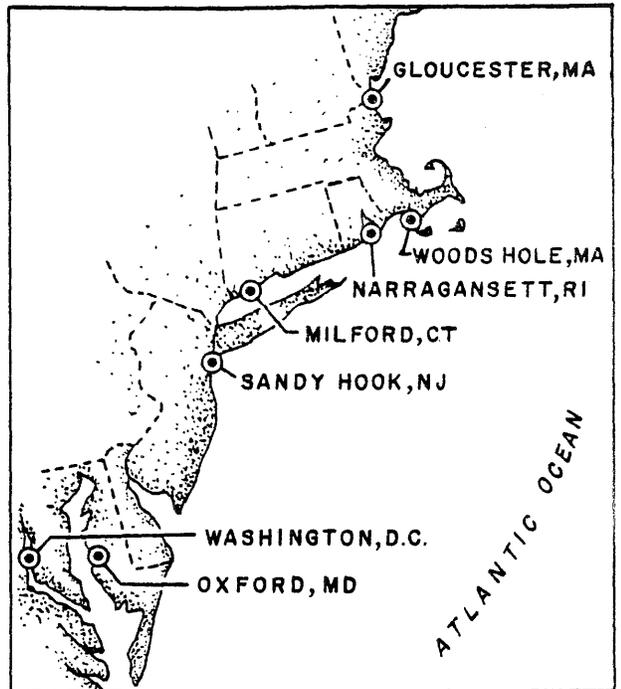


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NEWS

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



RESOURCE ASSESSMENT DIVISION

Resource Surveys Investigation

The Delaware II departed the Sandy Hook Laboratory on 27 July (Charles Byrne, Chief Scientist) to begin the first leg of a new summer bottom trawl survey series. This cruise, initiated with cooperation of the coastal states, will emphasize data collections for assessment and biological studies of recreationally important fishes occurring from the Gulf of Maine to Cape Hatteras. The standard No. 36 Yankee otter trawl, the one used in the autumn surveys, is the gear that is being used for this summer survey. Albatross IV will do the northern portion of the survey in August.

Processing of the spring 1977 surveys by Delaware II, Albatross IV, Görlitz (GDR), Anton Dohrn (FRG), and Wieczno (Poland) has been completed and the data are now available on computer tape. The results from the May-June 1977 scallop survey by Albatross IV have been processed and will soon be available on computer tape.

Warren Handwork has been assembling various types of gear for upcoming cruises, including a bottom trawl, a mid-water trawl, and gill nets. A third-wire monitoring package for the mid-water trawl was assembled and made operational utilizing the components of the trawl mensuration system. James Crossen continued his work with John Suomala (C. S. Draper Laboratory, MIT, Cambridge, Massachusetts) testing and assembling equipment for an August hydroacoustics cruise.

Recreational Fishery Investigation

This investigation participated in the planning of a three-part fisheries trawl survey to begin July 25. This cruise will provide valuable information to improve techniques for assessing the availability of summer sportfish stocks in the Middle Atlantic Bight using bottom and mid-water trawls inshore of the 30-fm contour.

Processing of data collected during the 2-yr New Jersey creel survey of charter- and party-boats continued during the month. All of the data have now been coded and keypunched.

The investigation of mackerel spawning and fecundity continued. To date, 1,016 Atlantic mackerel, Scomber scombrus, specimens have been processed for length, weight, maturity, ovary samples, and otoliths.

Age and Growth Investigation

Judy Penttila examined about 8,000 yellowtail flounder scale samples in detail to compile data on the time of annulus formation for this species.

Cathy Reardon, a cooperative student, completed a limited study on the growth rate of sea scallops using shell and ligament markings. Some differences appeared in growth curves, and were believed to be caused by ligament winter mark being completed before corresponding shell mark. The 1977 scallop commercial and research age samples have been aged, and indicate the 1973 year class makes up the bulk of the landings.

Age samples from red hake, silver hake, and Atlantic mackerel, with the ages derived by USSR scientists, have been sent to the Age and Growth Investigation for review for the purpose of maintaining quality control of their age data in accordance with the bilateral agreements established at the US-USSR meetings in Moscow in 1976.

A small number of samples of gross smears of silver hake ovaries onto paper liners in envelopes containing age samples were made on the Albatross IV summer bottom trawl survey to determine feasibility of staging ovaries by one expert at the laboratory instead of on board the vessel. Staging of dried smears was possible and the method will be refined and tried on other species.

Gary Shepherd, a summer assistant, completed aging 1976 commercial age samples of summer flounder scales. He has also examined fin-ray sections for aging this species, with good results. Otoliths cannot be taken from commercial landings, and fin-rays seem to be a good alternative for comparison to scale-derived ages.

Fisheries Statistics Investigation

Ralph Mayo continued final audits of the 21B report of the 1976 catch data, and with Karen Johnson participated in a joint US-Japanese squid survey aboard the Suzuka Maru between Georges Bank and Washington Canyon. Harold Foster and Joan Palmer continued work on the commercial-sample audit program for determining sampling efficiency and fleet coverage. Gordon Waring and Frank Almeida are taking courses in Survey Sampling and Analysis on Variance at Iowa State University. Paul Wood participated in a joint US-Canadian scallop survey on Georges Bank.

Fisheries Analysis Investigation

Fred Serchuk and Judy Brennan attended the Second International Ecological Congress on Statistical Ecology in College Station, Texas, during 18-31 July. Various assessment reports were completed for two regional fishery management councils, the statistical and scientific (S&S) committees, and the council's staffs. A laboratory reference summary document covering all assessments was produced. Vaughn Anthony attended the S&S Committee of the Mid-Atlantic Fishery Management Council in Norfolk, Virginia, on 11-12 July. He also reviewed the Atlantic herring assessments, tagging results, and management options with the Herring Oversight Committee (22 July) of the New England Fishery Management Council. Vaughn Anthony assisted in running a State-Federal Lobster Workshop on 26 and 27 July at Plymouth, Massachusetts, on estimation of fishing mortality and the short-term losses and the long-term gains from combinations of effort reduction and minimum-size increases. Data from eight states were analyzed. Mike Sissenwine participated in a Georges Bank Energy Flow Committee working group at Narragansett, Rhode Island, on 12 July, and with Emma Henderson began the review of more than 6,000 pages of direct testimony and exhibits from electric power generating companies on the Hudson River for EPA adjudicatory hearings. Fred Serchuk assisted the staff of the Mid-Atlantic Fishery Management Council during 5-8 July in writing the final draft of the surf clam-ocean quahog management plan. Steve Clark lectured at the Isle of Shoals Marine Laboratory of Cornell University and the University of New Hampshire on 28-29 July. The investigation assisted a consulting firm from Seattle on a contract with the New England Fisheries Development Program on a venture analysis and feasibility study in relation to Atlantic mackerel and silver hake. We also provided direction and data to the Atlantic bluefin tuna oceanography feasibility project of the University of Miami. Vaughn Anthony along with Lee Anderson and John Gottschalk wrote a white paper on, "Defining Objectives: The Basis for Fishery Management Plans," for the councils. The lawsuit against the federal government on the herring management plan finally went to court on 19 July. Vaughn Anthony reviewed the briefs for this suit and assisted in the defense.

Meetings, Talks, Visitors, Publicity

Bill Overholtz and Rhett Lewis have drafted a paper entitled, "The Effects of Environmental Factors on Albatross IV Trawl Survey Operations and Catches as Evidenced by a Doppler Speed Log (DSL-200)," and Bill and John Nicolas have drafted a paper entitled, "Northwest Atlantic Fin (Balaenoptera physalus) and Humpback (Megaptera novaeangliae) Whale Feeding Activities on the Sand Lance (Ammodytes americanus)."

Further samples of gadiform fishes were supplied to Dr. A. M. Bullock of the Scottish Marine Biological Association who is doing work on the microstructure of fish integument.

MARINE ECOSYSTEMS DIVISION

Ecosystem Dynamics Investigation

The ecosystem dynamics task group concentrated on preparations for the 3rd Workshop (12 July) on the Georges Bank Energy Budget. Ed Cohen reviewed material from the literature on zooplankton grazing, gave a critique of Julian Goulet's paper on modeling marine organic production, and reported on the ecosystem modeling workshop he attended in March at the University of Washington. He noted that with existing data for the Georges Bank area, a modification of Ivlev's original equation would probably suffice for estimating grazing by zooplankton. More complicated equations have been developed but they require inputs which are not available. The UW ecosystem model was based on a set of differential equations representing various parts of the Lake Washington ecosystem. One interesting feature of the model was the use of generalized mathematical functions to represent biological phenomena; while this is mathematically convenient it ignores the complex biological characteristics of the real system. Mike Pennington presented a report on his generalized feeding equation which accounts for many of the variables involved in estimating daily rations. Ed Cohen continued work on further estimates of food consumption based on Mike Pennington's equation and compared these with energy consumption derived from basic respiration equations from the literature; there are still significant anomalies in these estimates. Processing chlorophyll samples was continued by Pat Carter.

