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"NORTHEAST FISHERIES CENTER NEWSLETTER"

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

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CENTER DIRECTORATE

Fishery Technology

Members of the Resource Utilization Division/Gloucester Laboratory staff attended a seafood seminar held in Boston and cosponsored by NMFS and the Food Marketing Institute. Excellent presentations by various segments of the seafood industry reflected the higher level of academic background that these industry newcomers are bringing with them.

Outstanding among these was an ex-bank executive (Mr. Michael Foley of the M. F. Foley Company in Dorchester, Massachusetts) who, in a period of 2 yr, became knowledgeable in seafood utilization from harvesting to entree preparation. In his presentation, he made an outstanding case for quality control and demonstrated exceptional perception in his recommendations to achieve quality control.

RESOURCE ASSESSMENT DIVISION

Resource Surveys Investigation

April was a seagoing month for members of the Resource Surveys Investigation. All members had some sea time. Three legs of the spring bottom trawl survey, all aboard the NOAA R/V Delaware II, were completed during April. The first leg, with Tom Azarovitz as Chief Scientist, was completed on 3 April. Henry Jensen was Chief Scientist during the second leg which ran from 6 to 17 April. Linda Despres-Patanjo was Chief Scientist during the third leg which ran from 20 to 29 April. Southern areas were completed first and all areas south of Browns Bank and the southern half of Georges Bank have been completed to date. In addition, an experiment to examine the performance of the standardized survey #36 Yankee otter trawl relative to that of a commercially used trawl was conducted aboard NOAA R/V Albatross IV during 1-10 April. The experiment was conducted in waters off Southern New England and on Georges Bank; Chuck Byrne was Chief Scientist.

Henry Jensen has been working on a new format for the trawl logs. This format will reduce errors and streamline the collection of station data. No changes were made in the sections of the log dealing with biological data. Coupled with new computer software which will be written in the near future, this new format should reduce the labor and time necessary to prepare survey data for use.

Liz Bevacqua continued working on developing software for a computer-generated Fisherman's Report.

Invitations to bid on the construction of a new hydraulic-jet clam dredge and on the modifications to the ramp assembly were sent out during April. The contracts for this work will probably be awarded during May.

Jim Crossen worked on an electrical repair and maintenance manual for the electrically powered hydraulic-jet clam dredge. This manual will be used by scientific personnel at sea to troubleshoot any simple electrical malfunctions which may occur during a cruise.

Fishery Biology Investigation

Age and Growth

Vi Gifford and Kris Andrade completed the second aging for second quarter 1973 commercial redfish samples (478 fish). The sample data were also put on age sheets, computer coded, and summarized.

Kris Andrade completed aging, coding, and summarizing haddock samples from summer bottom trawl surveys [Albatross IV Cruise No.'s AL 77-07 (480 fish) and AL 78-09 (224 fish)] and a winter survey [Delaware II Cruise No. DE 81-01 (22 fish)]. The age sheets for these cruises were sent to the Woods Hole Laboratory Automatic Data Processing (ADP) Unit for punching. Kris also checked second-audit listings and cleared for placing on computer tape the pollock age data for the following two surveys: Delaware II Cruise No. DE 81-01 (a winter survey for 6 fish), and Delaware Cruise No. DE 80-05 and Albatross IV Cruise No. AL 80-08 (a summer survey for 104 fish).

Judy Penttila completed aging and summarizing the first quarter 1981 commercial yellowtail flounder samples (869 fish) and sent the coded age sheets to Fishery Assessment Investigation personnel. She checked Doris Jimenez's aging on the 1978 commercial Atlantic cod samples for all four quarters (1981 fish); after checking the age sheets and summaries, she sent the data to Fishery Assessment Investigation personnel. Judy also checked second-audit listings and cleared for placing on computer tape the following age data from the following surveys:

Species	Cruise	Season	Number of fish
Yellowtail flounder	DE 80-07	Autumn	994
Yellowtail flounder	DE 81-01	Winter	320
Atlantic cod	AL 78-09 & DE 78-05	Summer	494
Atlantic cod	AL 79-08 & DE 79-05	Summer	504
Atlantic cod	AL 79-12 & DE 79-10	Autumn	1137
Atlantic cod	AL 80-03 & DE 80-02	Spring	611
Atlantic cod	AL 80-08 & DE 80-05	Summer	533
Atlantic cod	DE 80-07	Autumn	627
Atlantic cod	DE 81-01	Winter	56

Everyone (Age and Growth Unit) spent a week helping to remove samples from the basement (after the hot-water heater burst and flooded the cellar with 10 inches of water) for drying and then repacking these and other samples for shipment to, and storage at, Otis AFB. The inventory sheets for these and other data were updated and reorganized.

Finfish

Sherry Sass continued experimenting with methods of preparing larval otoliths for daily-growth studies. Procedures for algal and rotifer rearing were revised and documented. David Pyoas, a cooperative education employee, was fully introduced to culture methods and sampling routines, as was Marcella Green, another cooperative education employee, to a lesser extent. Ms. Sass assisted Ambrose Jearld in revising and completing a research proposal on culture and growth studies of larval and young winter and summer flounder.

Returning to growth studies previously begun, Louise Dery reanlayzed and standardized growth patterns of several thousand silver hake otoliths from spring 1979 collections for the stock separation study. A large number of these otoliths were selected to be sent to otolith taxonomist Dr. Pieter Gaemers of Rijksmuseum van Geologie en Mineralogie in Leiden, The Netherlands, for morphometric studies and possible correlation of geographic area and otolith growth pattern. A final draft of the Summer Flounder Workshop report was completed during a meeting at the Milford Laboratory with coauthors Ronal Smith and Paul Scarlett from the Delaware Department of Natural Resources and Environmental Conservation and the New Jersey Department of Environmental Protection, respectively, and Ambrose Jearld on 28 and 29 April.

Alicia Kelly, a stay-in-school employee, began a literature search on age and growth studies by computer since 1964, and began reorganizing existing reprints and references.

Shellfish

Maurice Crawford completed aging sea scallops from Stratums 51-60 from Albatross IV Cruise No. AL 80-06. Maurice and Sherry Sass aged surf clam sample #35 from the University of Maryland Eastern Shore. Maurice keypunched the data and assisted Ambrose Jearld in a statistical analysis. Maurice also participated in the second leg of the spring bottom trawl survey aboard the Delaware II.

Mark Costa continued to prepare and age surf clams from a 1980 surf clam-ocean quahog survey. Mark took part in the third leg of the spring bottom trawl survey aboard the Delaware II.

Fishery Assessment Investigation

The Resource Assessment Division's contribution to the revised program development plan for the Marine Resources Monitoring, Assessment, and Prediction Program (MARMAP), was completed by E. Anderson, M. Sissenwine, B. Brown, F. Serchuk, T. Azarovitz, and V. Anthony, and submitted to George Ridgway, the Center Planning Officer, for submission to the NMFS Central Office.

Emory Anderson prepared a report for the Northeast Regional Office and Central Office on the effect of deferring from one year to the next the unused portions of Atlantic mackerel and butterfish quotas for foreign fishermen.

Fred Serchuk and Mike Sissenwine prepared comments for the Regional Office on the proposed Sea Scallop Fishery Management Plan (FMP).

Northeast Fishery Management Task Force research on the biological implications of fishery management options continued. Mike Sissenwine leads a team of S. Murawski, A. Lange, and R. Mayo. Nearly three-million records of data have been examined. As a result, we have new information needed to: (1) define fisheries by gear, season, and area based on species aggregations; (2) describe trends in catch and effort; and (3) to estimate by-catch.

Steve Clark initiated assessment of the Scotian Shelf, Gulf of Maine, and Georges Bank pollock stock with R. Mayo and L. O'Brien, and completed the yellowtail flounder assessments.

Vaughn Anthony, Mike Fogarty, and Gordon Waring continue to work with an ad hoc Atlantic herring assessment work group to update the herring assessment and consider management options.

John Boreman testified on 2 April in Cambridge, Maryland, on behalf of Chesapeake Bay Foundation in state hearings on impacts of a proposed power plant on the striped bass population in the Nanticoke River.

Anne Lange reviewed a cephalopod paper for the editor of Marine Fisheries Review.

Travel, Meetings, and Presentations

On 1 April, the Mid-Atlantic Fishery Management Council's (MAFMC) Scientific and Statistical (S&S) Committee met in Philadelphia; Emory Anderson attended.

On 6 April, M. Sissenwine met with Guy Marchesseault of the New England Fishery Management Council's (NEFMC) staff to discuss Atlantic herring assessment.

On 7 April, M. Sissenwine met with John Steele, Director of the Woods Hole Oceanographic Institution (WHOI), to discuss an upcoming fishery ecology workshop.

On 8 April, V. Anthony, G. Waring, and M. Fogarty, attended a meeting of the NEFMC's Herring Assessment Working Group in Saugus, Massachusetts.

On 8 April, a NEFMC S&S Committee meeting in Boston was attended by M. Sissenwine.

On 13 April, John Boreman met with the Emergency Striped Bass Study Planning and Coordinating Committee in Washington, DC.

On 15 April, Fred Serchuk attended the NEFMC's Red Crab Oversight Committee meeting at Saugus, Massachusetts.

On 15 and 16 April, Steve Clark and V. Anthony attended a joint meeting of the Northern Shrimp Technical Committee and the Northern Shrimp Section of the Atlantic States Marine Fisheries Commission in Boothbay Harbor, Maine.

On 16 April, a meeting of the Study Group on the Biological Effects of Fishery Management Options (a part of the Northeast Fishery Management Task Force) was chaired by M. Sissenwine and attended by A. Lange, S. Murawski, R. Mayo, B. Brown, R. Hennemuth, Barbara Stevenson (MAFMC), and Jay Lanzillo (National Advisory Committee on Oceans and Atmosphere).

On 16 April, a Sigma 7 computer users' meeting was attended by the staff to discuss preparation of a new system.

During 19-23 April, an American Fisheries Society divisional meeting was held in Virginia Beach, Virginia. Anne Lange presented a paper on "Fishery Trends Off the Northeastern Coast of the USA 1964-80." John Boreman chaired the Special Session on the Emergency Striped Bass Study. Ralph Mayo and Mike Fogarty also attended.

On 27 April, Fred Serchuk attended a Regional Office Sea Scallop FMP Development Team meeting in Gloucester to review the draft FMP.

During 27-30 April, a joint American-Soviet research coordination meeting was held in Woods Hole. Division activities in 1979-80 in cooperative studies with the Soviets were reviewed and a report was drafted by Emory Anderson. Emory, Brad Brown, Mike Sissenwine, and Vaughn Anthony participated in discussions and planning sessions for 1981 joint research.

On 28 and 29 April, Vaughn Anthony and Ed Bowman attended a NEFMC meeting in Danvers, Massachusetts.

A summer flounder aging meeting was held on 28 and 29 April at the Milford Laboratory. A. Jearld and L. Dery attended.

During 20 April-2 May, Mike Sissenwine, Gordon Waring, and Ralph Mayo attended the New England Estuarine Research Society meeting at Point Judith, Rhode Island.

University Affairs

Vaughn Anthony presented a talk on "Oceanography and Fishery Grounds" at a workshop held at the Massachusetts Maritime Academy on 4 April.

Emory Anderson gave a talk on assessments to a group of undergraduate students visiting Woods Hole from the State University of New York Agricultural and Technical College at Cobleskill, New York, on 20 April.

Fred Serchuk served as a member of the Masters Thesis Committee at the thesis defense meeting of Patricia Gerrior at Southeastern Massachusetts University in North Dartmouth on 28 April.

Steve Clark, Kay Paine, and Otis Jackson provided assessment-related computer program software and documentation to staff members at the University of Rhode Island (URI).

Ruth Gutjahr, under the direction of Steve Murawski, processed 160 witch flounder samples for the cooperative project with the University of Massachusetts at Amherst's Fisheries Biology Program.

