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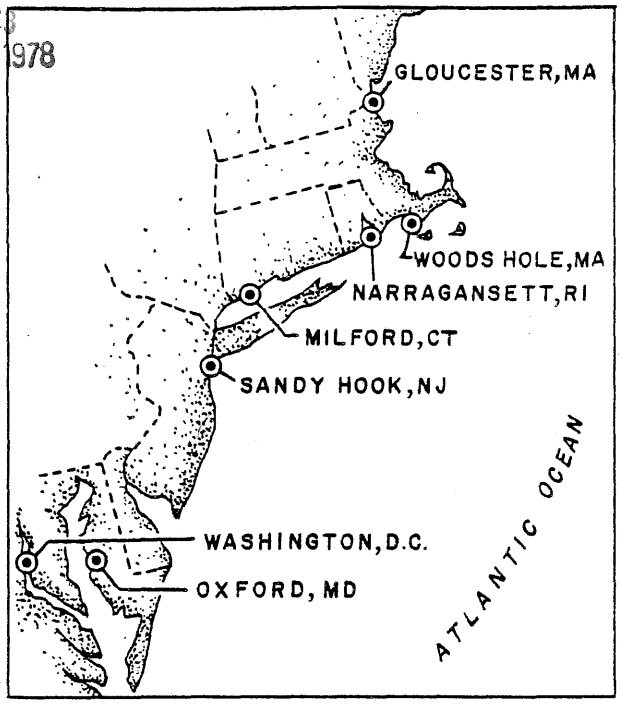
NEWS



MONTHLY NARRATIVE REPORT
DECEMBER 1977

Editor, Jon A. Gibson

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

RESOURCE ASSESSMENT DIVISION

Resource Surveys Investigation

The fourth leg (Gulf of Maine) of the autumn bottom trawl survey was completed on 5 December aboard the Delaware II (Henry Jensen, Chief Scientist). A special effort by the entire investigation permitted the completion and distribution of the Fishermen's Report before the Christmas-New Year holidays. The report was the most extensive since we began the series; important catches from 250 trawl stations were summarized.

In addition to the processing requirements of the large backlog of data collected during 1977, the investigation began preparing for 1978 cruises. Of immediate concern was the surf clam assessment cruise (Delaware II) and a special Atlantic herring survey (Albatross IV) both scheduled for January.

We continued the scheduled auditing of Sandy Hook Laboratory cruise data tapes as required in the interagency work agreement with the Bureau of Land Management.

Extra trawl stations, designed to increase the accuracy of our Atlantic cod assessments were made during a larval Atlantic herring cruise on Delaware II during December. Hillery Herring and Maureen Griffin participated.

Age and Growth Investigation

Two samples of Atlantic herring otoliths, aged by Louise Dery, were sent to Joe Hunt, St. Andrews Laboratory, Canada, for comparative aging. Purpose of the exchange is to standardize aging.

A small number of shells from ocean quahogs, sea scallops, and surf clams were stained with silver nitrate to see if it would enhance growth marks. No significant improvement occurred in scallop shells, but growth zones were clearly visible on the adductor muscle scar on ocean quahogs and the shell increments seemed to have been made more visible on ocean quahogs and surf clams. The shells will be sectioned when the shell cutter is operable.

Judy Penttila visited the St. Andrews Laboratory to discuss aging of Georges Bank Atlantic cod with Canadian age readers. Atlantic mackerel otoliths were also examined with very good agreement.

Sand lance otoliths were sectioned for Sarah Richards, Little Harbor Laboratory, Guilford, CT, to assist in aging this species.

The contract with Southestern Massachusetts University for aging scup, butterfish, and summer flounder continues with most of the time spent organizing an area at SMU and preparing samples for aging. Approximately 500 Atlantic herring have been aged under contract with the State of Maine at Boothbay Harbor and the data were sent to Woods Hole.

Sandy Hook Investigation

Processing data for the New Jersey creel census continued. The numbers of all species caught have been determined and estimation of weights was initiated for the last 9 mo of the survey.

Fishery Assessment Investigation

Steve Clark attended a meeting of the Northern Shrimp Section of the Atlantic States Marine Fisheries Commission held on 3 December in Portsmouth, NH. He also attended a northern shrimp research review held for biologists from Maine on 15 December in Boothbay Harbor, ME. At each of these meetings, Steve reviewed the stock assessment prepared in September by the Northern Shrimp State-Federal Scientific Committee. During the month biological material was prepared for use in a draft EIS/PMP for northern shrimp.

