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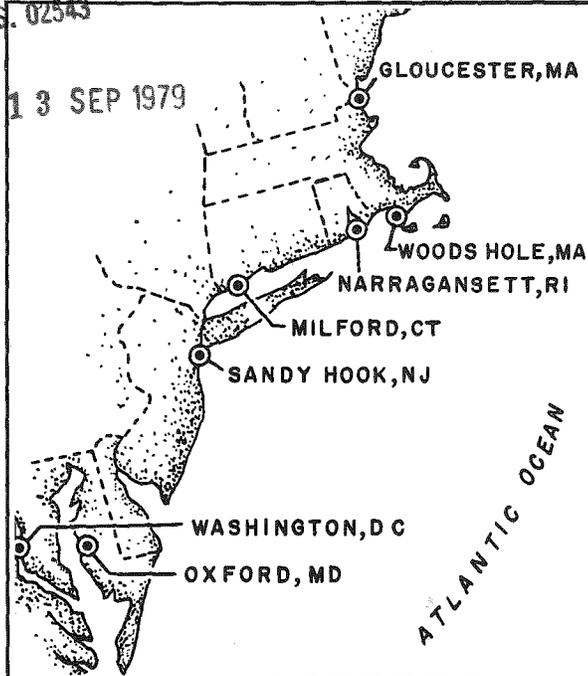
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NEWS

13 SEP 1979



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

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CENTER DIRECTORATE

Center Director's Office

As most of you know, NOAA assisted in the development of several scientific agreements with the People's Republic of China, notably in weather and oceanography. The agreements were formally signed by Secretary Juanita Kreps last month. Exchanges have been planned and particular areas of research highlighted for future consideration. Fisheries research is included under the oceanographic agreement.

Present plans include six Chinese specialists in aquaculture and related fields to spend about 2 mo in the US, mostly at the Milford Laboratory. We (NEFC) will be sending a team to China also late next spring.

The Chinese are interested in many oceanographic programs, including benthic studies, monitoring the environment (they also have pollution problems), and data archiving and processing. In the fisheries arena they are less interested in offshore problems, more in inshore opportunities. They are, as they always have been, deeply interested in any and all aspects of aquaculture. At the moment, the development of marine alga farms is clearly a prime interest.

China was an exceedingly interesting place to visit. It is quite unlike any place that I have ever been before. The countryside is neat, the people friendly and hard at work building the new China. The past 15 yr have been difficult for them as they will tell you, given the "Gang of Four" and the "Cultural Revolution." This was a period of extreme anti-intellectualism and incredible, juvenile naivete. They are trying now to catch up with the rest of the world by the year 2000. Since almost a generation of technically trained people is virtually missing, this will be a monumental task.

It is my impression that they will be refreshing visitors and co-workers. Their drive and dedication are impressive. You have never seen such dedication and determination to get on with it.

Environmental Management Office

An interagency coordination meeting for the New York Bight was held at the US Environmental Protection Agency (USEPA) facility in Edison, NJ, on 1 May. Data from cruises directed out of the Sandy Hook Laboratory relative to oxygen conditions and algal blooms were discussed, as were data from other participating agencies.

The New Jersey Sea Grant Advisory Group on Fisheries met at the Sandy Hook Laboratory on 4 May with Dr. Sindermann as Chairman. A full day of discussion of principal problems of New Jersey's fisheries led to preparation of a number of recommendations to the Sea Grant Director.

Dr. Sindermann participated in a NOAA retreat at Airlie House in Warrenton, VA, on 18 and 19 May, to consider NOAA's posture in relation to ocean pollution activities, especially in view of the lead role assigned to NOAA by the Ocean Pollution Research, Monitoring, and Development Act of 1978.

The Marine Ecosystems Analysis Program (MESA) New York Bight Preparatory Workshop on Pollution Effects on Fish and Shellfish was held at the Sandy Hook Laboratory on 22 May, with Dr. Sindermann as Chairman. Ten papers were reviewed and a draft summary document prepared, discussing the present status of knowledge about pollutant effects on New York Bight fish and shellfish.

Fisheries Utilization Office

During 7 and 8 May, we hosted members of the faculty of the Institute of Food Science and Marketing and of the Marine Advisory Service of Cornell University. The research staff of the Resource Utilization Division reviewed its programs, and considerable time was spent discussing the areas of mutual interest and the potential for collaboration that became evident to the Cornell University faculty from the presentations.

We have already initiated a collaborative research project with Cornell University's Professor Joe Regenstein and University of Massachusetts' Professor Herb Hultin.

Special Scientific Investigations Office

Arthur Posgay attended the International Council for the Exploration of the Sea (ICES) Working Group on North Atlantic Salmon. Catches in all countries except France and the US showed a drastic decline in 1978 (6400 tons) compared to the average for 1973-77 (9000 tons).

Special Technical Projects Office

Preparations continued for the upcoming sea scallop gear tests. Due to delays, the schedule has slipped, but all testing is expected to be completed by the end of June.

Cruise plans for the August clam dredge test cruise were written and purchase orders for various equipment were sent out.

Our underwater color video camera system arrived and was checked out. Work progressed on data logger specifications and five requests for technical information were processed.

RESOURCE ASSESSMENT DIVISION

Resource Surveys Investigation

During May, the spring bottom trawl survey was completed. The R/V Albatross IV (Linda Despres, Chief Scientist) visited the Scotian Shelf, Gulf of Maine, and Georges Bank during 2-12 May. Five hundred seven stations were occupied during the entire spring bottom trawl survey (all parts combined) of which 498 were trawl stations.

The German Democratic Republic (GDR) R/V Eisbar (Gordon Waring, US Chief of Party) returned to Woods Hole on 7 May after completing a cooperative Atlantic herring - Atlantic mackerel bottom trawl survey. The area surveyed was from the Hudson Canyon east to Georges Bank and north into the Gulf of Maine. Fifty-seven trawl stations were completed during the cruise.

A sea scallop assessment cruise was conducted aboard the Albatross IV (Henry Jensen, Chief Scientist) during 15 May - 1 June. The area surveyed was from False Cape, VA, to the southern part of Georges Bank and the Great South Channel. During the cruise, 311 scallop stations were visited. The new 8-ft, New-Bedford-type scallop dredge was used during the entire survey. It appeared to fish well, even though catches were generally light.

On 10 and 11 May, John Nicolas took part in a right whale survey in Massachusetts Bay and the Gulf of Maine aboard the M/V Phipps. The vessel was chartered by the University of Rhode Island (URI) expressly for the survey. The right whale count is part of URI's CETAP project and is funded by the US Bureau of Land Management (BLM).

Jim Crossen has been heavily involved in preparations for the joint American-Soviet-sponsored Symposium on Fisheries Hydroacoustical Research which will be held at the C.S. Draper Laboratory of the Massachusetts Institute of Technology (MIT) during 25-29 June. In addition to the 12 countries listed in the April issue of "NEFC News," the United Nation's Food and Agriculture Organization (FAO), Chile, Ecuador, and Indonesia will also send participants. The symposium was organized to discuss the progress, problems, and potential in using hydroacoustical methods for estimating marine fish populations. Jim Crossen and Jeff Mills will participate in the meetings and contribute a paper on "Fisheries Hydroacoustic Calibration Apparatus."

Fishery Biology Investigation

Age and Growth

Kris Kantola and Vi Gifford completed aging 1117 commercially caught haddock samples for the third and fourth quarters of 1978.

Vi also completed the first aging for 640 commercially caught redfish samples from 1969. Gary Shepherd checked the age on an aliquot (200) of the redfish read by Vi. He also worked on his summer flounder paper.

Vi, Gary, and Kris prepared summaries by area and season of bottom trawl survey data on haddock collected from 1972 through 1978. Kris began to impress the 1979 spring survey haddock samples with help from John Chambers and Jim Fletcher.

Judy Penttila prepared data for a meeting at Cambridge Instrument Co. in Monsey, NY, on the progress of the automatic age-reading system software development contract. She also started checking the spring bottom trawl survey Atlantic cod samples aged by personnel from the Massachusetts Division of Marine Fisheries.

Finfish

Members of the Finfish Task began aging recreationally caught bluefish samples from the Sandy Hook Laboratory. The structure used for aging is the scale. Samples of Atlantic herring and Atlantic mackerel were processed from the 1979 Albatross IV and Delaware II spring bottom trawl survey.

Cathy Rearden continued to work with Automatic Data Processing Unit (ADP) personnel on the age and growth archiving project and began aging butterfish samples from the 1979 spring bottom trawl survey.

Laurie Savelkoul began sectioning red hake otolith samples collected during the 1979 spring bottom trawl survey.

Mike Campbell assisted Fred Nichy with work at the aquarium and worked on the completion of his scup age and growth report.

Louise Dery continued to study silver hake otolith growth patterns for the stock separation project for that species.

Shellfish

Most of John Ropes and Loretta O'Brien's efforts this month have been concentrated on producing thin chondrophore sections from surf clams (Spisula solidissima) obtained from the University of Maryland Eastern Shore. With proper care in preparing the chondrophore piece, exact positioning of the shell on the saw, and a cut sufficiently close to the umbo, they have found little, if any, polishing is needed for a smooth section.

The thin-section slide preparations are easily processed photographically by simply projecting light through them on an enlarger. These same slide preparations are suitable for use with a slide projector and therefore may be projected directly onto a wall or screen for easy viewing and measurements. Loretta also spent time at sea aboard the Albatross IV on the last leg of the spring bottom trawl survey.

Sandy Hook Investigation

Darryl Christensen completed and submitted a manuscript to Marine Fisheries Review titled "Composition of Catches Made by Anglers Fishing for Summer Flounder, Paralichthys dentatus, from New Jersey Party-Boats in 1978." He also completed the first draft of a manuscript on 1978 recreational landings of Atlantic mackerel and submitted it for internal review. John Clifford and Darryl Christensen made a total of 10 trips aboard party boats to collect mackerel age samples and length-frequency data. Darryl also collected and preserved 100 mackerel kidney tissue samples for Robert Murchelano at the Oxford Laboratory.

John Clifford continued to obtain summer flounder data for an informal report to the Mid-Atlantic Fishery Management Council Summer Flounder Scientific and Statistical Committee.

Wally Morse completed development of computer programs for analysis of maturity data.

Fishery Analysis Investigation

Ralph Mayo and Liz Bevacqua begin the examination of domestic vessel and processor logbooks received by the NEFC during May. Initial auditing procedures have included detailed inspection of the logs for completeness of entries and documentation of errors and omissions. A summary report of the most frequent errors and omissions detected in the 869 logbook records received and reviewed during the month was submitted to the Fisheries Management Division of the Northeast Regional Office.

Ralph also completed the 1978 USA STATLANT 21A landings report during the month and submitted it to FAO and the International Commission for the Northwest Atlantic Fisheries (ICNAF).

Liz Bevacqua continued assessment analyses of research survey and commercial data on scup through 1978. Specific survey strata where scup have consistently been caught have been identified and are being used to define strata sets in evaluating trends in population abundance. Additionally, age-length keys have been derived from commercial scup samples from 1974 through 1978 for estimating catch composition and year-class identification. Commercial catch per unit of effort indices for the otter trawl fishery have also been determined. Liz also participated in the 15 May - 1 June sea scallop survey on the Albatross IV.

Rhett Lewis continued the re-stratification of the 1975-78 sea scallop research survey tow data into the newly established sea scallop strata. Rhett has also been working with Otis Jackson in developing the computer software to digitize shellfish and groundfish strata. During the month, Rhett became a certified NOAA Diver Trainee and began checkout dives with Cliff Newell.

Harold Foster initiated catch distribution and length-frequency analyses of the 1978 Gulf of Maine recreational Atlantic cod catch. Harold also completed a draft report summarizing the historical recreational cod catch from Georges Bank and the Gulf of Maine.

Paul Wood summarized both spring and autumn bottom trawl survey catches of Atlantic cod during 1963-1978. Computer-derived station location plots of stations at which cod have been caught were generated for all size groups of cod and for cod less than 37 cm. Paul also participated in the Canadian sea scallop research survey of the northern edge and peak areas of Georges Bank on the R/V E.E. Prince during 22 May - 6 June. Additionally, Paul assisted in planning the US sea scallop survey and selected station locations at which meat and shell samples are to be taken.

