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NORTHEAST FISHERIES CENTER

NEWSLETTER

JULY-AUGUST 1981

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US DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
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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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MEET THE ATLANTIC ENVIRONMENTAL GROUP

by

Dr. Merton C. Ingham, Director
Atlantic Environmental Group

INTRODUCTION

History

The Atlantic Environmental Group (AEG) began in autumn 1971 as part of the National Marine Fisheries Service's (NMFS) Marine Resources Monitoring, Assessment, and Prediction Program (MARMAP) in Washington, D.C. It spent nearly 3 yr trying to do scientific work in bureaucratic surroundings, not an easy task. In summer 1974, AEG requested and was allowed to transfer to Narragansett, Rhode Island--its present site--where it could work more closely with scientists of the MARMAP Field Group, the Northeast Fisheries Center (NEFC), and the University of Rhode Island (URI).

In autumn 1976, as part of a NMFS reorganization, administrative authority for the AEG shifted from the Central Office to the NEFC, an arrangement which still exists. In summer 1978, most of the MARMAP Field Group (five people) and most of its plankton monitoring and data analysis activities transferred to the AEG, bringing AEG up to its present staffing level.

Structure

The AEG currently has nine permanent and eight temporary (mostly college student) employees. These 17 employees include nine oceanographers, three technicians, two computer programmers, one visual information specialist, one secretary, and one clerk-typist.

The AEG occupies five house trailers (surplus from flood relief efforts) located adjacent to the NEFC's Narragansett Laboratory, and has space in that laboratory for an instrument workshop. Both the AEG and the Narragansett Laboratory are situated in the northwestern corner of the Narragansett Research Complex--a complex which includes facilities of URI and the US Environmental Protection Agency (EPA). See Figure 1.

Function

The AEG supports NMFS programs by "...conducting studies in marine environmental monitoring and providing data collection and interpretation for the purpose of better understanding fishery problems. The mission includes analysis, portrayal, and interpretation of oceanographic and meteorological data, and their interrelation to fishery and environmental forecasting."

The activities described in the above mission statement principally support NMFS interests in the Northwest Atlantic and Gulf of Mexico. They depend in part upon requests for assistance, cooperation, or information from individuals and programs, but are not limited to such initiatives.

OCEANOGRAPHIC STUDIES

Ship-based Observations

Monitoring activities at AEG include a Ships-of-Opportunity Program (SOOP) for: (1) collecting water-column temperature data using expendable bathythermographs and plankton samples using a Hardy continuous plankton recorder and neuston nets, or (2) a larger set of hydrographic data along with a plankton sample using an undulating oceanographic recorder (Figure 2). The ships participating in SOOP are mostly merchant vessels, with some research ships and US Coast Guard cutters helping out. These data and samples are collected monthly along predetermined transect lines or in specified areas in coastal and offshore waters (Figure 3). One transect has been sampled since 1962, but more commonly the coverage extends back about 7 yr, long enough to begin describing seasonal norms and year-to-year variations or anomalies.

The undulating oceanographic recorder (UOR) noted above is a recent addition to the instruments used in our ocean monitoring activities; its deployment by AEG began this spring on the New York-to-Bermuda transect. The UOR is an automatic, instrumented, towed vehicle which can be programmed to undulate between a minimum depth of 5 m and a maximum depth between 15 and 100 m, with a choice of undulation lengths from 0.8 to 40 km. Towing speed can vary from 8 to 26 knots. It continuously collects plankton while simultaneously making discrete measurements of depth, temperature, salinity, and chlorophyll-a. Data are captured on tape cassettes and processed either at sea (for research ship operations) or ashore (for merchant vessel and US Coast Guard cutter operations) by a microprocessor-based translator, which combines the data with sensor calibration coefficients and prints out tabular and graphic portrayals as well as a computer-compatible data file. All of these data become part of our ocean monitoring and climatology data bases.

In addition to using the ocean monitoring data in our own studies, we provide portrayals and interpretations to other investigators in the national and international marine science communities. Annual reports are prepared for the International Council for the Exploration of the Sea and the Northwest Atlantic Fisheries Organization, and an annual inventory of our physical oceanographic data is published by the NOAA Environmental Data and Information Service's National Oceanographic Data Center where it is archived and available to all interested parties.

Satellite-based Observations

Another form of oceanographic monitoring by the AEG is the detailed analysis of oceanic fronts as portrayed in infrared (IR) imagery (gray-scale photographs) and derived chart portrayals that are regularly available from the NOAA National Earth Satellite Service's (NESS) polar-orbiting and geostationary satellites. The time series of weekly IR imagery and chart portrayals for the Northwest Atlantic extends back to 1973. Systematic analysis of this information has produced detailed yearly and multiyear descriptions of: (1) variations in the position of the shelf-slope water front; and (2) characteristics of Gulf Stream warm-core rings (times, locations, and frequency of formation; rates and directions of movement; longevity; and interactions with adjacent shelf, slope, and Gulf Stream water masses).

This frontal analysis increases our understanding of how physical variability in the deep ocean may affect biological production in the shallower waters of the continental shelf and slope where the principal fisheries are concentrated. Prior to late 1973, when high-resolution infrared radiometers were deployed in NOAA satellites, such investigations were not possible because the frequency and density of conventional oceanographic observation (from ships, buoys, and occasional aircraft surveys) were insufficient.

Within the last year, the NEFC has acquired a GOES-TAP facsimile recorder and located it at AEG for timely reception of NOAA environmental satellite imagery. Linked by leased phone line to the NESS Washington Satellite Field Services Station in Camp Springs, Maryland, the recorder provides IR imagery from both the polar-orbiting and geostationary satellites, as well as visible light imagery from the geostationary satellites. Imagery is received 30 min after the data are recorded by the satellite. Although the great majority of transmissions are designed for meteorological rather than oceanographic applications, two channels are assigned to special requests regarding geographic coverage and enhancement. The recorder is a significant step toward real-time environmental monitoring. When the Northeast Area Remote Sensing System facility becomes established at the URI Bay Campus, we will be able to obtain more specialized data and data processing from NASA experimental satellites and foreign satellites with a much wider range of sensors.

Fisheries Support

An important by-product of our frontal analysis has been its usefulness to fishermen. For example, both commercial and recreational fishermen, who recognize that large pelagic predators such as sharks, tunas, and billfishes tend to concentrate in the vicinity of fronts, frequently request information on frontal configurations from the AEG. Furthermore, lobster and crab fishermen working on the outer continental shelf and on the continental slope have learned through unfortunate experiences that the strong currents associated with passing Gulf Stream rings can cause serious reductions in catch rates and the loss of gear resulting from submergence of surface floats and from movement of strings of pots along the bottom. Accordingly, they have developed considerable interest in frequent information on the location of rings for planning their operations. Presently, AEG partially meets the needs of both groups of fishermen by weekly mailing them modified or highlighted copies of the "Oceanographic Analysis" charts of surface thermal features produced by NESS (Figure 4) and by answering telephone inquiries for the most recent information.

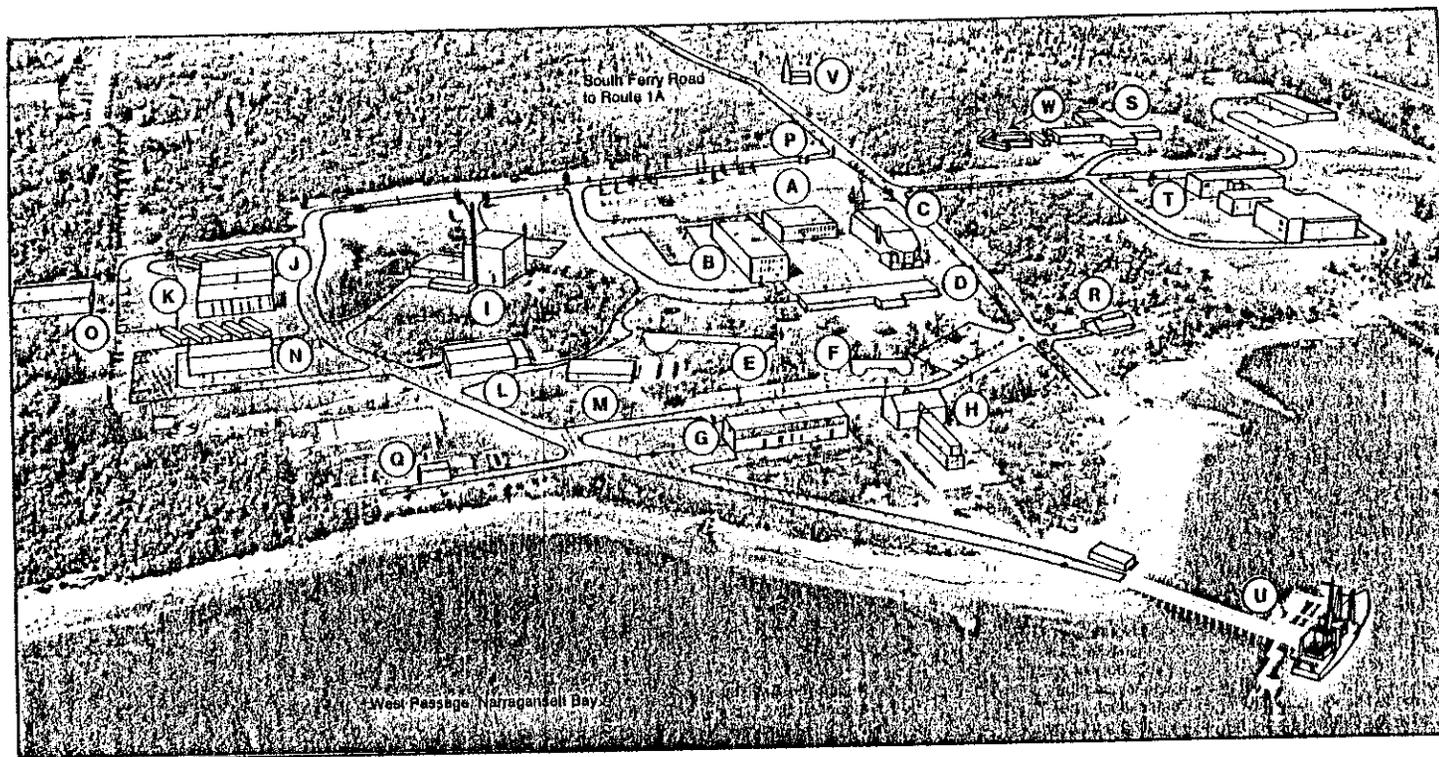
CLIMATOLOGICAL STUDIES

Climatological studies by the AEG have generally been part of cooperative efforts with several other NMFS scientists, usually fishery biologists. These studies have utilized time series of oceanographic and meteorological data in attempts to define the impacts of natural environmental variation on marine organisms. Past studies addressed the involvement of early water-column thermal stratification in the development of critically low oxygen concentrations in bottom water off New Jersey in summer 1976, the effect of winter wind-driven transport of Atlantic menhaden larvae south of Cape Hatteras upon year-class strength, the effect of variation in spring wind-driven transport of Atlantic mackerel larvae in the Middle Atlantic Bight upon year-class strength, the potential environmental impacts from petroleum development on the outer continental shelf in the Gulf of Mexico, and the environmental impacts of deepwater disposal of waste products in the Middle Atlantic Bight.

In the near future, similar cooperative studies will begin on conditions in the "cold cell" in the shelf water in the Middle Atlantic Bight, the effect of natural environmental variations on haddock recruitment, and the impact of entrainment of Georges Bank water around Gulf Stream warm-core rings on the survival of the larvae of various fish species.

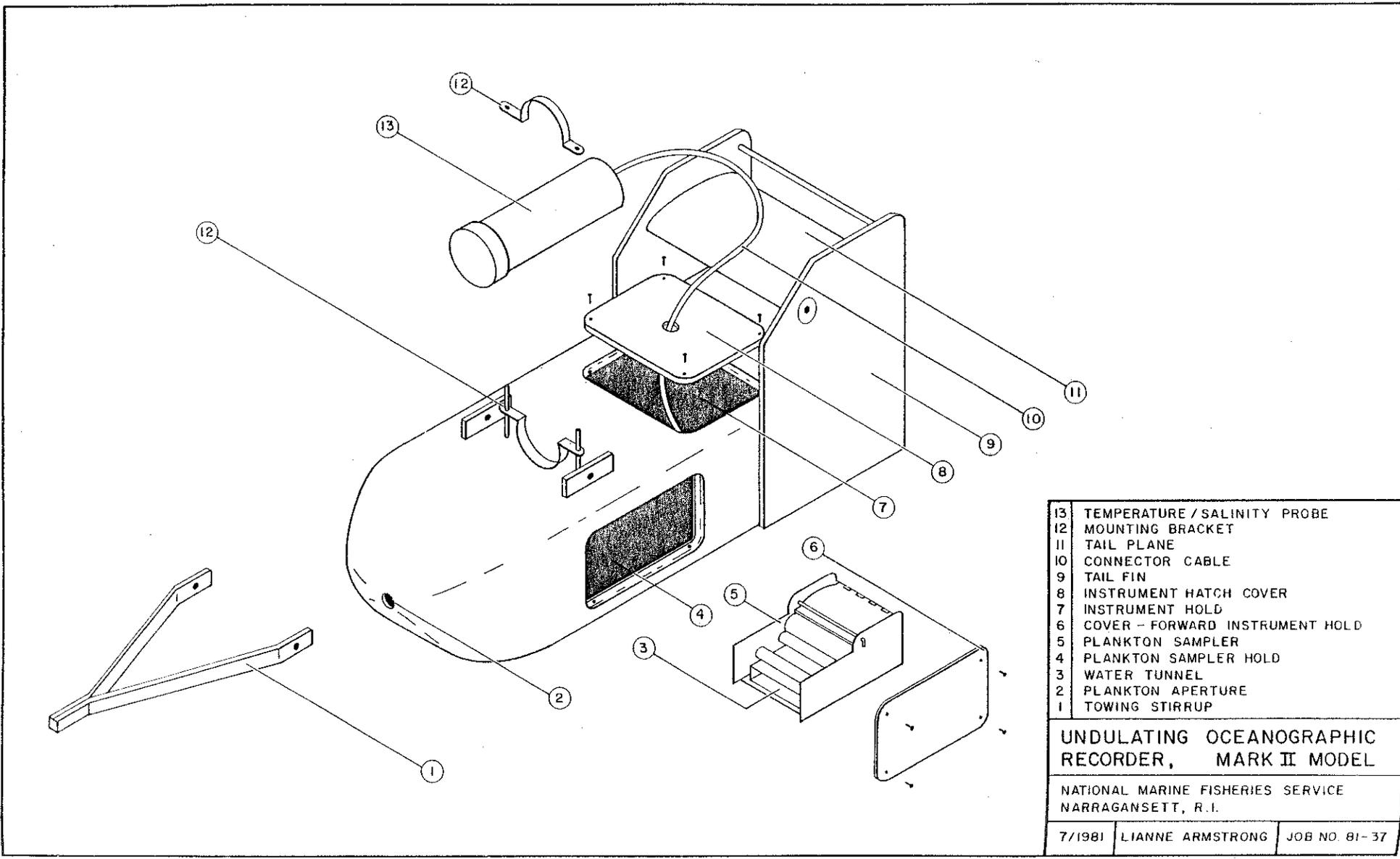
PUBLICATIONS/REPORTS

Since moving to Narragansett in 1974, the staff of AEG has produced over 135 reports, ranging from data portrayals distributed to NEFC and SEFC scientists in the Data Analysis Product series, to published articles in scientific and technical journals. Since 1976 the titles of current reports have been listed in the "Northeast Fisheries Center Newsletter" ("NEFC News"). Anyone wishing a complete listing of these publications/reports can obtain a copy from Mrs. Gertrude Kavanagh, Atlantic Environmental Group, National Marine Fisheries Service, South Ferry Road, Narragansett, Rhode Island 02882-1199.



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Figure 1. Building key: A = Claiborne de B. Pell Library (URI), B = Francis H. Horn Laboratory (URI), C = Norman D. Watkins Laboratory (URI), D = Charles J. Fish Laboratory (URI); E = Bunker Cram Laboratories (URI), F = Bunker Armstead Laboratories (URI), G = Research Aquarium (URI), H = Marine Environmental Research Laboratory (URI), I = Rhode Island Nuclear Science Center (URI), J = South Laboratory (URI), K = Trailer Park (URI), L = Technical Services Building (URI), M = Marine Building (URI), N = Maintenance Building (URI), O = Ocean Engineering Laboratory (URI), P = Police (URI), Q = Sewage Treatment Plant (URI), R = Helen Mosby Center (URI), S = Narragansett Laboratory (NEFC), T = Environmental Research Laboratory (EPA), U = Dock for R/V Endeavor (URI), V = South Ferry Church, and W = Atlantic Environmental Group (NEFC).



13	TEMPERATURE / SALINITY PROBE
12	MOUNTING BRACKET
11	TAIL PLANE
10	CONNECTOR CABLE
9	TAIL FIN
8	INSTRUMENT HATCH COVER
7	INSTRUMENT HOLD
6	COVER - FORWARD INSTRUMENT HOLD
5	PLANKTON SAMPLER
4	PLANKTON SAMPLER HOLD
3	WATER TUNNEL
2	PLANKTON APERTURE
1	TOWING STIRRUP
UNDULATING OCEANOGRAPHIC RECORDER, MARK II MODEL	
NATIONAL MARINE FISHERIES SERVICE NARRAGANSETT, R.I.	
7/1981	LIANNE ARMSTRONG
JOB NO. 81-37	

Figure 2.

Figure 2.

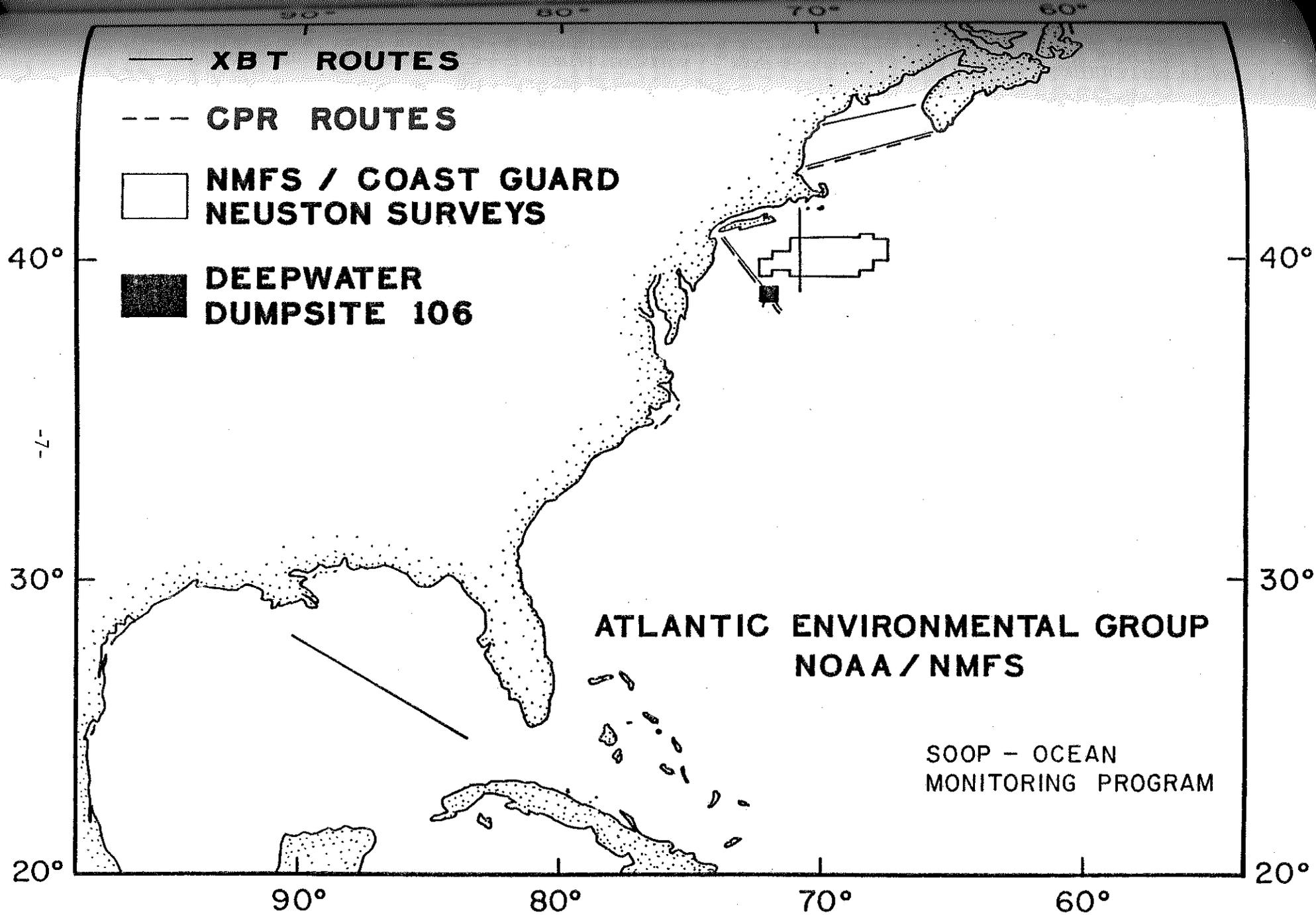


Figure 3.

OCEANOGRAPHIC ANALYSIS

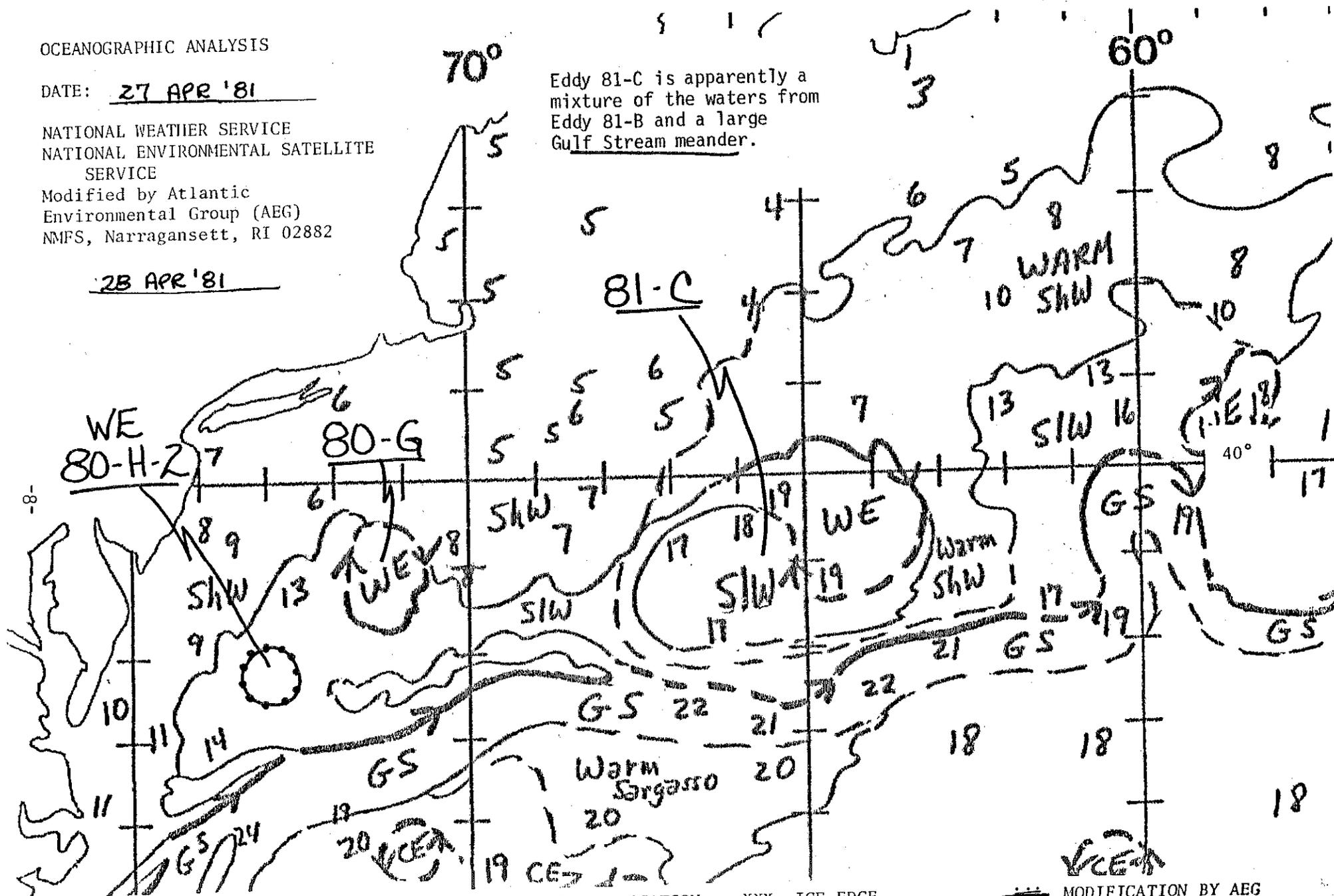
DATE: 27 APR '81

NATIONAL WEATHER SERVICE
NATIONAL ENVIRONMENTAL SATELLITE
SERVICE

Modified by Atlantic
Environmental Group (AEG)
NMFS, Narragansett, RI 02882

28 APR '81

Eddy 81-C is apparently a
mixture of the waters from
Eddy 81-B and a large
Gulf Stream meander.



GS	GULF STREAM	CE	COLD EDDY	---	FRONTAL LOCATION	XXX	ICE EDGE		
LC	LOOP CURRENT	SHW	SHELF WATER	---	ESTIMATED FRONTAL LOCATION	19	SEA SURFACE TEMPERATURE (°C)		
WE	WARM EDDY	SIW	SLOPE WATER						--- MODIFICATION BY AEG OF WARM CORE EDDY ANALYSIS

Figure 4.

CENTER DIRECTORATE

Fishery Technology

Robert Learson, Deputy Director of the Gloucester Laboratory, was nominated by the Northeast Regional Director and two Northeast Regional Office employees to receive an incentive award for his role in coordinating an international symposium on squid utilization in Boston during 9-12 August 1981. The citation by the Regional Director reads in parts: "The success of the event is attested by the fact that 20 foreign countries were represented." and "It gives me a great deal of pleasure to recommend these individuals for this award for their efforts were well beyond the normal requirement of their jobs."

RESOURCE ASSESSMENT DIVISION

Resource Surveys Investigation

The 1981 summer bottom trawl survey was completed 24 July aboard the NOAA R/V Delaware II. Darryl Christensen was Chief Scientist on the southern leg from 27 June to 2 July. Malcolm Silverman was Chief Scientist on the northern leg from 7 to 24 July. In addition to the standard finfish survey, a special shrimp diel availability study was conducted in Jeffreys Basin (Gulf of Maine) during the second leg. Other investigation personnel participating on the cruise were Liz Bevacqua, Carl Harrison, Amy Tuttle, and Susan Wigley.

Andy Thoms, Jim Crossen, and Chuck Byrne spent most of their time in July and August preparing for the ocean quahog-surf clam survey. The first leg of the survey aboard the Delaware II was successfully completed during 3-21 August with Chuck Byrne as Chief Scientist. Andy Thoms also participated on the first leg. The second leg of the survey began on 24 August with Tom Azarovitz as Chief Scientist; aboard with him were Chuck Byrne, Andy Thoms, and Jim Crossen.

The staff completed processing and placed on final tapes, the data from the spring bottom trawl survey and the June sea scallop survey.

Fishery Biology Investigation

Age and Growth

Vi Gifford completed the second aging of the second and third quarters of the 1974 commercial redfish samples. She also aged once the third quarter and twice the fourth quarter 1974 commercial redfish samples.

Kris Andrade completed aging, coding, and summarizing haddock samples from the 1981 spring bottom trawl survey (Delaware II Cruise No. DE 81-02) and sent the age sheets to the Woods Hole Laboratory's Automatic Data Processing (ADP) Unit for keypunching. She completed the age sheet for the second quarter 1981 commercial haddock samples and sent them to assessment personnel. Kris also checked Doris Jimenez's aging of pollock samples for the 1981 spring bottom trawl survey, and sent the coded age sheets to the ADP Unit for keypunching.

Melinda Grace put the second quarter 1974 commercial redfish age data on sheets, coded, and then summarized them. She also put the yellowtail flounder age data for frozen samples from the 1981 spring bottom trawl survey on sheets and then coded and summarized all of that survey's yellowtail flounder age data. She put the yellowtail flounder age data from the spring gear testing cruise (NOAA R/V Albatross IV Cruise No. AL 81-02) on sheets and summarized them. Melinda, Ruben Millor, and Jim Fletcher worked up all the F/V Francis Elizabeth (the State of Massachusetts chartered research survey vessel) frozen age samples for the 1978-81 spring bottom trawl surveys.

Wendy Sylvia continued to process various species for aging and assisted in auditing age sheets. At the end of August, Wendy entered as a freshman at the University of Massachusetts at Amherst.

Judy Penttila made selected checks of Atlantic cod samples aged by Doris Jimenez as follows: 1980 commercial samples for all four quarters, 1981 commercial samples for the first quarter, and 1981 spring bottom trawl survey samples. After checking the age sheets and summaries, she sent the commercial data to assessment personnel and the survey age sheets to the ADP Unit. Judy aged and summarized second quarter 1981 commercial yellowtail flounder samples and sent data to assessment personnel. She also sent yellowtail flounder age sheets for the 1981 spring bottom trawl survey to the ADP Unit.

Finfish

Sherry Sass aged and summarized butterfish samples from the fall 1980 and spring 1981 bottom trawl surveys. She and David Pyoas continued to rear young-of-the-year winter flounder. They met with Bob Cully from the US Geological Survey to learn scanning electron microscope techniques for aging young fish.

David Pyoas was trained by John Ropes to process shellfish samples, particularly ocean quahogs for reproductive and aging studies. David then participated in a shellfish survey aboard the Delaware II. Upon his return, David completed the final draft of a report describing his work experiences as a cooperative education employee, and returned to South Carolina State College.

Alicia Kelly sectioned 1981 spring bottom trawl survey silver hake otolith samples and impressed 1981 spring survey summer flounder scale samples. Alicia, Mark Costa, and Leslie DeFillipis processed frozen young-of-the-year scale and otolith samples from various species. Mark and Alicia both left at the end of August to enter as college freshmen at Lincoln University (Pennsylvania) and the State University of New York at Stony Brook, respectively.

Brenda Fields completed aging more than a year's backlog of commercial and research vessel survey scale samples from summer flounder. All summer flounder aging is up-to-date through the 1981 summer bottom trawl survey for research vessel survey samples, and through the second quarter 1981 for commercial samples.

Louise Dery completed aging and preparing age-length summaries for red hake from the 1980 spring and fall bottom trawl surveys. She also completed the first phase of a US-Canada Atlantic mackerel age study, and with Alicia Kelly completed

the age-and-growth reference file with subject and author index. Louise, Sherry, and John Ropes worked out new microphotography methods for fish otoliths and made photographs of butterfly otoliths for Gordon Waring and our own documentation. Mss. Dery and Sass also worked with Neil Churchill of the Massachusetts Division of Marine Fisheries on alewife aging methods.

Shellfish

John Ropes spent a considerable amount of time instructing other investigators in the techniques of preparing bivalve shells for observation of microgrowth features, completing preparations for the upcoming surf clam-ocean quahog cruises, and preparing marked ocean quahog specimens for future observation of age-growth lines.

Mary Hancock of the National Park Service completed sectioning about 200 shell specimens of hard clams (Mercenaria mercenaria). These were from archeological sites at the Cape Cod National Seashore.

Dr. Diane J. Brousseau of Fairfield (Connecticut) University, requested permission to thin-section shells of the ribbed mussel [Gukensia (Modiolus) demissa] for study of population age-growth line features. This species has been the subject of several recent studies of shell microgrowth analyses.

During 17-21 August, investigators (Jamie Young, Thomas MacLean, and Ross Chandler) of the Canadian Department of Fisheries and Oceans in Halifax, Nova Scotia, were at Woods Hole Laboratory to receive instruction in our methods of processing shells of ocean quahogs. They brought shells collected during Delaware II Cruise No. DE 80-06 off the Canadian coast as well as special inshore samples to process. About 75 shell specimens were sectioned, preparatory to embedding in epoxy resin for hand grinding and polishing the cut edges, etching, and producing acetate peels for microscopic examination. It was generally agreed that the grinding step was most labor intensive, due partly to embedding the shells in metal molds coated with paraffin. The uneven paraffin surface often produced an uneven surface and layer of epoxy that had to be removed to expose the cut edge. Nevertheless, more shells were processed than had been initially planned.

J. Ropes was on the surf clam-ocean quahog survey (Delaware II Cruise No. DE 81-05) from 24 August to 11 September.

Maurice Crawford aged surf clam samples received from the University of Maryland Eastern Shore and continued to train Sherry Sass to age surf clams. Maurice worked with Vi Gifford on aging sea scallops. He also entered previous surf clam age data into a computer file and trained Sherry Sass to handle the data on the computer.

Fishery Assessment Investigation and Senior Assessment Scientists

Brad Brown devoted a great deal of time to fiscal year 1982 budget problems and development of current-year operating plans. Brad also helped review programs and prepare material for a special issue of the "Northeast Fisheries Center Newsletter" dealing with key issues within the NEFC, as well as drafted a section on fishery resources for a Georges Bank monograph. Emory Anderson prepared fiscal year 1982 current-year operating plans for the Northwest Atlantic Multispecies Fishery Analysis Task.

Mike Sissenwine prepared a proposal for the three-tier system of fisheries statistics collection and a proposal for analysis of the no-regulation alternative for the Northeast Fishery Management Task Force.

Fred Serchuk drafted a Resource Assessment Division position statement on the merits of joining the Northwest Atlantic Fisheries Organization (NAFO). Fred is also working on sea scallop data from the 1963-81 bottom trawl surveys. Fred, Paul Wood, and Bob Rak have derived a shell height-meat weight regression and are analyzing shell height-gonad weight relationships for sea scallops.

Emory Anderson drafted status-of-the-stocks reports for Atlantic mackerel, bluefish, and butterfish. Ralph Mayo drafted status-of-the-stocks reports for redfish, scup, and river herring (alewives and blueback herring).

Emory Anderson completed the 1981 Atlantic mackerel assessment. Steve Clark updated the total-finish-and-squid biomass assessment. Steve and Ralph Mayo completed the pollock assessment. Steve and Loretta O'Brien updated assessments on white hake, witch flounder, cusk, and Atlantic wolffish. Rhett Lewis is finishing the black sea bass assessment. Steve Murawski, Fred Serchuk, and Bob Rak are updating the surf clam and ocean quahog assessments. Eileen Klopfer has assisted in data preparation for butterfish, dogfish, and silver hake assessments.

Gordon Waring and Eileen Klopfer analyzed Atlantic herring tagging data from the 1976-78 International Herring Tagging Program for an upcoming NAFO meeting. Anne Lange and Fred Nichy are conducting a squid growth study in the aquarium. Mike Sissenwine developed a method of estimating "M" and "q" from the Uston equation and research vessel survey data.

Emma Henderson has completed a proposal for revising bottom trawl survey analysis computer software. The revisions allow replaying the 18 analytical programs that have accumulated since the survey started with a single program. The new program will contain a new age analysis module and provide some additional information and more flexibility in use. Emma will continue cooperating with the Woods Hole Laboratory ADP Unit on development and documentation of the computer program. Emma consulted with the Fishery Biology Investigation on nonlinear curve-fitting procedures for von Bertalanffy curves. Margaret McBride compiled data on foreign and industrial yellowtail flounder discards as a step in improving virtual population analysis. Steve Murawski has implemented Rivard's APL program for Thompson-Bell yield-per-recruit analysis on the ADP-net. Anne Lange has debugged and documented an interactive version of NORMSEP on the Sigma 7.

Emory Anderson and Anne Lange drafted an NEFC review of the squid-mackerel-butterfish fishery management plan (FMP) merger amendment, and Emory reviewed a PL 88-309 Lake Michigan lake trout study proposal for the Northeast Regional Office (NERO). John Boreman reviewed a manuscript for the US Fish and Wildlife Service (USFWS) and one for the Canadian Journal of Fisheries and Aquatic Science. Steve Clark reviewed completion reports on northern shrimp research contracts with the States of New Hampshire and Maine. Fred Serchuk reviewed a manuscript on "Environmental Biology of Fishes" and the "Federal Aid Annual Project Completion Report" for NERO.

Gordon Waring went on a sea sampling trip for spiny dogfish on 9 July aboard the F/V Acme II from Gloucester, Massachusetts. Vaughn Anthony went sea sampling on 18 July on the lobster boat Sara C out of Sebasco, Maine. Pat Chew was a member of the scientific crew on the August surf clam-ocean quahog survey cruise. Harold Foster and Detra Green served on the summer bottom trawl survey in July.

In the area of providing technical information, Emory Anderson provided optimum yield/maximum sustainable yield information for hakes, squids, Atlantic mackerel, butterfish, and dogfishes in NAFO Subarea 6 to Mark Silverman of Associated Enterprise Development, Inc., in Baltimore. Emory discussed status of bluefish resource with Beth Amaral of the Massachusetts Division of Marine Fisheries. Vaughn Anthony provided species distribution plots to Norm Olson of Eastern Marine Builders and Supply in Maryland. Vaughn provided portions of the International Council for the Exploration of the Sea's (ICES) Advisory Committee on Fisheries Management report concerning Atlantic herring as per request of Maine sardine industry members. Anne Lange met in Providence, Rhode Island, on 22 July with Spanish technical representatives interested in joint ventures. Anne sent squid biology documents and discussed squid population dynamics with Hector Letz of the National Fisheries Institute of Montevideo, Uruguay. Fred Serchuk provided Ben Jones of the NAWFC with sea scallop sampling and data summary procedures at NEFC. (An intensive commercial sea scallop fishery has developed off Oregon.) Fred provided information on orange/red sea scallop meats and their nutritional value to F. J. O'Hara and Sons, Inc.

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- Murawski, S.; Lange, A.M.T.; Sissenwine, M. P.; Mayo, R. K. Definition and analysis of otter trawl fisheries off the Northeast Coast of the United States based on multispecies similarity of landings. Int. Council. Explor. Sea, Comm. Mem. 1981/G:63. (P)
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Fogarty, M. Review and assessment of the summer flounder (Paralichthys dentatus) fishery. Woods Hole Lab. Ref. Doc. No. 81-25;1981.

Lange, A. Stock status and estimates of potential yields of squid (Loligo pealei and Illex illecebrosus) populations off the northeastern U.S.A. Woods Hole Lab. Ref. Doc. No. 81-29;1981.

Waring, G.; Anderson, E. D. Status of the northwestern Atlantic butterfish stock, August 1981. Woods Hole Lab. Ref. Doc. No. 81-27;1981.

MANNED UNDERSEA RESEARCH AND TECHNOLOGY PROGRAM

During February through August 1981, MURT personnel accomplished the following tasks.

Georges Bank-Submarine Canyon Monitoring Regarding Oil/Natural Gas Exploration and Production

Preparations were completed in May for the July cruise, including underwater camera calibrations and coordination with the submersible operations crew of the Harbor Branch Foundation.

Two weeks of manned submersible diving at two site-specific monitoring stations on Georges Bank, two in Lydonia Canyon, two in Oceanographer Canyon, and one in Veatch Canyon were accomplished. Twenty-one dives were made, totaling 54 hr of "bottom time" or 108 man-hours (two scientists per dive). The following objectives were fulfilled:

1. The four Ocean Pulse Program (OPP) stations (No's. 2, 3, 5, and 6) established in August 1980 were revisited.
2. Three additional OPP stations were "set up" in Oceanographer and Veatch Canyons.
3. Approximately 1500, 35-mm color pictures (forward and aft camera systems) were taken at each station to define substrate type and associated megabenthic fauna, with special emphasis on American lobster, crabs, sea scallop, hakes, cusk, conger eel, squids, four-spot flounder, witch flounder, shrimps, ocean pout, and anemones. All photographs are quantitatively calibrated for analyses of species densities. Each photograph encompassed 6 m² of ocean floor or a total coverage of approximately 9000 m² per monitoring station.
4. Extensive observations and videotaping were accomplished in support of defining behavior and ecology of the megabenthic fauna. Special emphasis was given to defining shelter types and occupants.
5. Twenty-four replicate substrate samples were collected in-situ on Georges Bank (Station 3) and in Lydonia Canyon (Station 5) to: (1) define infauna; (2) collect tissue samples from one or two dominant species (infauna) for tissue-load determinations of contaminants; and (3) provide

a calibration for the conventional, surface-lowered sediment samples (Smith-McIntyre grab) at two stations characterized by different substrates.

6. Additional documentation of tilefish ecology, habitat, behavior, etc., was obtained.
7. Samples of tilefish, American lobster, Jonah crab, and sea scallops were collected for tissue-bound contaminant determinations at each monitoring station where they occurred. Sediment samples were also collected for contaminant analysis.
8. Extensive photographs, observations, and specimen collections were accomplished to define the distribution, abundance, ecology, and relative importance of the mud anemone and the mud anemone "forests" as animal shelters and as a very distinctive ecosystem of the ocean floor.
9. Over 1200 photographs and observations were made of the upper axis of Oceanographer Canyon with emphasis on its possible function as a conduit for bottom currents and the dispersal of bottom-oriented contaminants. Sediment samples were collected from various substrate types and geological formations (sand dunes, waves, etc.) along the canyon axis. Also, observations were made on the behavior of megabenthic fauna to strong (3 knots) and variable bottom currents.

All exposed film has been developed and some 10 000 individual frames are being analysed for species diversity, abundance, habitat type, community structure, behavior, etc. Geological observations and sediment samples are being analyzed by the US Geological Survey. Contaminant loads in the fish and crustacean samples and substrate samples are being analyzed by an analytical firm in Boston.

