

RG Heron Library

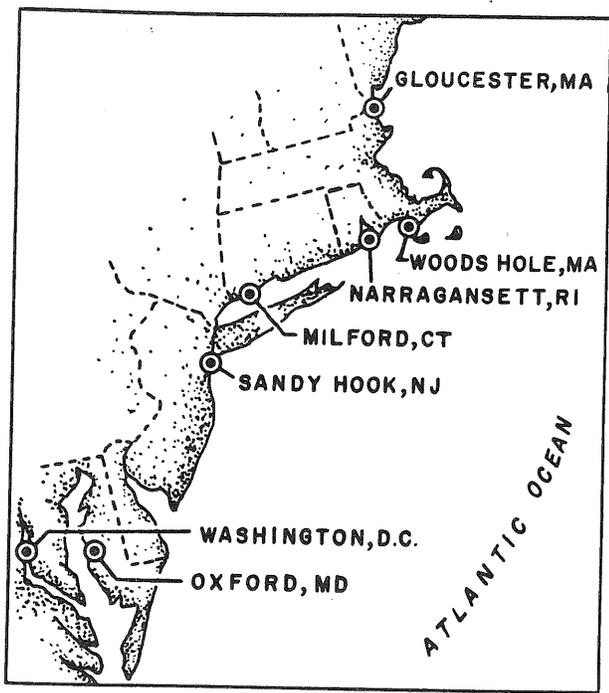
NORTHEAST FISHERIES CENTER
WOODS HOLE, MASS. 02543

NEFC

Northeast Fisheries Center

NEWS

THIS REPORT DOES NOT CONSTITUTE A PUBLICATION AND IS FOR INFORMATION ONLY. ALL DATA ARE PROVISIONAL. FOR MORE INFORMATION WRITE TECHNICAL INFORMATION UNIT, NORTHEAST FISHERIES CENTER, WOODS HOLE, MASSACHUSETTS 02543; OR CALL (617) 548-5123.



MONTHLY NARRATIVE REPORT JUNE 1977

RESOURCE ASSESSMENT DIVISION	1
MARINE ECOSYSTEMS DIVISION	3
RESOURCE UTILIZATION DIVISION	9
ENVIRONMENTAL ASSESSMENT DIVISION	12
AQUACULTURE DIVISION	18
PATHOBIOLOGY DIVISION	21
NATIONAL SYSTEMATICS LABORATORY	23
ATLANTIC ENVIRONMENTAL GROUP	24
MANNED UNDERSEA RESEARCH AND TECHNOLOGY PROGRAM	25
EXTENDED JURISDICTION LIAISON OFFICE	25

LIBRARY
NORTHEAST FISHERIES CENTER
WOODS HOLE, MASS. 02543



U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE



RESOURCE ASSESSMENT DIVISION

Resource Surveys Investigation

A sea scallop survey with Albatross IV (Tom Azarovitz, chief scientist) covering Georges Bank and southern New England was completed on 3 June. One hundred sixty-three randomly selected stations were completed in 11 days. The Fishermen's Report for this survey was completed and mailed. Of special interest is the fact that some small amounts of peat moss were taken in several tows on the eastern part of Georges Bank. Special credit goes to Marion Hubler of the Woods Hole Laboratory maintenance staff who constructed special measuring boards which were used with great success during the scallop survey.

Activities at the Sandy Hook Laboratory have included continued processing of data files for BLM studies, and work by Tom Azarovitz on the MESA New York Bight Atlas Monograph on Fish Distribution. Major activities at the Woods Hole Laboratory have included the routine processing of the spring survey data, and the selecting of stations for the upcoming summer and autumn trawl surveys. Special emphasis at both laboratories has concerned planning for the inshore summer survey which will, for the first time, be conducted from Maine to Cape Hatteras into waters as shoal as 5 fm. Inshore surveys have been conducted since 1972 by the Sandy Hook Laboratory.

James Crossen has been busy assembling and testing equipment to be used in a special hydroacoustics experiment to be conducted in August aboard Albatross IV (John Suomala, MIT Draper Laboratory, chief scientist). Patrick Twohig has continued his work with the automatic data logger aboard Albatross IV.

Recreational Fishery Investigation

The New Jersey creel survey of charter- and party-boats was continued through 11 June. Black sea bass (Centropristis striata) and summer flounder (Paralichthys dentatus) predominated in the catch of fishermen bottom fishing, while bluefish (Pomatomus saltatrix) dominated the catch of fishermen trolling or fishing with chum. Although the New Jersey survey has been discontinued, additional sportfish data are being obtained throughout the Middle Atlantic Bight under a contract with the SEFC. This survey will concentrate on the summer cod fishery of Long Island and on pelagic game fish associated with Atlantic bluefin tuna.

One thousand Atlantic mackerel (Scomber scombrus) have been collected from both commercial and sport catches from Maryland to Rhode Island. To date, 800 specimens have been processed for length, weight, maturity, ovaries, and otoliths. Twenty-five ovaries have been analyzed for intraovarian egg diameter frequencies as part of an investigation of mackerel spawning.

Approximately 5,000 shipboard maturity observations of 17 species have been analyzed for size at maturity and adult spawning parameters.

Age and Growth Investigation

Investigation personnel were involved in the preparation of samples for aging and the routine aging of the following species: haddock, pollock, redfish, silver hake, red hake, yellowtail flounder, summer flounder, blackback flounder, alewives, and sea scallops.

Fisheries Statistics Investigation

Investigation personnel culminated their work with the Fisheries Analysis Investigation assessment assignments by preparing synopsis write-ups for their species involvements. Distribution of the compiled synopses will be through Brad Brown or Vaughn Anthony.

Thurston Burns and Frank Almeida have completed summaries of the international herring tagging program which began last fall. Preliminary results of tag returns indicate a northward movement from the Great South channel area to the coastal waters of Maine around Monhegan Island.

New fisheries statistics being collected and processed include: (1) detailed vessel trip information for the Mid-Atlantic states (hope to be fully operational by January 1978); (2) log records taken by NMFS observers aboard foreign fishing vessels; and (3) the first quarter (1977) vessel statistics for foreign fishing vessels operating under the GIFA agreements.

Bill Callahan has begun collating WHOI-ADP summary statistics to allow for a better estimation procedure to predict run costs, and to provide for optimum turnaround times. Users should check with Bill for minimum core requirements to run different job types with quickest turnaround.

Candy Cain formalized the conclusion of a major NEFC commitment to help establish the NMFS foreign vessel observer program, by transferring the remainder of accumulated supplies and paperwork to the nearby established observer program office at Otis AFB (Cape Cod). Future NEFC involvement will deal largely with the data processing activities related to the log records collected by the observers and will be coordinated with the observer program chief, James Medeiros.

Anne Tibbetts has just returned from a spring semester academic leave at the University of Washington Quantitative Science Center in Seattle and will be looking at the population dynamics of squid for her thesis.

Fisheries Analysis Investigation

Division personnel prepared its annual "Summary of Stock Assessments" (June 1977) (Laboratory Reference No. 77-11); a review of 31 species-stock categories. These were presented to both the New England and Middle Atlantic Regional Fisheries Management Councils and the Statistical and Scientific Committee.

Brad Brown, Emma Henderson, Steve Murawski, and Fred Serchuk prepared a surf clam assessment, "Review of Status of Surf Clam Populations in the Middle Atlantic" (Laboratory Reference No. 77-8).

Fred Serchuk and Steve Clark prepared a review report on mesh selectivity for cod, haddock, and yellowtail flounder.

Vaughn Anthony prepared herring assessments which were presented by Emory Anderson at a meeting of the Statistical and Scientific Committee of the New England Regional Fishery Management Council held at Woods Hole, 21 June.

Meetings, Talks, Visitors, Publicity

Tom Azarovitz and Stuart Wilk from the Sandy Hook Laboratory were in Woods Hole 14-15 June to discuss program activities, particularly the upcoming summer survey.

Malcolm Silverman from the Sandy Hook Laboratory was in Woods Hole 29-30 June to make preliminary preparations for the September trawl mensuration cruise.

Emory Anderson gave a talk on 3 June at the Narragansett Laboratory to a class of NOAA Corps officers concerning survey operations and vessel needs. Emory also attended meetings of the Statistical and Scientific Committee of the New England Fishery Management Council on 21 June in Peabody, Massachusetts, and on 28 June in Woods Hole to review the assessments of the status of the finfish and shellfish stocks and particularly to review various options associated with the herring assessment.

Bryon Noe of Emory University, Atlanta, Georgia, has been obtaining goosefish pancreas samples collected during Albatross IV trawl surveys. He reports that the separate pancreatic islet tissue of the goosefish is employed for studies of the mechanism of insulin, glucagon, and somato-statin biosynthesis.

Gordon Waring, Steve Murawski, and Harold Foster attended the AFS New England Chapter Workshop in Shrewsbury, Massachusetts, on 22 June.

Steve Murawski assisted Brad Brown in the presentation of the surf clam assessment to the Mid-Atlantic Fishery Council on 16 June.

Gene Heyerdahl attended the National Data Management Committee meeting held at the NWFC on 23 June.

