bottom trawl survey cruise analyses on butterfish, weakfish, ocean pout, and windowpane. Analyses included distribution plots and length-frequency plots (both inshore and offshore).

Thurston Burns set up a data management program for entering biweekly quota reports into the ADP Network Services system, and developed several programs to audit the data. All quota information through the current reporting period has been entered into a master file and can be accessed by the Northeast Regional Office to generate quota reports.

### Fishery Socioeconomics Investigation

Jim Kirkley formulated and estimated expenditure equations for vessels harvesting groundfish. Other activities included: the completion of a draft report identifying the need to understand options available to industry when implementing management decisions, evaluating the applicability of information collected by the Northeast Regional Office's Market News Branch, and completion of a summary of problems in estimating bioeconomic production functions.

### Travel, Meetings, and Presentations

During 2-4 February, Vaughn Anthony and Gordon Waring met with Canadian scientists in Halifax, Nova Scotia, to discuss Atlantic herring stock status in the Northwest Atlantic. Vaughn also met with Canadian and Soviet scientists while in Halifax to coordinate three-country squid research.

On 6 February, Anne Lange and Vaughn Anthony attended a planning meeting in Woods Hole for a joint American-Canadian-Soviet squid survey.

On 9 February, Mike Sissenwine, Anne Lange, Steve Murawski, and Ralph Mayo met to discuss progress relative to the data analysis initiatives for the Northeast Fishery Management Task Force's Study Group on the Biological Effects of Fishery Management Options.

On 9 and 10 February, Emory Anderson participated in an assessment meeting on large sharks held at the SEFC.

On 10 February, Vaughn Anthony, Mike Sissenwine, Fred Serchuk, Gordon Waring, and Mike Fogarty met with various state representatives and New England Fishery Management Council (NEFMC) staff in Saugus, Massachusetts, to discuss Atlantic herring research.

On 10 February, Fred Serchuk attended a meeting of the Northeast Regional Office's Surf Clam/Ocean Quahog FMP Review Team, in Gloucester, Massachusetts.

On 19 February, Fred Serchuk met with Charles Seldon of Developmental Sciences, Inc., on preliminary biological sampling results from a sampling trip aboard the F/V Sea Dog V. This vessel is currently involved in a Saltonstall-Kennedy Act-funded project on automated longlining for which Mr. Sheldon is project manager. This meeting was held in Woods Hole.

On 19 February, Jim Kirkley attended a Northeast Fishery Management Task Force meeting on socioeconomic information needs, in Danvers, Massachusetts.

On 20 February, Steve Clark and Arnold Howe, the latter from the Massachusetts Division of Marine Fisheries (MDMF), jointly chaired a meeting between Resource Assessment Division and MDMF personnel to review the Massachusetts Inshore Survey Program, and discuss assessment applications. Numerous Resource Assessment Division staff members attended the meeting held in Woods Hole.

On 23 February, Fred Serchuk attended a meeting of the NEFMC's Groundfish Oversight Committee in Danvers, Massachusetts.

On 24 and 25 February, Mike Fogarty attended a State-Federal Program Summer Flounder Scientific and Statistical (S&S) Committee meeting in Norfolk, Virginia.

On 26 February, Mike Fogarty and Thurston Burns attended a meeting of the NEFMC's Lobster Oversight Committee in Danvers, Massachusetts.

On 26 February, Brad Brown met with Woody Chamberlin to discuss increased cooperation between the Atlantic Environmental Group and the Resource Assessment Division in the evaluation of the relationships between climatic changes and abundance of fishery resources.

On 27 February, a number of Resource Assessment Division personnel met with Bernie Skud of the Narragansett Laboratory to review work he has done relative to long-term changes in Atlantic herring and Atlantic mackerel abundance.

### Seminars

On 17 and 19 February, Dr. David Cushing, retired Deputy Director of the United Kingdom's Lowestoft Biological Laboratory, presented seminars on several aspects of fishery research. His lectures were well attended by Resource Assessment Division staff as well as the Woods Hole Scientific Community in general.

## University Affairs

Fred Serchuk was appointed to the Dissertation Committee of Steve Murawski who is a Ph.D. candidate at the University of Massachusetts, Amherst. Fred and Steve met with Drs. Finn, Boone, and Carritt in Amherst on 2 February to discuss ongoing research.

Fred Serchuk was appointed to the Dissertation Committee of Stuart Buckner, a Ph.D. candidate at the State University of New York at Stony Brook.

Brad Brown and Mike Sissenwine presented lectures on stock assessments on 17 February and multispecies assessment models on 24 February as members of the team teaching a course on multispecies fisheries at the University of Rhode Island's (URI) Graduate School of Oceanography.

Brad Brown met with Drs. Michael Ross and Henry Boone from the University of Massachusetts, Amherst, on 5 February to discuss expanding cooperative research with that institution.

On 16 February, Brad Brown met with William Schuller, Cooperative Education Coordinator for South Carolina State College, concerning cooperative education programs.

On 17 February, Brad Brown met with Melvin Hendriks of URI concerning cooperation in a number of areas effecting EEO and certain areas of international development.

On 28 February, Brad Brown met with Dr. Herman Branson, President of Lincoln University, to discuss ongoing cooperative relationships.

Mike Fogarty provided American lobster assessment data to researchers at URI and the University of Massachusetts, Amherst.

Anne Lange reviewed a funding proposal submitted to Sea Grant concerning Pacific squid resources.

Elizabeth Bevacqua compiled a complete listing of past survey cruise data on conger eel for Dr. Howard Winn of URI.

## EEO Activities

Linda Despres-Patanjo, Eva Montiero, Dennis Hansford, and Fred Serchuk were elected to 2-yr terms on the Woods Hole Laboratory EEO Committee.

On 3 February, the Woods Hole Laboratory EEO Committee met; Steve Clark, Fred Serchuk, John Boreman, and Emory Anderson attended.

On 22 February, a workshop on promotions and other personnel matters was held in Woods Hole, sponsored by FWP (Federal Women's Program)/EEO. Many Resource Assessment Division members attended.

On 13 February, Steve Clark and Fred Serchuk attended the Woods Hole Laboratory EEO Executive Subcommittee meeting in Woods Hole.

On 25 February, Brad Brown participated in a panel on "Opportunities in Marine Science for Minority Students," aimed at developing programs at pre-college levels, sponsored by the Woods Hole Laboratory EEO Committee with the support of the rest of the Woods Hole Scientific Community and the Education Committee of the Cape Cod Branch of the NAACP.

In conjunction with Black Heritage Month observances, many members of the Resource Assessment Division attended the aforementioned panel discussion on minority youths in marine science on 25 February, a lecture on Cape Verdean culture and maritime history on 20 February, and a keynote address by Dr. Herman Branson on 27 February.

#### Publications

Fogarty, M. J. Distribution and relative abundance of ocean quahog, (Arctica islandica) in Rhode Island Sound and off Martha's Vineyard. J. Shellf. Biol. (A)

Murawski, S. A.; Clayton, G. R.; Reed, R. J.; Cole, C. F. Movements of spawning rainbow smelt, Osmerus mordax in a Massachusetts estuary. Estuaries 3(4): 308-314;1980. (P)

Sissenwine, M. P.; Azarovitz, T. R.; Suomala, J. B. Determining the abundance of fish. MacDonald, A. ed. Experimental biology at sea. Academic Press. (S)

#### Reports

Azarovitz, T. R.; Byrne, C. J.; Bevacqua, E. S.; Despres, L. I.; Foster, H. A. Distribution and abundance trends of 22 selected species in the Middle Atlantic Bight from bottom trawl surveys during 1967-1979. NOAA Draft Final Report to BLM: Contr. No. AA550-1A7-35;1980.

Boreman, J. Entrainment impact of Vienna Unit No. 9 on the striped bass population in the Nanticoke River, Maryland. Woods Hole Lab. Ref. Doc. No. 81-04;1981.

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 report will be included in the March issue.

### MARINE ECOSYSTEMS DIVISION

#### Ecosystem Dynamics Investigation

Mike Pennington continued to develop general procedures for estimating daily rations of fish based on mean gut-content data from Marine Resources Monitoring, Assessment, and Prediction Program (MARMAP) surveys. Ed Cohen and John Hauser began summarizing food habits data by predator size category and time of day in a form required by the daily ration model, in preparation for simulation runs with the computer model GEORGE. Ed prepared an abstract on "Primary Production on Georges Bank and Why It Is So High" for presentation at the Third Gulf of Maine Workshop during 2-5 March. Mike began analysis of the statistical characteristics of the MARMAP plankton data base, with chief focus on confidence limits about estimates of ichthyoplankton abundance. Mike also assisted the Manomet Bird Observatory with analysis of their marine bird survey data.

Marv Grosslein participated in a meeting on 2 and 3 February of the Georges Bank Biological Task Force's (BTF) Monitoring Subcommittee relative to revision of the research and monitoring plan for Georges Bank; later he reviewed a draft of the new plan which is to be presented to the BTF on 13 March. Grosslein also reviewed several environmental reports accompanying oil exploration plans for Georges Bank submitted by the Exxon and Getty Companies. On 6 February, Marv, together with Thurston Burns and Mike Fogarty of the Resource Assessment Division, presented the NEFMC's S&S Committee report on American lobster biological data requirements to the Lobster Oversight Committee. On 11 February, Marv attended the S&S Committee meeting where, among other things, there was discussion of ecosystem "stability" in relation to fishery management strategy, and liaison with the newly formed Environmental Affairs Committee of the NEFMC. Finally, on 26 February, Marv attended a meeting of the Editorial Committee for the book on Georges Bank; discussion focused on: (1) status of the outline, (2) section editors and contributors identified to date, (3) team writing approach in terms of authorship credits of editors versus writers, and (4) style of the book. The NEFC is to play the lead role in the section on organic production ranging from primary production to apex predators.

#### Benthic Dynamics Investigation

Roger Theroux continued work on the northern macrobenthic invertebrate biomass report, completing a series of graphs relating major taxonomic groups to sediment organic carbon content, and initiating a compilation of the master species list for all taxa in the report. Roger also consulted with Don Maurer (University of Delaware) and Tom Leschine [Woods Hole Oceanographic Institution (WHOI)] on Georges Bank studies, and provided materials to Rick Price (WHOI) for a compendium of atlases and data reports on Georges Bank. An updated magnetic tape of the benthic taxonomic codes was prepared and sent to Nancy Kohler at the Narragansett Laboratory.

Ray Bowman completed revisions of a laboratory reference document on "Food of Silver Hake" and continued work on another on "Distribution and Abundance of Juvenile Fishes." William Michaels prepared a variety of food habits data listings and summaries for use in designing the new food habits monitoring program and analyzing the 1973-76 data.

John Hauser completed the production of zooplankton density tables, and began work on Fager tables for Roz Cohen. He also produced benthic invertebrate and food habits listings for Roger Theroux and Ed Cohen. Jackie Murray completed documentation of procedures used to create files and generate standard audits and listings for the food habits data base, and finished a series of outputs related to diet overlap studies by Rich Langton. Jackie resigned as of 27 February and John Hauser now has the burden of her work as well as writing new programs.