Jeffreys Ledge and Block Island Monitoring for the Northeast Monitoring Program

The MURT dive team conducted two cruises in May and June to: (1) revisit the Northeast Monitoring Program station on Jeffreys Ledge, and (2) establish a new station off Block Island. The NEFC's R/V Gloria Michelle proved to be an excellent platform for supporting the diving operations. The following tasks were accomplished at these monitoring stations:

Jeffreys Ledge

1. 30-m, site-specific transects were quantitatively photographed for both horizontal and vertical surfaces (substrates).
2. Twelve new site-specific 0.25-m² quadrats were established on horizontal and vertical surfaces.
3. Fouling panels of varied substrates were set up to measure, upon quarterly sampling, recruitment into the communities. Early results suggest Ptilota (dominant alga) recruitment to be due to immigration rather than sexual reproduction.

4. Samples of "key indicator species" (the red alga Ptilota, the starfish Asterias, and the ascidian Ascidia) were collected for determination of tissue-bound levels of pollutants (heavy metals, hydrocarbons, and polychlorinated biphenyls).

The data from this cruise will allow a completion of the baseline description of the site. Future efforts will monitor the site, utilizing our quantitative photographic methods.

Block Island

In an effort to better understand the impact of man's activity on the inshore coastal environment and its ocean floor biota, the MURT divers conducted an extensive survey of the waters around Block Island, off the mouth of Long Island Sound. This is an area considered to be "impacted" or "potentially impacted" because of the proximity to large population centers and the large amount of shipping through the area. The following tasks were completed:

1. Established one site-specific monitoring station off the southeast corner of Block Island.
2. Photographically documented (via 0.25-m² quadrats) the epibenthic fauna (attached and mobile) of the hard (bedrock and boulder) substrates.
3. Made detailed collections (air-lift sampling) of epibenthic fauna for comparison with photographic documentation.
4. Collected samples of two "key indicator species" (the sea anemone Metridium and the starfish Asterias) for determination of tissue-bound pollutants.
5. Conducted general photographic survey of station surroundings for a complete geological-biological description of monitoring site.

Assistance to the Southeast Fisheries Center's Manned Submersible Program

Assistance to the SEFC was rendered over the past 6 mo with regard to: (1) defining objectives and preparing proposals for two submersible programs to be conducted on Middle Ground off west-central Florida, (2) coordinating the science and operations through the Harbor Branch Foundation, and (3) arranging for outside NOAA financial support for equipment purchase. Both cruises were successfully completed this summer, representing a "good start" for the SEFC in their manned submersible-fishery assessment studies.

Deep Sea Camera Received

A 20 000-ft capacity Benthos 35-mm Deep Sea Camera System was purchased with assistance from the NOAA Manned Undersea Science and Technology Office to give MURT the capability to document quantitatively the megabenthic fauna at the Northeast Monitoring Program's Georges Bank and submarine canyon stations during the "cold rough weather" time of the year; all monitoring activity to date has been conducted with manned submersibles at site-specific locations during mid-late summer. We hope

to use this camera system at other Northeast Monitoring Program stations to define better the surficial geology and related fauna at sites where, to date, no such documentation has been obtained.

Manuscripts

MURT scientists are continuing the preparation of the following manuscripts:

1. "Biology and Geology of Veatch Submarine Canyon"
2. "Biology and Geology of the Heads of the Georges Bank Submarine Canyons -- Corsair, Lydonia, Gilbert, Oceanographer, Hydrographer, and Veatch"
3. "Pre-drilling Baselines of the Megabenthic Fauna and Their Habitats of Georges Bank and the Georges Bank Submarine Canyons"
4. "Trace Metal and Hydrocarbon Levels of Selected Marine Species from Inshore and Offshore Monitoring Sites (Georges Bank, Submarine Canyons, Jeffreys Ledge, and Block Island)"
5. "Distribution, Abundance, and Related Ecology of Mud Anemone, Cerianthus sp., Forests of the New England Continental Shelf and Submarine Canyons"
6. "Descriptive and Functional Ecology of the Macrobenthos of Horizontal and Vertical Substrates at a Pristine, Offshore, Rocky Pinnacle in the Gulf of Maine"

Publications

Able, K.; Grimes, C.; Cooper, R.; Uzmann, J. Habitat construction by tilefish, Lopholatilus chamaeleonticeps, at Hudson Submarine Canyon in the Mid-Atlantic Bight. Mar. Biol. (A)

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Meyer, T.; Cooper, R.; Pecci, K. Underwater observations on the performance and the environmental effects of a hydraulic dredge in a high clam density area off southwestern Long Island, New York. Mar. Fish. Rev. (A)

Pecci, K.; Hulbert, A. Descriptive and functional ecology of the macrobenthos of Jeffreys Ledge (Pigeon Hill), Gulf of Maine. Contribution to Annual NEMP report on the health of the northeast coastal waters of the United States, 1980. NOAA Tech. Mem. NMFS-F/NEC-10;1981. (P)

MARINE ECOSYSTEMS DIVISION

Ichthyoplankton Investigation

A number of 61-cm bongo samples were collected in three of the four MARMAP subareas in July by piggybacking on the summer bottom trawl survey. Our geographic coverage did not include the Gulf of Maine. Some additional samples were collected on Georges Bank during an Ocean Pulse Program survey. Cooperation by other vessel users in assisting us with field work over the past 4 mo has been outstanding.

In the lab much of our efforts in July went into the completion of contributions for the fall ICES meeting in Woods Hole (see list of publications). Other staff members continued work in progress. Myron Silverman is completing charts and tables on the distribution and abundance of silver hake, bluefish, Atlantic mackerel, and yellowtail flounder larvae collected between 1977 and 1980. Mike Fahay is putting the finishing touches on his guide to the identification of fish larvae spawned in the western North Atlantic, and John Sibunka, when not at sea, continues to work on an assessment of the spawning biomass of bluefish, using data on distribution and abundance of eggs as determined from our broadscale MARMAP surveys.

Ichthyoplankton samples were collected during August from Cape Hatteras to Nantucket Shoals on the annual summer surf clam-ocean quahog survey. Arrangements were made to have additional 61-cm bongo tows taken on Georges Bank during an Ocean Pulse cruise that began in late August. The combined sampling efforts will provide us with late summer samples from three of the four MARMAP I analytical subareas, but we will again miss the Gulf of Maine, an area we have not surveyed since spring. Our next plankton survey begins in late September, when we will participate in the autumn bottom trawl survey.

Autumn and winter MARMAP ichthyoplankton surveys of coastal waters between Cape Hatteras and Cape Sable during 1980-81 reveal that for the fifth consecutive year, production of Atlantic herring larvae was poor on Georges Bank. We caught no herring larvae on the Bank during three surveys, an indication that spawning activity in that part of the survey area continued in the ominous pattern of decline observed during the late 1970's. Most of the young herring occurred around the northern perimeter of the Gulf of Maine with numerically and geographically smaller concentrations in and around Massachusetts Bay.

For the past 25 yr, NEFC biologists have been conducting ichthyoplankton surveys off the New England coast on a regular basis. To our knowledge, the autumn of 1980 marks the first spawning season within the above time frame that Atlantic herring larvae were not caught on Georges Bank, the center of spawning activity during the 1960's and early 1970's.

Larval Fish Dynamics Investigation

Experimental Studies

During July, analysis of samples collected as part of the NOAA-USFWS study of the effects of existing contaminant burdens on the viability of the early life stages of striped bass was continued. Swim speed/stamina testing was completed for all groups of lab-reared larvae except the Brookneal group. Brookneal larvae will be

reared to an age of 78 days and tested for swim speed/stamina. Preparations are being made for an upcoming trip to the Chesapeake Bay region for collection and stamina/swim-speed testing of young-of-the-year striped bass from the Potomac, Nanticoke, and Choptank Rivers. We are constructing a mobile unit to carry the swim speed/stamina testing apparatus which will allow for quick onsite setup. Preliminary analysis of nucleotide levels in larval fish was begun; however, we are having some problems separating an unidentified peak from the AMP (adenosine monophosphate) peak using high-performance liquid chromatography. Preliminary estimates of the adenylate energy charge of lab-reared larvae range from 0.7 to 0.8.

A weeklong field trip to the Chesapeake Bay region was successfully completed. Thirty-six striped bass juveniles from the Potomac River and 32 from the Nanticoke River were collected with a beach seine, tested for swimming stamina, and frozen for biochemical analysis. Fish from the Potomac were generally larger and appeared to have greater swimming stamina than fish from the Nanticoke River. Despite considerable effort, no striped bass fry were caught in the Choptank River. Preparations are being made for similar work on the Hudson River.

One hundred thirteen samples of larval and juvenile sand lance were analyzed for standard length, dry length, dry weight, RNA, DNA, and protein. The sand lance were collected at 14 stations on the spring MARMAP survey (Albatross IV Cruise No. AL 81-01). Most samples consisted of individual fish between 0.17 and 50 mg in dry weight and from 5 to 42 mm in standard length. The RNA-DNA ratio values observed were uniformly high (range of 4.2-9.8; mean of 6.60 ± 1.18). One hundred three samples of larval and juvenile Atlantic cod collected at five stations on the larval dynamics process-oriented survey (Albatross IV Cruise No. AL 81-03) were analyzed for dry weight, standard length, RNA, DNA, and protein. Most of the samples consisted of individual cod between 0.49 and 14 mg dry weight and from 5 to 17 mm standard length. The RNA-DNA ratio values were uniformly high (range of 3.3-10.3; mean of 6.46 ± 1.38). One hundred twenty-five samples of haddock larvae ranging in size from 0.15 to 3.5 mg in dry weight and from 2.5 to 10 mm in standard length were also analyzed. These larvae were collected on another larval dynamics process-oriented cruise (Albatross IV Cruise No. AL 81-05). With very few exceptions, all haddock larvae analyzed had very high RNA-DNA ratio values (range of 2.8-17.0; mean of 7.65 ± 3.57). These haddock larvae had some of the highest RNA-DNA ratio values observed to date. The high RNA-DNA ratio values of these cod, haddock, and sand lance are indicative of good condition and rapid growth. The high RNA-DNA ratio values of the cod larvae were not unexpected since they appeared upon visual examination to be very robust and in excellent condition. Their guts were packed with Calanus finmarchicus. Based on lab studies of the relationship between RNA-DNA ratio and growth rate in cod larvae, the dry weight of these field caught cod larvae was estimated to be increasing at the rate of 14% per day. Although no comparable lab data exist for sand lance or haddock, those species would be expected to be growing at about the same rate.

Population Processes

Roz Cohen, George Bolz, and Greg Lough devoted July to the preparation of ICES documents which represent major summaries and analyses of the ICNAF (International Commission for the Northwest Atlantic Fisheries) larval Atlantic herring survey data base. Roz Cohen reported on larval herring food habits over three spawning seasons

(1974-76) in the Georges Bank-Nantucket Shoals area. A shift in the dominant copepod prey of larval herring was noted in 1976, as well as an increase in their feeding incidence and condition during that season. George Bolz examined the ichthyoplankton from 30 ICNAF surveys during 1971-77, and delineated three discrete faunal zones in the Georges Bank region by numerical classification techniques which were clearly related to water-mass types.

Final revisions were made in August on the 1981 ICES documents by Roz Cohen and Greg Lough, and by George Bolz and Greg Lough. Greg and George are making revisions on the larval herring growth manuscript returned from Fishery Bulletin. Roz is completing some additional analyses on the larval herring food habits data base and is in the final stages of putting together a data report on the 0.333-mm-mesh-captured zooplankton from 1974-77 ICNAF surveys, with the help of computer programming and processing by John Hauser and Nancy Lyons. Dave Potter and Randy Goodlett completed lab processing of a selected number of larval herring guts from a vertical series of MOCNESS samples (multiple opening-closing net and environmental sensing system) collected on a West German R/V Anton Dohrn survey (Cruise No. 77-03). Peter Donnelly, Philip LeBlanc, and Randy Goodlett continued sorting and identifying ichthyoplankton and zooplankton from the Albatross IV Cruise No. AL 81-05 MOCNESS hauls.

Fishery Oceanography Investigation

During July, Ron Schlitz and David Mountain met with investigators from Woods Hole Oceanographic Institution, US Geological Survey, University of New Hampshire, and EG&G, Inc., to discuss combining their respective data sets from Georges Bank to allow a more complete analysis. Ron and David also met with investigators of the warm-core ring study to discuss preliminary modeling results by Glenn Flierl of the Massachusetts Institute of Technology and Joe Wroblewski of Dalhousie University. Joe is modeling the entrainment of larvae from the shelf by a ring which is of primary interest to NEFC.

The month of August saw the preparations for the upcoming warm-core ring study accelerate. Meetings were held for coordinating the work on our own cruise and also for coordinating our work with National Science Foundation ship operations. The new O₂-sensor was installed in the CTD, and intercalibration with the CTD's to be used on the other vessels was performed. Coordination of our work with the visiting Soviet R/V Stvor was also accomplished. The Stvor, with Chief Scientist Anatoliy Bendik, will make up to three hydrographic and biological surveys of the region between the shelf/slope front and the Gulf Stream from Georges Bank to Cape Hatteras.

In other areas, Dan Patanjo worked with the Woods Hole Laboratory ADP Unit to get four MARMAP hydrographic data sets on computer-compatible tape and 10 more sets ready for key entry. Chris Nadeau continued analysis of hydrographic data from the April larval dynamics cruise as well as working up the Ship-of-Opportunity Program expendable bathythermograph (XBT) transects. David Mountain, with help from Jim King and Karen Lennon, completed analysis of the 1970-decade hydrography along the north-east US coast for presentation at a NAFO symposium in September.

Ecosystem Dynamics Investigation

As part of the NEFC's policy to reduce the number of task development plans, the Benthic Dynamics Investigation was consolidated with Ecosystem Dynamics Investigation, and henceforth the two activities will be conducted as one investigation. The focus of the personnel from the former benthic group will continue to be on the linkages between fish and the benthos via studies on the fish food habits and macrobenthic invertebrates. In addition to Roger Theroux and Ray Bowman, other full-time permanent employees include Tom Morris and Charles Wheeler, who will be involved with experimental fish feeding studies in the aquarium, with larval stages of American lobster in coastal waters, and with aspects of marine food webs.

Six ICES documents were completed in July and occupied most of the time for Ed Cohen, Mike Pennington, Marv Grosslein, and Tom Morris. The titles are listed in the "Publications" section. Roger Theroux prepared the French text of the abstracts.

Wendell Hahm made simulation runs on silver hake predation on other fishes with the computer model GEORGE, and worked on two manuscripts, one on flow analysis and one documenting GEORGE for users. John Hauser wrote a computer program to add displacement volumes to the ICNAF zooplankton data base and began debugging it. Also, John Hauser and Nancy Lyon worked on program documentation for data listing and plot routines for the ecosystem files.

Roger Theroux continued work on the northern (macrobenthic) biomass report and made revisions to the benthos section of the chapter on the Elsevier series, Continental Shelf Ecosystems; and he began reviewing the manuscript by Don Maurer on benthos versus oil on Georges Bank. Roger also consulted with Jon Gibson regarding remodeling the Woods Hole darkroom.

A summary of feeding and distribution data on swordfish prey was prepared by Ray Bowman for the Food and Drug Administration. On 7 and 8 July, he accompanied Charles Stillwell to the US District Court in Boston, where Chuck testified as an expert witness on the feeding of swordfish.

Marv Grosslein completed proofing and editing galleys of the text and references for the monograph on fishes for the New York Bight Atlas series.

Mike Pennington reanalyzed data on incidence of nematode parasites in Atlantic herring from a manuscript by Boyar and Brennan, which shows an infestation level off western Nova Scotia twice that of Georges Bank. This analysis was a first step toward evaluation of the potential use of parasite data for estimating herring stock mixing in the Gulf of Maine area; the manuscript and Mike's results will be presented at the NAFO meeting in September. Mike also worked with Greg Lough on revision of the larval Atlantic herring growth manuscript, and reviewed a paper for the Fishery Bulletin. Wendell Hahm completed a draft of the user manual for the simulation model GEORGE, and made additional test runs with the model and flow analysis methods by using silver hake data. Ed Cohen completed final editing of several ICES papers and continued refining estimates of prey size and consumption of fish predators for use in our modeling work. Ed Cohen and Ron Schlitz sent around for internal review their manuscript on the nitrogen budget for the Gulf of Maine and Georges Bank; the paper is to be submitted for publication in the Journal of Biological Oceanography.

John Hauser completed checkout of the computer program for adding displacement volumes to the plankton data base and updated Roz Cohen's zooplankton file. John began writing a program for cluster analysis of the zooplankton data on the Sigma 7 and also began familiarizing himself with the model GEORGE. Both John Hauser and Nancy Lyon produced data listings and plots of predator/prey weight data and predator length frequencies for the modeling. Nancy Lyon completed documentation on several computer routines for generating listings and plots of plankton and food habits data, and assisted a number of biologists in the Division with data retrievals and summaries. Nancy completed her summer appointment on 25 August to begin graduate school at Florida State University.

Roger Theroux continued work on the New England Region biomass report with first-draft typescripts for sections on "Materials and Methods," "Description of the Region," "Faunal Composition," and "Total Macrobenthos" completed; and he completed a review of Don Maurer's draft of "Review of Benthic Invertebrates of Georges Bank in Relation to Gas and Oil Exploration with Emphasis on Management Implications." Roger also spent a fair amount of time preparing plans and purchase orders for updating and improving the Woods Hole Laboratory's darkroom. Also, he prepared several sections for the "Photographic Methods and Techniques" portion of the NEFC audiovisual quality control guidebook. John Malone continued the arduous task of updating, via Sigma 7 EDIT, the Georges Bank motile invertebrates data base. Computer shutdowns are still plaguing this task.

Summer employees (Rene Eppi, Judith Scanlon, and Wendy Stephenson) completed examination of fourspot flounder stomach and intestine contents. Preliminary results indicate fourspot feed mainly during the daytime (as did winter and yellowtail flounders). Catchability data examined thus far show all three species are principally caught at night. Ray Bowman completed the paper on causes of variation in fish feeding studies. Ray also completed an examination of the data from several cruises to determine the catchability of flounders. William Michaels continued work on 1979 stomach content data. Bill also began a reorganization of the filing system for feeding information.

Plankton Ecology Investigation

Donna Busch and John E. O'Reilly completed and submitted an ICES paper (see list of publications). They also submitted an abstract titled, "The Annual Cycle of Phytoplankton Primary Production (Netplankton, Nannoplankton), and Release of D.O.M. for the Northwestern Atlantic Shelf (Middle Atlantic Bight, Georges Bank, and Gulf of Maine)," to Dr. J. J. Zijlstra, convenor of an ICES Symposium on Biological Productivity of Continental Shelves in the Temperate Zone of the North Atlantic.

Donna reviewed several ICES papers, the Marine Ecosystem Division's monthly report, and an ecosystem modeling proposal for the Narragansett Laboratory Director. She also prepared and sent the fourth shipment of phytoplankton samples to Gdynia, Poland, for cooperative studies between NEFC and the Polish Sea Fisheries Institute.

During July and August, Carolyn Griswold conducted a bibliographic search and literature review on gelatinous zooplankton species. She participated in Leg II of the surf clam-ocean quahog survey on the Delaware II from 14 to 21 August, and collected plankton samples for volumizing comparisons.

Jack Green was involved in the selection and purchase of equipment to improve the performance of the plankton pumping system. Preliminary analysis of the Nantucket Shoals samples was begun in preparation with the Bigelow Laboratory of Ocean Science, Brookhaven National Laboratory, URI, and the University of New Hampshire for fall participation in the Nantucket Shoals experiment.

Image Analysis

Jerry Prezioso continued processing Antarctic krill samples using the Image Analysis System. Counts and measurements for each major group are being stored on magnetic tape for statistical analysis by the URI computer. Length-frequency information will be summarized for each group and the entire sample. Biomass estimates based on dry-weight conversion factors presently being calculated will be made for both adult and juvenile krill.

The B&L image system has moved to new quarters in the plankton lab at the Narragansett Laboratory.

Ray Maurer, Jack Green, and Jerry Prezioso participated in a research coordination meeting for the Stvor on 26 August. This work will focus on hydrography and distribution of euphausiids and saury along the slope/shelf front.

Biostatistics

Julien Goulet spent a large fraction of time working with EPA on the implementation of ADP capability for the Narragansett Laboratory on the PDP11/70.

A marine ecosystem cartographic research project was developed with Professor Joe Berry of Yale University. This project will run about 6 mo and will involve spatial, temporal, and statistical analysis of about nine key ecosystem variables from 2 yr of MARMAP surveys.

Tom Plichta attended an Office of Personnel Management training course in Boston titled, "Systems Analysis and Design."

All of the 1977-80 station data, experiment/gear data, zooplankton volume data, zooplankton count data, and total ichthyoplankton count data have been extracted from the MARMAP Information System's master files and are now in unit-record sequential format on tape. This data will be input into the MARMAP Ecosystem Data Base which will be implemented on the EPA's PDP11/70. Lorrie Sullivan, Bob Sand, Paula Caito, and Steve Eldridge had dedicated their summer to this project.

Apex Predators Investigation

In July we received information on 23 recaptures. All were blue sharks except one dusky which was free for 20 mo. It remained near Bermuda and was recaptured within 25 mi of the tagging location.

Short-term recaptures predominated the blue shark returns with 14 of the 21 sharks recaptured after less than 30 days. Some of these individuals were retagged and released and for the first time in our study we have recaptured one of these retagged fish. The fish was originally tagged last July and recaptured and re-tagged 55 days later in September. A typical short-term recapture, or so we thought. After 288 additional days at liberty it was recaptured and retagged for the second time and is still free.

In August, we received information on 19 tag returns including 8 from blue sharks, 5 from sandbar sharks, 3 from dusky sharks, 2 from tiger sharks, and 1 from a mako shark. Three of the eight blue shark recaptures were at liberty for more than 1 yr. All of these had either remained or returned to the continental shelf off the Southern New England coast, except one which was recaptured 203 mi southwest of Bermuda by a Taiwanese longliner. A sandbar at liberty for 1818 days (5 yr) traveled from off Fire Island, New York, to Fort Pierce, Florida, a distance of 860 mi. Two other sandbars traveled over 1970 mi from off Long Island to Mexico in 751 and 738 days, respectively. A dusky shark released off Nantucket Island, Massachusetts, was also recaptured off Mexico (2015 mi) after 5 yr. These three Atlantic-to-Gulf recaptures are important additions to our recapture data base. The remaining sandbar recaptures (two) showed movements within the Mid-Atlantic Bight. One of the dusky sharks at liberty for 3 yr showed movement between the Jones Inlet area and Cape Ann, Massachusetts. We are attempting to verify this recapture which is the first to show movement of this species into the Gulf of Maine. The remaining dusky at liberty for 1.5 yr moved from off the North Carolina coast to the coast of Cuba. One of the tiger sharks tagged off New Jersey was recaptured within 50 mi of the tagging site after 400 days at liberty. The other tiger shark, free for only 68 days, traveled 650 mi across the Gulf of Mexico from the west coast of Florida to Galveston, Texas.

Three tournaments were attended by project personnel during July and three others were monitored for us by Scott Emery of the State University of New York at Stonybrook. Our two major sampling tournaments at Montauk, New York, resulted in the landing of 55 makos, 11 tigers, 29 blue sharks, 4 white marlin, and 1 scalloped hammerhead. During these tournaments, participating anglers tagged approximately 100 sharks for our program. Jack Casey, Wes Pratt, Chuck Stillwell, Alan Lintala, Nancy Kohler, and Pat Hadfield collected catch-per-effort data, reproductive tissues, age and growth samples, and food habits information.

Three shark tournaments were attended by project personnel in August: two on the south shore of Long Island, New York, and one at Hyannis, Massachusetts. A total of 51 sharks and 46 teleosts were landed and made available to us for examination. Lengths and weights were taken on all fish; biological samples were also obtained along with food habits information.

Jose Cort, a tuna specialist from Spain, joined us for several weeks of cooperative work on bluefin tuna. His study deals with the occurrence of gill and nasal parasites as indicators of the relationships between the eastern and western Atlantic population of bluefin. Jack Casey has arranged for him to sample bluefin tuna at Point Judith, Rhode Island, and Montauk, New York.

Chuck Stillwell sailed aboard the commercial longliner Darana R. to collect food habits data from sharks and swordfish. Longline fishing operations were conducted along the edge of the continental shelf from east of Oregon Inlet, North

Carolina, to Wilmington Canyon. Squid was the predominant food observed in the stomachs and consisted primarily of Illex illecebrosus. Beaks from the family Gonatidae were also identified in a few stomachs.

Nancy Kohler finished coding food habits data for three species of sharks, the bigeye thresher, porbeagle, and dusky shark. Coding of the swordfish data was begun.

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RESOURCE UTILIZATION DIVISION

Gloucester Laboratory Review

The Gloucester Laboratory was reviewed by a panel of 20 people representing a large segment of the Laboratory's constituency. Members of the panel represented the NEFC, NERO, NMFS Office of Utilization and Development, American consumers, fisheries development foundations, seafood industry organizations, seafood consultants, seafood processors, NOAA Office of Sea Grant, universities, Food and Drug Administration, and US Department of Agriculture.

Harvesting and Sampling Gear Development Investigation

Research Vessel Activity

Our R/V Gloria Michelle was used for experimental demonstration fishing for squid using light attraction and jigging equipment. The ship was deployed after dark to the Scantum area of Ipswich Bay. The fishing locations were varied and the best fishing experienced was at about 62 fathoms at a catch rate of 1000 lb/hr. The squid that was caught was landed and frozen at Gloucester for industry evaluation. The jigging equipment consisted of two hand-operated units with 30 jigs each and a double-reel automatic rig. The experiment was repeated 8 days later with a similar catch rate and a total catch of about two tons of squid for each trip.

The vessel is now being outfitted for a cruise scheduled for September and October for the acoustic biomass estimation of offshore Northwest Atlantic herring. A gallows frame has been designed and the plans will be sent to a contractor for construction. A new winch and net reel have been obtained.

Engineering Assistance to Other Center Programs

The new shellfish assessment dredge which was contracted and built in Florida was delivered to Woods Hole. The Golden Ship Repair, Inc., of Portland, Maine, did the redesign and rebuilding of the fixed ramp assembly and delivered it to Woods Hole as scheduled. Two of their representatives accompanied the ramp and remained during its installation on the Delaware II. Dan Baker also went to Woods Hole for the week to supervise the installation and to be there in case of any technical design problems. The installation went very well and everyone was pleased with the new design and felt

that handling and future assembly and disassembly would be much more efficient and accomplished much more easily and quickly than was previously possible.

Vern Nulk completed the July sampling trip on the M/V Marine Evangeline for AEG, and Kate Wiggin and Pat Donahue completed the August trip.

A meeting was held with W. J. Hall and C. Elliott, representatives of Solar Design Associates, to review the Gloucester Laboratory solar project and resolve technical problems with regard to interfacing new solar installations with existing systems.

Facilities and Safety

Freezer Room No. 5 at the Gloucester Laboratory has been repiped and is undergoing performance tests. Freezer No. 6 renovation is progressing with new insulation being installed at this time.

Manuscripts

Ms. G-497, "Recovery of Waste Energy in a New England Fishing Vessel," was submitted to Fish Boat for publication.

Program Changes

This will be the last bimonthly report from the Engineering Unit as it now exists. Al Blott, Vern Nulk, Jack Moakley, and John Kenney will soon be moving to Rhode Island to take up their new duties at URI. They have all had to spend considerable time planning and getting ready to move.

The rest of the people in the Unit will remain in Gloucester and will carry on with engineering activities related to processing and preservation.

Tom Connors will also assume some new duties that have to do with the operation of the marine products irradiator, radiology, and health physics.

Processing and Preservation Investigation

Nutrition

The unsaponifiable lipid fraction of selected bivalves was sent to the Massachusetts Institute of Technology (MIT) for mass spectral analyses. Our lab has been able to separate 10 different sterols from these, but MIT is experiencing some difficulty with the samples because they cannot achieve our resolution with their capillary columns.

The lipid research has led to the start of two manuscripts, each concerning lipid methodology. The research done on shellfish is so minimal compared to finfish, and the shellfish are so different, that a great deal of finfish research must be retailored to accommodate the shellfish. We are doing much more thin-layer chromatography as a cleanup step.

Determining cholesterol content in squid has proved to be a headache. Two distinct lots of squid had widely divergent amounts of cholesterol. Many more batches will need to be analyzed.

We resurrected 60-mm surf clams from rafts in Cape Cod Bay and brought them to the lab for organoleptic and proximate analyses.

Kate Wiggin is experiencing difficulty with agarose gel isoelectric focusing of denatured protein. She will be concentrating on extraction solutions.

Heather MacFarlane will be leaving to attend her freshman year at the University of New Hampshire.

Blue Crab

Organoleptic testing continued on commercially picked crab meat that was pasteurized in different types of plastic pouches and held at 34°F. Using a method of pasteurizing (185°F for 5 min) whereby a total of 30 lb of air pressure (absolute) was used in the retort vessel during come-up, pasteurization, and quick come-down (i.e., vessel was cooled in ice water), not one pouch burst. These pouches were then placed in refrigerated storage and taste-tested monthly against canned, commercially pasteurized meats of the same age.

To date, meats pasteurized in nylon-6 pouches and held for 9 mo at 34°F are as acceptable as the commercial controls. In fact, in eight out of nine tests, the appearance of the pouched meats was superior to the canned sample because there was no discoloration of the meats.

In two other experiments, commercially picked meats were pasteurized in Mylar (O₂ impermeable) and in polyethylene (O₂ permeable) pouches and are now being tested against commercially pasteurized canned meats. After 3 mo of refrigerated storage, the meats from the pasteurized pouches are as acceptable as the commercial controls.

Assured Quality of Frozen Fish Fillets

A fourth trip was made to the supermarket chain in the Albany, New York, area selling the "U.S. Grade A" frozen fish. Frozen samples were brought back to the lab for examination. Also, the temperature of the fish in the frozen food cases in the supermarkets was measured. The surface temperatures of the frozen fish packages varied from -2.5°C (27°F) to -13°C (8.5°F). These temperatures are too high to maintain the Grade A quality during storage in the supermarkets. The taste tests confirmed that the quality of the frozen fish samples was lower than it should have been. This situation was outlined in an informal report submitted to the fish processor. The processor discussed the findings with the fish buyer from the supermarket chain. With mutual agreement, the low quality fish is to be removed from the supermarkets and replaced with higher quality Grade A fish.

The study to determine the storage stability of "U.S. Grade A" haddock in the new Vendo freezer (a new concept in frozen food display cases) was begun. After 2 mo in the freezer, the haddock was graded as good by the Gloucester Laboratory panelists and as Grade A quality by the US Department of Commerce (USDC) inspector. This study will continue for 1 yr or until the haddock quality falls below Grade A.

The taste-test results from the 0°F and -20°F frozen storage study showed that after 2 mo of storage, all samples (Atlantic cod, haddock, pollock, winter flounder, and ocean perch) were graded as good to very good. All of these samples were graded by a USDC inspector and all received a "U.S. Grade A" score. Hunter L (color) and Instron (texture) measurements were also taken to complete the experiment.

Manuscripts

"The Sterol and Fatty Acid Content of Three Northwest Atlantic Crabs," by J. Krzynowek, K. Wiggin, and P. Donahue, will be submitted to the Journal of Food Science within the next 2 mo.

"The Utilization of Yearling Surf Clams - A Second Look," by J. Krzynowek and K. Wiggin, will be submitted to the Shellfisheries Journal within the next 2 mo.

"Fatty Acid and Sterol Composition of Three Varieties of Surf Clams (*Spisula solidissima*)," by J. Krzynowek, K. Wiggin, and P. Donahue, will be submitted to the Journal of Food Science within the next 2 mo.

Product Quality, Safety, and Standards Investigation

Product Quality

The Association of Official Analytical Chemists (AOAC) collaborative study of a method for fish species identification by agarose gel isoelectric focusing was completed, and the results were submitted to the AOAC. Fourteen collaborators identified a total of 276 samples with 84% accuracy. Slight differences in the protein patterns were judged to be the cause of the misidentifications which were largely attributed to only five of the fourteen collaborators. The other nine collaborators averaged above 90% correct. Since the overall average was below 90%, Ron Lundstrom (an AOAC Associate Referee) recommended to the AOAC that the method not be adopted as an "Official Method" and that another collaborative study be conducted after modification to the method.

Tests were conducted on either air-packed or vacuum-packed belly flaps or fillets of dogfish after 30 wk of storage at 0°F. Organoleptic tests indicated that the quality had become marginal. Vacuum-packed samples were only slightly better in quality compared to air-packed samples. Samples taken from headed-gutted fish held 11 days on ice prior to freezing were inferior in quality compared to samples from three-day-iced fish.

Work is continuing on the study with the USFWS to resolve the assertion by some consumers that American shad taken from different rivers during their annual spring spawning run have acquired different tastes characteristic of the area where caught (i.e., Connecticut River, Delaware River, York River, Hudson River, and Delaware Bay). Triangle tests are being conducted on frozen, freshly-caught shad to determine if significant flavor differences exist. To date, 28 tests have been conducted. These initial results indicate that there is a significant flavor difference between the Connecticut River versus the Delaware River samples; however, no firm conclusions will be drawn until all tests are completed.

Manuscripts

"Fish Species Identification by Agarose Gel Isoelectric Focusing: Collaborative Study," by R. C. Lundstrom, was submitted to the Journal of the AOAC.

Product Safety

Copies of the final report on a survey of polychlorinated biphenyls (PCB's) in selected finfish species from US coastal waters was submitted to Harry Seagran, Program Manager of the National Microconstituent Task, and Betty Hackley of the NMFS Central Office.

A final report on the analysis of polynuclear aromatic hydrocarbons (PAH's) in muscles of finfish and shellfish collected on the Gulf and Atlantic Survey-I was submitted to Mr. Reid, Project Coordinator for ERL's Marine Ecosystem Analysis Program. A copy of this report was sent to Dr. Pearce at the Sandy Hook Laboratory.

A draft for a manuscript on the determination of PAH's in the New York Bight was submitted by Mr. Humason for review.

The mass spectrum on the following PAH's was obtained on a Hewlett-Packard 5992B GC-MS: Acenaphthylene; Benzo-a-Pyrene; Benzo-e-Pyrene; Naphthalene; Pyrene; Chrysene; 1, 12 - Benzo Pyrene; Phenanthrene; Anthracene; Acenaphthene; Fluorene; 1, 2, 3, 4 - Dibenzanthracene; 1, 2, 5, 6 - Dibenzanthracene; 9 - Phenylanthracene; 1 - Methylanthracene; 2 - Methylanthracene; 9 - Methylanthracene; and Perylene.

A user library for PAH's is being provided in the Gloucester Laboratory. This data base will be used to compare one spectrum of an unknown to another in this base.

Our workup of liver samples for PCB's in striped bass is nearing completion. These samples were collected from San Joaquin River off Antioch, California; the Sacramento River off Clarksbury, California; and Coos River, Oregon. Some of the extracts have been analyzed by gas-liquid chromatography utilizing an electron-capture detector. A final report will be forwarded to Dr. Whipple of the NMFS Tiburon Laboratory as soon as the remaining extracts have been analyzed.

Product Standards and Specifications

Drafts of "Proposed U.S. General Standards for Grades of Fresh or Frozen Fish Steaks" and "Proposed U.S. General Standards for Grades of Shrimp" are being reviewed by the NMFS Central Office. They will be published as "Notices of Proposed Rule-makings" in the Federal Register. An initial draft of "Inspector's Instructions for Grading Fresh or Frozen Fish Steaks" is being reviewed by the USDC Inspection Service.

Comments were received on an initial draft of a "Proposed U.S. Standards for Grades of Frozen Fish Portions and Fish Sticks" from the USDC Inspection Service and others. These comments are being resolved.

Work is continuing on comments received on several Codex Alimentarius "Proposed Draft Standards" and "Codes of Practice." We are preparing appropriate draft U.S. comments on these documents.

Questionnaires for both producers and food service operators have been prepared for a market research and analysis report on fresh and frozen fish fillets.

A market research and analysis report on canned salmon is being prepared for the Quality Assurance Branch of the US Department of Agriculture.

Technical Assistance

Information and technical assistance were provided in the following areas: training for fish processors; agarose gel isoelectric focusing method for fish species identification; electrophoresis; differentiation of dehydrated fish and mussel tissue; red snapper; halibut; handling dogfish; scallop gear; design of our modified La Pine heading and gutting machine and the products that can be made from minced fish (four inquiries); squid utilization; storage of live lobsters; thaw drip as a defect in published "U.S. Standards for Grades of Cod and Haddock Fillets"; label designation for a new (imported) canned product made from pilchard; names of New England firms which make fish portions and fish sticks; scientific and common names of fishes; procurement of scallops "in-the-shell"; mechanical separation of fish flesh from bones; the English equivalent of "raie blanc" (in French) as a species name; freeze-thaw stability of extruded products, especially shrimp; parasites; publications of the Gloucester Laboratory; military purchase of Pacific Coast fish; fish entrees in the Federal Stock Catalog; and purchasing seafood.

DIVISION OF ENVIRONMENTAL ASSESSMENT

Biological Oceanography of Stressed Ecosystems Investigation

The Total Plankton Respiration Subtask completed and submitted a paper titled "Total Plankton Respiration in the Chesapeake Bay Plume" to be included in the NASA/NMFS Chesapeake Bay Plume Studies: Superflux 1980 Symposium Proceedings. Work is continuing on the "Chesapeake Bay Plume Studies (Superflux 1980): Shipboard Results" for the NOAA Technical Memorandum NMFS-F/NEC series, and also on the "Nantucket Shoals Experiment: Total Plankton Respiration" report.

Algal assay glassware was coated with Proril-28, a compound which increases chemical resistivity. This was done because the consistent growth limitation due to iron deficiency encountered in previous assays might be, in part, the result of iron adsorption on the culture-tube walls. Following this, 11 Northeast Monitoring Program (NEMP)/Ocean Pulse Program (OPP) samples were assayed, with cell counts made at 4, 8, and 12 days of incubation. Iron deficiency was again the most important limiter of growth of the assay diatom Thalassiosira pseudonana. Nitrogen was the next scarcest nutrient, but phosphorus supply was equally critical in five of the samples. In a single sample, vitamin B₁₂ deficiency equaled iron scarcity in importance. There was temporary growth limitation (evident at day 4, but not by day 8) associated with B₁₂ in two samples and with silicate in one sample.

Cell counts made early in the incubation period (day 4) can reveal when the concentration of a nutrient is not seriously growth limiting, but sufficiently deficient to lower the growth rate of the phytoplankton. Such information aids our understanding of the chemical water quality controlling phytoplankton growth in shelf waters. However, the temporary limitation is found only infrequently and with just two nutrients, vitamin B₁₂ and silicate. Dropping the initial count is, therefore, being considered in the interest of speeding the assays.

One hundred twelve samples from Albatross IV Cruise No. AL 81-07 during 7-27 July 1981 have been concentrated and stored in vials to settle before being evaluated for phytoplankton community structure by Mrs. Myra Cohn and Dr. Harold Marshall, the latter of Old Dominion University in Norfolk, Virginia.

Samples for phytoplankton population enumeration are currently being procured on an OPP survey on Albatross IV Cruise No. AL 81-10, which began on 26 August.

Two manuscripts have been sent to Jon Gibson, Coordinator of the NOAA Technical Memorandum NMFS-F/NEC series, for publication. They are "Phytoplankton Community Structure in Northeastern Coastal Waters of the United States. I. October 1978," and "Phytoplankton Community Structure in the Northeastern Coastal Waters of the United States. II. November 1978," coauthored by Dr. H. G. Marshall and Mrs. Myra S. Cohn.

Myra Cohn attended a meeting of the Interagency Committee on Phytoplankton Blooms on 26 August at Edison, New Jersey, where she gave a talk on the presence of phytoplankton species in areas of high chlorophyll-a concentrations. Present at the meeting were representatives of the Nassau County and Suffolk County (New York) Departments of Health, Ocean County (New Jersey) Department of Health; Food and Drug Administration Area 2 (New York) Shellfish Control; New Jersey Department of Environmental Protection, Bureau of Shellfish Control; NOAA Office of Marine Pollution Assessment; Interstate Sanitation Commission; New Jersey Department of Environmental Protection, Water Resources Division; Gateway National Recreation Area; Monmouth County (New Jersey) Health Department; EPA; and NMFS.

The final articles for the NASA/NMFS Chesapeake Bay Plume Studies: Superflux 1980 Symposium Proceedings, edited by J. W. Campbell and J. P. Thomas, have been received. The volume, to be released in about 2-3 mo, will be about 500 pages in length.

Jim Thomas attended a Northeast Area Remote Sensing System (NEARSS) meeting at the University of Massachusetts on 9 July. In addition to discussions concerning the implementation of NEARSS, a decision was made to produce vegetation maps of the wetlands between Cape Hatteras and Canada by 31 December as the initial thrust of the Coastal Habitat Assessment Research and Monitoring Program (CHARM). This will be done using LANDSAT imagery supplemented where needed by aircraft observations.

Jim Thomas attended a CHARM meeting on 22 July at the University of Delaware where planning and scheduling for accomplishing the wetlands vegetative mapping occurred.

On 31 July, Jim Thomas and Craig Robertson attended a Nantucket Shoals Experiment meeting at Old Dominion University in Norfolk, Virginia, to review data from the Nantucket Shoals Experiment of May 1981.