Vaughn Anthony attended the third meeting of the Statistical and Scientific Committee of the Mid-Atlantic Fishery Management Council held in Southampton, Long Island, on 13-14 June. He presented a mackerel assessment prepared by Emory Anderson to the committee.

Mike Sissenwine presented a paper entitled "Is MSY an Adequate Foundation for Optimum Yield?" at the National Workshop on Optimum Yield in Fisheries Management held 6-10 June in Houston, Texas. Mike also attended a meeting of the "Hudson River Inter-Agency Technical Review Team" held in New York City on 15-16 June.

Fred Serchuk and Brad Brown attended public meetings sponsored by the New England and Mid-Atlantic Fishery Management Councils to discuss the Surf Clam and Ocean Quahog Fisheries Management Plan. Meetings were held in Norfolk, Virginia; Ocean City, Maryland; Cape May, New Jersey; Asbury Park, New Jersey; Buzzards Bay, Massachusetts; Newport, Rhode Island; and Portsmouth, New Hampshire. Additionally, Brad Brown and Steve Murawski attended a public hearing on the Surf Clam and Ocean Quahog Plan held at Southampton, Long Island, on 16 June.

Several assessment division personnel attended the semiannual workshop of the Southern New England Chapter of the American Fisheries Society held in Shrewsbury, Massachusetts, on 22 June.

MARINE ECOSYSTEMS DIVISION

Larval Physiology Investigation

Measurements of the change in nucleic acid and protein content of winter flounder were completed through metamorphosis and work with scup was begun. Preliminary indications are that scup have a lower RNA/DNA ratio than either cod or winter flounder and have a higher retention of protein at hatching. Preparations were made for the measurement of respiratory electron transport activity and isolation of lipid and nucleic acid from winter flounder for standardization of chemical assays.

Experiments monitoring the influence of plankton prey concentrations of 0.01-3.0 prey organisms per milliliter at 18°C on larval scup growth and survival were completed. Both long-term experiments from the period hatching-to-

metamorphosis to determine growth and several rates, and short-term 1-day experiments to determine daily feeding intensity were conducted. Data analyses of the physical and biological measurements taken during the controlled environmental chamber experiment with winter flounder are nearly complete. A first draft of a manuscript on the comparative growth, respiration, and delayed feeding abilities of larval cod and haddock has been completed.

Oceanography Investigation

Albatross IV Cruise No. 77-04, current meters and hydrography, occupied most of the time of the oceanography group in June. The ship left Woods Hole on Tuesday, 7 June, and returned on Thursday, 16 June. All members of the group were aboard, plus Pat Carter of Ecosystem Dynamics, Kitty Clark of Administration, and Kevin Powers of Manomet Bird Observatory.

The cruise was only moderately successful. More than one-third of the time was lost because of unseasonable bad weather, failure of the ship's gear, and an injury to the Second Officer, Dennis Fox. Three current-meter moorings were set in Northeast Channel as planned, but 2 days of dragging failed to recover the missing mooring from the original array, and there was time for only 27 of a planned array of 60 hydrographic stations. Mr. Fox was injured on 8 June during the setting of the first current meter mooring. His hand was badly cut by the trip line he was holding when the anchor was swung out for launching. The vessel steamed toward Yarmouth, Nova Scotia, and Mr. Fox was transferred by Canadian helicopter to a Yarmouth hospital. He lost part of a finger on his right hand.

Dragging operations to recover the missing mooring were begun when the ship was back on station. Tows were made with two grapnels in line, a scallop dredge with grapnels attached, and an otter trawl with open cod end, but to no avail. The transponder on the mooring was still working well 9 mo afterwards, but the transducer strut that had been fabricated for the ship was bent sideways by the vessel's roll after about 30 hr in the water and had to be jettisoned. Another attempt to recover the mooring will be made with the research submersible Mermaid II in late August.

The dragging was stopped because of bad weather around noon on Friday, 10 June, and on that night the captain decided to head for St. Mary's Bay, Nova Scotia, to seek shelter from a predicted 2-day gale. While in St. Mary's Bay there was an opportunity to try a new technique of setting moorings from the stern, using the gantry to keep instruments and other gear clear of the ship. When the vessel was back on station, late Sunday night, the two other current meter moorings were set in this manner, smoothly and without incident. Electrical failures in the conducting hydro wire prevented use of the STD and several hours were lost trying to correct the problem and then re-rigging the Niskin bottles for direct attachment to the wire. The hydrographic survey began around noon on Monday, 13 June, and came to an end at midnight Wednesday when it was time to head in. Four stations were made in Northeast Channel, five along the axis of Georges Basin, and eighteen in the region of Great South Channel.

The cruise showed that Albatross IV is well suited for current-meter work, now that the proper technique has evolved, but there remain serious questions about her usefulness for STD work in bad weather. Since the cruise most of the work of cleaning up gear and plotting data has been accomplished. Gil Dering and Tim Cain have prepared a package containing the rosette and a full complement of Niskin bottles for loan to NOS for an Ocean Dumping Cruise in the Gulf

of Mexico. Dering has been preparing the AMF releases for the next current-meter cruise in September. Moving into new laboratory and office space has continued, complicated by absence of furniture and telephones.

Bob Pawlowski has prepared the May and June reports on the Ship of Opportunity (SOOP) XBT transects in the Gulf of Maine. The June cruise marked the beginning of the third year of regular monthly coverage. Ron Schlitz and Steve Ramp went to St. George Bay, Nova Scotia, for a week of experiments on ichthyoplankton patchiness in collaboration with scientists from Bedford Institute of Oceanography. Greg Lough of the Recruitment Processes Investigation also took part. Amy Briggs, a NOAA Junior Fellow, arrived in time for the cruise and will stay on through the summer. Ray Cloutier, Northeastern University Co-op student, completed his 6 mo at NEFC. Tom Laughton returned to complete the balance of the year.

Ecosystem Dynamics Investigation

The ecosystem dynamics task group continued work on nutrient-productivity and energy budget studies for Georges Bank. A series of filtered and unfiltered nutrient samples from both mixed and unfiltered Niskin bottles were collected on Albatross IV Cruise No. 77-04. The first batch of these samples was processed at the Marine Biological Laboratory in Woods Hole and subsequent batches will be processed at intervals to determine storage life. Ed Cohen and Pat Carter continued processing and plotting chlorophyll data from previous cruises on Georges Bank, and also assisted Donna Busch with preparations for the productivity sampling on R/V Nogliki.

Ed Cohen and Mike Pennington continued studies related to food consumption of zooplankton and finfish in preparation for the next workshop on the Georges Bank energy budget. Ed Cohen reviewed the literature on zooplankton grazing (particularly the paper by Swartzman and Bentley) and prepared an outline of the ecosystem modeling course he attended this spring at the University of Washington. Pennington reviewed the various models used in estimating daily rations of fish, compared each model to a generalized exponential function for digestion time, and examined the consequences of periodicity of feeding in relation to sampling chronology in estimating daily rations from field studies.

Both Ed Cohen and Mike Pennington worked on various other analytical and statistical problems including larval herring data (for Greg Lough and Dave Potter) and the nutrient comparison experiment.

Recruitment Processes

The recruitment processes task group spent full time preparing for the Larval Herring Workshop which was held from 20-23 June in Poland. Four manuscripts were completed involving age and growth of larval herring based on otoliths, vertical distribution of herring larvae and their food organisms, composition of February zooplankton populations on Georges Bank, and size-frequency distributions of zooplankton (particularly various stages of Pseudocalanus minutus) in 0.165-mm mesh samples. Additional documents were also prepared summarizing status of the larval herring program for 1976 and the current status of sorting and processing the backlog of data for the ICNAF time series 1971-1976. Dr. Lough presented most of these materials and Dr. Grosslein was chairman of the workshop. A report of the workshop including copies of all documents will be distributed in a few weeks.

Plankton Ecology Investigation

US-USSR Joint MARMAP Surveys

In January 1977 representatives of NEFC and AtlantNIRO agreed to conduct joint MARMAP surveys in the northwest Atlantic. The first US-USSR survey of ichthyoplankton, hydrography, and productivity was conducted on the USSR vessel Nogliki, during 22 May-6 June 1977. Ichthyoplankton-zooplankton collections were made at a total of 95 stations in the Gulf of Maine, on Georges Bank, and off southern New England. At all stations standard MARMAP tows were made using 60-cm (0.505-mm and 0.333-mm mesh nets) and 20-cm (0.253-mm and 0.165-mm mesh nets) bongos. At each station an XBT cast was made and salinity samples were taken at surface, 20 m, and 50 m. During daylight a nansen cast was made to sample water at surface, 10, 20, 30, and 50 m for chlorophyll determinations and nutrient analyses. The next joint survey will cover the continental shelf area from Cape Hatteras to western Nova Scotia. The survey will be conducted with the USSR vessel Uibileiniy from mid-July to mid-August.