Recruitment Processes

In the Recruitment Processes Task Group, Greg Lough and Dave Potter participated in Dan Ware's (Bedford Institute of Oceanography) Mackerel Egg Patch cruise in St. Georges Bay, Nova Scotia, 28 June-2 July, to observe sampling methods and gear that will be applicable to the Larval Herring Patch Study on Georges Bank, fall 1977 and 1978. The objectives of the study were: 1) to measure the passive diffusion and drift of a discrete mackerel egg patch in relation to tides and currents, 2) to determine the vertical distribution and development rate of eggs, 3) to estimate total abundance of eggs in the patch at successive intervals for mortality rate, and 4) to determine the relative importance of different species and sizes of fish as potential predators of mackerel eggs. Two chartered fishing vessels were used: one for biological sampling of the egg patch and the other for physical oceanographic studies such as chasing drogues and conducting a dye-diffusion experiment. One small (1.1-3.3 km), high density mackerel egg patch was mapped once during the

study. High winds dispersed the patch before a second mapping could be made. Further details will be circulated by Greg Lough in a trip report by late August.

Some preliminary testing is being done by Greg Lough and Dave Potter in Great Harbor using the TUBE apparatus (Transitional Underwater Behavior Experiment) to study the behavior of fish larvae and other zooplankters under quasinatural conditions. These experiments were conceived for cooperative work in the 1974 Helgoland Experiment on Jeffreys Ledge to study the diel vertical migrations of recently hatched yolk-sac larvae just above the spawning beds.

The 0.505-mm mesh ICNAF larval herring data is being analyzed by Greg Lough, George Bolz, and others for estimates of dispersal, abundance, growth, and mortality.

Plankton Ecology Investigation

US-USSR Joint MARMAP Surveys

Preparations were made for the second US-USSR survey of ichthyoplankton, hydrography, and productivity to be conducted on the USSR vessel Yubileiniy from 30 July-15 August. Janet Murphy, Jerry Prezioso, and Donna Busch will participate in the survey which will cover the continental shelf area from western Nova Scotia to Cape Hatteras.

Plankton Sorting and Identification

Processing of the invertebrates from the spring groundfish surveys, 1971-1975, for the Georges Bank area, continues. We have completed 1975, 1974, and 1973 and are preparing to start 1972. Separation of Pseudocalanus minutus from Paracalanus parvus has been completed for the spring 1973 surveys.

A preliminary data report from the 5-yr fall groundfish-zooplankton time-series over Georges Bank was prepared. Tables and figures of distribution, displacement volumes, dry weights, and horizontal contours of dominant species are completed.

Paul Carthas (Northeastern co-op student) is back for a 6-mo work period. Tom Plitcha attended a 3-day course in advanced computer training and has been assisting David Bearnse with computer inputs. Greg Delli Santi, a volunteer from Roger Williams College since 23 May, has accepted a position in Point Judith with the Statistics Branch.

A zooplankton workshop is scheduled during 15-28 August. Five biologists from the Polish Sorting Center, Szczecin, are scheduled to arrive on 14 August to participate in the workshop. During the 2-wk course, emphasis will be placed on zooplankton identification and laboratory methods. Problems common to both sorting groups (Narragansett and Szczecin) will be discussed in a continuing effort to arrive at an optimum sorting protocol.

Biostatistics

During July station data were entered from five cruises: Wieczno Cruise No. 77-03, Nogliki Cruise No. 77-02, Delaware II Cruise No. 76-13, Endeavor Cruise No. 76-01, and Endeavor Cruise No. 77-05. For each cruise master station records and zooplankton logs were processed and outputs are, or soon will be, available in the form of station activity summaries, net tow data summaries, cruise track and station position plots, and master file listings.

Automated plots are being produced of zooplankton displacement volumes covering spring and fall stations from 1971 to 1975 beginning with samples taken from the Georges Bank area. One plot consists of station data values, and a second plot consists of symbols representing the magnitude of the data values. Zooplankton data from the Albatross IV Cruise No. 75-02 were entered into the computer system and are being quality controlled prior to merging the data with the station data for that cruise. Once merged, zooplankton data summaries will be produced for the cruise.

Ichthyoplankton Investigation

We have completed identification of yellowtail flounder and Atlantic mackerel eggs from the April 1977 zooplankton survey. Mackerel eggs occurred from Cape Charles, Virginia, to Montauk Point, New York, and were in greatest abundance between Atlantic City, New Jersey, and Fire Island, New York. Yellowtail flounder eggs occurred mainly between Cape May, New Jersey, and Montauk Point, New York, mostly off Long Island, and were much less abundant than mackerel eggs during this cruise. Egg production estimates from this series of cruises will be forthcoming after sorting of all cruises is complete and the eggs have been staged. Preliminary results from staging snake eel (Pisodonophis cruentifer) eggs from a vertical distribution cruise (Delaware II Cruise No. 74-05) suggests that P. cruentifer spawns nightly around 9 p.m., that the eggs develop according to a predictable timetable, and that hatching occurs in 3-4 days.

A comparison of results from New York Bight cruises in July 1974 and July 1975 indicates that eggs of the same species were present in both years. The relative abundance and spatial distribution of the most commonly caught species in 1975 varied somewhat from the 1974 results. The area of greatest egg density shifted to slightly farther offshore in 1975 than the large inshore concentrations present in 1974. Preliminary results from Shinnecock samples in July of 1974 and 1975 indicate that the species composition remained the same for both years.

Oceanography Investigation

Much of July has been devoted to catching up on data backlog and organizing equipment and supplies, punctuated by intervals of leave-taking by most of those attached to the investigation.

Amy Briggs, a NOAA Junior Fellow, has compiled an inventory showing what data plots have been completed for STD and hydrographic stations on NEFC cruises made since 1960, and has been preparing the plots needed to fill in the gaps. At the same time Sam Nickerson has been keeping up with the necessary plots for current cruises, including the spring groundfish survey. The NODC regional office in Woods Hole has provided a summer employee to transcribe the backlog of STD and hydro station data to keypunch format, so that by the end of summer some 1,500 NEFC stations will have been added to NODC files. The data will also go to MEDS.

Tim Cain and Tom Laughton, with assistance from warehouseman Arthur Berrigan, have built an enclosure covering half of our assigned space at the Otis warehouse, and have organized and prepared an inventory for the equipment and supplies stored there. Cain has continued maintenance and repair of Niskin bottles and has provided operating bottles for cruises on the Albatross IV for Brookhaven National Laboratory and on the USSR fishery research vessel Yubileiniy.

Gil Dering has converted our three old-style AMF transponding releases to the new "enable-disable" mode, so that the instruments cannot wear down their batteries responding to random noises in the ocean. He has also modified the AMF range-bearing unit so that it can be switched easily from one to another of the various frequencies used in our equipment.

Steve Ramp has continued work on the STD processing programs, and is presently completing the final program for calculating and printing several additional oceanographic variables from the recorded data. In addition, he has been preparing to analyze the data from the first set of current-meter records, which were due in Woods Hole late in the month.

Plotting of historical data from Great South Channel has been completed by Tom Loughton and Ron Schlitz. Dr. Schlitz has begun writing a paper to be presented at the Oceanic Fronts conference in New Orleans in October. Work has begun on a volumetric temperature/salinity census of the deep basins of the Gulf of Maine, based on the data from Albatross IV Cruise No. 76-03, made in May of 1976. Each station has been assigned an area, bottom depths have been determined, and the station data are being keypunched so that they can be put through the WHOI Volmet computer program to determine the depth intervals between isotherms and isohalines. Salinities stored since the January 1977 cruise on USCG Cutter Evergreen are being run for comparison of degradation of values between sealed and unsealed bottles. A final set of samples will be run later to complete the study of change with time. The July XBT run from Gloucester to Cape Sable on the M/V Caribou Reefer was cancelled due to ship problems. The Bluenose run from Bar Harbor, Maine, to Yarmouth, Nova Scotia, was made and a report has been prepared for distribution.

A final draft has been completed for the first in the planned series of reports on the marine environment in the Georges Bank region. The initial report, by W. R. Wright and Carolyn Rogers, deals with the extraordinarily high salinities on Georges Bank in the winter of 1976-1977.

Gil Dering and Red Wright had planned to work with the research submersible Mermaid II in an effort to recover the current-meter mooring that was set in Northeast Channel in September 1976 but has not yet come to the surface. The cruise was cancelled because of difficulties with the escort vessel assigned to the submarine, but late in the month it appeared that some portions of the program might be resurrected, including the current-meter search. As of the end of the month, Gil Dering and Steve Ramp were scheduled to take part early in August.

Larval Physiology Investigation

Dr. Laurence attended the Advanced Study Institute of the International Statistical Ecology Program in College Station, Texas. He organized and lectured in a workshop on stock-recruitment problems. The first draft of a manuscript describing length-weight relationships of seven species of larval fishes was started. Plans have been finalized and dates set by GSA for letting the contract to construct the refrigeration systems for the large spawning tanks in the experimental aquarium.