Craig N. Robertson attended a 1-day workshop/training session on 18 August at the University of Delaware as part of the CHARM Mensuration and Assessment of Coastal Habitats (MACH) wetlands assessment program. Training was given to standardize aircraft observations and groundtruth sampling which will be an important part of Phase I of the program. In addition, criteria were established for picking calibration sites. Actual sampling should begin September-October 1981.

The paper, "Chesapeake Bay Plume Studies (Superflux) Relative to the Biology of the Contiguous Shelf, Fishery Research and Monitoring," by J. P. Thomas, was sent to the Oceans '81 Conference for inclusion in the proceedings of a symposium to be held 16-18 September 1981 in Boston.

Environmental Chemistry Investigation

Trace metal analyses continued on sea scallops collected during OPP surveys on Delaware II Cruise No. DE 80-09 and Albatross IV Cruise No. AL 80-07. Data on trace metals in sediments and tissues collected during the NEMP survey in August 1980 for contaminants in the New York Bight were keypunched and proofed. The ADP Unit at Sandy Hook is working with Bob Reid, Jay O'Reilly, and Vincent Zdanowicz to develop a data file for all of the data from this single survey (benthic species, trace metals, organic carbon and nitrogen, coprostanol, PCB's, PAH's, etc.).

Vince Zdanowicz, Tony Ruiz, and Frank Steimle provided materials to Tom Azarovitz and Steve Murawski of the Resource Assessment Division for sampling approximately 600 surf clams and ocean quahogs during the August survey of the shelf between Georges Bank and Chesapeake Bay aboard the Delaware II. These analyses, when complete, will provide a spatially reliable baseline for contaminant burdens in these two resource species, as well as permit a comparison of present levels of metals with a comprehensive baseline established for these two species in 1974 by Wenzloff, Greig, Merrill, and Ropes.

Vincent Zdanowicz also participated in the July OPP survey on Albatross IV Cruise No. AL 81-07. One hundred thirty-three sediment cores for trace metal analysis were collected at 30 stations. Approximately 290 samples of invertebrate and fish tissue were collected at 12 stations. Principal species sampled were winter flounder, sea scallop, windowpane, (Atlantic) rock crab, and American lobster. During the NEMP survey in August (Albatross IV Cruise No. AL 81-09), extensive collections of seabed cores were made in the New York Bight to assess the distribution of seabed contaminants (trace metals, coprostanol, PCB's, and PAH's), particularly in and adjacent to the sludge disposal site in the apex and in the Hudson shelf valley and canyon.

Approximately 5000 analyses of seawater nutrients (nitrate, nitrite, phosphate, silicate, and ammonium) were made in July and August, completing analysis for nutrients collected during four 1981 surveys.

Al Matte participated on the August New York Bight water-column monitoring survey on Albatross IV Cruise No. AL 81-08 for the purpose of intercalibrating our methods for nutrient analysis with the methods used by Dr. T. Whitledge and colleagues at the Brookhaven National Laboratory (BNL). Samples were collected throughout the water column at 33 stations. The BNL personnel analyzed nutrient concentrations on shipboard shortly after seawater collection, using an autoanalyzer. Aliquots were also frozen and analyzed at the Sandy Hook Laboratory and at BNL to evaluate the extent of alteration due to sample storage and the analytical agreement between the two laboratories. A report describing the results of this intercalibration exercise is being prepared.

Concentrations of chlorophyll-a and phaeophytin-a were measured in netphytoplankton (>20 μm) and in nannophytoplankton (<20 μm) throughout the water column at 65 stations sampled during the OPP survey on Albatross IV Cruise No. AL 81-07.

Euphotic integral rates of ^{14}C -primary production (by netphytoplankton, nanophytoplankton, and released dissolved organic matter) were measured at 28 stations. Mr. Andrew Draxler of this Investigation served as Chief Scientist.

Considerable time has been spent by members of this Investigation for final proofing of all chlorophyll and primary productivity data collected over the past 2 yr. These data along with information on sampling location and date are being computerized with hydrographic and nutrient data so that we can easily computer-generate contour maps of data collected during MARMAP and OPP surveys.

Members of this Investigation finished final drafts of three papers to be presented at the ICES meeting in Woods Hole in October: "Preliminary Estimates of the Annual Phytoplankton Primary Production for the Northwestern Atlantic Shelf (Middle Atlantic Bight, Georges Bank, Gulf of Maine)," by J. O'Reilly and D. Busch (for the Biological Oceanography Committee as Memorandum 1981/L:16); "The Relationship Between Surface and Average Water Column Concentrations of Chlorophyll-a in the Northwestern Atlantic Shelf," by J. O'Reilly, C. Evans-Zetlin, and J. Thomas (for the Biological Oceanography Committee as Memorandum 1981/L:17); and "Effects of Sewage Sludge Dumping on the Consumption of Oxygen in the Water Column at the New York Bight Apex Disposal Site During an Experiment on Acoustical Tracking of a Sludge Dump, 11-16 July 1976," by J. Thomas and J. O'Reilly (for the Marine Environmental Quality Committee as Memorandum 1981/E:32).

Coastal Ecosystems Investigation

Benthic Community Structure

We carried out much of the planning and sampling for the second annual New York Bight benthic contaminants survey, conducted aboard Albatross IV from 10 to 19 August. Christa Facciola and Clifton Banks (volunteers) and Bob Reid, Dave Radosh, and Steve Fromm participated on the cruise. Samples were collected for analysis of sediment grain sizes; concentrations of carbon, nitrogen, heavy metals, PCB's, PAH's, and radionuclides; benthic macrofauna; and levels of metals and organic contaminants in winter, windowpane, and fourspot flounder, silver and red hake, Cancer spp. crabs, and American lobsters. Bob Reid, Ann Frame, and Steve Fromm worked on proofing the benthic macrofauna data set and preparing a report on the summer 1980 survey of the Bight. Bob also helped complete the overall 1980 NEMP report, which is now available.

Dave Radosh collected the summer 1981 NEMP regionwide benthic macrofauna samples aboard the Albatross IV in July. Dave and Clyde MacKenzie continued their several in-situ projects concerning the biology and ecology of the surf clam as possibly influenced by contaminants. Trays with sediments from a gradient of less-to-more contaminated environments were set out to determine any effects on clam spatfall. Burrowing rates in clean, oil-contaminated, and sewage-sludge-area sediment trays were observed in the field.

We discussed our NEMP benthic work with John Scott and Don Miller of the EPA's Narragansett Laboratory. We answered an EPA New York Office request to estimate current benthic impacts of sewage sludge dumping at the New York Bight dumpsite, and to predict rate and extent of recovery if dumping there ceased. Information on Long Island Sound benthos was provided to the Connecticut Department of Environmental Protection.

Ann Frame and Steve Fromm collected capitellid polychaetes for Dr. Judy Grassle at WHOI. Ann also identified amphipods from the NEMP collection for Phyllis Johnson of the Oxford Laboratory.

Benthic Energetics

Jan Ward has designed formats so that benthic invertebrate life history information which we are presently compiling may be computer filed for rapid retrieval and updating. This file is being developed to allow us to characterize rapidly the functional attributes of dominant species from OPP or other benthic collections to assist in assessing causes or significance of apparent changes in community structure. She also helped design formats to list the species collected in each sample or station in descending order by number of individuals per species or biomass to detect automatically the dominant species at a station. These programs will decrease time spent in organizing data for analysis and interpretation. She continues to review literature and compile life history data on species defined as dominant (by number of individuals or biomass) at OPP monitoring sites. Dot Jeffress, with assistance from Bruce Baker, has completed the major portion of determining the biomasses of benthic organisms at an array of stations around the New York Bight apex dumpsite. She has only to fill in some small gaps and enter the data into the ADP system before we will be able to begin to examine apparent impacts of dumping on the standing stocks and productivity of benthic invertebrates.

Russ Terranova completed a calorimetric analysis of ocean quahogs from a range of size classes to determine if there is a significant difference in caloric content based on size of individuals. Analysis of preliminary data indicates there may be a difference, a possible inverse relationship with size. However, further analysis is needed. Russ also ran some additional shark liver samples for Chuck Stillwell and continues to work on seasonal variation samples for our basic benthic species series. Bruce Baker, our summer aid, worked on analyzing the salinity samples from our spring and summer OPP surveys and coded an early benthic survey off southwestern Long Island for ADP filing. The inclusion of this data set in our ADP files will assist us in computer searches for species occurrence and distribution, data required to augment our life history compilations.

When Frank Steimle had time off from his Ocean Pulse Coordinator duties, he addressed reviewer comments for his manuscript on a survey of the benthic invertebrates of Block Island Sound and is beginning to organize data for a contribution to the NEMP annual report.

Ocean Pulse Coordination

This summer, we completed planning and organizing the July OPP monitoring survey aboard the Albatross IV. With Andy Draxler's assistance as Chief Scientist, this cruise was very successful in its accomplishments. Besides our routine work, 12 additional stations were occupied to supply samples of sediments and benthic organisms to EPA for analysis of radioactivity levels adjacent to a dumpsite off Boston. Samples of epibenthic organisms were also collected for petroleum hydrocarbon analysis on Georges Bank to back up a concurrent effort by the Bureau of Land Management. We also planned and organized the early fall OPP monitoring survey that departed on 26 August aboard the Albatross IV.

During late July and early August, a drastic decline in dissolved oxygen (DO) levels along the northern New Jersey coast occurred. During this period we worked in cooperation with the EPA's Edison (New Jersey) Laboratory to monitor the situation, by adding special DO monitoring stations to OPP surveys and by reporting daily DO results. A cool-weather break in mid-August appears to have prevented the situation from developing into a major problem. We will continue to make a special effort to monitor the area until the fall water-column overturn occurs.

This summer, we also developed, with generous cooperation from the Resource Surveys Investigation, an extensive collection survey of ocean quahogs and surf clams between Chesapeake Bay and Georges Bank. This survey will collect both species of clams for heavy metal and petroleum hydrocarbon analysis at a large number of locations. This survey will augment our OPP monitoring by providing shellfish for analysis we are normally unable to collect in sufficient number in our routine surveys and will partially be a repeat, for comparison, of a 1974 survey.

Behavior of Marine Fishes and Invertebrates Investigation

Results of field studies conducted last summer on the effects of oiled sediment on predator-prey interactions between blue crabs and hard clams indicated that the crabs consumed more clams from oiled sediment than from clean. It appeared that this was related to changes in burying behavior of the clams. To investigate these findings further, lab studies were conducted to measure the effects of oiled sediment on burying behavior and vertical distribution of the clams in the absence of a predator. Preliminary results indicated that clams which were placed on the surface of oiled sediment buried at significantly slower rates than those placed on clean sediment. After a 96-hr exposure, clams in the oiled sediment were buried at shallower depths than the controls. When the clams were removed from the oiled sediment and then placed on clean sediment, normal burying behavior was resumed.

Environmental Statistics Investigation

We studied the geographical classification of the ocean water to achieve a reasonable precision in statistical estimation of various effects. The computed correlation matrix used the measurements of four physical variables: temperature, salinity, density, and transmissivity for each station, and then made comparisons with those of other stations. Using factor analysis and numerical classification, data resulting from the New York Bight studies of NEMP have been analyzed. The resultant similarity index matrix was subject to cluster analysis for detecting patterns. Preliminary results indicate the distribution of hydrographically similar stations is a reflection of the bottom topographic regime of the Hudson Canyon, the direction of the prevailing current and influx of river flows.

Technical consulting activities for various investigations carried out included data handling, format correction, data manipulation, software creation, and statistical analyses. A manuscript on the effects of a 30-mo exposure of juvenile blue mussels to copper and silver is in progress. An environmental data monitoring manuscript for NEMP is also in progress.

Physiological Effects of Pollutant Stress Investigation

Physioecology

Surf clams exposure to silver in a diluter system continues. All bay scallops, however, both controls and experimental, have died.

An experiment exposing surf clams and bay scallops to copper at 1, 5, and 10 $\mu\text{g}/\ell$ in a diluter system has been terminated because of high mortality in both experimentals and controls.

Studies exposing blue mussels to either copper or silver in a diluter system have been concluded after 2 yr of exposure. Mussels exposed to silver were removed and respiration measurements, shell length, and meat weights were noted. Survival of the mussels exposed to copper was so poor that the above measurements could not be made.

Juvenile mussels exposed to silver at 0, 5, 25, and 50 $\mu\text{g}/\ell$ for 6 mo were measured. Growth was significantly different from controls at 25 and 50 $\mu\text{g}/\ell$, with no growth at 50 $\mu\text{g}/\ell$.

Adult blue mussels were collected and set up in a diluter system. Twenty-seven mussels were placed in each aquarium and will be exposed to ambient water only. Ten animals will be removed at biweekly intervals to monitor copper uptake from our natural seawater.

Considerable time was spent on the translation of English abstracts into French for papers being presented at the ICES meeting in Woods Hole this fall.

The remainder of the reporting period was spent in refabricating diluters.

Physiology

We have completed two additional sets of blue mussel samples taken from Narragansett Bay as part of a cooperative study with the EPA's Narragansett Laboratory. Gill-tissue respiration measurements were made on 40 animals from both June and July collections, and hemolymph ions and osmolality were measured for each mussel. This study will continue on a monthly sampling basis into the fall months; the August collection has just been completed.

Lab analysis continues on fish and scallop samples collected during the spring NEMP/OPP cruise and additional samples added by personnel participating in the July NEMP/OPP cruise. Sixty-seven winter flounder, 15 yellowtail flounder, 140 sea scallops, and 22 windowpane were sampled during the July cruise. We are now preparing for the late summer NEMP/OPP cruise (Albatross IV Cruise No. AL 81-10) and will participate in both legs of that exercise.

Sampling continues at three stations in Long Island Sound. Blood samples were taken from 20 windowpane at each station in June, July, and again in August. Lab measurements have been completed on these samples for June and July.

We are now preparing for a new set of studies with striped bass in the swimming speed respirometers. We will be studying effects of pollution in the New York Bight/Hudson River area on various aspects of bass locomotion.

Recent reports in the literature have noted changes in the gill epithelium of finfish in response to environmental stress. Among the alterations reported were changes in mucus cells. We have been studying flounder gills with a scanning electron microscope and have made special note of mucus cells in gills of fish taken from OPP stations in Long Island Sound and from fish exposed to metals in the lab. Since the production of a protective mucus layer is one of the first lines of defense against a pollutant or irritant, this is an appropriate area to explore as a monitoring technique for environmental stress. Preliminary analysis of the gills collected thus far indicate increased mucus production and increased numbers of mucus cells in metal-exposed fish and in fish from the most polluted Long Island Sound station. These studies will continue.

Biochemistry

Biochemical work continues to focus on the sea scallop. Analyses were completed on phasic adductor muscle samples from scallops collected during the NEMP/OPP survey on NOAA R/V Kelez Cruise No. KE 81-04/05, and work is under way on kidneys from the same animals. For scallops experimentally exposed to 10 ppb of Ag for 60, 78, or 90 days (final takedown on 30 June), we've similarly finished testing adductor muscle and have started on kidney.

Adductor muscles from the June sampling of an offshore New Jersey scallop population, a continuing seasonal effort, were also analyzed, as were those from another two stations sampled during Delaware II Cruise No. DE 80-07 last October.

In an ongoing cooperative study with EPA personnel, blue mussels set out along a pollutant gradient in Narragansett Bay were sampled in July and August. Gill and posterior adductor muscle tissues were excised, packaged, and frozen at -80°C to await testing. Warming of Bay waters earlier than normal this summer threatens our plans to continue sampling through November, because of the early and fairly sudden heat stress.

Biochemistry did not take samples during the July NEMP/OPP cruise because we had just participated in the annual sea scallop survey immediately prior (Albatross IV Cruise No. AL 81-06). The assessment-oriented surveys are an invaluable source of scallop samples, and have successfully filled holes in our OPP data, in addition to alerting us to the "Gulf of Maine deepwater" and the "Mud Patch" populations. Biochemistry personnel are currently participating in the late summer NEMP/OPP survey on Albatross IV Cruise No. AL 81-10.

From the desk, a completed manuscript "Field Stress in the Sea Scallop, Placopecten magellanicus" (for the Marine Environmental Quality Committee as Memorandum 1981/E:7) was submitted to ICES for its annual statutory meeting this fall. The biochemical testing schedule, with options and windows for flexibility, was mapped out through May 1982.

Anaerobic Bacteriology/Metabolism

Lab activities during this reporting period were largely directed at characterizing bacterial isolates obtained from samples collected on this year's spring NEMP/OPP cruise. Clostridium perfringens counts were made for all sediments; there was little variation in the plate counts for this sampling period compared to previous ones, perhaps because of temperature differences. Vibrio counts were low, a normal occurrence at low environmental temperatures (5°C). V. parahaemolyticus, usually detected in summer and early fall samples, were not detected. Surprisingly, of the 16 isolates characterized, five were presumptive V. cholerae. Other characterized isolates belong to the genera Pseudomonas and Serratia. As has been the case previously, over half of the bacterial isolates tested could not be identified with our present methodology.

Other field activities included the monthly sampling of our Long Island Sound OPP stations and participation in the second annual New York Bight benthic monitoring cruise. On this cruise, sediments were collected from 58 stations. Top and bottom waters were sampled at 11 stations, and animals (sea scallops, American lobsters, and Cancer spp. crabs) were taken from seven of them. The sediments were analyzed for fecal coliforms, the waters for C. perfringens and the Vibrio group, and animals for both total coliforms, fecal coliforms, and a selected group of pathogens commonly associated with coliform bacteria.

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AQUACULTURE DIVISION

Aspects of Nutritional Requirements of Mollusks Investigation

Experimental Feeding of American Oysters

Experimental feeding studies were conducted with young American oyster (Crassostrea virginica) spat to corroborate previous studies in which a cryptomonad flagellate (previously described) was used as a food supply. In the previous studies, concentrations of 2.0×10^6 cells were available to each spat per day, and in the present study three concentrations of food are being compared: 1.8×10^6 , 3.6×10^6 , and 7.2×10^6 . In the earlier study it was noted that a lag of about 4-5 wk occurred before significant increases in sizes of spat were observed. Oysters in the present experiment have been held in the experimental condition for over 3 wk; hence, enough time has not elapsed for results to be available.

During the past several months we have made five different attempts to rear American oyster larvae from the fertilized egg. Although development is always good and the onset of larval growth proceeds normally, in every trial we have encountered serious mortalities between days 8 and 10 of the rearing process. In the most recent work, we separated the fertilized eggs into three batches and reared each one under different experimental conditions in an effort to shed light on the factors that could be provoking these mortalities. One batch of larvae was incubated at 26°C in buckets containing 10 liters of seawater that had been filtered, exposed to ultraviolet irradiation, and treated with activated charcoal; another batch of larvae was reared in the same water as the latter group, but these larvae were incubated in basins of 80 liters of water at room temperature; the third batch of larvae was incubated in a continuously flowing seawater system in which the seawater had been filtered and ultraviolet irradiated. In each of the above experimental containers, the results were similar in that larvae began to appear unhealthy about the sixth day, thereafter demonstrating heavy mortalities until 100% mortality was reached about the 10th day. Because the pattern of mortality is so similar in each experimental trial, we are looking for fundamental problems in the culture system. One hypothesis is that some adhesive bacteria are being introduced to the culture system through the fertilized egg suspension and the bacterial population takes about 10 days to increase to the point where it causes heavy mortalities.

Algae Culture

During the period covered by this report, 3164 liters of algae used as larval foods, and 2742 liters of algae used for juvenile molluscan food, were harvested from the semicontinuous algal mass-culture system. These algal foods were distributed to the various Milford Laboratory Investigations as follows: Spawning and Rearing of Mollusks, 2309 liters; Aquacultural Genetics, 2352 liters; Physiological Effects of Pollutant Stress, 258 liters; and Diseases of Larval Mollusks, 9 liters. All strains of the algal culture collection were subcultured on schedule. Starter cultures were forwarded to Mr. Chan Siu Ming of the Kowloon Workers Benevolent Society Hatchery in Hong Kong.

Aquacultural Genetics Investigation

Oyster Genetics and Breeding

Effort this period was expanded mostly in simply culturing and setting larvae from crosses made the prior month. Juveniles growing in outdoor tanks and lantern nets had to be cleaned of fouling organisms and silt.

S. Stiles prepared a paper updating progress on directed breeding of Long Island Sound oysters, to be presented to the Mariculture Committee at the statutory meeting of ICES to be held in Woods Hole in October. A. Longwell worked on the draft of the report of the ICES Genetics Working Group. This report discusses some aspects of the selective breeding of oysters and salmonids, and for the first time puts together a summary of aquaculture genetic studies ongoing in most ICES member countries.

Cytogenetic Studies of Environmental Contamination

Progress in applying the micronucleus test to fish was outlined in our quarterly report to the Ocean Pulse Program. Roughly 800 fish and a million erythrocytes have been examined in the course of this work. Micronuclear incidences are higher in the immature circulating blood forms found in larval and egg stages of teleosts than in the mature circulating blood of adults. Methodology perfected for applying the test to immature erythrocytes of the kidney reveals incidences there also to be higher than in circulating blood. Field data show a gradation of micronuclear incidences in Long Island Sound over three presumed dirty-to-clean stations with the clean area having an incidence essentially identical to that of open ocean areas. Ranked according to species background, micronuclear incidences ranged from low to high accordingly: windowpane in open ocean areas; Fundulus; silver hake in open ocean areas; windowpane in Long Island Sound; and Atlantic cod. In cod, a few fish with piscine erythrocytic necrosis infections may be the cause of elevated micronuclear levels. Some mammalian viruses and even vaccines are known to increase chromosome mutation in other vertebrate systems.

Once fully analyzed statistically, these data will be prepared for publication and the course of future field studies decided. In the meantime, additional experimental research is being planned using the micronucleus test on blood-forming tissue of the kidney.

Other efforts are underway to adapt the sperm mutation test to teleosts with monitoring as well as experimental applications in mind.

A. Longwell prepared a background paper on cytogenetic perspectives on petroleum pollution for the National Academy of Science's update of its 1975 report on "Petroleum in the Marine Environment."

Spawning and Rearing of Mollusks Investigation

The use of 3-mm-mesh pearl nets with bottom areas of 0.1 m^2 was explored as a method to grow hatchery-raised bay scallops (Argopecten irradians) to a seed size (25 mm) suitable for final grow-out in lantern nets. In addition, the effectiveness of the pearl nets was compared with our raceway system. Scallops initially 9.7 mm in shell height were stocked in the pearl nets at densities of 250, 2500, 5000, 7500, and 10 000/ m^2 and the nets deployed in Long Island Sound at a depth of 6 m. In the first month, shell height increased about 7 mm in the pearl nets and 11 mm in the raceway system. There was a significant inverse relationship between shell height and pearl net densities above 2500/ m^2 . At termination after 68 days, pearl net scallops ranged in mean height from 30.9 mm at the lowest density to 20.1 mm at the highest density. Raceway scallops had a mean height of 36.6 mm at termination. Much of the difference between raceway growth and growth in the pearl nets can be attributed to temperature and phytoplankton differences between the two experimental sites. The very acceptable growth of small bay scallops in pearl nets at moderate to high densities may make this a cost-effective alternative to raceway culture.

Juvenile softshell clams (Mya arenaria), hard clams (Mercenaria mercenaria), and surf clams (Spisula solidissima) were reared in the pumped raceway this summer. From May to August, Mya grew from 19 to 31 mm, Mercenaria grew from 12 to 20 mm, and Spisula grew from 18 to 37 mm. The clams were maintained at low densities to ensure adequate nutrition. A species-specific capacity for growth is evident, with Spisula exhibiting the greatest growth followed by Mya and Mercenaria.

Monitoring the physical, chemical, and nutritional conditions of seawater in the pumped raceway system has provided insight into its function in the grow-out of bivalves. Biweekly monitoring was performed for temperature, oxygen, ammonia, nitrate, nitrite, chlorophyll-a, and algal species composition. These data were compared with growth data of the surf clams held in individual tanks at different densities. Growth correlates well with many of the measured parameters. This monitoring study pinpointed the location of fouling organisms in the piping system and revealed reductions as high as 90% in the level of suspended phytoplankton. Dissolved oxygen content of seawater filtered by the fouling organisms was also reduced. Knowledge of those conditions which foster rapid growth will aid in making decisions about managing the system.

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PATHOBIOLOGY DIVISION

Fish Pathology Investigation

To verify newspaper accounts of the presence of red hake in the "Mudhole" of the Hudson shelf valley, a trip was scheduled on 5 August on board the head boat Dauntless from Point Pleasant, New Jersey. About 400 hake, some with ulcerative lesions, were caught. Subsequent trawling with the Sandy Hook Laboratory's R/V Kyma in 180-ft depths on 27 August yielded 152 red hake; 2.6% had ulcers. Fish ranged in size from 18 to 44 cm; however, ulcers were found only on larger fish measuring from 34 to 40 cm. Bottom temperature was 13°C. It was difficult to trawl at the "Mudhole" because of net fouling with worms, worm tubes, and organic matter which reduced the catch efficiency of the nets.

On 23 July and 20 August, flatfishes were sampled from the Arthur Kill for the hepatoma study. Thirty winter flounder were processed for histologic examination. The size of the fish ranged from 12 to 21 cm. Bottom temperatures were about 23°C. Most of the fish had no food in their guts and exhibited external signs of emaciation. Most livers were "off-color" from the normal creamy or chalky white coloration seen on fish from control areas (Great Bay, New Jersey).

Over 5400 sand lance collected from 118 stations have been examined to date. All data on vertebral anomalies have been entered into the computer and are retrievable by cruise number, station number, latitude and longitude, or depth. The number of fish examined to date represents a 75% increase in sample size since the beginning of the calendar year. Collection of sand lance will continue and analysis of the data will begin shortly. Multiple regression analysis for relationships between the percentage occurrence of several types of anomalies and depth and location of collection will be made.

A manuscript on "The Cytopathological Effect of Copper on the Olfactory Organs of Larval Fish (Pseudopleuronectes americanus and Melanogrammus aeglefinus)" was completed and submitted to ICES for presentation at the 1981 Statutory Meeting. The manuscript was accepted and will be presented in October at Woods Hole.

Scanning electron microscope preparations of striped bass larvae 4 to 21 days old are being examined for the development of the eyes (i.e., the cornea), olfactory organs, and neuromasts of the lateral-line system. The results obtained from these and other studies on the structure of sensory organ systems from normal larvae at different development stages will be used to evaluate changes observed in starved specimens and those exposed to toxicants (i.e., copper).

Microbial Ecology and Parasitology Investigation

Black gill condition in rock crabs (Cancer irroratus) was monitored in specimens collected from the New York Bight apex and the Philadelphia-Camden ocean disposal site. Since data collected from the New York site during the past 2 yr have shown that only small numbers of crabs are recoverable by trawling at our historical stations, the sampling regime now includes an area due south from the sewage site. The area known as the "Mudhole" appears to serve as a deep trough that progressively is becoming affected by the seaward flow of discharged wastes. Water depths at the "Mudhole" stations range from 130 to 180 ft, in contrast to depths of 60-80 ft at

the historical shoreward stations. The deeper stations also harbor crabs that appear to molt during mid-to-late summer in contrast to the wintertime molt of near-shore populations. Comparative data from the first two collections at the "Mudhole" are summarized below:

Date	Males	Females	Total	Clean	Discolored	<50% black	>50% black
May 1981 (a)	52	14	66	40	5	21	0
Aug 1981 (b)	46	17	63	60	3	0	0

(a) One female in papershell condition, all others in intermolt phase; 60% with clean gills.

(b) Five females and six males in molting stage (17%); 95% with clean gills.

The two collections showed that molting activity was associated with a high incidence of clean gills and that such an incidence varies seasonally with different *C. irroratus* populations. Also, it was of interest to note that intermolt crabs collected in May were larger than those collected during molting activity in August (see table below).

Location	Date	Size range (mean) in cm	
		Males	Females
Mudhole	May 1981	5-13 (9.1)	5-8 (6.4)
Mudhole	August 1981	3-12 (6.6)	3-8 (5.6)
Ambrose Light	August 1981	4-7 (5.1)	3-6 (4.5)

During intermolt, males averaged 2.5 cm larger than they did during molt, females only 0.6 cm. Such size differences suggest the large crabs probably moved further offshore by mid-to-late summer and were replaced by smaller crabs that had moved seaward subsequent to their final molt as juveniles. This suggestion is plausible as seen from data collected near Ambrose Light and the dumpsite during the August 1981 cruise where the average size for males was 5.1 cm and for females, 4.5.

Monitoring data for 1981, which included our first attempts to observe black gill disease further seaward, showed that the condition was remarkably high (32%) at the "Mudhole" during the intermolt phase of growth in May, but had essentially disappeared during molting activity in August. It was of interest to note, however, that all affected crabs showed less than 50% blackening of their gills; seriously blackened gills (>50%) have not been observed this year. Records of the incidence of ulcers or perforations of the carapace or appendages in crabs from the above collections also provided a means by which molting activity could be followed. Intermolt crabs from the May collection showed a 33% incidence of ulceration (22/66), while molting crabs showed only a 3% incidence (2/63).

Unreported observations made on the digestive gland (hepatopancreas) of *C. irroratus* collected during the past 8 yr include data on differences in color and

texture of this organ. Color ranges from orange, yellow, brown, green, pink, to black, and texture ranges from firm to watery. Histologically, the organ ranges from condensed to highly vacuolated and thin, depending upon the molting cycle and its influence on nutrient reserves. Such differences have now been implemented into the design of our monitoring activities. Hepatopancreas color and texture were recorded during our two most recent monitoring cruises--one in the Philadelphia dump-site (now inactive), and one in the "Mudhole," in the New York Bight apex. A firm orange-yellow gland, typical of intermolt crabs, was found in 93% of the animals from the Philadelphia site and in 60% of those from the "Mudhole." The difference in incidence of firm yellow was partly due to the fact that only 1% of the Philadelphia specimens were undergoing a molt while 15% of those from the "Mudhole" were in the molting cycle. Watery glands were found in soft crabs and in those in the early papershell stage. Additionally, watery glands from the intermolt Philadelphia crabs were found only in females in which 6/7 were berried or sponge crabs. Our very preliminary observations, which will be investigated further, indicate that the watery hepatopancreas occurs naturally in sponged females, and in molting crabs that are advanced peelers (pre-molt), soft crabs, or early papershells (postmolt). Jet-black glands were observed in three crabs from the Philadelphia site; two were firm and one was watery. Black hepatopancreas, and other degrees of discoloration, will be included with black gill monitoring activities, including limited histological studies on atypical tissues.

Diseases of Larval Mollusks Investigation

New systems are being developed for identifying microbial molluscan pathogens. Thus, two approaches were used in developing bridging reagents between commercially available, labeled antisera and antibacterial antibodies produced in fish. In one approach, rabbit antifish globulin antibody was produced by injecting fish antibodies which had been purified by affinity chromatography, directly into a rabbit. In the second approach, the antibody was produced by first injecting washed rabbit blood cells into a fish to produce fish antirabbit cell serum, then adsorbing the fish antibody onto fresh rabbit cells, and reinjecting the cells back into the rabbit. If current examination of the titers and specificities of these rabbit antisera proves satisfactory, they will be used with specific antibacterial fish antibodies and commercial reagents to identify pathogenic bacteria of mollusks.

Toxic filtrate of a Vibrio sp. has been concentrated and the material can now be separated by gel electrophoresis, the toxic fraction eluted, the three bands comprising the fraction separated on Sephadex columns, and each band demonstrated singly by gel electrophoresis. This means that molecular weight determinations are possible using either Sephadex column or gel electrophoresis. A determination as to which band(s) is toxic also should be possible.

Preliminary experiments indicate that four bacterial strains isolated from hard clam (Mercenaria mercenaria) larvae and culture water are pathogenic to oyster larvae. Tentative identification suggests that two are pseudomonads, one is a vibrio, and the other is a flavobacter. This is only the second time in 14 yr of bacterial identification studies that a bacterium belonging to the genus Flavobacterium was found to be pathogenic to oyster larvae. Further experiments and characterizations are in progress and still others are being planned. Another culture of hard clam larvae died and a study will be conducted of the bacterial strains isolated from it.

Additional studies showed three bacterial strains isolated from lab-reared oyster larvae to produce metabolites which can be toxic to developing oyster larvae. The toxic metabolite(s) produced by one of the strains, a pseudomonad, is heat stable; it can withstand 65°C for 30 min, while those produced by the other strains, two vibrios, are heat labile. The toxin produced by the pseudomonad is not found in the filtrate; it is released when the bacterial cells lyse. The characterization of the toxic metabolites will begin at the close of this spawning season. Bacterial isolates have been obtained from two other moribund cultures of oyster larvae. These microbes will be characterized and a determination will be made as to whether the same pathogens are present. Since the three isolates appear to be sensitive to ultraviolet (UV) light, prefiltration and UV treatment of spawning and rearing water were recommended to the Aspects of Nutritional Requirements of Mollusks Investigation where the problem originated.

Nineteen standard biochemical reactions were run on each of 34 bacterial isolates as part of a continuing attempt to analyze the effectiveness of a modified, miniaturized, biochemical identification system for differentiation of marine bacteria. Twenty-four of the isolates were organisms associated with fish lesions. Most of these had been stored in a lyophilized state after being used in an earlier study. After 6 yr of storage, 67% of the isolates were still viable.

In cooperative work with International Shellfish Enterprises in Moss Landing, California, three suspect pathogens (collected on 15 June) were used to challenge American oyster (*Crassostrea virginica*) embryos. One isolate killed all embryos in 48 hr, while the other two prevented larvae from setting, even after 4 wk of growth to the 150- μ m size. These results were reported to the hatchery manager and appropriate measures were taken and sanitation protocols changed, which reduced the on-going disease problem.

In other cooperative work with the Connecticut State Aquaculture Division, coliform tests were run on hard clam samples on 15 and 24 July. The clams, taken off Bayview Beach, Milford, showed positive coliforms at all dilutions tested. Of the three sets of samples taken on 24 July, the group closest to the shore had the highest counts and those furthest away had the lowest counts.

Three sampling cruises to the Stratford, Connecticut, natural shellfish bed were completed on 29 June, 8 July, and 19 August. Bacterial samples and plankton tows were taken in all four quadrants approximately 0.2 mi from Navigation Aid #20. On 8 July and 19 August, the stations were extended another 0.2 mi, or 0.4 mi from the navigation aid, which is the sampling center.

Five sets of Stratford isolates (approximately 150) will be challenged against oyster embryos in pathogenicity tests. These isolates will be identified via selected biochemical tests in attempts to determine the prevalence and exact location of pathogenic vibrios isolated during the 2-yr Long Island Sound sampling cruises.

Three additional oyster larval challenges were completed on 79 Long Island Sound isolates taken from February to June 1981 to terminate the Long Island Sound bacterial survey.

Comparative Invertebrate Pathology Investigation

Samples of blue mussels (Mytilus edulis) were received from Maine, Massachusetts, Delaware, and Virginia for coastal monitoring of the molluscan histopathology project.

Data from oyster samples collected from Maine to Virginia were assembled and compared for gross and microscopic pathologic differences regarding watery condition, mantle recession, green color, inflammation, haplosporidan infections, Nematopsis infections, Bucephalus infections, and presence of mutagens in the tissues. The data were incorporated in map form for interpretation. Interesting relationships were found between watery condition, inflammation, green color, and degraded areas in West Bay, Maine; Raritan Bay, New Jersey; Delaware Bay, Delaware; and James River, Virginia. Additional slides of oysters and mussels from most of these areas were prepared and stained for the presence of copper and mucin and will be examined in the near future. A paper on virus phylogeny and molluscan neoplasia was completed and is now in press. Data on microcell disease has been assembled and a paper on the microcell disease complex is being prepared.

During the reporting period, over 2000 specimens of fish and shellfish were received by the histology lab. Over 1000 histological sections of various tissues from these specimens were prepared for histopathological examination by the Division staff.

Paraffin embedded tissue of the European oyster (Ostrea edulis) from Greece was provided by Dr. Paul van Banning of The Netherlands. These oysters were examined to compare a coccidian parasite, Perkinsus sp., with other members of this genus that affect the American oyster (Crassostrea virginica). Special stains were used to study the characteristics of the parasite. It appears that the parasite in the European oysters most closely resembles the Perkinsus sp. we described in American oysters from Hawaii.

Samples of ocean quahogs (Arctica islandica) and surf clams (Spisula solidissima) from a Resource Assessment Division survey on Delaware II Cruise No. DE 81-05 have just been received. These are now being processed and the data will be included in our NEMP/OPP studies. A manuscript, "A Parasite and Disease Survey of Korean Oysters," has been completed and is to be submitted for review.

In other OPP activities, benthic amphipods collected on Kelez Cruise No. KE 81-04/05 have been examined histologically. A possible Baculovirus infected the hepatopancreatic nuclei of 2/39 and 1/1, respectively, Rhepoxynius episotmus collected at two stations. The nuclei were much enlarged and similar to Baculovirus-infected nuclei in the blue crab (Callinectes sapidus). Another possible nuclear viral infection occurred in one specimen of Photis dentata. In this animal, most of the epithelial nuclei were much enlarged and abnormal in staining properties. Various protistan parasites found during previous surveys were also present in amphipods collected on the April-May cruise. Data on these are being collated.

Amphipods collected on Albatross IV Cruise No. AL 81-07 have been identified and prepared for histological processing. Amphipods were collected at 18 stations on the July cruise, and Ampelisca agassizi were taken at eight of these stations. Microsporidian infections were present in A. agassizi collected at six of the eight stations, with prevalences ranging from 1 to 38%. Ovigerous females of A. agassizi were collected at only three of the eight stations.

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Rosenfield, A. Oyster cultivation in Chesapeake Bay. Underwater Nat. (S)

Visvesvara, G. S., Baxter, P. J.; Brandt, F. H.; Sawyer, T. K. Isolation of Rosculus sp. from a human nose and demonstration of anti-Rosculus antibody in human sera. J. Protozool. (Abstract.) (S)

Reports

Sawyer, T. K.; Galasso, M. A.; Lewis, E. J.; Ziskowski, J. Gill fouling in rock crabs, Cancer irroratus. Northeast Monitoring Program Contract Report; 1981.

NATIONAL SYSTEMATICS LABORATORY

Much effort was devoted to preparing for projected phase-out of the Laboratory by returning study material borrowed from collections all around the world and by cataloging specimens into the National Collections in the Smithsonian Institution, where they will be available to other research workers.

Benthic Fishes Investigation

A draft was completed of D. Cohen's contribution to a coauthored section on the family Ophidiidae for Sea Fishes of South Africa. Work was done on a seminar on the deepsea smelt family Bathylagidae.

Pelagic Fishes Investigation

Data on 18 specimens of Spanish mackerels were added to the computer-stored information base. Revisions were made on a coauthored manuscript on copepod parasites of scombrids. Anchovy collections in the Smithsonian and Harvard Museum of Comparative Zoology were surveyed. Data on the South American needlefish genus Potamorhaphis were summarized.

Penaeoid Shrimp Investigation

Work was done both in the SEFC and here in Washington, DC, on a revision of the rock shrimp genus Sicyonia.

Crustaceans Investigation

Corrections were made on the draft of the manuscript on "Shrimps, Lobsters, and Crabs of the Temperate Eastern U. S.," based on comments received from reviewers.

Publications

Cohen, D. M. Saccogaster melanomycter (Ophidiiformes: Bythitidae), a new fish species from the Caribbean. Proc. Biol. Soc. Wash. 94(2):374-377; 1981. (P)

Pérez Farfante, I. Solenocera alfonso, a new species of shrimp (Penaeoidea: Solenoceridae) from the Philippines. Proc. Biol. Soc. Wash. 94(2):631-639; 1981. (P)

Williams, A. B.; Williams, D. McN. Carolinian records for American lobster, Homarus americanus, and tropical swimming crab, Callinectes bocourti, postulated means of dispersal. Fish. Bull. (US) 79(1):192-198;1981. (P)

ATLANTIC ENVIRONMENTAL GROUP

Ocean Monitoring and Climatology Task

The announcements contained on pages 52 and 53 of eddy conditions in the Georges Bank-Middle Atlantic Bight area were sent to the Commander of the Atlantic Area for the US Coast Guard for publication in the August and September 1981 issues of Atlantic Notice to Fishermen.

The cooperative Ship of Opportunity Program obtained 14 expendable bathythermograph (XBT) transects and four continuous plankton recorder (CPR) transects in July-August: five XBT and two CPR transects in the Gulf of Maine, four XBT transects off Southern New England, four XBT and two CPR transects across the shelf and slope off New York, and one XBT transect across the Gulf of Mexico.

Ocean Dumping Task

Analysis of data collected from satellite-tracked buoys (03020 and 03021) continued.