Joan Palmer continued data analysis of finfish recruitment for input into the multispecies computer model, and also worked on growth analyses of finfish in relation to population density. Computer runs were made by Joan on population statistics of total finfish and squid, and preliminary work was begun on the probability-frequency distribution of bottom trawl survey Atlantic cod catches.

Fred Serchuk continued preparation of a report summarizing the historical and current status of Atlantic cod populations south of Georges Bank.

Fishery Assessment Investigation

Emory Anderson and Frank Almeida completed an assessment of the Northwest Atlantic bluefish resource and continued work on yield-per-recruit and mesh-selection analyses for silver hake. Emory also worked on pelagic shark catch and effort statistics for assessment purposes, and Frank also participated in the Gulf of Maine leg of the spring bottom trawl survey and compiled 1977 red hake biostatistical data summaries for submission to ICNAF. Thurston Burns, Pat Carter, and Steve Clark continued assessment analyses for pollock and offshore American lobsters. Dennis Hansford, Jeff Floyd, and Steve Morrison continued collection of morphometric data for use in silver hake stock identification studies.

Routine assessment activity continued during May 1979. Anne Lange continued to provide scientific information related to the East Coast US-Canadian boundary treaty. Implementation of the treaty awaits ratification by Congress.

Mike Sissenwine became involved in activity of the New England Groundfish Task Force. The Task Force has been jointly established by the New England and Mid-Atlantic Fishery Management Councils and NMFS. It is intended to provide a fresh look, and hopefully a more introspective one, at fisheries management problems associated with New England groundfish. Richard Hennemuth and Brad Brown are also members of the Task Force.

Meetings, Talks, Visitors, Publicity

On 3 May, Stuart Wilk talked on bluefish and weakfish biology and management to the Advanced Saltwater Fishing Class of the Watchung Saltwater Fishing Club.

On 4 May, Tom Azarovitz attended a meeting at the New England Aquarium to discuss a proposal to declare Cape Cod Bay a critical habitat for marine turtles. The meeting was held by state and federal scientists and officials associated with the Endangered Species Program.

On 4 May, Mike Sissenwine met with four professors from Malaysian universities to discuss assessment techniques used at the Woods Hole Laboratory.

On 7 May, Fred Serchuk and Paul Wood attended the New England Fishery Management Council's Sea Scallop Oversight Committee meeting in New Bedford, MA.

On 7 and 8 May, Stuart Wilk attended the Marine Recreational Fisheries Symposium in Fort Lauderdale, FL.

On 8 May, Paul Wood attended, in an unofficial observer capacity, the NMFS logbook public meeting in New Bedford, MA.

On 8 May, Fred Serchuk attended an IYABA meeting at the Oxford Laboratory.

On 11 May, Mike Sissenwine met with Dave Pierce of the Massachusetts Division of Marine Fisheries to discuss the report of the recent State-Federal Gulf of Maine Assessment Committee meeting held at the Woods Hole Laboratory.

On 14 May, Emory Anderson attended a meeting of the New England Fishery Management Council Billfish/Swordfish Oversight Committee in Boston, MA.

During 14-15 May, Anne Lange attended the Fourth Fisheries Consultative Meeting held in Ipswich, MA.

On 15 May, Stuart Wilk attended the Mid-Atlantic Fishery Management Council Bluefish Scoping Session in Dover, DE.

On 15 May, Emory Anderson attended a meeting sponsored by the Mid-Atlantic Fishery Management Council in Dover, DE.

On 15 May, Stuart Wilk talked on bluefish and weakfish biology and management to the Saltwater Anglers of Bergen County.

During 16-18 May, Steve Clark visited the Institute Espanol de Oceanografia Laboratory in Vigo, Spain.

During 17-18 May, Judy Penttila and Ambrose Jearld, along with Anthony Bocelle, Contracting Officer for NMFS, attended the technical discussion meeting on the automatic age-reading system with Cambridge-IMANCO personnel of the Cambridge Instrument Co., Inc., in Monsey, NY.

During 21-27 May, Tom Azarovitz and Ambrose Jearld attended the meetings of the ICNAF Standing Committee on Statistics and Research (STACRES) in Dartmouth, NS. This year's meeting was held in conjunction with the first annual meeting of the Northwest Atlantic Fisheries Organization (NAFO) Scientific Council.

During 23-24 May, Mike Sissenwine and Brad Brown met with Mert Ingham of the Atlantic Environmental Group and members of NOAA's Climatic Modeling Group to discuss climate-fisheries models at the Woods Hole Laboratory.

Judy Penttila gave a seminar on age and growth on 24 May at Woods Hole Laboratory.

During 28-31 May, Emory Anderson participated in the ICES European Hake Working Group meeting in Charlottenlund, Denmark.

During 29-30 May, Fred Serchuk attended public hearings by the New England and Mid-Atlantic Fishery Management Councils on proposed amendments to the Atlantic Groundfish Fishery Management Plan in Riverhead, NY, and New Bedford, MA.

During 29-31 May, Mike Sissenwine attended the East Coast-West Coast Workshop on Groundfish Management held in Tiburon, CA.

During 30-31 May, Brad Brown met in Washington, DC, with the NMFS New England Task Force for examining fisheries management in this region.

On 31 May, Fred Serchuk attended, as an unofficial observer, the NMFS logbook public meeting at Cape Cod Community College in Barnstable, MA.

Harold Foster attended the Woods Hole Laboratory May Equal Employment Opportunity (EEO) meeting and the Laboratory's Promotion Review Committee meeting.

Rhett Lewis attended a week-long computer class offered by the Woods Hole Oceanographic Institution (WHOI) for non-programmers.

Don Flescher gave presentations to two high school groups and one college group during May.

Manuscripts

- Anderson, E. D. 1979. Assessment of the Northwest Atlantic mackerel, Scomber scombrus, stock. NOAA Tech. Rep. NMFS SSRF-732. 23 p. (P)
- Anderson, E. D., and F. P. Almeida. 1979. Assessment of bluefish (Pomatomus saltatrix) of the Atlantic Coast of the United States. NMFS, NEFC, Woods Hole Lab. Ref. No. 79-19. 15 p.
- Murawski, S. A. 1979. On the question of the offshore surf clam, Spisula solidissima, populations off New England. NMFS, NEFC, Woods Hole Lab. Ref. No. 79-22. 14 p.
- Murawski, S. A., and G. T. Waring. 1979. A population assessment of butterfish, Peprilus triacanthus, in the northwestern Atlantic Ocean. ICNAF Res. Doc. 79/VI/92, Ser. No. 5454. 28 p.
- Neves, R. J., and L. I. Despres. 1979. The oceanic migration of American shad, Alosa sapidissima, along the Atlantic Coast. Fish. Bull., US 77(1):199-212. (P)
- Wenzloff, D. R., R. A. Greig, A. S. Merrill, and J. W. Ropes. 1979. A survey of heavy metals in the surf clam, Spisula solidissima, and the ocean quahog, Artica islandica, off the Mid-Atlantic Coast of the United States. Fish. Bull., US 77(1):280. (P)

MARINE ECOSYSTEMS DIVISION

Plankton Ecology Investigation

Image Analysis

An image analysis meeting was held on 14 May at the URI Graduate School of Oceanography. Progress during the past quarter was reviewed and a summer work schedule was set out. Danny Costas completed a thesis on imaging techniques for zooplankton processing. Future work by the URI Department of Electrical Engineering will focus on actual specimens and shadow graphs. Danny O'Neill presented a summary of his work on classification by morphometric analysis. Using a Mahalanobis model for testing absolute measurements of actual specimens as they appear on the TV screen he could classify the 18 species (from a 326 data-point matrix) to group and species with a 99% level of accuracy. When considering the 12 copepods only (a 255 data-point matrix), a 99% separation was achieved for species and sex.

Plankton Sorting

In connection with our interest in the role of warm-core eddies on the advection (entrainment) of shelf water and associated boreal ichthyoplankton into the slope water zone, Ruth Byron, Jackie Frisella, and Tom McKenney have examined MOCNESS (Multiple Opening and Closing Net and Environmental Sensing System) plankton samples taken at two stations in entrained shelf water southeast of Georges Bank during November 1977 by Peter Wiebe of WHOI.

Samples were taken sequentially in 50, 100, and 200-m depth strata to a maximum depth of 1000 m. Shelf water (characterized by salinity and dissolved oxygen values) occupied the upper 50 m of the water column. No shelf water larval fish species were found in any depth strata. The dominant larval fish taxa collected were Gonostomatidae (Cyclothone spp.) and Myctophidae (Benthoosema glaciace and Ceratoscopelus maderensis).

Neuston samples taken on USSR R/V Argus Cruise No. 78-04 have been completely analyzed for ichthyoplankton information. The 148 stations will provide data on species abundance, lengths, and distribution. Ammodytes was the dominant genus in the neuston samples in which more juvenile and adult sizes were found than in the corresponding 0.505-mm bongo net samples.

A meeting was held with Kevin Powers and Ann Mason of the Manomet Bird Observatory on techniques, equipment, and procedures which will facilitate the processing of neuston samples. They are interested in obtaining information on the size groups and abundance of organisms as potential prey for birds. Work on the samples will begin in June and our help will include training in processing techniques as well as in vertebrate and invertebrate identification.

Biostatistics

Master station records, sampling records, and ichthyoplankton identification records were merged into the Marine Resources Monitoring, Assessment, and Prediction Program (MARMAP) Information System (MIS) data files for Argus Cruise No. 78-04, Albatross IV Cruise No. AL 78-04, Delaware II Cruise No. DE 78-02, Mt. Mitchell Cruise No. MM 77-11, and Kelez Cruise No. KE 77-11. Fish summaries for all these cruises were produced. Master station records were opscanned and edited for Delaware II Cruises No. DE 77-05, DE 77-07, and DE 77-09. Fish summaries for Polish R/V Wieczno Cruise No. 73-01 were completed and sent to Georges Bolz at the Woods Hole Laboratory. Problems developed with merging some older cruises --- Delaware II Cruise No. DE 71-04, USSR R/V Belogorsk Cruise No. 73-01, and Federal Republic of Germany (FRG) R/V Walther Herwig Cruise No. 73-01.

Four BLM maps were produced with few remaining to be completed. This task has been delayed because of other priorities.

A data status file was established and will be updated regularly. This will enable us to track the status of all data sets being processed. A network of two biostatistical tasks was prepared to assist in scheduling work during the summer.

The disappearance of old data files during the interregnum (from close of the Peterson contract to start of the Input/Output Computer Services, Inc. (IOCS), contract) continues to plague us. A good bit of time has been spent searching old tapes for files. A number of problems are involved: file names have been changed, tape labels have been changed, some tapes have been overwritten, and an index book of archived data sets has disappeared.

A second CRT (cathode raytube) has been installed in the Biostatistics Group trailer for use during the summer months.

Running biostatistical analyses on data from the MIS data base initially involves extracting the data from master files. Because of the extreme flexibility allowed in merging data into a master file, many contingencies must be taken into account in extracting the data. The extraction then provides data that must be manipulated and rewritten before it can be passed to a Fager Analysis System or to a Statistical Analysis System. Program coding to extract and pass ichthyoplankton data was begun late in May.

A new contract, for June through September, was negotiated with IOCS. They will concentrate on system maintenance and on documentation of all system modules they have developed.

Gary Johnson and Chris Lindgren began a scientific SCUBA diving course at the Graduate School of Oceanography. They will switch to full-time employment in June and concentrate on loading, converting, editing, and merging our backlog of data sets. Louis Coakley and Marie Carter will begin working in June. They will assist with the loading, converting, editing, and merging of our backlogged data sets.

Tom Plichta received a promotion.

Lorrie Sullivan completed a manuscript on "Distribution, Abundance and Mortality Estimates of Larval Butterfish, Peprilus triacanthus, 1977-78, Cape Hatteras to Nova Scotia." This manuscript was a URI fishery biology course requirement. It is being reviewed as a potential ICES paper.