Emory Anderson attended public hearings on Atlantic mackerel and squid draft EIS/PMP's sponsored by the Mid-Atlantic Fishery Management Council on 7, 8, 9, and 14 December in Norfolk, VA; Ocean City, MD; Cape May, NJ; and Red Bank, NJ. Emory also attended the meeting on 13 December of the Mid-Atlantic Council's S&S Committee and the meeting on 14-15 December of the full Council, both held at the Sandy Hook Laboratory.

Frank Almeida completed work on a draft of biological sections of the New England Council's EIS/FMP for silver hake and has also been calculating von Bertalanffy growth equations for the three silver hake stocks using survey age/length data.

Emory Anderson has been working on drafts of assessment reports for silver hake and red hake stocks.

Other work has included data preparation and analysis for pollock and haddock assessments, and continued tabulation of Atlantic mackerel historical catch data and calculation of distant-water fleet Atlantic mackerel CPUE indices.

Fishery Analysis Investigation

During December 1977 the Fishery Analysis Investigation for the most part was finishing projects begun but delayed because of higher priority work. This was the case especially for those people in the group - Maureen Griffin, David Dodson, and Pamela Lanham - who completed their Coop assignments at Woods Hole as of 1 January 1977. Maureen and David went to sea during the latter part of the month but finished plotting Atlantic cod abundance index relationships between years for the Georges Bank and Gulf of Maine stocks. Pamela Lanham completed the biostatistics computer runs on yellowtail flounder and Paul Wood completed charting 20 yr of US sea scallop catches by 10′ square areas on Georges Bank, and 20 yr of Canadian catch data by 30′ square areas on Georges Bank.

Fred Serchuk and Steve Murawski developed a stratified random sample design for a surf clam cruise which will embark 4 January. Fred also participated in a sea-sampling program on the fishing vessel Tremont during 16-19 December.

Steve Murawski is working with Tom Azarovitz on a talk to be delivered

at the American Fisheries Society meeting at White Sulphur Springs, WV. The name of the talk will be "Evaluation of the Effects of the 1976 Fish Kill on the Fish Resources of New Jersey." Judy Brennan has been working on an update of the section on overfishing in the "Annual Report to Congress on Ocean Pollution, Overfishing, and Offshore Development."

Fred Serchuk attended the December New England Regional Fishery Management Council Meeting in early December.

Fisheries Systems Investigation

The primary activity was the National Pollutant Discharge Elimination System Adjudicatory Hearing dealing with the Hudson River Power Plant Case. The case involves a review of the biotic impact of once-through cooling systems of electrical power generating plants on the Hudson River. Hudson River power plants potentially adversely impact the entire river ecosystem including striped bass. Striped bass are the target of an intensive marine recreational fishery.

Northeast Fisheries Center staff have been reviewing thousands of pages of research documents and direct testimony by the utilities for more than a year. This activity has been coordinated by the Environmental Protection Agency. Other participants include the Oak Ridge National Laboratories, National Power Plant Team of the Fish and Wildlife Service and several prominent academicians. During December, several reviews of portions of the utilities direct testimony were completed. Michael Sissenwine spent approximately 3 wk in New York preparing cross-examination of the utilities case and acting as a scientific advisor to EPA lawyers during courtroom sessions.

Gordon Waring and Margaret McBride participated in the final leg of the autumn bottom trawl survey.

Anne Tibbetts-Lange completed a report on the November Argus squid survey cruise and began preparation for the ICNAF special meeting on squid which she will attend during February in Cuba.

Michael Sissenwine attended a public hearing on squid and Atlantic mackerel FMP's at Riverhead, Long Island, and he and Gordon Waring attended a New England Regional Fishery Management Council meeting on Atlantic herring FMP at Peabody, MA.

Manuscripts

Anderson, V. T., Jr. In press. Reversed summer flounder (Paralichthys dentatus L.) from the Middle Atlantic Bight. Bull. N.J. Acad. Sci. (A)

Anderson, E.D., and F. P. Almeida. 1977. Assessment of the southern New England-Middle Atlantic silver hake stock. NMFS, NEFC, Woods Hole Lab. Ref. No.77-30 (mimeo).

Murawski, S. 1977. An assessment of the butterfish, Pepulus triacanthus (Pech), off the Northwest Atlantic Coast. Woods Hole Lab. Ref. 77-29.