Plankton Ecology

To determine the feasibility of reducing the number of plankton stations occupied on groundfish surveys a comparison was made of the distribution of larval haddock and Ammodytes and zooplankton displacement volumes based on stratified-random and sectional stations made during a spring survey (Albatross IV Cruise No. 75-3). The sections were drawn at 30' intervals of longitude and stations within 10' either side of a section replotted on the section line. Data from stations at similar latitudes were averaged. The distributions based on the two sampling schemes were similar and the mean abundance values of the same order of magnitude. With 45' interval sections some of the detail in the distribution patterns was lost, but the mean abundance estimates did not change appreciably. Comparisons between the two methods for monitoring seasonal and annual changes in abundance and distribution of ichthyoplankton and zooplankton are continuing for other seasons. Preliminary analyses of the spring data suggests that the number of stations sampled can be reduced by 25-35%.

Plankton Sorting

Processing of the 0.333-mm mesh bongo samples from the spring MARMAP groundfish surveys continued with the completion of Albatross IV Cruise No. 74-4 and Albatross IV Cruise No. 73-3. Tabulations and contours of displacement volumes and dominant species were prepared for the 1974 spring survey.

Two students, Dianne Rankin (Suffolk University) and Andy Squires (University of South Florida) spent 3 days at the Center, receiving intensive training in plankton sampling and laboratory analysis. They are conducting a summer survey of plankton in Cobscook Bay, Maine, a unique system with the extreme tides. Dr. Arthur West of Suffolk University is directing this project which is sponsored by the National Science Foundation.

Preparation continued for the Zooplankton Identification Workshop to be held 15-30 August at the Narragansett Laboratory. Five Polish biologists from the Sorting Center in Szczecin will participate.

Biostatistics

During June ichthyoplankton and zooplankton data were entered from three cruises--Walther Herwig No. 74-1, Belogorsk No. 76-4, and Wieczno No. 76-4. For each cruise master station records, zooplankton logs, net tow data, station summaries, and master files were processed and outputs are available. In addition, the ichthyoplankton for Albatross IV No. 73-9 was coded. Laboratory materials and samples from Albatross IV No. 71-7 and No. 72-9 were crated for shipment to the Plankton Sorting Center in Szczecin.

Analyses were performed on the zooplankton displacement volume data (1971-1975) concentrating on Georges Bank. Nonparametric tests for day/night differences in the displacement volumes within each season (spring and fall) for each of the 5 yr did not reveal any significant difference between the time of day of sampling for the Georges Bank stations. Regression analyses also indicated a strong independence of zooplankton displacement volume to surface temperature and bottom depth for these same samples. Computer programs were evaluated for automated plotting of the displacement volume data.

Computer assistance was provided to Jack Green and Jack Colton in the analysis of R/V Atlantis data from five surveys of Georges Bank in the spring of 1940. This data was used to generate preliminary estimates of secondary production on Georges Bank. The results will be presented at Workshop No. 3 on the Georges Bank Energy Budget to be held 12 July at Narragansett.

Ichthyoplankton Investigation

The final cruise in an intensive series of spring surveys designed to monitor the spawning success of Atlantic mackerel (Scomber scombrus) and yellow-tail flounder (Limanda ferruginea) was conducted during the month in the Middle Atlantic Bight on the Delaware II.

It seems worthy of note that during the series of spring cruises in the bight that we observed more whales, tentatively identified as finbacks (Balaenoptera physalus) than anyone can remember seeing since we initiated plankton surveys in 1965. For example, on 24 June, 15 finbacks were sighted 32-38 mi east of Ocean City, Maryland.

Benthic Dynamics Investigation

Augmentation of the benthic invertebrate data base for the Gulf of Maine-Georges Bank region was continued throughout the month. Updating of the taxonomic entries in the invertebrate data base computer listings has progressed very well. A major task completed this month was a chart illustrating the quantitative geographic distribution of organic carbon in the bottom sediments of the Gulf of Maine-Georges Bank region. This was prepared for use in distributional studies of benthic invertebrates.

Analysis of the Gadiformes data base (1969-1972) is in progress. Tabulation of the data for 15 species of fish, individually, by year, cruise, area, and sex and also with all cruises, areas, and sexes combined has been completed. Information on the average length of fish, for the above tables, is being retrieved from the groundfish survey computer tapes. Analysis of the data to evaluate diet overlap and food resource partitioning has been completed. Stomach-content analysis of juvenile haddock, collected from 1953 to present, is in progress. An abridged account of predator-prey interaction for some

Northwest Atlantic fish and squid has been completed for use by the New England and Middle Atlantic Fishery Management Councils.

Ray Bowman attended a management training course at the Regional Training Center in Boston during the week of 27 June.

Apex Predator Investigation

Chuck Stillwell and Nancy Kohler participated in a cooperative longline cruise aboard the R/V Geronimo during 14-21 June. Objectives of this particular cruise were to tag sharks in the vicinity of Bay Shore, New York, prior to a large sport fishing tournament in that area, and to examine stomachs of longline caught sharks for food habit studies. Results included 166 fish (of which 159 were tagged) caught on 11 longline sets (1,938 hooks). The catch was almost exclusively blue sharks, the exceptions being a giant tuna of 450-500 lb and a small sandbar shark that were tagged and released.

Jack Casey, Chuck Stillwell, Wes Pratt, et al., attended the annual Bay Shore Mako Tournament for 24-26 June. A total of 150 boats participated and all were asked to maintain catch records, to land sharks for our examination, and to tag and release a part of their catches. A total of 1,247 sharks were caught during the 2-day tournament. Of these 300 were tagged and released, 347 were brought to the dock, and 600 were released untagged. All fish brought to the dock were measured, weighed, and the sex recorded. Internal examinations for food and reproductive and age and growth studies were conducted on about 200 specimens. Relatively few stomachs of the sharks examined contained food (23%). Bluefish was the dominant food in mako sharks while blue sharks and other species contained a variety of items including mammal remains (porpoise), small fishes, and garbage.

Five tagged blue sharks were recaptured during the tournament. Most of these were at liberty for less than 2 wk and were recaptured within 50 mi of the tagging site. We have had other tags returned in June, the most interesting from a sandbar shark tagged in Virginia 23 June 1965 and recovered 22 June 1977 in the Gulf of Mexico off Panama City, Florida. This is the longest time at liberty for one of our tagged sharks and is the first to demonstrate movement of this species from the Atlantic into the Gulf.

The interest in shark fishing, shark tournaments, and tagging continues to grow. In part this is due to an unusually high abundance of blue sharks north of Cape Hatteras, but shark fishing is expanding all along the coast. Last year 2,200 sharks were tagged; this year the total should reach 3,500.

Meetings, Talks, Visitors, Publicity

Ray Maurer presented a seminar to the staff on the taxonomic separation of euphausiid species common to the North Atlantic. The Investigation Chiefs of the Marine Ecosystems Division met at the Narragansett Laboratory on 6 June to discuss implementation of the US-USSR Joint MARMAP Program for 1977-1978.

Kenneth Sherman, Donna Busch, and Geoffrey Laurence attended the IYABA meeting at Gloucester, Massachusetts, on 7 June. With Wally Smith, Ken Sherman participated in the 3rd Annual Advisory Committee Meeting of the Polish-US Plankton Sorting Center, Szczecin, Poland, 14-17 June; and a larval herring workshop in Szczecin, 20-23 June. On the return from Poland, Sherman met with Dr. Hampel in Hamburg to discuss plans for joint work with FRG in 1978 and plan the ICES Larval Fish Symposium scheduled for Woods Hole in Spring 1979.

On 29 June he gave a talk on plankton ecology at Cobscook Bay Marine Laboratory to a National Science Foundation workshop for college students. Ken Sherman met with Dick Cooper at Narragansett Laboratory to discuss Ocean Pulse on 8 June and also met the same day with Paul Lefcourt of EPA and Mason Wilson of URI to discuss a workshop on Effects of Hydrocarbon on Ecosystem to be held at Alton Jones Campus 13 and 14 July.

Art Kendall attended the annual meeting of American Society of Ichthyologists and Herpetologists, 20-24 June, Gainesville, Florida, where he presented a paper entitled, "Relationships among American Serranids." Tom McKinney attended a pre-cruise meeting at Woods Hole, Massachusetts, on 6 June to plan for the DWD 106 cruise scheduled for July. Ed Cohen presented several lectures on ecosystem and assessment research at NEFC to students and faculty at Shoals Marine Laboratory (Cornell University and University of New Hampshire) on Appledore Island, Isle of Shoals. Greg Lough and Marv Grosslein also attended a workshop in Szczecin, Poland, 16-24 June, on ICNAF larval herring program. Marv Grosslein attended several meetings in Woods Hole related to work of the Science and Statistical Committee for the New England Fishery Management Council. Greg Lough and Dave Potter participated in a cruise, 27 June-3 July, on a Canadian research vessel in the Gulf of St. Lawrence, to observe methods used in high-speed sampling of mackerel egg patches (a technique to be applied to larval herring patch study).

Jack Casey attended a workshop on swordfish at the SEFC during 7-9 June. The purpose of the workshop was to bring together biologists and others who are studying swordfish in order to brief SEFC personnel who are developing a research plan on swordfish. Included in the 30 or so participants were biologists from Canada, NMFS, Florida, California, and the University of Miami. Also in attendance were representatives of sport and commercial fishing interests. A summary document outlining the major points for consideration in the research plan will be prepared by the SEFC.