Benthic Dynamics Investigation

Analysis of the macrobenthic invertebrate fauna from the continental shelf region south of Martha's Vineyard and Nantucket was continued during the month. The unusual presence of fine-grained bottom sediments spanning a rather broad depth range across the shelf has created an atypical habitat in which some extraordinary populations of benthic invertebrates have flourished. Brittle stars, holothurians, and octocorallids are a few of the groups that occur in unusually large quantities in this region. We are examining both the density and biomass of the component species of these and other taxonomic groups that occupy this interesting area. Good progress was made by Roger Theroux and Roland Wigley on the preparation of a data report which lists the detailed information pertaining to each sample in our collection of bivalve mollusks; this report is nearly completed. Roger Theroux also devoted a substantial amount of time on the analyses of the distribution of bivalve mollusks in the NEFC Invertebrate Collection.

Fish food-habit studies during the month dealt largely with haddock and flatfishes. Ray Bowman continued with the analyses of juvenile haddock feeding data, which pertain to both the quantity and kinds of foods eaten during 1953-76. Along somewhat different lines--emphasizing differences and similarities between predator species--Rich Langton compiled information and analyzed data pertaining to the food habits of nine species of flatfishes. Ray Bowman participated on one leg of the bottom trawl survey aboard the Albatross IV during the first half of May. The survey area included parts of Georges Bank, Gulf of Maine, and the Nova Scotia area. Some effort was devoted to updating the food habits data base--checking it for accuracy and completeness and preparing it for loading into the computer. Analysis of fish stomachs collected on Albatross IV Cruise No. AL-78-05 and the Belogorsk was undertaken primarily for the purpose of detecting diurnal variations in feeding activity.

Preliminary plans have been made for conducting a cruise on the Delaware II this fall. Major emphasis on this cruise will be collecting materials for determining the food habits of pelagic fishes and juveniles of demersal species that are pelagic at that life stage.

Ichthyoplankton Investigation

The spring MARMAP survey on Delaware II was successfully completed. With moderating spring weather we were able to complete 175 of the 180 stations. Two observations are worthy of note. Haddock larvae were relatively abundant on the eastern part of Georges Bank. Atlantic mackerel larvae were scarce in the Middle Atlantic Bight, although a concentration of eggs was encountered off Montauk

Point (Long Island), NY. In addition to the standard MARMAP stations, hydrographic observations and nutrient samples were taken along a line of six moored current meters south of Nantucket Shoals. Preparations are underway for the next survey which is scheduled to begin on 11 June.

Chris Powell made measurements of ^{14}C primary productivity on a MARMAP survey aboard the Delaware II during 17-29 May. He also collected qualitative phytoplankton samples for Dr. Ted Smayda of URI which will be examined for the presence and distribution of Coscinodiscus and Geratium.

Wally Smith accompanied Ken Sherman and Bob Marak to Poland to take part in the annual meeting of the Polish Sorting Center Advisory Board. This year's meeting was held at MIR (Morski Instytut Rybacki) in Gdynia. Two days were subsequently spent at the Sorting Center in Szczecin where changes in protocol were initiated to shorten turnaround time for processing samples. By expediting shipping and processing, we anticipate that turnaround time will be reduced from 6 mo to less than 3 mo.

Reviewers' comments have been considered and the BLM contract report was modified accordingly. It has been submitted for final typing.

Larval Physiology and Biochemistry Investigation

Larval winter flounder research was completed. Data on respiration and activity levels at a constant temperature are under analyses. Individual larval feeding rate studies showed a direct correlation of numbers of nauplii consumed with size. Numbers eaten ranged from 1-2 or less per hour for newly feeding larvae to 10-20 per hour for larvae close to metamorphosis. Results of daily mortality rate studies are to await analyses until further evolution of the prototype aquarium system used is completed.

Adult scup were induced to spawn on demand with the new controlled temperature system for the first time.

The kinetics of the $\text{N}\alpha$ -benzoyl-arginine- β -naphthylamide (BANA) fluorometric assay for trypsin were studied using isolated larval Atlantic silversides gut. The enzyme was stable to at least 45°C and had a pH maximum between 7.8 to 8.2. No activity was observed below pH 4.8. The Arrhenius activation energy (E_a) was 11.33 Kcal/mole. Trypsin activity in scup eggs and yolk-sac larvae was below the limits of detection of the BANA assay (ca. <1 mg of trypsin per individual).

Work was initiated on two manuscripts, one a joint effort with Dr. Jan Beyer of Denmark on stochastic modeling of larval fish survival and its relation to fishery management, and the other one on the effects of temperature and salinity on embryo survival and development in yellowtail flounder.

Apex Predators Investigation

During May, increasing numbers of fishermen have begun shark fishing along the US South Atlantic Coast and we have had a sharp increase in the number of requests for tags. There is an increasing interest in tagging sharks in the Gulf of Mexico and we are providing tags to shark fishing clubs, particularly along the West Coast of Florida and the Texas Coast. In May, only three tag returns were received, however, one of these came from a night shark (Hypoprion signatus) that was tagged off Cape Hatteras in 1966 and was at liberty for 13 yr. This is the longest time at liberty we have had from one of our tagged sharks. The remaining recaptures for this month included a silky shark at liberty for 6 yr and a blue shark at liberty for 8 mo. From past experience the month of June will

be one of our most active months with respect to tagging activities, attending tournaments, and conducting a research cruise aboard the R/V Geronimo.

Research into aging mako sharks continues. So far there is poor agreement in analysis of transverse sections of vertebrae due to an oversensitive technique. Attempts will continue utilizing the vertebral face following Stevens (1974) and original techniques. Half of the several hundred reproductive tissue samples from 1978 have been prepared for histological sectioning.

We have had several responses to our request for white shark sightings. Although the data are limited, there is some indication of a northeastward movement of white sharks following 10^o-12^oC water in the Middle Atlantic Bight.

Nancy Kohler continued to code apex predator food habits data for terminal entry by the Woods Hole Laboratory ADP Unit. The present data base will then be analyzed using existing programs developed by the Benthic Dynamics Investigation's Food Habits Task at the Woods Hole Laboratory.

An attempt was made by Chuck Stillwell and Nancy Kohler to conduct the initial phase of a feeding study designed to determine the rates of food consumption and gastric evacuation for three sandbar sharks at the New England Aquarium. The study was terminated, however, after 2 wk because of a series of unexpected disruptions in the tank which altered the behavior so drastically that a non-feeding response developed.

In May, the shark tagging data bases were removed from the MIS system, updated, and reformed into one common data base. New programs have been written and updated for analysis this summer.

Analysis of recreational shark catch data is being prepared for the Mid-Atlantic and Gulf of Mexico Fishery Management Councils' shark management plans. Preliminary estimates of the recreational catch of sharks along the Atlantic Coast and Gulf Coast have been completed. A paper summarizing these results will be prepared for an in-house report next month.

Fishery Oceanography Investigation

Most of our Investigation's time was spent attending meetings and at sea. Red Wright, Ron Schlitz, Steve Ramp, Kathy Bush, and Ron Kirschner presented papers at the second Gulf of Maine Workshop in Halifax, NS.

Red Wright presented a paper on the plankton and water distribution on Georges Bank. Ron Schlitz's presentation was on the current observations on northern Georges Bank. Steve Ramp's paper addressed the Northeast Channel flow; the data was based on 1 yr of measurements. Red Wright was also instrumental in the completion of the aforementioned paper. Kathy Bush presented a paper on the box model determination of the transport of Gulf of Maine/Georges Bank water into the Middle Atlantic Bight shelf region. Ron Kirschner's presentation was on the temperature structure and sea surface salinity conditions in the Gulf of Maine since the summer of 1975.

Red Wright and Ron Schlitz gave lectures at the Sailing Education Association (SEA) in Woods Hole, MA, in preparation for an upcoming cruise aboard R/V Westward. The cruise will include Nansen bottle water sampling techniques and drogue measurements. The objective is to test the hypothesis of a clockwise gyre on Georges Bank by measuring flow on the eastern end of the bank.

Ron Schlitz, Steve Ramp, and Kathy Bush presented papers at the American Geophysical Union (AGU) annual conference in Washington, DC. Ron Schlitz's presentation was on the currents on northern Georges Bank with similar presentations made by Steve and Kathy.

Dan Patanjo and Tom Laughton spent considerable time at sea aboard Delaware II Cruise No. DE 79-05. Red Wright, Tim Cain, Gil Dering, and Derek Sutton were also at sea aboard the R/V Whiting Cruise No. WH 79-01. We were able to look at the temperature, salinity, and nutrient structure across the shelf along our most recent deployment of moorings and to check the electronics of the firing mechanism of our subsurface moorings.

Sam Nickerson, Tim Cain, Ron Kirschner, Dan Patanjo, and Anne Dorkins ran salinities on the Guildline salinometer. Sam has contoured and plotted temperature and salinities for bottom trawl and MARMAP cruises. In his data analysis, he read all temperatures from expendable bathythermograph (XBT) traces of Albatross IV Cruise No. AL 79-04 and Delaware II Cruise No. DE 79-04. Ron Kirschner made the necessary repairs on the Winkler-method oxygen measurement system. Tim Cain made the necessary repairs on 1.7-liter Niskin bottles for Delaware II Cruise No. DE 79-04, Albatross IV Cruise No. AL 79-04, and Whiting Cruise No. WH 79-01. Gil Dering continued the design of the XBT digitizer and the preparation of vector-averaging current meters (VACM's) for sea. He also repaired two radio transmitters and one VACM to be used for another investigation.

Anne Dorkins has been on board as of 21 May. She has been working on velocities and volume transport through the Northeast Channel. Derek Sutton and Steve Ramp have worked closely with T. McKee of WHOI on the continued processing of the Northeast Channel and International Larval Atlantic Herring Patch Study current meter data.

Ron Kirschner, with the assistance of Tim Cain, completed the monthly Gulf of Maine ship-of-opportunity (SOOP) report for April and May. Tim Cain has taken on the assignment of writing the monthly reports of the Investigation. Dan Patanjo has completed compiling the station position data list; it is now ready for distribution.

Sam Nickerson completed contouring temperature sections for the following cruises: Argus No. 78-04, Delaware II No. DE 78-02, Belogorsk No. 78-01, USSR R/V Aliot No. 78-01, and Albatross IV No. AL 78-07.

Ecosystem Dynamics Investigation

Ed Cohen participated in the last 3 wk of a modeling workshop at the NWAFC in Seattle, where, together with Erik Ursin, Neils Daan, Emma Henderson, and NWAFC personnel, he helped conduct further evaluation of the biomass models developed by Laevastu. These models use discrete time steps and are based on functions which control changes in biomass as compared with the North Sea model (Andersen and Ursin) which uses continuous processes and numbers of individuals in each population. The NWAFC models have some parts which may be adapted to our model, notably circulation and fish migration. However, our model GEORGE is more along the lines of the North Sea model for which we now have a mini-version programmed for WHOI's Sigma 7 computer.

Wendell Hahm and Ed Cohen have begun simulation runs on this mini-model to explore effects of various time steps and fishing levels on behavior of the model.

Wendell Hahm and Rich Langton, together with Mike Pennington, began laying out the multivariate analyses for summarizing the size-specific food habits data set. Auditing of this data base is near completion by the Benthic Dynamics Investigation's Food Habits Task, and preliminary partitioning of food consumption by prey groups for six major species on Georges Bank is expected to be completed

by July; after this it will be possible to begin analysis of feeding interactions within the framework of GEORGE.

Mike Pennington continued work on several ongoing statistical projects, including modeling impact of various management strategies on the yellowtail flounder fishery and an analysis of sampling errors in ichthyoplankton survey data. Marv Grosslein continued editing of the fish monograph for the New York Bight Atlas; also, he attended the second informal workshop on oceanography of the Gulf of Maine-Nova Scotia Shelf at Halifax, NS. A report of the workshop is available on request.