Serchuk, F., P. Wood, S. Clark, and B. Brown. 1977. Analysis of the Georges Bank and Gulf of Maine cod stocks. Woods Hole Lab. Ref. 77-24.

Serchuk, F., P. Wood, and B. Brown. 1977. Comparison of Mid-Atlantic sea scallop length-frequency distributions between 1977 and 1975 as determined from research vessel surveys and commercial landings. Woods Hole Lab. Ref. 77-27.

MARINE ECOSYSTEMS DIVISION

Larval Biochemistry and Physiology Investigation

Dr. Jan Beyer, Danish Institute of Fishery and Marine Research, spent 2 wk in Narragansett working with Dr. Laurence on stochastic models of larval fish survival. The first version of a model which computes the probability of survival based on prey-capture efficiency and growth between minimum and maximum empirical barriers has been completed and is computer operational. Further documentation and testing are in progress.

Experiments on larval summer flounder prey-capture efficiency and digestion rates have been completed, and the data are being analyzed. Results from a study of adult summer flounder serum indicate that sex determination of live fish may be possible for a period of several months prior to spawning using either electrophoresis or a test for alkali-labile phosphorous, provided blood samples are taken shortly after capture. A serum component tentatively identified as vitellogenin was observed in all females tested within 2 wk after capture. The component which was absent in males was not consistently detected in either males or females held in aquaria for periods longer than 2 wk. Weekly measurements of dry weight, protein content, and excretion rates of ammonia and primary amines of summer flounder larvae were completed. Adult Atlantic cod have been obtained and are being maintained to serve as spawning stock for anticipated larval studies.

Benthic Dynamics Investigation

Analyses of the quantitative distribution of New England macrobenthic invertebrate fauna were continued throughout the month. A report on the distribution of Hydrozoa was completed. Good progress was also made on the analysis of bivalve mollusk data off New England and the Middle Atlantic Bight.

The analysis of the food habits of juvenile haddock is in progress; much of the data have been sorted and listed and are currently being tabulated and evaluated. The preliminary analysis of the 1969-1972 Pleuronectiformes food-habits data base has been started. Ray Bowman completed the preparation for a

talk entitled: "Food Habits of Fish and Squid Found in the Vicinity of the Argo Merchant Oil Spill, August 1977," which will be presented at a meeting on the effects of the oil spill, to be held at the University of Rhode Island in January. The first draft of a paper on the same topic has been completed.

The draft of a short note reporting the occurrence of a rare adult mud shrimp, Naushonia crangonoides, was prepared by Richard Langton and Richard Brodeur.

Oceanography Investigation

Seagoing activities in December involved Tom Laughton and Dan Patanjo on the storm-crossed MARMAP cruise of Kelez. Tim Cain has continued analysis of salinities from the MARMAP cruises and, with Dan Patanjo's help, should be able to clean up the backlog before the 1978 series begins in February. Tim has also checked over the Niskin bottles used in those cruises and has sent off for repair those which could not be reconditioned in the laboratory. Surface and bottom temperature plots for the Argus MARMAP cruise have been prepared by Sam Nickerson. Sam Nickerson has also completed surface temperature and salinity plots for the 1977 autumn bottom trawl survey, so that the 1977 set of charts can be incorporated in the report he has been preparing for publication with Bob Pawlowski. The text of the report is being revised to cover 1972 through 1977. Bob Pawlowski, with the assistance of Ron Kirschner, has prepared the November report for the SOOP run across the Gulf of Maine. Ron Kirschner will be taking over the SOOP program when Bob Pawlowski returns to sea duty with NOS later this spring.

Red Wright and Ed Cohen have submitted an abstract for a presentation to be given at the annual meeting of the American Society of Limnology and Oceanography in June, on the relation of hydrography, nutrients, and productivity on Georges Bank based on the larval Atlantic herring cruises. Ron Kirschner has completed the sigma-t calculations for this project. Abstracts are also in preparation for the spring meetings of the American Geophysical Union, where we will report on the results of the Northeast Channel current-meter program. Two papers are planned, one on the measurements themselves by Steve Ramp (NEFC) and John Vermersch (WHOI); and one relating the measurements to the hydrography of the Gulf of Maine by Red Wright and Ron Schlitz. Ron Schlitz has also been working on the text to accompany the volumetric temperature/salinity charts for the Gulf of Maine, while Steve Ramp has produced an in-house memo on methods of producing variance-conserving spectra of current-meter data and has completed the documentation for the set of STD computer programs.