Publications

- Armstrong, R. S. Transport and dispersion of potential contaminants at the Buccaneer Oil Field. EXPOCHEM '80;1980 October; Houston, Tex. (A)
- Crist, R. Wylie; Chamberlin, J. L. Bottom temperatures on the continental shelf and slope south of New England during 1979. Ann. Biol. 36. (A)
- Crist, R. Wylie; Chamberlin, J. L. Bottom temperatures on the continental shelf and slope south of New England during 1980. Ann. Biol. 37. (A)
- Fitzgerald, J. L.; Chamberlin, J. L. Anticyclonic warm core Gulf Stream eddies off the northeastern United States during 1979. Ann. Biol. 36. (A)
- Fitzgerald, J. L.; Chamberlin, J. L. Anticyclonic warm core Gulf Stream rings off the northeastern United States during 1980. Ann. Biol. 37. (A)
- Hilland, J. E. Variation in the shelf water front position in 1979 from Georges Bank to Cape Romain. Ann. Biol. 36. (A)
- Hilland, J. E. Variation in the shelf water front position in 1980 from Georges Bank to Cape Romain. Ann. Biol. 37. (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)
- Hughes, M. M.; Cook, S. K. Water column thermal structure across the shelf and slope southeast of Sandy Hook, New Jersey in 1980. Ann. Biol. 37. (A)

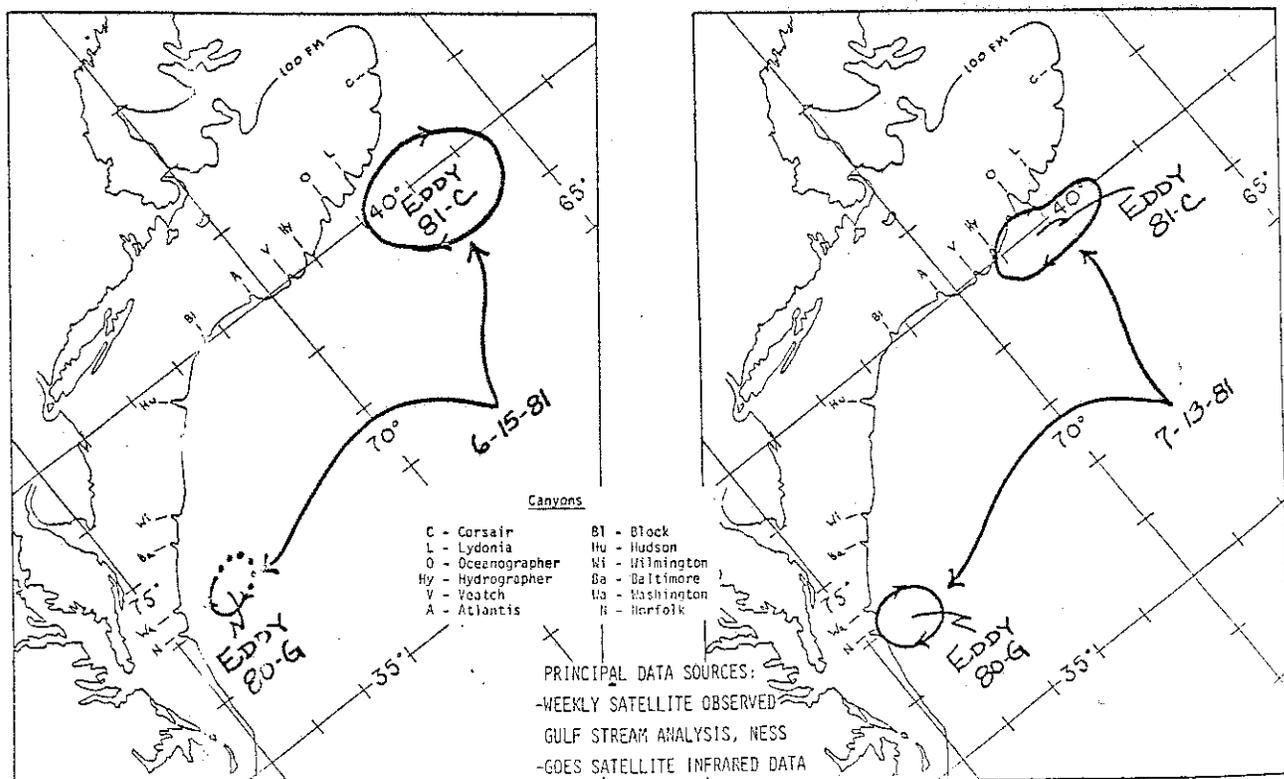
GULF STREAM EDDY LOCATIONS

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

Eddy 80-G entrained Gulf Stream water throughout late June and early July as the eddy travelled southwest about 53 km (30 nm). The eddy now has a center position near 36.9°N, 74.2°W, east of Norfolk Canyon. Eddy 81-C appeared to be partly resorbed by the Gulf Stream during late June. In early July the eddy was smaller in diameter and surrounded by both shelf water and slope water entrainments. The eddy is now located near 39.8°N, 68.2°W, south of Oceanographer Canyon.

During the next 30 days Eddy 80-G may be resorbed by the Gulf Stream south of Norfolk Canyon. Eddy 81-C may move west to a center position south of Hydrographer 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).



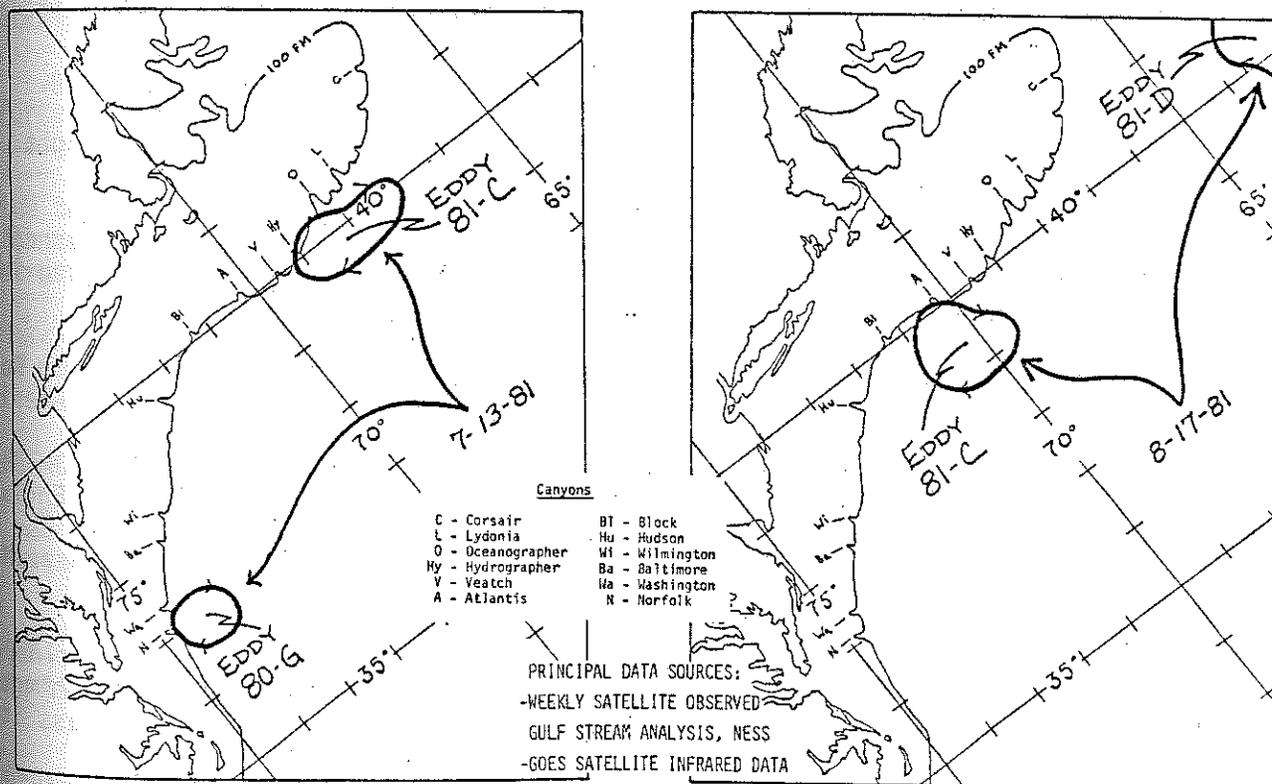
GULF STREAM EDDY LOCATIONS

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

Eddy 80-G was resorbed by the Gulf Stream east of Cape Hatteras during the last week of July. Eddy 81-C travelled west about 186 km (100 nm) and now has a center position at 39.4°N, 70.3°W, south of Atlantis Canyon. Eddy 80-D formed during the second half of July and has moved west to a center position at 40.3°N, 62.4°W, east of Corsair Canyon and far offshore of the 100 fm line.

During the next 30 days Eddy 81-C may move southwest to a center position east of Hudson Canyon; Eddy 81-D may travel west to a position southeast 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).



Ingham, M. C.; McLain, D. R. Sea-surface temperatures in the northwestern Atlantic in 1980. *Ann. Biol.* 37. (A)

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

TRAVEL, MEETINGS, AND PRESENTATIONS

Resource Assessment Division

On 1 July, Fred Serchuk attended a New England Fishery Management Council (NEFMC) meeting in Danvers, Massachusetts.

During 1-10 July, Vaughn Anthony participated in the ICES Advisory Committee for Fisheries Management meeting in Copenhagen, Denmark.

On 8 July, Brad Brown met in Washington, DC, with the Fishery Task Force of the Ocean Policy Committee of the National Academy of Sciences to review NMFS budget proposals.

On 8 July, Mike Sissenwine attended an Executive Committee meeting of the NEFMC in Danvers, Massachusetts.

On 8 and 9 July, John Boreman attended a workshop in New York City on establishment of a monitoring program for the Hudson River ecosystem.

On 14 July, Brad Brown met with Carl Sindermann and others to discuss the proposed Atlantic herring parasite study.

On 15 and 16 July, Brad attended the Center Board of Directors meeting.

On 17 July, Fred Serchuk attended a meeting of the Sea Scallop Oversight Committee of the NEFMC in Danvers, Massachusetts.

On 20 July, Fred attended a public hearing on the NEFMC's Interim Groundfish Fishery Management Plan in Hyannis, Massachusetts, and another public hearing in New Bedford, Massachusetts, on the 21st.

On 23 July, Linda Despres-Patanjo presented a paper she coauthored with Robert Murchelano at the annual meeting of the Eastern Fish Health Section of the American Fisheries Society, held in Starkville, Mississippi.

On 23 July, Detra Green attended a meeting in Boston of Southern New England Section of the American Fisheries Society's Northeast Division.

On 27 July, Fred Serchuk attended a NERO staff meeting in Gloucester, Massachusetts.

On 27 July, John Boreman and Vaughn Anthony attended a meeting in Washington, DC, of the Planning and Coordinating Committee for the Emergency Striped Bass Study.

During 27 July-20 August, Henry Jensen participated in a sea scallop survey aboard the Canadian R/V Prince. The survey was conducted on parts of the Scotian Shelf and eastern Georges Bank.

On 28 and 29 July, Fred Serchuk attended NEFMC meetings in Danvers, Massachusetts. Vaughn Anthony attended on the 29th.

During 3-7 August, Fred Serchuk attended the joint annual meeting of the Shellfish Institute of North America and the National Shellfisheries Association in Williamsburg, Virginia.

On 5 August, Mike Fogarty attended a meeting in Saugus, Massachusetts, of the NEFMC's Lobster Plan Development Team.

On 6 August, Emory Anderson and John Boreman attended a Mid-Atlantic Fishery Management Council (MAFMC) meeting in Philadelphia.

On 7 August, Steve Clark attended a meeting of the Atlantic States Marine Fisheries Commission's Northern Shrimp Technical Committee in Greenland, New Hampshire.

On 10 and 11 August, Anne Lange participated in the International Squid Symposium in Boston.

During 10-13 August, Joan Palmer attended the joint annual meeting of the American Statistical Association and the Biometric Society in Detroit.

On 11 August, Mike Fogarty attended the MAFMC's Summer Flounder Scientific and Statistical (S&S) Committee meeting in Philadelphia.

On 11-12 August, Mike Sissenwine attended a Northeast Fishery Management Task Force meeting in Portland, Maine.

During 12-14 August, Brad Brown and Ken Sherman participated in a meeting of the task force for the Antarctic Living Marine Resources Convention. Recommendations for the organization and initial work of the scientific committees and for commission structure were drawn up.

On 13 August, Emory Anderson attended a meeting in Gloucester, Massachusetts, of the Squid-Mackerel-Butterfish FMP Review Team.

On 17 August, Fred Serchuk participated in a meeting in Woods Hole with the NEFMC staff on updating the sea scallop FMP.

On 18 August, Vaughn Anthony and Mike Fogarty attended a meeting in Danvers, Massachusetts, of the NEFMC's Lobster Oversight Committee.

On 20 August, Vaughn Anthony and Mike Sissenwine met with Harry Marshall, Senior Deputy Assistant Secretary of State, and with Woods Hole Laboratory administrative staff.

On 21 August, Brad Brown met with Wells Burgess of the Fisheries Section of the Department of Justice.

On 26 and 28 August, Anne Lange met with Lou Goudreau and Bob Riedman of the NEMFC staff and Jim Sargent with the Woods Hole Laboratory ADP Unit to discuss 1980 commercial data preparation.

On 28 August, Fred Serchuk presented a surf clam assessment overview at the joint meeting of the MAFMC S&S Committee and the Surf Clam/Ocean Quahog Advisory Subpanel in Dover, Delaware. Emory Anderson also attended.

Manned Undersea Research and Technology Program

Dick Cooper presented talks on MURT monitoring studies of Georges Bank and the Georges Bank submarine canyons to: (1) Hampton Institute, (2) Bigelow Laboratory of Ocean Science, (3) State of Maine's Boothbay Harbor Laboratory, (4) Marine Technology Society's annual meeting, and (5) various local groups on Cape Cod.

Alan Hulbert presented a paper titled "Asteroids as Environmental Indicators" at the International Echinoderm Conference in Tampa, Florida.

Marine Ecosystems Division

During 29 June-13 July, Ken Sherman traveled to Lowestoft, United Kingdom, to preside as Chairman of the ICES Larval Fish Ecology Working Group Meeting. He then continued on to Gdynia and Szczecin, Poland, to attend the ICES Advisory Committee on Marine Pollution meeting and to meet with the Director and scientists at the Plankton Sorting Center.

On 7 July, Chuck Stillwell testified on swordfish food habits during a court case involving the Food and Drug Administration versus Globe Sea Food of Boston, for transporting swordfish with greater than 0.1 ppm mercury across state lines.

On 8 July, Robert Marak and Robert Edwards attended a meeting with Dean John Knauss at URI regarding joint research.

On 21 and 22 July, Julien Goulet and Tom Plichta attended a meeting of the Northeast Regional Fisheries Information System Technical Advisory Group at Narragansett.

On 23 July, Robert Edwards traveled to Narragansett to attend a meeting with EPA regarding the Memorandum of Understanding and the Research Agreement between NEFC and the EPA's Environmental Research Laboratory at Narragansett.

On 27 July, David Mountain met with Ken Sherman regarding FY 1982 plans for the Fishery Oceanography Investigation.

On 30 July, Ray Maurer, Jack Green, and Tom Halavik met with Jim Hall and Bob Osten of Solar Design Associates to review progress on the architectural and engineering phase of our solar project. Drawings for the greenhouse and active systems were presented and explained by Jim and Bob. Key decisions were made which will allow for a swift completion of Narragansett's solar design. The proposed greenhouse culture tank configuration was approved by Jim Hankins (NASA Project Manager) based on the Solar Design Associates' cost/performance analysis and discussions with Ray Maurer and Bob Osten. A site visit was planned by Jim Hall on 4 August to aid in final design of the domestic hot water system.

On 31 July, Donna Busch and Jack Green met with Creighton Wirick of Brookhaven National Laboratory to observe his chlorophyll monitoring and data logging equipment.

On 4 August, Jack Green, Ray Maurer, and Donna Busch met with Jim Hall, Solar Design Associates, to finalize details of plans for solar modifications at the Narragansett Laboratory.

On 4 August, Ken Sherman attended a meeting at EPA regarding joint work between EPA and NEFC. Dr. Pearce was also in attendance.

On 7 August, Greg Lough and Roz Cohen met with Lynn Bass (EPA, Narragansett) and Kay Paine (Woods Hole Laboratory ADP Unit) to discuss future needs on the new PDP11/70 system.

On 12 and 13 August, Jack Casey lectured and exchanged information with the Southeast Region's foreign fisheries observers in Pascagoula, Mississippi. He discussed shark identification to facilitate our cooperative arrangement under which observers tag sharks aboard foreign longline vessels which fish inside the US Fishery Conservation Zone.

During 12-14 August, Ken Sherman traveled to Washington, DC, to participate in a meeting of the US Antarctic Research Planning Group.

During 16-18 August, Ken Sherman attended meetings at the NOAA Environmental Research Laboratories' (ERL) Boulder, Colorado, facilities regarding MARMAP and fisheries research.

On 18 August, there was an apprenticeship program evaluation meeting at the Narragansett Laboratory to evaluate this summer's apprenticeship program and to propose and discuss improvements for future apprenticeships.

On 20 August, Ken Sherman and Frank Steimle (Sandy Hook Laboratory) met at the Narragansett Laboratory to work on a presentation to be given in Washington, DC, on the 21st regarding EPA/NEFC joint work.

On 20 August, Ron Schlitz chaired a meeting for planning the work on the September warm-core ring cruise with the other personnel to be on board.

On 21 August, Ken Sherman and Tudor Davies (EPA) were in Washington, DC, to present plans for a joint EPA/NEFC ecosystem assessment program to the Director of EPA's Water Resources Division.

On 24 August, Julien Goulet and Bob Payne (EPA) visited Kay Paine (Woods Hole Laboratory) and Skip Little (WHOI) to discuss a potential linkup between WHOI's VAX and the EPA's PDP11/70 computers.

On 25 August, Bob Greenan (NEFMC) visited the Narragansett Laboratory to transfer data from tapes provided by Kay Paine to the URI computer.

On 26 August, David Mountain, Jack Green, Ray Maurer, Jerry Prezioso, and Ron Schlitz participated in a research coordination meeting for the Stvor. This work will focus on hydrography and distribution of euphausiids and saury along the slope/shelf front.

On 26 August, Ken Sherman met with Peter Cornillion and Marty McClure (URI), Bob Edwards, and Helen Mustafa at the Narragansett Laboratory before traveling to the Milford Laboratory for the Center Board of Directors meeting to be held the 27th.

On 27 August, Ron Schlitz attended a warm-core ring executive committee meeting in Narragansett to coordinate ship operations in September.

On 27 August, Robert Marak, Jack Casey, and Marv Grosslein participated in a joint US-USSR and US-Cuban fisheries research meeting at the Woods Hole Laboratory. Three Cuban scientists discussed the possibility of cooperative research.

On 28 August, Julien Goulet, Jack Casey, Mike Couturier, and Sandy Lundin met with Bob Payne and Lynn Bass to discuss data structures and transfer of data and programs to the PDP11/70.

On 28 August, David Mountain and Ron Schlitz met with Anatoliy Bendik, the Stvor Chief Scientist, to discuss the warm-core ring study.

On 31 August-2 September, Ken Sherman traveled to Boulder, Colorado, for the NMFS-ERL Working Group meeting to review the national perspective of MARMAP.

Ed Cohen and Marv Grosslein met with Alassane Samba from Senegal about the multispecies modeling approach at NEFC, and also with Willa Nehlsen (EPA) about modeling and approaches to studying possible changes in fish production from eutrophication of Chesapeake Bay. Mike Pennington and Marv Grosslein consulted with Woolcott Smith (WHOI) on his contract work for NEFC on stock recruitment data analysis approaches. Marv Grosslein attended two meetings of the Editorial Committee for the book on Georges Bank.

Resource Utilization Division

Louis Ronsivalli and Dan Baker visited Amoriggi Seafoods in Rhode Island to discuss plant design and equipment layout.

Kate Wiggan and Pat Donahue traveled to Nova Scotia on board the M/V Marine Evangeline for purposes of water sampling.

Ron Lundstrom and Fred Correia attended a meeting at the request of the New England Fisheries Development Foundation to hear a presentation by two former URI students on the application of glucose oxidase to preservation of fish.

Ron Lundstrom presented the paper, "Dimethylamine and Formaldehyde Production in Fresh Red Hake: The Effect of Packaging Material Oxygen Permeability and Cellular Damage," by Lundstrom, Correia, and Wilhelm, at the 1981 meeting of the International Institute of Refrigeration (IIR) held at Cambridge, Massachusetts. Joe Licciardello presented the paper, "Frozen Storage Stability of Red Hake Fillet Blocks," by Licciardello, Ravesi, Lundstrom, Wilhelm, Correia, and Allsup. The papers will be published as part of the conference proceedings.

At the Atlantic Fisheries Technologists Conference (AFTC) in Norfolk, Virginia, Ron Lundstrom presented the paper, "Enzymatic Dimethylamine and Formaldehyde Production in Minced American Plaice and Blackback Flounder Mixed with Red Hake TMAO-ase," by Lundstrom, Correia, and Wilhelm; Kurt Wilhelm presented his paper, "Objective Measures of Textural Toughening in Red Hake"; and Joe Licciardello presented the paper, "Keeping Quality of Fresh and Frozen Sand Lance," by Licciardello, Ravesi, and Allsup.

Joe Licciardello and Ron Lundstrom attended the AFTC Executive Committee meeting.

J. Krzyonewek, K. Wiggin, P. Donahue, and J. Mendelsohn attended the IIR meeting in Cambridge, Massachusetts.

D. Dyer attended the International Squid Symposium in Boston, Massachusetts.

Tom Connors and Dan Baker attended the IIR meeting in Cambridge, Massachusetts, where Dan also presented a paper, "The Proper Handling of Seafoods from Ocean to Table." Tom narrated the slide presentation of the Gloucester Laboratory's functions to the delegates from the IIR who toured the Laboratory.

Fred King participated in four local meetings in August -- the IIR meeting in Cambridge, Massachusetts, during 3-6 August; the New England Fisheries Development Foundations's Seminar on New Seafood Products, held in Boston on 7 and 8 August, and its International Squid Symposium, held there during 10-12 August; and the New England Fisheries Institute meeting of 29 August in Gloucester.

Division of Environmental Assessment

On 1 July, Frank Steimle presented a 30-min seminar on the oxygen depletion situation along the New Jersey coast to an informal assemblage of representatives and guests from the National Park Service, New Jersey Marine Sciences Consortium, New Jersey Department of Environmental Protection, and Sandy Hook Laboratory personnel.

On 7 and 8 July, Dr. John Pearce chaired the NEMP management team meeting held at Rockville, Maryland. Frank Steimle and Bob Reid also attended and participated. The group discussed the finalization of the NEMP annual report for 1980, as well as problems concerned with vessel time and the development of future NEMP reports. Presentations were made by Wes Hull (about ship time), and Jim Audet [in regard to National Oceanographic Data Center (NODC) activities as they relate to NEMP].

Bob Reid and Frank Steimle participated in an NEFC review of Environmental Assessment Division programs at the Sandy Hook Laboratory on 3 July.

On Thursday, 9 July, Dr. Pearce and Dr. Thomas met with Dr. Edwards and the staff at the University of Massachusetts concerned with remote sensing activities. This was in relation to the developing MACH program for remote sensing in estuaries and the coastal zone. Protocols for groundtruth measurements were discussed as well as the use of NEARSS as a communication link between satellites and users.

On Wednesday and Thursday, 15 and 16 July, Dr. Pearce participated in the Center Board of Directors meeting at Woods Hole. In addition, he was involved with the Promotion Review Committee and a new committee set up to review promotion activities within the Center.

On Friday, 17 July, Dr. John Pearce met with Mr. Louis Ronsivalli, Mr. Don Gadbois, and Dr. Paul Boehm (Energy Resources Co., Inc.) at the Gloucester Laboratory to discuss future NEMP activities in relation to chemical analyses for pollutants.

On 20 July, Frank Steimle and Bob Reid attended a review of the NOAA Office of Marine Pollution Assessment's Hudson-Raritan Estuary project plans for FY 1982.

On 21 July, Dr. Pearce met with the Center Director and Mr. Jim Audet of the NODC to discuss NODC efforts in regard to data processing and statistical programs for environmental data. In the afternoon, Dr. Pearce gave a talk at the Woods Hole Laboratory. The talk was about recent findings by the Ocean Pulse and Northeast Monitoring Programs.

On 22 July, Dr. Pearce gave a talk at the New Jersey Marine Sciences Consortium summer program. The lecture was on benthic communities and their importance in marine fisheries and marine pollution research.

Dr. John Graikoski traveled to Washington, DC, on 22 July to confer with representatives of the Cryovac Corp. and with the NMFS Central Office staff on test procedures to evaluate the safety of vacuum-packed fresh fish.

On 28 July, Frank Steimle presented a 50-min lecture on the history, use, and effectiveness of artificial reefs as fishery management tools to a New Jersey Marine Sciences Consortium class.

On 27 July, Dr. Pearce gave a talk at the Milford Laboratory on recent findings which have developed from the Ocean Pulse and Northeast Monitoring Programs.

On 6 August, Frank Steimle and Dr. Pearce attended a meeting of the New York Bight Advisory Group at the EPA's Edison (New Jersey) Laboratory. The principal purpose was to review the current dissolved oxygen levels along the New Jersey coast and to arrive at decisions concerned with announcing the decision as it existed at that time. There did not appear to be a potential problem and it was agreed that any announcement should indicate simply that there had been no major problems during the past summer and there was little likelihood of one developing this fall. Both Mr. Steimle and Dr. Pearce presented results of current OPP and NEMP efforts and discussed future monitoring activities. Prior to the meeting of the Advisory Group, Mr. Steimle and Dr. Pearce talked about current activities being developed jointly between the NEFC and EPA's Narragansett Laboratory. The EPA Region II personnel, led by Dr. Peter Anderson, indicated some of their very real concerns for future monitoring efforts and described some of the deliverables and needs which they have in terms of managing ocean dumping in the Middle Atlantic Bight. The Region II personnel strongly suggested that they had need for input both from NEFC/NMFS/NOAA, as well as from their EPA researchers.

Ann Frame met with polychaete taxonomists Nancy Maciolek and Jim Blake at the Battelle Laboratory in Duxbury, Massachusetts, on 17 and 18 August, to iron out inconsistencies in identifications.

On 20 August, Frank Steimle met with Ken Sherman at the Narragansett Laboratory to review details of the OPP to help develop further cooperative activities with EPA groups in New England.

From 10 to 13 August, Sukwoo Chang attended the annual meetings of the American Statistical Association and Biometric Society in Detroit, Michigan.

Aquaculture Division

E. Rhodes attended the joint Shellfish Institute of North America-National Shellfisheries Association annual convention in Williamsburg, Virginia.

Pathobiology Division

Dr. Rosenfield met at the Sandy Hook Laboratory with Drs. Sindermann and Pearce regarding programs on 25 July; attended a NOAA Office of Marine Pollution Assessment-State University of New York-sponsored meeting on Chesapeake Bay research interactions and data management and synthesis at the EPA Region III Field Laboratory in Annapolis, Maryland, on 29 July; participated in the National Shellfisheries Association Board Meeting and consulted with disease experts on future pathobiology contracts and monitoring studies at Williamsburg, Virginia, during 3-7 August; discussed Pathobiology Division plans at the Gloucester Laboratory and the Milford Laboratory during 19-22 August; discussed Pathology Division plans with the Center Director on 27 August at the Milford Laboratory; and on 28 August, attended the Joint Subcommittee on Aquaculture meeting with Mr. Kern at the US Department of Agriculture in Washington, DC.

On 2 July, Dr. Blogoslawski returned from a 10-day research field trip to Homer, Alaska. He completed a series of experiments showing that ozonized ice was effective in preserving salmon.

Ms. Roe participated on the NEMP biological effects survey aboard the Albatross IV from 6 to 23 July.

Dr. Murchelano attended the Eastern Fish Health Workshop at Starkville, Mississippi, during 21-23 July, and discussed Pathology Division programs with the Center Director on 27 August at the Milford Laboratory.

Dr. Brown attended the Eastern Fish Health Workshop at Starkville, Mississippi, during 21-22 July, and presented a paper on "Characterization of Exotoxin Produced by a Shellfish-pathogenic Vibrio sp."

Mr. Michael Calabrese collected fish in the Arthur Kill at Sandy Hook on 23 and 24 July and again on 20 and 21 August.

Dr. Sawyer conferred with the Director of the Marine Science Program at Hampton Institute in Virginia Beach on 17 and 18 August, discussed Pathology Division programs with the Center Director on 27 August at the Milford Laboratory, and conducted a NEMP crab collection at Sandy Hook on 28 August.

On 5 August, Dr. Blogoslawski presented a paper on "Occurrence of Bacteria Pathogenic to Oyster Larvae: a Long Island Sound Study" at the 73rd joint Shellfish Institute of North America-National Shellfisheries Association meeting in Williamsburg, Virginia.

Dr. Robohm accompanied six chemistry professors from China on a tour of the Milford Laboratory on 6 August. The professors from Beijing, Qinquhua, Tian-jin, and Nanjing Universities and from Hua-dong Institute of Chemical Technology, were also visiting Fairfield University and the University of Connecticut prior to attending the 6th International Conference of Chemical Education at the University of Maryland.

Dr. Johnson attended the Executive Board and the Annual Meetings of the Society for Invertebrate Pathology at Bozeman, Montana, during 16-21 August.

Mr. Newman attended the Wildlife Disease Association meeting at Laramie, Wyoming, during 19-22 August.

National Systematics Laboratory

Dr. Isabel Canet worked at the SEFC and University of Miami.

Dr. Austin Williams presented a lecture on "Crab Life Histories in East Coast Estuaries" at the Calvert Marine Museum in Solomons, Maryland.

Atlantic Environmental Group

Reed Armstrong attended the Gloucester Laboratory Program Review for the IYABA Committee on 13 and 14 July.

During 14-16 July, Mert Ingham took part in discussions of the NEFC's participation in the National Climate Plan and attended a Center Board of Directors meeting in Woods Hole.

Amy Friedlander traveled to Ann Arbor, Michigan, during 1-8 August with a group from URI to attend a workshop on applications of remote sensing in oceanographic research.

On 13 August, Reed Armstrong gave an invited presentation on physical oceanography of the Middle Atlantic Bight to the "Fishing by Temperature Conference" held at the Cook College of Rutgers University and sponsored by the New Jersey Marine Advisory Service.

On 13 August, Melissa Hughes boarded the M/V Oleander to travel to Bermuda for deployment of the fast CPR in concert with the normal SOOP run. She returned to Narragansett on 20 August.

Mert Ingham visited the Woods Hole Laboratory on 20 August to present a seminar on "Weather Conditions in the Maine-Virginia Coastal and Offshore Area during the 70's," and to confer with staff.

Amy Friedlander attended a precruise briefing at the Woods Hole Laboratory on 20 August.

On 27 August, Ron Schlitz of the Woods Hole Laboratory, Terry Joyce of WHOI, and Glen Flierl of MIT visited Woody Chamberlin and Amy Friedlander to discuss remote sensing support of the upcoming warm-core ring cruise.

SEMINARS

Resource Assessment Division

On 9 July, Mike Sissenwine presented "An Empirical Examination of Species Interactions in Fish Populations Off the Northeast U.S.A." at the WHOI Biology Seminar Series.

On 19 July, Brad Brown gave a seminar at the Shoals Marine Laboratory.

On 18, 19, and 24 August, Mike Sissenwine lectured on multispecies assessment models at the Woods Hole Laboratory.

On 13 and 14 August, Vaughn Anthony presented two seminars at the Shoals Marine Laboratory.

Marine Ecosystems Division

On 13 July, Norton Strommen, US Department of Agriculture's Chief Meteorologist, gave a short talk to the Investigation Chiefs on the National Climate Program.

VISITORS

Resource Assessment Division

On 21 August, Brad Brown met with Allasande Samba of Senegal to discuss multi-species fishery research and management.

Marine Ecosystems Division

On 23 July, Luther Bivins, Stan Alper (NOAA Office of Technical and Engineering Services) and Bob Wolfe (NMFS Central Office) visited Ken Sherman at the Narragansett Laboratory regarding cooperative work.

Resource Utilization Division

Visitors to the Gloucester Laboratory were Dr. William Cowie of Unilever Laboratory in Aberdeen, Scotland, on 13 August; Dr. Chen Xiubai of Shandong College of Oceanology in Qingdao, Peoples Republic of China (PRC); Mr. Zang Ming of Quindao Marine Fisheries, Inc., in Qingdao, Shandong, PRC; and Mr. Cong Ziming of the Chinese Association of Refrigeration in Beijing, PRC, all on 12 August.

Aquaculture Division

Dick Harris and a group from Cooperative Educational Services in Norwalk, Connecticut, and Russell Wuertz of New Haven, Connecticut, visited the Milford Laboratory.

Pathobiology Division

Visitors to the Oxford Laboratory during the reporting period were Dr. Victor Downorra of the Fisheries Department in Ghana; Dr. G. Downorra of the University of Maryland at College Park; Ms. Julia Hatcher of Peoria, Illinois; Mr. and Mrs. James Brubaker of Birmingham, Michigan; and members of the American Littoral Society which held its annual picnic at the Oxford Laboratory on 2 August.

National Systematics Laboratory

Mr. W. Akers of Lake Worth, Florida, and M. W. How of the Skidaway Marine Institute visited Dr. Williams for information on crustaceans.

Mr. Eric Anderson of the Virginia Institute of Marine Science (VIMS) visited Dr. Cohen to discuss research on eelpouts.

Atlantic Environmental Group

Marty McClure and Jim Griffin of URI, and Fabian Polcyn, a research engineer with the Environmental Research Institute of Michigan, visited AEG on 13 August.

UNIVERSITY AFFAIRS

Resource Assessment Division

Steve Clark coordinated NEFC participation in the Shoals Marine Laboratory Summer Program on Appledore Island, Maine. Brad Brown lectured on 19 July and Vaughn Anthony on 13 and 14 August.

Fred Serchuk met with a student at the University of Massachusetts to discuss an autumn internship in the Fishery Assessment Investigation, with a graduate student from Cornell University to discuss Division activities, and with a graduate student at URI on American plaice assessment.

Margaret McBride provided yellowtail flounder age-length keys to Bill Overholtz at Oregon State University.

Steve Murawski and Loretta O'Brien worked with Mike Ross of the University of Massachusetts on analysis of witch flounder data.

Gregory Brown of Hampton Institute participated on the summer bottom trawl survey.

Research samples collected during the 1981 summer bottom trawl survey included spiny dogfish specimens for a study being conducted by the Virginia Institute of Marine Science.

Marine Ecosystems Division

In July, personnel from the Narragansett and Woods Hole Laboratories participated in the US Merchant Marine Academy Management Internship Program. Midshipman Kathleen Duffy spent 2 wk with us learning what the NEFC is all about. She spent considerable time with just about all the investigations at both laboratories, as well as being briefed on our operational techniques.

Resource Utilization Division

Al Blott, Jack Moakley, and John Kenney met with people at URI to discuss the implementation of our cooperative agreement. Present at the meeting from URI were representatives of the Departments Oceanography, Ocean Engineering, Fisheries and Marine Technology, and the Marine Advisory Service.

Aquaculture Division

A National Cancer Society fellow doctoral student of the University of Southern California spent 1 wk at the Milford Laboratory training on fish cytogenetics.

E. Rhodes visited the newly acquired Fort Stark Campus of the University of New Hampshire to help in seawater system design.

Pathobiology Division

Dr. Sawyer conferred with Dr. Eugene Small of the University of Maryland concerning ciliate diseases in oysters, and instructed students in marine microbial ecology at the Chesapeake Biological Laboratory in Solomons, Maryland, on 24 July.

On 24 July and 28 August, Dr. Blogoslawski met with Dr. Kuck to discuss continuing cooperative experiments on paralytic shellfish poisoning with Fairfield University. Progress has been made in defining methods for tagging the UV-invisible toxin with a fluorescent dye. Thus, the toxin can be readily detected and easily separated.

National Systematics Laboratory

Dr. Cohen participated in Ph.D. qualifying exams for two VIMS students.

Dr. Collette taught a course in ichthyology for Northeastern University.

PERSONNEL

Resource Assessment Division

Brad Brown, Jack Pearce, and Bob Murchelano developed a report on NEFC grade structure of personnel promotions for the Center Director. Most of the Division personnel attended one of the General Workforce Performance Appraisal System training sessions given by NERO on 9 July and 7 August.

Margaret McBride and Rhett Lewis will continue their graduate studies at Oregon State University this fall.

Evelyn Howe retired from the Resource Surveys Investigation on 22 August. Evelyn had been at the Woods Hole Laboratory since March 1963. She will be sorely missed.

On 25 August, Anne Lange met with the Judy Brennan-Hoskins Memorial Award Committee to select the 1981 recipient.

Marine Ecosystems Division

On 8 July, George Bolz, Roz Cohen, and Dave Potter attended a training session in Woods Hole on the General Workforce Performance Appraisal System.

On 9 July, Greg Lough, Julien Goulet, and Robert Marak attended a supervisor's training exercise in Woods Hole on the General Workforce Performance Appraisal System.

During 10-12 August, there were consecutive General Workforce Performance Appraisal System meetings held for the scientists and staff in the conference room at the Narragansett Laboratory and directed by Jim Taormina.

Reva (Gerry) Kuhlman, Purchasing Agent for the Narragansett Laboratory, resigned her position on 28 August to move to Pennsylvania.

Resource Utilization Division

Several of the Gloucester Laboratory staff attended a briefing session on the General Workforce Performance Appraisal System.

Fred Correia has left his position as chemist at the Gloucester Laboratory to pursue graduate studies at the State University of New York at Stonybrook where he will be working towards his Ph.D. in molecular biology.

Division of Environmental Assessment

On 27 July, Dr. Pearce met with Division personnel at the Milford Laboratory in regard to merit pay and other personnel matters.

Pathobiology Division

Dr. Rosenfield attended a training course on the General Workforce Performance Appraisal System at Woods Hole from 9 to 11 July; he attended a Center Board of Directors and a Center Promotion Review Committee meeting at Woods Hole from 15 to 17 July.

Dr. Murchelano attended a Center Board of Directors and Center Promotion Committee meeting at Woods Hole from 15 to 17 July. He attended a 1-day training session on the General Workforce Performance Appraisal System at the Sandy Hook Laboratory on 24 August. He also discussed Factor IV Committee business with Dr. Laurence at the Narragansett Laboratory on 28 August.

Dr. Brown attended the Office of Personnel Management workshops and Federally Employed Women's 12th National Training Program held 15-18 July in Indianapolis.

Dr. Sawyer attended a 1-day training session on the General Workforce Performance Appraisal System at Sandy Hook on 27 August.

Mr. Andrew Blizzard, a volunteer summer student, has returned to school.

Mr. Michael Calabrese, a biological laboratory technician, began a temporary appointment on 13 July.

Mr. Chris Fleurer, who participated in a special National Science Foundation-sponsored project for handicapped students, has returned to Gallaudet College in Washington, DC, to continue his studies.

Atlantic Environmental Group

The General Workforce Performance Appraisal System training meeting was attended by Jack W. Jossi on 9 July.

EEO ACTIVITIES

Resource Assessment Division

On 6 August, Brad Brown keynoted a panel presentation on opportunities for minorities and women in marine science at the National Marine Educators Association annual meeting at Texas A&M University.

Rhett Lewis discussed plans for a Centerwide EEO/multiethnic training session with Dr. Bailey Jackson of New Perspectives, Inc., in Amherst, Massachusetts.

Fred Serchuk discussed Division research and general activities with summer students in the Division.

On 8 July, the monthly Woods Hole Laboratory EEO Committee meeting was attended by E. Montiero, A. Thoms, L. Despres-Patanjo, S. Clark, M. Crawford, D. Hansford, R. Lewis, M. Sissenwine, and G. Waring.

On 4 August, the monthly meeting of the Woods Hole Laboratory EEO Committee was attended by Eva Montiero, Linda Despres-Patanjo, Steve Clark, Dennis Hansford, Mike Sissenwine, Gordon Waring, Louise Dery, and Sherry Sass.

On 4 August, Sherry Sass attended a meeting of the Woods Hole Laboratory Federal Women's Program.

Sherry Sass completed arrangements for an October Federal Women's Program workshop.

Marine Ecosystems Division

On 23 July, a film, "You Can," was presented to the Narragansett Laboratory staff. The film deals with the handicapped.

On 4 August, Ray Bowman attended the monthly Woods Hole Laboratory EEO meeting.

On 6 August, Roz Cohen attended a Federal Woman's Program meeting in Woods Hole.

The Narragansett Laboratory was pleased to join EPA in the 1981 Minority Apprenticeship Program. Robert Clemetson and Paul Francis ended their 8-wk apprenticeships in the Plankton Ecology and Apex Predators Investigations on 21 August. Their duties included an opportunity to participate in the FIBEX (First International Biomass Experiment) project, providing critical data for estimating size and density of Antarctic krill swarms. Bob and Paul aided in the process of calibrating the Image Scanning System and developing length/weight relationships for adult and larval stages of krill. In addition, they participated in the initial phases of computer analysis of fisheries data.

PUBLIC AFFAIRS

Center Directorate

During 29 July-4 August, Jon Gibson and Perry Lane (Gloucester Laboratory) joined Bill Gordon and Bob Hutton of the NMFS Central Office, Bob Kifer and Vincent DiBona of NERO, and Carl D'Epiro and his wife (retired NMFS employees) to prepare and man the NMFS exhibit at the National Boy Scout Jamboree at Fort A. P. Hill near Fredericksburg, Virginia.

Resource Assessment Division

During 22-26 July, Don Flescher displayed his fish mounts at the marine exhibit section of the Barnstable County (Massachusetts) Fair.

Aquaculture Division

R. Mercaldo, J. Widman, and E. Rhodes participated in the annual Milford (Connecticut) Oyster Festival.



NORTHEAST FISHERIES CENTER

NEWSLETTER

SEPTEMBER-OCTOBER 1981

SPOTLIGHT:

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



NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
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NORTHEAST FISHERIES CENTER

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"NORTHEAST FISHERIES CENTER NEWSLETTER"

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VIRAL DISEASES OF MARINE FINFISHES AND SHELLFISHES

by

C. A. Farley, Leader
Molluscan Pathology Project,
Comparative Invertebrate Pathology Investigation,
Pathobiology Division

INTRODUCTION

Scientists have recently discovered several viral diseases in marine animals. The Northeast Fisheries Center's (NEFC) Pathobiology Division, headquartered at the NEFC's Oxford (Maryland) Laboratory, is associated with many of these discoveries, particularly those viral diseases infecting commercially and recreationally important finfishes and shellfishes. The effects of these diseases can cause any one, or combination of, the following: abnormal behavior; physiologic, biochemical, or metabolic anomalies; tumors; morphologic, skeletal, or cellular abnormalities and lesions; morbidity; and even mortalities to individuals and populations. (See Figure 1.)