Tom Morris began a more detailed examination of feeding strategy information in relation to actual gut content data for species included in his preliminary literature review. Also, he began a review of literature on predator-prey studies of the Northwest Atlantic to assist with preparation of a general review paper on multi-species feeding interactions for the 1981 ICES meeting.

### Apex Predators Investigation

During February, we received information on eight recaptured sharks. The tagging information is pending on one. The other recaptures include three blue sharks, two mako sharks, and one each for the sandbar and tiger sharks. The longest time at liberty for these recaptures was for a mako which was free for 3 yr and 10 mo and traveled from Oregon Inlet, North Carolina, 1650 mi to Grenada in the West Indies. The next longest time at liberty (3 yr and 1 mo) was for a tiger shark tagged and recaptured in the vicinity of the Dry Tortugas, Florida. The longest distance travel was by a blue shark (over 3000 mi) tagged southeast of Montauk Point, New York, and recaptured off the Canary Islands 1 yr and 5 mo later. Another blue migrated over 800 mi in 1 yr and 3 mo from off the coast of New York to a point 210 mi southeast of Bermuda. The remaining mako was tagged and recaptured on the Gulf of Mexico south of the Mississippi River after 1 yr and 11 mo. The final recapture was from a sandbar shark which was at liberty for 5 mo and traveled 382 mi from Montauk to the Diamond Shoals area off North Carolina.

During January and February, John Hoey completed coding the longline data base. Final verification and corrections were also completed on over 2000 longline records. These data were entered into the computer and preliminary analysis begun. The information will be utilized for an ICES report on the species composition and relative abundance from selected longline fisheries in the Northwest Atlantic by John Hoey and Jack Casey.

Our annual summary newsletter, The Shark Tagger, was completed and sent to the printer. It will be mailed next month.

Approximately half of the vertebral samples for aging species of carcharhinid sharks have been mounted on slides and readied for analysis. Under cooperative agreement with the New England Aquarium, we have been monitoring the growth of sharks at that facility. Several of the tagged sharks there died during transfer from one tank to another. We dissected these animals and recovered vertebrae and measurements.

Casey participated in a shark management plan meeting at the SEFC. Purpose of the meeting was to review the NMFS data on sharks and to discuss problem areas with the Mid-Atlantic and Gulf Fishery Management Councils.

Stomach examination records from 292 sandbar and 79 scalloped hammerhead sharks collected during 1980 were coded for keypunching by Nancy Kohler and added to the food habits data base.

Chuck Stillwell presented a seminar on the large pelagic gamefish (sharks, tunas, and billfishes) occurring off the Rhode Island coast to four 5th grade classes at the Narragansett Elementary School.

### Ichthyoplankton Investigation

The winter MARMAP survey is underway. The cruise began in the Gulf of Maine and will proceed south. Exceptionally mild weather with calm-to-moderate sea conditions during most of the first leg of the cruise contributed to better than expected progress. Sampling was completed in the Gulf and will resume on Georges Bank on the second leg. John Sibunka is Field Party Chief on the first two legs. Peter Berrien will relieve him for the third, and final, leg. Doris Finan and Carolyn Griswold are assisting with plankton and neuston collections.

We have completed an update of information on the distribution and abundance of Atlantic cod and haddock larvae, adding results for 1979 and 1980. Our time series for these two important species now includes seven spawning seasons, dating back to autumn 1973. Larval populations of both species are consistently centered on Georges Bank. They were in short supply in 1979, but rebounded in 1980 when the winter abundance of cod larvae and the spring abundance of haddock larvae were the highest of the 7-yr period. In addition to cod and haddock, we are working on silver hake, yellowtail flounder, Atlantic mackerel, and Urophycis spp. hakes.

Mike Fahay recently returned from a 5-wk krill assessment cruise in the sub-antarctic Scotia Sea as a participant in the First International Biomass Experiment in the Antarctic (FIBEX), and the Vulcan Expedition, on the Scripps Institute of Oceanography's R/V Melville. The 28 scientists aboard were involved in a hydro-acoustic survey of krill and other zooplankton, physical and chemical oceanography, and several other biological investigations. Mike did a seabird census throughout the cruise and towed 20- and 60-cm bongo nets in order to collect ichthyoplankton and also to provide target-strength samples of zooplankton for the hydroacoustic team. Larval fishes were scarce in the otherwise very rich plankton samples, but the large numbers and diversity of seabirds (most species of which are neuston feeders) were at times staggering. Mike plans to work up the ichthyoplankton after the samples are sorted.

### Larval Fish Dynamics Investigation

#### Experimental Studies

Studies of the effect of delayed first feeding on winter flounder larvae have shown that recovery of whole body RNA-DNA ratio values to control (fed) levels is not rapid. Groups in which first feeding was delayed from 2 to 4 days after yolk absorption had significantly lower RNA-DNA ratio values than larvae fed at yolk absorption. This difference persisted for a period of several days after feeding was established in all groups, suggesting that delayed first feeding has a corresponding effect on growth rate for a period of several days after feeding is established. Similar starvation and refeeding experiments with older larvae are in progress along with

studies of the effect of water temperature during gonad/maturation on growth rate, timing of yolk absorption, and first feeding.

### Population Processes

Greg Lough and Hal Merry visited the Bedford Institute of Oceanography during 9-12 February to learn more about the application of electronic particle counting systems to quantifying marine plankton, and to talk with a number of scientists about analysis of data from the 1978 larval Atlantic herring patch study. One full day of this trip was spent with Robert O'Boyle of the Marine Fish Division, going over the operation of his HIAC Criterion PC-320 on-line particle counting and sizing system, the same unit recently acquired by our Investigation to study larval fish prey micro-distribution. Hal Merry left on 24 February to meet with engineers of the HIAC Corporation in Menlo Park, California, for technical training in the operation of our own PC-320 unit, and to see about the feasibility of using the HIAC sensors in a remote mode. He also will be visiting the Southwest Fisheries Center and Scripps Institute of Oceanography in La Jolla, California, to observe the latest developments in particle counting instruments and other gear. Roz Cohen has continued processing of samples [collected last November with a 0.25-m mouthed, fine-meshed, multiple opening-closing net and environmental sensing system (MOCNESS)] using the HIAC particle counter to evaluate its capabilities for at-sea work this coming April and May.

Greg Lough spent considerable time preparing sailing orders for our larval fish- prey microdistribution surveys on Albatross IV Cruises No. AL 81-03 and 81-05, which involved several lengthy meetings with members of the Fishery Oceanography Investigation (Dave Mountain and Ron Schlitz) and Ecosystem Dynamics Investigation (Ed Cohen). He also has been working with Bill Michaels and Dave Potter preparing materials on the vertical distribution of chaetognaths from the 1978 larval Atlantic herring patch study to present at the Third Gulf of Maine Workshop during 2-5 March. Dave Potter and Cabell Davis also have spent the month preparing materials for presentation at the workshop on the vertical distribution of Atlantic herring larvae on Nantucket Shoals, and the interaction of a copepod population with the mean circulation on Georges Bank, respectively.

Roz Cohen revised the length-weight paper on copepod prey of larval Atlantic herring which is nearly ready to be submitted (with Greg Lough) to Journal of Northwest Atlantic Fisheries Science. She worked on FISHMAP plots of zooplankton collected in 0.333-mm meshed nets for all 15 surveys conducted via the International Commission for the Northwest Atlantic Fisheries between 1974 and 1977, and larval Atlantic herring prey for three remaining surveys. John Hauser generated species diversity tables for the remaining three surveys (Albatross IV Cruise No. AL 75-14 and Soviet R/V Belogorskiy Cruises No.'s 75-02 and 75-03). Additional programming help is needed to complete the FISHMAP plots and to generate Fager tables before we can make further progress here.

Roz Cohen began the WHOI course "Ecology of Oceanic Zooplankton" offered by Dr. Peter Wiebe and others on 3 February.

### Fishery Oceanography Investigation

During February, Marianna Pastuzak returned to the Polish Sea Fisheries Institute in Gdynia, after spending 3 mo with the Investigation. She will continue the work begun with Red Wright and Dan Patanjo by including cruises from additional years and by incorporating chlorophyll data with the nutrient/hydrographic analysis

already done. Some of the results of this work will be presented by Dan at the Third Gulf of Maine Workshop during 2-5 March. Preparations for the other talks to be given at the workshop were also completed.

Tom Laughton and Dana Densmore are aboard Albatross IV on the first MARMAP cruise of the calendar year. Preparations for the upcoming larval dynamics cruises are also underway. The purchase of a data storage system for the CTD (conductivity, temperature, and depth) unit has been initiated to allow recording all of the data supplied by the instrument (30 samples per second). Previously, only one sample per second was recorded. A new table for the Tektronix calculator has also been designed for use at sea.

David Mountain and Ron Schlitz met with members of the Atlantic Environmental Group for an informal lunch to discuss areas of common interest. Uses of remote sensing in the Investigation's studies was a primary topic. Steve Ramp presented a talk on the Northeast Channel current measurements at a URI physical oceanography luncheon seminar on 18 February. Dan Patanjo attended a 3-day Fortran programming course.

Ron Schlitz is a joint author on a manuscript on "The Mean Circulation on Georges Bank" submitted to Science. The paper concludes that a permanent clockwise circulation exists on Georges Bank, but that it is not closed -- i.e., individual water parcels do not necessarily complete a full circuit.

#### Plankton Ecology Investigation

We have reinstated our in-house, informal seminar series at the Narragansett Laboratory. The first two speakers and subjects were: Bernard Skud--"Herring-Mackerel Interrelationships," and Lorrie Sullivan--"The Developing Fishery for the American Plaice."

Jack Colton gave an invited paper at the Third Gulf of Maine Workshop on "Residual Drift and Residence Times of Georges Bank Surface Waters As They Relate to the Distribution, Transport, and Survival of Larval Fishes," and Ken Sherman presented a tutorial to the Workshop on "Zooplankton of Georges Bank and Adjacent Waters in Relation to Fisheries Ecosystem Studies."

On 13 February, Jack Green along with Bob Marak and Pat Twohig met with Wilson Lamb of the URI Engineering Department for a preliminary technical briefing on the operation of opening-closing nets designed by Wilson under contract to URI. The equipment is expected for use on cruises this spring.

Estimates of the abundances of microzooplankton have been made from a spring 1980 survey on Soviet R/V Evrika Cruise No. 80-02. Mean naupliar abundance was 40 500 per square meter for calanoid copepods which averaged 39% of the total nauplii; Oithona provided most of the remaining 62% at 77 per square meter. By contrast, the abundance of nauplii from the fall 1980 survey on Albatross IV Cruise No. AL 80-11 provided total naupliar density in excess of  $1.5 \times 10^6$  per square meter.