Clearing up the backlog of data with NODC continues. NODC has keypunched the hydrographic station backlog and we have been checking the printouts. The bottleneck at NODC in processing XBT data has apparently been broken and they are once again prepared to receive our traces. In the meantime, we have developed a new backlog of some 3,000 observations, which will be photocopied and submitted as soon as we can hire a high school student to do the work. Our files on sailing orders and cruise reports, and the books of reversing thermometer records and calibrations have also been straighted out and brought up to date.

Equipment and hardware have been ordered for the fourth current-meter

setting scheduled for March. Added to the list is a pressure sensor which will enable us to determine how much of the tidal frequency fluctuations we observe is caused by the instruments being dragged down into greater depths by the strong currents encountered. The transducer for activating and communicating with the mooring releases has been installed in a thru-hull fitting in Albatross IV which should vastly improve our ability to locate the equipment. Steve Ramp and John Vermersch have continued analysis of the first setting of current-meter data and have read the cassettes from the second setting, which appear to have given a good return of data. The third setting is still in the water, of course. Ron Kirschner has kept up to date transcribing wind data from weather maps.

Gil Dering has devoted much time to servicing instruments such as the thermosalinograph salinometers, STD, and electronic meter blocks. He has also designed and built a test unit for calibrating the readout units of the meter blocks and has been accumulating lists of equipment and prices for undertaking the maintenance and reconditioning of our own current meters.

Ecosystems Dynamics Investigation

Ed Cohen continued analysis of the nutrient and chlorophyll data for Georges Bank. An abstract of the paper, "Changes in the Plankton on Georges Bank in Relation to Physical and Chemical Environment during 1975-1976," was submitted and it is hoped the paper can be presented at the next annual meeting of the American Society of Limnology and Oceanography. Ed Cohen also prepared a report summarizing primary and secondary production studies at NEFC for use in future program planning.

Mike Pennington worked on two special projects in December. In the first he analyzed biomass indices for the zooplankton samples taken on the 1971-75 fall trawl surveys. Using various statistical methods he found that mean levels (displacement volumes or dry weights) were the same for all years except 1973 which was considerably higher than the other years. However, he also noted that the ratio of dry weight to displacement volume was very different in 1973 as compared to the other years which may indicate a different plankton composition that year. The second project (in conjunction with Ron Smolowitz) involved estimation of trawl selectivity as a function of mesh size. Ratio statistics were found to be the appropriate estimators for determining selectivity coefficients for each length class. Using this method, estimates can be made independently of covered-trawl experiments, and since the theory of ratio statistics is well developed, confidence limits can be readily computed.

On 7-8 December Marv Grosslein participated in the Scientific and Statistical Committee review of the Atlantic herring FMP development document prepared by the staff of the New England Regional Fishery Management Council. He also worked on FY1980 Task Development Plans.

Recruitment Processes

The major activity this month for the Recruitment Processes group was the larval Atlantic herring survey aboard Delaware II, 8-20 December 1977. The majority of standard stations (62) were sampled, but one important

transect on central Georges Bank was missed due to bad weather and the fact that 12 bottom trawl stations were added to the cruise plan. Low numbers of herring larvae (1-10 per haul) were collected in the Nantucket Shoals area and only an occasional larva was noted on Georges Bank. Production of larvae this season, 1977, appears to be low, but somewhat higher than the 1976 season, which was the lowest observed since the ICNAF larval herring survey began in 1971. George Bolz was chief scientist on the Delaware II cruise, and Andrew Rosenberg and Robert Halpin, Coop students, both served as watch chiefs.

A report was prepared for the division summarizing the available larval herring production estimates for the period 1968-1977; additional processing and analysis are underway to fill in gaps for some years and areas, and also will include back calculations of spawning biomass for comparison with VPA assessments. Greg Lough finalized plans for the fourth US-Canadian larval herring patch experiment planning meeting to be held in Woods Hole, 9 and 10 January 1978.

Ichthyoplankton Investigation

We conducted the second ichthyoplankton survey of FY1978 from 10 November to 14 December. Because of a siege of foul weather, accompanied by strong winds, we completed only 90 stations, or less than one-half of the 185 survey stations, plus four special stations near the site of the Argo Merchant oil spill in December 1976. No samples were collected in shelf and slope waters of the Middle Atlantic Bight from Long Island to Cape Hatteras. Preliminary observations indicate that fish eggs and larvae were scarce in samples collected in the Gulf of Maine and Georges Bank sectors.