Through these studies of viral diseases, an important conceptual analogy is emerging on how infectious diseases affect aquatic animals; namely, that as with terrestrial animals, major stresses, either natural or man-induced, can influence the course and severity of disease. Below we look at viral diseases in marine finfishes and shellfishes, especially noting the role of stress in these diseases.

SHELLFISH VIRUSES

Sixteen years ago the French researcher Dr. C. Vago (1966) described a marine invertebrate virus for the first time--a virus in green crabs (Carcinus maenas). Shortly after, Bang (1971) described a second virus of the green crab. Since then, approximately 31 different viruses have been discovered in aquatic invertebrates (Farley 1981). Many of these viruses have been identified as belonging to over 10 families commonly associated with vertebrate viruses. Life forms infected by these viruses include sponges, flatworms, coelenterates, mollusks, annelids, shrimps, and crabs.

Most, but not all, of these viruses were found by electron microscope examination of tissues from animals showing either clinical signs of disease or lesions as seen in tissue sections. None, thus far, have been isolated and grown in culture; therefore, none have been completely characterized. Growth of viruses in tissue or cell culture is about the only way to obtain enough viral material to perform biochemical, biophysical, and immunologic tests for complete characterization. Until marine invertebrate tissues can be grown in test tubes or dishes, it will be difficult, if not impossible, to characterize better the viruses that affect them. However, these tissue and cell cultures are underway with cooperating universities and other government laboratories.

Only a few of these viruses have been experimentally transmitted from one animal to another, but even these few successes are encouraging for they will permit further study of how viral diseases operate, and greater understanding of how invertebrates fight off such diseases. Also, few of these viral diseases show the extreme virulency that, acting alone, can kill the host. However, in some cases, natural and man-induced stress has shown additive or synergistic interaction with viral infection. A good example of this interaction can be seen in John Couch's work. Couch, now at the U.S. Environmental Protection Agency's (EPA) Gulf Breeze (Florida) Laboratory, but formerly at the Oxford Laboratory, discovered a Baculovirus in shrimp while working for us. His later experiments in Florida showed that shrimp infected with latent or low levels of such viruses, when exposed to sublethal levels of polychlorinated biphenyls (PCB's--in this case Aroclor 1254), displayed obvious signs and greater prevalences of the virus (Couch 1974).

As implied above, degraded environments appear to be implicated, either directly or indirectly, in the enhancement and expression of viral diseases. Temperature changes in the animal's environment have long been associated with the prevalence and severity of infection. This appears to be the case particularly with seasonal epidemics among marine animals. When power plants use marine waters for cooling purposes, some viral diseases seem to be enhanced in local animal populations. For example, we discovered a herpesvirus (see Figure 2) associated with the death of American oysters (Crassostrea virginica) being held in the thermal discharge of a Maine power plant (Farley et al. 1972). A 50% mortality occurred. All of the dead and moribund animals were significantly infected with viral disease. However, for control oysters held nearby in colder waters (by about 10°C), only a 10% prevalence of the disease existed, and none of the oysters had advanced infections. Another herpesvirus disease was discovered a few years later in European oysters (Ostrea edulis) in Wales, United Kingdom; this infection appeared to be associated with naturally occurring but unusually warm water during August (D. A. Alderman, personal communication).^(a)

Tumors, or neoplasms, in aquatic animals are receiving more interest than ever before, primarily because, as with terrestrial animals, some (i.e., in trout) have been shown to be caused by carcinogenic chemicals. Also, some neoplasms (i.e., in invertebrates) have been shown to be caused by viruses. The question arises on what are, if any, the relationships among carcinogenic chemicals, viruses, and neoplasms.

Consequently, the recent findings of several types of neoplasms in marine mollusks (Farley 1976) have excited the scientific community. Many of these neoplasms have occurred randomly in only a few individual animals from relatively pristine or undisturbed environments. In other instances, many of the neoplasms have occurred in epidemic levels from polluted environments. On further scrutiny, however, this association seemed to break down. Thus, studies on the cause-and-effect relationships of carcinogenic chemicals and neoplasms in the environment have led to frustration.

A few years ago, however, scientists with the Pathobiology Division and at the EPA's Narragansett (Rhode Island) Laboratory discovered almost simultaneously

^(a)Ministry of Agriculture, Fisheries, and Food; Weymouth, United Kingdom.

a neoplastic disease in soft-shell clams (Mya arenaria). Our study revealed a 12% prevalence of an invasive sarcoma-like neoplastic condition in soft-shell clams from an area in Massachusetts where paralytic shellfish poisoning (PSP) had occurred (Farley 1976). The EPA study revealed a high prevalence of the disease in clams from areas in Rhode Island where oil spills had occurred (Yevich and Barszcz 1977). Dr. Robert Brown, then of the University of Rhode Island, undertook a study that showed the disease could be transmitted from infected clams, via effluent waters of aquaria holding them, to previously uninfected clams held in other aquaria (Brown 1980). This indicated that an infectious agent was involved. The highest prevalences of disease induction were associated with stress, i.e., in aquaria with oil-polluted sediments or in aquaria where clams could not burrow into sand. The lowest prevalences occurred under "normal" conditions where clams could burrow into clean sediments (Brown 1980).

Even more recently, this neoplastic disease has been experimentally transmitted to uninfected clams using a cell-free ultrafiltrate from infected clams, indicating a viral origin (Oprandy et al. 1981). Considerably more isolation and transmission work is needed, though. The Pathobiology Division, Tufts University's College of Veterinary Science, and the University of Maryland--where molluscan tissue culture systems are being developed--will cooperatively undertake this work. At the moment, however, the possibility that we have a virus triggering invertebrate cells to divide uncontrollably is intriguing, if not provocative. If this hypothesis proves correct, then those researchers, including biomedical researchers, requiring a model system for neoplastic studies, will have it.

The Pathobiology Division has also participated in studying another neoplastic disease of epidemic levels in blue mussels (Mytilus edulis). During our studies of shellfish mortalities on the West Coast in the late 1960's and early 1970's, we described proliferative cell conditions in mussels from Yaquina, Coos, and Tillamook Bays in Oregon (Farley 1969). The disease has also been observed in mussels from British Columbia, and even more recently, has been observed by British investigators in mussels from Plymouth, England, and North Wales (Lowe and Moore 1978).

Dr. Michael Mix of Oregon State University is studying this disease in Yaquina Bay, Oregon. Apparently, infected animals are confined to the lower north side of the Bay where Dr. Mix has found a close association of the occurrence of neoplastic disease with the presence of benzo-a-pyrene (BAP) (Mix et al. 1979). Our ongoing studies of mussel disease on the East Coast have failed to find this disease at any site, including some with high levels of BAP contamination. It seems, then, that this mussel disease on the West Coast might be duplicating the pattern with the soft clam neoplasm on the East Coast. It is speculative, but conceivable, that a synergistic relationship exists among stressed or polluted environments, viral infections, and neoplastic diseases in West Coast blue mussels.

Several other invertebrate viruses, especially in shrimps and crabs, have been described (Couch 1980). Dr. Phyllis Johnson of the Pathobiology Division has described nine viruses of blue crabs at last count (Johnson 1978). (See Figures 3 and 4.) Some of these viruses occur as concurrent infections (i.e., more than one virus infecting a single animal). Furthermore, additional molluscan viruses (Farley 1978) have been observed, but their origin remains an enigma. We are

planning experiments to learn if any of these viruses, working alone or in concert, are lethal or if there are enhanced effects in the presence of high temperatures, reduced oxygen, or environmental pollutants. However, holding animals in aquaria or commercial holding tanks itself represents abnormal conditions and stresses the animal. Consequently, the interactions between culture conditions and viral disease deserve intensive study, particularly from the viewpoints of experimental design and commercial holding operations.

FINFISH VIRUSES

With the advent of in-vitro cell culture of fish tissues, scientists discovered, and continue to discover, many new fish viruses (McAllister 1979). Some of these viruses affect freshwater cultured species [such as channel catfish (Ictalurus punctatus) and common carp (Cyprinus carpio)] as well as wild species [such as walleye (Stizostedion vitreum) and northern pike (Esox lucius)]. However, many also affect marine species. At least four viral diseases have been described from salmonids. These include: infectious hematopoietic necrosis (IHN); infectious pancreatic necrosis (IPN); viral erythrocytic necrosis (VEN), which was formerly called piscine erythrocytic necrosis (PEN); and a fourth virus, Herpesvirus salmonis, infecting salmonids.

Of particular interest to the Pathobiology Division are the IPN-like viruses which probably belong to the Family Reoviridae. These viruses infect not only salmonids but other vertebrates and even invertebrates. For many years, fishery biologists and resource managers were perplexed by the annual spring appearance and causes of the so-called "spinning disease" of Atlantic menhaden which causes extensive mortalities. Martin Newman of the Pathobiology Division, working with University of Maryland investigators, has shown that the "spinning disease" is associated with IPN infections of the central nervous system (Newman 1980). The agent, isolated from Atlantic menhaden by cell-culture techniques and ultracentrifugation, when injected into healthy menhaden, produced the disease. The virus was then reisolated, thereby demonstrating Koch's postulates. Although we continue to try to characterize the virus more precisely, we have shown it to be related to other IPN viruses by immunological techniques. Thus, we seem to be getting a little closer to solving the riddle of the causes of the annual spring/early summer mortalities of menhaden along the East Coast.

Of further interest to the Pathobiology Division is the finding that IPN virus isolated from Atlantic menhaden can also infect other clupeids -- at least American shad (Alosa sapidissima). This raises other interesting questions on whether menhaden could be carriers or reservoir hosts for this virus, and on what roles seasonal temperatures, feeding, and cohabitation play in spreading viral diseases.

Two other fish viruses, both belonging to the Family Iridoviridae, are subjects of our studies -- lymphocystis virus and VEN virus.

Lymphocystis occurs worldwide in over 90 fish species, but generally in low prevalences. The virus can be grown easily in culture and transmitted experimentally via many routes. Viral lesions develop on body surfaces, but can occur internally, sometimes as protuberances or greatly enlarged cells. Heavy infections, giving the body surface a grainy sandpaper-like appearance, render the fish

aesthetically unappealing, diminish the angling experience, and cause concern among consumers over the fish's usefulness or safety as food. (See Figure 1.) Thus, lymphocystis can seriously affect important recreational and commercial fisheries.

Lymphocystis can occur in relatively high prevalences in striped bass (*Morone saxatilis*) overwintering in thermal effluents of power plants on Long Island (Sindermann 1979). Although this disease is not believed to be lethal, it could be another useful model for researchers to test hypotheses on the influence of pollutants and other man-induced environmental stresses on latent viral infections.

Considerable confusion previously existed over whether or not PEN, as first observed in several East Coast fish species, was a viral or protozoan disease. The disease has now been seen in some West Coast species, including salmonids, and its viral nature confirmed by electron microscopy, hence its current designation, VEN. Only erythrocytes appear to be affected. However, the disease is not well enough understood to evaluate its lethality, but in some cases it is associated with anemia which, in turn, could have serious physiological effects. The Pathobiology Division is currently studying the prevalences of this disease in target species of Northwest Atlantic fishes.

SUMMARY

As our techniques improve and as we make more observations and histopathologic and tissue-imprint examinations during our finfish and shellfish surveying and monitoring programs, we obviously shall discover greater numbers and varieties of diseases, including viral infections. Others, already discovered, require our immediate attention for they provide insight into the transmission mechanisms of viral disease, and into the interactive influences that physical, chemical, and biological (including genetic) factors have in affecting the behavior and survival of host species and populations. However, it is critically important to realize that while observation, identification, characterization, and naming of disease entities, as well as consequent description of their pathologic conditions, are useful, it must be understood that only by integrating these efforts into the NEFC's ongoing efforts in population, community, and ecosystem dynamics, that we can ultimately understand and determine the role that disease--parasitic, infectious, or noninfectious--plays in fisheries resource distribution, abundance, and production.

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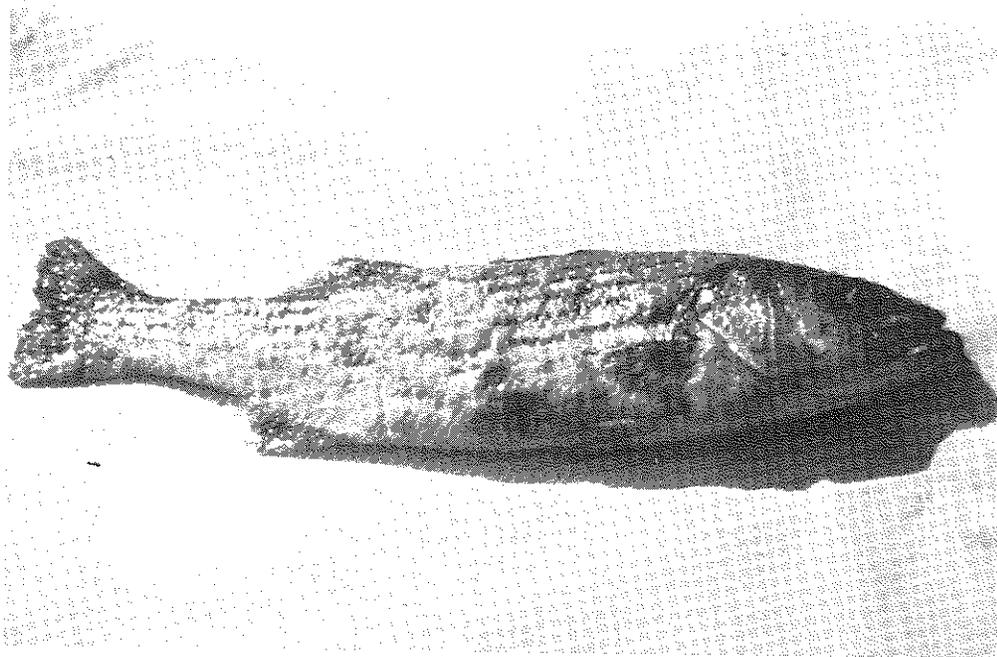


Figure 1. Severe infection of lymphocystis virus in striped bass (Morone saxatilis) from East Coast.

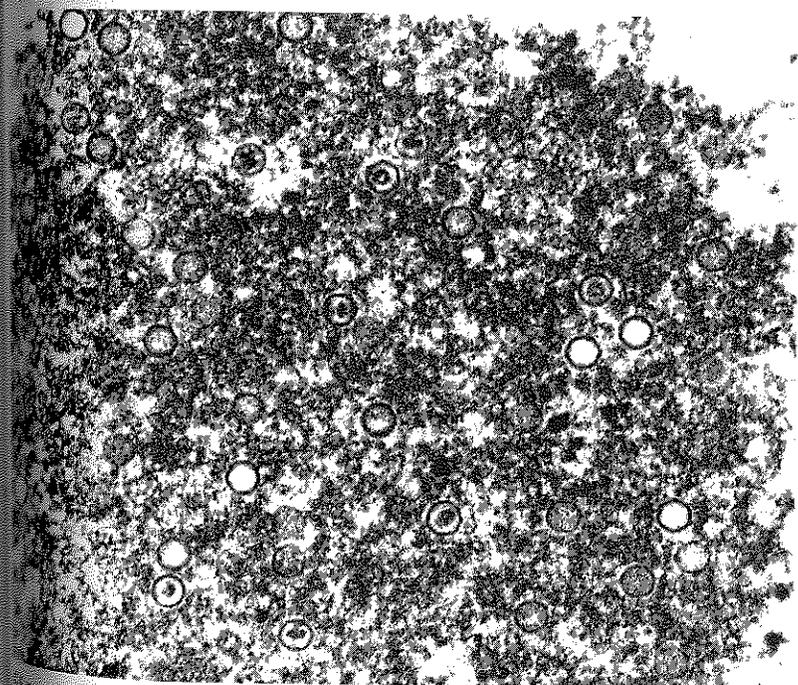


Figure 2. Electron micrograph of herpesvirus nucleocapsids in the nucleus of an American oyster (Crassostrea virginica) hemocyte. Viral particles are uniform in size, have angular profiles, and some appear to be empty while others contain nucleoids showing the spindle-top toroid configuration characteristic of all herpesviruses. Magnification 108 000X.

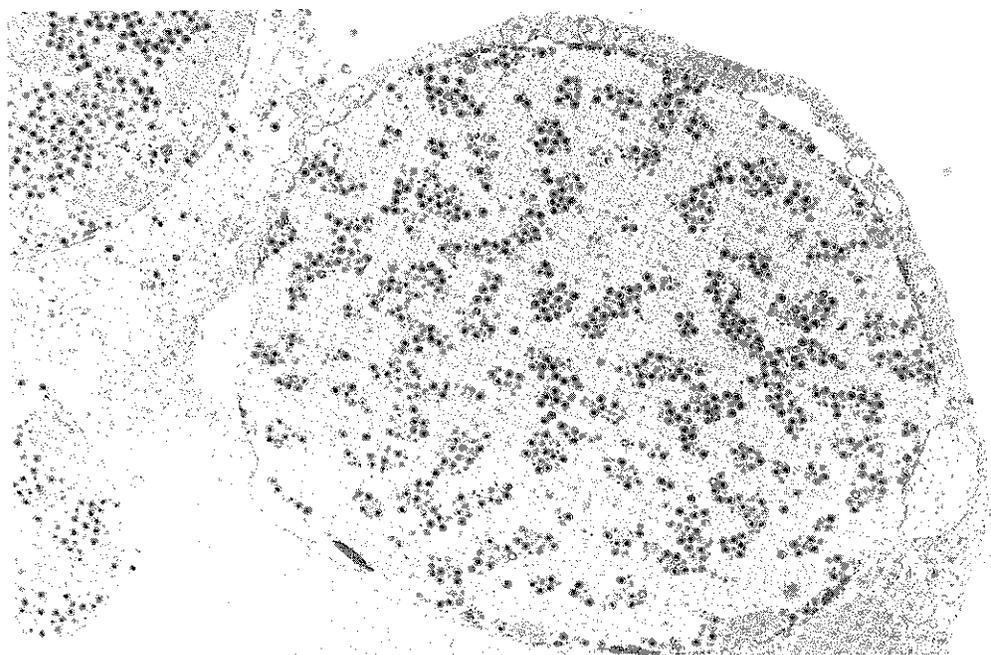


Figure 3. Herpes-like virus of the blue crab (Callinectes sapidus) in the nucleus of a hemocyte.

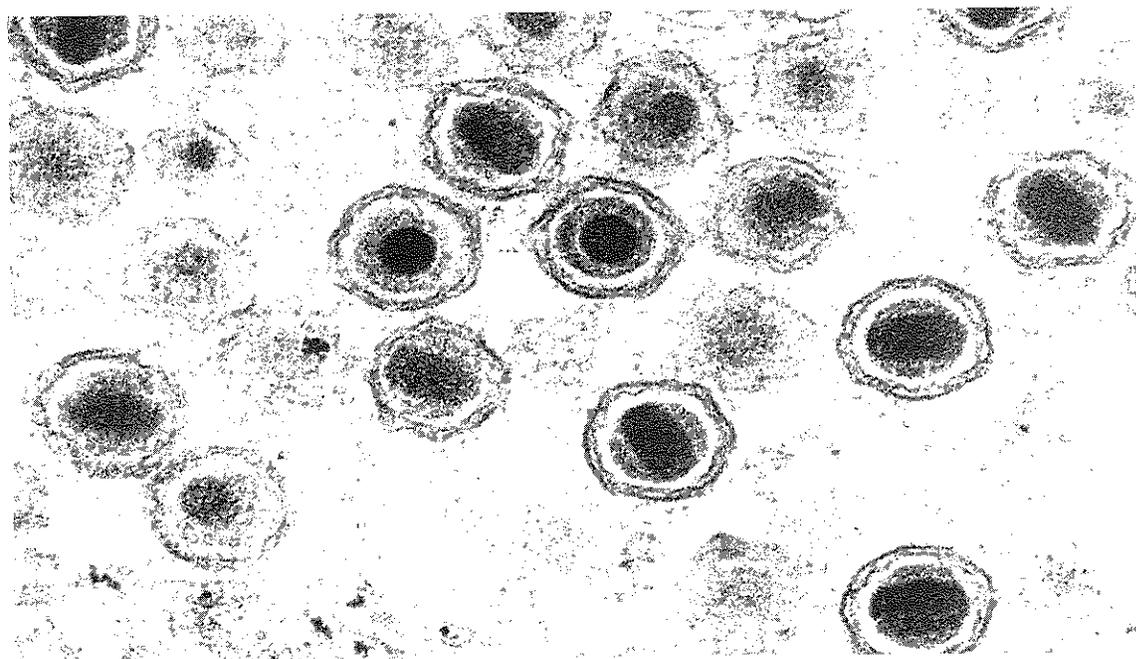


Figure 4. Higher magnification of the viral particles.

CENTER DIRECTORATE

Fishery Technology

For the second time in its history, the Marine Products Development Irradiator, located at the Gloucester Laboratory, has literally salvaged a valuable study--this time in dental medicine. A 2-yr-old study conducted by the Forsythe Dental Center was suddenly put in jeopardy when it lost the radiation services supplied by the US Department of Defense laboratories at Natick, Massachusetts. The sum of constraints placed on the preparation of germ-free feed for lab animals required a local radiation facility having a special set of specifications which apparently would not have been met except at the Gloucester Laboratory.

RESOURCE ASSESSMENT DIVISION

Resource Surveys Investigation

On 11 September, the NOAA R/V Delaware II returned to Woods Hole after completing a cooperative shellfish resource assessment cruise with scientists from the Canadian Department of Fisheries and Oceans. The primary objective of this cruise was to investigate the distribution and abundance of marine pelecypods. The cruise was conducted on the outer banks of Nova Scotia from Emerald Bank to Banquereau, and on Georges Bank on the return trip. The NEFC hydraulic-jet clam dredge gear was used during this cruise. The American Chief of Party was Tom Azarovitz.

The autumn bottom trawl survey began on 15 September as the Delaware II departed Woods Hole. Linda Patanjo was Chief Scientist and Part I ended in Woods Hole on 2 October after completing the area from Cape Fear to middle New Jersey. Part II was conducted during 6-16 October. Coverage was extended from New Jersey through Southern New England onto Georges Bank. Henry Jensen was Chief Scientist. Malcolm Silverman was Chief Scientist during Part III which was conducted during 19-30 October. During this cruise both Georges and Browns Banks were surveyed.

On 18 October, Linda Patanjo departed Cherbourg, France, aboard the French R/V Thalassa to participate, as an International Council for the Exploration of the Sea (ICES) member, in a fish disease survey in the English Channel and along the French Atlantic coastline. Sixteen scientists, representing eight nations, participated in this cruise.

Charles Byrne departed Woods Hole aboard the Soviet Union's R/V Boguslav on 28 October to participate in an investigation designed to study the distribution of Atlantic saury relative to temperature.

Pat Twohig installed electronic gear aboard the NEFC's R/V Gloria Michelle to be used during the upcoming Herring Hydroacoustic Technology Experiment. Pat also assisted Ron Smolowitz in the fabrication of a constant-tension winch which will be used with the new net mensuration and monitoring system which Pat installed on the vessel. Also installed was an underwater television which will be used to verify targets detected hydroacoustically.

Pat Twohig and Jim Crossen assisted Ron Smolowitz in completing field tests for a fluid dynamics study relating to the manifold and nozzle arrangement on a hydraulic-jet clam dredge. Both a deck-mounted diesel pump and a submersible electric pump (used during assessment surveys) were used during these experiments.

Jim Crossen and acoustic engineers from the C.S. Draper Laboratory, assisted by Manned Undersea Research and Technology Program divers Roger Clifford and Ken Pecci, calibrated hydroacoustic equipment aboard the Polish R/V Wieczno prior to her departure on an Atlantic herring assessment cruise.

Fishery Biology Investigation

Age and Growth

Vi Gifford completed the second aging of first quarter 1975 commercial redfish samples.

Kris Andrade completed the first aging of the second quarter 1975 commercial redfish samples and checked audit listings of haddock age data from the 1981 spring survey. Haddock samples from the 1981 summer survey were aged, coded, and summarized and sent to the Woods Hole Laboratory Automatic Data Processing Unit (ADP).

Judy Penttila aged and summarized frozen Atlantic cod samples from the 1979, 1980, and 1981 summer surveys and from the 1978, 1979, and 1980 State of Massachusetts inshore cruises. She completed the expanded age sample sheets for cod for the spring 1981 survey and calculated mean lengths at age. She also checked final audit listings for cod in the spring 1981 survey.

Doris Jimenez aged Atlantic cod otoliths from 1981 commercial samples. Judy Penttila checked her aging and summaries of second quarter 1981 commercial samples, 1981 Massachusetts inshore spring survey samples, and 1981 summer survey samples, as well as cod samples from the 1978 summer, 1979 spring, and 1980 spring Maine surveys.

Doris sectioned and aged second quarter 1981 commercial pollock otoliths. Kris Andrade checked Doris's pollock aging and sent data to the ADP Unit. Kris also checked aging of pollock samples from the 1981 summer survey.

Judy Penttila completed aging and summaries of yellowtail flounder from the summer 1981 survey and third quarter 1981 commercial samples, and sent data to the ADP Unit. She also checked final audit listings for yellowtail age data from summer and fall 1972 surveys and the 1981 spring survey.

Ruben Millor sectioned redfish otoliths and impressed yellowtail flounder and haddock scale samples.

Finfish

Louise Dery analyzed a subsample of Atlantic mackerel (ages 1-3) from 1980-81 samples as part of a US-Canada comparison of aging criteria. Louise also worked on an age validation study for red hake.

Leslie DeFillipis and Annette Mitchell completed sectioning of red hake otoliths from the 1981 spring survey.

Butterfish age determinations were made for the 1980 summer and spring surveys; analysis of the 1979 fall survey was begun by Sherry Sass.

Ambrose Jearld, Louise Dery, and Sherry Sass discussed experimental design and objectives of the lab investigation of young-of-the-year summer flounder age and growth. Ira Palmer and Annette Mitchell maintained the flounder culture system.

Jean Chenoweth processed Atlantic herring samples from Maine and Massachusetts, and sent completed data to the ADP Unit.

Shellfish

Vi Gifford prepared station/stratum-tow lists for sea scallop cruises, and reorganized the storing of shells with Ira Palmer and Jim Fletcher. She and Ira Palmer are now investigating a consistent and accurate aging methodology for scallop shells.

Sherry Sass, Ira Palmer, and Jim Fletcher reorganized surf clam shell samples. Sherry monitored Ira and Jim in chondrophore preparation and photography. Most samples of the spring 1980 survey have been aged, and samples from the Delmarva strata of the summer 1980 survey are now being cut and processed for aging. Ira Palmer, Gary Shephard, and Jim Fletcher aged surf clams, and Sherry Sass made final age determinations.

Sherry Sass and Gary Shephard aged and analyzed data for University of Maryland Eastern Shore (UMES) surf clam sample #39. Gary began an investigation into the analysis of UMES data, with the goal of improving computer-facilitated procedures.

John Ropes organized shellfish samples for storage and future project work. Gonadal tissues from marked ocean quahogs were sent to the Oxford Laboratory for slide preparation.

John Ropes is currently preparing shell specimens of marked ocean quahogs for examination under scanning electron microscopy. Fine-structure details can then be scrutinized for differential deposition of growth increments in marked and unmarked specimens.

Don Jimenez collected samples for a heavy metal study and aided Chris Kellogg, a resource economist for the State of Massachusetts, with compilation of lobster data.

Experimental Studies Investigation

A pilot experiment was undertaken to determine the feasibility of maintaining adult and juvenile squid for food and growth-role studies next year. The experiment ended in October and results indicate that it is possible to conduct this activity with the holding facilities on hand. Experimenters were Anne Lange, Cynthia Demo, and Fred Nichy.

An experiment on growth of white hake on different ration levels was ended. The experiment was started in July 1980. Data have been summarized and are being prepared for a laboratory reference document. The experimenter was Fred Nichy.

An array of selected metal wires is being maintained in running seawater to determine the rate of decay. Ultimate use of the wire is to install release points in lobster traps to prevent ghost fishing when the trap is lost. Experimenters are Ron Smolowitz and Frank Ansuini, the latter a consulting engineer on corrosive metals.

A study on predation of soft-shell clams by horseshoe crabs and on their method of locating clams is near completion. The experimenter is Ms. Sandra Youngblood, a graduate student in the Department of Biology at Southeastern Massachusetts University.

Winter flounder larvae, obtained from the Narragansett Laboratory at metamorphosis, are being reared for age studies by examination of otoliths. Experimenters are Ambrose Jearld, Sherry Sass, and Annette Mitchell.

Dr. Louis Leibovitz, Director of the Cornell University Fish Diagnostic Laboratory, and Fred Nichy have undertaken a cooperative study of causes for mortalities of fishes maintained in the experimental facility. In conjunction, the seawater system of the facility will be monitored to evaluate any significant changes in quality.

The 2500-gal holding tank was removed for replacement due to the corrosion of the iron mullions supporting the viewing glass. The striped bass that were in the tank were anesthetized and transferred to the outside seal pool until the new tank arrived. So far, one large treble snagging hook has been found on the bottom, and in another incident, the outside gate to the seal pool had been forced open and the protective netting over the pool cut open and pulled off. One bass was injured and ultimately died. The Martha's Vineyard Bass Tournament was being held at this time.

Educational Outreach

An open house was held for the New England Science Teachers Association which was meeting locally. The facility was also made available for a tour by the Cooperative Educators Association that was meeting in Falmouth.

A total of 14 classes participated in the Woods Hole Laboratory's Educational Outreach Program. This is approximately the same number that visited last year for this period, reflecting a tightening of educational travel budgets, for attendance has usually been on the increase.

Fishery Assessment Investigation

Anne Lange, Fred Nichy, and Cindy Demo conducted a preliminary investigation on the feasibility of maintaining long-finned squid in captivity for growth-rate estimation. Anne also made preliminary arrangements for participation in a joint US-Canada-Japan short-finned squid survey and worked on adapting a computer program

for analysis of length-frequency data for squid research. In addition, Anne served as Resource Assessment Division liaison to the NMFS Foreign Fisheries Observer Program.

Steve Murawski, Ralph Mayo, and Anne Lange continued research on the biological effects of management options for the Northeast Fishery Management Task Force. Steve completed an update of the surf clam assessment. Ralph revised the scup assessment and assisted in recent pollock assessment.

Karen Johnson continued work on an application of multispecies cohort analysis to Georges Bank fish stocks.

Emma Henderson reviewed existing computer software for analysis of the survey and commercial data bases. Emma also responded to a request from the Instituto de Biologia Marine Y Pesquera, Argentina, for information on computation of survey statistics.

Michael Fogarty worked on an American lobster assessment and ongoing Atlantic herring analysis. Mike also reviewed a paper for the Fishery Bulletin (US).

Paul Wood and Robert Rak continued research projects on sea scallops.

Senior Assessment Scientists

Brad Brown and Mike Sissenwine reviewed the Interim Groundfish Plan developed by the New England Fishery Management Council (NEFMC). Brad and Joan Palmer continued research requested by the Northeast Fishery Management Task Force on the effects of random recruitment on constant-catch strategies. A considerable amount of Brad's time was devoted to administrative activities related to budgetary matters.

Emory Anderson drafted the protocol for a proposed US-Poland Atlantic mackerel research program. Emory also worked on an updated mackerel assessment.

Steve Clark completed growth, mortality, and yield-per-recruit analyses for northern shrimp with Alfonza Thrower. Steve, Loretta O'Brien, and Ralph Mayo finished a draft pollock assessment.

Fred Serchuk analyzed relationships between sea scallop shell height-ovary weight and meat weight-ovary weight for Georges Bank and the Middle Atlantic Bight with Paul Wood and Bob Rak. Fred also reviewed a manuscript for Fishery Bulletin (US) and a Federal Aid to Fish Restoration Act completion report.

John Boreman conducted an investigation into the sensitivity of striped bass entrainment mortality estimates to increased heat discharged over design specifications for the Indian Point (New York) Nuclear Power Plant.

Mike Sissenwine was involved in research activities on the role of uncertainty in fisheries science and management. Mike also reviewed and contributed to a special issue of the "Northeast Fisheries Center Newsletter."

Resource Economics Investigation

Jim Kirkley was involved in development of a socioeconomic submodel for a simulation model of fishery units 8, 2, and 6, and a financial simulator model for the otter trawl fleet. Jim also reviewed the "Economic Valuation of Fishery Resources of the Great Bay/Mullica River Estuary." Further duties included: (1) development of a multiobjective/multiattribute framework for fisheries management; (2) preparation of a paper on bioeconomic concepts of effort for presentation at a workshop by the Northeast Fish and Wildlife Conference in April 1982; (3) analysis of the Northeast Fishery Management Task Force's views on important socioeconomic variables; (4) development of computerized operation of "Market News" for the NMFS Northeast Region; (5) overview and evaluation of economic scarcity indicators applied to marine resources; (6) completion and submission of a paper on analysis of quotas by Kirkley, Pennington, and Brown; (7) investigation of the uses of cluster analysis for classifying vessel sizes for purposes of designing fishery regulations and comparing to economic criteria of efficiency versus equality; (8) analysis of daily prices of Atlantic cod, haddock, yellowtail flounder, and other flounders in response to daily landings (analysis complete but not written in report); (9) investigation of the response of effort to socioeconomic variables (functional specifications have been examined with respect to Georges Bank yellowtail flounder, and analysis to be extended to entire otter trawl fishery and sea scallop fishery); (10) review of Paper by J. Gateson on "Uncertainty and Risk in Harvesting" to be presented at a November workshop at the University of Rhode Island; (11) review of a text on "Limited Entry" (review to be published in 1982); and (12) completion of programming a financial simulator by port.

Publications

- Azarovitz, T. R. A brief historical review of the Woods Hole Laboratory trawl survey time series. Doubleday, W. G.; Rivard, D. eds. Bottom trawl surveys. Can. Spec. Publ. Fish. Aquat. Sci. 58:62-67;1981. (P)
- Byrne, C. J.; Azarovitz, T. R.; Sissenwine, M. P. Factors affecting variability of research vessel trawl surveys. Doubleday, W. G.; Rivard, D. eds. Bottom trawl surveys. Can. Spec. Publ. Fish. Aquat. Sci. 58:258-273;1981. (P)
- Cohen, E.; Grosslein, M.; Sissenwine, M.; Serchuk, F.; Bowman, R. Stomach content studies in relation to multispecies fisheries analysis and modeling for the Northwest Atlantic. Int. Counc. Explor. Sea, Comm. Mem. 1981/G:66. 14 p.
- Mayo, R. K.; Lange, A. M.; Murawski, S. A.; Sissenwine, M. P.; Brown, B. E. A procedure for estimating rates of escapement and discard based on research vessel bottom trawl survey catches. Int. Counc. Explor. Sea, Comm. Mem. 1981/G:62.
- Murawski, S. A.; Lange, A. M.; Sissenwine, M. P.; Mayo, R. K. Definition and analysis of otter trawl fisheries off the Northeast Coast of the United States. J. Cons. Int. Explor. Mer. (S)
- Ropes, J. The Atlantic Coast surf clam fishery. Mar. Fish. Rev. (S)

Sissenwine, M. P.; Kirkley, J. Fishery management techniques. Mar. Policy. (S)

Waring, G. T.; Anthony, V. C. Results of the International Tagging Program conducted by USA in the Gulf of Maine, Georges Bank, and contiguous waters from 1976-78. Northw. Atl. Fish. Org., Sci. Council. Res. Doc. 81/IX/122.

Reports

Boreman, J. Life histories of seven fish species that inhabit the Hudson River estuary. Woods Hole Lab. Ref. Doc. No. 81-34;1981. 97 p.

Waring, G. T.; Anderson, E. D. Status of the northwestern Atlantic butterflyfish stock, 1981. Woods Hole Lab. Ref. Doc. No. 81-27;1981. 24 p.

MANNED UNDERSEA RESEARCH AND TECHNOLOGY PROGRAM

No report received. The September-October report will be included in the November-December issue.

MARINE ECOSYSTEMS DIVISION

Ecosystem Dynamics Investigation

Marv Grosslein, Ed Cohen, Mike Pennington, and Tom Morris prepared ICES papers (see list in July-August bimonthly narrative report) in preparation for the special ICES session on application of food habits data to multispecies modeling of fisheries. Ed Cohen and Wendell Hahm conducted further analyses of predator/prey size ratios using data summaries from the fish stomach file produced by John Hauser. These data will be included in joint modeling studies with Eric Ursin following the October ICES meeting in Woods Hole.

Marv Grosslein chaired a meeting of the Larval Herring Task Force on 14 and 15 September in Dartmouth, Nova Scotia, at the September 1981 meeting of the Northwest Atlantic Fisheries Organization (NAFO) Scientific Council. Ten research documents and several working papers were presented on topics including Atlantic herring stock interrelationships (i.e., tagging, parasites, and meristics) and spawning stock studies for the Gulf of Maine region, as well as studies of the 1971-78 time series of larval herring surveys itself. Proposals were discussed for summarizing herring tagging data and establishing expanded and US-Canada cooperative herring parasite studies in 1982 in order to improve estimates of stock mixing. The report of the Task Force meeting, including a list of documents and recommendations approved by the Scientific Council, will be circulated to investigation chiefs in October. Comments on two NAFO symposia ("Remote Sensing Applications to Oceanography" and "Environmental Conditions in the Northwest Atlantic in the 1970's") will also be included.

Marv Grosslein represented the NEFC at a Georges Bank Study Committee meeting at the Woods Hole Oceanographic Institution on 9 September. Progress was reviewed on the selection of chapter authors and there was general discussion of the need for a general inventory of major unpublished data bases to be used in the book, and also a need for authors to begin writing in the very near future. A general report on the meeting and current status of the book will be circulated to investigation chiefs in October.

John Hauser and Roger Theroux began preparations for transfer and conversion of ecosystem computer files and programs from the Sigma-7 to the new VAX computer in Woods Hole. This included locating and identifying all tapes and beginning reformatting necessary for transfer of food habits and benthic data files to the VAX. John also completed writing a zooplankton cluster analysis program for Roz Cohen's use on the larval Atlantic herring time series.

Ray Bowman conducted a literature search on flatfish feeding and catchability and he completed an analysis of stomach contents from fish collected on the Wieczno in late fall 1976 in the "mudpatch" south of Nantucket. This was just prior to the Argo Merchant oil spill, and these samples will be compared with subsequent stomach samples from the same region following the spill. Ray also participated on the first leg of the fall bottom trawl survey on Delaware II. Bill Michaels sailed on the first cruise (No. 81-01) of the Soviet R/V Stvor, devoted to zooplankton and hydrographic sampling along the shelf/slope region from Cape Hatteras to Georges Bank in conjunction with the ongoing warm-core ring studies.

Roger Theroux completed preliminary listings of motile invertebrate data collections and associated environmental data, and began work with plotting programs PREMAP and FISHMAP in preparation for making species distribution plots for this data series.

Roger Theroux met with Nancy Kohler regarding coding new prey species.

The highlight of October was the ICES meeting in Woods Hole with nearly all Investigation personnel participating in one way or another. Marv Grosslein, Ed Cohen, and Mike Pennington presented papers at the special session on fish feeding studies and Mike also presented a paper on variability of Marine Resources Monitoring Assessment, and Prediction Program (MARMAP) egg abundance estimates in the Pelagic Fish Committee. Roger Theroux served as coordinator of all audiovisual and photographic services for the ICES meetings, and Cheryl Windsor provided typing services for committee reports. Most staff attended a number of sessions of the various scientific committees and the special symposia and poster displays.

On 5 October the NEFC modeling group, including a number of assessment personnel, met with Taivo Laevastu, Murray Hayes, and Richard Marasco from the Northwest and Alaska Fisheries Center for an informal progress review on the status of multispecies modeling at our two Centers. Following the ICES meeting, the modeling group spent 2 wk working with Dr. Erik Ursin on the use of Andersen's new food preference model applied to NEFC data, and reviewing the structure and mathematics of the model. Ed Cohen, Mike Pennington, Marv Grosslein, John Hauser, and Jeremy Collie (graduate student at the Woods Hole Oceanographic Institution) were involved in these sessions. Finally, Ed and Mike revised two ICES documents for presentation at the GUTSHOP '81 meeting in December, and Ed also worked on further revisions of two papers for the American Geophysical Union/American Society of Limnologists and Oceanographers (AGU/ASLO) meetings in February.

Work continued on transfer and conversion of ecosystem data files from the Sigma 7 to the VAX. John Hauser worked on food habits and zooplankton files and Roger Theroux began the transfer of benthic files.

Charlie Wheeler continued daily sea temperature and weather observations in Woods Hole and performed routine maintenance on the NEFC's R/V Phalarope II. He also made trap sets or trawl hauls for green crabs in Sippewissett Marsh for 5 days in September and 8 days in October; catches were very low this year relative to catches made in 1980, apparently due to severe winterkill last year. Charlie began sorting small fish and lobster larvae from the summer neuston surveys in Buzzards Bay and Vineyard Sound; preliminary results indicate few lobster larvae this year compared with the previous 5 yr.

Ray Bowman and William Michaels continued work on the food habits data. Ray completed a first draft of a summary of dominant prey of major fish species found in the oil lease areas of Georges Bank, and also worked on diet overlap data from a Wieczno cruise. Bill participated in the Georges Bank leg of the fall bottom trawl survey, and revised stomach sampling procedures were applied to increase the sampling rate on major fish predators. Bill also participated on the Stvor Cruise No. 81-01 (a warm-core ring study) and prepared the cruise report. He noted the occurrence of a 240-m deep bongo sample heavily fouled with oil south of the oil lease area on Georges Bank (over about 2000 m of water). Roger Theroux identified the small mollusk shells in the sample as pelagic pteropods, probably Limacina spp., which probably would not be unusual in that area.