EEO Activities

Sherry Sass helped in preparations for two Federal Women's Program (FWP) presentations: "Advanced Assertiveness Training Workshop" and "Stress Management Seminar." The Advanced Assertiveness Training Workshop, sponsored by the FWP at the Woods Hole Laboratory, was held on 8 April. S. Sass, L. Dery, M. Costa, and A. Kelly attended. The Stress Management Seminar, sponsored by the FWP at the Woods Hole Laboratory, was held on 15 April. S. Sass, L. Dery, M. Costa, D. Pyoas, A. Kelly, and M. Green attended.

An FWP meeting was held at the Woods Hole Laboratory on 20 April. S. Sass attended.

A Woods Hole Laboratory EEO Committee meeting was held on 21 April. L. Dery and S. Sass attended.

A. Jearld, L. Dery, and S. Sass attended an EEO conference during 22-24 April.

Vaughn Anthony discussed hiring possibilities with D. Jackson, Director of Native American Career Education in Natural Resources at Humboldt State University in Arcata, California.

Publications

Sissenwine, M. P.; Kirkley, J. E. Practical aspects and simulation of fishery management techniques. Mar. Policy. (S)

Reports

Clark, S. H.; O'Brien, L.; Mayo, R. K. Yellowtail flounder stock status - 1981. Woods Hole Lab. Ref. Doc. No. 81-10;1981. 47 p.

Suomala, J. B.; Crossen, J. M. Spherical reference targets for hydroacoustical equipment calibration. Int. Counc. Explor. Sea Comm. Mem. P-1331;1981. 6 p.

MANNED UNDERSEA RESEARCH AND TECHNOLOGY PROGRAM

No report received. The February, March, and April reports will be included in the May-June report. (Beginning 1 May 1981, the "Northeast Fisheries Center Newsletter" will use a bimonthly format.)

MARINE ECOSYSTEMS DIVISION

Larval Fish Dynamics Investigation

Population Processes

The principal activity this month was Albatross IV Cruise No. AL 81-03, an interdisciplinary sampling study of larval fish and prey microdistribution during 14 April-1 May. This cruise also involved members of the Plankton Ecology and Fishery Oceanography Investigations. A patch of Atlantic cod larvae (with a mean standard length of 7 mm) at densities greater than 256 per 10 m^2, and a concentration of mixed gadid eggs (about 10-days old) at densities greater than 4000 per 10 m^2, were located by a bongo-net, grid-pattern survey on the southeastern part of Georges Bank. A time series of vertical profiles was made following deployment of current drogues (one drogue with an array of four current meters), and sampling with a CTD (conductivity, temperature, and depth)-Niskin bottle rosette, an in-situ fluorometer, a plankton pump, and 1.0 and 0.25-m MOCNESS units (multiple opening-closing net and environmental sensing system).

Real-time sample and data processing showed the water column to be well mixed at about 6°C down to 60-70 m, the bottom; however, the chlorophyll-a concentration increased from about 3 mg/m^3 near the surface to greater than 10 mg/m^3 at the bottom. The dominant netphytoplankton species were Thalassiothrix sp., Coscinodiscus spp., and Ceratium spp. The dominant zooplankton species for the bongo-net samples were Calanus

finmarchicus copepodites and Pseudocalanus minutus adults (100-1000/m^3) which were distributed uniformly throughout the water column.

One integrated sample count of copepod nauplii (the calanoid type)--known larval fish prey--provided a density estimate of 1.3 nauplii per liter. Gadid eggs, believed to be mostly haddock with a smaller number of Atlantic cod, were distributed throughout the water column, but showed a consistent increase in density with depth. Cod and sand lance larvae also were collected throughout the water column, but they too appeared to be concentrated more in the lower half of the water column. Residual drift in the area (based on the drogues) indicated little net movement for some periods, and 1-4 mi/day in a southwesterly direction at other times. In the final days of the cruise, the onset of the spring thermal stratification was believed to be just beginning at the same time most of the haddock eggs were about to hatch.

Experimental Studies

Studies of the effects of seawater temperature during gonad maturation on larval growth rate and the timing of yolk absorption and first feeding in winter flounder were completed. A companion study of the effect of water temperature on the relationship between RNA-DNA ratio and growth rate was also completed with winter flounder larvae. A series of samples of sand lance and Atlantic cod larvae were collected and frozen on the spring MARMAP survey cruises and a recent larval dynamics process-oriented cruise. These field-caught larvae will be analyzed for biochemical composition including RNA, DNA, and protein content. We hope to get a better idea of the range of RNA-DNA ratio values found in wild larvae and to determine if any have low RNA-DNA ratio values corresponding to poor or starving condition. We should also be able to make an estimate of their growth rate. Sorting and counting of plankton samples from Soviet R/V Evrika Cruise No. 80-02 were continued.

The second year of research with striped bass larvae began with the arrival of a single group of larvae from the Nanticoke River. To date, we have received two spawns from the Nanticoke River and eight from the Choptank River. We are presently maintaining and sampling 20 rearing tanks for growth and survival studies, 20 tanks for biochemical studies, and 10 grow-out tanks. Larry Buckley presented preliminary results of the study at the Northeastern Fish and Wildlife Conference's Special Session on the Emergency Striped Bass Study.

Samples of winter flounder larvae spawned in the aquarium were supplied to personnel of the Gloucester Laboratory to aid in development of an electrophoretic technique for larval species identification.

Ecosystem Dynamics Investigation

Work continued on development of computer inputs and control routines in preparation for simulation runs of predator-prey interactions with the multispecies model GEORGE. Wendell Hahm completed initial test simulations with three components (zooplankton, benthos, and yellowtail flounder) and then began setting up the species interaction matrixes to include Atlantic cod, haddock, silver hake, and pollock. Wendell simplified the structure of the model to reduce run time by about 30%. Ed Cohen calculated initial conditions and parameter values controlling predator-prey interactions among the biological components by age group. Ed and Wendell also completed a written description of the functions in GEORGE which control these interactions.

Mike Pennington completed the first draft of a paper describing a general model for estimating average food consumption by fish utilizing mean gut-content data. With proper sampling through time and space, the model provides unbiased estimates of consumption for fish whose gastric evacuation rate is proportional to the amount of food in their stomachs. This is the basic model to be used in estimating daily rations for GEORGE. Mike also began work on the precision of the MARMAP plankton data base in conjunction with Wally Smith and Pete Berrien.

John Hauser produced a series of food habits data listings for both Ed Cohen and Mike Pennington, and began writing a new computer program on zooplankton diversity analysis and providing Fager tables for Roz Cohen.

Marv Grosslein spent much of the month assisting George Ridgway with drafting and editing a revised MARMAP program development plan. He also coordinated the preparation of a summary of joint American and Soviet research for 1979 and 1980, for the American-Soviet fishery research meeting in Woods Hole during 27-30 April. He also attended two meetings of the editorial committee for the book on Georges Bank.

Benthic Dynamics Investigation

Ray Bowman and Bill Michaels continued work on summarizing food habits data from MARMAP surveys as well as from the BIOME series in Cape Cod Bay. Ray also reviewed several papers on food habits of Atlantic shelf and estuarine fishes. Preliminary results with the new food habits sampling protocol at sea are encouraging. Identification and recording of prey items and gut-content volumes at sea worked quite well for larger fish during the first leg of the spring bottom trawl survey. Data collected so far indicate American sand lance are a principal prey of piscivorous species such as silver hake and spiny dogfish.

Brian Powers, a student volunteer from Holderness School in New Hampshire, will be working in the Marine Ecosystems Division at the Woods Hole Laboratory until 15 May, and is presently summarizing food data collected on the first and second legs of Delaware II Cruise No. DE 81-02.

Roger Theroux continued to focus on the northern benthic biomass manuscript, particularly on graphic material. Also, he retrieved data on motile epibenthic fauna on Georges Bank in response to a request from Frank Steimle at the Sandy Hook Laboratory.

Fishery Oceanography Investigation

During April, the Investigation's efforts focused on preparing for and participating in the first leg of the larval dynamics/process-oriented cruise (Albatross IV Cruise No. AL 81-03). Ron Schlitz, Art Allen, Gil Dering, and David Mountain performed CTD, expendable bathythermograph (XBT), current-drogue, and current-meter observations in conjunction with biological sampling by other investigators in the Division. The CTD-rosette was used to obtain water samples for chlorophyll analysis. Initial results indicate that the water column on southeast Georges Bank (about 60-m deep) was initially well mixed, but that weak stratification by surface warming progressively developed during the last week of the cruise. The drogue work indicated that the net drift during observations was to the southeast at 5-10 cm/sec. This result reinforces the idea that while the long-term drift on the bank may be clockwise the variability is high and the short-term movement may be in very different directions.

April also saw the completion of the MARMAP cruise on the NOAA R/V Kelez with Dan Patanjo and Derek Sutton making the hydrographic measurements. The data from this cruise and the earlier MARMAP cruises in March were processed during the month.

A pressure-activated water sampler developed by Derek Sutton was successfully tested on the gear-testing cruise aboard Albatross IV. This sampler allows for obtaining a water sample from a prescribed depth during a bottom trawl.

Robert Backman began a 12-wk cooperative education appointment with the Investigation, replacing Chris Nadeau who returned to school.

Ichthyoplankton Investigation

Our spring MARMAP I survey on the Kelez ended on 9 April after completing work in the Middle Atlantic Bight, Southern New England, and Georges Bank. Sand lance larvae which had been spawned during the winter continued to dominate numerically the ichthyoplankton, but small Atlantic cod larvae and concentrations of gadid eggs were caught on the southeastern part of Georges Bank. The information on gadids was passed on and proved useful to the Larval Dynamics Investigation which on 15 April conducted a site-specific, intensive study on the vertical distribution and feeding of cod and haddock larvae. In addition to the Kelez survey, we participated in a piggyback mode on the spring bottom trawl survey on Delaware II to collect ichthyoplankton and zooplankton samples. At the close of the month, Delaware II was working in the Gulf of Maine. Tom McKenney and Carolyn Griswold were aboard to oversee plankton collections and assist with working up the trawl catches. The current level of vessel activity will go on through the spring and summer months. We will have people at sea continuously through mid-July and again from September through most of December.

Lab work continues to center around several species. We are following closely annual changes in the distribution and abundance of larvae of Atlantic cod, haddock, Atlantic mackerel, yellowtail flounder, silver hake, sand lance, bluefish, Atlantic herring, and Urophcyis spp. hakes. At the same time, estimates of spawning stock biomass, based on collections of eggs, are progressing for yellowtail flounder, silver hake, bluefish, and haddock.

Peter Berrien met with Mike Pennington to decide on an approach for analyzing the statistical characteristics of the MARMAP I data base. They will present the results of their effort at the International Council for the Exploration of the Sea's (ICES) meeting in Woods Hole in October.

Plankton Ecology Investigation

Ray Maurer completed a draft manuscript on "A High-speed Electronic Method for Counting and Measuring Samples of Krill." Using the image analysis system, we can process krill at the rate of 4000-5000 per day. Regression and correlation analysis of the image-analysis length to the standard length as measured manually, indicates a very high degree of correlation ($r^2 = 0.941$; $r = 0.970$). The system will be used to provide independent estimates of krill biomass from the recent Antarctic cruise as part of the First International Biomass Experiment. Quantitative information on the size composition and numerical density of swarming krill will be an invaluable tool for interpreting the high-frequency hydroacoustic records. By knowing the size structure of the swarm it may be possible to detect "signal signatures" for different euphausid life stages.

Donna Busch spent the beginning of the month completing construction of a ne set of equipment for determining chlorophyll-a. From 14 April to 1 May, the gear used on the larval dynamics/process-oriented cruise to measure chlorophyll-a in ar of larval Atlantic cod and haddock abundance on southeastern Georges Bank. The ra of the extracted chlorophyll samples will be compared with continuous recording of chlorophyll fluorescence made with an in-situ fluorometer.

Carolyn Griswold attended a meeting of the North Atlantic Technical Working Group in Somerville, Massachusetts, on 14 and 15 April. Results of environmental studies programs on Georges Bank funded by the Bureau of Land Management were pres (physical oceanography--EG&G, Inc., and Raytheon Co.; sediment transport and geolo US Geological Survey (USGS); and canyon processes and biota--Lamont-Doherty Geolog Observatory. The Working Group reviewed the Georges Bank monitoring plan which has been submitted to the USGS Oil and Gas Supervisor for the North Atlantic by the Geo Bank Biological Task Force. The Group recommended that the program manager be desi nated from the USGS Office of Marine Geology in Woods Hole, that the program be con ducted in concert with, but independent of, other ongoing Georges Bank research, an that the program commence as soon as possible.