Recruitment Processes

Members of the Recruitment Processes Group were involved in several Marine Ecosystems Division meetings and one international conference during May. Greg Lough, George Bolz, Dave Potter, Roz Cohen, and Marv Grosslein attended an informal meeting at the Milford Laboratory on 8 May with other members in the Division concerned with plankton activities, to discuss the plankton research program prior to the general review on 31 May at the Narragansett Laboratory. Greg Lough spent considerable effort early in the month preparing materials for the first group presentation of the Georges Bank International Larval Atlantic Herring Patch Study at the second informal workshop on the Gulf of Maine and Scotian Shelf at Dalhousie University in Halifax, NS, during 14-17 May. Greg Lough attended the meeting (with Marv Grosslein) and presented two of the seven talks on the preliminary results of the patch study. Abstracts, as well as the report mentioned above, are available upon request.

Analysis and summary of the Georges Bank ichthyoplankton collected during the fall and winter of 1971-77 ICNAF time series (0.333-mm mesh net samples) have been continued by George Bolz. Twenty-eight of the 35 surveys have been received to date from the Narragansett Laboratory Biostatistical Unit. Dave Potter is concluding the analysis and manuscript of the neustonic ichthyoplankton collected on six surveys during 1974-75, in both the autumn and spring. Dana Temple, a University of Massachusetts Co-op student, sorted ichthyoplankton from 29 special hauls (Albatross IV Cruise No. AL 78-02) to compare the ICNAF 3.5-knot versus the MARMAP 1.5-knot hauls. Ammodytes larvae were the only larval fish in abundance, and the results indicate significant day escapement by the slower haul.

The 0.333-mm mesh net-caught zooplankton data from the 1974-75 ICNAF surveys (nine cruises) were received from Julien Goulet in the form of a tape, and Roz Cohen together with Kay Paine have begun matching up the raw sorted data with the station-haul data for standardization and computer outputs. Roz Cohen together with Janet Murphy will be comparing these data with the larval Atlantic herring gut content - condition factor data from the same surveys.

Robert Livingstone continued work on haddock fecundity-maturity analysis and on a report with Mike Pennington and Marv Grosslein. This month, sex ratios were examined in detail.

Dana Temple completed his second and final Co-op student session (January-May) with the Recruitment Processes Task. William Michaels (a University of Massachusetts Co-op student) replaces him as of 4 June.

Meetings, Talks, Visitors, Publicity

Robert Marak, Ray Maurer, Donna Busch, Jack Green, and Larry Buckley attended a plankton ecology planning meeting at the Milford Laboratory on 8 May.

Donna Busch met with Deneb Karentz of the Botany Department at URI on 11 May to discuss ^{14}C autoradiographical methods in preparation for US-USSR joint research aboard the R/V Belogorsk in August 1979.

Dr. Diana Valiela Ward of the Westwater Research Center of the University of British Columbia (UBC), visited the Narragansett Laboratory. She is working on salmon ecology at UBC.

Donna Busch presented results of ^{14}C primary production work from MARMAP surveys at the University of Lund (Sweden) on 29 May.

During 13-20 May, Robert Marak, Wally Smith, and Ken Sherman were at the Fifth Advisory Meeting of the Polish Sorting Center at Gdynia and Szczecin, Poland.

During the week of 22 May, Ken Sherman attended the ICNAF/NAFO meeting in Nova Scotia.

Geoff Laurence attended an IYABA meeting at the Oxford Laboratory.

Julien Goulet attended a meeting of the Providence Chapter of the Data Processing Management Association. The featured speaker discussed bridging the communication gap between the data processing professional and senior management.

The Division held a meeting on 31 May at the Narragansett Laboratory. Among those present were: Marv Grosslein, Greg Lough, Wally Smith, Robert Edwards, Roz Cohen, George Bolz, Robert Marak, Ed Cohen, Ray Maurer, Jay O'Reilly, and Ken Sherman.

Discussions were held with Bob O'Boyle (Canada) concerning cooperative mid-water trawling for predator-prey studies and gear evaluations in September. These efforts are coupled to our investigation of cooperative work with Polish colleagues in Szczecin as a followup to discussions held in Poland.

Ken Sherman and Reuben Lasker met on 11 May to discuss the Early Life History of Fish Symposium publication.

Roz Cohen attended the WHOI Computer Users Workshop during 21-25 May, and Janet Murphy participated on the MARMAP survey aboard the Delaware II during 4-15 May.

Roz Cohen attended the Massachusetts statewide meeting of Federal Women's Program Managers sponsored by the Women's Opportunity Committee of the Boston Federal Executive Board in Boston, MA, on 16 May. Roz Cohen and George Bolz attended two Woods Hole Laboratory EEO meetings, on 1 and 16 May. George Bolz also participated in a special EEO Subcommittee meeting on 22 May at the Woods Hole Laboratory.

About 15 high school students from the Cambridge School in Weston, MA, were given a general presentation to field and laboratory work of the larval Atlantic herring studies by Roz Cohen on 18 May.

On 3 May, Carl Zeiss, Inc., representatives from Boston, MA, provided the Recruitment Processes Group with a demonstration of the Modular System for Quantitative Digital Image Analysis (MOP-1, 2, 3).

Roger Theroux gave a talk on benthic invertebrate communities and fish food habits to the students of the Cornell University-University of Pennsylvania Aquavet Program in Woods Hole on 23 May.

Jack Casey attended the Fourth Marine Recreational Conference at Ft. Lauderdale, FL, on 7 and 8 May and visited the SEFC to assist in coordinating future shark studies being undertaken at that facility. He also visited the Shark Research Institute and the University of Miami where shark studies are in progress.

Jack Casey participated in a TV program on sharks. The show, titled "You," was broadcast out of New York City on 26 May.

Rudy Van der Elst, Research Officer at the Durbin Aquarium in South Africa, visited the Narragansett Laboratory and gave a seminar on the fisheries of South Africa.

Dr. John Stevens of the Marine Biological Laboratory of the United Kingdom, visited the Narragansett Laboratory and presented a seminar on his studies of shark populations in Aldabra in the Indian Ocean.

Richard Kierstead retired on disability on 28 May after 24 yr with NMFS and the US Fish and Wildlife Service.

The following presentations were made at the second informal workshop on the Gulf of Maine and Scotian Shelf: "Current Observations on Northern Georges Bank" (R. J. Schlitz and R. W. Trites); "Plankton and Water Distribution on Georges Bank" (W. R. Wright, R. G. Lough, and R. O'Boyle); "Northeast Channel Flow" (S. R. Ramp and W. R. Wright); "Temperature Structure and Sea Surface Salinity Conditions in the Gulf of Maine" (R. A. Kirschner); and "A Box Model Determination of the Transport of Gulf of Maine/Georges Bank Water into the Middle Atlantic Bight Shelf Region" (K. Bush and S. Kupferman).

The following presentations were made at the AGU conference: "Current Observations on Northern Georges Bank during Fall 1978" (R. J. Schlitz and R. W. Trites); "Observations of the Seasonal Variability of Low-Frequency Currents in the Northeast Channel, Gulf of Maine" (S. R. Ramp and W. R. Wright); and "A Box Model Study of Middle Atlantic Bight Transports" (K. A. Bush and S. L. Kupferman).

During May there were two talks given as part of the Narragansett Laboratory In-House Lecture Series: "Food and Feeding Habits in Apex Predators" by Chuck Stillwell on 18 May, and "Diel Distribution and Relative Abundance of Adult and Larval Fishes in a Potomac River Tributary" by Chris Powell on 4 May.

Manuscripts

Kendall, A. W., Jr., and M. P. Fahay. 1979. Larva of the serranid fish Gonioplectrus hispanus with comments on its relationships. Bull. Mar. Sci. 29(1):117-121. (P)

Kirschner, R., and T. Cain. 1979. April and May 1979 temperature transects of the Gulf of Maine. NMFS, NEFC, SOOP Rep.

Lough, R. G. 1979. Larval herring patch study. ICNAF Res. Doc. 71/VI.

Lough, R. G., G. R. Bolz, M. D. Grosslein, and D. C. Potter. 1979. Abundance and survival of sea herring (Clupea harengus L.) larvae in relation to environmental factors, spawning stock size, and recruitment for the Georges Bank area, 1968-1977 seasons. ICNAF Res. Doc. 71/VI/112. 47 p.

Sherman, K. 1979. Emerging ecosystem theory in relation to plankton studies in the Northwest Atlantic. ICNAF Res. Doc. 79/VI/117.

Sherman, K. 1979. Fisheries ecosystem studies off the Northeast Coast of the United States: summary of the initial results. ICNAF Res. Doc. 79/VI/114.

MANNED UNDERSEA RESEARCH AND TECHNOLOGY PROGRAM

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

DIVISION OF ENVIRONMENTAL ASSESSMENT

Behavior of Marine Fishes and Invertebrates Investigation

During the past month, several experiments were conducted in cooperation with Battelle, Pacific Northwest Laboratories, with funding from the US Department of Energy (USDOE) on the effects of oiled sediments on shelter selection and utilization by juvenile red hake. Although the results are still being analyzed, with the biological data being handled by both Sandy Hook Laboratory and Battelle biologists, and the chemical data by Battelle chemists, certain trends were evident. In experiments where shelter was only available on the oiled sediments, the animals readily selected these shelters. In addition, under these conditions, socially dominant fish would exclude subordinant ones from the shelter area thereby restricting them to the clean sediments. Additional experiments which examine the significance of these behaviors are in progress.

Biological Oceanography of Stressed Environments Investigation

Bill Phoel completed the data analysis of riverbed oxygen consumption and nutrient regeneration from stations at the mouth of the York River (Virginia) and has presented a paper titled "Nitrogen Regeneration and Total Oxygen Consumption by the Sediments at the Mouth of the York River, Virginia, USA" at the International Symposium on Nutrient Enrichment in Estuaries in Williamsburg, VA. This study was part of the Intensive York River Study conducted by the Virginia Institute of Marine Science (VIMS) which is investigating a fortnightly stratification/destratification phenomenon in the river. These data will be added to our existing data base concerning oxygen consumption and nutrient regeneration by the seabed to establish a continuum from the estuaries to the outer continental shelf. The establishment of such baselines is crucial to understand the role the seabed plays in providing nutrients necessary for productivity and determine what natural or man-induced perturbations in this capability occur.

Myra S. Cohn worked on completion of the analysis of the October 1978 collection of whole water samples for phytoplankton from the joint study with Dr. Harold Marshall. Determinations have been completed on total number of individuals, total number of taxa, species diversity index (based on the Shannon-Weaver diversity index), relative abundance, equitability, and species associations for each station.

When subsequent samples (from later cruises) are evaluated, we will be able to discuss overall community structure and seasonal changes and trends, and to coordinate these with other Ocean Pulse variables. Mrs. Cohn has examined samples from inshore stations from Cape Hatteras to Nova Scotia. Samples from offshore stations are to be examined by Dr. Marshall as part of the Ocean Pulse Program.

Mrs. Cohn's paper, with Paul Olsen of the New Jersey Department of Environmental Protection (NJDEP), has been accepted for publication in the silver anniversary edition of the Bulletin of the New Jersey Academy of Science to be published in the late fall of 1979. The paper is titled "Phytoplankton in Lower New York Bay and Adjacent New Jersey Estuarine and Coastal Areas."

An Olisthodiscus luteus phytoplankton bloom from Sandy Hook to Mantoloking began during the Memorial Day period. Counts of 100,000 cells/ml inshore at Sandy Hook and Sea Bright and 50,000 cells/ml off Asbury Park were noted. This bloom traditionally occurs during the week of 21 June near the summer solstice. The bloom is being monitored both temporally and spatially because of its potential impact on oxygen concentrations and fishery resources.

A draft of a paper on the seasonal changes of blood characteristics of winter flounder in New York Harbor during 1969-70 was nearly completed by Dr. John Mahoney. He also reviewed a Sea Grant proposal for a study on the role of heavy metals in fish disease.