All temperature data collected during semiannual surveys of the Middle Atlantic Bight from 1973 through 1976 have been formatted and forwarded to NODC for processing. Thus far, we are holding to the projected schedule of accomplishments for meeting contractual obligations to BLM.

Plankton Ecology Investigation

Jack Green has been attempting to calculate the food requirements of Atlantic herring stocks based on ICNAF estimates of stock size for Statistical Area 5Y. A preliminary estimate of 638×10^6 metric tons was calculated for 1976. This value is probably in excess due to the fact that data on food ration were available only for small size fish.

Plankton Sorting

Processing of spring cruises from 1972 to 1976 for Georges Bank continued during the month of December. These cruises had been selected for analysis of the ichthyoplankton data with special emphasis on the abundance of Ammodytes americanus. These data are being analyzed for trends in distribution and abundance which may indicate major shifts in the composition of the ichthyoplankton community. One hypothesis being tested suggests that commercially important species such as Atlantic herring are being replaced by less desirable, faster growing, shorter-lived species such as sand lance. Paul Carthas, a Northeastern student, has completed his cooperative

appointment. Paul worked with the Ichthyoplankton Sorting group at the Sandy Hook Laboratory before joining the Narragansett staff. Joe Kane participated in a 2-wk MARMAP survey aboard the R/V Kelez. A comparison of 0.253-mm and 0.333-mm mesh bongo net retention rates at towing speeds of 1.5 and 3.5 knots has been completed and the results of this analysis summarized by Jack Colton, Jack Green, Ruth Byron, and Jackie Frisella (Narragansett Laboratory Reference No. 77-11).

Biostatistics

Displacement volume and dry weight data from the 1971-75 spring-fall data base generated by the Plankton Sorting group at Narragansett is being analyzed for year-to-year variation. Mike Pennington in Woods Hole is assisting in the analysis. The URI Academic Computer Center was temporarily shut down during the last week of December for hardware conversion from an IBM 370 to an Itel AS-5 computer. Master station record data and zooplankton sample log data from R/V Anton Dohrn Cruise No. 77-03 and R/V Wieczno Cruise No. 77-06 are being processed by computer for use in the larval Atlantic herring study requested by the New England Regional Fishery Management Council. The plankton samples for these cruises are presently being sorted in Narragansett and Woods Hole. The ichthyoplankton data which had been processed previously by the Sandy Hook Laboratory personnel into the computer at Fort Monmouth were scheduled to be extracted and put on computer tape on 29 December. During January the data will be loaded into the URI computer for further processing. The 0.333-mm bongo samples from the Anton Dohrn (Cruise No. 77-03) MOCNESS cruise and neuston and 0.505-mm bongo samples from the Argus (Cruise No. 77-01) ecosystem monitoring cruise were archived at Davisville, RI. The 0.333-mm bongo samples from the Argus cruise are scheduled to be shipped to Poland for analysis at the Polish Sorting Center in Szczecin.

Apex Predators Investigation

Shark recaptures for December included a sand tiger, a silky, a night, and two blues. The night shark was at liberty for just over 5 mo and migrated 980 m off Miami, FL, to the coastal waters of Veracruz, Mexico. This is the second recovery of a tagged shark to demonstrate movement from the Atlantic into the Gulf of Mexico. A blue shark tagged south of Nantucket by cooperators from St. Georges School in Newport, RI, was recaptured after 3 mo near Havana, Cuba. This is a straight line distance of approximately 1,100 m and is the second recovery for this species from the Cuban coast bordering on the Florida Straits.

Preliminary tag and recapture summaries for 1977 showed a total of 3,679 sharks tagged and 137 recaptured for the year. This represents an increase of 59% in the number of fish tagged compared to 1976. The recapture rate of 3.7% was slightly higher this year and recoveries provided new information on both sharks and teleosts. The biannual newsletter summarizing results of the tagging program in more detail is in preparation and will be mailed to cooperating fishermen next month.

Meetings, Talks, Visitors, Publicity

On 1 and 2 December Ken Sherman attended a program review at EPA, Narragansett. Spencer Apollonio, Executive Director of New England Regional Fisheries Management Council, Peabody, MA, visited the Narragansett Laboratory to discuss the Marine Ecosystems Division's Investigations.