The sulphophosphonanillin method for "total" lipids was standardized with gravimetric results for winter flounder. Lipid material accounted for 12% of the dry weight of juvenile winter flounder. Preliminary measurements of respiratory electron transport activity in scup and winter flounder were made. Dr. Buckley is preparing a paper describing use of DNA/RNA ratios as indicators of condition of larval winter flounder to be submitted at the annual ICES meeting.

Benthic Dynamics Investigation

Updating and augmentation of the benthic invertebrate data base for the Gulf of Maine-Georges Bank region was continued. Data records for three cruises were retrieved onto working disc files and the contents for two cruises have been successfully updated using Information Processing Center's EDIT Processor. The third cruise is currently being updated. Basic station data for this study has been assembled in tabular form.

Tabulation of the food habits data for the 1969-1972 Gadiformes data has been completed. This data set provides basic information on the foods of 15 gadiform species in an overall summary, by ecological area, sex, season, and year. A description of the above tables together with a description of the diet overlap and resource partitioning between species is now being prepared in report form. Analysis of the stomach contents of juvenile haddock for the years 1953-1970 was completed; specimens from 1971-1975 are currently being analyzed. Stomachs of fishes from the inshore Cape Ann-Cape Cod area were collected by Fred Lux and Clarence Davis of the COMAP Investigation during Cruise No. 77-03 of M/V Spirit of '76. Plans and preparations for the forthcoming fish food-habits sampling cruise of R/V Albatross IV are completed. On this cruise, early August, fish stomachs will be sampled at 2-hr intervals during two, 24-hr sampling periods for the purpose of determining diurnal feeding periodicity.

Apex Predator Investigation

An unusually large population of blue sharks in the New York Bight precipitated an increase in interest in shark fishing and tagging. New anglers, and increased tagging by veteran taggers resulted in 2,350 tags being sent out this month. A total of 580 were delivered to the Montauk Open Shark Tournament participants and 1,770 were supplied to regular and new taggers. Nearly 500 tags were applied to sharks in July and 20 tagged sharks were recaptured.

Jack Casey, Chuck Stillwell, Wes Pratt, Cheryl Cavin, and Larry Lindgren attended the Montauk Open Shark Tournament from 14 July to 17 July. During the course of the 3-day tagging tournament we were assisted by the crew of the R/V Geronimo of St. George's School, Newport, Rhode Island, and the staff of the New York Ocean Science Center. Approximately 50 boats caught a total of 211 sharks. Of these 82 were brought in and 129 were tagged and released. All fish brought to the dock were weighed and measured, and samples obtained for reproductive, age and growth, and food habit studies.

The highlight of the weekend was the capture of a 1,039-lb female mako shark by a nontournament angler. The shark was an 11-ft, 9-inch long specimen and was the first mature female mako we have had an opportunity to examine. In the past we have examined hundreds of immature females ranging in size to 411 lb. On 28 July a second large female mako was harpooned south of Block Island by a Long Island commercial fisherman. The 1,250-lb shark was also about 11 ft, 9 inches in length and is to the best of our knowledge the heaviest mako ever reported. The viscera, head, and other anatomical parts were saved for our examination (including the stomach that reportedly contains from 150-200 lb of swordfish).

Meetings, Talks, Visitors, Publicity

Marv Grosslein, Ed Cohen, Mike Pennington, Greg Lough, Dave Bearse, Richard Langton, Roland Wigley, Geoff Laurence, Mike Sissenwine, Jack Green,

Jack Colton, and Ken Sherman attended the Georges Bank Energy Budget Workshop No. 3 at Narragansett on 12 July.

Roland Wigley participated in a meeting concerning institutional matters at the Woods Hole Oceanographic Institution on 8 July.

Marv Grosslein attended a meeting of the Science and Statistical Committee for the New England Fishery Management Council in Boothbay Harbor on 18-19 July.

Lorrie Sullivan and Dave Bearnse attended an informal workshop at the Sandy Hook Laboratory on 20 July to discuss the automatic data processing system being used by the Sandy Hook personnel to process ichthyoplankton data.

During July Carolyn Rogers attended two BLM Biological Committee meetings-- the first on 7 July in New York City and the second at the Virginia Institute of Marine Science on 28 July. A list of recommendations has been drafted to present to the USGS District Supervisor, regarding the production phase of lease area 40 (Mid-Atlantic).

A 2-day oil spill workshop was held at URI's Alton Jones Campus, 13 and 14 July. Ken Sherman presented a paper the first day and Carolyn Rogers attended the second day. The diversity and high level of expertise present in the URI-EPA-NMFS community with regard to oil research is very impressive. This meeting helped to enhance the possibility of cooperation on oil-ecosystem problems in the research community.

Carolyn Rogers participated in a meeting at the Regional Office on 22 July to help develop a regional plan. The Ocean Pulse program document and needs of the Environmental Assessment Branch will be incorporated in the final plan which will also incorporate our Center's approach to the national goal of habitat protection.

Publications and Reports

Sherman, K., K. Honey, L. Sullivan, and D. Busch. Changes in the availability of prey of larval herring in Maine coastal waters. Trans. Amer. Fish. Soc. (A)

Smigielski, A. Induced spawning and larval rearing of yellowtail flounder. Prog. Fish. Cult. (S)

Technical Reports

Wright, W. R., and C. A. Rogers. Marine environment of the Georges Bank region, February 1977.

Byron, R., et al. Species composition, distribution, and abundance of zooplankton on Georges Bank, fall 1971-1975. (Revision 5)

Manuscripts being prepared for 1977 ICES meeting

Rosenberg, A. A., and R. G. Lough. A preliminary report on the age and growth of larval herring (Clupea harengus) from daily growth increments in otoliths.

Dube, G. P., R. G. Lough, and R. E. Cohen. Zooplankton composition, abundance, and distribution on Georges Bank during February 1975 and 1976.

Sherman, K., ed. The Argo Merchant oil spill and fishery resources of Nantucket Shoals: A preliminary assessment of impact.

Buckley, L. Biochemical changes during ontogenesis of the winter flounder (Pseudopleuronectes americanus) and the effect of starvation.

Green, J., J. B. Colton, and D. Bearse. Estimates of zooplankton production on Georges Bank.

Laurence, G. C. Comparative growth, respiration, and delayed feeding abilities of larval cod (Gadus morhua) and haddock (Melanogrammus aeglefinus) as influenced by temperature during laboratory studies.

Casey, J. The occurrence of large sharks off northeastern U.S.; results of monitoring an annual shark fishing tournament at Bay Shore, New York, 1965-1977.

RESOURCE UTILIZATION DIVISION

Resources Development and Improvement--Finfish

Deliveries of fish under this program are continuing at the same rate at both stores (with no promotion) of a large New England-based chain of supermarkets. It is notable that the two stores charge up to 50 cents more per pound than a competing chain using the same quality of fish packed the same day by the same producer.

Product Safety and Standardization

Bone-detection methods for minced fish blocks are being evaluated. The determination of the calcium content of the bones is being carried out to compare the results with the calcium content of the fish. A literature survey of the mineral content, as well as the bone content, of minced fish is being conducted in preparation for a meeting with the Food and Drug Administration in Washington, DC.

Southern New England Fisheries Development Program

Sensory tests and chemical analyses have been continuing on the various storage studies.

Ron Lundstrom has been setting up a cold laboratory and the instrument room in preparation for the purification of enzymes.

A study to determine the effect of chlorine treatment on the refrigerated shelf life of cod fillets was begun. Plate counts are being done, and the percentages of each type of colony growth noted. Chemical tests, fats, volatile bases, TBA's, and TMA's will also be done on the fillets.

Product Quality and Safety

A variety of cold-smoked salmon products containing various concentrations of nitrite and salt, smoked to 85°F for 18 hr, vacuum packed, and stored at 34°F was received from the Seattle Laboratory. The samples are being composited, weighed, and stored at -26°F. Some of these samples have been worked up

by the multidetection method and analyzed by glc. An internal standard solution of 2,3,5,6-tetramethylpyrazine was made up. This solution will be incorporated into the workup of the cold-smoked salmon samples.

Fisheries Engineering

Work has continued on equipment and hardware for the August Albatross IV hydroacoustic assessment calibration cruise. A wet test of the system was performed this month.

Final plans for the August Delaware II hydraulic shellfish dredge testing cruise are being prepared.

Model trawl doors were made to go along with a model net provided to the laboratory for display.

Vern Nulk and John Kenney continue to lend assistance to Process Engineering in the design and construction of the primary sorter and the squid processing machine.

Meetings, Talks, Publicity

Burt Tinker and Kurt Wilhelm participated in a demonstration at the Raytheon Company on using microwave energy to open ocean quahogs. Four microwave units were tested, operating at wave lengths of 915 MHz or 2450 MHz.