Donna Busch worked on primary productivity data in preparation for a presentation by Jay O'Reilly, Chris Evans, and Donna Busch at the Third Gulf of Maine Workshop during 2-5 March. She reviewed a paper for the Fishery Bulletin, and she also spent

considerable time searching literature as part of a contribution on primary productivity, chlorophyll-a, and nutrients to a jointly authored book chapter on the north-eastern US shelf ecosystem.

### Image Analysis

Dr. Mark Berman is presently using the Bauch & Lomb image analysis system for zooplankton community analysis. This approach considers size structure to be a useful parameter to characterize the response of a community as a whole to environmental perturbations.

Ray Maurer is documenting the image analysis system's capability to count and size plankton. In addition, he is adapting the system and developing a protocol to provide rapid measurement of krill samples presently being taken on a FIBEX cruise. With appropriate software, measurements of Euphausia superba can be automatically converted into estimates of biomass (dry weight, grams of carbon, etc.). Using system, count, length-frequency, and biomass analysis will be completed within 30 days after the cruise.

### Biostatistics

Julien Goulet completed a review of four Data Dictionary/Directory Systems for possible implementation of the ADP Network Services system. The Northeast Descriptive Catalog package, with some modifications, may be the most feasible. This will be explored in detail with the NERFIS (Northeast Regional Fisheries Information System) people in Woods Hole.

Julien Goulet reviewed the Mensuration and Assessment of Coastal Habitat-Phase I draft preliminary design document and provided comments to NEFC and SEFC.

An SAS (Statistical Analysis System) program to calculate dominance of ichthyoplankton or zooplankton was revised and debugged. Dominance reports for 23 area-season data sets for 1978 ichthyoplankton were generated.

Specifications for dumping formats for eight data types were developed. These data types will be used to dump data from MIS (MARMAP Information System) format to industry standard format. Details of data fields for one data type (station information) were also developed.

Lorrie Sullivan finalized and distributed "Protocol for Data Flow Through the MIS." Lorrie also completed a complete survey of the MIS data base, identifying data types in master files, copies of input data, and file copies of data reports.

Lorrie is coordinating a poster session for the American Fisheries Society Northeast Division meeting in April. Lorrie and Tom Plichta prepared tables and graphs, including quality checking, for a revision to the Ammodytes sp./spp. paper.

Zooplankton sorting data to be entered into the EK8001 master file were received from Poland and sent to Sandy Hook for keypunching.

Karen Johnson completed debugging of a multispecies interaction model program on the Woods Hole Sigma-7 computer. This model was developed by John Pope of the Institute for Marine and Environmental Research in Plymouth, England, and will be used to investigate Georges Bank fish stocks.

Karen Johnson set up and debugged a parameter file to dump station information from MIS master files.

Tom Plichta, Steve Eldridge, and Robert Sand plotted zooplankton and temperature versus time for 1977-79 data. Data for zooplankton in the Gulf of Maine were loaded into SAS data sets for plotting and hypothesis testing. Data editing and input into SAS of blue shark stomach contents were done for the Apex Predators Investigation. A search for euphausiids at Deepwater Dumpsite 106 failed to turn up any in the cruise master files for 1977-79. Calibration factors for flow meters are being updated into master files. Data type identifications for zooplankton are being updated into master files. The following data merges were accomplished:

Master file	Data type
DL8003	ichthyoplankton
EK8006	stations
EK8006	nets
AL8010	stations
AL8010	nets
AL8003	zooplankton
DL8003	zooplankton

#### Travel, Meetings, and Presentations

On 4 February, the Narragansett Solar Committee hosted a solar planning meeting attended by nine prospective design firms wishing to be awarded contracts for the design of solar retrofit projects for the Gloucester, Narragansett, and Woods Hole Laboratories. Narragansett personnel in attendance were Donna Busch, Jack Green, Ray-Maurer, Peggy Lamoureux, Tom Halavik, and Tom Caldwell. Dave Potter represented Woods Hole; Al Blott represented Gloucester; and Tony Bocelle represented the Northeast Regional Office. From the nine firms, one was chosen at a subsequent meeting in Gloucester to submit designs for the three laboratories' solar proposals.

On 6 February, Bob Marak and Ken Sherman met with Soviet scientists at Woods Hole to discuss plans for a Northwest Atlantic Fisheries Organization study to define squid spawning areas off the North American coast. Also, Greg Lough attended the Nantucket Shoals remote sensing experiment planning session on the WHOI Quissett Campus. Donna Busch met with Marianna Pastuzak of the Polish Sea Fisheries Institute at the Narragansett Laboratory concerning future cooperative research.

On 10 February, Donna Busch attended a meeting with Ken Sherman, Wally Smith, Dave Mountain, and Marv Grosslein at Narragansett to outline a book chapter on US shelf ecosystems.

On 12 and 13 February, Julien Goulet attended a NERFIS user group meeting followed by a NERFIS Systems Steering Committee meeting.

On 17 and 18 February, a meeting of the Advisory Group on the High-Speed Plankton Sorting and Identification System was chaired at the Narragansett Laboratory by Ken Sherman. Invited panel members included Dr. H. Akefors of the University of Stockholm, Dr. G. Grice of WHOI, Dr. R. Kirsch of the National Bureau of Standards, Dr. C. Pavlides of Bell Laboratories, and Dr. M. Reeve of the University of Miami.

On 19 February, Robert Marak departed for Punta Arenas, Chile, to board the R/V Melville for Leg II of the FIBEX study of krill ecology in the Southern Ocean.

On 19 February, Bernard Skud gave a talk in the Narragansett Laboratory conference room on Atlantic herring and Atlantic mackerel interrelationships.

On 25 February, Jim Sargent visited to discuss requirements for a data dictionary directory system.

### EEO Activities

On 9 February, Lorrie Sullivan attended a Narragansett Laboratory EEO meeting and was reelected Secretary.

### Publications

Schlitz, R. The mean circulation on Georges Bank. Science. (S)

Sherman, K.; Jones, C. The dominant zooplankton component of a Northwest Atlantic ecosystem. J. Plankton Res. (S)

### Reports

Patanjo, D. Cruise summaries and equipment list. Woods Hole Lab. Ref. Doc. No. 81-01;1981.

## RESOURCE UTILIZATION DIVISION

### Fisheries Engineering Investigation

A prototype squid ring cutter was designed, constructed, and demonstrated. Its performance was entirely satisfactory.

### Research Vessel Activity

Refurbishment of the Gloucester Laboratory's R/V Gloria Michelle continues. The heating system is working. New windows have been installed in the pilot house and are being installed in the deck house. Weathertight doors have been ordered and the interior is ready for the new accommodations to be built.

After breaking out of the ice in Gloucester Harbor, the Gloucester Laboratory's other research vessel, the Rorqual, was run to check out the main engine cooling system.

### Engineering Assistance to Other Center Programs

Vern Nulk and Dan Baker have spent the entire month redesigning and drafting plans for the Center's shellfish assessment dredge and ramp. The drawings are nearly completed and the jobs of rebuilding the ramp and dredge can go to bid soon.

The February Ship of Opportunity Program trip on the M/V Marine Evangeline was completed by John Kenney.

## Facilities and Safety

Rebuilding of freezer #4 is continuing, and a new compressor for freezer #3 has been installed at the Gloucester Laboratory.

An architectural and engineering firm has been selected for the design of the Gloucester Laboratory's solar heating system. A contract for the design work should be written in March.

## Resource Development and Improvement Investigation

Pat Donahue is investigating iodine value methodology as a means of determining the degree of unsaturation in shellfish samples. Heather MacFarland is researching peroxide values for degree of oxidation in shellfish samples. Blue mussel samples have been collected for the month of February.

Kate Wiggin is still attempting identification of tuna samples using our method of crab species identification; but, as yet, she has not been successful.

Judy Krzynowek hosted a guest speaker, Mr. R. Woodman Harris, who talked on "Impediments at the Retail Level to the Increased Per Capita Consumption of Seafood in the U.S."

## New Product Development

The "U.S. Grade A" frozen fish was distributed to the supermarket chain by the processor and put up for sale to the consumer.

The i-point time-temperature indicators (inexpensive temperature recorders for detecting abusive handling) were found acceptable when the color change at the end point can be recognized. Experience is necessary to determine this end point.

## Blue Crabs

A storage study on pasteurized crab meat packed in nylon pouches is continuing. After 3 mo of refrigerated storage, there is no difference between the plastic-packed meat and commercially packed, canned, pasteurized meat.

## Product Quality, Safety, and Standards Investigation

### Product Quality

During this period, a final report, "An Investigation into the Stabilization of the Texture of Frozen Red Hake," was prepared and submitted to the New England Fishery Development Program, the sponsor for this research project. This report represented our effort in a joint study involving the University of Massachusetts, Cornell University, and the NMFS.

Another report describing the progress of our research on ammonia development in iced dogfish is now being prepared.

Frozen samples of dogfish from the December 1980 iced storage study were analyzed for volatile amine -N content. Dimethylamine content was insignificant (<1 mg-N/100 g)

and remained relatively constant throughout the 23-day storage period. Trimethylamine content was unchanged during the first 16 days and then increased to a final concentration of 5-6 mg-N/100 g. Ammonia content also remained unchanged during the first 16 days, but after 23 days had reached a level of about 30 mg-N/100 g in the fillet and 40 mg-N/100 g in the belly flaps. There was good correlation ( $r = 0.79$ ) between ammonia content and flavor score; however, this parameter by itself may not be an adequate measure of overall quality since oxidative rancidity or textural deterioration can occur independently of ammonia formation and cause spoilage. At spoilage, the predicted concentration for ammonia in the flesh was about 30 mg-N/100 g. Total volatile basic nitrogen, which is the sum of dimethylamine -N, trimethylamine -N, and ammonia -N, also correlated well with flavor score and has limited use as a quality test subject to the same criticism applied to the ammonia test. Ammonia content and pH correlated well ( $r = 0.92$ ). Thus, the pH meter could be used for crudely estimating the ammonia content of dogfish. We have, thus far, conducted two separate iced storage studies with dogfish and the conclusion is that the development of ammonia in the flesh is not a problem provided the fish are handled properly from the time they are caught.

Experimental materials for the agarose gel isoelectric focusing collaborative study have been dispatched to 14 collaborators. The results of this study are expected by April.

A glass column was packed with Chromosorb 103 for Dr. Hultin's group at the University of Massachusetts Marine Station to be used for analyses of volatile amines by gas chromatography.

#### Product Safety

Sixteen samples for polychlorinated biphenyl (PCB) analysis were received from the University of Southern California (USC) along with the corresponding archived samples of livers and gonads. This shipment, the winter collection, is the last one from USC and officially terminates the contract on the collection of samples from the Los Angeles area.

Workup of summer and fall samples collected from the Galveston Bay area by Texas A&M University has been completed. All florasil and silica gel eluants have been analyzed by gas-liquid chromatography. Total PCB results indicate no high level of PCB's in the muscles of the species analyzed. The winter samples have not been received as yet.