Jo Ann Macatier of the Lt. Governor's office, Newport, visited the Narragansett Laboratory to discuss the NEFC ichthyoplankton program.

On 5 December Martin Newman, Oxford Laboratory, NEFC, visited the staff at Narragansett to discuss the application of histopathology studies to larval fish mortality assessments.

On 6 December William E. Woodward, NOAA Office of Ocean Engineering, along with Barbara Pijanowski and Stanley Alper, NOAA Office of Marine Technology, visited our Narragansett Laboratory to review instrument development needs for MARMAP and Ocean Pulse.

On 8 December Donald Been and Patricia Russell of the American Institute of Biological Sciences visited the Laboratory in Narragansett for an overview of our program.

Ken Sherman participated in the National Science Foundation review in Washington, DC the 14th and 15th of December.

Ed Handy, Kay Paine (Woods Hole), and Raymond Tillery (Washington, DC, Fx2) discussed problems associated with the MIS wind-down on the 20th of December at the Narragansett Laboratory.

At the invitation of NWAFC, Anne Naplin is spending 2 wk in Seattle where she is assisting Gene Dunn with the identification of marine fish eggs.

A paper entitled, "The Argo Merchant Oil Spill and the Fisheries," was prepared by Ken Sherman and Donna Busch to be presented at the Argo Merchant Symposium to be held 11-13 January at the University of Rhode Island.

Manuscripts

Langton, R., K. C. Haines, and R. E. Lyon. 1977. Ammonia-nitrogen production by the bivalve mollusc Tapes japonica and its recovery by the red seaweed Hypnea musciformis in a tropical mariculture system. Helgolander wiss. Meeresunters. 30:217-229. (P)

MANNED UNDERSEA RESEARCH AND TECHNOLOGY PROGRAM

The MURT group continued processing and analysis of data from summer and fall cruises concerned with surf clam biology, hydroacoustics, sand lance behavior, contintental shelf canyon ecology, and Atlantic herring spawning ecology. Each of these studies had sampling objectives requiring diving or submersible technology. Cruise reports and manuscript reports of these activities are being developed along with manuscript reports of earlier studies.

Meetings

On 13 December Joe Uzmann and Ken Pecci attended a meeting of diver scientists at Charles Stark Draper Laboratory in Cambridge, MA, to help determine the detailed information inputs required for configuration of the laboratory spaces of NOAA's currently evolving Oceanlab.

During this period 12-20 December, Dick Cooper, in capacity as member of the NOAA Diving Safety Board, assisted with inspection, startup, and preliminary certification of NOAA's Hydrolab installation at Fairleigh Dickinson University, St. Croix, Virgin Islands.

DIVISION OF ENVIRONMENTAL ASSESSMENT

Behavior of Marine Fishes and Invertebrates Investigation

Data analysis of a completed series of experiments is continuing on the effects of elevated, sublethal temperature of spawning behavior of adult tautog, Tautoga onitis. In contrast with normal paired spawning observed within a two male-one female group at 20°C, as the temperature rose above 25°C certain components of the courtship repertoire were modified. These included participation in spawning by a subordinate male, increased prespawning stimulation by the dominant male towards the female and disruption in the typical progressive shading changes of the female. However, even as the temperature rose 5-7°C above normal, the fish continued to spawn each day. Recent analysis of egg development indicated that anomalies began to occur at 24-25°C. These included stunted embryos with deformed yolks which resulted in a significant decrease in hatching success. Although anomalies continued to occur in a small proportion of the samples after the temperature returned to 20°C, generally most embryos showed normal development after 4-5 days.

Biological Oceanography Investigation

Our Phytoplankton Baseline Survey (PBS) subtask is rapidly moving toward full effectiveness with the assignment of Ms. Christine Evans as subtask leader and the hiring and training of three temporary technicians. The subtask is designed to determine phytoplankton biomass distribution, abundance, composition (netplankton versus nannoplankton) and phsyiological state of health both horizontally and vertically in the waters of the continental shelf between Cape Hatteras and Nova Scotia using discrete chlorophyll a measurements taken throughout the year. The purposes are to: (1) look for repeating year-to-year patterns, (2) look for influence (impact) of river-estuarine inputs to shelf, (3) look for influence (impact) of man in discrete areas over the shelf, and (4) use the information to dissect the shelf area from Cape Hatteras to Nova Scotia into manageable units and guide our research. Ultimately we would like to be able to understand how the distribution and abundance of phytoplankton over the shelf is regulated, be able to predict its distribution and abundance, and relate these concentrations and distributions to higher trophic levels, including fish.