Coastal Ecosystems Investigation

Jan Caracciolo and Frank Steimle completed draft versions of: (1) their atlas on distribution, abundance, and life history information for dominant benthic invertebrates of the New York Bight apex; (2) a paper on impacts of dumping on apex benthos, to be discussed at the MESA New York Bight Symposium in June; and (3) a manuscript for a talk presented in March at Temple University describing the Ocean Pulse Program. Frank also completed the second Ocean Pulse Newsletter which was distributed this month. Frank and Chuck Idelberger began making calorimetric measurements on species collected on the April Ocean Pulse cruise. Eleven additional species were collected for these measurements. Most are fish identified by the Benthic Dynamics Investigation's Food Habits Task as important forage species, but two shelf-break crustaceans, Munida and Acanthocarpus, will also be analyzed. Data from an artificial reef food habits program and a benthic survey of Block Island Sound have been tabulated and entered into the computer; manuscripts are being prepared on these two subjects. Two reported "fish kills" were investigated; each case involved fewer than 10 fish, which appeared to have been discarded by fishermen.

Clyde MacKenzie and Dave Radosh began a series of SCUBA surveys of local surf clam beds. This program, part of Ocean Pulse, is designed to document eventually such features as growth, reproduction, setting, predation, and other mortality in surf clam beds from high- and low-contamination areas. Dave continued his cluster analysis of faunal groups recolonizing the anoxia area off New Jersey. Bob Reid worked on papers: (1) describing the three major faunal assemblages in Long Island Sound (in mud, sand, and "transitional" sediments); and (2) examining changes over a 6-yr period in the mud-bottom group. Bob and Greg Parker again assisted personnel from the Atlantic Environmental Group's Ocean Dumping Investigation in determining currents at Deepwater Dumpsite (DWD) 106 by tracking buoys from shore with radio direction-finder equipment. Sukwoo Chang continued work on a biometric handbook for the Ocean Pulse Program.

Environmental Chemistry Investigation

Several members of the Environmental Chemistry Investigation (i.e., Jay O'Reilly, Sue Barker, and Bill Hogelin) participated in the MARMAP ichthyoplankton/hydrography/productivity survey aboard the Delaware II during 6-29 May. Netphytoplankton (>20 μm) and nannophytoplankton (<20 μm) chlorophyll-a was measured at 8-to-10 depths in the upper 75 m of the water column at 176 stations. The weighted mean concentration of total chlorophyll-a was relatively high (3 mg/m^3) off the mouths of the Hudson, Delaware, and Chesapeake estuaries and approximately 1 mg/m^3 throughout the mid-shelf region between Cape Hatteras and Nantucket.

Measurements of primary productivity were made at 38 stations throughout the survey area.

Samples of seawater were filtered aboard the Delaware II for nutrient determinations (i.e., ammonium, nitrite, nitrate, phosphate, and silicate). Generally five-to-nine depths were sampled throughout the entire water column at 99 stations. This data set should give us a comprehensive understanding of nutrient distributions throughout the shelf area from Cape Hatteras to the Gulf of Maine. We have begun analyses for these nutrients at the Sandy Hook Laboratory using the Technician Autoanalyzer.

Al Matte participated on a 3-day survey aboard the Whiting with Red Wright and other members of the Fisheries Oceanography Investigation. Mr. Matte collected 200 samples for nutrient analyses in and around the current meter array off Nantucket, as well as trained members of the Fishery Oceanography Investigation in the shipboard methods for handling nutrient samples.

Most of the equipment related to heavy metal analyses was transferred from the Milford Laboratory to the Sandy Hook Laboratory. Construction of the metals laboratory continued at Sandy Hook.

Physiological Effects of Pollutant Stress Investigation

Physioecology

The long-term effects study of silver on slipper limpets (Crepidula fornicata) continued this reporting period. Water temperature in test aquaria has risen from 9°C to 17°C in the last month. Ninety percent of the adults and paired juveniles are producing egg masses. Egg masses of paired adults are being sampled to determine whether silver, after 1 yr of exposure, has done any genetic damage.

The larvae which were exposed to 10 ppb silver and had crawled out of their shells were examined. The larvae have undergone metamorphosis, but have not regenerated shells.

A proportional diluter was set up to expose adult slipper limpets to copper. Cupric chloride will be the form of copper and adults will be exposed to 0, 2, 10, and 20 ppb.

Numerous attempts to spawn surf clams, conditioned at 12°C, have not been successful.

A 10-day experiment to determine the effects of silver (0, 10, 15, 20 ppb concentrations) on embryos and larvae of the blue mussel (Mytilis edulis) under various temperature (12°, 16°, 20°C)-salinity (20, 25, 30 ‰) regimes was performed this month. It was the third successful spawning this spring.

Mussel larvae, obtained from a spawning on 17 April, continue surviving well. Many have reached 500 µm or more in length and are releasing byssal threads for attachment.

Three chemistry laboratory rooms were dismantled this month and various supplies packed in preparation of shipment to the Sandy Hook Laboratory as part of the transfer of the Environmental Chemistry Investigation to that laboratory.

Analyses were completed on tissues of the duck clam (Macoma balthica) which had been exposed to copper. Samples of slipper limpets exposed to silver for 6 mo were also analyzed.

Physiological Effects

The first group of blue mussels for this season from Narragansett Bay, were examined this month. This study is part of a cooperative effort with the USEPA's Narragansett Laboratory. Mussels held in various parts of the Bay are being examined at monthly intervals to detect any possible physiological and biochemical differences that might exist between mussels held in heavily polluted waters and those from cleaner sites. In addition, a laboratory study is underway to determine the effects of ammonia as the chloride on physiological condition, since high ammonia levels were detected at sites where low scope-for-growth measurements were determined.

A study of changes in respiration rates of American lobsters over the molt cycle has been initiated. This information will be used in the Ocean Pulse Program where respiration measurements are made on lobsters aboard various research vessels. If significant differences are detected, it will be necessary to determine and note the molt stage of each lobster studied.

The Physiological Effects Group placed two people on the R/V Advance II for the spring Ocean Pulse cruise. Respiratory and hematological measurements were made on about 250 fish, crustaceans, and mollusks during the 9-day cruise.

Biochemical Effects

Biochemical effects personnel participated in the Ocean Pulse survey on Advance II Cruise No. AD 79-01, with stations in the New York Bight - Mid-Atlantic area, and off the Southern New England Coast; 224 tissue samples were taken for analysis. Of these, examination has been completed for the sea scallop adductor muscles (77) from the Philadelphia Dumpsite, the anoxic area, and two control stations, and for winter flounder and windowpane kidneys (33) from the anoxic area and two control stations. Rock crab (Cancer irroratus) hearts remain to be analyzed.

Biochemical examination was also completed for tissues (i.e., kidney, liver, and heart) from lead-exposed flounder (50 ppb for 2 mo) subsequently held for 2 days at either ambient (27 ‰) or low (17 ‰) salinity. In some instances, lead did not affect enzyme activity, but low salinity did; in others (both heart and kidney), low salinity had no effect in control animals, but did depress enzyme activity in lead-exposed animals. The latter observation could have significance for the animal's capacity to adapt to normal environmental variables.

We began (with the Physiological Effects Group) an experimental exposure of blue mussels, obtained for us by the USEPA from "clean" Rhode Island waters, to 20 $\mu\text{moles NH}_3/\ell$, having observed both physiological and biochemical abnormalities in field-collected mussels last August at a station with that concentration of NH_3 ; there was also low dissolved oxygen (DO) at that station, but we're trying the ammonia variable first. Thus far, we've taken baseline samples and samples from animals exposed for 1, 8, or 15 days. Fresh gill preparations were made and frozen, and adductor muscles were frozen for analysis after the exposure is completed in another week. The first month's sampling was obtained of blue mussels held at polluted and at "clean" stations in Narragansett Bay by the USEPA's CEAS group; gills and adductor muscles from these animals were also taken for later testing.

Anaerobic Bacteriology/Metabolism

Ocean Pulse activities included participation in the Advance II cruise, covering the southern leg of the study. Sediment samples from 19 stations were obtained for bacteriological analysis.

Clostridial counts were predominantly of the perfringens type and ranged from approximately one million per gram of sediments at the inshore stations to 20 per gram for the offshore stations. Enrichment cultures for toxin-producing anaerobes yielded 6-out-of-16 sediment cultures which were toxic for mice.

Except for one sediment, no organisms were detected on our Vibrio media, either by direct plating or by primary enrichment procedures on the sediments. A few colonies were detected in the sediment from the sewage sludge area. Isolates were not of the Vibrio group.

Total aerobic and anaerobic counts on marine agar from a select group of sediments gave counts in excess of one million per gram of sediment. The minute colonies appearing under anaerobic conditions would indicate that this medium is deficient for these organisms. Isolates from the plates incubated aerobically yielded three biochemical groupings, one of which was a Vibrio-like organism.

Meetings, Talks, Visitors, Publicity

On 1 May, Frank Steimle attended a New York Bight Advisory Committee meeting at the USEPA facility in Edison, NJ. He presented some preliminary results of the April Ocean Pulse cruise dealing with DO levels and phytoplankton blooms in the Bight, and coordinated planning with the other agencies monitoring the Bight.

On Wednesday, 2 May, Dr. John Pearce participated in a meeting of the NEFC Consolidation Committee which was held at the Oxford Laboratory. The final report to the Center Director based on the results of this meeting is being prepared by the Chairperson of the Committee with advice from Committee members.

Andy Draxler attended the Ninth Annual Symposium on the Analytical Chemistry of Pollutants sponsored by the USEPA, University of Georgia, and American Chemical Society, from 6 to 9 May at Jekyll Island, GA.

On Tuesday, 8 May, Dr. Pearce met with invited participants in a meeting sponsored by the Concerned Scientists at the Harvard Club in New York City. This meeting was to review work which has been conducted in the lower Hudson estuary and Raritan Bay in order to advise the MESA personnel on the design of the Hudson-Raritan estuary program. This monitoring program is to be initiated in FY80 and will have connections with the ongoing NMFS Ocean Pulse Program.

Drs. Pearce, Thomas, and Sindermann met with the Center Promotion Review Committee on 10 May in Woods Hole to review nominations for promotion.

During 12-19 May, Dr. Pearce participated in the ICES Working Group on Marine Pollution Baselines and Monitoring. The Working Group met at the Portugal Fisheries Institute in Lisbon. Of particular significance were discussions in regard to current intercalibration activities, as well as those related to the establishment of toxic substance baselines in fish and the physical environment. A review of the pertinent items covered during the meeting is available as a foreign travel report which can be obtained by writing to Dr. Pearce.

Bob Reid attended the US Army Corps of Engineers annual Disposal Area Monitoring Survey (DAMOS) Conference at Newport, RI, on 14 and 15 May.

Dr. Thomas participated as panelist and speaker at the Long Island Sound conference at the University of Bridgeport on Saturday, 19 May. He spoke concerning current effects and problems of sewage sludge disposal in the marine environment.

On Wednesday, 23 May, Dr. Pearce participated in the Coastal Zone Measurements, Mapping, and Management meeting held in New York City. The deliberations and presentations at the meeting were of particular importance in relation to ongoing NEFC monitoring programs as well as programs involved with mapping conducted under the aegis of ICES.

Dave Radosh described NEFC facilities and programs to a visiting group of oceanography students from Nassau Community College on 25 May.

On Friday, 25 May, Dr. Pearce met with MESA personnel to review items to be presented at the MESA Symposium to be held in early June in New York City. Individual papers are being prepared with abstracts to be submitted for use by management personnel as advice to the body politic.

Bill Phoel attended the International Symposium on Nutrient Enrichment in Estuaries during 29-31 May and presented a paper on "Nitrogen Regeneration and Total Oxygen Consumption by the Sediments at the Mouth of the York River, Virginia, USA." The paper is to be published in the symposium proceedings.

Drs. Pearce and Thomas attended a meeting on remote sensing which was held at URI's Whispering Pines Conference Center. Dr. Pearce presented an overview of the ongoing Ocean Pulse Program and Dr. Thomas reviewed the planning and implementation of the Large Area Marine Productivity Experiments (LAMPEX) program.