During June Carolyn Rogers attended two meetings of the Biological Committee to consider areas of special biological interest in Lease Sale Area #49 (Mid-Atlantic Bight). A series of recommendations are being prepared to present to the USGS area supervisor prior to the exploratory drilling phase. Included are recommendations for: rig positioning based on topography and species distributions; alternatives to surface disposal of mud cuttings; special studies; and resource assessment of all leased areas prior to developmental drilling. She also attended a conference on the US Coastal Belt sponsored by the Center for Ocean Management Studies at URI during 20-21 June. On 22 June Carolyn Rogers, Jerome Prezioso, Loretta Sullivan, and Wes Pratt attended the Southern New England Chapter of the American Fisheries Society Workshop meeting in Shrewsbury, Massachusetts. Wes Pratt presented a paper entitled, "Reproduction in the Blue Shark."

RESOURCE UTILIZATION DIVISION

Resources Development and Improvement - Shellfish

Three experiments were completed on the refrigerated (32-35°F) shelf life of squid (Loligo pealei). Squid were held in chilled seawater, in pens with ice, and in boxes with ice aboard the fishing vessel. After landing, the squid in chilled seawater and in pens were boxed with ice and the squid boxed at sea were re-iced. All the squid were brought to the laboratory within 2 days of capture for evaluation. The squid held in seawater aboard the vessel had a shelf life of 10 days, penned squid 10 days, and boxed squid 9 days.

Resources Development and Improvement - Finfish

To date this month, nearly 1,600 lb of fish have been delivered to two retail stores of a large supermarket chain that is participating in this program. The summer months are historically and notoriously poor for fish sales, yet June deliveries of fish exceeded those of May. It is still too soon to estimate any trend.

Product Safety and Standardization

Work is continuing on a unified USDOC voluntary standard to cover all forms of shrimp except breaded shrimp. Comments received on a proposed unified fillet standard are being resolved. A cooperative study of free drip in fillet blocks with USDOC-inspected plants is underway.

Product Quality and Safety

A variety of hot-smoked silver salmon products containing various concentrations of nitrite and salt, vacuum-packed, and stored at 77°F for 0-21 days were analyzed for 14 volatile N-nitrosamines by using a method demonstrated to be sensitive to 10 ppb. The study has been completed.

A new rubidium glass bead was installed into the Perkin-Elmer 910 GC. A new 12-ft by 2-mm i.d. glass column of 7% carbowax 20M+2% potassium hydroxide on 80/100 mesh high performance Chromosorb-W was conditioned. The sensitivity for 1 g of nitrogen was determined with a solution of pyridine (0.5 g/ml) in acetone. Some of the cold-smoked salmon samples have arrived from the Seattle Laboratory and are in the process of being composited.

Southern New England Fisheries Development Program

Minced whiting supplemented with either 10 or 20% minced quahogs was still acceptable in flavor and texture (as cooked sticks) after 48 wk storage at +5°F, whereas controls (100% minced whiting) were judged unacceptable in both of these attributes following 25 wk storage. The development of formaldehyde, which is to some extent responsible for protein denaturation in gadoid fish during frozen storage, was diminished in the samples containing quahogs.

Organoleptic tests (triangle type) were conducted for the Massachusetts Department of Environmental Quality Engineering to detect the possible presence of hydrocarbons on samples of quahogs taken from seven different stations in the Cape Cod area.

Resources Development and Improvement - Engineering

A large number of improvements were made on the squid-skinning machine that will both improve and simplify its operation.

The newly built minced fish extruder has been received from the machine shop and meets all required specifications. Thomas Connors is consolidating all the control systems - pneumatic, hydraulic, and mechanical - in one water-proof control cabinet with the system actuators mounted on the front panel. Progress is on schedule.

Work on the Primary Fish Sorter, under the guidance of Vern Nulk, is in the final stages of completion. Only the outlet chutes and water spray system have yet to be completed before testing can begin.

Meetings, Talks, Publicity

Kurt Wilhelm and Perry Lane attended "Toward Tomorrow Fair" at the University of Massachusetts in Amherst. Samples of marinated squid and minced whiting salad were served to the public. Approximately 26,000 people attended the 3-day affair.

Members of this group have been asked for information on smoking, drying, and pickling of alewives and red mullet, composition of commercial fish caught on Georges Bank (protest group against oil drilling on Georges), swallowing of stones by codfish sensing approaching foul weather, jellied swordfish detection, and labeling of European plaice, North Pacific arrowtooth flounder, pomfret, and Australian fish allied to the cod family.

John Kaylor and Louis Ronsivalli furnished the New England Fishery Management Council information on fisheries collected under the Joint Master Plan some years ago. The Council was very appreciative because the information may result in considerable saving of time and effort.

John Kaylor and Louis Ronsivalli have furnished an industry group information on the occurrence of methyl mercury in swordfish.

John Ryan participated in a meeting of the NEFC Awards Committee at Woods Hole on 16 June.

Louis Ronsivalli, John Ryan, and Henry McAvoy collaborated to present an integrated program on the technology and marketing of fishery products at a meeting of supermarket and department store personnel and consumers in Marlboro, Massachusetts, on 6 June.

Four public health officials from the Hong Kong government were given a tour of a Gloucester fish-processing plant and of the State Shellfish Depuration plant at Plum Island on 22 June by John Ryan.

Richard Maney attended a course at Rockville, Maryland, on high-resolution gas chromatography using glass capillary columns. The course was sponsored by Hewlett-Packard.

Donald Gadbois attended an open house at Hewlett-Packard's office in Lexington, Massachusetts. Several of their application chemists were present to discuss gas chromatography, liquid chromatography, and GC/MS.

Technical Assistance

R/V Galatea - A breakdown in the hydraulic system put its quahog survey temporarily out of action. With our test equipment we were able to pinpoint the problem and determine how to solve it.

James Ackert, Gorton Corporation - information provided on fishing vessels and economics of specific vessels.

Capt. Don Allan, Hialeah, Florida - plastic lobster pots (collapsible).

Southern Maryland Dredging, Inc. - general fishing methods.

Robert Bruce, Massachusetts DNR - current New England vessel information.

Bruce Barber, NOS - Delaware II information.

Charles Moss, Extension Agent, Texas - clam dredge information.

Manuscripts

Ryan, J., and J. A. Peters. Guidelines for packaging chilled and frozen fish. NMFS Seafood Qual. Inspec. Div. Tech. Notes, Part III, No. 13.

(P)

King, F. J. 1977. Past, present, and future uses of minced fish. Mar. Fish. Rev. 39(4): 1-4. (P)

King, F. J. Food from the sea. In: Daniel N. Lapedes (ed.) Encyclopedia of Food, Agriculture, and Nutrition. McGraw-Hill. New York, NY. (A)

ENVIRONMENTAL ASSESSMENT DIVISION

Behavior of Marine Fishes and Invertebrates Investigation

Mr. Bori Olla, Chief, Behavior Investigation, was invited to present a paper entitled "Comparative aspects of the activity rhythms of tautog, Tautoga onitis, bluefish, Pomatomus saltatrix, and Atlantic mackerel, Scomber scombrus, as related to their life habits" at the meeting of the Fisheries Society of the British Isles at the University of Stirling during the first week in July.

Recent preliminary work (supported by ERDA funding) on the blue crab (Callinectes sapidus) has shown that the animals are capable of detecting low levels of naphthalene. The detection of such perturbations is the first step in attempting to predict whether behavioral activities, such as avoidance, can mitigate pollutant effects.

Preparation of the yearly progress reports for ERDA on "Behavioral Measures of Environmental Stress: Marine Fishes and Invertebrates" is still in progress and should be ready for submission within the next 2 wk.

Biological Oceanography of Stressed Environments Investigation

On Wednesday, 22 June, investigation personnel departed Sandy Hook on an R/V Albatross IV cruise, examining the integrated water column for primary productivity, nutrients, chlorophyll phytoplankton counts, oxygen consumption by the water column, and ichthyoplankton and zooplankton distribution, biomass, and taxonomy over the continental shelf. Particular emphasis will be placed on determining the extent and magnitude of estuarine effects on the biological components and activities (particularly those near the base of the food web for pelagic and demersal fisheries or their larval stages) of this area. Samples for phytoplankton productivity, chlorophyll, and decomposition experiments will be fractionated to determine with which fraction the activity or biomass resides. Phytoplankton samples may also be spiked to better define nutrient limitations. This cruise is particularly important inasmuch as the New York Bight section will occur during the approximate time when last year's massive oxygen depletion episode developed. The low dissolved oxygen resulted in extensive mortalities of shellfish and possibly finfish.

The second phase of the cruise will be conducted over Georges Bank. A similar suite of measurements and stations will be completed over the bank and comparisons will be made between this productive area and the New York Bight system.

Coastal Ecosystems Investigation

Frank Steimle and Dave Radosh led a Delaware II cruise of the New York Bight on 1-5 June 1977 to monitor dissolved oxygen concentrations for detection of possible anoxic problems. XBT casts were made, and surface, 10-m, 30-m, and bottom salinity and dissolved oxygen were determined, at 50 stations. Twenty-four benthic grab samples were also collected to provide a preliminary estimate

of surf clam spatfall and recolonization of last year's oxygen depletion-sulfide area. Frank Steimle was the Chief Scientist of this cruise and overall coordinator of the oxygen depletion monitoring program.