Samples of rock crab and American lobster from the New York Bight area have been worked up and analyzed for PCB's. This officially completes our work in the New York Bight area for this Marine Ecosystems Analysis Program (MESA) project. A final report will be issued in the near future.

The last collection from Montclair State College and the fall collection from USC are in the process of being worked up for PCB analysis. Winter collections from USC and Texas A&M University, as well as the NMFS Tiburon Laboratory, remain outstanding.

## Product Standardization

A revised draft of a "U.S. Standards for Grades of Fresh and Frozen Fish Steaks" has been prepared. This revision is based on comments received from the USDC Inspection Service and others. A word processor was used to facilitate the work of revising this document.

At the present time, there are four "U.S. Standards for Grades" which describe fish sticks and fish portions. Since these standards were written in the 1960's, they do not include the newer forms of presentation for these products such as portions in batter or "crispy" portions. We have started to prepare a single document whose objective is to include all coated products (breaded or in batter, singly or in combination).

Work has started to evaluate the performance of a device for measuring dehydration [see Marine Fisheries Review 42(6):32-34; June 1980] for USDC inspection of dehydration in frozen fish steaks.

Additional comments from the National Fisheries Institute have been received on the "Advance Notice of Proposed Rulemaking" of the "U.S. General Standards for Grades of Shrimp." Over 65 pages of comments have been received to date which are now being resolved. A new draft is being prepared for the Federal Register.

A Saltonstall-Kennedy Act funding proposal was prepared for a project on: (1) cooked yield determinations for various minced seafood products, and (2) market research and analysis on various seafoods as purchased by government user agencies.

Work on market research and analysis for canned salmon was continued. A questionnaire was prepared and submitted to the USDA for their approval. An extensive mailing list of private and government food service organizations is being prepared for use in this market study.

## Technical Assistance

Information and technical assistance were provided in the following areas: red crab; plant sanitation; aquaculture of scallops; the Gloucester fishing industry; drying fish; lobsters; eels; determining net weight of shrimp; Pacific whiting; widow rockfish; handling fishery products; fish preservation equipment; yield figures on scallops, clams, and oysters; military purchasing policies; whiting and whiting blocks; scallops; nutritive value of cod, ocean perch, and flounder; USDC Inspection Service and U.S. grade standards; trade associations of fishermen on the South Shore; breaded fishery products; optimum water temperature for marine fish; minced fish; handling fish aboard vessels; freezing lobster; holding fish in chilled seawater; trawl warp tension measurement; fuel usage by fishing vessels; fishermen's training; and multiple inquiries on the botulism potential associated with the packaging of unfrozen fish in vacuum or in a gas mixture having little or no oxygen.

## Travel, Meetings, and Presentations

Al Blott attended a meeting of the solar negotiating team in Gloucester, a meeting with the solar architectural and engineering firm in Lincoln, and a meeting with the North Shore Fishermen's Forum in Newbury, Massachusetts.

Perry Lane attended the monthly meeting of the New England Fisheries Steering Committee in Boston.

Bob Learson attended a meeting of the New England Fisheries Development Foundation.

### Personnel

Vern Nulk and John Kenney attended a 3-day course on "Introductory Basic Programming" given in Boston by the US Office of Personnel Management.

### EEO Activities

Perry Lane attended "EEO Counselor Training" for a week in Washington, DC.

## DIVISION OF ENVIRONMENTAL ASSESSMENT

### Biological Oceanography of Stressed Ecosystems Investigation

#### Total Plankton Respiration

The Total Plankton Respiration (TPR) Subtask has been continuing the analyses of data from the 1980 Superflux experiments. Preparation of the Superflux Symposium paper by Craig N. Robertson and James P. Thomas is proceeding as well as a technical report covering most of the oceanographic activities. Preliminary findings suggest that TPR rates are highest inside and just around the mouth of the Chesapeake Bay estuary and are associated with the bay's plume. Proceeding down the coast away from the bay's mouth, TPR rates separate their close association with the plume, but are still elevated. This appears to suggest the settling of particulate material with increasing distance from the estuarine source. Correlations between TPR rates and other biological parameters are variable and additional analyses are proceeding to determine better the relationships between these factors.

Large Area Marine Productivity Experiments total suspended matter (TSM) samples (18) from two cruises have been received and processed. More TSM samples are currently being collected on the February MARMAP cruise and will be processed as soon as they are received.

#### Seabed Metabolism

The Seabed Metabolism Subunit continued to analyze seabed oxygen consumption measurements and began to regress and correlate these with measurements of other variables.

Bill Phoel and Steve Spina provided diver support to the NOAA Atlantic Oceanographic and Meteorological Laboratory in Miami, Florida, for their studies in the US Army Corps of Engineers' dredge spoil capping experiment.

Bill and Steve also began cruise preparations for seabed oxygen consumption experiments in the New York Bight aboard the WHOI R/V Knorr with investigators from Brookhaven National Laboratory in Upton, New York.

## Phytoplankton Growth Potential

Additional preparation, including reviews by several staff members, was done on a paper, "The Effects of Metals on Growth of a Phytoflagellate, Olisthodiscus luteus, Which Blooms in Lower New York Bay." The study is a screening of O. luteus to the toxicity of 12 metals in concentration ranges based on values reported for the area. Manganese, zinc, molybdenum, lithium, mercury, and arsenic were apparently not inhibitory. The higher concentrations of iron, copper, cadmium, chromium, lead, and nickel were partially inhibitory, but not algicidal. The results suggest that metal toxicity may at times influence abundance and dominance of this species in the Hudson/Raritan estuary.

Work was continued on the assay of samples collected on 1980 Northeast Monitoring Program (NEMP)/Ocean Pulse Program (OPP) cruises. Because metals limitation thus far has been important, the assay was modified to include testing of possible specific limitation by iron and manganese.

## Phytoplankton Community Structure

Phytoplankton sampling bottles are aboard the R/V Clearwater for a "drought" cruise to be conducted during 25 February-2 March 1981 in New York Harbor (Hudson River, East River, and Upper and Lower Bays) and adjacent coastal waters to determine the effects of drought conditions on environmental quality and living marine resources. Contaminant and biostimulant concentrations as well as salinities, chlorophyll-a, and other variables are to be determined at the same time and will be compared with "normal" data from this area.

A second NOAA Technical Report on phytoplankton community structure in north-eastern waters of the US during November 1978, by Harold G. Marshall (Old Dominion University in Norfolk, Virginia) and Myra S. Cohn, is nearly complete and should be submitted to the editor shortly.

## Coastal Ecosystems Investigation

We helped to plan and carry out a survey of effects of the extended drought on patterns of temperature, salinity, dissolved oxygen, nutrients, and sediment contaminants in Raritan Bay and the apex of the New York Bight. Clyde MacKenzie and Dave Radosh conducted preliminary in-situ experiments on the effects of sediment contaminant levels on burrowing activity of the surf clam on the beds they have been studying off Long Island.

Bob Reid reviewed and commented on Shell Oil Company's environmental report for the Georges Bank lease tract area, and also the draft plan for monitoring impacts of oil-related activities on Georges Bank.

We provided tapes of data on sediments and benthic macrofauna of Raritan Bay and Long Island Sound to Dave Berg of the State University of New York at Stony Brook. Dave, who is putting together an inventory of all environmental information for the New York area, also obtained our file on zooplankton of the East River. We sent Jon Gibson (Center Directorate) a list of references which include common names for the invertebrates found in our sampling. This is part of an effort to standardize invertebrate common names, as has been done for fishes, for the several Centerwide reports prepared each year. We began the process of renewing our contract for the

sorting of NEMP benthic samples. Jay O'Reilly helped us deliver the December samples to the University of New Hampshire for analyses. Sorting, identifying, and confirming of our backlog of earlier NEMP samples continued.

### Benthic Energetics

Jan Ward worked with Dave Radosh in completing final revisions and proofing of the benthic fauna monograph for the MESA atlas series. Jan also has completed her updating of the benthic invertebrate life history file, current now to spring 1980. Dorothy Jeffress continued to work at determining the biomass data for benthic samples collected in the New York Bight apex to assess the impact that dumping may have on this community.

Frank Steimle spent his time this month between meetings and manuscript and/or report writing or review. He prepared a draft outline on benthic organic production as a section of a chapter ("Organic Production") for the proposed book on Georges Bank, being developed with WHOI and other research organizations. He spent considerable time reviewing and commenting on the draft NEMP annual report and worked with Donna Sanchez to begin to organize and catalog the numerous and diverse reports and documents developed for or by NEMP. Frank also began to solicit papers on artificial reef ecology for a Middle Atlantic Artificial Reef Symposium being planned for this fall for which he is obligated to develop and chair a reef ecology section and discussion panel. Russ Terranova continued to develop calorimetric data for organisms important as forage for Northeast demersal finfish stocks.

### Behavior of Marine Fishes and Invertebrates Investigation

As part of our ongoing NEMP research activities, studies are continuing to examine the responses of juvenile red hake to reduced concentrations of dissolved oxygen (DO). Results from preliminary experiments show hake capable of detecting and avoiding sublethal concentrations of DO. Changes in activity, aggression, and substrate association were also observed. Experiments are continuing to determine the concentrations at which these behavioral changes occur.

### Environmental Chemistry Investigation

Al Matte and Hank Rota participated in Part I of the spring MARMAP survey on the Albatross IV (Cruise No. AL 81-01), collecting 312 seawater samples for nutrient analysis. Ralph Bruno measured primary productivity at 18 stations. Jim Duggan and Kathy Workman estimated chlorophyll-a in netplankton and nanoplankton size fractions at 50 stations resulting in 993 chlorophyll estimates.

Ruth Waldhauer and Ingro Desvousges completed 2700 analyses of inorganic nutrients (nitrate, nitrite, and phosphate) and silicate using the Technicon Auto-analyzer.

Vinnie Zdanowicz completed the analysis of tissue composites collected during NOAA R/V Kelez Cruise No. KE 80-07/08 (MESA) for Ag, Cd, Cr, Cu, Ni, Pb, and Zn. Hg remains to be determined. Analysis of sediment samples from Delaware II Cruise No. DE 80-09 was also completed.

A survey aboard the Clearwater and Sandy Hook Laboratory's R/V Kyma was conducted to assess the effect of the 1980-81 drought on the Hudson-Raritan estuary. As part of the survey, water for nutrients, temperature, salinity, oxygen, and chlorophyll-a determinations was collected from stations in the estuary and in the inner New York Bight apex. Andrew Draxler served as Chief Scientist. Additionally, sediment samples were collected for analysis of heavy metal content throughout the estuary and up the Hudson River.

Ruth Waldhauer, Al Matte, Jay O'Reilly, and Andrew Draxler provided instruction to the New Jersey Marine Sciences Consortium in the calculation and interpretation of data collected, i.e. inorganic and organic nutrients, chlorophyll-a, temperature, and salinity, during their tidal marsh study. Data from this study may aid in assessing the effects of the 1980-81 drought.