Bob Learson participated in a panel discussion on Marketing, Nutrition, and Resource at the annual meeting of The Shellfish Institute of North America.

We have demonstrated the feasibility of certain equipment used to formulate a special diet for lobsters being raised under controlled conditions. We have furnished: (1) information on the structure of the fish business to a concern that is interested in entering the business; (2) information to a Brazilian interested in promoting freshwater catfishes of the Amazon basin; (3) information to a huge Japanese fishing concern as to prospective producers of squid and herring; (4) information on common names of three fishes of commercial importance off northern Africa.

We have also helped a food consultant to develop a method of dehydrating squid for Asian outlets.

Also, information was given on the landings of swordfish in New England to two U.S. Food and Drug Administration officials, and the method of determining percent glaze in crab meat was explained to the City of Gloucester Sealer of Weights and Measures.

Many of the laboratory staff attended a 1-day course on information retrieval using the SDC Search Service.

Technical Assistance

David Roebuck, Wakefield, Rhode Island--refrigerated seawater
Bruce Davey, Queensland, Australia--pair trawling
James Ackert, The Gorton Group--vessel design

ENVIRONMENTAL ASSESSMENT DIVISION

Behavior of Marine Fishes and Invertebrates Investigation

Currently, testing is continuing on the capability of blue crabs, Callinectes sapidus, to detect naphthalene. This fits into the general theme

of behavioral response capabilities which mitigate the effects of stress. To respond behaviorally, the animal must first have the ability to detect particular contaminants; this is especially significant when considering those potentially lethal substances which might be novel as regards the evolutionary history of the organism.

Work is still in progress on attempting to separate the effects of seasonal photoperiod and temperature as signals for seasonal migration using, at present, Tautoga onitis as the experimental animal. Techniques developed for this species should be applicable to other species as well.

Biological Oceanography of Stressed Environments Investigation

Investigation personnel completed a 3½-wk cruise in the New York Bight and Georges Bank. Measurements were made of primary production using the carbon-14 technique, standing stocks of chlorophyll, levels in nutrients, and other physical and chemical factors involved in primary and secondary production.

Personnel of the investigation also conducted seabed oxygen consumption studies in the New York Bight apex and over Georges Bank. These studies are designed to measure the relative total metabolism of benthic communities.

Dr. James Thomas, Jay O'Reilly, and Craig Robertson began a cruise in the New York Bight apex on Monday, 18 July, to measure the rates of carbon/oxygen/nitrogen cycling in the apex. This is a joint cruise with personnel from Lamont-Doherty Geological Observatory and the MESA program. The cruise has particular significance this year inasmuch as some of the measurements may provide information of importance to understanding oxygen depletion and possible fish kills.

Coastal Ecosystems Investigation

In a continuation of the effort to detect possible anoxia problems in the New York Bight, Dave Radosh and Leigh Baines sampled stations off Manasquan Inlet on 6 July to measure bottom oxygen. Frank Steimle and Dave Radosh sampled 51 hydrographic stations aboard Delaware II, 18-22 July, in the New York Bight. Frank continues to coordinate the hydrographic monitoring effort in the New York Bight, which involves dealing with the press and cooperating with other federal and state agencies.

The Delaware II cruise included sampling to assess recovery of the benthos from last year's anoxia. Pilot Ocean Pulse experiments were also conducted. On another leg of this cruise, Bob Reid, Ann Frame, and Clyde MacKenzie sampled the benthic macrofauna of Long and Block Island Sounds, and especially the New London (CT) disposal area. Some hydrographic and epibenthic sampling was included on this leg, and a preliminary assessment was made of the effects of hydraulic dredging (for ocean quahogs) on the benthos of quahog fishery areas in eastern Block Island Sound.

Macrofaunal biomasses have been worked up for the first Block Island Sound benthic baseline survey (February 1976) and for several of the second survey (September 1976) samples. Three-quarters of the second Block Island Sound survey have been sorted and most of the specimens have been identified. We also continued processing benthic samples from the Baltimore Canyon Trough region and from the area of 1976's anoxia problem off New Jersey. Sampling equipment was provided to the group aboard Albatross IV to collect benthic samples from the deepwater dumpsite off New Jersey.

Frank Steimle assisted in the preparation of a report of the oxygen levels in bottom water in the New York Bight, covering the period of late June through July, presented at an interagency committee meeting concerning monitoring the conditions of the New York Bight environment, held in Edison, New Jersey, on 28 July. We also worked on several manuscripts relative to documenting last year's New York Bight oxygen depletion phenomena.

Coastal Monitoring, Assessment, and Prediction Investigation (COMAP)

A sampling program for lobster larvae in Buzzards Bay, begun in May, was continued by COMAP personnel through July. A 2x1-m neuston net was towed from Phalarope II once a week at six stations on two transects across the bay. Relatively large numbers of larvae, stages I through IV, were collected at all stations. Numbers in the neuston decreased greatly by the end of July. On 26 July, when only two larvae (both stage IV) were caught, an algal bloom caused considerable clogging of the net. Results for the season are summarized in the table below.

Date 1977	Number of Larval Stage				Total
	I	II	III	IV	
04 May					
13 May					
18 May	6				6
23 May	81	1			82
31 May	35	48	4		87
07 Jun	126	80	26	10	242
15 Jun	254	292	127	83	756
20 Jun	203	598	373	63	1,237
27 Jun	4	18	116	510	648
05 Jul	1	11	62	138	212
14 Jul	3	12	23	56	94
19 Jul	1	3	28	70	102
26 Jul				2	2
Total	714	1,063	759	932	3,468

The Buzzards Bay studies are an outgrowth of neuston sampling begun by Marine Research, Inc., off the Pilgrim Power Plant in 1975 and are a part of a larger plan that is coordinated through an informal committee of state, federal, and industry investigators who have sampled since May over a broader area of southern New England. This year, data similar to those in the table have been compiled from Charleston, Rhode Island; Cape Cod Canal; southern Cape Cod Bay; and off Duxbury, Massachusetts. The relatively high abundance of larvae, ease of sampling, and similarity of observations throughout the study area suggest that intensive studies of lobster larval distribution and survival in these waters should be pursued and could produce new information about mortality that might be applicable to lobster populations elsewhere.

The recent disclosure of high levels of PCB (polychlorinated biphenyl) contamination, above the federal standard of 5 ppm, in lobsters from the Acushnet River drainage around New Bedford and Fairhaven, close by an area where large numbers of larvae were taken, has focused attention on the need for intensified assessment of man's impact on the environment of heavily used coastal waters such as these. Planning for environmental research underway at present in the Center and Regional Office will designate Buzzards Bay as one of a series of stations to be sampled regularly in a proposed inshore Ocean Pulse program.

Environmental Chemistry Investigation

Progress has been fairly slow in development of the procedures for the use of anodic stripping voltametry (ASV) for analysis of Pb, Dc, and Cu in seawater. Cadmium does not appear to present too many problems and thus analysis of certain samples has begun. Copper needs further work and lead analysis seems feasible but a significant amount of lead is showing up in the blanks; this is being investigated now to determine what component of the blank is contributing to the lead.

The necessary supplies were provided to personnel from other investigations who will collect fish, sediment, and plankton samples for us on the Deepwater Dumpsite 106 cruise begun 20 July. Unfortunately, we may not be able to obtain all the samples we desire on this cruise because other investigators have first priority.

Data obtained on the metal content of bivalves in the intertidal zone between Bridgeport and Guilford, Connecticut, were reviewed and it was decided that about 20 of the original 57 stations should be resampled to confirm the unusually high levels of cadmium and lead found there.

Physiological Effects of Pollutant Stress Investigation (PEPS)

Physioecology

Studies continued this month to determine the toxicity of the metals copper, zinc, and mercury in combination to embryos of the American oyster. Samples are now being examined to determine the results of the fifth test in this series.

Seven tests have now been completed in a study to determine the effect of salinity and temperature on the toxicity of silver to embryos of the American oyster. The results of these tests are now being analyzed statistically.

A study to determine the effects of the metals arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc to embryos of the surf clam was resumed this month. One test was performed to determine a range of metal concentrations to be used in final tests.

Physiological Effects

A third in a series of lobster experiments was completed this month. Lobsters were exposed to 3 and 6 ppb cadmium for 30 days and then held for 1 wk in cadmium-free ambient seawater (salinity 27 ± 1 ‰). This test was performed to compare with a test completed last month in which lobsters were exposed to 3 and 6 ppb for 30 days and then held in low salinity (17 ‰) water for 1 wk. At the end of the test period, blood serum samples were taken for analysis of sodium, potassium, calcium, and osmolality. Gill tissues were

also taken for measurement of oxygen consumption rates. The results of these tests have yet to be analyzed.