A significant amount of time was spent in October preparing general workforce performance plans, and compiling space requirements for Divisional staff at the Woods Hole Laboratory relative to the impending move of Resource Assessment Division personnel back into the main building.

Larval Dynamics Investigation

Experimental Studies

Collection and on-site swim speed/stamina testing of young-of-the-year striped bass were completed. A total of 238 fry were tested including 32 fry from the Nanticoke River, 36 fry from the Potomac River, 60 fry from the Hudson River, 40 fry from the Edenton Hatchery (Brookneal Stock), and 70 fry from the Harrison Lake Hatchery (35 Brookneal Stock and 35 Chesapeake Stock). Despite considerable effort, we collected no fry from the Choptank River. Subsamples of the fry tested for swimming stamina will be subjected to contaminant residue analysis and tested for backbone mechanical properties and biochemical composition at the US Fish and Wildlife Service (USFWS) Columbia National Fisheries Research Laboratory. These samples will also be analyzed for RNA, DNA, and protein content at the Narragansett Laboratory. All samples that were taken during the lab growth and survival portion of the joint NOAA/USFWS study of the effects of existing contaminant burdens on the viability of the early life stages of striped bass have been analyzed for RNA, DNA, and protein content, as well as standard length and dry weight.

Sorting of plankton samples from Soviet R/V Evrika Cruise No. 80-02 was continued. A manuscript, "Nitrogen Utilization by Larval Summer Flounder (Paralichthys dentatus, Linnaeus)," was accepted for publication by the Journal of Experimental Marine Biology and Ecology and is in press.

Chemical analysis of American sand lance, Atlantic cod, and haddock larvae collected during the spring cruises NOAA R/V Albatross IV 81-01, 81-03, and 81-05, and NOAA R/V Kelez No. KE 81-03, has been completed. Although all field-caught larvae analyzed to date have had high RNA-DNA ratio values, significant differences between stations were observed for sand lance and cod. Estimates of growth rate for these larvae expressed as percent increase in protein content per day based on RNA-DNA ratio as related to growth observed for lab-reared fish are in the range of 14% per day. Arrangements were made for acquiring haddock and sand lance spawning stock for lab studies. Computer data file storage of the completely sorted fine-scale bottle samples from the Evrika cruise prior to final statistical analysis is in progress.

Several members of the task, including Al Smigielski, Bruce Burns, and Mary Grojean, participated in the recent warm-core ring cruises. Larry Buckley presented a paper, "Some Effects of Temperature on Growth and Biochemical Composition of Larval Winter Flounder (Pseudopleuronectes americanus)."
A manuscript with the same title was submitted to the Marine Ecology, Progress Series for publication.

Population Processes

Greg Lough completed revisions on the larval Atlantic herring growth manuscript and resubmitted it to the Fishery Bulletin (US). George Bolz reexamined a number of larval herring otoliths necessary for revision of the growth manuscript, and he processed otoliths for 100 Atlantic cod larvae and 80 haddock larvae collected on last spring's larval dynamics cruises. A preliminary growth curve has been made for the cod larvae (5-23 mm SL) based on daily otolith growth increments.

Roz Cohen met with Janet Murphy to complete revisions on the copepod identification manual. She also made larval herring prey biomass calculations for the 1974-76 seasons to augment the 1981 ICES larval herring food habits paper, and began translating some of the French literature on the copepod, Centropages spp., as background for her Ph.D. thesis research. All the larval herring food habits data from the 1978 patch study were entered on the HP-85 calculator by Peter Donnelly this month.

Randy Goodlett identified zooplankton captured with our multiple opening-closing net and environmental sensing system (MOCNESS) from the larval herring guts processed from West German R/V Anton Dohrn Cruise No. 77-04. These data are being used by David Potter to complete his study of larval herring vertical migration. Randy completed rechecking zooplankton identification of the Albatross IV Cruise No. AL 81-05 MOCNESS samples.

Philip LeBlanc participated on the Marine Resources Monitoring, Assessment, and Prediction Program (MARMAP) cruise on Stvor during 28 August-22 September, and terminated his summer appointment on 29 September. Hal Merry and Dave Potter made preparations for use of the MOCNESS 1-m system on the Warm Core Ring Study and participated on the Albatross IV Cruise No. AL 81-11 during 22 September-6 October.

During the first part of October, most members of the task participated in the 1981 ICES Statutory Meeting in Woods Hole and/or assisted with related logistical tasks. Roz Cohen and George Bolz presented papers at the ICES meetings on larval Atlantic herring food habits (H:59) and Georges Bank ichthyoplankton (L:30).

Greg Lough spent the remainder of the month revising a manuscript on larval Atlantic herring abundance and mortality, and preparing abstracts for the winter AGU/ASLO meetings. Roz Cohen revised the larval Atlantic herring food habits manuscript for publication, revised the larval gut content-condition factor lab manual, and continued work on the ICNAF zooplankton report.

Dave Potter has continued work on the larval Atlantic herring vertical distribution data, as well as participating in several Woods Hole Laboratory Space Committee meetings. Hal Merry has been busy with post-cruise repair jobs, including four MARMAP meter blocks. Also, engineering discussions were started with several corporations regarding the suitability of their pulse-height analyzers to use with our HIAC particle-sizing system. Peter Donnelly and Randy Goodlett devoted most of the month to Stvor Cruise No. 81-02, participating in the Warm Core Ring Study during 10-26 October, and in pre- and post-cruise activities.

Ichthyoplankton Investigation

We are participating in the autumn bottom trawl survey which began in mid-September to collect ichthyoplankton samples through the MARMAP survey area. At the close of the month the ship (Delaware II) was working in the Middle Atlantic Bight. This cruise will continue through mid-November, at which time we will begin our traditional late autumn MARMAP I survey on Albatross IV. These two autumn cruises will bring the total number of ichthyoplankton-zooplankton surveys for the year to eight.

We have made significant progress in setting up the 1977-79 larval fish data from MARMAP I surveys for Fager analysis, a recurrent group technique to analyze distribution patterns. By isolating species groups that recur at different sampling sites, those organisms that are constantly a part of each other's environment can be identified. After the groups are identified, we will study their distributions in relation to known environmental variables to look for important controlling factors which determine communities. In addition to the recurrent group analysis, work continues on a spawning stock biomass estimate for silver hake and we have added several species to our list of larvae for which we routinely map seasonal and annual patterns of distribution and abundance.

We completed the third leg, or Georges Bank subarea, of the early autumn ichthyoplankton survey at the close of the month. In response to growing interest over the status of Atlantic herring stocks on Georges Bank, additional and more intensive sampling was conducted in the northeast peak area. Preliminary observations of the plankton samples revealed no herring larvae at a time of year when they should be at peak levels of abundance. Last autumn marked the first time in 25 yr that herring larvae did not occur in plankton samples taken on the Bank, the principal spawning grounds for herring during the 1960's and early 1970's.

Mike Fahay attended a steering committee meeting in Boulder, Colorado, during 19-22 October to plan the Ahlstrom Memorial Symposium. The Symposium, tentatively scheduled for 1983, is to honor and perpetuate Dr. Ahlstrom's achievements in the field of larval fish taxonomy and systematics. It will include contributions from

internationally acknowledged experts and culminate with a high quality publication on the ontogeny and systematics of fishes. Mike will serve as coeditor as well as contributing senior author on the Gadiformes chapter.

Mike Fahay and Don McMillan assumed responsibility for setting up our display for the Open House held at the Sandy Hook Laboratory on 2 October. The display included: enlarged photographs, tables, and graphs; drawings of larval fishes; preserved specimens for viewing microscopically; and a small aquarium with juvenile stages of several species we routinely collect on coastal surveys, which Don seined around Sandy Hook. It was a descriptive, visual presentation of our research activities and received many favorable comments. During the course of the day the exhibit was staffed by Mike, Don, Alyce Wells, John Sibunka, Peter Berrien, and Myron Silverman.

Apex Predators Investigation

On 23 September, we received 15 shark tag recaptures: 12 from blue sharks, 2 from sandbar sharks, and 1 from a nurse shark. Returns from blue sharks included: one tagged off Montauk, New York, and recaptured off Shinnecock, New York, 14 mo later, and another tagged aboard the Wieczno southwest of the Cape Verde Islands and recaptured by a Korean longliner 275 mi southwest of its tagging location. A second blue shark tagged on the same day aboard the Wieczno was recaptured 71 days later by a Japanese longliner 200 mi southwest of its original location. Both sandbar sharks were tagged off Long Island and traveled 124 and 133 mi southwest, respectively, in 72 and 389 days. The nurse shark was tagged off Everglades City, Florida, and was recaptured 32 days later off Naples, Florida.

During October, tags were returned from the following: blue sharks (6), tiger sharks (1), sandbar sharks (1), dusky sharks (1), and swordfish (2). Most of the blue sharks were short recaptures (i.e., less than 100 days and 200 mi). However, one blue shark tagged in the central Gulf of Maine and recaptured 60 days later off New Jersey was the first to demonstrate movements from the Gulf of Maine to the Middle Atlantic Bight. Another blue tagged off Southern New England in October 1980 was recaptured by a Spanish longliner 1-yr later off the coast of Morocco (3000 mi). A third tagged blue shark was returned from the coast of Newfoundland. We are awaiting confirmation of the tagging data, but the tags were sent to a big game fishing club in Portugal. It seems likely that the shark was tagged off Portugal within the last 2 yr.

The tiger shark return came from a shark tagged in Bermuda in 1979 that was recaptured in the Dry Tortugas after 2 yr. The shark's weight at recovery was estimated at 900 lb and length estimates indicate it had grown about 2 ft in 2 yr. This is first evidence of movements of sharks between Bermuda and US waters. Last month we established an informal cooperative shark project with the Bermuda Division of Fisheries. They recently began exploratory longline fishing and we have provided catch data, tags, and other information on an exchange basis. Tag returns from other species of sharks included: a sandbar shark tagged off New York and recaptured off South Carolina after 8 mo (700 mi); and a dusky shark tagged off Mayport, Florida and recaptured off Oregon Inlet 7 mo later. The latter is the first direct evidence of movement of the dusky shark from the Southeast to the Northeast Coast.

Of the two swordfish recaptures, one was recaptured within 30 mi of the tagging site -- off Georges Bank after 4 yr at liberty. At tagging its total weight was estimated at 40 lb, and at recapture its total weight was calculated to be 144 lb (from dressed weight). The second swordfish return came from a fish at liberty for nearly 6 yr (November 1975 to October 1981). The fish was tagged off the southeast part of Georges Bank and recaptured off Hillsborough Inlet, Florida. At tagging, its total weight was estimated at 30 lb and at recapture 250 lb. The average annual weight increase for these two fish was 34 lb (15.3 kg) and 37 lb (17 kg), respectively. These data are comparable to growth estimates currently proposed by Berkeley and Houde from interpretation of fin spines.

Jack Casey, Wes Pratt, and Chuck Stillwell made progress on their age and growth analyses of the shortfin mako, the brown shark, and several other species of carcharhinids. Tag-recapture data were summarized and reduced into preliminary growth curves. Vertebral readings were completed and inventoried in preparation for a final back-calculation.

Three tournaments were attended by project personnel in September: the Rhode Island Tuna Tournament, the Master's Invitational Tuna Tournament, and the Roger Williams Big Gamefish Tournament. The tuna were examined for food studies by Chuck Stillwell and Nancy Kohler. Visiting Spanish scientist, Jose Cort, completed field collections of nasal and gill parasites from bluefin tuna. He returned to Spain on 25 October.

Wes Pratt reviewed two manuscripts, one for Copeia and the other for Fishery Bulletin (US).

Food habits data from over 200 swordfish were coded and keypunched. Verification and preliminary analysis of the data will be conducted in the next few weeks by Chuck Stillwell and Nancy Kohler.

Frank Carey of the Woods Hole Oceanographic Institution, under NMFS contract, conducted sonic tracking experiments aboard the Wieczno during 7-22 October. During the cruise, a blue, bigeye thresher, and scalloped hammerhead were tracked for up to 30 hr over distances of 20 mi and averaged speeds of 0.7 knots. The blue shark's cyclic movements in the water column reached depths of 225 m and confirmed a pattern observed in a previous experiment. The hammerhead shark stayed in the mixed layer near the thermocline and remained in the same area of release. The bigeye thresher shark also remained in the release area, but selected for a narrow temperature range of 14.0°-14.5°C. In addition to these experiments, 100 sharks were tagged and stomach samples were obtained from 20 sharks for food studies.

On 23 October, Chuck Stillwell, Nancy Kohler, John Hoey, and Alan Lintala left for a 17-day cruise aboard the Wieczno. The objectives of the cruise are to study the food habits and distribution of apex predators in shelf, slope, and Gulf Stream waters, with particular focus on a warm-core ring (81-D) located off the southeast part of Georges Bank.

The Squadron Anglers Sport Fishing Club of Long Island, New York, donated a computer modem valued at \$850 to the Apex Predators Investigation. The American Littoral Society donated shark tagging equipment valued at \$1000 to the Investigation.

Fishery Oceanography Investigation

During September the Fishery Oceanography Investigation began the first cruise of the Warm-Core Ring Study in cooperation with a large National Science Foundation project involving investigators from many institutions. While the University of Rhode Island R/V Endeavor and Woods Hole Oceanographic Institution R/V Atlantis II will be making physical, chemical, and biological measurements within the ring, Albatross IV will use CTD (conductivity, temperature, and depth) and MOCNESS sampling to study the entrainment of shelf water and shelf organisms around the outside of the ring. The study is interdisciplinary with Ron Schlitz as Chief Scientist and Jack Colton overseeing the biological sampling.

The Investigation continued cooperation with the Stvor as it surveyed the slope-water region from Georges Bank to Cape Hatteras in connection with the Warm-Core Ring Study. Salinity samples from the Stvor were analyzed by Sam Nickerson, Dan Patanjo, and Chris Nadeau.

Steve Ramp has completed an initial draft of a manuscript on the Northeast Channel current measurements. Art Allen has done the same for the current measurements from the 1978 Larval Atlantic Herring Patch Study. These are being reviewed inhouse before preparation for submission for publication.

During October the Fishery Oceanography Investigation completed the first warm-core ring cruise. The ring studied (81-D) was located south of Nova Scotia (40°30'N, 60°20'W). Using CTD and MOCNESS sampling, we surveyed the entrainment of shelf water and shelf organisms from the northwest edge of the ring clockwise to the southeast. A narrow bank of low salinity surface water about 25-m thick was observed on the eastern edge of the ring. The second cruise, Albatross IV Cruise No. AL 81-12, with Jack Colton as Chief Scientist, sampled the shelf/slope frontal region south of Nantucket Shoals and Georges Bank.

The results of the Investigation's cooperative research with the Stvor show the remnants of two warm-core rings and provided a characterization of the slope-water region.

Plankton Ecology Investigation

Donna Busch worked on calibration techniques for the in-situ chlorophyll sensor with Grayson Wood, reviewed and commented on two manuscripts for the Narragansett Laboratory Director, supplied equipment for measuring chlorophyll-a to be used on warm-core ring cruises, supplied information on timing of phytoplankton blooms on Georges Bank in response to a request from the US Geological Survey, and sent revised data listings to the Polish Sea Fisheries Institute in Gdynia and to AtlantNIRO in Kaliningrad, USSR.

She also attended ICES meetings during 5-9 October, plotted chlorophyll-a data from the 1981 spring larval Atlantic cod and haddock cruises, and worked on a briefing book for the Narragansett Laboratory Director's trip to the Soviet Union in November.

The technical specifications and drawings for Narragansett's solar project were revised and completed by Solar Designs, Inc., and then submitted to Rockwell International for final approval.

During September Carolyn Griswold prepared an update on Phaeocystis sp. for Ken Sherman and continued to update her literature review of gelatinous zooplankton. From 15 to 25 September, she participated in a MARMAP/bottom trawl survey on the Delaware II, and reviewed the draft environmental impact statement for OCS Sale #52.

Jack Colton and Jackie Frisella took part in Albatross IV Cruises No. AL 81-11 and 81-12 and completed a preliminary draft of a manuscript, "Comparison of Wind Regimes at Nantucket Island and Georges Bank."

MARMAP neuston samples will be made available to the Manomet Bird Observatory for use in a study of sea bird distributions and food availability. Ed Backus of Manomet will be trained at the Narragansett Laboratory in the identification of the larger components of the neuston catches. He will be determining the availability of food types which fall within preferred size stanzas along oceanic fronts. Special attention is being given to the abundance and distribution of fish eggs and larvae in the neuston as they comprise a major proportion of the diets of certain sea birds.

Ray Maurer and Jerry Prezioso participated in Stvor Cruise No. 81-02 (Part I) which ended 6 October. The area covered extended the MARMAP Survey I transects to the edge of the US Fishery Conservation Zone from Cape Hatteras to Georges Bank. The objective of the study was to obtain data on the hydrographic and biological features of the slope/shelf front and warm-core rings, with special emphasis on the distribution and abundance of euphausiids and Atlantic saury.

Ray Maurer also participated in Delaware II Cruise No. DE 81-06, a MARMAP/bottom trawl survey during 19-30 October.

Information regarding the Bausch & Lomb Image Analysis System and its application for counting and sizing MARMAP plankton samples was provided to Ben Breedlove of Breedlove Associates, environmental consultants from Gainesville, Florida. The System was featured in the recent issue of Fisheries.

Joe Kane spent much of September at sea on Albatross IV Cruise No. AL 81-11. Paul Fofonoff is completing the last of the 20 bottle samples from Evrika Cruise No. 80-02 and is summarizing the taxonomic work he has done from both bottle and pump samples.

Jack Green presented a paper to the Biological Oceanography Committee session of ICES. Much of the week following the Statutory Meeting of ICES was spent in discussion with various ICES representatives. The remainder of the month was spent in analysis of data from the first series of pump samples.

Biostatistics

Bob Sand extracted abundance data for chaetognaths, salps, and other zooplankters, and provided a formatted listing for Carolyn Griswold.

Tom Plichta copied several tapes to provide data security for several files being used under contract to the NEFMC.

Julien Goulet spent much time in meetings with EPA personnel preparatory to implementing the cooperative agreement and purchasing equipment to support the ADP aspects of the agreement.

Tape-read problems at the University of Rhode Island's Academic Computer Center (ACC) plagued our unit for about 2 wk. While they lost no data, they had severe difficulty reading tapes. The problem has been solved and the ACC will give them credit for several jobs run.

The University of West Florida's System Support Group (SSG) began operations on 1 October. Sue Koelb is currently on board. The SSG will provide analytic and programming assistance in our move of the Marine Ecosystem Data Base to EPA's PDP11 computer.

Version 6 of the General Reformatting System (used to convert data from the MARMAP Information System format to unit-record format) was put on line on 30 September. The programmer, Oke Lundin, accepted a position at Brown University beginning 1 October. Sue Koelb, SSG, and Julien Goulet spent half of October hunting down a few remaining bugs in Version 6.

A rush job to obtain Atlantic herring data listings, including delta means, was completed under such time pressure that output was not verified or quality checked.

Publications

- Buckley, L. J. Some effects of temperature on growth and biochemical composition of larval winter flounder (Pseudopleuronectes americanus). Mar. Ecol., Prog. Ser. (S)
- Buckley, L. J.; Dillman, D. W. Nitrogen utilization by larval summer flounder, Paralichthys dentatus (Linnaeus). J. Exp. Mar. Biol. Ecol. (A)
- Goulet, J.; Sailor, J. K.; Berry, J. K.; Sherman, K. Computer-assisted map analysis and marine ecosystem information. Proc. Oceans '81 Conf. 1981 September; Boston, Mass. 1981:264-272. (P)
- Griswold, C. A.; McKenney, T. W. Larval development of the scup, Stenotomus chrysops (Pisces: Sparidae). Fish. Bull. (US). (S)
- Kane, J. Effect of season and location on the relationship between zooplankton displacement volume and dry weight in the Northwest Atlantic. Fish. Bull. (US). (A)
- Laurence, G. C.; Howell, W. H. Embryology and influence of temperature and salinity on early development and survival of yellowtail flounder Limanda ferruginea. Mar. Ecol., Prog. Ser. 6:11-18;1981. (P)

Smith, W.; McMillan, D. G.; Wells, A. The distribution and abundance of Atlantic herring larvae in the Gulf of Maine region as determined from MARMAP surveys during autumn and winter, 1980-81. Northw. Atl. Fish. Org., Sci. Council. Res. Doc. 81/IX/115.

Stillwell, C.; Kohler, N. Food, feeding habits and estimates of daily ration of the shortfin mako (Isurus oxyrinchus) in the Northwest Atlantic. Can. J. Fish. Aquat. Sci. (A)

RESOURCE UTILIZATION DIVISION

Processing and Preservation Investigation

Blue Crabs

Organoleptic testing is continuing on blue crab meat packaged and pasteurized in plastic pouches. Meats pasteurized in oxygen-impermeable mylar pouches are slightly better in overall quality than the commercially pasteurized canned control after 5 mo of refrigerated storage.

Crab meat pasteurized in oxygen-permeable polyethylene spoiled after 2 mo of storage.

This experiment is being repeated.

Sorbate Preservation

An experiment designed to determine the effect of potassium sorbate on the shelf life of dressed Atlantic cod was begun.

Frozen Fish

A sixth trip was made to the supermarket chain in the Albany, New York, area selling U.S. Grade A frozen fish. Frozen samples were brought back to the Gloucester Laboratory for evaluation. The surface temperature of the frozen Grade A fish in the frozen food cases in the supermarkets varied from -4°C (24°F) to -18°C (0°F). These temperatures are somewhat better (lower) than those found in the previous visit. The quality of the samples brought back from New York was found to be below Grade A by the US Department of Commerce inspector and the Laboratory taste-test panel.

Preliminary results from an experiment to monitor the temperatures of the frozen fish in the new Vendo freezer have been obtained. When all the doors were kept closed, the temperature at the center of the package and at the surface of the package never went above 0°F even throughout the defrost cycle. When the large door used in refilling the chest is opened several times a day, the temperature on the surface of the fish goes above 0°F , but doesn't remain above zero for any length of time. The temperature at the center of the fish packages barely goes above 0°F and again comes back to 0°F in a short period of time. This Vendo freezer appears to hold the temperature of the fish much lower than the chest or tiered freezers used in the supermarkets.

The study to determine the shelf life of frozen U.S. Grade A haddock fillets held in the Vendo freezer is continuing. After 4 mo in the freezer, the haddock was found to be Grade A by a US Department of Commerce inspector.

Manuscripts

We sent "Utilization of Cultured Yearling Surf Clams" to Aquaculture, and "Cholesterol and Fatty Acid Content in Four Species of Crab Found in the Northeastern United States" to the Journal of Food Science.

The first draft of the report on the frozen fish quality program is being prepared.

NMFS-URI Cooperative Fisheries Engineering Unit

The harvesting and sampling gear development group has been relocated to the URI Bay Campus at Narragansett, Rhode Island.

The outfitting of the Gloria Michelle has continued on schedule with the installation of the gallows frame, winch, and net reel. The vessel sailed to Woods Hole late in October to prepare for a cruise relating to acoustic biomass estimation of Atlantic herring.

Product Quality Investigation

A storage study of the iced storage characteristics of spiny dogfish was initiated during this period. Fish receiving three different treatments were examined. The treatments were: (1) in the round, (2) gutted, and (3) headed and gutted. One-day postmortem fish landed in Gloucester were stored in ice and tested periodically for trimethylamine, trimethylamine oxide, ammonia, thiobarbituric acid number, moisture content, pH, Torrymeter reading, and bacterial count. Sensory evaluation was also performed on steamed portions of the fish. While examination of the results is not complete, it is apparent that the bacterial count increased most rapidly in the headed and gutted fish.

A second study with frozen dogfish includes: (1) 5-lb blocks prepared from skinless fillets with and without a prior treatment with a 3% sodium erythorbate solution; (2) 1-lb blocks prepared from belly flaps with and without erythorbate treatment, and (3) batter-breaded sticks prepared from skinless fillet blocks.

A storage study initiated earlier on frozen skin-on dogfish fillets and belly flaps prepared from fish held for different periods of time on ice prior to freezing is continuing. Samples in storage for 45 wk were recently examined. The appearance of vacuum-packed samples was superior to that of non-vacuum-packed samples which showed signs of discoloration. The odor of rancidity was also apparent in the air-packed samples. Ammonia production has not become a problem in any of these samples.

Debbie Dyer has been assigned to the Product Quality Investigation and will assist in the species identification work.

Ron Lundstrom attended the 95th Annual Meeting of the Association of Official Analytical Chemists (AOAC) and presented a paper describing the collaborative study of the agarose gel isoelectric focusing method for fish species identification. Ron's recommendation, as Associate Referee, that the AOAC not adopt the agarose gel method was accepted. Additional modification of the method and another collaborative study will be completed prior to the next annual AOAC meeting.

Six 5.5-lb blocks of red hake fillets were plate frozen and stored at 0°F to study the efficacy of the naturally occurring proteases for stabilizing the texture. Controlled cooking time and temperature will be used to activate the enzymes which are most active at a pH of 7-8 and at a temperature of about 125°-140°F. A bibliography on alkaline proteases in fish muscle was assembled and is available in the Gloucester Laboratory library.

The equipment for laser diffraction measurements of fish muscle sarcomere length has been ordered. An attempt will be made to correlate sarcomere length with textural change during storage of frozen fish.

Striped bass and winter flounder larvae were obtained from the Narragansett Laboratory for the ongoing larvae identification technique via isoelectric focusing. The larvae were frozen individually in ampholine at -80°F. Work is currently concentrated on the refinement of the staining method.

We are still comparing American shad taken from various locations for flavor differences using the triangle taste test. From the 38 separate tests conducted thus far, preliminary results indicate a significant difference between Delaware River fish and Connecticut River fish; however, a final conclusion will be reserved until all tests are completed.

At the request of American Pouch Foods International, which is working on a NOAA grant for developing retort-pouch-processed seafoods, samples of pouch-processed smoked carp and smoked freshwater drum were evaluated by the Gloucester Laboratory taste panel and were both rated as "like moderately."

For the annual Gloucester Laboratory Open House, Elinor Ravesi demonstrated the amino acid analyzer, Ron Lundstrom demonstrated the isoelectric focusing device, Kurt Wilhelm demonstrated the Instron texturometer, Joe Licciardello demonstrated the Torrymeter, and Betty Tuhkunen served breaded dogfish sticks.

Joe Licciardello reviewed two manuscripts for the Journal of Food Science: (1) "Bioconversion of Shellfish Chitin Waste: Waste Pretreatment, Enzyme Production, Process Design and Economic Analysis," and (2) "Inactivation and Injury of a Hemolytic Radiation-resistant Micrococcus Isolated from Chicken Meat."

Manuscripts

The manuscript, "Extended Fresh Storage of Fishery Products with Modified Atmospheres: A Survey," by Kurt Wilhelm, has been accepted for publication by Marine Fisheries Review.

Product Safety Investigation

NIH Mass Spectral Data Base

Necessary hardware and software were acquired for the Hewlett-Packard 5992B mass spectrometer. This powerful system will enable us to interrogate the mass spectral data bank of the National Institutes of Health. This data bank has over 665 000 mass spectra. Some of our unknown compounds will be searched against this vast library.

Mass Spectral Library on PAH's

Work has been completed on a user's library for polynuclear aromatic hydrocarbons (PAH's). The data base also has Aroclors 1016, 1254, and 1260.

Maintenance of Hewlett-Packard 5992B Mass Spectrometer

The ion source, analyzer, and electron multiplier were thoroughly dismantled. Various components of the ion source were cleaned with abrasives and solvents. The unit was assembled and pumped down.

PCB Analytical Column

A 6-ft x 2-mm i.d. glass column of Ovid-101 on 100/120 mesh Supelcoport has been conditioned and installed in the Perkin-Elmer Sigma-1 gas chromatograph. The new column will be used to analyze fish extracts for polychlorinated biphenyls.

PAH Analytical Column Supelcosil

A new 25-cm x 4.6-mm column of LC-PAH is being used in the Perkin-Elmer Series 3B high-performance liquid chromatograph for the analysis of PAH's in sediments and fish extracts.

PCB Workup of Striped Bass Samples

Workup of liver samples in striped bass is complete. Approximately 60 extracts remain to be analyzed by gas-liquid chromatography utilizing a Ni⁶³ electron-capture detector. This will complete all agreed work for Dr. Whipple of the NMFS Tiburon Laboratory. A report of our findings will be forwarded shortly.

PCB and PAH Workup of New York Bight Area Samples

Sixty samples of fish and shellfish were received from Mr. Reid of the Sandy Hook Laboratory. These samples will be analyzed for PCB's and PAH's in liver and muscle tissues.

PCB and PAH Workup of Casco Bay, Maine, Sediments Samples

Workup of approximately 40 sediment samples has begun. Glassware for the PCB work is being ordered. Some portions of the PCB methodology have changed substantially because of the nature of the samples.

Replacement of Electron-Capture Detector

The old cell was removed from the Perkin-Elmer Sigma-1 gas chromatograph. A reconditioned cell (new Ni⁶³foil) was installed and tested for specifications by Perkin-Elmer service engineers. This reconditioned cell meets Perkin-Elmer specifications. It is now being used to analyze outstanding extracts.

Product Standards and Specifications Investigation

Work reached a seasonal peak in preparation for the 15th Session of the Codex Alimentarius Committee on Fish and Fishery Products. Draft US comments were prepared for the following agenda items: canned Pacific salmon, fish blocks, fish sticks and portions, salted and dried cod, and harmonization of defects tables for frozen fillets. They have been sent to the head of the US Delegation for approval.

We have reviewed and commented on a final report titled, "Consumer and Instrumental Edibility Measures for Grouping of Fish Species from the Families Lutjanidae and Scorpaenidae," from the US Army Natick (Massachusetts) Laboratories under a contract with the US Department of Commerce. This final report is now being distributed.

Drafts of "Proposed U.S. General Standards for Grades of Fresh or Frozen Fish Steaks" and "Proposed U.S. General Standards for Grades of Shrimp" are being reviewed by the NMFS Central Office. They will be published as "Notices of Proposed Rulemakings" in the Federal Register. An initial draft of "Inspector's Instructions for Grading Fresh or Frozen Fish Steaks" is being reviewed.

An initial draft of a "Proposed U.S. General Standards for Grades of Frozen Fish Portions and Fish Sticks" has received comments which are being resolved.

Questionnaires for both producers and food service operators have been distributed as part of a market research and analysis report on fresh and frozen fish fillets. Telephone follow-ups have been conducted on companies not replying by mail.

A market research and analysis report on canned salmon has been sent to the NMFS Central Office for transmittal to the Quality Assurance Branch.

DIVISION OF ENVIRONMENTAL ASSESSMENT

Behavior of Marine Fishes and Invertebrates Investigation

As part of our ongoing effort to assess the impact of petroleum hydrocarbons on marine communities, we have begun a series of studies, conducted in cooperation with Battelle Pacific Northwest Laboratories, to identify sublethal effects of oil-contaminated sediment on selected behaviors of sand worms, an important prey item for a wide variety of marine organisms that inhabit the estuary at least for a part of their life history. Experiments to date have examined whether oiling of the sediment disrupts the worm's normal burrowing behavior. Results thus far have shown that although worms reburied at the same rate in both oiled and clean sediment, those in the oiled sediment reemerged while those in the clean remained buried. The significance of these findings is that while sand worms appear capable of mitigating the effects of oil contamination by avoidance, they are potentially increasing their vulnerability to predation.

Biological Oceanography of Stressed Ecosystems Investigation

Algal bioassays were run on seawater samples from a series of stations off the New Jersey coast ranging from near New York Harbor to mid-shelf off Delaware Bay. In terms of phytoplankton requirements, nitrogen was the nutrient in scarcest supply, and phosphorus was the second-most-important limiting nutrient, in 19 of 28 seawater samples. These nutrients were growth limiting to about equal degrees in five other samples; just nitrogen was in deficient supply in one sample. In three samples, the seawater was apparently rich enough in nutrients to preclude growth limitation. It may be pertinent that two of the nutrient-rich samples were collected close to New York Harbor; the third was a bottom sample from near the shelf break off Delaware Bay.

Analysis of ambient nutrient concentrations in bioassay samples by the Environmental Chemistry Investigation was initiated with this series. Correspondence appears to be good between the assay results and the nutrient measurements. The degrees of growth limitation by nitrogen and phosphorus in the assay coincided with the levels of these critical nutrients in the seawater; absences of growth limitation in the assay reflected nutrient concentration peaks in the seawater.

A culture of the dinoflagellate Gonyaulax tamarensis obtained recently from Dr. Clarice Yentch of the Bigelow Laboratory, is thriving at the Sandy Hook Laboratory. In light of its apparent spread to waters south of Cape Cod, it will be interesting to see how this species, which is highly sensitive to copper and grows best in highly chelated media, fares in assays of New York Bight apex waters.

Two publications, "Phytoplankton Community Structure in Northeastern Coastal Waters of the United States. I. October 1978," and, "Phytoplankton Community Structure in Northeastern Coastal Waters of the United States. II. November, 1978," by Harold G. Marshall and Myra S. Cohn have been published as NOAA Technical Memorandum NMFS-F/NEC-8 and -9. Dr. Marshall and Mrs. Cohn met in Norfolk recently to plan a journal article on seasonal phytoplankton assemblages in Northeast coastal waters of the United States and the relationship of these assemblages to fisheries in the area. Samples have been collected on MARMAP and Northeast Monitoring Program (NEMP)/Ocean Pulse Program (OPP) cruises during this period as well as on a warm-core ring study cruise. These samples presently are being concentrated for examination.

Preparation of the Superflux technical report continued. Graphics were checked and readied for photographing. Work was continued on the Nantucket Shoals experiment report with completion targeted for the latter part of November. Preparations were begun for the Coastal Habitat Assessment, Research, and Monitoring (CHARM) Program. Maps and photography were obtained for Long Island, New York, to begin selection of test sites. Contact was made with Fred Thurberg at the Milford Laboratory to assist in collection of groundtruth from the test sites. Jim Thomas and Craig Robertson attended an Executive Committee meeting at Manomet Bird Observatory in Massachusetts where LANDSAT imagery for CHARM was examined. Also, progress reports from the area coordinators were received.

Environmental Statistics Investigation

We began developing the methodology for interpretations of the multiple-factor biological assay problems of the environmental monitoring process. The study of synergistic and antagonistic effects is the main theme for understanding interactions among several factors, which are closely related with environmental and/or biological phenomena. Interpretations must relate to natural and lab experiments, particularly for describing relations between physiological observation and effects of several heavy metal burdens.

Documentation is in progress for: (1) the multivariate characterization of water mass using hydrographic data, (2) retrieval procedures used for data analysis in the water-mass problems, and (3) sensitivity analysis for heavy metal loads of the New York Bight marine species.

Statistical consulting for various investigations remains an ongoing activity.

Environmental Chemistry Investigation

Approximately 200 sediment cores and 330 tissue samples were collected for trace metal analysis during the OPP survey on Albatross IV Cruise No. AL 81-10. Tissue samples were mainly from sea scallop, windowpane, and Atlantic rock crab. Mercury analyses of fish tissue composites collected during the NEMP survey on Kelez Cruise No. KE 80-07 were completed and the data were computer archived. Analyses for Cd, Cr, Cu, Ni, Pb, and Zn in sediment cores collected during the August survey of the New York Bight were also completed and computer archived. Tony Ruiz sorted and shipped sediment and animal tissue composites from the above survey to Donald Gadbois at the Gloucester Laboratory (tissues) and Paul Boehm of ERCO, Inc. (sediments), for hydrocarbon analyses.

All 1979 nutrient data collected during MARMAP and OPP surveys were coded and submitted for keypunching. Nutrient samples from Albatross IV Cruise No. AL 81-08 were analyzed, and ammonium concentrations were measured in seawater samples collected during Albatross IV Cruise No. AL 81-10. Al Matte began a comparison of our nutrient measurements with those nutrient measurements made by Dr. T. Whitley of Brookhaven National Laboratory during the intercalibration exercise which occurred during the NEMP New York Bight water-column monitoring survey on Albatross IV Cruise No. AL 81-10.

Bob Fitzgerald measured chlorophyll (netplankton and nanoplankton size-fractions) abundance at 67 stations during the OPP survey on Albatross IV Cruise No. AL 81-10. Primary productivity was measured at 28 stations by J. Nichols during this survey. Two new seagoing technicians, D. Burdick and T. Finneran, were trained in the measurement of chlorophyll and C-14 productivity. Computer-generated contour maps of water-column average chlorophyll-a concentrations were made for all 1980 surveys.

A data report titled, "A Summary of the Chlorophyll Measurements Made During the Wieczno 80-02 Survey," by Evans and O'Reilly, Report No. SHL 81-33, was written and copies were sent to M. Pastuszak via A. Kofier, the Chief Scientist aboard the Wieczno.

Jay O'Reilly presented two papers at the ICES meeting at Woods Hole in early October. A. Draxler attended the annual Middle Atlantic Bight Physical Oceanography Workshop held at Narragansett, Rhode Island, during 21-22 October. A. Draxler also presented a slide-talk on seagoing activities on MARMAP and OPP surveys during the Sandy Hook Open House in October. All members of this Investigation were involved in the preparation of an annual report of data for NEMP. The report should be available in December.

Coastal Ecosystems Investigation

Benthic Community Structure

We neared completion of the first annual report on contaminant concentrations in sediments and demersal species of the New York Bight, and contaminant impacts on the benthos. Yet to be run is an analysis of correlations between variables measured by different disciplines, e.g., each of several sediment contaminants versus contaminants in biota and versus several indices of benthic macrofauna "health." A computer matrix will soon be available for these calculations.

We also worked on the NEMP annual report. Ann Frame and Steve Fromm checked species data sent by our contractor, and readied logsheets for computer entry.

Clyde MacKenzie and Dave Radosh conducted lab and field experiments on ability of surf clams to burrow into contaminated sands (from the New York Bight sludge dumpsite) as compared to clean sands. No differences were detected in burrowing speeds in the two substrates. Samples of both sands are being analyzed for heavy metals to determine whether handling the sediments for these experiments alters their chemical profiles. The surf clam studies indicated that spatfall off Long Island in 1981 was an order of magnitude less than in 1980, but about the same as in 1979. Predation by crabs and moon snails appears to be a factor limiting recruitment success since it eliminates nearly all juvenile clams in most years.

Bob Reid assembled a paper on long-term changes in the benthic macrofauna of Long Island Sound muds, for the Estuarine Research Federation conference in Gleneden, Oregon, in November. There was an extensive "population crash" in the benthos between 1972 and 1973; from 1973 to 1980 the fauna remained fairly stable but depauperate, resembling the assemblages now found in Raritan and Delaware bays. Contaminant concentrations and correlations with spatial-temporal faunal patterns are now being examined.

Other activities included providing information to: (1) the New York-New Jersey Port Authority, on the benthos southeast of the Ambrose Channel terminus, for estimating impacts of deepening and lengthening the channel to accommodate coal carriers; (2) the US Army Corps of Engineers, on characteristics of deep holes in western Long Island Sound which are being considered for spoil disposal, and also on contaminants in marine turtles, mammals, and their forage items; (3) the Marine Science Research Center of the State University of New York at Stony Brook, on benthos off eastern Long Island which might be impacted by a large beach reclamation project; and (4) ecological consultants, who requested information on shipworms in the Hudson River and also on the benthos of Georges Bank. We are providing gear and advice to the USFWS for an assessment of blue crab populations overwintering in the Arthur Kill River, New Jersey, and to FDA for a survey of extent of sludge-associated

pathogens in the New York Bight apex. Dr. Bob Diaz, Virginia Institute of Marine Science, requested and received oligochaete specimens from our NEMP sampling.

Benthic Energetics

Russ Terranova worked on determining indices for separating shell weight from total biomass of various species of mollusks collected in our benthic community assessment collections. This is a necessary step in obtaining a realistic conversion of rough organismal biomass into calorimetric terms. Russ also continued to work on the calorimetry of seasonal samples of important benthic and forage species. Discussions continued on the feasibility of burning additional samples of shark tissue to support the MARMAP Oceanic Gamefish Project's life history studies. Work began on the calorimetry of ocean quahogs to determine the relationship between caloric content of meats compared to shell length and pollution influences; preliminary results suggest an inverse relationship between shell length and caloric content of meats for 1980 fall samples.

Jan Ward continued accumulating references and data and summarizing life history information on dominant benthic invertebrates found at OPP monitoring sites and continued working on formats for entering invertebrate life history data into an ADP file for rapid retrieval, updating, and integration with other data sets. She began analysis of OPP benthic data, with emphasis on characterizing the functional attributes of the assemblages at each monitoring site to understand better the cause of any future detectable changes in community structure and to assess the sensitivity of the community to impacts.

Dorothy Jeffress began a course at Brookdale Community College on data processing which will enable her to play a more active role in benthic data management. She also began entering the benthic biomass data from the 1973 New York Bight apex benthic survey onto the computer data file and began determining the biomass of the final nine stations to be examined in the study that directly related to current OPP survey efforts.

Frank Steimle completed revisions on two manuscripts, one dealing with the benthic invertebrates of Block Island Sound and the other on the food habits of fish associated with artificial reefs.

Ocean Pulse Program Coordination

Most of the coordination activities during this period dealt with: (1) participating in various meetings related to the Program; (2) training and orienting a new OPP Operations Officer (LTJG Denise Holloman) who will take over major areas of responsibility related to implementation of OPP field surveys; and (3) developing plans for OPP survey cruises.