Jim Nickels and Ralph Bruno revitalized and redesigned the sampling gear (sunlight incubator, acid fumer, photocell, filtration rack, etc.) used for primary productivity analysis at sea.

Jay O'Reilly and Chris Evans worked on the preparation of an oral presentation on "Distribution of Phytoplankton Biomass (Chlorophyll-a) and Primary Production in Shelf Waters Between Cape Hatteras and Nova Scotia," which will be made during the Third Gulf of Maine Workshop at Durham, New Hampshire, during 2-5 March.

### Physiological Effects of Pollutant Stress Investigation

#### Physioecology

Work with bay scallops and surf clams exposed to either copper or silver in a diluter system continues. All scallops and clams exposed to 10  $\mu\text{g}/\ell$  of Cu have died, as have all scallops exposed to 5  $\mu\text{g}/\ell$ . Scallops exposed to either silver or copper and surf clams exposed to copper were sampled for chemical analysis.

Three more 96-hr heavy metal bioassays using young adult blue mussels were performed this reporting period. Results are being tabulated and analyzed. Experiments with lab-reared blue mussels exposed to either copper or silver in a diluter system continues.

Three oyster embryo experiments were also performed. Sperm and eggs are being exposed individually to Hg or Ag to determine whether these early life stages are affected differentially by heavy metals.

Methodological development for analysis of copper in seawater continues.

We are participating in an NEFC task force study designed to look at causes of skin lesions in red hake. We are now in the process of analyzing a group of red hake for the presence of PCB's and heavy metals.

#### Physiological Effects

The study of silver-exposed sea scallops continued this month. We measured sodium, potassium, calcium, and total osmolality in hemolymph, and also measured gill-tissue respiration of animals exposed to 10 ppb of Ag for 60 days. The only significant difference between controls and exposed animals was in potassium concentration.

We have completed measurements of plasma sodium, potassium, calcium, and osmolality in blood samples collected on all past NEMP cruises.

With the return of the Milford Laboratory's R/V Shang Wheeler, we have resumed collecting blood samples from windowpane from three stations in Long Island Sound.

Scanning electron microscope (SEM) examination of gills of American lobsters exposed to Cd was completed this month. No evidence of damage was obvious. Preliminary examination of the olfactory organs of the same lobsters did not reveal any visible damage. The SEM examination of the gills of windowpane exposed to Cd was begun this month.

### Biochemical Effects

The second group of sea scallops in the long-term (60-day) exposure to Ag (10 ppb) was sampled for our purposes and those of other subtasks within the Investigation. The gills were homogenized and frozen, and biochemical analyses completed the following week. Analyses were also completed for kidneys from the 30-day and the 60-day groups. The adductor muscle samples archived at  $-80^{\circ}\text{C}$  will probably be tested in June.

Work continued on scallop adductor muscle from Albatross IV Cruise No. AL 80-09 (OPP). We tested the feasibility of using frozen aliquots of adductor muscle preparations, thawing a portion each day for enzyme analysis, and comparing results with an unfrozen aliquot which had been kept refrigerated during the 4-day assay period. The latter method is our standard procedure; John Stegeman (WHOI) has suggested looking into the frozen aliquot method as a possible way of getting around certain enzyme labilities. Results were mixed; although the freeze-thaw preparations had considerably higher IDH and GlutDH activities (both are strongly ion-activated), the ODH, which started high, faded fast in four consecutive 1-min assays. Moreover, biuret protein values for the frozen aliquots increased daily (0.192, 0.242, and 0.326 mg) although they were portions of the same preparation, whereas the refrigerated portion remained stable. We'll keep to our standard method.

We also adapted an amalgam of procedures (mostly from Sigma Chemical Company) and, after a bit of trial and error and a lot of guesswork, have arrived at a workable glycogen assay for use with scallop adductor muscle. We'll begin to use it immediately.

The enormous backlog of biochemical data from OPP cruises is being put into shape for computer entry. In getting together all the data for individual animals, some patterns are coming to light. Adductor muscle GlutDH, for example, seems to be related to shell length, with much higher activity in the smaller adult (8-10 cm) than in the larger (11-16 cm). This is true for scallops taken from stations in the southern sector only, thus far. We don't have a sufficiently wide size range in scallops from Georges Bank or from the Gulf of Maine stations to learn whether this pattern is also true for the northern stations. Recent analyses for scallops from these stations, however, show significantly higher GlutDH ( $p < 0.005$ ) at the deepwater station (155 m and  $6.0^{\circ}\text{C}$ ) than at the nearby control station (Fippennies Ledge -- 68 m and  $7.3^{\circ}\text{C}$ ), with central Georges Bank (65 m and  $14.0^{\circ}\text{C}$ ) falling somewhere in between. The high GlutDH, together with a slightly lower PK, suggests a lower cellular

energy charge in the deepwater animals. GlutDH is of fundamental importance in the synthesis of amino acids, and plays a key role in cell-volume regulation and, in marine invertebrates, in osmoregulation; it is tightly controlled by nucleotide concentrations, strongly activated by inorganic ions, and thus responds to energy levels with the cell, a low energy charge leading to GlutDH activation.

### Anaerobic Bacteriology/Metabolism

Lab activities continue on the identification of bacterial isolates obtained from past OPP cruises. Some 26 isolates from Albatross IV Cruise No. AL 80-07 were analyzed. Only eight were identified by our profile indexes: three were presumptive Vibrio cholerae (NAG), two were Aeromonas spp., two were Vibrio spp., and one was a Lactose (+) halophilic spp. The latter organism is causing some concern because it is a human pathogen; pathogenicity for the fisheries has not been recorded, as yet. Seven frozen ulcerated red hake received for chemical analysis were examined bacteriologically, as an effort of the task force on ulcerated red hake. Several bacterial isolates [pigmented gram(+) cocci and gram(+) rods] were obtained from the lesions on the fish. Supernatants from two of six cooked meat cultures proved toxic to mice.

With the return of the Shang Wheeler, sampling of our OPP stations on Long Island Sound has resumed.

### Travel, Meetings, and Presentations

Dr. A. Calabrese assisted in the preparation of the NEMP annual report at meetings held in Narragansett during 27-30 January and in Sandy Hook on 17 February. Dr. Calabrese was a panelist on the site-review team for the New Jersey Sea Grant Program held at Hoboken, New Jersey, during 17-19 February.

Dr. F. Thurberg attended the ICES Workshop on Marine Pollution Baseline and Monitoring Studies held in Nantes, France. Dr. Thurberg continued his temporary assignment at NMFS headquarters.

Dr. J. Graikoski attended a meeting of the participants of the New York Bight Benthic Sampling Study at Sandy Hook on 18 February.

Frank Steimle joined Dr. Pearce at the 2-4 February meeting at Woods Hole to review plans for monitoring the oil drilling activities in Georges Bank.

On 3 February, Dave Radosh, Bob Reid, Tony Pacheco, and Stan Gorski attended a meeting on sand mining in New York's Lower Bay, and subsequent disposal of contaminated spoils in burrow pits, with capping with clean spoils. Dave presented NMFS data on distribution and abundance of benthic macrofauna, and on possible impacts of mining and spoil disposal.

Bill Phoel attended a precruise meeting at the Brookhaven National Laboratory in Upton, New York, on 10 February.

On 17 February at Sandy Hook Laboratory, Frank Steimle and Bob Reid participated in a meeting to draft the NEMP annual report for fiscal year 1980.

On 18 February, Bob Reid chaired a meeting at Sandy Hook attended by Frank Steimle, Dave Radosh, and a number of other NEMP personnel, to discuss integrating results of our 1980 benthic studies in the New York Bight into a single annual report, and to plan for 1981 sampling.

Vincent Zdanowicz attended a MESA meeting concerning the results of the summer 1980 cruise and the planning of the summer 1981 cruises.

On Tuesday, 10 February, Dr. James Thomas participated in the NOAA National Ocean Survey's (NOS) review of its developing Chesapeake Bay study program at Rockville, Maryland. The proposed NOS studies, principally concerned with physical oceanography and hydrographic measurements, have obvious relationship to the Superflow Program which is measuring the seaward flow of Chesapeake Bay source and entrained materials.

On Friday, 6 February, Dr. John Pearce met with Ms. Ruth Rehfus, Acting Chief of the Northeast Regional Office's Habitat Protection Branch, and with Dr. Robert Lippson, also of the Habitat Protection Branch, the latter at the Oxford Laboratory. The purpose of the meeting was to develop further dialog between the habitat protection personnel and our Division of Environmental Assessment scientists. The meeting resulted in the preliminary development of a category of activities which the Habitat Protection Branch perceives as being critical to their data needs and the research and monitoring activities that are being conducted by NEFC personnel and the importance of these in meeting habitat protection goals and objectives.

During 18-28 February, Dr. Pearce participated in the ICES Working Group on Marine Pollution Baseline and Monitoring Activities in the North Atlantic. The Working Group has a new Chairman, Dr. Miles Parker of Ireland, and much of the meeting was devoted to identifying the future direction that ICES baseline and monitoring studies should take. In addition, there was a joint meeting between the Marine Chemistry Working Group and the Monitoring and Baseline Working Group to discuss how data should be treated statistically to be of most use in establishing long-term trends in loading of fish tissues with trace metals and organic contaminants. The understanding of such trends is a key part of the ICES coordinated monitoring program. In addition, considerable attention was devoted to discussions of biological effects monitoring, using field and lab studies in several disciplines to understand better how contaminants impact on living marine resources. Several recommendations were developed and will be brought forth to the ICES Marine Environmental Quality Committee for further discussion during the Statutory Meeting to be held in Woods Hole in October 1981.

#### Publications

- Mackenzie, C. Biotic potential and environmental resistance in the American oyster (Crassostrea virginica) in Long Island Sound. *Aquaculture* 22:229-268;1981. (P)
- Pearson, W. H.; Woodruff, D. L.; Sugarman, P. C.; Olla, B. L. Effects of oiled sediments on predation on the littleneck clam, Protothaca staminea, by the Dungeness crab, Cancer magister. *Estuar. Coast. Mar. Sci.* (A)
- Steimle, F. W., Jr. Trophic relationships of artificial reef fishes. *Int. Council. Explor. Sea Comm. Mem.* 1981/E:3;1981. (S)

Terranova, R. J.; Stillwell, C.; Steimle, F. W., Jr. Insight into the calorimetric analysis of shark liver. N.J. Acad. Sci. Ann. Meet.;1981 March 28. (Abstract.)  
(A)

## AQUACULTURE DIVISION

### Aquacultural Genetics Investigation

#### Oyster Breeding

American oysters in the fast-growth and slow-growth lines have commenced spawning in what is their second selected generation. A paper detailing this experiment and briefly reviewing selection experiments has been prepared for publication. In the first selected generation, five of seven comparison fast-growth lines grew about twice as fast as the slow-growth lines. In the other two, the slow-growth lines exceeded the fast lines slightly. Overall, even though no comparison was made to a randomly bred line, the results document that very sizable gains in growth rate can be made in American oysters through selective breeding. This is provided environmental control is maintained in the brood stock so that meaningful selection of spawners can be made.