Dr. Thomas was visited by Dr. Frank Farmer of the NASA Langley Research Center to discuss objectives for LAMPEX during FY80-85.

Dr. A. Calabrese participated in a pre-symposium workshop in Arlington, VA, on 15 May, which met to draft a summary statement about toxic effects of pollutants on communities and ecosystems for the June MESA Symposium on Ecological Effects of Environmental Stress.

Dr. A. Calabrese, Miss E. Gould, and Dr. J. Graikoski participated in an Ocean Pulse meeting at the Sandy Hook Laboratory on 11 May.

E. Gould participated in a pre-symposium workshop at the Sandy Hook Laboratory on 22 May, which met to draft a summary statement about pollutant effects in fish for the June MESA meeting.

Dr. J. Graikoski attended the State of the Sound Conference at the University of Bridgeport on 19 May.

Mr. R. Greig visited the USEPA laboratory in Narragansett, RI, to discuss techniques for metals analysis in seawater. He also attended a symposium on "Analytical Chemistry of Pollutants," during 7-9 May, held at Jekyll Island, GA.

Dr. F. Thurberg attended a meeting of the ICES Working Group on Marine Pollution: Baseline and Monitoring Studies in the North Atlantic in Lisbon, Portugal, during 15-18 May.

Manuscripts

Greig, R. A., and J. Krzynowek. 1979. Mercury concentrations in three species of tunas collected from various oceanic waters. Bull. Environ. Contam. Toxicol. 22:120-127. (P)

Mahoney, J. B., and F. W. Steimle, Jr. Possible association of fishing gear clogging with a diatom bloom in the Middle Atlantic Bight. Bull. N.J. Acad. Sci. (A)

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AQUACULTURE DIVISION

Aquacultural Genetics Investigation

Experimental Hybridization in Oysters

Hybridization experiments with commercial oyster species continued this month. Most crosses were made with Crassostrea virginica (American oyster) and C. gigas. Length and width measurements are being taken of recently metamorphosed animals from the two species as there appears to be a difference in the angle of shell growth at this stage. Additionally, larval respiration rates indicate a species difference in some preliminary trials.

Other hybrid studies are underway with C. corteziensis oysters obtained from a researcher in Mexico. H. B. Stenzel, in his volume of a treatise on Invertebrate Paleontology, proposed that C. corteziensis and C. virginica were daughter species of a common Pacific-Atlantic ancestor species of the Miocene and Pliocene Ages. C. corteziensis ranges from Panama to the Gulf of California, while C. virginica ranges from Yucatan to the Gulf of St. Lawrence. Before the land bridge formed between North and South America, the Pacific Ocean was open to the Gulf of Mexico and a Crassostrea species probably ranged through the gap. As the gap closed, the species became dichotomous by geographic separation. A hybrid cross between the two species, then, might exhibit heterosis. Spawning has been limited to date. A C. corteziensis female produced a few eggs. C. virginica sperm was used to fertilize the eggs from which a few larvae resulted. Examination of a cytological sample of the eggs revealed 10 chromosomes at metaphase I of meiosis, a haploid number consistent with that reported for other oyster species studied cytogenetically.

Spawning and Rearing of Mollusks Investigation

Two April spawnings of bay scallops (Argopecten irradians) yielding significant quantities of larvae have survived and grown well and will form the base stock of animals for our summer program. More than 500,000 scallops, now averaging 2 mm in length, remain from these groups.

Experiments are underway to determine the food and spatial requirements of young juvenile scallops between setting size (0.2 mm) and raceway planting size (5.0 mm). Preliminary results show that 1-2 mm scallops are not spatially limited at biomass densities up to 40 ml/m². During an 8-day trial these animals doubled in length and quadrupled in volume.

Experimentation is underway in the pumped raceway system to evaluate the production of 55-mm yearling surf clams. Four of the outdoor tanks have been established with about five thousand 20-mm seed clams in each. Growth of these clams will be monitored throughout the season. Growth will be compared to both phytoplankton availability and utilization as determined fluorometrically. This experiment is an attempt to simulate a potential commercial production system. Estimates of pumping and labor costs will be tabulated to determine the economics of this method to grow bivalves from seed size to potential marketability.

The growth of 4-mm surf clams to a size of 15 mm was monitored in both static and flowing culture systems. A mixture of cultured algal species was the sole source of nutrition in these experiments. In a static environment, groups of clams grew best at algal densities of 250,000 cells/ml. Similar growth was recorded in a flowing situation at cell densities of 100,000 cells/ml. Water flow in a culture system appears to increase feeding efficiency.

Aspects of Nutritional Requirements of Mollusks Investigation

Investigations on the utilization of freeze-dried algae by American oyster veliger larvae are continuing. Recent experiments with feeding studies on veliger larvae were conducted with animals between 1 and 9 days of age. The problem of dried food clumps that appeared troublesome in previous experiments was solved by treating samples using a modified sonification technique. Living Isochrysis galbana cells that were sonified (as a control to experimental treatments) supported growth of the larvae for 6 days equivalent to that of the non-sonified samples. However, after 6 days the sonified food sample did not supply enough nutrition to larvae to support continued growth. Dried food material was tested in three concentrations; the two highest resulted in excessive mortality but not the lowest. The lowest concentration of dried material allowed the larvae a very small increase in size over the 9-day period. We intend to experiment with other concentrations of dried material and some other variations in the experimental design. The fundamental question to be answered is if the freezing process has made the algae nutritionally inadequate, or if growth is inhibited by the large amount of debris that accumulates in the larval suspension.

Experiments are being conducted to determine the nature of the algal adaptation to copper, zinc, and cadmium that has been cited in an earlier report. Four species of marine unicellular algae were adapted to tolerate concentrations of these metals that were inhibitory to growth upon the first exposure of the algae to these metals. The adapted strains were subcultured for several months into media containing the high metal concentrations and then back-transferred to the original stock culture medium for about 2 mo and then again challenged with the high metal concentrations to which they had previously demonstrated an adaptive tolerance. The data collected thus far indicate that these strains have not lost their capacity to tolerate the high metal concentrations despite the fact that they had been growing in the absence of metals for many generations.

Meetings, Talks, Visitors, Publicity

Cultures of several species were sent to the Bluepoints Oyster Company upon their request.

A new publication, edited by Otto Kinne, and titled "Marine Ecology - Progress Series," is now being organized. Dr. Ukeles has been invited to act as one of the editorial advisors.

Edwin Rhodes presented a paper at the spring meeting of the New England Estuarine Research Society (NEERS) in St. Andrews, NB.

E. Rhodes, J. Widman, and R. Goldberg completed the necessary steps to become NOAA-certified for SCUBA work. This skill will be utilized this summer in an expanded field program.

PATHOBIOLOGY DIVISION

Comparative Invertebrate Pathology Investigation

Microscopic examination of histologic slides from 21 molluscan service samples was completed and 11 reports were prepared. These reports were sent to appropriate state and local shellfish management agencies and industry officials to assist them in developing management strategies involving importations or transplantations of shellfish stocks. Species represented were Crassostrea virginica (6 samples); C. gigas (6 samples); Ostrea edulis (5 samples); Mercenaria mercenaria (2 samples); Tapes semidecussata (1 sample); and an abalone (1 sample). Geographically, samples were from Alaska, California, Maine, Massachusetts, Connecticut, and North Carolina. Most showed no significant pathology or parasites. Mytilicola orientalis was found in the California C. gigas samples. Ostrea edulis usually showed ciliates in the digestive gland. The American oysters (C. virginica) had low prevalences of the trematode Bucephalus cuculus, the gregarine protozoan Nematopsis ostrearum, Chlamydia-like inclusions, and papovirus. Common pathologic lesions were granulocyte infiltrations, perivascular infiltration, cirroidosis, and digestive gland metaplasia. Four neoplasms were found in samples of C. virginica from Milford, CT, Clinton, CT, and two locations from Massachusetts. This is a relatively high prevalence of neoplasm considering the total number examined from New England. These findings may represent changing environmental conditions or increasing contamination. Interestingly, tests for mutagen activity, using modifications of the Ames microbial assay system, were positive on sample animals taken from these locations. At this time, we are unsure of the significance of these positive tests.

The National Ocean Survey (NOS) Deepwater Dumpsite Project includes a site over the Puerto Rico Trench about 40 mi north of Arecibo, PR. Combined wastes from seven pharmaceutical companies in Puerto Rico are dumped there. A comparative Ocean Pulse field study on the effects of disposal of these wastes on planktonic crustaceans began this month with a collection trip to the site. Specimens were collected from the surface, 10 m (thermocline), and 100 m from 2 days prior to the scheduled dump to 60 hr after the dump was made. A total of 12 neuston and 20 bongo tows was made during the 5-day cruise.

Several of the planktonic species were the same as those collected on DWD 106 cruises and will provide a basis for comparative pathology studies on the effects of ocean dumping. Field observations of the specimens noted five cases of tumor-like growths in the branchial region of the shrimp Latreutes fucorum. Bopyrid isopods have been reported to cause such growths in other decapods and laboratory examination will reveal the nature of these in Latreutes. Benthic amphipods, most of which were gravid females, were sampled from a depth over 5,700 ft. Histological examination of benthic amphipods will provide information useful for comparison with the histology of neustonic forms. There is some indication that wastes dumped in the Puerto Rico Trench pass through the thermocline and presumably settle on the bottom; therefore, benthic amphipods may hold more significance in this dumpsite study than do neustonic forms.

The chapter on crustacean viruses, rickettsiae, etc., prepared for Biology of the Crustacea is now in the hands of the editor.

Examination of tissues from gaffkemic lobsters continues. Serial sections of normal caridean shrimp, Palaemonetes sp., and an amphipod, Gammarus sp., are being studied to provide baseline information for eventual use in Ocean Pulse studies. The histology personnel are presently serial sectioning and staining representative marine isopods and amphipods to be used for the same purpose.

The histology personnel sectioned approximately 850 tissue blocks and stained approximately 750 slides of various marine vertebrates and invertebrates to be examined in Ocean Pulse and disease and environmental monitoring studies.

Fish Pathology Investigation

Peripheral blood smears for assessment of protozoan and viral blood diseases have been obtained from fish collected on two recent cruises aboard the FRG R/V Anton Dohrn and the Albatross IV. These are currently being evaluated and should be completed by the end of June. Smears were obtained from 96 Atlantic cod, 131 yellowtail flounder, 115 haddock, 75 Atlantic herring, and miscellaneous other species.

Attempts to obtain Ammodytes for evaluation of skeletal anomalies have been only moderately successful and we are currently trying to modify some gear to sample specifically this species. In the samples obtained to date, all of which are from non-impacted coastal areas, skeletal anomaly frequencies have been between 3.2 and 5.7%.

In cooperation with Dr. Frank Hetrick and Mr. Edward Stevens of the University of Maryland, a virus has been isolated from Atlantic menhaden with "spinning disease." The virus was isolated in a menhaden cell line developed by Hetrick and Stevens. It appears to be very virulent in menhaden and caused death within 48 hr when inoculated into experimental fish at a dose of 10^5 infectious units. Current plans are to characterize the virus and test its pathogenicity in other clupeids. We are also looking into the feasibility of a serological survey to determine the extent of the population exposed to this agent.

Microbial Ecology Investigation

Results of all "black gill" studies on rock crabs were presented in summary form at a MESA pre-symposium workshop held at the LaGuardia-Sheraton Hotel on 25 May. The survey on gill condition has been completed and all observations and conclusions will be published in the symposium proceedings. Gross and microscopic observations, station data, etc., have been keypunched by personnel at the Sandy Hook Laboratory and we have received our first data file print-out for editing. Plans are now being made to develop several computer programs for statistical studies. The data bank contains information on over 2,000 rock crabs and will be used for designing further studies on correlations between gill disease and factors such as sediment and tissue heavy metal concentrations, bacterial populations, etc.