Frank, Dave, Bob Reid, and Ann Frame participated in six shorter cruises (aboard laboratory and Coast Guard vessels) also monitoring oxygen levels in the bight. Frank prepared a report on oxygen values and trends from February through June. Bottom DO declined at a nearly linear rate from an average of 7.6 ml/l in February to 5.6 ml/l in mid-June, for an overall depletion rate of 0.024 ml/l/day. The depletion rate was highest between May and June measurements, but most recent data indicate this rate decreased again in late June. Greatest declines were found at stations within 20 n mi of the New Jersey coast. Preparations are underway for July and August cruises of the Delaware II and smaller vessels in a continuing effort to detect onset and causes of any anoxia-fish kill situations. The July Delaware cruise includes the yearly resampling of the benthic macrofauna of Long Island Sound.

Ann Frame, Martha Halsey, and Tom Wilhelm continued processing of samples from the Block Island Sound benthic census, and from areas of the New York Bight which were anoxic for long periods in summer 1976. Dave Radosh, under a contract with the Bureau of Land Management, began processing benthic samples taken from New Jersey's outer continental shelf (OCS) in 1974. These samples provide a baseline for detection of impacts of oil-related activity in the OCS area. Dave also continued the revision of the MESA Atlas volume on the benthos of the bight (with John Pearce), while Ann worked on descriptions of new polychaete species from the bight and Long Island Sound.

Jan Caracciolo is preparing a report on the impacts of industrial chemical dumping on the benthos of Deepwater Dumpsite 106, for the Marcus Wellenberg Foundation for International Cooperation in Science Symposium on Deep Sea Biology to be held in Sweden in August. Frank Steimle continued to prepare a report on the impact of last year's anoxic problem on the benthos of the New York Bight; this report will be part of the proposed NOAA professional paper on the 1976 anoxic phenomenon. Frank is working with the New Jersey Department of Environmental Protection and New Jersey Marine Science Consortium in advising a graduate student, Kenneth Sass, who is investigating the possible use of intertidal organisms to define the legal mean high tide line in estuaries. Leslie Rogers worked with John Pearce on two International Council for the Exploration of the Sea (ICES) reports, and continued ADP processing of MESA benthic data. Clyde MacKenzie neared completion of two manuscripts, on estuarine shellfish management and on oyster population ecology.

Coastal Monitoring, Assessment, and Prediction Investigation (COMAP)

A spring plankton, neuston, and otter trawl survey of the inshore areas of Cape Cod and Massachusetts Bays was conducted 6-11 June 1977 aboard the MV Spirit of '76. Adverse weather permitted completion of only 11 of the 18 stations normally occupied in this cruise series. Surface water temperature ranged from 11° to 15°C. Larval lobsters were caught in the neuston sampler at 9 of the 11 stations. Trawl catches consisted principally of winter flounder, dogfish, and skates. Fred Lux, Larry Davis, and Warren Handwork participated in the cruise.

Lobster larvae sampling by COMAP personnel at six Buzzards Bay neuston sampling stations in a coordinated state-federal program has continued weekly aboard Phalarope II through May and June. Large numbers of larvae began to appear in early June. The peak was about 20 June. In early June, larval stages I and II predominated in catches; by the end of June stages III and IV were more abundant. No stage V and older lobsters, which are primarily benthic stages, have been caught. The table below summarizes catches for each sampling date this year. It is expected that the pelagic stages will be almost entirely completed by mid-July in the Buzzards Bay area.

Date	Number of Larval Stage				Total
	I	II	III	IV	
4 May 77	-	-	-	-	-
13 May 77	-	-	-	-	-
18 May 77	6	-	-	-	6
23 May 77	81	1	-	-	82
31 May 77	35	48	4	-	87
7 Jun 77	126	80	26	10	242
15 Jun 77	254	292	127	83	756
20 Jun 77	203	598	373	63	1237
27 Jun 77	4	18	116	510	648

Sampling will continue as long as lobster larvae are present.

A draft copy of Disaster Survey Report 77-1, "A Review of NOAA's Response to the Argo Merchant Incident" by Dr. Donald Martineau, was sent to George Kelly on 20 June for review. Comments were incorporated into Director Schoning's response to Dr. Martineau.

In follow-up studies of the Argo Merchant oil spill, 23 frozen samples of fish and invertebrates were selected by Henry Jensen, Jon Nicolas, and George Kelly from collections taken by the Polish R/V Wieczno, 18 February-6 March 1977, and were sent to Dr. William D. MacLeod at the National Analytical Facility, Seattle, for hydrocarbon analysis. Samples of planktonic invertebrates were also sent to Dr. MacLeod by Carolyn Rogers from the Narragansett Laboratory. These studies are coordinated (through Ken Sherman) with John Robinson and Garry Mayer of the MESA New York Bight Project. On the same subject, a request was received from the Exxon Analytical Laboratory, Linden, New Jersey, for samples of fish collected near the site of the Argo Merchant oil spill. Approval to release samples has been given by the Center Director and specimens will be sent off soon.

Chris Atkeson, a summer student aid, reported on duty with COMAP on 20 June and has worked principally with Fred Lux on the Buzzards Bay lobster larvae sampling.

Physiological Effects of Pollutant Stress Investigation

Physioecology

A study of the acute toxicity of four heavy metals, copper, mercury, silver and zinc, added singly to embryos of the American oyster (Crassostrea virginica) in natural seawater at 20°, 25°, and 30°C, was completed. The toxicity of copper-zinc and mercury-silver mixtures to oyster embryos at 25°C was also determined. The toxicity of these metals, added either singly or in combination,

was less at 25°C than at either 20° or 30°C. Antagonistic effects were observed at all temperatures tested with the mercury-silver mixture, and at 20° and 25°C with the copper-zinc mixture. A slightly synergistic effect was noted at 30°C in the copper-zinc mixture. Equitoxic metal concentrations added at different proportions to the test cultures did not significantly alter the efficacy of the mixture, which was that of simple additivity.

Physiological Effects

A series of lobsters was exposed to 3 and 6 ppb of mercury for 30 days. At the end of this test period, they were sampled for analysis of blood sodium, potassium, calcium, and osmolality. A second series of lobsters was exposed to 3 and 6 ppb cadmium for 30 days and then held for 1 wk in low salinity (17 ppt) water to test the effect of both stresses. Again, blood ions and osmolality were measured. Gill-tissue oxygen consumption rates of these lobsters were also measured and found to be elevated about the same amount as would be expected after a cadmium exposure without low salinity stress. Additional tissues were prepared for later biochemical studies. In addition to the lobster studies, work continued on the blood chemistry of mercury-exposed winter flounder.

A series of blue mussels was exposed to 0.01 to 0.1 ppm silver for 30 days followed by a 30-day recovery period in silver-free water. A second group of mussels and a group of American oysters were exposed to silver for 90 days. At the end of both exposure periods, oxygen consumption measurements were made on each animal. This completes a study on the effects of chronic, low-level silver exposure on the metabolism of five bivalve species (Crassostrea virginica, Mercenaria mercenaria, Mytilus edulis, Mya arenaria, and Placopecten magellanicus).

Considerable time was also spent preparing for two "Ocean Pulse" test cruises in July.

Biochemical Effects

Tissues were taken from animals in a variety of experiments, and frozen-stored for future biochemical analysis. Because adductor-muscle (AM) preparations from surf clams (Spisula solidissima) in a low-DO experiment were inactive, Environmental Chemistry's offer of excess bivalves from their three-metal exposure study (46 days, nitrate salts of Cd, Cu, and Ag) was very welcome. Their few remaining Spisula were used to try several extractants with AM; all preparations were very active and we were able to work up assay protocols. Crassostrea virginica and Arctica islandica AM samples were also taken from the Chemistry experiment, for future testing. Teleost brains from the January oil-spill cruise of the Delaware II were analyzed for various enzyme activities, as were gonads from mercury-exposed lobsters. Tissues were also taken from lobsters that had been exposed to cadmium (16 ppb) for 30 days and subsequently held for 7 days in metal-free but low-salinity water (17 ppt). Preparations for the forthcoming DWD 106 cruise, trouble-shooting, travel, and some sick leave delayed analysis and interpretation of the data generated this month.

Anaerobic Bacteriology/Metabolism

Some 21 isolates of anaerobes obtained from platings of bottom sediments from the Advance II cruise were characterized biochemically and by the gram stain.

Sixteen of nineteen were gram (+) rods and presumptively identified as Clostridium perfringens by biochemical tests. Two of the isolates did not grow out on subculture and three were mixed cultures although they contained gram (+) rods. Further characterizations are in progress in regards to toxin type by neutralization tests. The differential and selective medium being evaluated seems to be effective in the isolation and demonstration of the C. perfringens type.

Reprints on Seafoods and Botulism were submitted to two requesters as well as some background information on smoked fish processing (cold) to a New Jersey smoker. It would seem that the most recent outbreak of botulism (largest recorded in the United States, due to home canned peppers served in a restaurant) has rekindled some concern in this area.