Carolyn Griswold participated in a bottom trawl/ichthyoplankton survey on boa the Delaware II during 20-29 April.

Biostatistics

The Biostatistics Unit continued to extract data on Atlantic cod, haddock, Atlantic herring, and yellowtail flounder for use by URI in modeling Georges Bank.

Karen Johnson completed the conversion of all 1977 station information into an industry-standard, unit-record format. Lorrie Sullivan continued to transfer all of the 1977 total ichthyoplankton data into a standard, unit-record format.

Tom Plichta, Steve Eldridge, and Robert Sand: (1) continued statistical analys of Gulf of Maine data for Ken Sherman, (2) continued statistical analysis of apex predator data for Jack Casey, (3) generated several ichthyoplankton summary reports (FISHSUM) for Soviet scientists, (4) continued updating calibration factors in maste files, (5) continued updating the zooplankton-count field in master files, (6) merge ichthyoplankton data into the EK8001 master file, (7) merged ichthyoplankton data in the YU7702 master file, (8) merged zooplankton volume data into the EK8001 master fi and (9) set up a revised, net-tow, report writer using the general reformatting syst

Apex Predators Investigation

In March and April we received information on six shark tag returns. These included two blue sharks, two blacktip sharks, and one each for the sandbar and mako sharks. Both blue sharks were short-term recaptures from last summer. The blacktip sharks were recaptured within 60 mi of the tagging site although one was free for 5.5 yr. One of these remained in the Florida Keys area while the other was tagged and recaptured near Galveston, Texas. The sandbar shark traveled 366 mi in 7.4 mo from Virginia to Mayport, Florida. The mako traveled 310 mi in 20 mo from 30 mi south of Nantucket Island, Massachusetts, to 35 mi east of Oregon Inlet, North Carolina.

An ICES document on "Daily Ration of the Shortfin Mako (Isurus oxyrinchus) in the Northwestern Atlantic" is in preparation by Chuck Stillwell. The paper is extracted from a manuscript on mako food habits for publication in the Canadian Journal of Fisheries and Aquatic Sciences. Estimates range from 1.4 to 2.7 kg/day with annual consumption varying from 8 to 15.6 times the average body weight (63 kg). First estimates of bluefish biomass consumed by shortfin makos in the area between Cape Hatteras, North Carolina, and Georges Bank have been made by Chuck Stillwell. Estimates of 17 021, 8510, and 5108 metric tons have been derived using mako biomass estimates of 2952, 1476, and 886 metric tons. Values for mako biomass were based on fishing mortality rates of 10, 20, and 33.3% and a maximum sustainable yield of 295 metric tons.

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

In cooperation with Polish scientists at the Polish Sea Fisheries Institute in Gdynia, 500 shark tags were forwarded to Dakar, Senegal, to be used aboard the Polish R/V Wieczno. The tags will be used on selected species of sharks caught during exploratory longline fishing operations being conducted in the area 10°N to 20°S latitude and 5°W to 40°W longitude. These tags are in addition to 200 sent to Poland in February. At the present time over 200 sharks have been tagged, primarily blues and oceanic whitetips.

In April, Wes Pratt finished reading the shortfin mako shark vertebral sample. Results agree well with other techniques for the smaller fish sizes, but indicate a greater age for larger fish. Septate vertebrae for other sharks including white, longfin mako, and threshers were stained and prepared for reading by Wes.

Alan Lintala and Helen Cottrell completed sectioning and staining the backlog of all vertebrae on hand, bringing our vertebral work up to date.

Travel, Meetings, and Presentations

On 1 and 2 April, Marv Grosslein served on the Sea Grant site review team at WHOI.

On 7 April, Bob Edwards and Ken Sherman met with Tudor Davies of the Environmental Protection Agency (EPA) at the Narragansett Laboratory to discuss possibilities for conducting joint studies on the shelf ecosystem.

On 8 April, Julien Goulet visited Dr. Joseph Berry of Yale University to discuss a joint paper on computer mapping for ecosystem research.

On 10 April, Jack Green, Donna Busch, and Ray Maurer met with Jim Hall from Solar Designs in Lincoln, Massachusetts, to review progress on plans for the solar installation at the Narragansett Laboratory.

During 19-23 April, Lorrie Sullivan attended the American Fisheries Society's Northeast Division Meeting in Virginia Beach, Virginia, and served as poster session coordinator.

On 21 April, Bob Edwards and Ken Sherman met with Tudor Davies again to outline an agenda for a June planning meeting of EPA and NEFC scientists.

On 23 and 24 April, Julien Goulet attended the Federal Information Processing Council Conference in Woods Hole and presented a talk on "Information Resource Management for MARMAP Ecosystem Research."

On 30 April, Ken Sherman was at the Woods Hole Laboratory to attend a promotion meeting, as well as meetings with Soviet scientists to develop a protocol for joint research in 1981 and 1982.

Seminars

On 20 April, Ed Cohen presented a seminar on ecosystem approaches to fisheries science for students from the fisheries program at the State University of New York at Cobleskill.

On 27 April, Dr. Dag Slagstad of the Norwegian Institute of Technology at Trondheim presented a seminar in Woods Hole on his model of zooplankton dynamics. The seminar was attended by Woods Hole scientists and members of the Soviet delegation.

During 28-30 April, Bess Robinson of ADP Network Services presented a course on a data-base management system at the Narragansett Laboratory.

Visitors

On 9 April, Gene Heyerdahl was at the Narragansett Laboratory to review options with the EPA's Narragansett facility for sharing computer facilities.

On 27 and 28 April, Dr. Dag Slagstad met with Ed Cohen to discuss his model of zooplankton dynamics.

On 28 April, Dr. Vyacheslav Suchin, the Laboratory Chief of the Soviet Union's Atlantic Institute for Marine Fisheries and Oceanology (AtlantNIRO), Dr. Yuri Vyalov, the Director of AtlantNIRO, and Dr. Sergei Evseenko, ichthyoplankton researcher at the Soviet Union's All-Union Institute for Marine Fisheries and Oceanology, visited the Narragansett Laboratory.

Public Affairs

On 8 April, Lorrie Sullivan presented a talk to Narragansett Elementary School students on "Reproductive Behavior of Wrasses."

EEO Activities

On 31 March and 21 April, Ray Bowman attended two meetings of the Woods Hole Laboratory EEO Committee, and he was elected Secretary of the Committee.

Publications

Pratt, W. Observations on large white sharks, Carcharodon carcharias, off Long Island. Fish. Bull. (US). (S)

RESOURCE UTILIZATION DIVISION

Fisheries Engineering Investigation

Research Vessel Activity

An all-out effort has been made to complete as much as possible the renovations to the Gloucester Laboratory's R/V Gloria Michelle, or at least enough to make the vessel seaworthy for the pending Nantucket Shoals experiment in May. Interior paneling, heating, plumbing, and electrical work are examples. Also completed is the installation of the generator set and boom. The hull and deckhouse have received a fresh coat of paint.

The Gloucester Laboratory's other research vessel, the Rorqual, has reluctantly been relinquishing equipment for transfer to the Gloria Michelle which will increase the effectiveness of the new vessel.

Engineering Assistance to Other Center Programs

The surf clam-ocean quahog survey dredge and fixed-ramp assembly redesign were completed and the entire package has gone out for bid.

Due to the concentrated efforts on the Gloria Michelle, our physical oceanographic sampling on the M/V Marine Evangeline for the AEG during April was deferred and will be continued again in May.

Facilities and Safety

Repairs to the roof of the Gloucester Laboratory are in progress.

Resource Development and Improvement Investigation

Another experiment on the preservative effect of a potassium sorbate dip on fish fillets was completed. Skinless Atlantic cod fillets cut from 1-day-old iced fish were dipped in 2.5 and 5.0% potassium sorbate, packaged in polyethylene (O_2 permeable) and Mylar (O_2 impermeable) pouches, and stored at 33°F. The shelf life of the fillets packed in polyethylene pouches was 10 days for the nondipped control, 15 days for the fillets dipped in 2.5% sorbate, and 17 days for those dipped in 5% sorbate. The shelf life of the fillets packed in Mylar pouches was 10 days for the nondipped control, 17 days for the fillets dipped in 2.5% sorbate, and 19 days for those dipped in 5% sorbate.

This was the third of four similar studies, the first one was not tabulated since the fish obtained from the processor were of questionable age. The data from three experiments with fillets cut from 1-day-old cod indicate that the shelf life of those packed in polyethylene pouches was 8 days for the nondipped controls, 12 days for those dipped in 2.5% sorbate, and 14 days for those dipped in 5.0% sorbate. The shelf life of the fillets packed in Mylar pouches was 9 days for the nondipped control, 14 days for fillets dipped in 2.5% sorbate, and 17 days for those dipped in 5.0% sorbate. Fillets packed in Mylar pouches always had a longer shelf life than similarly treated fillets packed in polyethylene. In fact, fish dipped in 2.5% sorbate and packed in Mylar had the same shelf life as those dipped in 5.0% sorbate, but packed in polyethylene.

An experiment was conducted to determine whether formaldehyde liberated by the action of TMAO-ase on TMAO (trimethylamine oxide) found in crab meat would cross-link protein and thus act as a binder. TMAO-ase was added to raw, blanched, and fully cooked crab meat which was incubated at 90°F for 2 hr, then formed into molds and given a steam cook. No binding occurred. No formaldehyde was formed in all three samples as determined by chemical analysis.

We are pleased to welcome Elaine Griggs to our ranks for 6 wk. She is here on the Manchester High School SCORE (Senior Choice of Relevant Experience) Program.

Judi Krzynowek and Pat Donahue continue on their detail to analyze for poly-nuclear aromatic hydrocarbons.

The chapter titled "Food Value" for our book, Marine Anglers' Guide to Fish as Food, was completed.

A second trip was made to the supermarket chain in the Albany, New York, area which is selling the "U.S. Grade A" frozen fish. Again, as in the first trip, the temperature of the frozen "U.S. Grade A" fish in the frozen food cases was measured, and frozen samples were brought back to the lab for grading by USDC inspectors and for sensory evaluation by the lab panelists. The surface temperatures of the frozen fish varied from -1°C (30.2°F) for the fish in the open cases to -17°C (1.4°F) for the surface of the fish stored deeper in the case. Although the higher temperatures are much too high to store good quality frozen fish for any length of time, they were slightly lower than those temperatures found in the first trip to these markets. The fish processor has been notified of these high temperatures.

The experiment to determine the oxygen concentration in packages containing fresh pollock fillets stored at 4°C (40°F) in permeable, semipermeable, and impermeable pouches was completed. The results showed that the evacuated impermeable and supposed semipermeable pouches which had no oxygen at the start of storage remained oxygen-free throughout the storage time. Even the permeable pouch with 21% oxygen at the beginning of the experiment had only 4.4% oxygen in it after 13 days. These data indicate that even the gas-permeable pouch is unable to transmit oxygen as rapidly as it is consumed. This has unfavorable implications concerning the potential for botulism.

The energy consumption of the new frozen-food vending machine is being measured. With the doors closed, the unit uses about 16 kW/day. An experiment is in progress to determine to what extent the opening of the small freezer doors 70 times per day will affect the energy consumption of the unit.

Product Quality, Safety, and Standards Investigation

Product Quality

We welcome Ms. Christine Pzenny, a Manchester High School senior, who is participating in the SCORE program. Chris will be helping out with the isoelectric focusing work for her 6-wk project. Also on board for 5 wk is Timothy Gleason, a student at Bates College, who will be working on the dogfish project to fulfill a school requirement.

As part of the time-temperature tolerance study, red hake fillet blocks being held at either -5°, -20°, or -80°F were examined after 72 wk of storage. Compared to the previous examination at 58 wk, taste panel scores showed very little change for samples stored at -20° and -80°F. However, texture scores for -5°F samples dropped from fair to borderline, while flavor scores dropped from good to fair.