S. Stiles prepared a poster paper for the Oyster Workshop and World Mariculture Society meeting in Seattle, Washington. This presentation concerns ability of different American oyster populations to hybridize, and the genetic outcome of such for oyster transplantations on natural beds.

A. Longwell, along with Dr. John Ryther of WHOI, prepared the administrative report on US aquaculture activities for the ICES Mariculture Committee. Also, plans are being made for the first meeting of the ICES Genetics Working Group in Copenhagen in May.

#### Genetic Effects and Ocean Contamination

Although several species have been sampled at sea (altogether more than 600 fish), application of the micronucleus test for chromosome mutation has been concentrated on windowpane and Atlantic cod. Most definitive data are presently on the flounder, which will be sampled as frequently as every month on the Mini-Pulse cruises into Long Island Sound. As in most fish species examined, background mutation rates in the blood-forming tissues are low, in fact, rather comparable to those of animals, an average of two per 1000 cells. Of the three Long Island Sound stations sampled intensively, the one chosen on the basis of its bottom contaminants with heavy metals near Hempstead Bay appears to have a micronuclear incidence three times that of other sample stations. Moreover, the morphology of the blood sampled at this site and another moderately contaminated station shows signs of physiological stress seldom observed in fish taken from yet another, cleaner portion of the Sound.

Experimental work further appears to be demonstrating that micronucleated erythroblasts induced in kidney cells of lab fish can and do enter circulation after a period of months as regulated by the longevity and slow turnover of red blood cells in fish as opposed to shorter-lived erythrocytes of mammals. This demonstration is deemed of importance to meaningful application of the micronucleus test in field monitoring.

Background incidences of mitotic errors in amphipod eggs are being calculated for a second OPP collection (September 1980) of ovigerous Ampelisca agassizi.

Plans are to make a second year's collection of blood samples of Atlantic cod on Georges Bank during a forthcoming bottom trawl survey. Because of the complicated presence of cod erythrocytic necrosis disease in this area, the micronucleus test is to be applied this year to both blood-forming tissue of the kidney and to circulating blood cells. Data are to be analyzed relative to disease incidence. Since some viruses can and do break chromosomes, viral disease, as well as environmental mutagens, in these fish could elevate mutation rates in them.

Fish eggs and larvae, as well as amphipods, are to be collected for cytological studies on May and July OPP cruises.

Other work done in this reporting period concerns the improvement of methods for preparing erythropoietic tissue of kidney for more specific application of the micronucleus test, and a survey of the blood cells of embryonic and larval fish with the intent to employ them in future studies.

The practicality of in-vivo assays of sister-chromatid exchange in fish (a phenomenon correlated to chromosome mutation) and chromosome banding in cells of the yolk-sac membrane of fish is being explored. Some progress has been made on demonstrating the prefertilization chromosome apparatus of the fish egg, and the gamete chromosomes in the process of fertilization. The usefulness of such a capability in appraising the state of the fish egg seems to warrant efforts at developing a reliable means to handle a procedure technically very difficult for finfish though relatively simple in shellfish.

#### Aspects of Nutritional Requirements of Mollusks Investigation

American oysters about 2-3 inches in size were obtained from F. M. Flower and Sons, Inc., of Long Island, for continuation of our feeding studies on mature oysters in the rearing chambers. Studies were designed to test the effectiveness of two different feeding schedules using a flagellated chlorophyte, Tetraselmis maculata, as the food source. The experiment is now in progress and significant data have not yet been generated. It is of particular interest, however, that oysters kept in basins in static seawater developed a high mortality (37%) in a few days, while those held in the culture rearing chamber had only a 5% mortality during this period.

Requests for starter cultures were received from, and subsequently forwarded to Shellfish, Inc., on Long Island, and to Long Island Oyster Farms.

#### Spawning and Rearing of Mollusks Investigation

Additional feeding studies with bay scallop larvae have been completed. Results from experiments in which the larvae were held at constant phytoplankton concentrations for their entire larval period confirm our earlier observations that growth rates are faster at relatively low cell concentrations. These phytoplankton concentrations are similar to the levels found in natural scallop environments during the spawning season. At these low algal concentrations, bay scallop larvae at normal culture densities consume about 20% of the total available cells each hour, so, to take advantage of the superior growth rate at reduced phytoplankton levels, a continuous feeding program will be used.

Surf clam growth data from our 1980 tank farm experiments have been analyzed. Determinations were made of the average amount of chlorophyll-a that was removed from the individual tanks containing different numbers of clams. Samples of seawater entering and exiting the tanks were monitored for in-vivo fluorescence to estimate this removal. Flow rates were kept constant in the tanks at 50 l/min. The gross increase in biomass and the increase in length of the clams were recorded. Tanks with more clams had greater final biomasses; however, the percent increase in biomass was greater in tanks with fewer clams. The final length of clams was inversely related to the number of clams in a tank. The greatest increase in biomass per tank occurred in the tank with the least number of animals. The algal requirement per clam per day was calculated for clams in this tank. The amount of algae that would have been required to produce maximal growth for the increasing biomasses was explored. For this experiment, clams grew from 36 to 48 mm and required 204.3 µg of chlorophyll-a /day/l for maximal growth. It may be possible to manage the growth of clams in raceways by increasing flow rate to increase the amount of available nutrition.

### Visitors

Jim MacGlaflin of Pawcatuck, Rhode Island, and Ken Boni of Groton, Connecticut, visited the Milford Laboratory and discussed culture techniques for bivalves with Ed Rhodes and Ron Goldberg.

John Duffy of Holy Cross College visited and discussed with Ed Rhodes a possible thesis problem involving scallops.

### Publications

Goldberg, R. Biological and technological studies on the aquaculture of yearling surf clams. Part I: Aquacultural production. Proc. Nat. Shellfish. Assoc. 70:55-60; 1980. (P)

### Reports

Stiles, S.; Choromanski, J. Breeding and crossability of geographic populations of the American oyster with genetic implications for transplantations in nature [poster display]. World Maricult. Soc. Meet.; Seattle, Wash.

## PATHOBIOLOGY DIVISION

### Comparative Invertebrate Pathology Investigation

Amphipods collected on the December OPP survey (Delaware II Cruise No. DE 80-09) have been prepared for examination and these specimens compared with ones collected on the September (Albatross IV Cruise No. AL 80-09) and July (Albatross IV Cruise No. AL 80-07) surveys. Ampelisca agassizi was the most abundant species in all three cruises. Microsporidians were the most common parasites in this amphipod. There was an apparent rise in prevalence of infection during the late fall, with 9% infected with microsporidians in July, 8% in September, and 36% in December. The number of stations with microsporidian-infected A. agassizi also increased from 2 of 7 stations in July to 5 of 10 in September to 7 of 9 in December. Microsporidians are usually host specific, and forms like the species from A. agassizi were not seen in amphipods that occur with that species. Although an obvious stress factor, this microsporidian is usually

confined to a few posterodorsal muscles, and probably does not cause direct mortality. A very different parasite was also consistently present in collections from each cruise. This Hematodinium-like organism was found in several amphipod species and does not appear to be strongly seasonal in distribution. Assuming all Hematodinium-like infections were due to the same species of parasite, it appears that it is a less adapted parasite than the microsporidian. Not only is its host range much broader, but the majority of infections were intense and would have caused death.

Over 4500 euphausiids (Euphausia krohnii, Meganctiphanes norvegica, and Nematoscelis megalops) collected during Deepwater Dumpsite (DWD) 106 cruise in May 1980 from slope waters of the Middle Atlantic Bight have also been sorted, identified and examined for gross abnormalities. It appears from these examinations that N. megalops has the highest prevalences of focal gill melanization (42-61%) and M. norvegica has the lowest (0.08-0.7%). E. krohnii had focal melanization prevalences of 19-29%. These data will be examined further to relate the occurrence of ecto-commensals to euphausiid life histories and to sampling sites. It may thus be possible to gain information on the cause and/or significance of focal melanization.

Histologic examinations of euphausiids showing melanization still revealed no etiological agent; however, a Hematodinium-like organism was found throughout one specimen of M. norvegica. Further microscopic examinations are in progress to disclose other internal parasites of these planktonic organisms.

Examinations of histologic sections of surf clams, ocean quahogs, and sea scallops continued during the month. These mollusks were collected on a bottom trawl survey (Delaware II Cruise No. DE 80-06) for OPP studies. One hundred forty-five of the 344 animals have thus far been examined and no significant parasite levels or serious pathology have been observed. These results are similar to the observations made on samples from previous cruises.

Thick sections of Ostrea edulis microcell disease and Crassostrea gigas microcell disease have been prepared, examined, and thin sections selected for ultrastructural examination. Microcells were recognized in the O. edulis, but not yet identified in C. gigas.

Mr. Farley returned to the Oxford Laboratory after having served on the faculty of the Comparative Pathobiology Course at the Marine Biological Laboratory at Woods Hole, Massachusetts, and where he delivered lectures and gave classroom and lab exercises in molluscan anatomy and histology, parasitic diseases, virus diseases, and neoplasia.

The Histology Unit prepared over 150 histologic sections of various fish and shellfish tissues. Other activities of the Unit involved: working with the Shellfish Disease Group of the State of Maryland in preparing slides, preparing demonstrations for children from the Neighborhood Service Center, and organizing materials for a manual on histological procedures.

#### Diseases of Larval Mollusks Investigation

Three shellfish-pathogenic bacterial strains isolated from moribund Milford Laboratory oyster larvae are being studied. Two of the isolates are thought to be the same; they cause mortality after embryos reach the straight-hinge stage. Pre-

liminary study showed that the other bacterial isolate inhibited early embryonic development. Exposure experiments are scheduled using fewer bacterial cells. Identification of the bacterial strains is in progress. Hopefully, the new water table will be put into good working order soon so that the toxin study can be resumed.

Twenty bacterial cultures were isolated from an oyster hatchery in South Bristol, Maine. Six of the isolates (M1, M4, M11, M14, M15, and M22) appear to be pathogenic to oyster larvae. Eighty biochemical tests were run on these six isolates to identify them to species, while the others were tested only to genus. Additional challenges are necessary to confirm identification. The total plate count data were reported to the hatchery manager.

Forty isolates were taken from the January OPP inshore survey and will be subjected to biochemical and oyster larval challenge testing in March. Now that oyster eggs and larvae are available weekly, survey isolates from July, August, and September have been challenge-tested. Results from these tests will be available in March.

Antibody against a Vibrio sp. has been obtained from striped bass and purified on an affinity chromatography column consisting of Vibrio sp. cells coupled to polyacrylamide gel. After testing to verify the presence of a sufficient quantity of Vibrio-specific globulin, the antibody will be injected into rabbits to produce a rabbit anti-fish globulin. The latter reagent can be used as a bridge between fish antibodies and commercially prepared reagents for immunodiagnostic tests. Hopefully, this will allow us to produce striped bass antibodies against a series of bacterial pathogens and then use these antibodies in conjunction with commercial fluorescein-linked or enzyme-linked reagents in the identification of pathogens involved in epizootics. The purchase of small aliquots of commercial reagents for this purpose is much simpler and less expensive than repeated lab preparation of fluorescein-linked or enzyme-linked antibodies which lose their potency with storage.