During the month, Joe Ruane participated in a MARMAP cruise on the NOAA Ship Kelez to collect chlorophyll samples in the New York Bight.

Unfortunately, due to adverse weather and limited ship time, sampling south of New Jersey was not possible. Chlorophyll analyses of samples collected onboard the USSR Ship Argus between Cape Hatteras and Nova Scotia were completed and analyses of samples from the NOAA Ship Mt. Mitchell in the Gulf of Maine were begun.

Biological Oceanography Investigation also is involved in working up the tremendous backlog of data generated from four Kelez cruises, two Albatross IV cruises, two Delaware II cruises, and one Advance II cruise. We are presently working on the chapter, "Maintenance of Hypoxic Conditions off the Coast of New Jersey during the Summer of 1976," for the NOAA-sponsored volume concerned with low dissolved oxygen conditions in the New York Bight in 1976 and 1977.

Coastal Ecosystems Investigation

We neared completion of three data reports on benthic studies sponsored by MESA. These reports are: (1) the results of five quarterly cruises conducted in 1973 and 1974; (2) an intensive study of the sewage sludge dumping ground, in 1975; and (3) a 1975 study of the outer continental shelf off New York-New Jersey. These reports will provide a good baseline for future Ocean Pulse monitoring. Work is continuing on processing samples collected during the second of two benthic monitoring cruises (made in 1975 and 1976) in the bight apex, and the preparation of a data report on results has been initiated. Progress is being made in summarizing benthic data from the apex to form an atlas on distribution of benthic invertebrates. These reports and atlases will be important in planning and implementation of Ocean Pulse research as well as in developing NMFS response protocol to be followed after major oil spills and other catastrophes occur.

We continued the workup of benthic macrofauna samples collected from the Baltimore Canyon Trough (BCT) on New Jersey's outer continental shelf in 1974. Data are being assembled into a report to the Bureau of Land Management (BLM) on benthic baselines for the BCT, and how they relate to future oil exploration and production impacts in that area. A quarterly report was sent to BLM, covering progress of the benthic as well as finfish ichthyoplankton, and pathobiology tasks which BLM is sponsoring.

We also made preparations to utilize the NOAA Ship Researcher in April as part of the operational test phase (OTP) for Ocean Pulse. We answered a request from Dr. Michael Norton of England's Ministry of Agriculture, Fish, and Food, for information on benthic impacts of dredge spoil disposal.

Coastal Monitoring, Assessment and Prediction Investigation (COMAP)

Fred Lux attended a meeting of the New England Fishery Development Program task force on 16 December at Portsmouth, NH, as NEFC coordinator for this program. Current task force programs include contracts for mussel harvesting technology and a study of New England fish processing capacity.

There were a few reports of strandings of shortfin squid (Illex illecebrosus) in Cape Cod Bay in November and December 1977. These strandings were very light compared with the extremely heavy ones of fall 1976.

Telephone discussions were held by George Kelly with Leigh Bridges of the Massachusetts Division of Marine Fisheries and John Cookson of the

Regional State-Federal Office regarding the Massachusetts proposal for a "Coastwide Fishery Resource Assessment Program." George Kelly attended a meeting of the Pilgrim Power Plant Technical Advisory Committee on 20 December at the Boston Edison office in Boston. Kelly also attended a meeting of the Center Awards Committee on 1 December at Woods Hole.

Environmental Chemistry Investigation

Most of the month was spent on either collecting dredge spoils samples or analyzing plankton samples under our contractual work to MESA.

We also analyzed some plankton from a contract study by NOS on DWD 106. We obtained some very high metal concentrations in a couple of the samples but unfortunately, the duplicate results on the samples disagreed significantly and there was not sufficient sample left to repeat the analyses.

Physiological Effects of Pollutant Stress Investigation (PEPS)

Physioecology

A second experiment to determine the effects of copper on Macoma balthica was completed and the results are being analyzed. These clams were exposed to 0, 20, and 100 ppb Cu for 96 hr and then transferred to clean water (without copper addition) for 72 hr. Like the first study, no clams died during the exposure phase, but several of those exposed to the highest concentration (200 ppb in the first experiment and 100 ppb in the second) died after 72 hr in clean water. Respiratory data analyses indicated no difference between controls and the 20- or 100-ppb exposed group at the end of 96 hr of exposure or 72 hr depuration. Analyses for copper uptake in whole body tissues will be performed at a later date.