Dogfish samples being stored at 0°F were tested after 15 wk of storage. The development of rancidity still appears to be the most apparent deteriorative change occurring in these fish, especially in the belly flaps. Increasing thiobarbituric acid scores are being obtained even in vacuum-packaged samples. Discoloration on both fillets and belly flaps of air-packaged samples was noticeable. No ammonia has been detected.

An experiment was completed in which the dimethylamine/formaldehyde producing enzyme (TMAO-ase) isolated from red hake muscle was made to function in admixture with minced American plaice, a flatfish species not normally capable of producing dimethylamine and formaldehyde. Storage was under anaerobic conditions at 32°F. The TMAO-ase fraction contained only molecular species of 100 000 Daltons or larger and was shown to be functional in-vivo utilizing the flatfish's endogenous substrate and cofactors. A low-molecular-weight (<100 000 Daltons) protein fraction produced no dimethylamine or formaldehyde when mixed with the flatfish. This experiment is being repeated for the third time using winter flounder as the flatfish to receive the enzyme. A control sample of TMAO-ase treated winter flounder, which was irradiated (100 Krad) with gamma rays, was included to demonstrate that the enzyme was not of bacterial origin.

All of the various media and reagents for the Ames test have been prepared, and we have sent away for the test Salmonella cultures.

Three manuscripts were reviewed at the request of journal editors:

1. "Improved 4-aminoantipyrine Colorimetry for the Detection of Minute Quantity of Residual Hydrogen Peroxide in Noodle, Fish Paste, Dried Fish and Herring Roe" (for Journal of the Association of Official Analytical Chemists).

2. "Effect of Gamma Radiation on Toxicity and Immunogenicity of Salmonella typhimurium" (for Journal of Food Safety).

3. "A Note on the Estimation of Trimethylamine in Fish Muscle" (for Fishery Bulletin).

Joe Licciardello prepared a chapter on "Freezing the Catch" for the book, Marine Anglers' Guide to Fish as Food.

Product Safety

Thirty muscle samples of striped bass received from the NMFS Tiburon Laboratory have been worked up for polychlorinated biphenyls by the Association of Official Analytical Chemists procedure and analyzed by gas-liquid chromatography.

A new 6-ft x 2-mm glass column of 1.5% SP-2250 and 1.95% SP-2410 with 100/120-mesh Supelcoport has been conditioned and installed in the Perkin-Elmer Sigma 1 gas chromatograph.

A new electron-capture Ni^{63} cell has been ordered and will replace the defective cell. A manufacturing flaw in the gas line silver-soldered to the body of the cell is causing a small leak when the cell is at 300°C. Since the cell is extremely flow sensitive, reproducibility of analytical results is totally inadequate.

Product Standardization

A revised draft of the "Proposed U.S. General Standards for Grades of Shrimp" has been forwarded to the NMFS Central Office for publication in the Federal Register as a "Proposed Rulemaking." It is based upon the resolution of over 65 pages of comments received on the draft published in the "Advance Notice of Proposed Rulemaking" in the Federal Register.

Preparations have been made for the presentation of three fishery products at the 13 and 14 May meeting of the Armed Forces Product Evaluation Committee to be held at the US Army's Natick Laboratories. These will be: (1) cusk fillets; (2) a surf burger composed of Atlantic cod, pollock, silver hake, clams, shrimp, and crab meat; and (3) fish portions containing Pacific hake.

The market research and analysis questionnaire on canned salmon was approved by the USDA. They will prepare copies of the questionnaire for our distribution.

The Natick Laboratories have transferred their fishery standardization document file to our Gloucester Laboratory. It is now being reviewed.

A draft copy of a chapter on "Fish Smoking" was prepared for our book, Marine Anglers' Guide to Fish as Food.

After resolving comments from the USDC Inspection Service and industry, we prepared revised draft proposed "U.S. Standards for Grades of Fresh or Frozen Fish Steaks," and a preamble for the Federal Register. We have forwarded these documents to Washington, DC, for approval and publication in the Federal Register as a "Proposed Rulemaking."

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

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

Technical Assistance

Information and technical assistance were provided on the following subjects: Gloucester fishing industry; plant sanitation; fish parasites; shellfish; fishery training films; brine chilling; measuring color of formed fish fillets; quality of surimi blocks; washing fish frames; production of dried scallops; automated clam

shucking; authentic samples of Atlantic fish; refrigerated seawater; smoking of fish; drying fish; brining; canning of herring; nutrition; and radiation preservation.

Travel, Meetings, and Presentations

Dan Baker, Joe Mendelsohn, and Fred King attended the New England Fisheries Institute meeting in Boston where Tom Morris of the Empire Fish Company spoke on the importance of marketing and high quality assurance.

Joe Mendelsohn, John Kaylor, Burt Tinker, and Louis Ronsivalli attended the Food Marketing Institute seafood seminar in Boston. The Institute reviewed its plan to promote fishery products, and the speakers stressed the need for high quality products.

John Ryan and Fred King discussed standards development on 30 March with Mr. Dwight ("Pat") Patlillo and MJR Douglas King, both of the Veterinary Sciences Division, Academy of Health Sciences, Fort Sam Houston, and with Mr. B. Ross Jones of the Defense Personnel Support Center, Philadelphia.

Perry Lane attended meetings of the Northeast Shellfish Sanitation Association, the New England Marine Advisory Service, and the New England Fisheries Steering Committee.

Visitors

Dr. Grete Ellermann, a veterinarian with the Danish Inspection Service for Fish, and Ms. Ellen Jorgensen, a staff assistant with the Danish Consulate in New York City, visited the Gloucester Laboratory to discuss inspection and standards.

University Affairs

Mr. Arthur Grant of the Massachusetts Institute of Technology Sea Grant Program, contacted us regarding use of meat-bone separators to obtain cartilage from sharks for a pharmaceutical-extraction study.

Dr. Glen Brown, Head of the Department of Food Science at the University of Massachusetts in Amherst and Dr. Herbert Hultin, Director of the University of Massachusetts Marine Station in Gloucester, contacted us on 22 April to become better acquainted with the nature and needs of the seafood industry.

Dr. Robert Grodner of Louisiana State University contacted us on 3 April regarding comments on "Amendment 1" to "Military Specification MIL-F-43142E, Fish Squares, Dehydrated, Raw," as requested by the Research and Development Associates for Military Food and Packaging Systems, Inc., in New York City. Fred King is a member of the Specification Review Committee of which Dr. Grodner is Chairman.

Personnel

Judi Krzynowek, Kate Wiggin, Pat Donahue, and Elaine Griggs attended a 3-day course in the ADP 1022 system.

DIVISION OF ENVIRONMENTAL ASSESSMENT

Coastal Ecosystems Investigation

Benthic Communities

Ann Frame completed identification of the New York Bight benthic macrofauna samples collected during the benthic contaminants cruise of August 1980. Steve From coded data on benthic macrofauna for computer entry. He also determined numbers and weights of several kinds of human artifacts, such as tomato and melon seeds, in the Bight samples -- this provides one indication of presence of sewage material. Bob Reid began preparation of an interdisciplinary report on contaminant fates and effects in the New York Bight, based on the summer 1980 cruise.

Dave Radosh dove with Clyde MacKenzie to continue their studies of surf clam population dynamics off Rockaway, Long Island, and to conduct field experiments on cl burrowing in relatively contaminated (from Staten Island) and clean (Rockaway) sediments. Dave also helped the NOAA Atlantic Oceanographic and Meteorological Laborator (AOML) install and retrieve current meters in their study of water movements at the New York Bight dredge-spoil dumpsite. He worked with the New Jersey Marine Sciences Consortium personnel on their guidebook to the fauna of the Sandy Hook area. Clyde and Knee McNulty analyzed data for a paper on effects of hydraulic dredging on benthi macrofauna of an ocean quahog bed.

We continued to respond to numerous requests for information. Tapes of sedimen and macrofauna data for Raritan Bay and Long Island Sound were sent to Dr. Jeff Levin of the State University of New York at Stony Brook, who is collating all such data fo the New York area. Information on temperature cycles in the East River and on fishin use of a deep borrow pit in Raritan Bay was provided to the US Army Corps of Engineer Ocean Pulse Program (OPP) benthic macrofauna data sets were provided to Drs. Fred Grassle of the Woods Hole Oceanographic Institution and Bob Diaz of the Virginia Institute of Marine Science. We sent data on polynuclear aromatic hydrocarbons in fi fish (from our Gulf and Atlantic Survey I cruise) to the toxicology unit at Gateway National Park headquarters at Floyd Bennett Field in Brooklyn, New York.

Benthic Energetics

Frank Steimle organized and served as Chief Scientist for the OPP spring cruise which began on 24 April and is scheduled to conclude on 9 May, aboard the Kelez. Fra worked on compiling all Northeast Monitoring Program (NEMP) reports under a single numerical designation system. He and Bob Reid reviewed yet another draft of the NEMP annual report.

Russ Terranova continued calorimetry measurements on trophically important continental shelf species. Dot Jeffries made biomass determinations on benthic macrofauna from the 1973-75 collections (sponsored by the NOAA Environmental Research Laboratories' Marine Ecosystem Analysis Program) in the New York Bight.

Biological Oceanography of Stressed Ecosystems Investigation

Seabed Metabolism

Seabed metabolism data obtained on the WHOI R/V Knorr cruise last month have been reduced and will be analyzed for presentation at a post-cruise meeting at Brookhaven National Laboratory in May.

Bill Phoel and Steve Spina were invited by Brookhaven National Laboratory to participate in a June cruise aboard the R/V Alpha Helix in the Bering Sea. We will conduct seabed metabolism experiments on the Alaskan continental shelf (which is affected very little by upwelling) and compare these measurements with those at NEMP/OPP stations. The packaging and shipping of equipment for this cruise have been completed.

Bill completed his manuscript on "NOAA's Requirements and Capabilities for Diving in Polluted Waters."

Bill and Steve continued to provide diving support to the AOML in Miami, Florida, in their dredge-spoil capping experiments.

Phytoplankton Growth Potential

Algal bioassay activities during the month included assay of samples collected from six depths at two outer continental shelf stations. The assay format had been expanded to include tests of specific trace metals because earlier results had suggested a major role for metals in phytoplankton growth regulation. At both stations and at all depths, metals limitation was most critical. This metal deficiency was satisfied to a great extent by additions of iron, and to a small extent by manganese. Likewise through the water column at both stations, nitrogen and phosphorus were moderately growth limiting. Phosphorus was slightly more limiting than nitrogen at one station and these two nutrients were limiting to similar degrees at the other station. The assay data, therefore, continue to point to a more complex chemical water quality regulating mechanism for phytoplankton in Northeast shelf waters than suggested by the classic concept of nitrogen limitation.

Behavior of Marine Fishes and Invertebrates Investigation

Work, supported in part by US Environmental Protection Agency (EPA) funding, is continuing on the study of the behavior and ecological requirements of juvenile red hake. Currently we are analyzing field data for day-night rhythms in activity as well as food habits. These data were collected over a 5-day period aboard a commercial sea scallop vessel.

In lab studies, we had found that the presence or absence of fish within scallops was directly correlated to the hake's rhythm of activity. Using this as a basis of activity, a random sample of 10 scallops was taken from the catch every hour during the 5 days and examined for the presence of hake. Results showed the fish to be day-inactive and night-active with about 75% of the scallops being occupied by hake during the day, decreasing to 40% at night. These findings provide the rare opportunity to confirm observations with field-collected data.

Ocean Pulse Program

Mr. David Townsend has recently completed a Ph.D. thesis concerned with comparative ecology and population dynamics of larval fish and zooplankton along the Maine coast, based in part on an OPP contract. The thesis was concerned with larval fish and zooplankton in two dissimilar areas, Sullivan Harbor and the Damariscotta River estuary.