Additional work is in progress to develop optimal conditions for the use of a fluorescamine reagent to count oyster phagocytes by spectrofluorometry. Bovine serum albumin was used as a standard for quantification of total phagocyte protein; however, at several pH values the relative fluorescence values of standard and test proteins were not quantitatively linear. Buffer substrates and pH values are being worked out.

A comparison study is being conducted to determine whether estuarine agar, described by Weiner, Hassong, and Colwell (Canadian Journal of Microbiology 26:1366-1369; 1980), would be better than the marine agar presently being used.

In cooperative work with the Maine Department of Marine Resources, the investigation completed two more experiments on inactivating Gonyaulax tamarensis "complex" cysts with ozone treatment. The experiments proved inconclusive due to the poor condition of the cysts as a result of shipping delays. On 26 March, more material is expected to be "hand-delivered" to the Milford Laboratory and the tests will be repeated.

Extractions from bluefish using organic solvents were made for toxicity tests. An acid and water-based bioassay showed no toxicity to mice.

In cooperation with the Connecticut Aquaculture Division, a coliform test on hard clam samples from Bayview Beach near Milford was completed. Coliform tests were negative.

## Fish Pathology Investigation

For the second month in a row it has not been possible to obtain red hake with ulcers from the New York Bight sewage sludge dumpsite. Despite several trips to the area, red hake could not be obtained. Apparently, bottom water temperatures are too low and the hake have moved offshore to deeper, warmer water. John Ziskowski has interviewed several commercial fishermen from New Jersey and it is apparent that they are aware of the red hake integumental lesion (red sore disease). All fishermen interviewed were very cooperative and offered their assistance in obtaining diseased fish. Unfortunately, because the fish have moved offshore, there is little chance to obtain them again until spring. Most red hake are caught as a by-catch in the New Jersey silver hake fishery.

Tabulation of data on vertebral anomalies of *Ammodytes* sp./spp. collected in 1977 and 1980 bottom trawl surveys is complete. It is hoped that statistical analysis of the data can begin next month. The most common anomaly found was fusion of vertebrae. The greatest prevalence (20%) of vertebral fusion was a sample from nearshore waters south of Virginia Beach, Virginia. Prevalences of other skeletal anomalies in excess of 20% were seen in some areas.

Studies of infectious pancreatic necrosis virus (IPNV) in clupeid fish populations have been temporarily suspended. The Atlantic menhaden kidney cell line being used to detect the presence of virus may have become refractory to infection by IPNV. A series of experiments to evaluate the susceptibility to IPNV of the cells presently in use versus menhaden kidney cells from earlier passage which have been in frozen storage, as well as a newly developed cell line from American shad, is being planned. If the results of these experiments are satisfactory, the search for natural carriers of infection will be continued.

Additional studies to determine the specific identity of the diotrophymid nematode found in Chesapeake Bay's American eels were discussed with Dr. Ralph Lichtenfels of the USDA.

Transmission electron microscope studies were conducted on the olfactory organ of the striped killifish. The sensory tissue was composed of extremely long receptor cells with round-to-oval nuclei located in the basal one-third of the epithelium. The supporting or sustentacular cells also had their nuclei (broad oval in shape) in the basal region of the tissue. The sensory and sustentacular cells formed an epithelium, the upper two-thirds of which was filled almost entirely with slender, apical or dendritic cell processes. Extensive regions of tight cellular junctions were observed around the perimeter of the cells at their apical borders. The structure of these cells will be further examined by freeze-etch electron microscopy. The apical ends of the receptor cells were characterized by a prominent olfactory tubercle or swelling from which stout cilia were observed to emerge into the luminal space of the organ. The supporting cells had numerous microvillous processes but did not appear to possess any cilia. As mentioned previously, the fine structure of the sensory organ in this species must be understood prior to initiating experiments involving copper as a toxicant.

## Microbial Ecology and Parasitology Investigation

Cooperative research on the impacts of sewage sludge on bottom sediments of the Philadelphia-Camden disposal site has constituted a major work effort during the past

2 yr. Since sludge disposal at the site was terminated in November 1980, a meeting with our collaborators from EPA and the Food and Drug Administration was held to outline two major publications for submission to the Journal of the Water Pollution Control Federation; both papers were completed and forwarded. The first manuscript summarized our recovery of potentially pathogenic amoebae (Acanthamoeba) from the same sediment samples which yielded sewage-associated bacteria. Amoebae were found at 28/147 (19%) different stations. Only 2/28 positive stations were located outside of the area positive for sewage bacteria; one station was located at the inactive dumpsite at the mouth of Delaware Bay and the other only several miles west of the present site. Amoebae were not found at any of the 26 control stations located west and northeast of the dumpsite. Further analysis of the data showed that 20% of the stations sampled within the impacted area were positive for the amoebae. Comparative data on sewage-associated bacteria and the cyst-forming amoebae will be used to design continuing studies on the decline of bacterial numbers with the cessation of sewage disposal. Since the amoebae eat dead as well as living bacteria, it is expected that the frequency with which they are recovered will remain high after sediments no longer yield viable coliform bacteria. The second manuscript (O'Malley et al.) describes the drift of sewage bacteria along an extensive northeast-southwest course and a narrow east-west course, and documents a very high statistical correlation between the distribution of amoebae and the bacteria. The two manuscripts provide an excellent data base from which further studies may be planned to follow the rate of recovery of the sea bottom subsequent to the cessation of sludge disposal. Both topics are to be presented at the March meeting of the Atlantic Estuarine Research Society in Wrightsville Beach, North Carolina.

Attempts to make direct plate counts on the numbers of amoebae per gram of sediment have not been initiated since the time required to make dilutions, cultures, etc., has been spent in preparing manuscripts. We have developed a semiquantitative procedure by which six replicate cultures are prepared for each sediment sample--three with fresh water and three with brackish water. A statistical comparison between the number of positive dishes and the fecal coliform bacterial count is then computed. Preliminary studies have shown that three or more dishes may yield amoebae when the fecal coliform MPN (most probable number) is 50 or more ( $p = 0.01$ ). Fresh water and brackish water are used because, in some instances, species other than those of Acanthamoeba grow rapidly and exhaust added food organisms before acanthamoebas become established. In one recent study on sewage-impacted sediments from the Appalachicola River, Florida, brackish water amoebae overgrew two of three saltwater agar cultures to yield only one with Acanthamoeba, while on freshwater agar the amoebae appeared on two of three dishes. A small number of experiments are now in progress to incorporate a second step--the preparation of six new freshwater cultures when it is found that non-Acanthamoeba species overgrow the brackish water plates. Other publications on results in the New York sewage disposal site and Narragansett Bay, Rhode Island, are in preparation to demonstrate that the frequency with which the amoebae may be isolated is directly related to the numbers of sewage bacteria present in the sediments.

Data on the pathology and heavy metal burdens in gills of the rock crab, have been analyzed and a manuscript for submission to Marine Pollution Bulletin has been drafted. Results are presented to describe our findings in 100 animals collected during the first year of work under NEMP. The heavy metal analyses accomplished in cooperation with Richard Greig at the Milford Laboratory provide our first data base from which metals in crabs from clean stations may be compared.

## Travel, Meetings, and Presentations

Dr. Murchelano conferred with Michele Cox at the Sandy Hook Laboratory on 7 February; attended National Institutes of Health site visit to the Marine Biological Laboratory in Woods Hole on 19 and 20 February; conferred with Linda Despres-Patanjo (of the Woods Hole Laboratory) at the Narragansett Laboratory on 23 February; and attended an emergency meeting on Center budget and personnel at the Woods Hole Laboratory on 27 February.

Dr. Bodammer and Mr. Newman attended the Helminthological Society of Washington meeting on 13 February; Dr. Bodammer presented a talk on "Microscopic Observation of Epiphytic Organisms on the Gills of Cancer irroratus," and Mr. Newman presented a talk on "The Occurrence of Eustrongylides sp. from Eels in Chesapeake Bay."

## Visitors

Visitors to the Oxford Laboratory during the month included Mr. James B. Engle of Oxford, Maryland; Mr. Michael Castagna of the Virginia Institute of Marine Science in Wachapreague, Virginia; and Mr. Austin Williams of the National Systematics Laboratory.

## University Affairs

Dr. Rosenfield met with representatives from the University of Maryland on 23 February to discuss and refine a document that will establish a Cooperative Agreement between the Oxford Laboratory and the University of Maryland Center for Estuarine and Environmental Studies' Horn Point Laboratory in Cambridge, Maryland.

Dr. Blogoslawski continued cooperative research with Dr. Julius Kuck of Fairfield University on separation and purification of paralytic shellfish poison in surf clam extracts. One set (26) of mouse bioassays was completed showing the location of the poison in the Bio-Rex 70 column.

Messrs. Colin Campbell and William Condon of Fairfield University visited Dr. Blogoslawski to report progress on microbial degradation of No. 2 fuel oil by isolates taken from a locally polluted estuary and grown in Swisher tubes.

On 4 February, Dr. Blogoslawski conducted a tour of the Milford Laboratory for Dr. Pellegrino's Marine Biology class at Southern Connecticut State College.

On 3 February, Dr. Blogoslawski from the Milford Laboratory judged the St. Mary School Science Fair. The winning exhibitor (8th grade) showed a poster on recombinant DNA research.

A film and tour of the Oxford Laboratory was presented by Ms. MacLean to a small group of students from the Neighborhood Service Center in Easton, Maryland, on the evening of 25 February. Various examples of fish diseases and abnormalities were demonstrated and explanations of their occurrences were given to the students. Students were given an opportunity to examine various specimens under a microscope. Judging from their questions and participation, the students apparently enjoyed their visit and learned something new.

## Publications

O'Malley, M. L.; Lear, D. W.; Adams, W. N.; Gaines, J.; Sawyer, T. K.; Lewis, E. J. Microbial contamination of continental shelf sediments by ocean disposal of sewage sludge. J. Water Pollut. Contr. Fed. (S)

Patanjo, L.; Murchelano, R. A. Fish health in the western North Atlantic. Sixth East. Fish Health Workshop. (Abstract.) (S)

Robohm, R. A.; Brown, C.; Murchelano, R. A. Comparison of antibodies in marine fish from clean and polluted waters of the New York Bight. Int. Assoc. Aquat. Anim. Med. (Abstract.) (S)

## NATIONAL SYSTEMATICS LABORATORY

### Penaeoid Shrimp Investigation

Work was done on the description of the external genitalia of the American Pacific rock shrimp, *Sicyonia mixta*, the females of which have not been recorded in the literature. Research continued on two species of solenocerid shrimp from the Indo-West Pacific.