The remainder of the month was spent in preparation for and participation in two cruises. Margaret Dawson and Randy Goodlet participated in the Deep-water Dumpsite 106 study aboard the R/V Albatross IV and Robert Tucker and Mark Freadman (University of Massachusetts graduate student attached to this investigation) participated in a mini "Ocean Pulse" cruise aboard the R/V Delaware II in the New York Bight. These cruises were operational test phases for us to determine what baseline physiological measurements can be made in line with future "Ocean Pulse" studies.

Biochemical Effects

Apart from bench chemistry, most of July was spent in tracking down hard-to-obtain equipment, calibrating results from the Spectronic and its recorder against those from the DB-G spectrophotometer and its linear-log recorder, and fastening down and packing for the DWD 106 cruise, in which Nancy Rawson is participating. Some items were also supplied to Mark Freadman, who will take samples for baseline biochemical analysis during his cruise with the R/V Delaware II, which is primarily oriented towards physiology feasibility studies.

Mary Grojean, W/S aide currently assigned to PEPS, has worked for the past 2 wk on enzyme analyses with Maureen Nitkowski, newly assigned to this task. Testing of heart, gonad, and antennal gland preparations (including a kinetic study of G6PdH) was performed, completing work with tissues from lobsters exposed to HgCl_2 . Work will now begin with heart, gonad, antennal gland, and skeletal muscle from the cadmium-exposed lobsters that were subsequently held for 1 wk in low-salinity water (17 ‰), as well as cadmium-exposed lobsters analogously held for 1 wk at ambient salinity (27 ‰ ppt). Lobster tissues from the latter experiment were taken and frozen stored (-29°C) earlier this month. This is the type of experimentation that PEPS has been building up baseline metal-exposure data for: testing the capability of sublethally metal-stressed animals to withstand "natural" stress.

Anaerobic Bacteriology/Metabolism

Most of the effort this past month has continued on manuscript development. The paper on the hemolytic activity of Vibrio parahaemolyticus is in internal review and a draft on the inactivation of botulism toxin by ozone has been prepared. Work is continuing on the New York Bight bacteriology and distribution of Clostridium perfringens in the marine environment.

Laboratory activity was directed towards the evaluation of enrichment media for the demonstration of sulfate-reducing bacteria. Employing a medium developed some time ago for the growth of anaerobic sulfate-reducing bacteria, growth was obtained from two out of four marine sediments when cultured under increased hydrogen tension and pressure and prolonged incubation at room temperature. The organisms present in the positive cultures were gram negative rods and actively motile. As evidenced from the blackening of the indicator system and smell, hydrogen sulfide was being produced. Some difficulty is being experienced in obtaining isolates on plates, no doubt due to the sensitivity of the organisms to oxygen.

Meetings, Talks, Visitors, Publicity

On Thursday, 30 June, and Friday, 1 July, Dr. John Pearce participated in a NOAA-level workshop at NASA Flight Control Center, Bay St. Louis, Mississippi, to develop long-range plans for NOAA environmental research. The nature of the Ocean Pulse program developed within NEFC was outlined to the working group, and other environmental programs developed by NMFS elements, as well as other NOAA MLC's, were discussed. A report will be prepared for review and eventual planning use within NOAA.

Mr. Bori Olla, Chief, Behavior Investigation, attended a Symposium on the Rhythmic Activity of Fish sponsored by the Fisheries Society of the British Isles, held at the University of Stirling. He presented 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."

On 11-13 July, Dr. Pearce met with the Scientific and Statistical (S&S) Committee, Mid-Atlantic Fishery Management Council, to discuss definitions and objectives of the fishery management plans (FMP) to be developed by the council. An opportunity was also taken to present, briefly, the nature of the Ocean Pulse program and to discuss some of the long-range environmental research which would be required by the councils. A special Mid-Atlantic Council Committee on Pollution will meet sometime in the late summer at Sandy Hook Laboratory to discuss the requirements of the council in terms of environmental and pollution oriented research.

Frank Steimle presented a short report on his efforts to estimate benthic productivity on Georges Bank at a meeting of the Georges Bank Energy Budget Committee at Narragansett, Rhode Island, on 12 July.

On 24 July Dr. Anthony Calabrese and Dr. John Pearce met with MESA personnel of the New York Bight Project Office to discuss possible research activities that might be undertaken by the MESA Project in regard to research on deepwater dumping of waste materials. Dr. Calabrese and Dr. Pearce also attended a Corps of Engineers Waterways Experiment Station (WES) program review at New London, Connecticut. In one session of the program review, Dr. Pearce moderated a panel discussion. The panel included Dr. Jerry Schubel, Director, New York Marine Science Center, State University of New York, Stony Brook; Mr. Chris DuPont Roosevelt, a lawyer and President of the Oceanic Society; Dr. Robert Enger (WES); and Mr. William Webster, Science Editor, New York Times. The review session was well attended by the public and scientific community and resulted in a 2½-hr discussion on problems concerned with ocean dredging and spoiling.

On Friday, 15 July, Dr. James Thomas and Dr. Pearce met with Ken Sherman and Wally Smith to discuss ways that certain aspects of primary productivity and secondary productivity investigations can be integrated to increase the total output of both activities and to make the research more useful in terms of environmental and fisheries management, especially those aspects concerned with eutrophication and long-range changes in production due to climatic changes. Detailed plans were developed for future joint cruises between personnel of the divisions, as well as plans to expedite environmental research.

Dr. Frederick Thurberg attended the 27th International Congress of Physiological Sciences in Paris, France, 17-23 July. He presented some of his research findings on the effects of silver to marine bivalves at a poster session of this Congress. He then traveled to Plymouth, England, to visit the Institute for Marine Environmental Research of the Natural Environment Research Council and The Plymouth Laboratory of the Marine Biological Association of U.K.

Dr. Pearce met with Center and Regional personnel on Thursday and Friday, 21-22 July, at the Gloucester office to discuss the implementation of the Ocean Pulse program, particularly at "inshore" stations. Regional and Center personnel were joined by Corps of Engineers staff and representatives from NOS.

Bob Reid and Dr. Carl Sindermann met with Bureau of Land Management representatives in New York City on 28 July to discuss plans for NMFS workup of baseline biological data for the mid-Atlantic and outer continental shelf.

Dr. John Graikoski visited Dr. Carol Litchfield at Rutgers University. Topics discussed were New York Bight microbiology, her studies on carbon-14 heterotrophic utilization and cadmium sensitivity by marine microorganisms, problems on the enumeration of bacteria in sediments, and anaerobic bacteriology. Dr. Graikoski also visited with Dr. Bob Kuchler, newly elected chairman of the Microbiology Department and former University of Michigan colleague.

A meeting was held in Gloucester on 22 July to address the regional policy, needs, and objectives of the habitat protection goal expressed in the National Plan for Marine Fisheries and to explore how specific tasks within the proposed Ocean Pulse program will relate to the regional objectives and, perhaps, aid the regional Environmental Assessment Branch in its response to specific proposals for environmental alterations. With representatives present from the regional Environmental Assessment Branch, Sandy Hook, Narragansett, and Woods Hole Laboratories, Ocean Dumping Program of the National Ocean Survey, and the Engineering Branch of the Corps of Engineers, the discussions ranged widely over ongoing research, proposed coastal environmental studies, and the needs for integration of new proposals into the framework of existing programs.

Manuscripts

MacKenzie, C. 1977. Development of an aquaculture program for rehabilitation of damaged oyster reefs in Mississippi. Mar. Fish. Rev. (P)

Olla, B. L., and A. L. Studholme. Comparative aspects of the activity rhythms of tautog (Tautoga onitis), bluefish (Pomatomus saltatrix), and Atlantic mackerel (Scomber scombrus) as related to their life habits. Proceed. Symp. on Rhythms in Fish. Fish. Soc. of the British Isles. (S).

Pearce, J. B. Information on production of marine sand and gravel in the ICNAF areas off the northeast coast of the United States. Fisheries Improvement Committee Document. ICES. (S)

AQUACULTURE DIVISION

Aspects of Nutritional Requirements of Mollusks

Mass Culture of Algal Food Organisms

Despite the fact that there have been several failures of the cooling system in the mass culture room during recent heat spells, harvesting remained at its normal productivity because repairs were made rapidly and inocula were available for immediate substitution of new carboys for moribund cultures. During this month, a yield of 1,627 liters of larval foods and 1,526 liters of juvenile foods (each at PCV 0.003) was obtained from the mass culture apparatus. These bacteria-free food cultures were distributed to laboratory

investigations as follows: Genetics, 995 liters; Spawning and Rearing, 617; Pathobiology, 50; Bioassay, 40.

Stock Culture Collection

Subcultures in the stock culture collection were performed on schedule. This included the entire collection in artificial seawater and on solid agar media. Two species were added to the collection that were sent to us from the Tahiti CNEOX station. These organisms were isolated locally and were purported to be tolerant of high temperatures. The isolates were identified as Tetraselmis sp. and Isochrysis sp. Both are growing well in our culture conditions, but unfortunately, the strain of Isochrysis arrived contaminated with ciliate cysts. We will make an effort at purifying the strain.