Environmental Statistics Investigation

We have initiated the implementation of the "ADP Dec-System"-oriented data-base management system in order to integrate different types of NEMP data sets. A hierarchial file structure set up within a data base is being investigated to maximize efficiency in the memory space usage as well as to minimize the undesirable impacts on the file structure to accommodate possible future changes. The cruise and station information will be used for reference purposes, while the sample data will be separately stored. This approach is consistent with the development of the new "114" version of the Systems 1022 of the ADP Network, which allows multiple data sets to be stored in a single file.

A computer-connection and terminal-use demonstration session was held at the Oxford Laboratory. The scientists learned how to utilize data management System 1022 for entering and manipulating the NEMP data sets. Input formats for the Milford and Oxford Laboratories are now being refined.

As indicated in a previous narrative report on the prevalence of vertebrate anomalies in Ammodytes sp./spp., a significant difference between regions was observed. However, another test showed that there was no inshore-offshore difference within these regions. This could not be explained due to meagerness of the data.

Geung-Ho Kim presented a paper on "Species Sensitivity Study for Heavy Metals Monitoring Via a Canonical Variable Approach" at the Environmetrics 81 symposium at Alexandria, Virginia, on 10 April. A result includes a certain clustering of the New York Bight finfish and shellfish according to the seven selected heavy metals load pattern, and a new type of similarity index (originated from a factor analysis) was used to form the cluster above. This result reveals that the dominant variables influencing the metal uptake may be reduced to the habitat and diet patterns. Roddy MacInnes has started working on a manuscript on the effects of a 30-mo exposure of juvenile blue mussels to copper and silver. Sukwoo Chang is preparing an environmental data monitoring manuscript for NEMP as a supplement to the "Biometric Guidebook."

Environmental Chemistry Investigation

During April, approximately 1800 seawater samples collected during OPP and MARMAP surveys were analyzed to determine concentrations of nitrate, nitrite, phosphate, and silicate nutrients. Ruth Waldhauer and Ingra Desvouges completed analyses of ammonium concentrations in 367 samples collected during a MARMAP survey on Kelez Cruise No. KE 81-03. Tom Kienzle served aboard that survey, collecting, filtering, and preserving seawater samples and supervising Rowena Rosenberg, a volunteer from Darien (Connecticut) High School. Jim Nicols was responsible for measuring phytoplankton production at 25 stations and Kathy Workman and Bob Fitzgerald measured chlorophyll-a at 80 stations sampled during the Kelez survey.

Vincent Zdanowicz and Tony Ruiz completed the preparation of material for sampling trace metals during the May OPP survey, Kelez Cruise No. KE 81-04/05, completed trace metal analyses of fish tissue from Albatross IV Cruise No. AL 79-07, and built two new noncontaminating hotplates and hoods which will be employed during the digestion of samples for mercury analyses. Forty sediment samples from the Gulf of Maine (provided by Dr. Peter Larsen of the Bigelow Laboratory for Ocean Sciences) were analyzed to determine trace metal content.

Considerable time was spent by several members of this Investigation drawing together data which were presented to our Soviet colleagues during the US-USSR research review held in Woods Hole during 27-30 April. Jay O'Reilly attended this meeting and presented and discussed some broad generalizations on the distribution of chlorophyll-a and phytoplankton primary production on the shelf. Several data reports were provided to Soviet scientists during the Woods Hole meeting (see "Reports" section).

Physiological Effects of Pollutant Stress Investigation

Physioecology

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

Lab-reared blue mussels exposed to either silver or copper in a diluter system were sampled at 21 mo for chemical uptake and histopathology. Blue mussels were also removed from the silver exposure system to determine the effect of silver on oxygen consumption.

Field-collected blue mussels were spawned and the larvae will be reared to young adults for future experimentation. Experiments with blue mussel embryos exposed to eight metals individually will now be started.

Field-collected blue mussels were set up in a diluter and are being exposed to mercury at 0, 5, and 10 μg/ℓ.

The remainder of this reporting period was spent cutting glass for the diluter systems. Six diluters will be refabricated to a new, improved design.

Chemistry

Two groups of about 50 (Atlantic) rock crab samples obtained from the Philadelphia Dumpsite in 1978 and 1979 were analyzed for metals. The results were sent to Dr. Sawyer at the Oxford Laboratory as part of a cooperative study. Nearly 100 rock crab samples have yet to be analyzed.

An attempt was made recently to analyze dried sediment samples for polychlorinated biphenyls (PCB's). Having found no PCB"s in the samples, which was unexpected, we sought the advice of Dr. Virginia Stout at the NMFS Seattle Laboratory for further analytical procedures which we will be attempting to utilize over the next several weeks.

Approximately 60 blue mussels, exposed to either silver or cadmium for 21 mo at 0, 1, 5, and 10 μg/ℓ, were analyzed for the presence of both copper and silver. Results were provided to the Physioecology Subtask.

Physiological Effects

Data from a recent study comparing two methods of cadmium exposure in the American lobster were compiled and analyzed this month. Gill tissue of lobsters fed cadmium-tainted clams for 30 days had significantly elevated oxygen-consumption rates when compared to those fed "clean" clams. The cadmium-fed lobsters had twice as much cadmium in their digestive diverticula as the controls, but no elevation in gill-tissue cadmium. Lobsters exposed for 30 days to cadmium in solution in a diluter system showed a 150% increase in cadmium in the gills and a 100% increase in the digestive diverticula. No differences in antennal gland uptake were noted in either group, but the data on this tissue were quite variable and will be analyzed again in future studies. Oxygen-consumption measurements on gills of lobsters exposed to cadmium in water were inconclusive, and tests will be repeated this spring.

Scanning electron microscopic examination of gill tissues of flounder and lobsters exposed to heavy metals continues. A number of gill abnormalities have been detected, but it is too early yet to attribute these abnormalities directly to metal effects.

Two master's degree theses were completed in this lab and approved this month. One evaluated the usefulness of "scope-for-growth" metabolic measurements in detecting pollutant stress in blue mussels from various Long Island Sound stations, and the second compared the effects of silver on the rock crab when exposed to a pollutant either via a food source or via the water column.

The analysis of blood of windowpane collected from three stations in Long Island Sound is in progress. The data from this Mini-Pulse project are being tabulated and analyzed for inclusion in a paper for the October ICES meeting to be held at Woods Hole.

Biochemical Effects

Analyses were completed: (1) on sea scallop adductor muscle samples (26) collected from five deepwater stations in the Gulf of Maine during last April's bottom trawl survey on Delaware II Cruise No. DE 80-02; (2) on all sea scallop adductor muscle samples (72) from December's OPP survey on Delaware II Cruise No. DE 80-09; (3) on all rock crab hearts (43) from September's OPP survey on Albatross IV Cruise No. AL 80-09; (4) on scallop adductor muscle samples (12) collected from the offshore New Jersey population in March; and (5) on 16 sea scallop samples with a wide size range from the Damariscotta River, Maine. A 3-mo exposure of scallops to 10 ppb of silver (as $AgNO_3$) was started this month.

Of the five deepwater stations sampled during Delaware II Cruise No. DE 80-02, two were within a minute or two of the deepwater (155 m) station on Albatross IV Cruise No. AL 80-09. These latter deepwater animals have been exceptionally useful in spotlighting those parameters most useful in signaling metabolic stress. These scallops, thought to be nutritionally deficient and nonspawning, had very low glycogen reserves and low levels of cellular energy [as determined by low pyruvate kinase (PK) and high

glutamate dehydrogenase (GDH)] compared to scallops from a nearby 68-m deep station. They also were relatively uniform in size, averaging 9 cm in shell length. Two immature animals were taken from this population during Delaware II Cruise No. DE 80-02, a sign that some recruitment is taking place, although not necessarily from the local population; these small scallops (4 and 4.7 cm) had the lowest PK/GDH we've yet seen, largely due to very high GDH, following the pattern seen at southern stations (inversely proportional GDH and shell size). Glycogen levels were low to moderate. The other three deepwater stations (159-181 m) produced animals with similar glycogen levels and, with few exceptions, moderate-to-high PK/GDH (nonstressed). We are testing the ratio of PK/GDH as an index of cellular energy charge.

Results from the December OPP survey, which included six scallops from the anomalous Block Island population just north of the "Mud Patch," showed very low PK/GDH and low-to-moderate glycogen. Kidneys from these animals also produced a picture of stressed metabolism (see March narrative report).

Data for the rock crab hearts from Albatross IV Cruise No. AL 80-09 showed unexceptably large individual variation at all stations and no discernible pattern. As a result, we have decided to stop sampling this animal.

With the completion of analyses for all samples from the aforementioned cruise and Delaware II Cruise No. DE 80-09, we are all caught up on archived OPP samples, and are presently working on a backlog of bottom trawl survey samples. Most of the field data have been analyzed and tabulated for a paper for the October ICES meeting. We are also participating in the current OPP survey of Kelez Cruise No. KE 81-04/05.

Anaerobic Bacteriology/Metabolism

Our OPP activities included sampling of Long Island Sound stations and working up the last of the bacterial isolates from previous cruises. A presumptive *Vibrio cholerae* (non-01) was demonstrated in a sediment sample (Station 54) from the February cruise. Previously, we had demonstrated *V. cholerae* from Long Island Sound. Bacterial counts in water samples collected during the winter months are low, as expected. Growth of bacteria and population shifts will be monitored by our monthly cruises.

Travel, Meetings, and Presentations

During 27 April - 1 May, Dr. Pearce participated in the International Maritime Consultative Organization/Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP) Working Group meeting concerned with criteria for ocean dumping and the final drafting of the United Nations Environmental Program/GESAMP report on the health of the oceans. Center personnel have made particularly large inputs to these important reports and the present meetings were principally to finalize the reports.

Ruth Waldhauer and Al Matte attended a meeting of the local chapter of the American Chemical Society. The keynote speaker delivered a paper on environmental modeling activities underway at Bell Laboratories.

Seminars

Bob Reid gave a talk on "Monitoring Benthic Macrofauna in the Northeast" at the monthly joint Sandy Hook Laboratory-New Jersey Marine Sciences Consortium seminar series, held at the Sandy Hook Laboratory on 1 April.

On Thursday, 9 April, Dr. Fred Vukovich presented a seminar at Sandy Hook Laboratory concerned with his research related to remote sensing of coastal and shelf habitats. This seminar involved discussions of contemporary strategies which can be used to monitor variables such as suspended materials, chlorophyll, salinity, and others of interest to oceanographers. Dr. Vukovich has been involved with the Superr program.

On Friday, 24 April, Dr. Joseph Nadeau of Rider College gave a seminar on the distribution of heavy metals in riverine and estuarine systems. Of particular interest were his discussions and data on heavy metals in major drainage systems such as the Raritan River and Chesapeake River. His data so far indicate sometimes unusual distributions of heavy metals and will be extremely important in future monitoring and research concerned with sources, fates, and effects of contaminants in areas such as the Hudson River/Raritan Bay complex, Delaware Bay, and Chesapeake Bay.

Visitors

On Wednesday and Thursday, 23 and 24 April, Dr. Marguerita de Barros from Portugal visited the Sandy Hook Laboratory as part of an Eisenhower Foundation tour of the US. Dr. de Barros is Chairwoman of the Marine Chemistry Working Group of the ICES Marine Environmental Quality Committee. She was most interested in the contaminant analyses ongoing within the NEFC, as well as the biological-effects studies, particularly behavioral studies.

Dr. Sheriff Ramadan of the Marine Biological Laboratory of Alexandria, Egypt, met with B. L. Olla for 2 days to discuss experiments that are being conducted on the effects of oil on selected benthic organisms of the Red Sea. This is part of a cooperative program between the EPA and the Egyptian Academy of Science (for which B. L. Olla is serving as a consultant).

University Affairs

The Physiological Effects of Pollutant Stress Investigation hosted a marine biology class from Suffolk Community College.

On 8 April, Bob Reid presented an overview of NEFC activities to an ecology seminar at Stockton State College in Pomona, New Jersey.

Publications

Regan, J. D.; Carrier, W. L.; Olla, B. L. Photoreactivation and longevity in two marine fishes. Amer. Soc. Photobiol. (Abstract.) (S)

Reports

Evans, C.; O'Reilly, J. E. A manual for the measurement of chlorophyll a in net-phytoplankton and nannophytoplankton. Ocean Pulse Tech. Man. No. 3/Sandy Hook Lab. Rep. No. 80-17;1980.