On 3 September we participated in an environmental monitoring data management meeting held in New York City with representatives of the NOAA Office of Marine Pollution Assessment and the NOAA Environmental Data and Information Service to discuss data management problems and requirements. On 9 September we met with representatives of EPA's Narragansett Laboratory to discuss the activities of OPP and MARMAP as they might relate to EPA's needs. The week of 14 September, Frank spent attending the Annual Meeting of the American Fisheries Society in Albuquerque, New Mexico. During the Mid-Atlantic Artificial Reef Conference held in Atlantic

City, New Jersey, during 23-25 September, Frank chaired a session on the "Ecology of Temperate Reefs," many of the papers presented at this session will be sent to Marine Fisheries Review for publication in a special issue on artificial reefs. During September we also did the final planning and completed our fall OPP monitoring survey aboard the Albatross IV.

During the first week of October Frank attended the ICES meeting in Woods Hole and presented a short paper in the Marine Environmental Quality Committee on food habits of fish collected on artificial reefs and the potential role of artificial reefs as a mitigation tool. On 14 October Frank joined a working group in Woods Hole to begin to develop a Regional Action Plan for the Center; a second working group meeting was held on the 27th in Washington, DC, to review our progress and to receive comments and guidance. To assist in the preparation of a synthesis paper on the role of oceanography in the dispersal of pollutants in the Northeast, Frank attended a meeting in Narragansett, Rhode Island, on 20 October. During October we also began planning for the mid-November OPP short survey on the Delaware II. This survey will examine sea scallop health-contaminated sediment relationships in the Gulf of Maine to the New York Bight, genetic abnormalities and pathology of benthic amphipods, and coliform distribution (in cooperation with FDA).

Physiological Effects of Pollutant Stress Investigation

Physioecology

Eight hundred adult blue mussels were collected at a beach near the Milford Laboratory. One hundred eighty of these mussels were set up in a diluter system and exposed to 0, 2, 10, and 20 $\mu\text{g}/\ell$ copper for a time-dose study. The remaining mussels will be used as spawning stock for embryonic experiments.

The spawning and rearing program provided 180 surf clams and 180 bay scallops which were set up in the same diluter and exposed to copper as described above for the field-collected blue mussels.

Adult and subadult blue mussels have been exposed to silver at 0, 5, 25, and 50 $\mu\text{g}/\ell$ and growth measurements taken monthly. Young blue mussels exposed to 50 $\mu\text{g}/\ell$ had not grown after 6 mo, but have now grown so rapidly that they have caught up to the controls.

Adult blue mussels in ambient water only are being held in a diluter system and a number removed biweekly to monitor copper uptake from our seawater system.

A diluter was calibrated and the metal supply turned on for the physiology group. Windowpane are being exposed to 0, 5, and 10 $\mu\text{g}/\ell$ of mercury.

Surf clams exposure to silver in a diluter system continues.

Physiology

Sampling continues at three stations in Long Island Sound. Blood samples were taken from 20 windowpane at each station in September and October. Considerable progress was made analyzing plasma samples for magnesium. The 1980 samples have been completed and the 1981 samples are in progress. Data from this study, through May 1981, were presented at the ICES meeting in Woods Hole and at the New England Estuarine Research Society Meeting at Kittery, Maine.

We participated in both legs of the August-September OPP survey on the Albatross IV. Seventy-one windowpane, 36 winter flounder, 30 yellowtail flounder, and 134 sea scallops were sampled during this cruise. We are now preparing for the November OPP survey and working on the samples from the last trip.

We have completed the 1981 blue mussel study with EPA scientists in Narragansett. This cooperative study, conducted along a pollutant transect in Narragansett Bay, has been very successful in evaluating techniques used to measure metabolic stress due to pollutant exposure. We are now discussing plans with our EPA colleagues for next year's program.

Other activities this reporting period included the submission of two manuscripts on lobster physiology, participation in the ICES Statutory Meeting in Woods Hole, and additional work on OPP gill tissues using the scanning electron microscope.

Biochemistry

During this reporting period, Biochemistry participated in the OPP survey on Albatross IV Cruise No. AL 81-10, during which tissue specimens were collected from 157 sea scallops taken variously from 12 stations. Signs of metabolic stress were observed grossly in 57 of these animals: 18 had an edematous ventral kidney, 2 had small cysts over one or more organs, 2 were spent males, and 35 had shell blisters and other signs of earlier infestation by what was probably a boring sponge; included in this last group were two scallops that also had discolored tissues and a small, tough adductor muscle. These specimens should be helpful in pointing to populations that should be given particular attention.

Biochemical examination of adductor muscle samples from sea scallops collected during Delaware II Cruises No. DE 80-05 and 80-07 and Albatross IV Cruise No. AL 80-08 has been completed, and the data have been analyzed. No biochemical stress was observed in the animals taken from stations distantly bordering the "mud patch" area, although glycogen levels were low in scallops at the northernmost stations above the mud patch. In the Gulf of Maine, a very slight degree of stress could be seen at station #392 at 155 m -- a slightly lower PK, a very slightly higher GDH, a moderately higher MDH, and low glycogen all produced the picture of a mild stress with which the animals were coping normally (PK:GDH ratio was above stress range). Most striking was the picture of low nutritional levels at the two deepwater stations (#392 and #398) as compared to the control, #303. One would normally expect glycogen reserves in the adductor muscle to be at their highest in mid-summer, just prior to the normal spawning season.

Scallop kidneys from the OPP survey on Kelez Cruise No. KE 81-04/05 were also completed, finishing the biochemical data collection from that cruise. These also have been analyzed, tabulated, and are being mapped.

Analysis of the tissues from the recent experimental exposure of scallops to 10 ppb Ag was also completed, and the data analyzed and tabulated. Both adductor muscle and kidney samples from the July and August sampling of an offshore New Jersey population were finished, in this continuing cooperative study with Sandy Hook Laboratory personnel.

Scallop samples from more recent surveys were also put through biochemical analysis and the data tabulated; Delaware II Cruise No. DE 81-01 (winter bottom trawl) was completed, and Cruise No. DE 81-02 (spring bottom trawl) is in process.

Blue mussels set out in a pollution gradient in Narragansett Bay in a cooperative study with EPA personnel had high mortality rates in late summer, probably because of abnormally early and high heat stress. Because of this our field study has moved to a series of consecutive monthly samplings, an experimental design that will be used for the entire 1982 seasonal field study. September and October samplings were completed.

Anaerobic Bacteriology

Activities for the 2-mo period included participation in the OPP survey on Albatross IV Cruise No. AL 81-10. Sediments from 56 stations and water from 14 were obtained for bacteriological analysis of Clostridium perfringens and Vibrio spp. Lab activity has been directed to the identification of the many bacterial isolates obtained from the samples. Other than an increase in bacterial numbers, as one would expect during the warmer summer months, the results obtained agree with those from previous cruises except for the fecal coliform counts in sediments from the dumpsite in the New York Bight. Counts were significantly lower in the top sediment than was observed at the same stations last year. No explanation for the low counts is apparent at present, but could be related to changes in the bacterial flora or to chlorination of the sewage sludge, which could affect the fecal coliform test.

A good portion of time was devoted to preparation of two manuscripts on the bacteriological aspects of ocean dumping for the ICES meeting and the Third International Ocean Disposal Symposium. The papers reviewed our work on the distribution of C. perfringens and Vibrio spp. as well as fecal coliforms in the dumping areas of the western Atlantic. EPA and FDA representatives attending the meetings expressed interest in the use of C. perfringens as an indicator organism, and in the methodology for enumeration.

Chemistry

Our task participated in the September OPP survey on Albatross IV Cruise No. AL 81-10, conducting physiology tests and collecting samples of windowpane and Atlantic rock crabs from six stations to supplement our ongoing sampling effort.

A new graphite furnace and auto sampler were received in late October. The new equipment will be installed and put into full use as soon as possible.

Personnel changes occasioned by the end of FY 1981 have proceeded smoothly.

Analyses of four metals on Atlantic rock crab samples collected at the Philadelphia Dumpsite in May 1981 were completed and the results were sent to Dr. Sawyer at the Oxford Laboratory who is collaborating in this study.

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AQUACULTURE DIVISION

Aspects of Nutritional Requirements of Mollusks Investigation

Experimental Cultures and Algal Stock

For some time we have been working on modifications in our standard algal growth medium with the aim of developing a more dilute and, consequently, more economical algal growth medium. A number of strains have been subcultured for about 2 yr in a dilute formulation. This formulation consists of a medium with greatly reduced concentrations of phosphate, nitrate, and vitamins. Serial subcultures of seven strains appear to be growing well over this long period of time. Experiments are now being conducted to compare the rate of growth and maximum populations achieved by seven strains of algae that were subcultured in the minimal medium during the past 2 yr. Results of experiments to date indicate that in the

dilute medium, higher maximum populations are reached than in the standard medium for Isochrysis galbana and Monochrysis lutheri, but populations in more dilute medium are slightly reduced for Dicrateria inornata, Pseudoisochrysis paradoxica, and Phaeodactylum tricornutum. However, in the minimal medium there was a drastic reduction in populations of Dunaliella euchlora and Tetraselmis maculata. This line of investigation will require many additional studies to understand the impact of the individual ingredients of the medium and to develop an economical growth medium that will support good growth of many different species.

Various stock cultures and special strains that are being held for future use were subcultured, although not on schedule. Due to our recent loss of cooperative education program student personnel, there is about a 2-wk delay in the sub-culturing procedures.

Oyster Rearing

During this past summer we have had little success in rearing American oyster (Crassostrea virginica) larvae to metamorphosis except for the last batch of fertilized eggs produced. A solution of Sulmet (commercial preparation of sulfamethazine) was added to this latter batch of developing eggs and each day throughout larval development. With this treatment the larvae remained healthy and setting occurred at the appropriate time. These spat are being held in basins of seawater at room temperature, the seawater changed and oysters fed daily. Other larger spat are also held in basins and being cared for daily, until such time as we will be prepared to conduct additional feeding studies.

Semicontinuous Algal Cultures

During the period covered by this report, the harvest of algal larval foods from culture carboys was 3402 liters and that of juvenile algal foods was 1884 liters. Requests for algal foods from two Investigations were satisfied as follows: Spawning and Rearing of Mollusks, 2379 liters; and Aquacultural Genetics, 2149 liters.

Axenic algal cultures were sent upon request to Dr. David Egloft of Oberlin College in Ohio, and to Mr. John Bayes of the Seasalter Shellfish Hatchery in Kent, England.

Spawning and Rearing of Mollusks Investigation

A major effort to determine the feasibility of bay scallop (Argopecten irradians) culture in a three-dimensional lantern net system was initiated in early July. The nearly 40 000 bay scallops with a minimum shell height of 20 mm required for this test were produced in-house from a spawning in April using hatchery and raceway technology developed here. In the lantern net experiments, scallop growth, mortality, and adductor muscle yield at densities between 100 and 2500/m² are being investigated, as well as are various handling strategies. Although final samples will not be taken until November, interim observations indicate that single-season growth to market size is obtainable in this type of intensive culture system.

Some effects resulting from different experimental combinations of temperature and nutrition have been observed in the study of gametogenic processes of the surf clam (Spisula solidissima). Histological methods and measurements of changes in weight and length were used to determine the physiological response of clams to the

interactions of temperature, ambient phytoplankton levels, and supplementally provided cultured algae. Surf clams held at ambient seawater temperatures maintained early developing gonadal cells from the previous season. Surf clams held at 15°, 18° or 21°C underwent resorption of these cells. Clams held at ambient temperatures developed mature gonads earlier than those at elevated temperatures. Somatic growth was least pronounced at ambient temperatures, indicating that energy was diverted toward sexual development. Somatic growth was greatest in clams held at 15°C, while gonadal development was slower than those clams held at ambient temperatures. Significant somatic growth occurred in clams at 18° and 21°C; however, they remained sexually immature for most of the experiment. Only slight effects were observed due to the addition of supplemental cultured algae, possibly indicating insufficient quantity. Ambient phytoplankton levels appear to have been too low to support precocious gonadal development at elevated temperatures.

Aquacultural Genetics Investigation

Genetics and Breeding of the American Oyster

A. Longwell and S. Stiles attended the annual ICES Statutory Meeting held at Woods Hole in October. S. Stiles summarized recent work on oyster genetics and breeding done at the Milford Laboratory, and also prepared a poster on the subject. This included the two-way selection experiment for growth, inbreeding, and hybridization results.

As a member of the Mariculture Committee, A. Longwell invited several US papers on mariculture genetics and other aspects of mariculture for presentation at the meeting. Invited papers were intended to cover a range of topics of particular current concern to the Mariculture Committee or its Working Groups, or demonstrate different current aspects of American efforts in mariculture. These were: C. Brown (Milford) on bacterial diseases in shellfish larval culture; E. Rhodes (Milford) on bay scallop culture; H. Hidu (University of Maine) on European oyster culture in Maine; S. Allen and J. Stanley (Maine Cooperative Fishery Research Unit) on induced parthenogenesis in fish and shellfish; H. Kincaid (US Department of Interior) on inbreeding in trout; O. Smitherman (Auburn University) on selection experiment for growth rate in catfish; J. Lindbergh (Domsea Farms) on establishing runs of Pacific salmon in Chile; B. Allee (Oregon Aqua-Foods, Inc.) on development of salmon broodstock programs; D. A. Erdahl *et al.* (University of Minnesota) on cryogenesis of gametes and zygotes for mariculture; S. Rideout (US Department of Interior) on restoration of Atlantic salmon to the Connecticut River basins. Other US papers were invited by Mariculture Committee member Dr. John Ryther. Prof. H. Haskin (Rutgers University) also attended the meeting as an invited guest, and met with various Committee members.

A. Longwell presented the report of the Working Group on Genetics to the Mariculture Committee. In view of the presence of so many persons at the meeting concerned with Mariculture Genetics, and in response to A. Longwell's remark about the practical difficulties of getting adequate representation of diverse US aquaculture groups, Chairman K. Tiews asked that these persons meet impromptu one evening. This was for further discussions of matters concerning the Genetics Working Group.

Cytological and Cytogenetic Measures of Marine Pollution Effects

While data on micronuclear incidences in circulating blood of the 600 window-pane sampled from about seven sites in Long Island Sound and the New York Bight are being examined statistically, field sampling emphasis has shifted to the hematopoietic tissue of the kidney. Examination of the sperm of both finfish and shellfish reveals that sperm-shape abnormalities can be reliably recognized in these groups. Such fish are then potential candidates for application of the sperm mutation test. Experimental work is underway to assess further the reliability of the test as applied to particular marine species.

By participating in a joint project with Dr. H. Rosenthal (West Germany's Biologische Anstalt Helgoland), yolk-sac membranes of Atlantic mackerel embryos are being examined for chromosome abnormalities. This project is an effort to demonstrate any correlation between gonad contaminant levels, hatchability, and other measures of egg performance. These samples are from the northern contingent of mackerel, and were sampled with the cooperation of scientists at the Canadian Bedford Institute of Oceanography. This is the first opportunity we have had to examine mackerel eggs stripped from fish as all our other extensive experience has been with eggs sorted from plankton. The material provided confirms our early impression that the yolk-sac membrane, at least of some pelagic marine eggs, is fine material for cytologic study.

An effort has begun with other Divisional researchers to rear closed populations of nearshore and offshore amphipods continuously over many amphipod generations. This is for genetic-oriented study of their eggs, mature sperm, and embryos.

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PATHOBIOLOGY DIVISION

Special Note

We are sorry to have to report the death of Mr. James B. Engle, former Director of the Oxford Laboratory. Mr. Engle was known nationally and internationally for his research in shellfish biology and conservation. He will be sorely missed by his many friends and colleagues.

Fish Pathology Investigation

Protocols were written for recording observations and collecting and processing tissues from fishes obtained on bottom trawl surveys conducted by the Resource Assessment Division. Mr. John Ziskowski has been on the Delaware II since 5 October. Upon completion of the fall survey, we will know if the procedures instituted are feasible and can provide useful information to monitor fish health. If the data are not useful, we will reevaluate the problem and modify our protocols in time for the spring survey.

On 24 September, flatfishes for the hepatoma study were sampled from the Arthur Kill. No significant hepatic lesions have been found in the fishes sampled to date (23 July, 20 August, and 24 September). The slides will be reexamined to determine if melanin-macrophage centers are larger and more abundant in bottom fishes inhabiting a severely polluted environment than in bottom fishes inhabiting unpolluted environments.

The second edition of the "Catalog of Slide Accessions of the Registry of Marine Pathology" (ROMP) was completed and is being forwarded to domestic and international scientists engaged in studies of diseases of marine fishes, crustaceans, and mollusks. The catalog is cross-indexed by host, disease, and pathogen; it lists 357 slide accessions and is 94 pages long. The ROMP catalog is the culmination of considerable effort directed to the acquisition, examination, and description of slides exhibiting lesions induced by infectious and noninfectious agents.

A manuscript titled "Results of an Initial Survey to Evaluate Fish Health in the Western North Atlantic" (Despres-Patanjo and Murchelano) was submitted to the Marine Environmental Quality Committee of ICES. The paper was presented at the Statutory Meeting in Woods Hole by Ms. Despres-Patanjo on 9 October.

In an effort to develop a tool for monitoring viral infections in clupeid populations, three new primary cultures of Atlantic menhaden cells were established in cooperation with the USFWS's National Fish Health Laboratory at Leetown, West Virginia. These cells are now in their second or third passage and consist of menhaden fin, heart, and kidney cells. All are growing very well. Initial attempts to isolate virus from moribund menhaden which had been collected during the most recent epizootic were not successful. Attempts to produce a cytopathic effect (CPE) using the VR 199 strain of infectious pancreatic necrosis virus (IPNV) also failed. The cells are presently undergoing testing using homogenates of menhaden tissues from which IPNV was originally isolated by Stephens and Hetrick at the University of Maryland. If CPE is not produced with this inoculum, the cells will be stained using acridine orange to determine if virus is replicating in the cultures.

Data on 5000 Ammodytes sp./spp. radiographs have been entered into a computer data bank. It was decided to add a new category to the data tabulations during the examination of the 1981 collections. This will necessitate the updating of previous years' entries to include the new category. As soon as this is accomplished, the data will be ready for statistical testing for correlation of the prevalence of anomalies with geographic location, depth, or other parameters.

A thorough light microscopic examination of olfactory tissues of striped bass larvae exposed to 75 and 150 ppb of Cu⁺⁺ (lethal doses within 24 hr) did not reveal any visible lesions. Previous scanning electron microscopic examination of the surface of the olfactory tissue in comparably treated larvae also failed to disclose any severe changes. These results contrast markedly with those presented in a paper describing the effects of copper on the olfactory tissues of haddock and winter flounder larvae [Bodammer, J. E. The cytopathological effect of copper on the olfactory organs of larval fish (Pseudopleuronectes americanus and Melanogrammus aeglefinus). Int. Counc. Explor. Sea, Comm. Mem. 1981/E:46]. The lesions produced in the sensory tissue of these larval species were readily discernible and have been described in detail in previous reports. Different larval fish species, therefore, may demonstrate unique responses to this heavy metal contaminant. In addition to examining a certain proportion of the specimens for olfactory lesions with transmission electron microscopy, we are also evaluating the effects of copper on the structure of the cornea and neuromasts from the developing lateral-line system.

Since the integrity of the olfactory organ, with its demonstrated sensitivity to various contaminants, may be affected by environmental pollutants, a sampling protocol for butterfish has been implemented on the bottom trawl surveys. Olfactory tissues from butterfish collected at various strata throughout their range are being preserved for light microscopic examination.

Microbial Ecology and Parasitology Investigation

Data on "black gill" condition in Atlantic rock crabs (Cancer irroratus) during fiscal year 1981 were analyzed and summarized to provide comparative information on the incidence of the condition monitored in fiscal year 1980. Among 888 crabs collected from Sandy Hook Bay and ocean waters in fiscal year 1980, it was found that 76% had clean gills and only 2% showed evidence of blackening. In contrast, fiscal year 1981 data showed that among 604 specimens, 85% had clean gills and 4% had evidence of blackening. The 2-to-4% increase in blackening was due to the selection of a new collection site referred to as "Mud Hole." The new site situated at the head of the Hudson Valley shelf yielded sediment samples that ranged in character from black mud and silt to dirty brown sand and black silt. Bacteriological studies by collaborating investigators showed that, except for one station positive for total coliforms, all stations were negative for sewage-associated coliforms, although sediment characteristics were similar to those observed at sewage disposal sites. We suspect that the new sampling site which ranges up to 60 m deep is a deep trough that progressively is becoming filled with drifting sludge that is rich in dead or decaying organic matter. The site was selected for study since our historical collection site near Ambrose Light consistently has yielded very small numbers of crabs per trawl effort in recent years. Findings at the "Mud Hole" in May 1981 showed that 21/66 specimens had slight blackening of the gills and illustrated the need for new surveys in the Bight apex to verify our suspicions that spatial modifications in the distribution of C. irroratus have occurred in recent years. Preliminary histological observations on 31 specimens caught at the "Mud Hole" have shown that an unidentified probable microsporidian parasite that rarely has been observed in crabs from our historical stations is present in large numbers of crabs caught at the new site. Since the complete life cycle for many protozoan diseases of marine animals is incompletely known, it is not possible to speculate on any association between pollution effects and the incidence of the probable microsporidian. Attempts will be made this year to locate other sites within the

Bight apex that have the same physical and chemical characteristics found at the "Mud Hole", and to sample C. irroratus for evidence of the disease. Monitoring efforts during fiscal year 1981 support our earlier contention that there remains a critical need to resurvey historical grid stations of the NOAA Environmental Research Laboratories' Marine Ecosystems Analysis Program for evidence of spatial changes in the distribution of the benthic biota.

Cooperative work with other elements of NOAA, the EPA, and the FDA allowed us to participate in a recent "recovery" phase cruise to the Philadelphia dumpsite. Stations sampled ranged northward to the New York Bight disposal site and included an east-west transect across the "Mud Hole" trough which earlier was sampled for C. irroratus. Two stations located within the trough yielded black mud-silt bottom sediment indicative of sludge accumulation, and one of them yielded a low count for coliforms. Four species of Acanthamoeba were isolated at the two stations and one of them yielded amoebae from five of six culture dishes. It has been shown that Acanthamoeba will thrive on bacteria whether alive or killed by autoclaving. Our findings at the "Mud Hole" suggest that the amoebae are excellent indicators of bacterial loading in the environment regardless of whether test stations harbor viable sewage bacteria or those that are dead. Amoeba culture studies will be conducted away from sewage disposal sites whenever bottom topography shows swales or sinks in which sediment characteristics reflect high organic loading.

Comparative Invertebrate Pathology Investigation

More than 100 samples of ovaries and pleopods from the blue king crab, taken during fall and winter sampling periods, have been received from the NMFS Kodiak Laboratory. These have been prepared for histological processing, and will be studied as part of an informal cooperative project with personnel of the Kodiak Laboratory.

Analysis of data gathered on parasites and abnormal conditions in amphipods collected during three 1980 and two 1981 Ocean Pulse Program surveys continues. Material from the July 1981 survey is now available for histological examination. Following study of that material, it will be possible to compare amphipod populations, parasites, etc., seasonally at certain key stations over the 2-yr period.

In order to gain more information on pathologic melanization in crustaceans, as related to industrial waste disposal, Northeast Monitoring Program managers suggested that zooplankton collected from the vicinity of the expired New York Bight acid-waste dumpsite be examined for occurrence of melanization. Samples collected from this area were obtained for examination through the cooperative efforts of NEFC's MARMAP surveys and cytogenetic studies. Planktonic crustaceans sorted from the MARMAP bongo net tows were 433 mysids (Neomysis sp./spp.), 24 hyperid amphipods, and 55 caridean shrimp (Crangon septemspinosus). Only the isopod Idotea metallica (13) was taken from the cytogenetic studies. Gill melanization was not apparent in any of these crustaceans, although areas of cuticular melanization were observed in both mysids and Crangon; two mysids and three Crangon showed melanization in association with missing appendages, and 10 (18%) Crangon had melanization at the tips of appendages, on the uropod, or at the joints of appendages or abdominal segments. Gross examinations of the amphipods and Idotea yielded unremarkable results.

Pathologic melanization has been reported as "shell disease" in Crangon from Raritan Bay (30%) and the New York Bight (15%), and was suggested to be a result of chemical pollution in the water (Gopalan and Young 1975). The present examination finds a similar prevalence of cuticular melanization in New York Bight specimens of Crangon and suggests the problem may still exist, but chemical analyses of water in the area are needed to suggest any correlation of pathologic melanization and chemical pollutants. Crangon typically is found close to the bottom, and the lack of melanization in other crustaceans of these samples (other than that in mysids associated with missing appendages) suggests that sediment pollution loads may play a part in the presence of melanization in Crangon.

Quarterly samples of blue mussels (Mytilus edulis) were received from Searsport, Maine; Clark Cove, Damariscotta River, Maine; Sandwich, Massachusetts; Falmouth, Massachusetts; and Wachapreague, Virginia; they are being processed.

Archived and current data from coastal sites were evaluated and mapped for eight conditions in American oysters (Crassostrea virginica). These were inflammation, poor condition, mantle recession, presence of mutagens in tissues, green color, and three parasitic diseases. Interestingly, two parasites (i.e., Nematopsis and Rucephalus) are absent from the most polluted sites. Green color and inflammation correlate with heavy metal (i.e., copper) contamination generally occurring in heavily populated sites in estuaries.

Considerable time has been devoted to developing data processing systems for molluscan and ocean mollusk pathology. Data dictionaries have been developed for 30 categories of data encompassing all known entities involving pathology, parasitology, organ systems, and physical data. Items have been recoded and reformulated for more adaptable usage in the NEMP data system.

A cooperative project has been developed with personnel from Tufts University Veterinary College involving the soft-shell clam (Mya arenaria) neoplasm common in the New England area. A sample of clams from Falmouth, Massachusetts, was processed at the Oxford Laboratory for training purposes and to attempt to diagnose neoplasms. Tufts is expected to provide disease diagnostic services for the Massachusetts Division of Marine Fisheries and attempt to establish tissue culture with neoplastic clam cells. The Oxford Laboratory will provide electron microscopy backup to attempt visualization of the etiologic agent, presumably a virus.

With the help of John LeBaron of the Sandy Hook Laboratory, programs have been written to enter, store, and retrieve data in a manner compatible with other NEMP programs. Using these programs as examples, other staff members are developing similar methods to enter their data into the system.

Over 2500 specimens of marine finfish and shellfish were received into the Division's histology lab and approximately 1200 sections were prepared and distributed to pathologists for microscopic examination.

Diseases of Larval Mollusks Investigation

Additional experience with a novel chemical-spectrofluorometric method for quantifying American oyster cells in monolayers has improved the experimental data for the technique. It was found that the pH at which cells were lysed, prior to

addition of the fluorogenic reagent, influenced the eventual fluorescent intensity of reaction mixtures measured at pH values of 6.0-9.5. Demonstration of the effects of pH, protein protective agents, and variation in cell numbers as well as cell sources is continuing in preparation for publication of the technique.

Analysis of a simplified system for identification of marine bacteria is nearing completion. A modification of the Minitek biochemical differentiation system has now been applied to 65 bacteria in parallel with conventional testing techniques. After filling in a few data gaps for instances where organisms failed to grow or results were equivocal, this work will be ready for collation and publication.

Two microbial challenges against American oyster larvae to test for pathogenicity were completed on 1 and 9 September; these will be the last for this year. A total of 60 bacterial isolates were tested; 30 from the 12 June survey off Stratford, Connecticut, and 30 from the 29 June survey off Stratford. The isolates used from 29 June (challenged on 1 September) were not pathogenic. Due to poor oyster egg development, the 12 June samples (challenged on 9 September) had poor percent survival and the challenge must be repeated in January 1982.

On 8 September, the Investigation received 12 bacterial plates and live European oyster (Ostrea edulis) larvae (10-days old) from Marine Bioservices in High Island, South Bristol, Maine. The larvae were examined for abnormalities or mortality; none were seen. Counts of the plates were completed and 23 isolates were taken. In addition, six isolates were taken from disassociated O. edulis larvae that had been plated. These 29 isolates were subjected to five biochemical tests to determine their genus which is as follows: 12--Pseudomonas, 15--Vibrio, and 2--Achromobacter. In addition to this information, which was forwarded to Marine Bioservices on 30 September, some disinfection tests using pH adjustment were completed on the above isolates and on other pathogens isolated from the Maine hatchery in 1980.

A shellfish pathogen, coded CA10, isolated from International Shellfish Enterprises in Moss Landings, California, has been subjected to selected biochemical tests to confirm the stored isolate's identity. With confirmation complete, it will be submitted to DNA base-pair ratios analysis. This information will help complete the data needed to publish the paper, "Isolation, Characterization and Control of a Vibrio sp. Pathogenic to Crassostrea virginica and Ostrea edulis Larvae."

Characterization of the exotoxin produced by a Vibrio sp. is continuing. Partially purified toxin has proteolytic and amylase activities; these activities, however, have not been demonstrated in the purified exotoxin. No glycolipids could be detected using thin-layer chromatography and an aniline-diphenylamine-phosphoric acid reagent. Protein was detected using the Lowry method for protein determination. Bacteriostatic property of the toxin was tested and it appears that the purified material contains a vibriocin. Large quantities of the filtrate are being prepared for further testing.

Fertilized American oyster eggs were exposed to the purified exotoxin and to other fractions of the partially purified toxin. Only the purified exotoxin was detrimental to oyster embryonic development. Calculations suggest that less than 48.6 μ g of purified toxin represents the required LC₅₀ value for a 1-liter oyster embryonic culture containing about 15 000 embryos.

Data from an ultraviolet (UV) light radiation study on pathogens of clam larvae suggest that three of the four isolates were sensitive to exposure to UV light. The data from the fourth isolate are inconclusive and further testing must be done.

A nonvirulent mutant of a pathogenic red pseudomonad became invasive in the presence of the toxic pigment of the parental strain. The data show that invasiveness was a secondary factor in the disease process; invasion occurred only after oyster larvae were weakened by the pigment.

Bacteriological study comparing two types of bacteriological media for growth enhancement is continuing. The data demonstrate that although estuarine agar plates yield higher counts (except during July and August), the seawater agar yield a greater variety of colonies. Pigmented colonies and agar digesters predominated during late spring and early summer.

Additional paralytic shellfish poison (PSP) purification work has been done with Dr. Kuck from Fairfield University. Chromatographic separation of PSP in surf clams (Spisula solidissima) was used for the 50-mouse assay. Fluorescence and toxicities were calculated and it appears that the samples have lost their toxicity in either the separation process itself or in the lapse of time since originally collected.

Publications

Brown, C. A prodiginine pigment toxic to embryos and larvae of Crassostrea virginica. J. Invertebr. Pathol. 38:281-293;1981. (P)

Greig, R. A.; Sawyer, T. K.; Lewis, E. J.; Galasso, M. E. A study of metal concentrations in relation to gill color and pathology in the rock crab, Cancer irroratus Say. Bull. Environ. Contam. Toxicol. (A)

Sawyer, T. K.; Lewis, E. J.; Galasso, M. E.; Greig, R. A.; Ziskowski, J.; Pacheco, A.; Gorski, S. Gill condition in the rock crab, Cancer irroratus, as an indicator of ocean health. Third Int. Ocean Disposal Symp., Prog. Abstr. 1981:57. (Abstract.) (P)

NATIONAL SYSTEMATICS LABORATORY

Pelagic Fishes Investigation

Progress was made on the revision of the Spanish mackerels, counts and measurements were made and a complete dissection of a specimen of Scomberomorus sinensis from Hong Kong was done. Material of all 18 species in the genus has now been dissected, and writing on sections on the anatomy has begun.

A study of scombroid copepods that began 25 yr ago on board the Delaware I was completed and submitted to the Fishery Bulletin (US). A total of 46 species of copepods were found on the 47 species of Scombrinae. Occurrence of copepods on Spanish mackerels has been useful in working out the evolutionary history of several species groups.

Anchovies housed at the Field Museum of Natural History in Chicago were surveyed in preparation for taxonomic work on the family.

Several sections of a revision of the needlefish genus Potamorrhaphis were written.

Benthic Fishes Investigation

A preliminary draft was completed of a review of the cusk eel genus Sirembo, with the description of a new species.

Reviewed and re-identified were segments of the US National Museum's (USNM) gadid collection. Data were taken on South American specimens of the hake genus Urophycis.

Crustacea Investigation

A revision and extension of Austin Williams' 1965 publication on "Decapod Crustaceans of the Carolinas," [Fish. Bull. (US) 65:1-298] was completed and submitted to the Smithsonian Press for publication as a book. The text treats 341 species in 46 families that occur on the continental shelf to a depth of 190 m. Following an introduction that gives a brief history of decapod crustacean studies in the region, a comparison of classification systems, and a zoogeographic summary, illustrated accounts for each of the species are introduced by keys for identification of families, genera, and species. Each species account treats synonymy, recognition characters based on specimens in the USNM, measurements, observed variation, color if known, habitat, type locality, known range, and a documented resume of biological information, exclusive of physiology and biochemistry. Selected literature is surveyed through 1979, with a few subsequent references. There are 379 figures, mostly line drawings. An extensive bibliography and indexes to illustrations, species, and synonyms round out the presentation.

A manuscript describing a new genus and species of caridean shrimp from the thermally influenced Rose Garden area of the Galapagos Rift zone was also completed. Characters of this form indicate placement in the family Bresiliidae which is re-defined. A key to its five genera is given. Many illustrations are included.

In collaboration with biochemists from the Duke University Marine Laboratory, the "forms" of the mud crab Panopeus herbstii are being reevaluated on the basis of hemocyanin electrophoretic patterns, morphology, habitat, and food habits. A draft manuscript is in preparation which treats the relationship of the published names for the "forms" to these factors.

Penaeoid Shrimp Investigation

The final draft of a manuscript on a new species of penaeoid shrimp was completed. The specimens, which represent the first record of the occurrence of the genus Mesopenaeus in the Indo-West Pacific, were taken on Saya de Malha Bank and off Mozambique. The data available suggest that this shrimp may be present in commercial quantities and that it is already taken, although in small numbers, during spiny lobster trawls and trap fishing.

A systematic revision of the American Pacific rock shrimps (genus Sicyonia) is in progress. These shrimps, which were previously discarded by the commercial trawlers operating in many areas from the Gulf of California to the Gulf of Guayaquil, are now being marketed in large quantities. Little information is available for the identification of the species, most of it found in difficult-to-obtain publications; their morphology is poorly known, many of the taxonomic characters of some species have never been properly described or illustrated. In addition, data on the distributional pattern of the 12 Sicyonia found in the region are very limited. In order to facilitate the task of both field workers and researchers, detailed morphological studies are being made, intraspecific variation and species relationships are being examined, and bathymetric and geographic records are being assembled. Numerous illustrations are also being prepared.

Scientific Services

A grant proposal was reviewed for the American Philosophical Society. Manuscripts on the type-specimens of fishes at the Academy of Natural Sciences in Philadelphia (sections on the families Scombridae, Belonidae, Hemiramphidae, Batrachoididae, and Percidae) and on the description of a new genus of gempylid were reviewed for the authors. Manuscripts were reviewed for Journal of Crustacean Biology (2), Fishery Bulletin (US), Smithsonian Contributions to Zoology, and Estuarine and Coastal Marine Science.

Identifications were made of palaemonid shrimps for L. P. Rozas of the University of North Carolina at Wilmington; xanthid and majid crabs from Brazil for S. Harris of the University Federal in Rio de Janeiro; anomurans and brachyurans from Tobago for the North Carolina State Museum; shrimps and crabs for the Ministry of Agriculture, Lands, and Fisheries in Tobago and Trinidad; Munida, calappid, and goneplacid crabs from Lydonia and Veatch Canyon for C. Grimes at Rutgers University; and a halfbeak from Palau for the National Geographic Society.

Correct common and scientific names were supplied for: two Panamanian shrimps for W. Rathjen of the Northeast Regional Office and for the Panama Council in New York; five clams, mussels, and snails from Chile and crabs from the eastern Pacific for S. Kaplin of the Southwest Regional Office Market News Branch in Terminal Island, California.

Information on the breeding seasons of four species of estuarine crabs from the Northeast Atlantic plus general information on larval development of Pacific spider crabs was provided to T. Hines of the Smithsonian Chesapeake Bay Center. Information on the Lerner Marine Laboratory in Bimini was furnished to A. Seamons of the Heritage Foundation. Advice on Red Sea halfbeaks and needlefishes was given to John E. Randall of the Bishop Museum. Radiographs of European perch were examined for Hugh MacCrimmon of the University of Guelph. Identification of a bonito on a stamp was furnished to the Franklin Mint. Technical assistance on shrimps was provided to Lic. Emilio Macia Regalado of the Instituto de Ciencias del Mar y Limnología in Mexico D.F., Mexico.

Publications

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- Yabe, M.; Cohen, D. M.; Wakabayashi, K; Iwamoto, T. Fishes new to the eastern Bering Sea. Fish. Bull. (US). 79(2):353-356;1981. (P)

ATLANTIC ENVIRONMENTAL GROUP

Ocean Monitoring and Climatology Task

The cooperative Ship of Opportunity Program obtained 11 expendable bathythermograph (XBT) transects and three continuous plankton recorder (CPR) transects in September-October: three XBT and one CPR transects in the Gulf of Maine, one XBT transect off Southern New England, five XBT and two CPR transects across the shelf and slope off New York, and two XBT transects across the Gulf of Mexico. The undulating oceanographic recorder (UOR) was deployed on one of the New York-Bermuda runs of the M/V Oleander with poor results. Flooding occurred in a pressure case containing electronic circuitry, and a shear pin on the power-supply propeller broke. It is apparent after two failures that the flat-sided pressure cases with flat gaskets provided by the manufacturer of the UOR are not reliable. Consequently, we are trying to reconfigure the electronics circuits to fit into a standard cylindrical pressure case with O-ring seals before redeploying the UOR with all systems in operation. Also, we are modifying the power-supply propeller before the next deployment of the instrument.

The announcements on pages 51 and 52, showing eddy conditions in the Georges Bank-Middle Atlantic Bight area, were sent to the Commander of the Atlantic Area for the US Coast Guard for publication in the October and November 1981 issues of Atlantic Notice to Fishermen. Near real-time information on the location and configuration of warm-core ring 81-D was provided to the Albatross IV during two cruises in late September and early October that collected data on offshore eddy entrainment of shelf water. The information was sent in the form of traced and geographically gridded satellite infrared imagery via the radio facsimile transmitter at the University of Rhode Island. Information was also provided to the scientific party on the Endeavor while it worked in ring 81-D. The agreement between the satellite-derived maps and ship observations was considered good, allowing the scientists to locate and make measurements in the desired ring features.

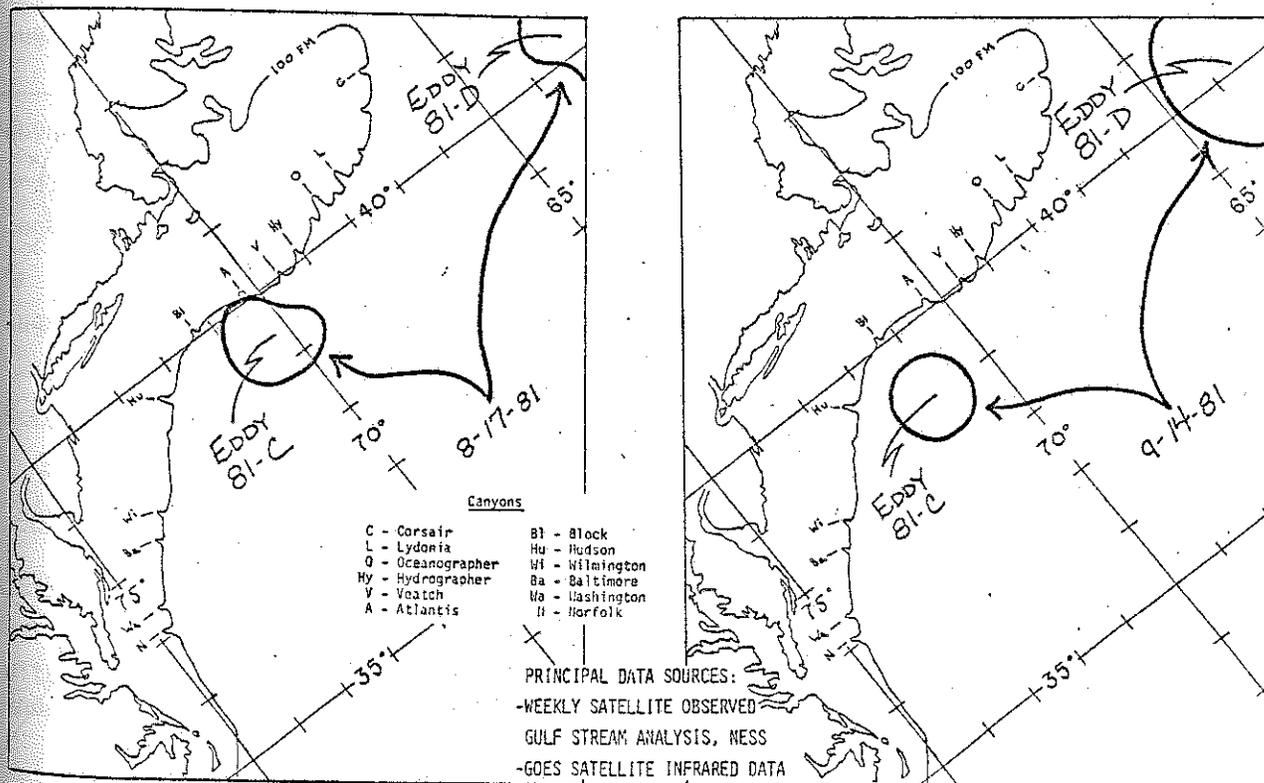
GULF STREAM EDDY LOCATIONS

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

Eddy 81-C moved southwest about 78 km (42 nm) to a center position at 39.1°N, 71.2°W, south of Block Canyon. Eddy 81-D traveled about 128 km (69 nm) to the west and is centered near 40.1°N, 63.8°W. This eddy is now located southeast and far offshore of the 100 fm line.