We are continuing to experiment with our diatom isolate D-77 which is so dependent on the nutritional composition of the growth medium for normal pennate morphology. Our previous report described a unique "hollow ball" colony formation by this isolate. Our recent observations have revealed another structural anomaly. The normal pennate shape of the diatom is altered to a circular structure. This occurs in the absence of certain ions in the growth medium. Studies on the relationship between nutritional components and morphological configurations are of fundamental importance to several biological disciplines.

Nutritional Components in the Algal Growth Medium

We are continuing studies on the response of several pure cultures of algal food organisms to a reduction in concentration of nutrient enrichments in the algal growth medium. Organisms adapted to a medium in which the concentrations of nitrate and phosphate were reduced by 50% from the normal were also evaluated for the capacity of these species to tolerate reduced vitamin concentrations. Growth curves were plotted for three successive subcultures in media with reduced phosphate and nitrate, as well as vitamin concentrations reduced by 50%, 25%, and 13% from that normally used. Observations for 17 days of the daily population increases demonstrated that although the initial growth rate was partially depressed, the maximum population was not significantly altered in reduced vitamins with the following species: Phaeodactylum tricornutum, Tetraselmis maculata, Monochrysis lutheri, and Pseudoisochrysis paradoxa. However, populations of Dicrateria inornata were significantly diminished in all three of the reduced-vitamin concentrations. These results do suggest that it may be possible to culture certain algal food organisms in a more economical growth medium.

Feeding in Crassostrea virginica Veligers

The question has often been asked as to whether small nonmotile marine unicells with "Chlorella"-type cell configurations can be utilized by C. virginica larvae as a source of food. In two recent experiments we have compared feeding the clones of this type to veliger larvae with feeding Monochrysis lutheri.

To avoid obscuring results with potentially toxic extracellular products of algae, all food cells were washed in seawater before being fed to larvae. Results, however, did not show any significant difference between washed and unwashed food cells. In the first experiment, larval growth was evaluated for 9 days as percentage of growth obtained with Monochrysis lutheri as food.

Results were as follows: clone U-109 (size 5.4 μ), 62%; clone T-9 (5.4 μ), 49%; clone 580 (3.6 μ), 67%; and clone Va 19 (1.8 μ), 54%. In the second experiment, larvae were evaluated until day 13. Results here showed that animals fed on clone 580 died after day 9, but growth at day 13 of clone O-15 (size 6.5 μ) was 54% and clone Chloro (6.5 μ) was 89% of that obtained feeding M. lutheri.

Spawning and Rearing of Molluscs

Most of the recent research effort with the bay scallop has centered on experiments with young hatchery-reared juveniles. To identify the spatial and nutritional requirements of young Argopecten irradians, we carried out tests in which the stocking densities and water flow rates were varied. Preliminary analysis of the data indicates that at summer chlorophyll levels the nutritional requirements of scallops in the 2-5 mm range can be met by flowing 10 ml/min of water through a system for every 1 ml of animals in the system. Scallops 2 mm in length can be stocked in trays at 8000/m²; at 5 mm in length densities of 1500/m² are necessary to assure maximum growth.

We have recently investigated the survival and growth of very small bay scallops in our outdoor pumped-raceway system in a series of experiments designed to determine the minimum-sized animal for successful transplantation to that system. Scallops between 1 and 2 mm exhibited high initial mortalities in that system, probably due to siltation despite weekly cleaning. Bay scallops, 3 mm in length or larger, survived and grew well under these same conditions.

Our success in rearing bay scallops this year has enabled us to begin a giveaway program that will allow interested groups to try this animal under various grow-out conditions. This month 50,000 4-mm scallop seed were flown to the Wampanoag Tribal Council of Gay Head, Martha's Vineyard, Massachusetts, who will use the animals in their aquaculture project. A few hundred 10-mm scallops were provided to Mr. Ian Walker of Durham, New Hampshire, for analysis as a potential mariculture species in his area.

A recent observational dive in Little Narragansett Bay on the Connecticut-Rhode Island border showed that a substantial number of hatchery-reared scallops that we planted last fall are still alive and growing at a rate comparable to that of nearby natural populations.

Spisula solidissima spawned in November of 1976 have been reared to their projected market size of 50 mm in 8 mo. This effort represents the shortest period to date for raising clams from egg to marketable product. This group of animals was held in about 4 cm of sand substrate in 2.5 x 1.3 m compartments of a larger tank. The flow rate of the incoming seawater was 50 l/min. The biomass of the animals was at such a level that the population did not significantly reduce the available chlorophyll.

Analysis of seawater through fluorometry has revealed seasonal peaks and lows in phytoplankton levels. This information is especially important in understanding the relationship between available nutrition to bivalves and their growth rates in our pumped raceway system. By performing a regression analysis, plots have been derived which relate chlorophyll-a levels, determined spectrophotometrically, with fluorescence levels from in vivo samples.

Aquacultural Genetics

Breeding Studies on the American Oyster

Mass Selection Experiments - Demonstration for Realized Heritability Estimates

Progress is being made on dividing the 1976 year-class animals into fast growth, slow growth, and random lines. The 1976 year class consists of 10 spat groups, each group having been spawned on the same day. Four of the spat groups have been completely counted, measured and selected. Work is under way on a fifth group.

Heritability Estimates for Theoretical Predictions of Heritability

Work continues on measuring juvenile oysters for the heritability studies. Juvenile measurements at 6 wk post-setting have been collected for all studies, and measurements at 14 wk post-setting have been collected for two studies. The third group has not yet reached 14 wk post-setting. In all cases, 100 individuals from each half-sib family were measured to produce the necessary data.

Family Selection Trials

Ten full-sib families have been spawned for this project. Five families have produced abundant spat; three families are still in the larval stage. Ultimately these families should be used to select for traits that cannot be measured on live animals, i.e., meat weight.

Inbreeding-Hybridization Trials

Three new crosses were made for the purpose of inbreeding full sibs. Larvae from another line for inbreeding reached the setting stage. Clusters of juvenile oysters from last year's crosses have been separated into singles.

Interspecies Hybridization

Another successful hybrid cross was achieved between the American and Japanese commercial oysters. It appears that Japanese oysters can be maintained in spawnable state at Milford for several months under conditions that would not allow release of their gametes to nature.

Cytogenetic and Cytological Studies on Fish Eggs

Mackerel Eggs from the New York Bight

A breakdown of the components of the plankton samples taken for heavy metal and organic chemical analyses on our May Annandale cruise has been made on all 15 stations. This should aid Chemistry in their choice of which of the sets of broad-scan and replicate samples to analyze, and aid in the interpretation of analyses. Some samples have more mackerel eggs than copepods, and vice-versa. The Sandy Hook-Rockaway Inlet sample is contaminated with non-living material. Data on the composition of samples have

been sent to chemists R. Greig, W. McCloud, G. Meaburn, and to J. O'Connor of MESA.

Salinity samples from the Annandale cruise taken at every station at which plankton was sampled have all been read. All values were normal for oceanic salinity, with exception of those at two stations. One of these stations was at the Sandy Hook Rockaway Inlet transect, which had a salinity of 26. This same station had one of the two very low pH's measured, 6.7. A nearby station, also with a salinity of 26, had a more normal pH. The station 6 mi to the southwest of Acid Waste with the pH of 5.7 had a normal salinity, 37. Different physical oceanographers appear to view as low a pH as 5.7 at sea as being either impossible or, quite likely, in an area as the New York Bight. Temperatures recorded on the May Annandale cruise have been read at the NMFS Narragansett Laboratory.

Data format sheets for archiving the cytogenetic studies prepared by P. Eisen of MESA have been checked. They appear to be quite suitable from the cytogenetic standpoint. A. Longwell met with A. Pacheco and J. LeBaron of the NMFS Sandy Hook Laboratory regarding the format and keypunching of the mackerel data from the Westward 1974 cruise. No problem was anticipated in keypunching data in such a way as to facilitate transcribing it to the MESA format for archiving and data are now being keypunched. Data collecting sheets used in our fish cytogenetic work will be modified slightly to accommodate better the transfer of figures to format sheets and for keypunching.

Mackerel eggs from the cytogenetic samples of plankton taken from the bight on the May Annandale cruise are being dissected and studied microscopically. Although numbers are still relatively small, it appears that mackerel eggs, taken at the Sandy Hook-Rockaway Inlet station are again largely dead at Stages I-IV (cleavage through early embryo). The later, less sensitive Stage VII (tail-free) embryos appear to have a regular number of fairly normal cell divisions and good survival, although they also were all dead in our 1974 collection. Interpretation of results at this station may be confounded by low salinity at this station. Any cytological-cytogenetic effect of low salinity on mackerel eggs should be determinable from our at-sea salinity experiment on mackerel eggs. Eggs from this salinity experiment conducted in cleaner water at Montauk Point are now being dissected and prepared for analyses.