Evans, C.; O'Reilly, J. E. Report on chlorophyll measurements made between April 1980-August 1980 during surveys EV 80-01, EV 80-02, DE 80-03/EV 80-04, and EV 80-06. Sandy Hook Lab. Rep. No. 81-12;1981.

O'Reilly, J. E.; Busch, D. A.; Bruno, R. A.; Nickels, J. Summary of measurements of primary productivity made during MARMAP surveys (Albatross 79-06, AL 79-11, Evrika 80-01, EV 80-01, EV 80-02, and Delaware 80-03/Evrika 80-04. Sandy Hook Lab. Rep. No. 81-14; 1981.

Waldhauer, R.; Matte, A.; Draxler, A.; O'Reilly, J. E. Ammonium concentrations measured during Evrika 80-06 survey. Sandy Hook Lab. Notebook;1981.

Waldhauer, R.; Matte, A.; Draxler, A.; O'Reilly, J. E. Nitrate, nitrite, phosphate, silicate concentrations in seawater collected during the Evrika 80-02 survey. Sandy Hook Lab. Notebook;1981.

AQUACULTURE DIVISION

Spawning and Rearing of Mollusks Investigation

A recent sample of surf clams from our experimental cages in Long Island Sound has indicated a high rate of survival over the winter. The length measurements of the clams reveal some growth, probably during late October and November of last year. Fouling of the 0.75-inch mesh wire cages has been slight and there is no evidence that the cages have shifted their positions in the last 9 mo. An experiment is planned to monitor the growth of hatchery-reared clams within these cages over the entire 1981 season. Different numbers of clams will be placed in cages to investigate the effects of crowding on their survival and growth.

Over 75% of the hatchery-raised bay scallops we planted in cages in two Connecticut estuaries in October survived the winter. In previous overwintering experiments, mortality was almost complete; thus, these new results are very encouraging. The key to high winter survival of transplanted scallops appears to be getting them into the natural environment while the water temperature is still above 10°C to allow time for acclimation to the new environment before very cold temperatures occur.

We have started our 1981 bay scallop field experiments with seed produced from February spawnings. In our first experiments, we are attempting to determine how early we can successfully put small seed into Long Island Sound without sacrificing seed viability. We acclimated 10-mm seed to 5°C and put them overboard in mid-April and will start similar groups when the water temperature reaches 10° and 15°C.

Aspects of Nutritional Requirements of Mollusks Investigation

Larval feeding experiments were conducted with larvae of two different sizes, 70 µm and 120 µm, to determine if a seawater-adapted cryptomonad flagellate could be utilized as a source of nutrition by oyster larvae. Three different concentrations of algae were offered to the larvae; controls either were not fed or were fed *Isochrysis galbana*. After 4 days of feeding, size determination of the larger larvae indicated that unfed oysters increased in size by 7.5 µm, while oysters fed *I. galbana* increased by 25 µm. The three concentrations of the cryptomonad species yielded size increases of 16 µm, 33 µm, and 36.5 µm. The increase in growth of the oysters, relative to concentrations of food, indicates that this species is a potentially useful larval oyster food. Additional studies will be conducted to corroborate and expand on this information.

Oyster larvae are being reared to setting size in the lab at room temperature so that we may obtain spat for additional feeding studies. One feeding experiment on small spat is now in progress, but results are not yet available.

Transfers of stock cultures and special strains are now back on schedule. The freshwater cryptomonad flagellate that we have been adapting to tolerate 30% seawater in the growth medium is now cultured in large volumes (2.5 liters) so that sufficient culture volume is available for use in feeding studies.

Requests for starter cultures from Long Island Oyster Farms, Inc., and Old Dominion University were obtained and mailed to them. In addition, a request for information on culture techniques and starter cultures was received from a group located in Hong Kong who are interested in developing a molluscan hatchery there.

A harvest of 1363 liters of juvenile algal foods and 1838 liters of larval algal foods was obtained from the semicontinuous algal culture system. The algal cultures were distributed to the various investigations as follows: Aquacultural Genetics--1194 liters, Physiological Effects of Pollutant Stress--333 liters, Spawning and Rearing of Mollusks--1053 liters, and Diseases of Larval Mollusks--47 liters. Some changes have been recently instituted in the species that are cultured in the semicontinuous system. Our recent studies of feeding in larval and juvenile oysters have indicated that Chlorella autotrophica is a species with no food value for young oysters and Phaeodactylum tricornutum is of mediocre value. Therefore, C. autotrophica has been completely eliminated from the culture system and fewer carboys of P. tricornutum cultures are maintained. Since our experiments also revealed that Tetraselmis maculata is an excellent juvenile food, this alga has now been put into carboy culture in the semicontinuous culture system. Also, Thalassiosira pseudonana is a new species added to the culture system. Due to modifications in the culture medium (increasing concentrations of silicon and iron), excellent growth of this species is now obtained.

Aquacultural Genetics Investigation

Oyster Breeding

In a preliminary evaluation of various grow-out sites for selected groups of American oysters comprised of different year classes of full-sibs, F_1 geographic hybrids, and their local controls, the juveniles grew best in a lantern net at an offshore site. Other locations were trays on the suspension dock and in the tank raceway. Survival was generally good at all locations, but recovery was poor for the net because of a problem with the anchoring device.

There was no significant difference in growth and survival between F_1 geographic hybrids of Maryland and local oysters, and the local nonhybrid controls. There was greater growth in smaller, younger oysters than in individuals from older year classes.

For other hybridization studies, approximately 60 American oysters were received from Florida with the cooperation of Florida State University Professor Dr. R. Winston Menzel. These oysters are being maintained in a small-scale recirculating unit.

The second selected generation of American oysters was obtained in the two-way selection experiment for growth rate. Several thousand juveniles will be available for continuing the experiment. It is still too early to ascertain whether continued favorable response to selection was obtained.

Genetic Effects of Ocean Contamination

As a basis for utilizing micronuclear incidences in erythrocytes of fish as an indicator of chromosome mutation, there should be some demonstration that mutagens do indeed increase such incidences in fish as they do in mammals. This has been demonstrated now in the circulating blood cells of coho salmon parr irradiated just before complete yolk-sac absorption. Final data are currently being collected. Work will be prepared for publication.

A method for dissociation of kidney tissue cells of adults, which allows their subsequent preparation for cytological and cytogenetic studies of erythropoiesis, has been developed. This can be used in the field as well as the lab in conjunction with both the micronuclear test, the sister-chromatid test, and in chromosome morphology studies.

About 200 additional windowpane from three Long Island Sound stations have provided blood and kidneys for the micronucleus test. Flounder from these three stations sampled on a monthly basis indicated earlier that chromosome mutation might be slightly elevated at the more seriously contaminated station. Also, the circulating blood of some fish at this station appeared to show an enhanced fragility of its circulating cells. Once the new samples of circulating cells are scored, data will be analyzed in full. Any additional field samples will probably be of kidney tissue exclusively, now that a suitable method is available.

Kidney tissue and circulating blood have been sampled this month from about 60 additional Atlantic cod from Georges Bank, the Northeast Channel, and Browns Bank. Cytogenetic analyses of micronuclear incidences in erythroblasts and erythrocytes are to be made. Cytological analyses of the incidences of piscine erythrocytic necrosis virus, which could be a factor influencing chromosome mutation, are also to be performed.

Applications of the micronucleus test to embryo and larval fish are being explored in both hatchery and field samples.

New samples of amphipods are presently being field-sampled for a continuing study of the cytological/cytogenetic state of their early-stage eggs relative to contamination of the sample area.

Staff participated in and sampled material on the spring bottom trawl survey (Legs II and III) and on an OPP survey on the Kelez.

Travel, Meetings, and Presentations

Ed Rhodes made an aquaculture presentation at the 1981 State of the Sound Conference sponsored by the Oceanic Society and the Yale University School of Forestry held at Yale University.

Ed Rhodes attended the spring meeting of the New England Estuarine Research Society in Narragansett, Rhode Island.

Visitors

The research of the Aquacultural Genetics Investigation was discussed this month with the following visitors: students from Fairfield University, Suffolk Community College, Harvard University, and Berlin (Connecticut) High School; two professors from URI; five economists from African countries; and a member of the Maine oyster business community.

Other visitors included Bob Birks of South Kent, Connecticut; Bill Penkava of West Haven, Connecticut; Fred Lipschultz of Harvard University; Dr. Thomas Waller of the National Museum of Natural History in Washington, DC; Dr. Mary Peterson of the Zoological Museum of the University of Copenhagen; and Dr. Wayne Durfee and Dr. Dymsza of URI.

Personnel

Richard Hass, on a temporary assignment with us for nearly a year, has taken a new position in Maryland.

Publications

Rhodes, E. W.; Widman, J. C. Some aspects of the controlled production of the bay scallop (Argopecten irradians). Proc. World Maricult. Soc. 11:235-246;1980. (P)

Stiles, S. Preliminary studies on genetic variation in oyster populations, species and hybrids. Can. J. Genet. Cytol. 22(4):678. (Abstract.) (P)

PATHOBIOLOGY DIVISION

Microbial Ecology and Parasitology Investigation

Rock crabs were collected from Sandy Hook Bay and the New York Bight apex in order to follow gill condition before, during, and after the annual 1980-81 winter molting period for adult males. Late summer collections (August 1980) near Ambrose Light failed to provide sufficient numbers of crabs for making valid estimates of the incidence of black gill. One successful collection was made up of 15 live adult specimens, 2 with black gills and 3 additional dead and decomposing specimens. An examination of our historical data from 1978-79 agreed with the 1980 findings by showing that late summer and early fall collections consistently yield very few specimens per tow. The data suggest that perhaps adult crabs have moved peripherally away from the historical sewage disposal site that has been sampled continuously since 1975. Plans are being made to resample the grid stations (previously used by the NOAA Environmental Research Laboratories' Marine Ecosystem Analysis Program) to determine whether distribution patterns in late summer have changed. Three collections made in Sandy Hook Bay were timed to coincide with the annual migration of adult males into shallow waters for the wintertime molt. Unexpected results were obtained in November when 51 crabs were caught, including 28 females of which 13 were in the postmolt papershell condition. Previous accounts indicate that females in deepwater locations molt in May and June and that females in shallow coastal waters molt in late summer or early fall. One month later in the middle of December 1980, 45 crabs were collected in Raritan Bay; 2 were papershell females and 3 were premolt males. The collection again yielded an unusually large number of females (26 females and 19 males). A third collection at the end of December yielded 105 crabs of which 101 were males; 70 of

the males were recently molted papershells. Monitoring efforts showed, therefore, that during the winter season, which is supposed to be the time when adult males undergo an annual molt, this activity was immediately preceded by unexpected molting by females. While females were molting, 96 specimens were captured (54 females and 42 males), and, subsequent to this activity, 105 specimens were caught of which 101 were males. The winter season in 1980 produced an unexpected and previously unrecorded reversal of male:female sex ratios of approximately 1:1 prior to the male molting period and 25:1 immediately thereafter. The data suggest that females aggregated early in winter to mate while they were in the premolt condition and then dispersed when males were in the postmolt or soft condition. The data also suggest that typical molting activity occurred during the winter of 1980 and that an estimate of the incidence of "black gill" this summer will depend on a spatial reassessment of rock crab dispersal and abundance in ocean waters.

In cooperation with microbiologists from the Food and Drug Administration facility in Davisville, Rhode Island, sediment samples from the Apalachicola River, Florida, were tested for the presence of Acanthamoeba. Six samples were received representing a gradient from fresh water to salt water of 20 o/oo salinity, and all yielding positive cultures for fecal bacteria. The amoebae were cultured from all six samples and two strains were isolated which grew at 40°C, thus showing a potential for pathogenicity in warm-blooded vertebrates. The sediments were sampled to test our hypothesis that the amoebae may routinely be recovered from sites that are known to harbor viable sewage-associated bacteria. Findings were in excellent agreement with previous results from the Philadelphia-Camden dumpsite, New York Bight sewage sludge dumpsite, and Narragansett Bay, Rhode Island. All data are now being subjected to statistical analyses.