Larval Diseases of Mollusks Investigation

One of the major problems in attempts to produce long-term cell cultures from larval oyster tissue has been the presence of microbial contaminants in the culture fluids. Bacteria have been present even though larvae were produced by fertilization

in sterile seawater after eggs and sperm were removed from surface-sterilized gonads by means of sterile syringes. It was found that bacterial growth could be controlled if larvae were allowed to develop for several days in sterile seawater containing a mixture of five antibiotics. However, development of normal-appearing larvae has been found to be dependent upon time of antibiotic addition. Adding antibiotics within the first 3 hr after fertilization resulted in low survival and a high percentage of abnormal animals. Antibiotic addition at 4 hr produced high survival and few abnormal animals; however, addition at 5 and 6 hr again caused increased numbers of abnormal animals. Apparently, there are key periods during cell differentiation when larval cells are least affected by antibiotics.

Data collected this month showed that the potency of the toxic metabolite produced by a shellfish-pathogenic Vibrio is not lost when the metabolite-containing filtrate is kept in a frozen state; the filtrate was still potent when it was thawed out 3 wk later. Crystals form when the filtrate is refrigerated. Whether these crystals contain the toxic component, as yet, has not been determined.

A disease situation appears to exist at Flower's Hatchery in Bayville (Long Island), NY. An investigation is being conducted to determine if the problem is bacterial in origin.

During this period, five ozone-UV quarantine runs were completed using exotic species effluent from the Aquacultural Genetics Investigation.

Cooperative work with the Fairfield University Chemistry Department showed that extensive ozonization of paralytic shellfish poison (PSP)-surf clam extracts reduced the toxicity 200-fold. Using high pressure liquid chromatography, only one original peak remained in ozonized samples, compared with control samples giving five peaks. Eluents from these peaks will be concentrated, ozonized, chromatographed, and mouse bioassayed to determine breakdown sequence of the poison.

A cruise aboard the R/V Shang Wheeler to shellfish beds in Norwalk, Bridgeport, Stratford, and New Haven, CT, was completed on 15 May. Water and sediment samples were taken for isolation of the predominant bacteria. These isolates, along with 110 others, are part of an extensive oyster larval challenge experiment to assess natural disease occurrence.

Meetings, Talks, Visitors, Publicity

Dr. Rosenfield met with the Center Consolidation Committee at the Oxford Laboratory on 2 May; Dr. Rosenfield, Dr. Murchelano, and Mr. Farley attended a meeting convened by the Center Director at the Sandy Hook Laboratory on 4 May; Dr. Rosenfield and Dr. Murchelano attended a meeting of the NEFC Promotion Review Board and Factor IV Committee meeting at the Woods Hole Laboratory on 10 May; Dr. Rosenfield attended a Sea Grant Site Review meeting at the University of Delaware in Lewes, DE, on 15 and 16 May; he also met with the Society for Invertebrate Pathology Program Committee in Washington, DC, on 22 May to arrange the program for the forthcoming meeting in Gainesville, FL, in August; and attended an Interagency Collaborative Group on Environmental Carcinogenesis meeting in Washington, DC, on 23 May.

Dr. Blogoslawski attended the New England Shellfish Sanitation Association meeting in Atlantic City, NJ, on 26 April.

Mr. O'Connell discussed administrative operations with Northeast Regional Office personnel in Gloucester, MA, on 1 and 2 May.

Beginning on 28 April, Ms. MacLean participated in a 5-day cruise aboard the Mt. Mitchell to the NOS deepwater dumpsite project over the Puerto Rico Trench; she also attended a course on "Women in Management" in New York on 22 and 23 May. Dr. Murchelano and Dr. Sawyer attended a pre-symposium meeting of the MESA Symposium on Ecological Effects of Environmental Stress at the Sandy Hook Laboratory on 22 May.

Dr. Johnson attended a workshop on "Future of Invertebrate Pathology" at Stone Harbor, NJ, on 10 and 11 May.

Ms. Wheatley attended a Center Awards Committee meeting at Woods Hole, MA, on 17 and 18 May.

Mr. William Walsh completed a 6-mo temporary assignment with the Larval Diseases of Mollusks Investigation at the Milford Laboratory.

Ms. Ann Charles, Biological Laboratory Technician, entered on duty 21 April for the summer.

Visitors to the Oxford Laboratory during May were Ms. Marjorie Sherwood of the Southern California Coastal Water Research Project in El Segundo, CA; Dr. David Alderman of the Ministry of Agriculture, Fisheries, and Food in Weymouth, England; Mr. Ernest Barlow of the Talbot County Board of Education in Easton, MD; and Dr. John D. Briggs and Ms. Kimberly Kline of The Ohio State University in Columbus, OH.

Manuscripts

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RESOURCE UTILIZATION DIVISION

Fisheries Engineering Investigation

Efforts this month were concentrated on the R/V Rorqual and preparing to study scallop gear and gear-related scallop behavior. By the end of this month, it is expected we will be test fishing a scallop drag in preparation for direct diver and underwater TV observations of moving drags next month.

Resource Development and Improvement Investigation

New Product Development

Joseph Mendelsohn and Vincent Ampola traveled to Rhode Island to view a new packaging machine and to discuss new product preparation with the owners of a fish processing plant. New ways of handling and processing their products were also discussed, and some suggestions were made to improve their operating efficiency.

Joseph Mendelsohn and Vincent Ampola, with Kurt Wilhelm's help, are becoming familiar with the Instron Texturometer. As with the Hunter L Colorimeter, small changes of size and shape of the sample alter the results significantly. They are working on ways to cut fish so as to obtain a reproducible sample size.

Two demonstrations were made using the Bibun meat/bone separator for two different companies. In the first run, haddock and Atlantic cod frames with heads were put through the meat/bone separator; while in the second run, flounder frames with heads were minced. From the haddock and cod frames, 57% minced fish was recovered; while from the flounder frames, 49% minced fish was collected. New minced fish products are being developed by the companies.

A second packaging machinery company promised to submit a quote for a packaging machine for handling the "U.S. Grade A" frozen fish.

Storage of Blue Mussels

Samples have been analyzed in May.

Surf Clams

A presentation on the storage and acceptability of surf clams is being prepared for the Shellfish Institute of North America (SINA) meeting in late June.

Seafood Nutrition

New spot-detection sprays were used in conjunction with the thin-layer chromatography of blue mussels with excellent results. A license has finally been submitted to the Nuclear Regulatory Commission to permit the use of ^{14}C -labeled cholesterol for recovery purposes.

Species Identification

A sample of cooked fish allegedly involved in human ciguatera poisoning has been submitted to the crab lab for species identification. Experiments early in May using broiled hake and whiting showed species differences.

Blue Crabs

The heat exchanger for cooling the seawater in the fish house was repaired. The temperature of the water in the tanks can now be maintained at about 50°F which is adequate for holding live blue crabs.

Krill

The revision to the second draft of the krill paper is nearly complete, and it is hoped that it will be ready for typing next week.

Living History of Fishing

As a result of attending a meeting sponsored by Northeastern University and the New England Aquarium, John Kaylor has been in touch with one of the speakers on that program -- a professor of history who is interested (along with two other professors) in obtaining tape recordings from retired elderly fishermen about various facets of the New England fisheries. John has a list of several retired fishermen whose average age is over 82 and who have a wealth of remembered observations.

Product Quality, Safety, and Standards Investigation

Product Quality

Frozen cownose ray is still holding up very well after 40 wk at 0°F. Organoleptic scores for flavor and texture were in the good - very good range. In comparison, fresh skate was evaluated for acceptability and its texture was rather tough and fibrous.

Whiting fillet blocks produced last July as part of the Arenco SFA-4 filleting machine trial were still acceptable in quality after 10 mo at 0°F. Thus far, the treatment which was afforded the best protection against quality deterioration has been storage at very low temperature. Blocks treated in other ways such as vacuum packaging, antioxidant, or antioxidant plus tripolyphosphate dip are comparable in quality to the controls.

We have been evaluating two methods for determining hypoxanthine and have chosen the method of Jones for standard lab use because of its simplicity and popularity. It is planned to compare hypoxanthine content, as an index of fish freshness, with other chemical and organoleptic tests and in particular with the Torrymeter.

We welcome back Sarah Roderick who is returning to work here for the second summer. She will be assisting us on the various isoelectric focusing projects.

We welcome Rita Schenck, a graduate student at URI. She will be working with us on the silver hake population study. At present, she is collecting commercial silver hake samples from Gloucester, MA, and Point Judith, RI, and working out the various histochemical staining techniques we will be adapting to the isoelectric focusing method.

We welcome Kurt Wilhelm who will be providing us with much needed help on the silver hake and red hake texture projects. Kurt has been busy developing methodology for objective texture evaluation using our Instron 1132. Two texture tests which appear promising are a straight compression test and the Kramer Shear Press. The force-deformation curves from these tests yield data on the elasticity of the sample, peak shear-extrusion forces, and cohesiveness of the sample. We will

attempt to correlate these data with various chemical studies and sensory panel evaluations. Kurt has also been readying the minced fish extruder for initial testing to set up optimum operating parameters.

Collaborative study samples were sent out to seven collaborators. Participants in the Association of Official Analytical Chemists (AOAC) collaborative study of the isoelectric focusing-species identification method include: Judy Krzynowek and Kate Wiggins of the Gloucester Laboratory; Dr. Richard Robohm of the Milford Laboratory; Mr. Tony LaTerza of the US Food and Drug Administration (USFDA) in Boston; Dr. Gerald O'Leary of Providence (RI) College; Dr. Charles Barmore of the University of Florida at Lake Alfred; and Dr. Brian Little of the University of Vermont in Burlington. Preliminary arrangements have been made for LKB Instruments, Inc., to loan an electrofocusing setup to Beverly Smith of the SEFC's Pascagoula Laboratory so that she may participate in the collaborative study.

Ron Lundstrom and Rita Schenck spent a day at Boston City Hospital with Dr. C. Saravis learning a new isoelectric focusing (IEF) technique developed by Dr. Saravis. The method involves direct isoelectric focusing of tissues on a highly purified agarose gel. This method was developed for Dr. Saravis' work with cancer marker proteins and allows even high molecular weight proteins to be focused in 20-25 min. Fixing, staining, and destaining of the gels requires only 5-10 min. Resolution and reproducibility are comparable to IEF in polyacrylamide gels. Samples of five species of fish were tested using this technique, and the results were excellent. Each protein pattern was unique, and the whole procedure was completed in less than 45 min. We will begin using this technique in the very near future.

Samples of American sand lance and Atlantic cod larvae obtained from Tom Morris of the Woods Hole Laboratory were subjected to isoelectric focusing. The protein pattern was different for each larval species and did not resemble the protein pattern from the adults of each species. Additional species of larval fishes will also be tested.

Mike Allsup has again modified our reflux condenser cooling system so that a third isoelectric focusing setup may be put into operation to help with the heavy load of samples we have to focus over the summer.

The engineering and maintenance staff helped in renovations of the former ladies lounge into additional lab space. We especially thank not only the engineering and maintenance staff for their assistance, but also the women for donating their room to science. Since most of our presently available bench space is littered with various instruments and apparatus, the additional lab space will provide us with much needed clear bench space on which to work.

Product Safety

Shipments of samples of hot-smoked coho salmon and sablefish have arrived from Seattle, WA. These samples contain nitrite at the following concentrations: 0 ppm, 100 ppm, and 200 ppm.

Work-up of samples of hot-smoked salmon containing 200 ppm of nitrite for volatile N-nitrosamines is continuing. Some of the worked up samples have been analyzed by gas-liquid chromatography (GLC) and show no nitrosamines present at the 5-ppb level.

The project advisory group for polychlorinated biphenyls (PCB's) met in Washington, DC, at the USFDA building on 10 May. The project advisory group consisted of: Dr. Virginia Stout (NMFS, Seattle, WA); Dr. Malcolm Meaburn (NMFS, Charleston, SC); Mr. Robert Learson (NMFS, Gloucester, MA); Dr. William Trotter

(USFDA, Washington, DC); Dr. Douglas Kuehl (USEPA, Tallahassee, FL); Dr. James Pettie (US Department of the Interior, Columbia, MO); and Dr. Steven Loeff (New Jersey Marine Science Consortium, Highlands, NJ). An experimental design was formulated to survey PCB's in finfish of US coastal waters. Don Gadbois has written a final research proposal on surveying finfish in US coastal waters for PCB's. The proposal is being sent to Dr. Seagran, Director of the SEFC's Charleston Laboratory and Program Manager of the National Microconstituents Task. The proposal was reviewed by Mr. Ronsivalli and Mr. Learson before submission.