### Crustaceans Investigation

Preparation continued of the manuscript on the "Shrimps, Lobsters, and Crabs of the Temperate Eastern U.S."

### Pelagic Fishes Investigation

We sent out for review a draft of a paper (written with R. Cressey of the Smithsonian Institution) on host specificity of copepods parasitic on scombrids. Work continued on a revision of the Spanish mackerels. We also completed sections on Scombridae and Hemiramphidae for "Sea Fishes of South Africa."

### Benthic Fishes Investigation

We completed a draft of a paper on a collection of benthic fishes trawled off West Africa, including descriptions of three new species. We also completed drafts of sections on families Bathylagidae and Argentinidae for "Sea Fishes of South Africa."

### Travel, Meetings, and Presentations

Bruce Collette attended a meeting of the NMFS Publications Advisory Committee in Washington, DC.

### Visitors

Dr. Gilbert Rowe of Brookhaven National Laboratory visited D. Cohen for information on deepsea fishes.

## Publications

- Collette, B. B. Belonidae (A) and Hemiramphidae (S). In Sea fishes of South Africa.
- Collette, B. B. Redescription of Hyporhamphus xanthopterus, a halfbeak endemic to Vembanad Lake, Southern India. Matsya. (S)
- Russo, J. L. Field guide to fishes commonly taken in longline operations in the western North Atlantic Ocean. NOAA Tech. Rep., NMFS Circ-435;1980. 51 p. (P)

## ATLANTIC ENVIRONMENTAL GROUP

### Ocean Monitoring and Climatology Task

The cooperative Ship of Opportunity Program obtained five expendable bathythermograph (XBT) transects and two continuous plankton recorder (CPR) transects in February: two XBT and one CPR transect 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 March 1981 issue of Atlantic Notice to Fishermen:

AEG/February 17, 1981

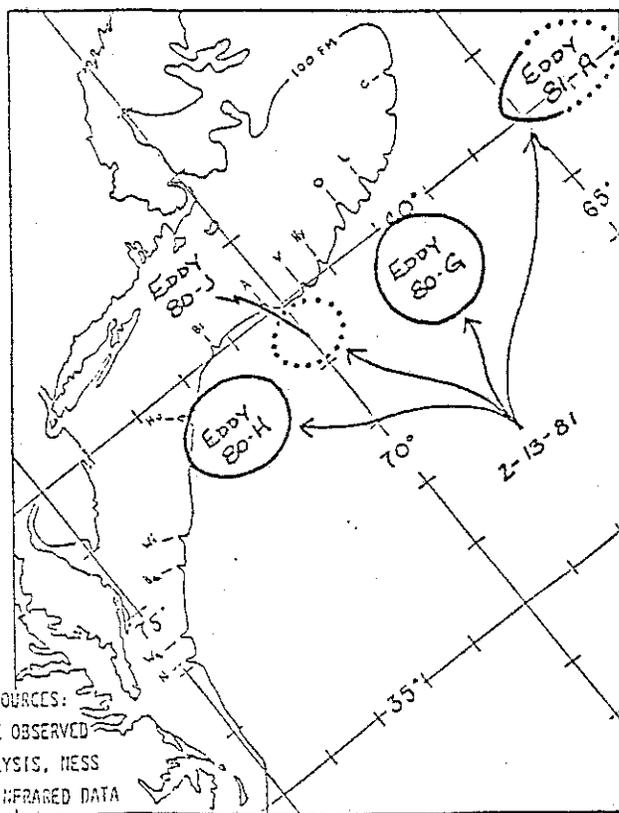
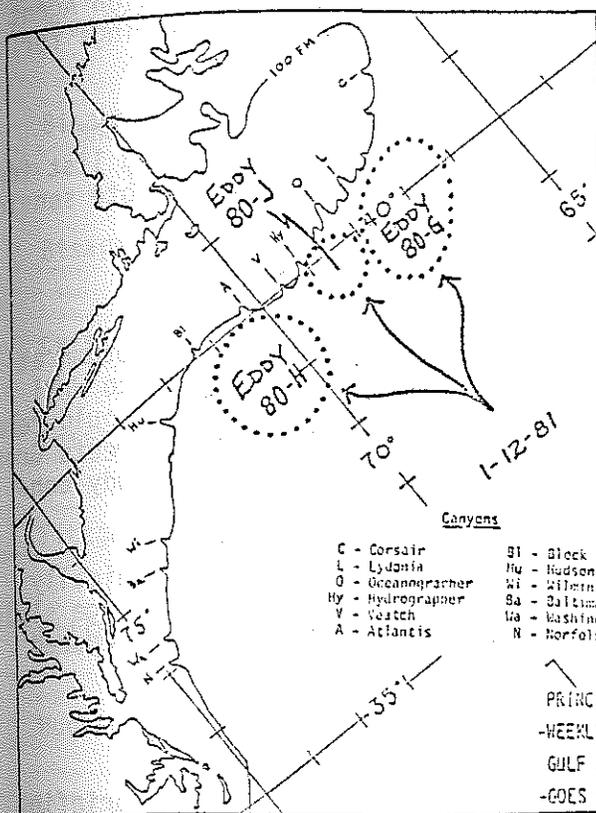
### GULF STREAM EDDY LOCATIONS

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

Eddy 80-H moved 104 km (56 nm) to the west and is now centered at 39.1°N, 71.8°W, east of Hudson Canyon. Eddy 80-J advanced to a center position of 39.4°N, 69.9°W, a distance of 125 km (67 nm) and is presently south of Atlantis Canyon. Eddy 80-G traveled 85 km (45 nm) to a position south of Lydonia Canyon at 39.2°N, 67.7°W. Eddy 81-A formed about 14 January 1981 at 40.0°N, 62.5°W. The eddy has moved 130 km (70 nm) to the west and is now located at 40.2°N, 64.0°W, southeast of Corsair Canyon and far offshore of the 100 fm line.

During the next 30 days Eddy 80-H may move to a center position south of Hudson Canyon; Eddy 80-J may move to south of Block Canyon; Eddy 80-G may travel to south of Hydrographer Canyon and Eddy 81-A may move to a position south of Corsair Canyon.

Fishermen are requested to report unusual conditions or catches occurring in the vicinity of these eddies to the Director, Atlantic Environmental Group, National Marine Fisheries Service, RR 7, South Ferry Road, Narragansett, 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).



The following requests regarding remote sensing activities or products were received and answered during February:

1. 19 February -- Duncan Chesley of the University of Massachusetts' Remote Sensing Center phoned J. L. Chamberlin for information on NEFC's use of remote sensing. He wanted it immediately for use in preparing a proposal for the Northeast Area Remote Sensing System. So, Dr. Chamberlin told him about: (1) analysis of slope-water fronts from warm-core rings and Gulf Stream position, (2) the Superflux project (he knew something of this), (3) drift-buoy tracking, and (4) weekly charts supplied to fishermen and oceanographers. Chesley was referred to J. L. Chamberlin by H. Mustafa.
2. 20 February -- Mike Curran, head of MDI in Boston, phoned J. L. Chamberlin. He said MDI is a seafood processing company and that he is trying to get better cooperation from fishermen in harvesting Atlantic mackerel. The fishermen are reluctant because of difficulty in finding the fish. He had heard of satellite info being useful to Alaska fishermen and wondered about the possibility for the Atlantic Coast. Dr. Chamberlin told Curran about the interest of fishermen in oceanographic analysis charts and desire to receive them by radio facsimile. Information on charts was mailed to Mr. Curran.

3. 20 February -- Dr. Chamberlin mailed Gef Flimlin, a Marine Extension Agent in Toms River, New Jersey, information on Gulf Stream warm-core rings for use in an article he is writing for fishermen.
4. 23 February -- Dr. Ingham answered a letter from Dr. D. L. Kan of the Massachusetts Maritime Academy requesting to be put on the mailing list for AEG's weekly Gulf Stream analysis (modified) charts and other remote sensing information.

#### Ocean Dumping Task

Our keypunched data from satellite-tracked buoys utilized this past autumn at Deepwater Dumpsite (DWD) 106 and the Puerto Rico dumpsite were transferred to WHOI for filtering and processing. Some processing costs may be incurred, but should remain small. Wind and wind-stress data plots were received from the URI Data Projects Group. These plots were generated for the radio-direction finding, drogued-buoy study conducted at DWD 106 during May 1980.

Dr. Peter Anderson (EPA, Region II) has been contacted and will periodically supply updated information on permit applications for dumping flyash and sewage sludge at DWD 106. Dumping input summaries for 1979 and 1980 at DWD 106 will be prepared from information also supplied by Dr. Anderson.

#### Travel, Meetings, and Presentations

On 5 February, Steve Cook traveled to Port Newark, New Jersey, for a briefing on the operations of the M/V Oleander, a recent ship of opportunity.

Jim Bisagni attended an ocean dumping meeting held in Bay St. Louis, Mississippi from 9 to 13 February.

Sandy Lundin attended a meeting at the Woods Hole Laboratory on NERFIS and other automatic data processing systems on 12 February.

On 17 and 18 February, Mert Ingham attended a NEMP Management Team meeting which was held at the Sandy Hook Laboratory.

Bob Benway and Dan Smith visited the M/V Oleander at Port Newark, New Jersey, to supervise the installation of davits on 19 February.

On 25 February, Woody Chamberlin and Jim Bisagni traveled to Woods Hole, Massachusetts, to confer with personnel at NEFC and WHOI.

Mert Ingham attended a Center Board of Directors meeting on 27 February at Woods Hole Laboratory concerning budget restrictions.

#### Publications

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

- Armstrong, R. S. Current patterns and hydrography of the Buccaneer Field and adjacent waters - vol. IV. NOAA Tech. Mem. NMFS-SEFC-50;1981. 31 p. (P)
- Bisagni, J. J. The movements of two satellite tracked drogued buoys deployed at the offshore 106 mile dumpsite. COPAS (Coastal Ocean Pollution Assessment News). (S)
- Bisagni, J. J.; Kester, D. R. Physical variability at an East Coast United States offshore dumpsite. Proc. First Int. Ocean Dump. Symp.;1978 October. (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)
- Crist, R. W.; Chamberlin, J. L. Real-time ocean thermal front monitoring. URI Com. Fish. News. Jan.-Feb. 1981. p. 6. (P)
- Fitzgerald, J. L.; Chamberlin, J. L. Anticyclonic warm core Gulf Stream eddies off the northeastern United States during 1979. Ann. Biol. 36. (A)
- Hilland, J. E. Variation in the shelf water front position in 1979 from Georges Bank to Cape Romain. Ann. Biol. 36. (A)
- Hughes, M. M.; Cook, S. K. Water column thermal structure across the shelf and slope southeast of Sandy Hook, New Jersey, in 1979. Ann. Biol. 36. (A)
- Ingham, M. C. Water masses and dumping at the 106-mile site. COPAS (Coastal Ocean Pollution Assessment News). (S)
- McLain, D. R.; Ingham, M. C. Sea surface temperatures in the northwestern Atlantic in 1979. Ann. Biol. 36. (A)