Diseases of Larval Mollusks Investigation

On 9 and 10 April, the monthly Mini-Pulse sampling survey of Long Island Sound recovered 30 bacterial isolates for larval shellfish challenge and biochemical identification. Thirty-eight isolates from December and 40 from January were tested for larval pathogenicity, but the samples are not yet counted due to manpower shortages. The Mini-Pulse project will stop with the June cruise, completing 2 yr of monthly sampling of Long Island shellfish beds. Data from that survey will be reported at the August meeting of the National Shellfisheries Association in Williamsburg, Virginia.

To assist Marine Bioservices solve a disease problem, challenges with 42 suspect shellfish pathogens were made against American oyster larvae. None of the isolates proved to be pathogenic and most belonged to the genera Aeromonas and Pseudomonas. This information was reported to the owner. Additional assistance was requested for improvement in the design of a water-treatment system used to cleanse the Vibrio-bacteria-affected brood stock. More samples will be tested to locate the source of the bacterial infection.

In continuing work with bacterial oyster pathogens to compare the Minitek diagnostic system with the standard diagnostic procedure, better results were obtained using a sterile mineral overlay rather than an anaerobic incubation environment. Several bacterial isolates have now been tested and confirmed as marine organisms, using a growth medium containing from 3 to 7% NaCl. Others are now being run in the Minitek system for comparative purposes.

To obtain a better correlation of the Minitek system oxidase reaction with the standard method for the oxidase reaction, the Minitek growth medium is being tested and modified further by the addition of HEPES buffer and small amounts of agar.

Ultraviolet light (UV) studies on a recently isolated bacterial pathogen (see February narrative report) indicate that UV radiation, given at our routine dosage level, greatly inhibits growth of the pathogen; a few cells, however, are able to repair their damages within 24 hr. The effect of UV radiation on two other pathogens will be determined next month.

Experiments to determine the LC_{50} of toxic filtrate produced by a pathogenic Vibrio sp. for fertilized oyster eggs and embryos have been conducted. Data still must be analyzed before the concentration is established. The toxic fraction of the filtrate is being concentrated so that its molecular weight can be determined.

Comparative Invertebrate Pathology Investigation

A major effort was made this month to work ocean mollusk data collected for NEMP into a format that can be entered into the ADP Network system. John MacInnes of the Sandy Hook Laboratory spent 2 days at the Oxford Laboratory instructing staff members on the use of the ADP system and providing information on data entry, manipulation, and preparation.

Histologic tissue sections of sea scallops from the Sheepscot River, Maine, were examined at the request of the Maine Department of Marine Resources. We have confirmed the presence of a fungal organism in tissue abscesses. No information is yet available on the pathogenicity or prevalence of this disease.

The Histology Unit prepared over 200 sections for microscopic study by staff pathologists and continued work on preparation of a manual on histological procedures.

Ultrastructural studies continued on the American microcell diseases in American and European oysters. Successful embedment of additional Denman Island disease lesions from Japanese oysters led to the examination of numerous blocks. One block was found which possessed microcell organisms. Ultrastructural features were clear enough to distinguish these organisms from microcells as found in the European oyster. Specific features observed were: diameter of 1-3 μm, nucleus of 0.5 μm with an eccentric nucleolus, dense bodies of about 100-150 nm in the cytoplasm which resemble "haplosporosomes," other organelles which were possibly mitochondria, abundant free ribosomes and an electron-dense glycocalyx. The organism from the European oyster was similar, but had clear large mitochondria, larger more spherical haplosporosome-like bodies, and a peripheral nucleolus. The European oyster microcell, as isolated in American waters was found to be virtually identical to the European oyster microcell, as isolated in French waters, and is believed to be the same species.

Literature retrieval and study have been done on occurrence and types of gynandromorphs in crustaceans, and of hormonal systems that effect sexual differentiation in crustaceans. A blue-crab gynandromorph was brought to Sara Otto of the Maryland Department of Natural Resources in 1979 and briefly described by her in Commercial Fisheries News (Maryland). This blue crab is, to our knowledge, the only gynandromorphic blue crab that has been seen by scientists concerned with crustaceans. It is only the eighth bilateral gynandromorph to be described for the crustaceans. The

other seven specimens were macrurans. Gynandromorphism is confined to decapods, and occurrence of bilateral gynandromorphs indicates that circulating hormones--thought to be sexual determinants in most other malacostracans--are probably not the only factors that influence sexual determination in decapods. A preliminary rough draft of a manuscript has been prepared that describes the anatomy and histology of the gynandromorph and discusses the significance of bilateral gynandromorphism to an understanding of sexual determination in decapods. The paper is being coauthored by Phyllis Johnson and Sara Otto.

A summary report of the spatial distribution of focal gill melanization in euphausids was submitted to the NOAA Office of Marine Pollution Assessment upon request. The report suggests that species differences in gill melanization may occur since Meganyctiphanes norvegica rarely shows any focal melanization while Nematoscelis megalops of the same sample may have a prevalence of gill melanization as high as 25%. The data for the inner continental shelf and Gulf of Maine areas are still meager in comparison to the outer shelf and slope waters data. Examination of material collected on two OPP surveys should help fill in those gaps.

Fish Pathology Investigation

Integumental ulcers constitute the most numerous lesions of demersal fishes collected from French coastal waters. These cutaneous lesions are the subject of intensive study in France because of the possibility that they may be caused by pollution. As part of a cooperative study between NOAA (i.e., our Pathobiology Division) and the French analog of NOAA, the National Center for the Exploitation of the Oceans, or CNEXO, tissues from French and American fishes with ulcers are being exchanged for lab study. In December, histologic sections were prepared from ulcers of red hake. The stained slides were sent to Dr. Louis Orcel at the Faculty of Medicine at the University of Pierre and Marie Curie in Paris. Dr. Orcel examined the slides and forwarded a report of his findings. Recently, stained slides from French fish with ulcers (dab, Limanda limanda; plaice, Pleuronectes platessa; flounder, Platichthys flesus; and cod, Gadus morhua) were sent to the Oxford Laboratory. The lesions exhibited by these fish share many similarities to those of red hake. Although ulcers frequently are found in many species of fish in France, in the US red hake from the New York Bight appear to be the only fish species in which ulcers are abundant. Upon completion of the microscopic examination of the slides from France, a report will be forwarded to Dr. Orcel.

Two black-crowned night herons were obtained from the US Fish and Wildlife Service. The birds are being fed American eels infected with larval Eustrongylides sp. If the nematode completes its life cycle in the heron, the adult worms will be subjected to taxonomic study. This roundworm caused some embarrassment to US exporters of live eels to Europe last year.

Analysis of the data collected on vertebral anomalies of Ammodytes sp./spp. is proceeding with the cooperation of Sukwoo Chang of the Sandy Hook Laboratory.

A manuscript on blood parasites of fishes from the Northwest Atlantic by R. A. Khan (Memorial University of Newfoundland) and M. W. Newman is in lab review.

Light and electron microscope studies on haddock and winter flounder larvae exposed to 500 ppb of copper (as Cu++) for 18 hr were completed this month. Extensive

lesions were noted in the olfactory organs. The details of the observed sensory tissue cytopathology will be presented at the International Association for Aquatic Animal Medicine in May at Mystic, Connecticut.

Preparations and protocols were completed for experiments on larval striped bass exposed to 100 ppb of Cu++ for as long as 72 hr. These experiments will be conducted at the Narragansett Laboratory in conjunction with the Larval Fish Dynamics Investigation.

Travel, Meetings, and Presentations

Dr. Rosenfield visited the Sandy Hook Laboratory on 9 April to formulate plans for an upcoming ICES meeting.

Dr. Rosenfield attended a meeting at the NMFS Central Office on 15 April regarding the signing of a Cooperative Agreement between the Oxford Laboratory and the University of Maryland Center for Environmental & Estuarine Studies' Horn Point Laboratories in Cambridge, Maryland.

During the week of 20 April, Dr. Rosenfield, Dr. Murchelano, Dr. Johnson, Dr. Blogoslawski, Mr. Farley, Mr. Newman, and Mr. Kern participated in the ICES Working Group on Pathology of Marine Organisms meeting held at Oxford.

Dr. Rosenfield, Dr. Johnson, Mr. Farley, and Mr. Kern attended the Workshop on Intracellular Pathogens in Marine Poikilotherms at the Registry of Tumors in Lower Animals, National Museum of Natural History, Washington, DC, on 29 April; Dr. Rosenfield chaired the workshop and Mr. Farley presented a talk and materials concerning microcell diseases and the viral and chemical etiologies of molluscan neoplasms.

On 30 April, Dr. Rosenfield held a staff meeting at the Milford Laboratory relative to Pathobiology Division programs.

Dr. Edwards held a staff meeting at the Oxford Laboratory on 16 April; also in attendance were Dr. Sindermann, Mary Laird, Helen Mustafa, and Herb Stern.

Dr. Robohm attended the Fish Biologics Symposium: Sero-diagnostic and Vaccines, held at the US Fish and Wildlife Service's National Fish Health Research Laboratory in Kearneysville, West Virginia. He presented a paper on "Evidence for Genetic Selection of High Antibody Responders in Summer Flounder."

Ms. Gretchen Roe departed 24 April for 2 wk to collect benthic amphipods on a NEMP cruise.

Visitors

Visitors to the Oxford Laboratory during the month included CPT Al Smith of the US Navy and three colleagues from the Congressional Underwater Club in Washington, DC; Dr. Carl Sindermann and Mr. John MacInnes of the Sandy Hook Laboratory; Dr. Robert Edwards, Mr. Herb Stern, Ms. Helen Mustafa, and Ms. Mary Laird of the Center Directorate; and participants and members of the ICES Working Group on Pathology of Marine Organisms -- Dr. M. H. Grizel of the (French) Institut Scientifique et Technique des Pêches Maritimes (ISTPM) in La Trinité sur Mer, Dr. M. Comps of the ISTPM in Sète,

Dr. C. Maurin of the ISTPM in Nantes, Dr. Baudin-Laurencin of the (French) Laboratoire National de Pathologie des Animaux Aquatiques in Brest, Dr. G. Balouet of the (French) Laboratoire d'Anatomie Comparée in Brest, Dr. N. Poder of the (French) Laboratoire de Pathologie in Brest, Dr. B. Watermann of the (West German) Universitat Hamburg, Dr. H. Moeller of the (West German) Institut fuer Meereskunde in Kiel, Dr. J. Menezes of the (Portuguese) Instituto Nacional de Investigatigacaos Pesqueras in Lisbon, Dr. P. van Banning of The Netherlands Institute for Fishery Investigations in Ijmuiden, Dr. D. Declerck of the (Belgian) Ryksstation voor Zeevissery in Oostende, Dr. E. Egidius of the (Norwegian) Institute of Marine Research in Bergen, Dr. A. Munro of the (Scottish) Department of Agriculture and Fisheries in Aberdeen, Dr. N. O. Christensen of the (Danish) Royal Veterinary and Agricultural University in Copenhagen, Dr. J. McArdle of the (Irish) Department of Fisheries and Forestry in Dublin, Dr. G. Hill of the (British) Ministry of Agriculture, Fisheries and Food in Weymouth, Dr. F. B. Bank of Johns Hopkins University in Baltimore, and Dr. C. J. Sindermann of our Sandy Hook Laboratory.

University Affairs

Dr. Blogoslawski visited Dr. Julius Kuck at Fairfield University, giving him additional paralytic shellfish poison (PSP)-toxic clam samples for chromatographic separation. PSP-contaminated clam samples were also shipped to Joseph Betz of the Philadelphia College of Pharmacy and Science for cooperative research on toxin separation.

A bacterial isolate used by Mrs. Hockale of Quinnipiac College in Hamden, Connecticut, for her master's thesis work was used to challenge American oyster larvae and was found to be pathogenic. The isolate, a species of *Vibrio*, was made 4 yr ago by Dr. Blogoslawski from Long Island Oyster Farms' hatchery in Northport, and given to Mrs. Hockale for comparative taxonomic identification with other ATCC *Vibrio* strains.