Meetings, Talks, Visitors, Publicity

During the past month several meetings were attended by division personnel. Dr. James Thomas participated in the NOS course organized by Ken Sherman and held at the Narragansett Laboratory on Friday, 3 June. On the same day, Dr. Pearce and George Kelly participated in a regional planning meeting with personnel attached to the Regional Environmental Assessment Branch (Marvin Boussu and Ruth Rehfus) and the Narragansett Laboratory (Carolyn Rogers). The principal purpose of the meeting was to discuss inshore Ocean Pulse and how Pulse activities in general relate to the habitat protection goal of the National Fisheries Plan. A follow-up meeting is scheduled for 22 July in Gloucester; at this meeting plans for specific studies will be addressed.

On 6 June, division personnel including Anthony Calabrese, Frederick Thurberg, John Pearce, Margaret Dawson, Edith Gould, and George Kelly, as well as personnel from other divisions who are to participate in the DWD 106/Ocean Pulse operation, met in Woods Hole to review the cruise plan and to discuss general operations. The participants also visited the R/V Albatross IV in order to plan better for experimental facilities and setups.

Frederick Thurberg attended a Center IYABA meeting in Gloucester on 7 June.

On 11 June, Bob Reid attended the Eighth Conference on Long Island Sound at Stony Brook, New York, and presented a poster display of NEFC's benthic studies at New London, Connecticut, and throughout Long Island Sound.

George Kelly (representing Woods Hole Laboratory) and Edith Gould (representing Milford Laboratory) attended the NEFC Awards Committee meeting on 16 June at Woods Hole. Under the temporary chairmanship of Jack Casey, the committee addressed a full slate of recommendations for cash awards and Quality Step Increases related to a substantial number of outstanding ratings that had been generated recently. After a full day of intensive discussions and debates on the consistencies and disparities that appear to prevail in the present Center Awards Program and Performance Rating System, the committee felt that some progress had been made in establishing guidelines to aid supervisors in their recommendations, and the Awards Committee in reviewing such recommendations. This task will be addressed further at a future meeting and the committee's proposals will be reported to the Center Director.

Bruce Torbett of the R. S. Friedman Cobscook Bay Laboratory in Dennysville, Maine, visited Milford Laboratory on 20 June to learn various fish hematological techniques.

On 23 June, personnel attached to the Environmental Assessment Division including Anthony Calabrese, Frederick Thurberg, Frank Steimle and other divisions involved in Ocean Pulse met at Sandy Hook Laboratory to develop a budget for Ocean Pulse for FY 1979. The results of the budget meeting are being provided as an advisory to the Center Directorate.

Dr. John Pearce participated in a cruise of the NOAA R/V Researcher on 25 June. Delegates to the United Nations Law of the Sea Conference, including former Commerce Secretary Elliot Richardson, were aboard for the cruise. The cruise occurred principally in the New York Bight and was designed to demonstrate to the delegates the various equipment and activities involved with assessing the impact of ocean dumping.

Anthony Calabrese was program chairman for this year's National Shellfisheries Association meeting held 26-29 June in Hunt Valley, Maryland.

On 27 June, Dr. Richard Cooper and Joseph Uzmans of the Center MURT program, visited Sandy Hook to meet with Dr. Pearce, Robert Reid, and Clyde MacKenzie in regard to upcoming diving activities aimed at assessing the impact of last summer's fish kill on shellfish and benthic populations. Also discussed was the probable role of the MURT program in Ocean Pulse.

Fred Lux, as NEFC Fishery Development Coordinator, attended a meeting of the New England Fishery Development Program task force in Boston on 28 June.

Members of the Physiological Effects of Pollutant Stress Investigation attended the symposium, "The State of Marine Environmental Research," as part of the Marine Education Week (URI) and dedication ceremony of the recent \$4M addition to the EPA Laboratory, Narragansett, Rhode Island. The key speaker was Dr. E. Odum, who spoke on the total ecosystem approach to a proper understanding of the environment. Of interest was his statement on the need for studies in anaerobic bacteriology for a more complete understanding of the marine ecosystem. Dr. E. D. Goldberg of the Scripps Institute spoke on "Prehistoric and Polluted Seawater." His talk dealt mostly with natural marine toxicants and, in particular, the halocarbons (see the May issue of Environmental Science and Technology). Most papers of the program related to the studies of the EPA Laboratory which are summarized in their annual report.

Manuscripts

Calabrese, A., F. P. Thurberg, and E. Gould. 1977. Effects of cadmium, mercury and silver on marine animals. *Mar. Fish. Rev.* (P).

Calabrese, A., J. R. MacInnes, D. A. Nelson, and J. E. Miller. 1977. Survival and growth of bivalve larvae under heavy-metal stress. *Mar. Biol.* 41(2). (P).

MacInnes, J. R., F. P. Thurberg, R. A. Greig, and E. Gould. 1977. Long-term cadmium stress in the cunner, Tautoglabrus adspersus. *Fish. Bull.* 75(1):199-203. (P).

Pearson, W. H., and B. L. Olla. Chemoreception in the blue crab, Callinectes sapidus. *Biol. Bull.* (A).

Phoel, W. C. The history, physics and physiology of saturation diving. Sea Frontiers, Spec. Vol. (A).

Tucker, R. K. Effects of in vivo cadmium exposure on gill Na⁺, K⁺ ATPase from the lobster Homarus americanus. J. Fish. Res. Bd. Can. (S).

Tucker, R. K. Free amino acids in developing larvae of the stone crab, Menippe mercenaria. Comp. Bioch. and Physiol. (S).

AQUACULTURE DIVISION

Aspects of Nutritional Requirements of Molluscs

The mass culture production of algal foods has been proceeding well under the management of our new work-study student Gail Saunders of Lincoln University. Miss Saunders has also trained a more recent student, Vernon Lunt of Connecticut College, in the procedure used in mass culture. This month's requests for algal foods from the various investigations at the Milford Laboratory were filled as follows: Genetics - 1,110 liters, Rearing - 989 liters, and Pathobiology - 5 liters.

Algal strains in our stock culture collection were subcultured on schedule. In addition, we are now exploring the possibility of culturing strains on large circular sheets of filter paper rather than small discs as was done in the past (Ukeles and Bishop 1976). An unusual colony formation was observed in one of our diatom cultures. We are conducting experiments in an artificial seawater medium to determine if the formation of the hollow-ball-type colony that we observed can be associated with any particular ionic configuration in the medium. Results thus far appear to implicate calcium as being the colony inducer.

The microscopic counting and measuring of oyster larvae from several experiments were completed. The experiments were designed to elucidate the cause of our previous problems in our efforts to culture larvae under 'very clean' and defined conditions. We have identified the poor growth obtained in previous experiments with three principal factors. These were: (1) the nature of the culture container--our data conclusively demonstrated that larvae suspended in Pyrex glass beakers have a rate of growth very much slower than that obtained with larvae suspended in Polypropylene beakers; (2) steam sterilization of seawater--whereas this treatment does not affect development or cause mortality, growth rate is inhibited; and (3) one of the antibiotics in the antibiotic mix we used to treat the larvae in order to eliminate bacteria from the culture is responsible for inhibiting the rate of growth. We regard all these data to be reliable.

Genetics

Mass Selection

Work is continuing on dividing the 1976 year-class animals into fast growth, slow growth, and random lines. Selection criterion is total shell surface area. The 1976 year class consists of 10 spat groups, each group having been spawned on the same day. Each spat group is selected separately to minimize environmental bias between groups and to avoid inbreeding in the next generation. For example, high line animals of Group 5 will be crossed with high line animals of the remaining nine groups. Three of the spat groups have been completely counted, measured, and selected. Work is underway on a fourth group.

Hybridization

Setting-stage larvae have been obtained from another more recent interspecific polycross between the American oyster (Crassostrea virginica) and the Japanese and Pacific Coast oyster (C. gigas). C. gigas adults continue to spawn even after 6 mo in our holding tank, though obviously not as well as when they first arrived.

Oyster larvae from some of the crosses made for the breeding part of the X-irradiated sperm experiment have reached the setting stage. Samples for cytogenetic study to determine if development were parthenogenetic are just being examined. Doses of 20,000r, 100,000r, and 225,000r were delivered to oyster sperm at X-ray facilities of the VA Hospital in West Haven.

Temperature stress experiments utilizing geographic and interspecific hybrid larvae were initiated. Preliminary analyses indicated that both hybrid groups did not survive quite as well as local C. virginica controls under the particular conditions tested.

Inbreeding

Oyster spat have been obtained from about one-half of the 35 crosses made in the past few months to establish inbreeding lines. A total of 111 single crosses have been made to date in attempts to establish full-sib lines. Surviving lines will be crossed beginning next year in efforts to obtain hybrid vigor while preserving uniformity.

Heritability

Three separate heritability studies are underway. All three groups have produced spat. Larval measurements for all three studies have been collected (at ages 7, 14, 21, and 28 days). Juvenile measurements at 6-wk post-setting have also been collected for all three studies, and measurements at 12-wk post-setting have been collected for one study. The other two groups have not yet reached 12-wk post-setting. In all cases, 100 individuals from each half-sib family were measured to produce the necessary data. It has not been feasible to start processing the data for these studies yet.