Cytological-cytogenetic study of the mackerel eggs collected at the low pH station southwest of Acid Waste shows a high mortality of early developmental stages but reasonable survival of the post-gastrula stages. About a quarter of these eggs, chiefly the gastrula and earlier stages, contained a black precipitate-like material about the embryos and sometimes also in the yolk. On dissection this material appeared attached to the outside of the embryo. This has never been observed in any of the eggs previously dissected from the bight or DWD 106. It is not possible to relate such to any low pH condition of this sample station. Our best interpretation now is that the dark areas represent patches of dead cells or necrotic tissue sloughing off the embryo. A few eggs at nearby stations contained the same material.

About a third of the mackerel eggs collected in slope waters about DWD 106 have grossly abnormal embryos. Most of the abnormalities occur about the early embryo stage and appear to reflect difficulties in gastrulation. Gastrulation is the time abnormal chromosomes would begin to effect abnormal embryogenesis. (A dump of acid-iron waste was made at DWD 106 about 12 hr before these stations were sampled.) The Sandy Hook and low pH stations

are also characterized by significant numbers of abnormal embryos. As in the case of our 1974 Westward collection of mackerel eggs, a station in the northeast periphery of the bight contains mostly normal eggs, has a greater mitotic index, and fewer abnormalities of its chromosome divisions.

The 1977 collection of mackerel eggs, just as the 1974, has a high mortality of the earliest Stage I (cleavage) over the entire bight. The background incidence of eggs over the bight with abnormal embryos may be somewhat higher than the very low figure recorded for the 1974 samples.

Ocean Pulse-Deep Water Dumpsite 106 Research

Neuston and bongo samples were collected on a cruise to DWD 106 for the purpose of conducting cytogenetic appraisals of the effects of dumps there on fish eggs. Sampling was correlated with hydroacoustic tracking of plumes from sewage sludge and acid-iron waste. Fish eggs, which were not obvious at the time of sampling, did occur in low numbers. These are now being picked out of the plankton. They will be identified through a subcontract to S. Richards, and then prepared for cytogenetic study. Control samples come from a station outside of DWD 106, and from pre-dump tows on DWD 106.

Cytogenetic bioassays were also conducted on the vessel with copepods given exposures of 4 and 8 hr of plume water. Eggs of these copepods may also be examined cytologically.

In an effort to have continuous laboratory cultures of copepods for bioassays on future Ocean Pulse cruises, cultures were initiated on this cruise and brought to Milford.

S. Stiles was the genetics participant on this first trial Ocean Pulse cruise, and responsible for conducting all the on-vessel bioassays and fixations.

Fish eggs were also collected at about 30 stations over the New York Bight this past July. This collection of opportunity will be the basis for cytogenetic appraisals of fish eggs in the bight under the Ocean Pulse program. It is anticipated that these eggs cannot be studied in the next 12 or so months, but our methodology allows examination of eggs several years old.

Measurements of pH at the stations sampled for eggs on this cruise were all in the unequivocally normal range (same pH meter as used to record the low values in the May Annandale cruise to the bight).

PATHOBIOLOGY DIVISION

Disease and Environmental Stress Investigation

Caging experiments with winter flounder in the New York Bight have been hampered by rock crabs which have entered the cages. Presently it is unknown whether the rock crabs, which apparently enter the cages by breaking the netting, feed on fish which have died in the cages or whether they allow the fish to escape through broken netting. In the last cages retrieved, 80-100% of the fishes in three of four cages were missing after a 10-day period. An experiment examining phagocyte chemotaxis, changes in blood leukocytes, and serum antibodies in cadmium-exposed striped bass continues. The last of this group of fish was sacrificed on 26 July. However, microscopic examination of preserved material will continue for several weeks. A culture of the flatfish ulcer disease bacterium was processed for DNA base ratio studies. The isolated DNA will be examined

spectrophotometrically to determine if enough purified material is available for analysis of the guanine and cytosine content. Experiments are in progress evaluating the effects of copper sulfate on chemoreceptors of the blue crab. Adult male crabs are being exposed to 50, 100, and 1000 $\mu\text{g/l}$ concentrations of Cu^{++} for 24 and 48 hr. Prior to exposure the left chemoreceptor is recovered from each crab (control). The receptors will be examined with electron microscopy. It is expected that the cytopathology which ensues will be a disruption of the dendritic component of the receptor close to the cuticular pores. These dendrites are composed principally of neurotubules (microtubules) which are readily disrupted by various chemicals. There is no data available describing the early morphologic changes accompanying the loss of chemoreceptive capacity. A preliminary summarization of data on gill fouling of rock crabs collected during the past 4 yr has been completed. Comparisons of discoloration, amount of debris, numbers of bacteria, diatoms, and copepods between crabs from the New York Bight Apex and Sandy Hook/Raritan Bay showed essentially no differences. Except for diatoms, seasonal data show that minimal fouling is evident during January-March and maximum fouling occurs during August-December. Data analysis is in progress to evaluate the effects of molting cycle and carapace width on the intensity of fouling.

Comparative Pathobiology Investigation

Diagnostic services were provided to Kahuku Farms, Inc., Hawaii, for two samples of oysters. Personnel from the Center for Environmental and Estuarine Studies (CEES) of the University of Maryland were instructed in procedures used to evaluate oyster spat setting. They were shown how to identify oyster spat and associated fouling organisms. Preparations were made for participation in the DWD 106 cruise departing Woods Hole on 20 July. Work continues on the normal histology of the blue crab. Detailed study has been made of tissues stained by several cytochemical methods, particularly those used for localization and identification of elastic fibers, lipids, proteins, and metals. These studies have satisfactorily proven or disproven personal hypotheses and statements in the literature concerning localization of lipid storage (neutral fats). More tests will be necessary before general identification of other sudanophilic substances is possible. Methods for elastin showed that basement membranes (basal lamina) of both the midgut and blood vessels contain substances that stain similarly with three different methods used to determine presence of elastin in vertebrates. The character of basal lamina, particularly the very thick ones of the midgut and blood vessels of the blue crab, might play a role in preventing or limiting passage of certain viruses and other biotic entities, or in providing a device for filtration and diffusion of nutrients that can be utilized by the parasites. In arthropods, many disease organisms are known or suspected to enter through the midgut epithelium. Similarly it has been found in this laboratory that such widely disparate organisms as an amoeba and a trematode preferentially locate themselves in endothelia of blood vessels, in juxtaposition with the "intima" (which is actually the basement membrane, since in decapod crustaceans this structure serves as the inner lining of blood vessels. Cytochemical studies of tissues from "whirling" menhaden are in progress. Mr. Rick Smitherman ("Aquavet") has been evaluating the use of alpha amylase to determine the identity

of glycogenlike particles in ultrathin sections. During the month 877 sections of paraffin-embedded tissues were cut and 807 slides were stained.

Aquaculture: Diseases of Larval Mollusks

Studies on the effectiveness of the Aquafine UV-unit continued. In a cooperative effort with Ms. Stiles of the genetics program, fertilized oyster eggs were exposed for 1 hr to seawater which had run through the UV-unit at various flow rates (0.5-4.0 l/min). After the 1-hr exposure, the oyster embryos were fixed for cytogenetic analysis. We are attempting to determine whether the abnormalities and/or mortalities seen when fertilized eggs are reared in the slower flowing seawater are due to chromosomal damage. Results of such studies may help to explain why UV appears effective in some hatchery installations but not others. Fertilized oyster eggs exposed to the red pigment extracted from the red pseudomonad and to the yellow pigment of its yellow mutant suffer high mortalities after developing to the straight-hinge stage. The solvent in which the pigments are dissolved has no adverse effect on survival of fertilized eggs. Preparations are being made to do some preliminary thin-layer chromatography on the two pigments.

Meetings, Talks, Visitors, Publicity

Dr. Rosenfield visited the Region 3 EPA Office at Philadelphia on 18 July to discuss the Chesapeake Bay Program. He visited the Washington Office on 19 July to discuss the EPA pass-thru money project with the staff of the Habitat Protection Division. Dr. Rosenfield participated in a meeting at the Regional Office in Gloucester on 22 July to discuss interactions with the Environmental Assessment Branch; he also discussed the possibility of an industry open house in Oxford with members of the Regional Office staff.

Dr. Phyllis Johnson presented a seminar titled "Diseases of the Blue Crab" at the Chesapeake Biological Laboratory, Solomons, Maryland, on 7 July.

Dr. Thomas Sawyer conducted a lecture and laboratory exercise at the College of Marine Science, University of Delaware, Lewes, on 13 July; he also conducted a lecture and laboratory exercise in a marine biology course at the New Jersey Science Consortium, Sandy Hook, on 14 July.