Two temporary helpers will be joining this unit for the summer. They are Ms. Susan Edlestein, presently attending Smith College, and Richard Marcell, an instructor at Lowell State University.

Product Standardization

We have received information from the Washington Office that the proposed standards for minced fish blocks, unified fillets, and the revision of the fried scallop standard to include breaded scallops have been signed off by Mr. Meibohm and will be published in the Federal Register shortly as final rulemakings.

A rough draft of a position paper on the role of the standardization program in NMFS was prepared by John Ryan with the assistance of members of the task force. It was transmitted to the Washington Office for further review and comment.

A request was received from the Washington Office for a revision of the USDOC precooked fish portions and fried fish stick standards to include battered fish portions and sticks. The National Food Institute (NFI) is very interested in such a standard because of the rapid growth of these products.

A new schedule for FY79-80 standardization projects was completed for typing. It is based upon comments received from the Washington meeting on standardization held in March.

A revised draft of the unified shrimp standard is being prepared for publication in the Federal Register as a notice of availability.

Technical Assistance

Division personnel provided information and technical assistance in the following areas: identification of a sea lamprey; student summer placement; overview of commercial fishing; eels; tub trawling and gill nets; chilled seawater and refrigerated seawater systems; products from minced fish; fish meal producers; fish species that are considered "Kosher"; analytical laboratory services available in this area; mechanical extraction of cooked conch meats; processing of squid; fish producers; obtaining squid for export; harvesting, shipboard freezing, and overseas marketing of squid; identification of different squid species; use of squid as bait; refrigerated seawater storage of lobsters; Pacific pelagic red crab; export of live lobsters, live eels, quahogs, and fresh fish; freshwater drum; differences between Pacific salmon and Atlantic salmon for Julia Child; anglerfish; identify dolphin; and amount of fat in flesh of butterfish, sea trout, croaker, and spot.

Perry Lane has been designated as Regional Fuel Coordinator. A network of the Northeast Regional Office's Statistics and Market News Branch personnel has been set up to monitor the fuel supply for the fishing industry in the region.

Meetings, Talks, Visitors, Publicity

Perry Lane attended the monthly meeting of the New England Fisheries Steering Committee (NEFSC). He also attended a meeting of the New England Marine Advisory Service (NEMAS) and was elected Secretary-Treasurer for a second year.

Several members of the Gloucester Laboratory staff participated in a program review for members of the Cornell University faculty and marine advisory staff on 7 and 8 May 1979.

John Ryan participated in a meeting of the Center Awards Committee on 24 and 25 May at the Woods Hole Laboratory.

Fred King and Joe Carver attended a USFDA/NFI Import Workshop in Boston, MA, on 29 May.

Fred King attended a Codex Alimentarius meeting in Bergen, Norway, during 4-14 May.

On 8 May, John Ryan attended a meeting of the Interagency Committee on Federal Specifications at the USDA Building in Washington, DC. Several favorable comments were received on NMFS activities during the transfer of fishery products inspection from the military to USDOC Inspection Service by a representative from the Office of Federal Procurement of the Office of Management and Budget.

Mike Corbett and Al Blott attended the ICES Fishing Technology Committee Working Group meetings in Goteborg, Sweden.

Don Gadbois attended a workshop on PCB's at Cape May, NJ, on 11 May.

Kate Wiggin and Judi Krzynowek attended a course on "Current Practices in Chromatography."

A high school class of 48 students from Acton, MA, toured the Gloucester Laboratory.

Mr. Richard Aiela and five students from Hamilton-Wenham High School interviewed Perry Lane as part of a course requirement on the economics of the fishing industry.

NATIONAL SYSTEMATICS LABORATORY

Benthic Fishes Investigation

Preliminary work was done on an account of several families for the UNESCO (United Nations Educational, Scientific, and Cultural Organization)-sponsored publication Fishes of the Northeast Atlantic and Mediterranean. Research was done on the osteology of the deepwater ophidiid Enchelybrotula. A manuscript was completed on a revision of the toadfish genus Batrachoides. A contract was arranged for translation of a comprehensive Russian paper on fossil Gadidae.

Pelagic Fishes Investigation

Work continued on a revision of the Spanish mackerels.

Crustaceans Investigation

Penaeid shrimps and crabs were studied in several European museums.

Meetings, Talks, Visitors, Publicity

Drs. Canet and Williams attended the Second Colloquium Crustacea Decapoda Mediterranea, in Ancona, Italy, where each presented a paper (cited below). Dr. Cohen attended a meeting on biogeography at the American Museum of Natural History in New York City.

Visitors included Dr. Rodolpho Claro of the Cuban Institute of Oceanology, Dr. William Eschmeyer of the California Academy of Sciences, Professor K. Able from Rutgers University, Mr. Mike Keen from the University of Rhode Island, and Mr. Luis Alberto Zavala-Camin, a Brazilian ichthyologist.

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ATLANTIC ENVIRONMENTAL GROUP

Ocean Monitoring and Climatology Investigation

Seven XBT transects were obtained by the cooperative Ship of Opportunity Program during May, two in the Gulf of Maine, one across the Southern New England Shelf along the 71°W meridian, two across the shelf and slope off New York City, and two in the Gulf of Mexico.

Continuous plankton records (CPR) transects were obtained from ships of opportunity in the Gulf of Maine, the shelf and slope waters off New York City, and the waters northeastward of Chesapeake Bay. The Gulf of Maine and New York tows also successfully utilized temperature recorders mounted in the CPR's, yielding a continuous trace of water temperature at the 10-m depth. Two undulating oceanographic recorders (UOR) were loaned to us by the Institute of Marine Environmental Research (IMER) laboratory in Plymouth, England. IMER's engineer on the UOR project accompanied the samplers and with Grayson Wood conducted a 1-w series of trials to determine its acceptability on URI's R/V Endeavor. Approximately 240 mi of successful sampling was accomplished with data collected in the upper 50 m on temperature, salinity, depth, chlorophyll, and netplankton. The cruise verified several small design changes which will be included in the production models. Data processing programs, also brought from Plymouth, are to be made operational on the URI computer.

The unusual offshore extension of shelf water, which was a pronounced anomaly off the Northeast Coast from January through April, became obscured during May except off the southern Middle Atlantic Coast. From about 36°00'N to 37°36'N, infrared satellite imagery has clearly shown shelf water extending far beyond its normal limit and being strongly entrained by the Gulf Stream. Farther to the

north of the Middle Atlantic Coast, the offshore shelf water apparently mixed with, and was displaced by, slope water early in May.

There has been uncertainty throughout the month regarding the possible movement of Gulf Stream eddy 79A into the region south of New England. In mid-April, 79A was moving westward across the 70th meridian, but then disappeared in clear-sky satellite imagery. It has not subsequently been relocated with certainty. Although 79A may have been destroyed by a Gulf Stream meander in mid-April, there have been the following indications that it persisted and moved to the offing of the Hudson Canyon during May:

(1.) Tongues of shelf water extending into the slope water, as seen in satellite imagery, may have been produced by entrainment on the east side of the eddy.

(2.) A patch of slightly elevated surface temperature on the west side of the shelf water tongues appeared briefly in satellite imagery early and late in May.

(3.) Deepening of isotherms off Hudson Canyon in a temperature section obtained aboard the Whiting on 7 May may have represented the western margin of the eddy.

(4.) Movement of drogued buoys, released from the Whiting on 7 May in Deepwater Dumpsite 106, in a northward and then eastward direction near the shelf break during the second week of May, suggests the anti-cyclonic circulation of an eddy located east of the dumpsite.

This eddy is a good example of the occasional one that is difficult to track in satellite infrared imagery, apparently due to surface heating in surrounding waters reducing the temperature contrast.

Three other Gulf Stream warm core eddies (i.e., 78I, 79B, and 79C) remained essentially stationary to the southeast and south of Georges Bank during May. Eddy 79C which formed at the beginning of the month may have been resorbed by the Stream near the end of May.

Ocean Dumping Investigation

Work this past month included the completion of the third in a series of studies measuring the near-surface currents at Deepwater Dumpsite 106. A suite of six Lagrangian drift buoys drogued at 5, 10, and 30 m in depth were released at the center of the dumpsite on 8 May, with the last drift buoy signal being received on 18 May. The movement of this longest-lived buoy indicated slow initial movement to the north followed by rapid movement to the northeast between 16 and 18 May of approximately 1.5 knots. This movement correlates well with the position and circulation of an anticyclonic Gulf Stream ring which was observed to be within the vicinity of the dumpsite during this time period. A correction obtained from the receiving station at Sandy Hook, NJ, during this experiment will be applied to data from the winter (March) experiment which at present are being analyzed. Wind analysis plots from the October 1978 drifter study were obtained through the URI Data Projects Group and are being incorporated in the report for this initial experiment.

Meetings, Talks, Visitors, Publicity

Mert Ingham attended a meeting of the editorial review committee for the anoxia volume which was held in Rockville, MD, on 2 May.

Mr. Harry Hunt of the IMER research laboratory located in Plymouth, England, visited the AEG from 7 through 22 May to discuss CPR sample analysis and data processing procedures and programs.

On 7 May, Mert Ingham traveled to Washington, DC, to confer with Headquarters staff and from there went to Harper's Ferry, WV, to attend a National Climate Plan Data Management Workshop which was held from 8 to 11 May.

Ms. Kathy Meyer of the Virginia Institute of Marine Science at Gloucester Point, VA, visited AEG from 8 to 10 May to meet with Mr. Harry Hunt of IMER and AEG staff on CPR and XBT matters.

Reed Armstrong attended an IYABA meeting at the Oxford Laboratory on 8 May.

On 10 May, Woody Chamberlin attended a meeting of the Center Promotion Review and Factor IV Committee which convened at the Woods Hole Laboratory.

Woody Chamberlin presented two papers in Halifax, NS, at a second informal workshop on the oceanography of the Gulf of Maine and Scotian Shelf which was held from 13 to 17 May. One paper, by Jack Jossi and Dan Smith, was titled "Continuous Plankton Records. A Summary of Data in the Gulf of Maine and Adjacent Regions, 1955-1979." The second paper, by himself and R. W. Crist, was titled "Offshore Extension of Cold Shelf Water Off the Northeast Coast of the United States in 1978 and 1979."

Elizabeth Haynes of the NMFS Office of Science and Environment in Washington, DC, visited the AEG from 14 to 18 May to assist in the initial draft of the Status of the Environment Report.

Dr. James Aiken of the IMER laboratory in Plymouth, England, is visiting AEG from 15 May through 15 June, to assist in UOR acceptance trials and to operationalize UOR computer programs for AEG.

Jim Bisagni visited Rockville, MD, on 16 May to attend a meeting of the NOS's Ocean Dumping Program staff.

Steve Cook visited the Merchant Marine Academy at Kings Point (Long Island), NY, on 16 and 17 May to confer with the Academy representative.

On 21 May, Sharon LeDuc and Louis Steyaert of the Models Branch of the Climatic Impact Assessment Division of Environmental Data Information Service in Columbia, MO, arrived at AEG and conducted a Models Seminar for AEG and the Narragansett Laboratory on 22 May. On 23 May, they traveled to the Woods Hole Laboratory accompanied by Mert Ingham to conduct a similar seminar there, and then went on to the Sandy Hook Laboratory where another seminar was held.

The URI Center for Ocean Management Studies held a conference on remote sensing at the Alton Jones Campus in West Greenwich, RI, during 30 May - 1 June which was attended by Mert Ingham and Woody Chamberlin. Woody also served on the Steering Committee of this conference.

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- Cook, S. K., and M. M. Hughes. Water column thermal structure across the shelf and slope southeast of Sandy Hook, NJ, USA in 1978. Annales Biologiques. Vol. 35. (S)
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