Family Selection

Eight full-sib families have been spawned for this project. Four families have produced abundant spat, two families are still in the larval stage. It is hoped that ultimately these families will be used to select for traits that cannot be measured on a live animal, e.g., meat weight.

Reversible Inhibition of Fertilization

Experiments on fertilization inhibition in Crassostrea virginica, which had been discontinued a few years ago, have been started again. The practical significance of fertilization inhibition to control breeding in oyster genetics is the prevention of conspecific crossing or crossing within a particular group for which there is usually preferential fertilization, particularly in mass spawning for crossbreeding or hybridization. Concentrations of EDTA ranging from 0.05% to 0.1% were tested. It appears that of the concentrations tested thus far, 0.02% produced the desired result; that is, fertilization was inhibited, but after washing of the eggs, "refertilization" occurred. Some

lower doses that were tested did not inhibit fertilization, while some of the higher ones inhibited fertilization but were not reversible, that is, did not allow "refertilization." Cytology samples have to be examined to ascertain what occurred at the cytogenetic level. Further experimentation will be conducted to confirm the results of this first test and also to determine spawnability of adults in EDTA seawater.

Miscellaneous Work

As the 1977 year-class animals reach 5 mm in length, they are being moved to the outdoor tank farm. An ultraviolet light system has been attached to one outdoor tank in order to prevent wild spat from setting on top of young experimental animals. Trays to hold the older oysters, now mostly in single form, are in the process of being built. Routine care, feeding, and cleaning of animals continues.

Spawning and Rearing of Molluscs

Biweekly measurements of surf clams (Spisula solidissima) in our tank farm system indicated rapid growth during June. Results indicate that although the percent growth in length dramatically decreases as the initial size increases, the overall increase in biomass is nearly equal. This suggests that in managing a growout raceway, biomass may be a suitable gauge of the capacity of a system over a range of initial length measurements.

A larval feeding experiment with the surf clam has shown that utilization of algae is greater at 20° and 22°C than at 25° and 28°C. Cultures maintained at these four temperatures were measured fluorometrically and the net decrease in fluorescence was recorded. Control buckets containing no larvae showed no significant decrease in fluorescence over a 24-hr period. Experiments are planned to carry this monitoring through the entire larval period so that growth may be related to food utilization.

A single spawning of bay scallops (Argopecten irradians) in early June has resulted in the production of more than three million juvenile scallops. The majority of the larvae from this population were reared in a 400-l conical tank and became attached to the walls of the container as they metamorphosed.

We are still finding that some water treatment is necessary in order to grow bay scallop larvae successfully to metamorphosis. The larvae can be grown in water treated with 25 ppm Neomycin or in UV-treated, carbon-filtered water but total mortalities occur by day 8 in untreated cultures.

Tests are underway to determine appropriate conditions for growing small scallops (~1 mm) to a size suitable for planting in our outdoor raceways. In these experiments we are measuring the growth and algal consumption of scallops at a single stocking density with various water flow rates.

Trips, Visitors, and Services

Mr. E. Rhodes attended the joint convention of the Shellfish Institute of North America and the National Shellfisheries Association and presented a paper entitled "The use of pumped raceway systems for the intermediate growout of hatchery-reared bivalves."

Mr. Steven Tettlebach, University of Washington, has started preparations for a master's thesis problem during the next academic year in the Spawning and Rearing of Molluscs Investigation.

Erik and Marsella Baqueiro, University of Mexico, spent several days with the latter investigation becoming familiar with bivalve culture methods. Denez L'Hostis, INRA, France, a food industry economist, spent a day discussing the bay scallop and surf clam culture potential.

Dr. Uhlig of the Helgolander Laboratories visited with Dr. Ukeles and discussed aspects of 'food chain' studies. He was very interested in the design and operation of the mass culture facilities and was considering some potential applications for the new Helgolander facility.

Requests for strains from our culture collection were received from Mr. R. Connell, Jr., of a New Jersey hatchery and from Mr. S. Kraul of a molluscan hatchery in Hawaii.

PATHOBIOLOGY DIVISION

Disease and Environmental Stress Investigation

Caging experiments with winter flounder are continuing. Winter flounder placed at the sludge and control sites were retrieved on 23 May 1977 after an exposure of 10 days. Gross examination on the day of retrieval revealed no differences between the two groups of fish. Except for fraying and hemorrhaging of the caudal fins of fishes from both areas, they appeared normal. The fish retrieved from the cages are being used in infection and progression studies at the Sandy Hook Laboratory. Cages with winter flounder were returned to the exposure sites on 23 June 1977 and will be retrieved in 10 days. Olfactory tissues from Great Bay, New Jersey, winter flounder have been prepared for histopathologic examination. These tissues are required to adequately evaluate the nodular hyperplasia observed in some yellowtail flounder collected on the December Delaware II "Argo Merchant" cruise. It will be necessary to obtain additional yellowtail flounder before a final evaluation of this observation can be made. Fin tissues from Great Bay winter flounder were prepared for examination by electron microscopy. These tissues are essential in evaluating early fin lesions observed in winter flounder from the New York Bight. A group of cadmium-exposed striped bass have been followed over an 8-wk period for phagocyte chemotaxis, changes in blood leukocytes, and serum antibody. Similar analyses are being conducted on a second group of fish immunized 6 wk after cadmium exposure. Plans are being made to evaluate the serologic cross reactivity of the ulcer-disease bacterium isolated from summer flounder. Dr. Evelyn Sawyer at the University of Maine will compare the organism to a number of Vibrio species isolated from diseased fish in the New England area.

Comparative Pathobiology Investigation

Diagnostic services (mollusks) were provided to six organizations during the month. Two of the samples examined were pre-transplantation examination of oysters and surf clams intended for introduction to the State of Hawaii. The remaining four samples were examined for the Campbell Soup Company, Virginia Institute of Marine Science, the State of Delaware, and the Department of State (Korean oysters). For the second consecutive month, samples of Korean oysters were infected with Minchinia sp. (4%). Egg parasites were also noted in 6% of these oysters. Work on a manuscript reviewing the viruses of marine invertebrates continues. Emphasis is being placed on developing practical diagnostic methods based on morphologic criteria. Assistance was provided to a shedding tank operator who had been experiencing up to 50% mortality in pre-molt blue crabs. On 22 and 23 June 1977 the facility was visited and crabs obtained for laboratory study. No specific cause of the mortality was evident by inspection of the facility or cursory examination of the crabs. It was suggested to the operator that he stop using crabs in early pre-molt stages since such crabs are subjected to stresses for a longer time and preexisting disease would be exacerbated. During the month over 900 slides were prepared from a variety of fishes, crustaceans, and mollusks.

Aquaculture Diseases of Larval Mollusks Investigation

During June, studies on the effectiveness of the Aquafine UV unit continued. Two more pathogens, a vibrio and a pseudomonad, have been used to determine whether the unit could sterilize seawater in which the bacteria were present. Three separate tests have shown that the unit, with a seawater flow rate of 4 l/min, could sterilize seawater containing up to 3.0×10^6 cells of the vibrio. To date only two tests have been performed using the pseudomonad; the plates yet have not been counted. Data collected suggest that fertilized oyster eggs develop abnormally when exposed to seawater which has passed through the Aquafine UV unit slowly. This effect, however, is not apparent if there is a delay before exposure. In one experiment, development had proceeded to the 16-cell stage before the embryos were exposed further; development was normal. An attempt to rear fertilized oyster eggs to the setting stage in UV-treated seawater has been successful. A study is underway to determine if it is beneficial to seed UV-treated seawater with a non-pathogenic bacterial culture before adding fertilized oyster eggs.

Meetings, Talks, Visitors, Publicity

Dr. Aaron Rosenfield visited with representatives of the Society for Invertebrate Pathology permanent program committee on 1 June 1977 to complete program scheduling and printing of abstracts for the SIP meeting in East Lansing, Michigan. Dr. Rosenfield participated in an EPA Chesapeake Bay planning study at Solomons, Maryland, on 2 June. Mr. John Dyer, Office of Management and Budget, and representatives from NOAA's Office of Marine Resources visited the Oxford Laboratory on 7 June; the Ocean Pulse Program and other Center programs were briefly discussed, and informal discussions were also held on the Oxford Laboratory's research programs. Dr. Rosenfield visited the Regional Office in Gloucester on 10 June to discuss personnel matters at the Oxford Laboratory. He visited the University of Maryland Center for Environmental and Estuarine Studies at Solomons on 16 June to discuss mutually beneficial disease research and to present an evening seminar entitled "Infectious and Noninfectious Diseases of Marine Animals." Dr. Rosenfield and Mr. Austin Farley visited the Sandy Hook Laboratory on 23 June for purposes of discussing plans for personnel and budget requirements for FY 79 under the Ocean Pulse Program. On the evening of 24 June Dr. Rosenfield met with members of the Maryland Department of Natural Resources to discuss oyster recruitment problems in Chesapeake Bay. He attended the National Shellfisheries Association executive board meeting on 26 June at Hunt Valley, Maryland, and the Shellfish Sanitation Workshop on 28-29 June at Hunt Valley.