Mr. Greg Goonan entered on duty 1 June under a work/study agreement from Boston University; he is assisting Mr. John Ziskowski at the Sandy Hook Laboratory. Mr. Jonathan Gold and Mr. Bruce Harke joined the Oxford staff as summer temporaries in July. Ms. Jacqueline Strol, a CETA Summer Youth Program enrollee, is assisting Dr. Walter Blogoslowski during the summer at the Milford Laboratory.

Visitors to the laboratory during July included Mr. Ed Hollis and Mr. Jay Lewis to discuss cooperative research on the coastal zone and Canada/Philadelphia dump site research; Drs. Ben Trump and Ray Jones, University of Maryland Medical School, to discuss cooperative research; Dr. Mel Light, U. S. Coast Guard, Groton, Connecticut, to discuss research on protozoa; Mr. Maldeis and a class of 15 students from the Chesapeake Bay Foundation summer instructional program--lectures, demonstrations, films, and a tour of the laboratory were provided.

Manuscripts

MacLean, S. A. A juvenile acanthocephalan in rock crabs, Cancer irroratus, from Maine. J. Parasitol. (S).

Sawyer, T. K., S. A. MacLean, J. Ziskowski. A histological survey of nodules in wild-caught American lobsters from New Jersey and the New York Bight. J. Protozool. (S).

NATIONAL SYSTEMATICS LABORATORY

Pelagic Fishes

Work continued on an anatomical study and taxonomic review of the Spanish mackerels, and on the taxonomy of Indo-West Pacific halfbeaks.

Benthic Fishes

A draft was completed of a paper on the taxonomy of the abundant deepsea genus Antimora (the blue hakes). Of six named species two appear to be valid, one living in the N. Pacific, the other living in all other oceans.

Penaeoid Shrimps

Studied extensive collections of tropical eastern Pacific shrimps taken by Scripps Institution of Oceanography.

Other Crustaceans

Completed the description of a new genus of spider crabs from the West Indies. Continued work on the preparation of a guide to the temperate water decapod crustaceans of the U.S. East Coast.

Meetings, Talks, Visitors, Publicity

Dr. Bruce Collette participated by invitation as a member of a Technical Panel on Species for the Senate Subcommittee on Resource Protection of the Senate Committee on Environment and Public Works.

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. (A).

Collette, B., J. Russo, and L. A. Zavala-Camin. Scomberomorus brasiliensis, a new species of Spanish mackerel from the western Atlantic. Fish. Bull. (A).

Springer, S. A revision of the catsharks, family Scyliorhinidae. NOAA Tech. Rep. NMFS Circ. (S).

Williams, A., J. K. Shaw, and T. S. Hopkins. Stilbomastax, a new genus of spider crab (Majidae: Tychinae) from the West Indian region, with notes on American relatives. Proc. Biol. Soc. Wash. (A).

ATLANTIC ENVIRONMENTAL GROUP

Ocean Monitoring and Climatology Task Group

Data Analysis Products No. 2 and No. 3 were completed and transmitted to the Center Director for use by NEFC scientists in bio-environmental studies. Product No. 2 consisted of month-by-month graphical portrayals of zonal, meridional, and scalar resultant wind stress for the period of 1946-75 for eastern Georges Bank, and No. 3 was a collection of twelve plots of mean monthly sea surface temperature for the same area for the period of 1948-67. Efforts are underway to update the sea-surface temperature data base to cover the longer period (1946-75).

The Canadian National Railways vessel, M/V Bluenose was resupplied for participation in the program of monthly monitoring transects of temperature and salinity across the northern Gulf of Maine (Bar Harbor to Yarmouth, Nova Scotia). Unless equipment difficulties are experienced, the vessel has adequate supplies to last until October when the vessel's navigational season ends. Observations have been made by crew members since February, greatly reducing the funding and effort required of AEG and NEFC to maintain this monitoring transect. Apparently, some members of the crew will be shifted to the Portland-to-Yarmouth, Nova Scotia, run for the winter months, so we can expect similarly good cooperation on the winter transects also.

This year's session of the annual review of the NMFS/MARAD Ship-of-Opportunity Program was attended by Steve Cook at the National Maritime Research Center, co-located with the Maritime Academy at Kings Point, New York. Discussions were held concerning present and future AEG/NMRC interactions. Sources of possible outside fiscal support for SOOP activities were also discussed. A more detailed briefing of SOOP activities will be presented to the Director of NMRC early in August.

Final drafts of six chapters were submitted by AEG to the coordinator of the annual NMFS Status of the Environment Report for inclusion in the 1976 edition.

Manuscripts for two chapters in a NOAA final report on the broad-scale anoxic condition and fish kill incident off New Jersey (summer of 1976) were prepared by Reed Armstrong, entitled "A physical interpretation of the anoxia development" and "Prediction of future events". The first chapter describes unusual climatic conditions that developed in the first few months of 1976, how such conditions contributed to the resulting anoxia and why the anoxia was limited to the continental shelf off New Jersey. The "prediction" chapter provides a comparison of climatic conditions in 1976 with what occurred during the preceding 29 yr and indicates that (1) similar conditions developed in earlier years and account for reported fish kills and anoxic events, (2) such conditions can be expected to recur in the future and, (3) future events can be predicted.

Ocean Dumping Task Group

The first half of July was spent preparing for the upcoming research cruises to DWD 106 aboard the Albatross IV and the Peirce. Necessary equipment was forwarded to Dr. Marshall Orr at the Woods Hole Oceanographic Institution. This

included an XBT system, one surface current drogue buoy, and surface water sampling equipment. All were for use aboard the Peirce during the July research cruise.

Two monitoring transects to DWD 106 were completed during July. On 26 July, a successful XBT transect to DWD 106 was completed aboard the M/V Port Jefferson, a licensed dumping tug. A second XBT transect and a Hardy continuous plankton recorder transect were completed by the USCGC Tamara.

The July 1977 research work at DWD 106 aboard the FRS Albatross IV and the Peirce was successful in tracking the waste plume from two dumping operations. A control station was occupied east of the dumpsite area within an anticyclonic Gulf Stream eddy. Acoustical scattering and physical and biological oceanographic sampling were completed at this control site. On 24 July, a dump of approximately one million gallons of primary sewage sludge was completed at DWD 106 which was occupied by an anticyclonic Gulf Stream eddy. Acoustical tracking of the dump plume began aboard both vessels immediately after the dump. Discrete sampling using a rosette sampler and Niskin bottles also began at this time aboard the Albatross IV. Physical, chemical, and biological oceanographic variables were measured at depths where acoustical data described the presence of the sewage sludge.

On 26 July, a second dump of approximately one million gallons of acid waste was disposed at DWD 106. Acoustical tracking of the dump plume again was initiated by both vessels immediately after the dump. Light scattering measurements were made continuously using a nephelometer and a continuous pumping system. The continuous pumping system also provided the necessary subsurface physical and chemical sampling at acoustically keyed depths down to 40 ft.

The physical data collected aboard the Albatross IV is presently being sorted out and digitized and will be reported on within the coming months.

Meetings, Talks, Visitors, Publicity

Mr. Brooks Townes, Assistant Editor, National Fisherman, visited AEG on 1 July and discussed with Woody Chamberlin possibilities for more regular reporting of marine environmental conditions on the fishing grounds.

Mert Ingham attended a meeting of NMFS and MESA scientists held at the Milford Laboratory on 14 July to consider the development of a plan for research on the effects of dumping sewage sludge at DWD 106, to be used in the event the Philadelphia or New York City sludge dumpers are forced to move their operations to DWD 106.

Mert Ingham attended a meeting on 25 July with the Associate Director of NMFS and the Center Directors in NMFS Headquarters held to review the status of the NMFS national laboratories (AEG, PEG, NSL, FEL).

Steve Cook attended a conference on 28 July at the National Maritime Research Center to review the status of the NMFS/MARAD Ship of Opportunity Program.

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)

Bisagni, J. J. 1977. Physical oceanography of Deepwater Dumpsite 106 February-March 1976. In: Baseline Report of Environmental Conditions in Deepwater Dumpsite 106. (A)

Bisagni, J. J., S. W. Congdon, and K. A. Hausknecht. 1977. A summary of input of industrial waste chemicals at Deepwater Dumpsite 106 during 1974 and 1975. In: Baseline Report of Environmental Conditions in Deepwater Dumpsite 106. (A)

Jones, C. M., and Richard Haedrich. 1977. Epibenthic invertebrates. In: Baseline Report of Environmental Conditions in Deepwater Dumpsite 106. (A)

Hulburt, E. M., and C. M. Jones. 1977. Phytoplankton in the vicinity of Deepwater Dumpsite 106. In: Baseline Report of Environmental Conditions in Deepwater Dumpsite 106. (A)

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)

Ingham, M. C., J. J. Bisagni, and D. Mizenko. 1977. The general physical oceanography of Deepwater Dumpsite 106. In: Baseline Report of Environmental Conditions in Deepwater Dumpsite 106. (A)

MANNED UNDERSEA RESEARCH AND TECHNOLOGY PROGRAM--No report received.