During the next 30 days Eddy 81-C may move southwest to a position south of Hudson Canyon. Eddy 81-D may move west to a center location 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).



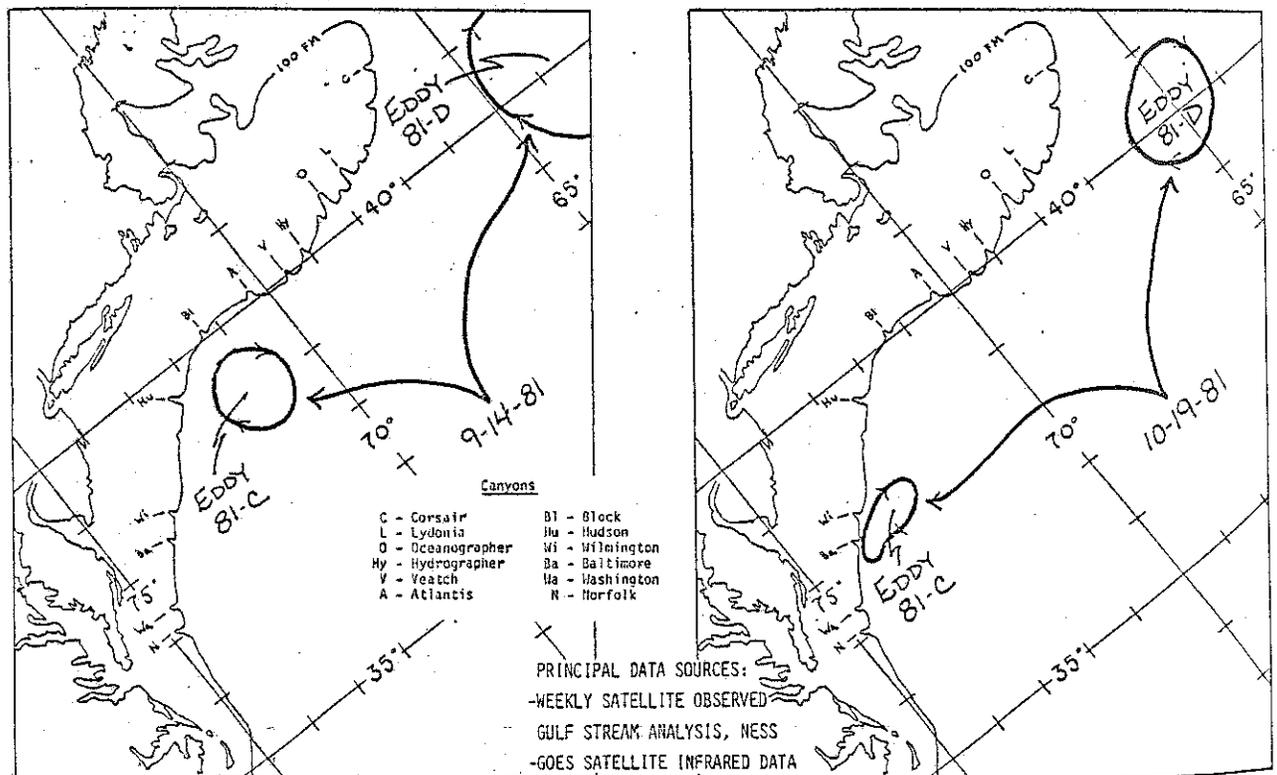
GULF STREAM EDDY LOCATIONS

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

Eddy 81-C traveled about 214 km (116 nm) to the southwest and is now being resorbed by the Gulf Stream east of Baltimore Canyon. The eddy remnants are located at 38.2°N, 73.3°W. Eddy 81-D moved west about 111 km (60 nm) to a center position at 40.2°N, 65.1°W, southeast of Corsair Canyon.

During the next 30 days Eddy 81-C may be completely resorbed by the Gulf Stream east of Baltimore Canyon. Eddy 81-D may move west along the outer continental shelf edge to a center position south of Lydonia 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).



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- Crist, R. Wylie; Chamberlin, J. L. Bottom temperatures on the continental shelf and slope south of New England during 1979. Ann. Biol. 36:25-28;1981. (P)
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- Fitzgerald, J. L.; Chamberlin, J. L. Anticyclonic warm core Gulf Stream eddies off the northeastern United States during 1979. Ann. Biol. 36:44-51;1981. (P)
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- Hilland, J. E. Variation in the shelf water front position in 1979 from Georges Bank to Cape Romain. Ann. Biol. 36:34-36;1981. (P)
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- 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. 36:15-25;1981. (P)
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- Ingham, M. C. Weather conditions and trends in the Maine-Virginia coastal and offshore area during 1970-79. Northw. Atl. Fish. Org., Sci. Stud. (S)
- McLain, D. R.; Ingham, M. C. Sea-surface temperatures in the northwestern Atlantic in 1979. Ann. Biol. 36:29-33;1981. (P)

TRAVEL, MEETINGS, AND PRESENTATIONS

Resource Assessment Division

On 1 September, Brad Brown, Mike Sissenwine, Emory Anderson met in Woods Hole with members of a Cuban delegation to discuss possible US-Cuba fisheries research. Anne Lange met with members of the delegation to discuss joint squid research.

On 3 September, Emory Anderson met with the Northeast Regional Director and members of its Fishery Management Division in Gloucester to discuss an upcoming Mid-Atlantic Fishery Management Council (MAFMC) meeting.

On 8 September, Fred Serchuk met with Guy Marchesseault of the NEFMC to discuss data requirements for the Draft Fishery Management Plan for Atlantic Sea Scallops.

On 8 and 9 September, Emory Anderson attended a meeting of the MAFMC in Philadelphia, Pennsylvania.

During 8-12 September, Anne Lange attended a meeting to discuss international squid research in Halifax, Nova Scotia.

On 9 September, Mike Sissenwine attended a meeting of the NEFMC's Scientific and Statistical Committee.

During 13-16 September, Mike Sissenwine attended a Center Board of Directors meeting.

During 14-16 September, Brad Brown attended the Executive Board meeting and the opening session of the American Fisheries Society at the national meeting held in Albuquerque, New Mexico.

During 14-17 September, Vaughn Anthony, Mike Sissenwine, and Gordon Waring attended the NAFO annual meeting in Halifax, Nova Scotia. Gordon presented a paper on Atlantic herring tagging results and Vaughn presented a paper on the use of meristic characters as stock discriminators of Atlantic herring at a meeting of the Ad Hoc Herring Working Group.

On 22 and 23 September, John Boreman conducted workshops on striped bass aging and tagging at Stony Brook, New York, in cooperation with the New York Department of Environmental Conservation. Stu Wilk attended the tagging workshop held on 23 September.

On 24 September, Stu Wilk convened a workshop on sciaenid biology at Stony Brook, New York, sponsored by NMFS and the Atlantic States Marine Fisheries Commission. The meeting was also attended by Emory Anderson.

On 24 September, Charles Byrne attended the Sciaenid Workshop held at the State University of New York at Stony Brook in the company of other Division personnel.

On 29 September, Emory Anderson and Brad Brown met in Woods Hole with Jack Suomala of C. S. Draper Laboratory to discuss proposed US-Poland Atlantic mackerel hydroacoustic research. Andrezey Paciorowski, a visiting Polish scientist, also attended.

During 5-7 October, Stu Wilk attended the 40th Annual Meeting of the Atlantic States Marine Fisheries Commission in Charleston, South Carolina, and presented a paper titled "Weakfish-Prospectus for Management."

On 2 October, Mike Sissenwine and Brad Brown met with George Grice and other Woods Hole Oceanographic Institution staff to discuss cooperative research programs.

During 5-9 October, members of the Resource Assessment Division attended various sessions of the 69th Statutory Meeting of ICES held in Woods Hole. Papers were presented by Louise Dery, Steve Murawski, and Ralph Mayo. John Ropes provided a poster display on ocean quahog growth determination. Karen Johnson served as rapporteur for one session of the Demersal Fish Committee.

On 12 and 13 October, Emory Anderson met with Dr. B. Bragonik and Dr. J. Dopiela of the Polish Sea Fisheries Institute to discuss possible American-Polish Atlantic mackerel research to be conducted in February and March 1982.

On 15 October, Linda Patanjo presented a paper titled "Fish Diseases of the Western North Atlantic" at the 69th Statutory Meeting of ICES held concurrently at both the Marine Biological Laboratory and Woods Hole Oceanographic Institution. Other members of the Resource Surveys Investigation also attended these meetings as guests.

During 16-18 October, Gordon Waring, Ralph Mayo, and Loretta O'Brien attended the Atlantic Fisheries Biologists meeting in Greenport, Long Island, New York.

On 26 October, Fred Serchuk met with Howard Russell of the NEFMC to discuss sea scallop biological data to be included in the Draft Fishery Management Plan for Atlantic Sea Scallops.

On 29 October, Emory Anderson met with Beth Amaral and Arnold Carr of the Massachusetts Division of Marine Fisheries to discuss status of the bluefish resource.

On 30 October, Fred Serchuk attended a Surf Clam/Ocean Quahog Subpanel meeting in Dover, Delaware.

Mike Campbell attended a meeting of the Massachusetts Marine Educators Association in Boston.

Marine Ecosystems Division

On 1 and 2 September, Ken Sherman attended meetings at the NOAA Environmental Research Laboratories in Boulder, Colorado.

On 3 September, Ken Sherman met with Tudor Davies, Robert Oglesby, and Rick Lattimer (EPA) regarding cooperative research. He then met with Don Miller and Bob Payne (EPA) regarding joint research on the health of coastal ecosystems.

On 4 September, Ken Sherman traveled to Woods Hole for a meeting with Bob Edwards and Tudor Davies.

On 4 September, Donna Busch, Jack Green, Ray Maurer, Tom Halavik, Peggy Lamoureux, Tom Caldwell, and Tony Bocelle met with Jim Hall and Bob Osten (Solar Designs, Inc.) and Paul Olson (Rockwell International) to review final drawings and specifications for the Narragansett Laboratory Solar Project.

On 9 September, NEFC and EPA held a meeting at the Narragansett Laboratory. Among those present were Ken Sherman, Bob Payne, Don Miller, Robert Murchelano, Aaron Rosenfield, Rick Lattimer, Don Phelps, Steven Schimmel, Jack Pearce, and Frank Steimle.

On 9 September, Marv Grosslein met with the Georges Bank Study Committee at the Woods Hole Oceanographic Institution. Marv Grosslein, Roger Theroux, Ray Bowman, and John Hauser met to review status of Georges Bank drilling site study with Tom Leschine and Ann Martin of the Woods Hole Oceanographic Institution.

On 14 and 15 September, Marv Grosslein met with the NAFO Larval Herring Task Force at Dartmouth, Nova Scotia.

During 14-17 September, David Mountain presented a paper titled, "Oceanographic Conditions in Subareas 5 and 6 during 1970-1979," at a NAFO environmental symposium in Dartmouth, Nova Scotia.

On 15 September, Ken Sherman met with Luther Bivins and Jack Cawley [NOAA Office of Ocean Technology and Engineering Services (OTES)], Perry Jeffries [University of Rhode Island (URI)], Alex Poularikas (URI), Constantine Katsinis (URI), Mark Berman (URI), and Peter Cornillion (EPA) at the Narragansett Laboratory regarding joint research on automated plankton sorting.

During 16-18 September, Bob Marak, Jack Green, Donna Busch, Ray Maurer, Julien Goulet attended the Oceans '81 meetings in Boston. Julien Goulet presented a poster titled, "Computer-assisted Map Analysis and Marine Ecosystem Information," by J. Goulet, J. K. Sailor, J. K. Berry, and K. Sherman.

On 17 September, Ken Sherman attended a luncheon meeting with the new NOAA Administrator John Byrne at Woods Hole.

On 18 September, Randy Goodlett met with Ed Backus (Manomet Bird Observatory) and identified copepods from red phalarope and storm petrel stomachs.

On 24 and 25 September, Ken Sherman held a Marine Ecosystems Division meeting at Boothbay Harbor, Maine. The Division's principal investigators attended.

On 2 October, Ken Sherman and Marv Grosslein participated in a meeting with other NEFC staff and representatives from the Woods Hole Oceanographic Institution reviewing fishery ecology research problems of mutual interest between the two groups.

On 2 October, Donna Busch and Jack Green met with Lars Hernroth and Odd Lindhal of the Kristineberg's Marinbiologiska Station in Fiskebackskil, Sweden, to discuss phytoplankton-zooplankton work in Sweden and NEFC.

On 5 October, Ken Sherman traveled to Woods Hole to attend ICES meetings. Various staff scientists presented their papers and attended the meetings. See the July-August report for a listing of titles.

On 12 October, Ken Sherman met with Soviet scientists and Dr. Edwards at Woods Hole.

On 14 October, Carolyn Griswold attended a meeting in Woods Hole to develop a draft Regional Action Plan. The results of that meeting were presented at the Center Board of Directors meeting on 15 October attended by Ken Sherman.

On 16 October, Donna Busch, Jack Green, and Dr. and Mrs. K. Vagn Hansen met with Rick Segetti of the Mystic (Connecticut) Aquarium, to discuss ideas for construction of a new aquarium Dr. Hansen is supervising at Hirtshals, Denmark.

During 16-18 October, David Potter, Julien Goulet, and Peter Donnelly attended the Oceans '81 Conference in Boston.

On 21 October, Dave Potter traveled to Solar Design Associates in Lincoln, Massachusetts, to discuss final plans for the Woods Hole Laboratory solar system design.

On 22 October, an ADP meeting and Marine Ecosystems Division meeting were held at Narragansett with Bob Edwards, Ken Sherman, Wally Smith, Wally Morse, Gene Heyerdahl, Lorrie Sullivan, Julien Goulet, and Tom Plichta present.

On 22 October, Donna Busch described ongoing research at Narragansett for several researchers attending a symposium at URI on the "Oceanography of the Middle Atlantic Bight."

On 26 October, Donna Busch and Carolyn Griswold attended an EPA seminar on effects of increased nutrients on microcosm food webs.

On 27 October, there was a meeting of the Image Scanner Group at the Narragansett Laboratory. Attendees were Ken Sherman, Luther Bivins (OTES), Tom Bartholomew (OTES), Charles Kears (OTES), Perry Jeffries (URI), Mark Berman (URI), and Alex Poularikas (URI).

Carolyn Griswold attended a meeting of the Mid and North Atlantic Technical Working Group in New York City.

Resource Utilization Division

Kate Wiggin presented the results of her agarose gel isoelectric focusing research at the 95th Annual Meeting of the AOAC. Her manuscript for submission to the Journal of the AOAC is in progress.

Fred King participated in a meeting of the New England Fisheries Institute on 17 September.

Perry Lane participated in the National Convention of the National Association of State Purchasing Officials (NASPO) held at Oklahoma City, Oklahoma, during 14-16 September. He presented an illustrated talk on underutilized species and procurement documents to be used for buying seafoods. He also attended the monthly meeting of the New England Fisheries Steering Committee and a Board of Directors meeting of the New England Marine Advisory Service.

Environmental Assessment Division

A. Calabrese, M. A. Dawson, F. P. Thurberg, E. Gould, and J. T. Graikoski attended the ICES Statutory Meeting in Woods Hole the week of 5 October. Four papers were prepared and/or presented by these personnel..

R. Greig attended the "Ocean Pollution, 1981" meeting in Halifax, Nova Scotia, during 19-23 October and presented a paper titled "Metals and PCB's in Livers of Windowpane Flounder Collected in Long Island Sound."

A. Calabrese is spending 5 wk in Salvador, Brazil, as an invited visiting investigator. He will be setting up a bioassay facility to help determine the role of pollution in oyster mortality there.

J. Graikoski attended an Interagency Botulism Research Coordinating Committee meeting on 5 and 6 October in Philadelphia, Pennsylvania.

J. Graikoski presented a paper, "Bacteriological Aspects of Ocean Dumping," at the Third International Ocean Disposal Conference in Woods Hole during 13-16 October.

M. Dawson presented a research paper, "Seasonal Variations in Hematology of the Windowpane Flounder, Scophthalmus aquosus, at Three Stations in Long Island Sound." at the New England Estuarine Research Society meeting in Durham, New Hampshire, during 16-17 October.

Jim Thomas attended a Coastal Zone Color Scanner - Nimbus Experimental Team meeting during 9-11 September at the Bigelow Laboratory for Ocean Sciences in Boothbay Harbor, Maine.

Jim Thomas presented a paper at the Oceans '81 Symposium on 18 September in Boston, Massachusetts. The paper is published with the proceedings.

Jim Thomas visited the NASA Goddard Space Flight Center on 25 September to view their processing capabilities for thermal infrared imagery from TIROS and GOES satellites.

Jack Pearce, Frank Steimle, Jay O'Reilly, and Jim Thomas participated in this year's ICES meetings during 5-9 October at Woods Hole, Massachusetts, and presented papers.

Jim Thomas attended and presented a paper at the Third International Ocean Disposal Dumping Symposium, during 12-16 October in Woods Hole, Massachusetts.

Frank Steimle, Jim Thomas, and Bob Palawski participated in two Regional Action Plan meetings 14 and 28 October with the Northeast Regional Office and the NMFS Office of Habitat Protection in Washington, DC.

Jim Thomas and Craig Robertson attended a meeting on 19 October at the Manomet Bird Observatory to review the status of CHARM.

Frank Steimle, Jim Thomas, and Andy Draxler participated in a meeting on 20 October at the Narragansett Laboratory to begin planning the writing of a summary of the physical oceanography of the shelf and slope region from Cape Hatteras to the Gulf of Maine.

Aquaculture Division

Gary Wikfors and Ronald Goldberg attended the Second International Conference on Aquaculture Nutrition, sponsored by the University of Delaware in Lewes.

E. Rhodes presented a paper in the Mariculture Section of ICES at Woods Hole, Massachusetts titled, "Experimental Evaluation of Nursery and Grow-out Methods for the Bay Scallop, Argopecten irradians."

E. Rhodes gave a talk at the New England Estuarine Research Society meeting in Kittery, Maine.

E. Rhodes, R. Goldberg, and J. Widman conferred with researchers at the State of South Carolina Department of Marine Resources' Charleston Laboratory, and visited a pilot-scale hard clam rearing project.

E. Rhodes hosted a visiting aquaculture delegation from France.

Pathobiology Division

Dr. Rosenfield participated in OPP discussions at the Sandy Hook Laboratory on 3 September; attended a Maryland Sea Grant Advisory Board meeting at College Park on 4 September; attended with Dr. Murchelano the EPA/OPP conference at Narragansett on 9 September; participated with Dr. Sawyer in an EPA/National Ocean Survey/NEMP research and management planning session at the Sandy Hook Laboratory on 23 September; and attended with Mr. Farley and Mr. Newman the Center Board of Directors meeting at Woods Hole during 13-16 October.

Ms. Wheatley participated in the Center Administrative Officers meeting at Woods Hole on 15 and 16 September.

Dr. Bodammer visited hatcheries related to Atlantic salmon propagation studies and development at Bar Harbor, Maine, from 17 to 30 September; he attended and presented a paper at the ICES Statutory Meeting at Woods Hole during 5-9 October.

Dr. Murchelano convened a meeting of the Center Factor IV Committee at the Milford Laboratory on 22 September; discussed cooperative research with French scientists at the headquarters of the French National Center for the Exploitation of the Oceans in Paris on 12 October; participated on an ICES/French Scientific and Technical Institute for Marine Fisheries fish disease survey on the French R/V Thalassa from 13 to 25 October; and attended the business meeting of the 10th Annual United States-Japan Natural Resources Cooperative Agreement Aquaculture Panel at Lewes, Delaware, on 27 October.

Mr. Farley and Dr. Brown (Milford Laboratory) attended the Center EEO Committee meeting at Narragansett on 28 September; and Mr. Farley picked up samples from the State in Sandwich, Massachusetts, on 30 September.

Mr. Newman visited the USFWS's National Fish Health Laboratory at Leetown, West Virginia, on 30 September and 23 October to develop cell lines for virus isolation.

Dr. Brown (Milford Laboratory) presented a paper and participated in a poster session at the ICES meeting at Woods Hole on 7 and 8 October.

Dr. Blogoslawski (Milford Laboratory) participated in a Sea Grant site review of the Virginia Sea Grant Consortium at Charlottesville, Virginia, during 13-15 October; and presented a paper at the American Society for Microbiology meeting titled "Bacteriological Depuration of the Mexican Scallop, Argopecten circularis," on 24 October.

Mr. Jay Lewis attended the Third International Ocean Disposal Symposium at Woods Hole from 13 to 16 October, and presented a paper on "Gill Condition in the Rock Crab, Cancer irroratus, as an Indicator of Ocean Health."

On 14 October, Dr. Robohm (Milford Laboratory) outlined the Milford Laboratory's program on control of molluscan disease for 18 members of a French delegation interested in utilization of power station cooling water for growth of oysters, scallops, and fish.

Mr. Kern consulted with John LeBaron at the Sandy Hook Laboratory on NEMP data entry on 15 and 16 October.

Dr. Blogoslawski, Dr. Brown, and Ms. Petti attended a lecture in New York City at Rockefeller University by Dr. Paul Berg on genetic engineering.

National Systematics Laboratory

Dr. Bruce Collette participated in a workshop on voucher specimens held at the University of Maryland under the auspices of the Association of Systematics Collections and funded by the National Science Foundation. He represented the American Society of Ichthyologists and Herpetologists at a reception held by the American Association for the Advancement of Science to honor foreign science counselors and attaches posted in Washington, DC. He attended a meeting of the scientific advisors to the Ocean Trust Foundation held at Wingspread, the Johnson Foundation's meeting center in Racine, Wisconsin. Extensive discussions took place on many aspects of marine affairs. He briefly visited the fish collection at the Field Museum of Natural History in Chicago to survey anchovies and to examine specimens of Scombridae and Belontiidae.

Dr. Daniel Cohen attended several planning sessions at the US State Department and National Academy of Science for a US State Department-Aid for International Development Program Conference on Biological Diversity, the NMFS-NOAA-Commerce representative.

Dr. Isabel Canet examined collections of rock shrimps, Sicyonia, at the Museum of Comparative Zoology, Harvard University.

Atlantic Environmental Group

Woody Chamberlin and Amy Friedlander met with staff from the NEFC, the Woods Hole Oceanographic Institution, and the Massachusetts Institute of Technology on 10 September for a precruise briefing.

Woody Chamberlin gave an invited presentation at a special NAFO session on remote sensing methods and their possible application to fisheries science, held at the Bedford Institute of Oceanography in Nova Scotia. A paper on weather conditions in the 1970's, written by Mert Ingham, was presented by Dave Mountain. Woody attended the NAFO Conference from 13 to 16 September.

Grayson Woods and Greg Behie attended the Oceans '81 Conference held in Boston this year from 16 to 19 September. Steve Cook also attended the Conference on 17 September.

Dan Smith boarded the Oleander on 17 September and traveled to Bermuda for the purpose of collecting environmental data and plankton. Grayson Wood made the return trip for the same purpose on 20 September.

Mert Ingham attended a NEMP management team meeting which was held at the Sandy Hook Laboratory on 21 and 22 September.

Amy Friedlander participated in the Warm-Core Ring Study cruise aboard the Albatross IV from 21 September through 6 October.

Woody Chamberlin attended a Center Factor IV Committee meeting at the Milford Laboratory on 22 September.

Bill Brennan made the XBT/CPR transect aboard the M/V Marine Evangeline during 23-25 September.

On 25 September, Woody Chamberlin traveled to Greenbelt, Maryland, to attend a meeting on image processing and transmission.

Woody Chamberlin, Amy Friedlander, and Jayne Fitzgerald made a poster presentation at a mini-symposium on remote sensing at the ICES Conference which was held in Woods Hole on 7 October.

Bill Brennan traveled to Norfolk, Virginia, to meet the M/V E.M. Queeny and to install XBT equipment on 9 and 10 October.

The Center Board of Directors meeting held at the Woods Hole Laboratory during 13-16 October was attended by Mert Ingham.

Woody Chamberlin was cochairman of the Annual Middle Atlantic Bight Physical Oceanography Workshop. The workshop was held at the URI on 21 and 22 October this year, and was well attended by AEG members. Mert Ingham made an oral presentation titled "Weather Conditions and Trends in the Maine-Virginia Coastal and Offshore Area during 1970-79." Woody's presentation was titled "Shoreward Transfer of Kinetic Energy by Gulf Stream Rings and Meanders and Their Interactions: What Are the Limits?"

SEMINARS

Resource Utilization Division

After attending a course in on-line literature searching, Judi Krzynowek presented two in-house seminars on the subject.

VISITORS

Resource Assessment Division

On 17 September, Dr. John Byrne, NOAA Administrator, visited the Woods Hole Laboratory.

During 16 September-14 November, Andrzej Paciorkowski, a visiting assessment scientist from the Polish Sea Fisheries Institute, worked with Emory Anderson on analysis of Atlantic mackerel data.

On 12 October, Brad Brown met with a delegation from the Soviet Union to discuss cooperative research programs.

During 5-9 October, Brad Brown held discussions with Derek Iles of Canada during the ICES meeting regarding an upcoming US-Canada assessment meeting. Vaughn Anthony subsequently developed plans for the meeting more fully. Brad met with Hans Larsen of the Danish Fishery Institute to discuss participation by Danish scientists in NEFC bottom trawl surveys. Brad also met with Rafael Robles of Spain regarding future exchanges with Spanish scientists and with Emelio Cadima of Portugal concerning joint research to resolve aging difficulties in hake.

On 9 October, Fred Serchuk met with Dr. Eric Edwards from the Essex, England, Fisheries Laboratory to discuss shellfish resources and management in the Northwest Atlantic.

Marine Ecosystems Division

On 29 September, Dr. Bohdan Draganik and Dr. Josef Popiel of the Morski Instytut Rybacki in Poland visited the Narragansett Laboratory for informal discussions regarding cooperative research work.

On 8 October, Barry Thompson visited to examine our phone system.

During 14-16 October, Dr. K. Vagn Hansen of Denmark visited the Narragansett Laboratory.

On 20 October, Gary Boomer, a NOAA Corps Officer, visited the Narragansett Laboratory.

Resource Utilization Division

On 25 September, Mr. Bush Bond and Mr. John Emberley, Inspection and Technology Branch, Department of Fisheries and Oceans, Government of Canada, Ottawa, Ontario; and Mr. Beldon Davis, Canadian Consulate General, Boston, Massachusetts, visited to discuss Canadian standards development.

Nancy McLaughlin, Interim Executive Director, New England Marine Advisory Service (NEMAS) visited to discuss NEMAS organization and direction.

The NOAA Administrator with the Northeast Regional Director and other Regional staff visited to introduce the Administrator to NMFS personnel stationed in Gloucester.

Aquaculture Division

Visitors to the Milford Laboratory included John Campbell of Norwalk, Connecticut; Donald Gilpatric of Annandale, Virginia; Carlos Ramos of Greenwich, Connecticut; and a group of Japanese scientists, members of the Aquaculture Panel of the United States-Japan Natural Resources Cooperative Agreement.

Pathobiology Division

Visitors to the Oxford Laboratory during the reporting period were Ms. Nancy Mullis of the USFWS's Patuxent Wildlife Research Center in Laurel, Maryland; Drs. Paul James and Wylie Burge of the US Department of Agriculture in Beltsville, Maryland; Dr. J. D. Andrews of the Virginia Institute of Marine Science at Gloucester Point, Virginia; Mr. Joseph Ripay of Olympus Corp. in New Hyde Park, New York; and Dr. John Byrne, NOAA Administrator, visited and toured the Laboratory along with officials from the Maryland Department of Natural Resources and Maryland Tidewater Administration.

National Systematics Laboratory

Drs. Collette and Cohen were visited by Guido Dingerkus (American Museum of Natural History), Ken Sulak (Virginia Institute of Marine Science), Dr. James Tyler (National Science Foundation), Dr. G. David Johnson (South Carolina Department of Marine Resources), M. Boeseman (Rijksmuseum van Natuurhistorie in Leiden, Holland), and Tom Potthoff (NMFS Miami Laboratory--to study gempylids).

Dr. Canet was visited by Dr. Marea Hatziolos.

Dr. Williams was visited by D. Felder (Southwest Louisiana State University in Lafayette), R. Kropp (University of Maryland and University of Guam), H. Dean and M. Redmond (University of Delaware and University of Costa Rica), D. Weston (McNeese State University at Lake Charles, Louisiana), and K. Singleton (Peace Corps in Zaire, and Duke University Marine Laboratory).

UNIVERSITY AFFAIRS

Resource Assessment Division

On 10 September, Emory Anderson and Stu Wilk met with investigators at Rutgers University to review research on tilefish.

On 10 September, Brad Brown and Emma Henderson met with Kevin Kane of Harvard University to discuss methods of estimating indices from survey data using expected values in a given year.

On 10 September, Fred Serchuk met with Laurie Sullivan to discuss assessment data for American plaice to be included in her thesis work at the URI.

During 14-17 September, John Boreman served as a member of a site review panel for the University of Michigan-Michigan State University Sea Grant Program.

On 21 September, Fred Serchuk met with Mark Alexander of the State University of New York at Stony Brook to discuss assessment of marine fisheries.

On 24 September, Brad Brown participated in the annual program review of the Massachusetts Cooperative Wildlife and Fisheries Research Units.

On 17 September, Brad Brown and Ambrose Jearld discussed opportunities in fisheries science with the faculty of Jackson State University.

On 6 October, Brad Brown and Mike Sissenwine met with Saul Saila at URI to discuss the cooperative educational program.

On 7 October, Brad Brown met with members of Karen Johnson's thesis committee at URI.

On 9 October, Brad Brown met with Dr. O. Smitherman of Auburn University to discuss possibilities of a seminar presentation at Auburn University.

On 13 October, Mike Sissenwine met with Geof Evans of the Woods Hole Oceanographic Institution to discuss modeling fisheries systems.

Donald Flescher presented a lecture on New England fish species to Dr. Dennis Sabo's ichthyology class at Massachusetts Maritime Academy in Bourne on 14 October.

On 15 October, Fred Serchuk presented a lecture on fisheries assessment and management to a senior class in marine biology at Worcester State College.

On 22 October, Mike Sissenwine presented a seminar at the Chesapeake Bay Biological Laboratory in Solomon, Maryland.

On 26 October, John Ropes met with Dianne Drousseau of Fairfield University to discuss marine bivalve research.

On 28 October, Brad Brown visited the University of Maryland Eastern Shore and presented two lectures to environmental science classes. Brad also discussed contract work with Dr. T. Hopkins and cooperative education programs with Dr. W. Hyche, Dr. E. Richardson, and Dr. Ewers.

Judy Penttila assisted Mark Lussier of the University of Massachusetts on American plaice aging techniques.

Marine Ecosystems Division

Roger Theroux met with Vern Crane (Harvard University graduate student) regarding available sediment data for a study of fish distribution.

On 23 September, Vickie White (URI) gave a talk on women and work, held at the Narragansett Laboratory conference room.

During 25-29 September, Jack Green met with scientists at Dalhousie University and Bedford Institute of Oceanography. At Dalhousie, areas of mutual interest in secondary production and micronekton studies were discussed with Carl Boyd. Discussions with Bob O'Boyle, Miou Paranjape, Doug Sameoto, and Bob Conover at Bedford Institute of Oceanography centered around sample gear and techniques.

On 29 September, the Narragansett Laboratory scientific staff was visited by a Philippine delegation consisting of administrators from the University of the Philippines/College of Fisheries and seven Regional Institutes of Fisheries Technology. The Philippine administrators visited the University of Rhode Island, International Center for Marine Development, as part of a Fisheries Training Project (financed by a World Bank loan) for the purpose of upgrading and strengthening the University of the Philippines College of Fisheries and establishing Regional Institutes of Fisheries Technology and Training Centers.

Ed Cohen presented a lecture on biological oceanography to students from the US Coast Guard Academy in October.

On 20 and 21 October, David Mountain and Steve Ramp attended the Middle Atlantic Bight Physical Oceanography Workshop at URI.

On 29 October, Kenneth Sherman presented a talk, "Perturbations in the Structure of Fisheries Ecosystems in the North Atlantic," at the Chesapeake Biological Laboratory of the University of Maryland.

Resource Utilization Division

Dr. Tyre Lanier of the Department of Food Science at North Carolina State University in Raleigh, called regarding formed or moulded seafood products on 2 September.

Dr. Richard Stockard of the College of Fisheries at the University of Washington in Seattle called regarding fish muscle as a food binding material.

Aquaculture Division

E. Rhodes participated in the Sea Grant Aquaculture Plan Workshop at Texas A&M University at College Station.

Pathobiology Division

Mr. Farley conferred with Dr. Carol Reinisch at Tufts University on 29 September.

Dr. Muchelano was a member of the Office of Sea Grant Site Team at the University of Maryland from 5 to 7 October.

Dr. Rosenfield attended the University of Maryland Sea Grant review at College Park on 6 October.

National Systematics Laboratory

Dr. Collette was reappointed as Research Associate of the Museum of Comparative Zoology at Harvard University.

PUBLIC AFFAIRS

Resource Assessment Division

On 1 September, Emory Anderson met with Jeff Reichle of Lund's Fisheries of Cape May, New Jersey, on status of the Atlantic mackerel resource and potential for fishery development.

On 11 September, Emory Anderson was visited by Bjorn Stackelius and Bill Quinlan of Joint Trawlers, Ltd., of Gloucester, Massachusetts, to discuss status of the Atlantic mackerel resource.

On 21 September, Fred Serchuk provided information to Robert Davies of the Mayor's Office in New Bedford, Massachusetts. Fred also met with Jim Pauline, a New Bedford scallop fisherman, on 23 September to discuss deepwater scallop resources.

On 2 October, Brad Brown attended a meeting of the New England Science Teachers Association and presented a lecture on resource assessment on 3 October at a session of their annual meeting.

On 13 October, Emory Anderson was interviewed by Martin Conrad, a journalist from West Germany, on current events in the US East Coast fisheries.

On 16 October, Emory Anderson met with Edward McTiernan of the Long Island Regional Planning Board concerning fisheries in the New York Bight.

On 21 October, Sherry Sass assisted in a middle school class field trip to several marsh/beach/rocky shore environments along Cape Cod Bay.

Resource Utilization Division

Tom Connors participated and assisted in the production of a television filming of the marine products development irradiation for Channel 4's (Boston) "Money Sense" program. The show is to be aired on 5 November 1981 at 8 p.m.

The Gloucester Laboratory held its Open House during October. Attendance was very poor because of lack of attendance by school children. Presumably this was due to budget cuts in the various school systems.

Pathobiology Division

Dr. Rosenfield represented the Center and Oxford Laboratory at The Johns Hopkins University School of Oceanography dedication ceremonies at its new facilities at Shady Side, Maryland on 11 September.

On 23 October, a class of 20 Greenwich Middle School students visited the Milford Laboratory's pathobiology labs; they were part of the Tag Program for gifted children.

PERSONNEL

Resource Assessment Division

John Nicholas was converted from a handicap indefinite appointment to a career appointment in October.

Fred Serchuk was appointed Chairman of the National Mail Ballot Tally Committee of the American Fisheries Society (AFS).

Anne Lange served as Chairman of the Marine Section of the AFS Ballot Committee.

Ralph Mayo, Mike Fogarty, Anne Lange, and Gordon Waring attended a training class on the new VAX computer during 21-23 and 28 October, and participated in the Conversion Team assigned to aid in transition to the new system.

Marine Ecosystems Division

Summer students Rene Eppi, Judith Scanlon, Wendy Stephenson, and John Malone completed their appointments in September; they accomplished a great deal of processing of food habit and benthic data in the past 3 mo while working with the Ecosystems Dynamics Investigation.

During 1-4 September, Julien Goulet attended a course on SEED, a data base management system.

On 14 September, the Gloria Michelle and Alan J. Blott, Vernon E. Nulk, and John F. Kenney were transferred from the Gloucester Laboratory to the Narragansett Laboratory.

Annette Pratt's 1-yr appointment expired at the end of the month. She has taken a position in private industry.

Patty Schaeffer had a girl on 22 September! We expect Patty to return in mid-November.

Appointments for Bob Sand, Philip LeBlanc, and Oke Lundin were terminated on 29 September.

Geoff Laurence attended the Department of Commerce Annual Award Ceremony in Washington, DC, where he was presented the Department's Gold Medal for research accomplishment.

On 2 October, Jack Casey was awarded the Graham McMillan Prize by the American Littoral Society.

On 9 October, Roz Cohen began a Woods Hole Oceanographic Institution course on "General Circulation of the Oceans" as part of her 20/20 Work-Study Program leading to a Ph.D. degree.

On 21 October, Jack Casey received the Bronze Medal from the Department of Commerce.

During 21-23 October, John Hauser, Roger Theroux, and Ed Cohen attended the introductory training course on the VAX.

On 23 October, Jack Casey and Chuck Stillwell received Medals of Appreciation from the Morski Instytut Rybacki in Poland.

Resource Utilization Division

Joe Licciardello and Ron Lundstrom attended a supervisor's training session on the General Workforce Performance Appraisal System.

Joe Licciardello attended a training course on "How to Write a Position Description."

Betty Tuhkunen attended a US Office of Personnel Management training course on "Introduction to Automatic Data Processing."

John Ryan, Fred King, and Perry Lane participated in a training session on the new verification procedures and statistical quality assurance techniques for US Department of Commerce fish inspection presented at the Gloucester Laboratory by the Department's Inspection Service.

Pathobiology Division

Mr. Michael Calabrese terminated his temporary assignment on 29 September.

Mr. Jay Lewis, an oceanographer, began a 1-yr appointment on 5 October.

National Systematics Laboratory

After 23 yr at the National Systematics Laboratory, 22 of them as Director, Dr. Daniel Cohen has accepted a transfer to the Seattle Laboratory of the Northwest and Alaska Fisheries Center where he will serve as a senior scientist dealing with Bering Sea fishes and continue work on gadoid fishes such as Theragra. His leadership will be missed; Dr. Collette assumes the responsibilities of Acting Laboratory Director.

Dr. Collette was presented a conservation award by the International Wildlife Foundation "for advancing the science of study of fishes, amphibians and reptiles."

EEO ACTIVITIES

Resource Assessment Division

On 1 September, a meeting of the Woods Hole Laboratory EEO Committee was held and was attended by Louise Dery, Steve Clark, Mike Sissenwine, and Fred Serchuk.

Fred Serchuk served on a special EEO subcommittee to draft an information memorandum to the Woods Hole Laboratory Director in support of a fact-finding mission by Dr. Jackson, President of New Perspectives, Inc., as background material for a workshop on discrimination within large organizations.

As the Federal Women's Program Cochairperson for the Woods Hole Laboratory, Sherry Sass arranged film showings and a discussion group concerning men's work issues.

Louise Dery began preparing a workshop using the EEO film "A Tale of '0'."

On 9 September, Brad Brown attended a meeting of the New England Chapter of the American Association for Affirmative Action at the University of Massachusetts' Boston Campus.

On 2 October, Emory Anderson held an advisory session with Darryl Moore, a student temporary.

On 15 and 16 October, Brad Brown attended a meeting of the State Advisory Committees of the US Civil Rights Commission in Washington, DC. Brad presented a talk on affirmative action at the Affirmative Action Conference sponsored by the New England Region of NAACP on 16 October, and attended the remainder of the conference on 17 and 18 October.

On 30 October, Steve Clark chaired an Affirmative Action Review Subcommittee meeting. Steve also compiled a list of suggested EEO-related components for inclusion in future merit pay -general workforce performance appraisal plans.

In October, Brad worked with the Center Director to appoint a new Federal Women's Program (FWP) Coordinator for the Center to fill that vacancy. Brad then conferred with the new Coordinator, Dr. Carolyn Brown, concerning planning activities for a meeting with laboratory FWP coordinators.

During the American Fisheries Society meetings (15-18 September) in Albuquerque, Brad met with Dr. Vernon Henderson, Chair of the Equal Opportunity Committee of the American Fisheries Society, to discuss aspects of the work of that Committee.

Brad maintained ongoing correspondence with Mr. Larry Wallace of the Human Environment Foundation concerning their projects in the area of opportunities for minorities in the natural resources, and with Dr. John Hannahan, Department of the Navy, concerning ongoing efforts of the Committee on Opportunities for Minorities and Women in Marine Science of the National Marine Educators Association. The July issue of Fisheries published the summary presented by Brad along with the other panel discussions from the Panel on Equal Opportunity at the 1980 annual meeting of the American Fisheries Society.

On 28 October, Fred Serchuk met with Ira Palmer, a cooperative education student, to discuss research activities at the NEFC.

Marine Ecosystems Division

On 1 September, Ray Bowman attended the monthly EEO meeting at the Woods Hole Laboratory.

On 28 September, an EEO meeting was held at the Narragansett Laboratory.

Pathobiology Division

Dr. Brown (Milford Laboratory) recently was appointed Federal Women's Program Manager for the Center.

Dr. Brown (Milford Laboratory) held a seminar for the Milford Laboratory staff on the "Federally Employed Women's 12th National Training Program" held in Indianapolis.

Ms. MacLean participated in a panel discussion during a supervisor's workshop held on 22 October at Gallaudet College in Washington, DC. Based on their own experiences, panelists responded to questions relative to supervising deaf students.