Three laboratory staff members, Dr. Robert Murchelano, Dr. Phyllis Johnson, and Mr. Austin Farley, presented lectures at the University of Pennsylvania/Cornell University-sponsored "Aquavet" course at the Marine Biological Laboratory, Woods Hole, during the month of June.

Mr. Farley and Mr. Martin Newman attended a planning meeting at Woods Hole on 5 June for studies at DWD 106.

Dr. Joel Bodammer attended a meeting of the IYABA group at Gloucester on 6-8 June.

Dr. Thomas Sawyer and Ms. Sharon McLean attended the Fifth International Congress of Protozoology in New York from 27 June to 1 July.

Dr. Walter Blogoslawski completed a 3-wk training assignment in the Washington Office.

Visitors to the laboratory during June included Dr. Larry Graves, Department of Pathobiology, Johns Hopkins University, Baltimore, Maryland; Mr. James Applegate and a class of 15 wildlife management students were presented lectures and given a tour of the laboratory; Dr. Anthony Enderbitzen and Mr. William Goldsborough from MAR Company discussed potential contracts with Dr. Rosenfield; and Ms. Linda Ferraro and Mr. Rick Smitherman, students from the University of Pennsylvania/Cornell-sponsored "Aquavet" course, are engaged in a cooperative 2-mo study at the Oxford Laboratory.

Manuscripts

Sawyer, T. K., G. S. Visvesvara, and B. A. Harke. 1977. Pathogenic amoebas from brackish and ocean sediments, with a description of Acanthamoeba hatchetti n. sp. Science 196: 1324-1325. (P).

NATIONAL SYSTEMATICS LABORATORY

Pelagic Fishes

Completed the description of a previously unrecognized species of Spanish mackerel from Brazil.

Benthic Fishes

Completed a guide to the identification of the genera of ophidiiform fishes.

Penaeoid Shrimps

Studied the taxonomy of the Amphi-Atlantic species Penaeopsis serrata.

Guide to the Temperate Water Decapod Crustaceans of the U.S. East Coast

Continued work is in progress.

Editing

A 3-yr term of office as Scientific Editor of NMFS was completed by Dr. Bruce Collette. He is succeeded by Dr. Jay Quast of the NWFC, Auke Bay Laboratory.

Meetings, Talks, Visitors, Publicity

The annual meeting of the American Society of Ichthyologists and Herpetologists was attended in Gainesville, Florida, by Daniel Cohen who presented a paper entitled, "A Tentative Classification of Ophidiiform Fishes," and by Bruce Collette who presented two papers, "Revision of the Spanish Mackerel (Scomberomorus)" and "Revision of the Scaly Toadfishes of the Genus Batrachoides."

Among visitors was E. H. Ahlstrom of the SEFC, who studied anatomical preparations of fishes for a week, and Dr. A. Rojo of St. Mary's University, Halifax, who discussed anatomical techniques.

Manuscripts

Cohen, D. M., and J. G. Nielsen. Guide to the identification of genera of the fish order Ophidiiformes with a tentative classification of the order. NOAA Tech. Rep. NMFS Circ. (S).

Collette, B., and J. Russo. A new species of Spanish mackerel from the western Atlantic. Fish. Bull. (S).

Pérez Farfante, I. 1977. American solenocerid shrimps of the genera Hymenopenaeus, Haliporoides, Pleoticus, Hadropenaeus new genus, and Mesopenaeus new genus. Fish. Bull. 75: 261-346. (P).

Pérez Farfante, I. 1977. Penaeopsis eduardoi, a new species of shrimp (Crustacea: Penaeidae) from the Indo-West Pacific. Proc. Biol. Soc. Wash. 90: 172-182. (P).

ATLANTIC ENVIRONMENTAL GROUP

Ocean Monitoring and Climatology Task Group

In response to reports of below normal concentrations of dissolved oxygen in the bottom waters off New Jersey, climatological and oceanographic data were compiled to consider the cause of this condition. Indications are that record warming during the spring, and record river discharge for the month of March led to the conditions observed in late May and during June of this year. A forecast was developed that repetition of the severe anoxic condition of last summer would not develop this year, unless summer-type weather persists into the fall months. Reference should be made to the report of the Sandy Hook Laboratory for description of the oxygen conditions observed this year.

Because of the concentration of warm-core Gulf Stream rings off the New England and Middle Atlantic shelf this spring, efforts have been made to obtain opportunistic XBT sections in these features, and especially in areas where the rings are removing water from the shelf by entrainment. Such observations were made from the R/V Endeavor (University of Rhode Island), R/V Oceanus (WHOI), Coast Guard Cutter Hamilton (while on offshore fishery patrol), and R/V Delaware (NEFC, Sandy Hook Laboratory).

Steve Cook will participate with U.S. NavOceanO in a 9-day cruise in the warm rings aboard the R/V Lynch in early July. He is providing XBTs, and through cooperation of the MARMAP Field Group and Narragansett Laboratory, a continuous plankton recorder, Bongo plankton net, and a parachute drogue.

Ocean Dumping Task Group

Mert Ingham and Jim Bisagni attended a pre-cruise meeting at WHOI, on 6 June, for the July 1977 cruise effort to Deepwater Dumpsite 106 aboard the Albatross IV. Preparation of equipment for the cruise has been underway. One complete STD system is operational, while a second system is still being tested. Rosette sampler units have been tested and found to be operational also. Three water-current drogues along with the associated surface floats have been completed. Other water testing equipment such as the Winkler dissolved oxygen measuring system and the Turner nephelometer system have undergone refurbishing and extensive testing and calibration procedures using DuPont Edgemoor waste-seawater solutions. A 12 KHz Benthos pinger has also been readied for the cruise. One or two XBT systems and XBT probes are also available to complete subsurface temperature measurements.

This month's monitoring transects from New York to Deepwater Dumpsite 106 were completed 10 June by the USCG Tamaroa and 24 June by the Red Star tug Crusader. The Hardy continuous plankton recorder from the Tamaroa was not successful. The XBT transects from both cruises, however, were completed. These data are presently being portrayed and analyzed.

Meetings, Talks, Visitors, Publicity

Dr. Douglas McLain of the Pacific Environmental Group spent several days at AEG during the second week of June. He conferred with various members of AEG regarding environmental data processing and analysis and improvement of coordination of efforts between the two groups.

Mert Ingham attended a conference of NMFS personnel regarding the Status of Environment report held in Washington, D.C.

Reed Armstrong attended a planning session at the SEFC Galveston Laboratory for principal investigators in this year's studies of a developed offshore oil field (Buccaneer Field Studies). He described AEG's project on dispersion and transport of potential contaminants.

Participants in the Newport to Bermuda yacht race visited AEG to obtain the latest satellite information on surface currents and fronts for navigational purposes.

Manuscripts

Armstrong, R. S. 1977. Climatic conditions related to the occurrence of anoxia in the waters off New Jersey during the summer of 1976. In: Compiled reports of workshops on the New Jersey fish kill. (A).

Cook, S. K., and K. A. Hausknecht. 1977. Expendable bathythermograph observations from the NMFS/MARAD ship-of-opportunity program for 1974. NOAA Tech. Rep. SSRF 709. (P).

Ingham, M. C., S. K. Cook, and K. A. Hausknecht. 1977. Oxycline characteristics and skipjack tuna distribution in the southeastern tropical Atlantic. Fish. Bull. 75(4). (A).

MANNED UNDERSEA RESEARCH AND TECHNOLOGY PROGRAM

Major emphasis during June was variously dedicated to short-term and long-term program planning and budgeting, analysis of accumulated data, and preparation of a manuscript on ghost lobster pots.

Manuscripts

Uzmann, J. R., R. A. Cooper, R. B. Theroux, and R. L. Wigley. 1977. Synoptic comparison of three sampling techniques for estimating abundance and distribution of selected megafauna: Submersible vs. Camera sled vs. Otter trawl. Mar. Fish. Rev. (A).

EXTENDED JURISDICTION LIAISON OFFICE

The Mid-Atlantic Fishery Management Council held a 3-day meeting and conducted a public hearing in June to receive public comments on a Draft Fishery Management Plan for surf clams and ocean quahogs. The June meeting of the New England Council was held in late May and reported in the May "NEFC News." In addition to Ed Bowman, who attended the 3-day session of the Mid-Atlantic meeting, R. L. Edwards attended on 15 June and briefed the group on the NEFC's programs and priorities. B. E. Brown attended on 16-17 June and reviewed certain biological considerations, stock evaluations, and historical survey indices for surf clams and ocean quahogs.

Both the Mid-Atlantic and New England Councils are currently engaged in the collection and analysis of data regarding their respective priority species as the basis for establishing management objectives. Other subjects of concern and discussion were: the effectiveness of the NMFS observer program; the US-Canadian boundary question; the status of an American-Canadian bilateral agreement; and the definition of optimum yield.

The Extended Jurisdiction Liaison Office continued to respond to specific requests by Council staffs for information, reports, and documents, as well as preparing meeting reports which are routinely distributed to the NEFC Laboratory Directors.