Oyster larvae were provided to Dr. Willard Hartmann of Yale University in cooperative work on the effect of chlorinated sewage effluent to larval development.

Dr. Rosenfield particpated in a conference on career opportunities at the University of Delaware at Newark on 1 April.

Personnel

Ms. Linda Dorigatti's appointment terminated on 3 April.

Dr. Rosenfield visited the Sandy Hook Laboratory on 9 April to discuss merit promotion plans.

Dr. Rosenfield and Dr. Murchelano attended an organizational meeting of the Center Personnel Management Advisory Committee on 28 and 29 April at the Woods Hole Laboratory.

EEO Activities

On 22 April, Mr. Rose attended the Milford Laboratory's EEO Committee meeting.

Publications

Bodammer, J. E.; Sawyer, T. K. Aufwuchs protozoa and bacteria on gills of the rock crab, Cancer irroratus Say: a survey by light and electron microscopy. J. Protozool. (A)

Brown, C. A prodiginine pigment toxic to embryos and larvae of Crassostrea virginica. J. Invertebr. Pathol. (A)

MacLean, S. A.; Farley, C. A.; Newman, M. W.; Rosenfield, A. Gross and microscopic observations on some biota from Deep Water Dumpsite 106, Ketchum, B. H.; Kester, D. R.; Park, P. K. eds. Ocean dumping of industrial wastes. New York: Plenum Publishing Corp.;1981:431-437. (P)

Murchelano, R. A.; Edwards, R. L. An erythrophoroma in ornamental carp, Cyprinus carpio L. J. Fish Dis. 4:265-269;1981. (P)

Sawyer, T. K.; Greig, R. A. Black gill disease and heavy metal concentrations in the rock crab, Cancer irroratus. Annu. Rep. Congress, 1978 Ocean Pollut. Res. Prog. Act. (Abstract.) (S)

Sawyer, T. K.; Lear, D.; O'Malley, M.; Adams, W.; Gaines, J. Pathogenic protozoa associated with fecal bacteria in sewage sludge disposal sites. Annu. Rep. Congress, 1978 Ocean Pollut. Res. Prog. Act. (Abstract.) (S)

NATIONAL SYSTEMATICS LABORATORY

Benthic Fishes Investigation

An annotated list of commercially exploited and potentially commercially exploit cod-like fishes of the world, which is being compiled at the request of and with suppo from the UN Food and Agriculture Organization, was nearly completed. It includes information on 30 species of cods (Gadidae), 23 species of grenadiers (Macrouridae), and 11 species of deepsea cods (Moridae).

Work was done on a paper to be presented at the annual meeting of the American Society of Ichthyologists and Herpetologists, describing the fish fauna of the Galapagos Rift thermal vents area.

Pelagic Fishes Investigation

Research continued on a revision of Spanish mackerels. Three manuscripts were revised, one on the tunas and mackerels of southern Africa, one on a Pacific bluefin in New Guinea, and a third on the nomenclature of southern African halfbeaks.

Bruce Collette commenced preparation of his Presidential Address to the American Society of Ichthyologists and Herpetologists -- "A Review of Scombroid Classification."

Penaeoid Shrimp Investigation

Preparation continued on a manuscript on the classification of the rock shrimps of the American Pacific. Work was also done on the description of a new species of Mesopenaeus from the Indo-Pacific.

Crustaceans Investigation

The long-term project describing the shrimps, lobsters, and crabs of the temperate eastern US is drawing to a close. All species accounts are completed and set in type, the bibliography is half done, and the figures are completed and captions written.

Visitors

Visitors included Dr. Phyllis Cahn of NOAA in Rockville, Maryland; Dr. James Tyler of the National Science Foundation; Dr. P. Ryan of the University of Fiji; Barbara Block, a WHOI graduate student; and J. Carter of the Virginia Institute of Marine Science.

Publications

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

Cohen, D. M. New and rare ophidiiform from the eastern Atlantic: Canary Islands to Cape of Good Hope. Proc. Biol. Soc. Wash. (A)

Collette, B. B. Tunas and mackerels, family Scombridae. In Sea fishes of southern Africa. (A)

Collette, B. B. Status of two names for southern African halfbeaks. Copeia. (S)

ATLANTIC ENVIRONMENTAL GROUP

Ocean Monitoring and Climatology Task

On 15 April, in conjunction with the AEG's Ship of Opportunity-Ocean Monitoring Program, the new Undulating Oceanographic Recorder (UOR)-Mark II was launched on its maiden voyage on a route between New York and Bermuda, utilizing the Bermuda Container Line ship M/V Oleander. For its first performance, the UOR towed along its programmed sawtooth pattern from 8 to 50 m in depth with an undulation wavelength of 3 nautical miles. Measurements of pressure, temperature conductivity, and fluorescence of chlorophyll-a were made every 15 sec and recorded on a digital tape cassette. The UOR performed successfully for 100 undulations during its 15-hr, 150-mile tow, marking the longest single deployment to date for either the Mark II version or the Plessey Mark I.

The Oleander's weekly trip frequency (New York to New York), the attractive rhumb line (course 137°/317°T), and the enthusiasm of the officers and crew provide an excellent opportunity for regular and frequent observations of important features such as Gulf Stream rings and the shelf-slope front.

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

The following announcement of eddy conditions in the Georges Bank-Middle Atlantic Bight area was sent to the Commander of the Atlantic Area for the US Coast Guard for publication in the May 1981 issue of Atlantic Notice to Fishermen:

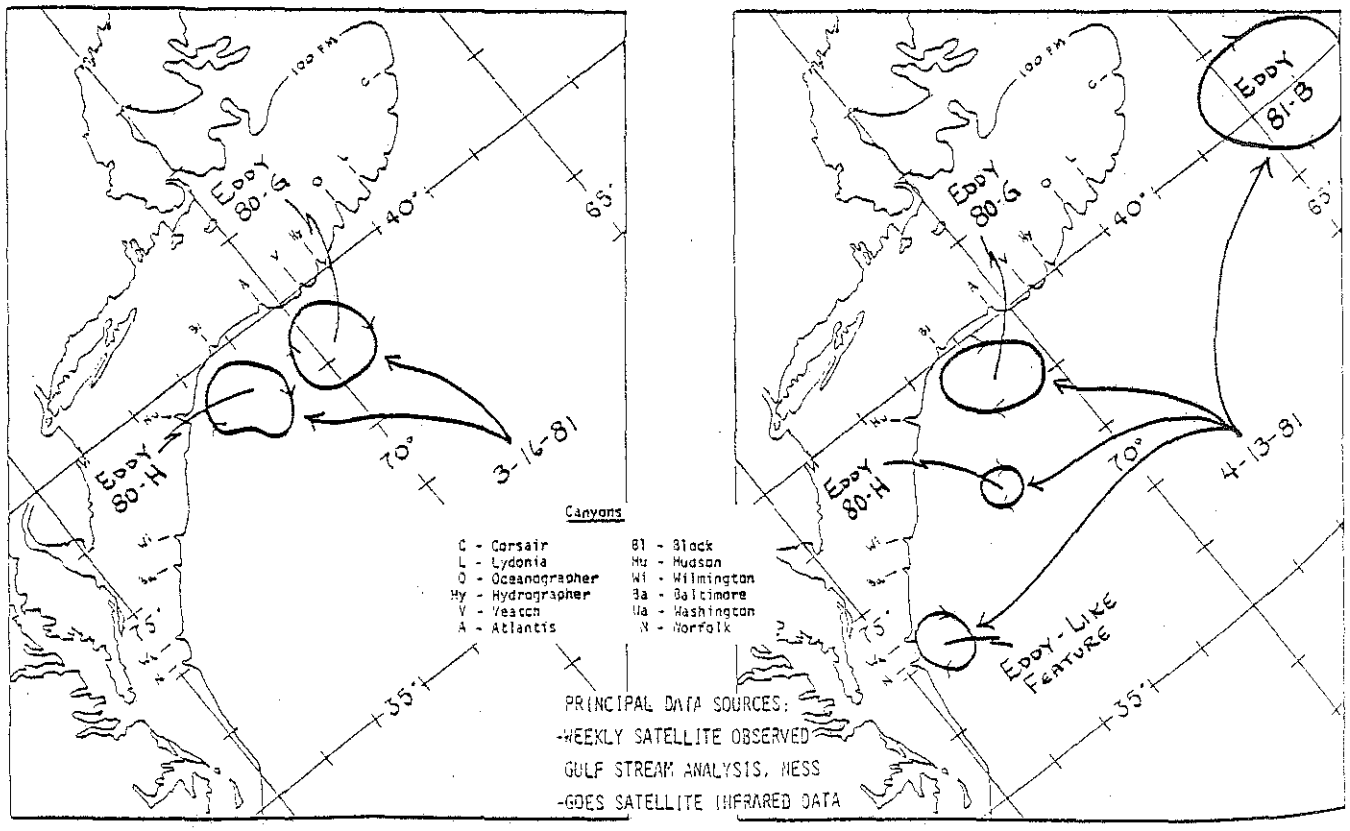
GULF STREAM EDDY LOCATIONS

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

Eddy 80-H moved southwest about 120 km (65 nm) to a center position at 38.2°N, 71.8°W, south of Hudson Canyon and far offshore of the 100-fm line. Eddy 80-G traveled about 103 km (55 nm) to the west and is now centered at 39.4°N, 70.9°W, south of Block Canyon. Eddy 81-B moved into the study area during early April. This eddy is now located at 40.2°N, 64.3°W, southeast of Corsair Canyon and far offshore of the 100-fm line. During early April an eddy-like feature of unknown origin appeared east of Washington Canyon. This warm, anticyclinic feature is centered at 37.1°N, 74.2°W, east of Norfolk Canyon.

During the next 30 days Eddy 80-H may remain far offshore and become resorbed by the Gulf Stream. Eddy 80-G may travel southwest to a center position southeast of Hudson Canyon; Eddy 81-B may move west to a location south of Corsair Canyon. The eddy-like feature may be resorbed by the Gulf Stream east of Cape Hatteras.

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



Largest Gulf Stream Warm-Core Ring

During the last week of April, satellite infrared imagery revealed the largest Gulf Stream warm-core ring ever observed off the Northeast Coast. The ring formed to the southeast of Georges Bank by merger of a large warm-core ring (designated as 81-B) with a large Gulf Stream meander to the west of the ring. Elongated from east to west when first clearly seen on 28 April, the new ring (designated as 81-C) had a greater diameter of over 200 nautical miles and a lesser diameter of about 105 nautical miles. Its northwest margin was closest to Georges Bank, being about 30 nautical miles from the 200-m isobath in the vicinity of Lydonia Canyon. Personnel of the High Seas Corporation in Fall River, Massachusetts, were advised of the presence of the new ring and that it was a potential hazard to their deep-sea red crab gear in the vicinity of Lydonia Canyon. Efforts were undertaken in the company to safeguard this gear. Clouds obscured Ring 81-C in infrared imagery for several days after 28 April. The unusual manner of formation of 81-C suggests that its strength of circulation may not be commensurate with its great size.

Ocean Dumping Task

Satellite-tracked buoy 03021 was retrieved by a fisherman on Great Guana Cay in the Bahamas. The buoy was released at Deepwater Dumpsite 106 on 4 September 1980, was carried south-southwest until 6 October 1980 when it was carried rapidly northeast by the Gulf Stream. It moved out of the Gulf Stream about 16 October, then drifted slowly to the vicinity of Bermuda and traveled southwest towards the Bahamas until 8 April 1980 when the last satellite fix was obtained. The buoy has been shipped to the manufacturer (ORE, Inc.) in Falmouth, Massachusetts, where it will be checked and refurbished for later deployments. The expected turnaround time for this servicing will be about 1 mo.

Detailed processing by WHOI of the positional and sea-surface temperature data from both satellite buoys (03020 and 03021) was completed.

Travel, Meetings, and Presentations

During a visit to the facilities at Narragansett by Soviet scientists from their Atlantic and All-Union Institutes for Fisheries and Oceanology on 29 April, Woody (Dr.) Chamberlin described the character and uses for research of satellite-obtained, remote-sensing products from polar-orbiting and geostationary NOAA satellites.

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