Three diluters were set up this month with winter flounder, Pseudopleuronectes americanus, for exposure to sublethal levels of cadmium chloride as a test pollutant. These fish will be exposed for 60 days with subsequent recovery periods in clean water of 15 and 60 days. After each test period, they will be removed and examined for physiological and biochemical changes.

Also, three diluters were set up with juvenile striped bass for exposure to mercuric chloride at sublethal levels. These bass will be exposed for 60 days with subsequent recovery periods of 15 and 60 days for hematological and physiological testing.

Physiological Effects

Our studies on the effects of arsenic on bivalves are continuing. Recent data have shown that 5 ppm arsenic as $NaAsO_2$ cause a significant elevation in gill-tissue oxygen consumption in soft-shelled clams (Mya arenaria) held at 15 ppt salinity. Concentrations below 5 ppm did not alter respiration. Similar tests with blue mussels (Mytilus edulis) resulted in elevated oxygen consumption at 7.5 ppm arsenic. Concentrations below that value had no effect.

A considerable part of this reporting period was spent preparing a

presentation and manuscript for the symposium, "In the Wake of the Argo Merchant," to be held 11-13 January at the University of Rhode Island. We will present some of our physiological and biochemical findings on teleosts and bivalves collected from the spill area.

The balance of the month was spent on manuscripts and various activities associated with the move to our new laboratory.

Biochemical Effects

Scallops (Placopecten magellanicus) frozen whole during the Wieczno cruise of March 1977 were thawed just enough for excision of the adductor muscle, and were then packaged and refrozen; these tissues were subsequently tested for MDH, LDH, and PK. The data are now being calculated.

Al Beck and Grace Klein-MacPhee, of the EPA Culture Unit at Narragansett, RI, have generously furnished us with ample fresh gonad material from both male and female winter flounder (Pseudopleuronectes americanus) for exploratory work. With these, we are currently working out methods that we hope will detect possible changes in metalloenzyme ligand affinities, all for use with gonads to be obtained from the flounder-cadmium recovery experiments, scheduled for takedown from late January through late March 1978.

Considerable time was spent in manuscript preparation. A first draft of a joint paper with the Physiological Effects subtask on our Argo Merchant oil-spill work was completed for the "In the Wake of the Argo Merchant" symposium, to be held at URI in January.

A second paper to be given at the forthcoming AAAS meeting is also in preparation.

Anaerobic Bacteriology/Metabolism

Bottom sediments from five stations (New York Bight - New Jersey area) were obtained by the personnel of the Environmental Chemistry Investigation aboard the R/V Johnson for enumeration and procedure evaluation for clostridial and anaerobic counts. Work continues on preparation of manuscripts based on past research concerned with bacteria and ocean dumping.

Meetings, Talks, Visitors Publicity

Dr. C. Ladd Prosser, University of Illinois, and visiting professor at the University of Massachusetts at Amherst, visited with Dr. Fred Thurberg, Milford Laboratory, on 19 November. They toured the laboratory and discussed mutual research interests.

Bori L. Olla presented a review of work in progress within the Behavior Investigation on chemoreception in Dungeness and blue crabs at the program review of research supported by the NOAA Outer Continental Shelf Environmental Assessment Program held in Seattle, 29 November-2 December. He also gave a seminar on current research in the investigation at Oregon State University, Marine Science Center, Newport, OR.

Dr. John Graikoski attended the meeting of the Northeast Shellfish Sanitation Association in Hartford on 30 November and 1 December. This meeting was held in conjunction with the New England Food and Drug Officials

Association meeting, since there is consideration for these two groups to merge. Some topics of discussion during the meeting included: seed oysters entering commercial channels, practical action levels of PSP in shellfish, opening and certification of New York waters to shellfish harvesting, and the Bauman report. Mr. David Clem gave an update on the Tenth National Shellfish Safety Workshop.

Dr. John Graikoski consulted with Mr. W. Wilson of the Institute of Anguilliform Research, University of Bridgeport, on eel mortalities in their holding system. Several bacterial isolates, including a strict anaerobe, were obtained from morbid eels.

Frank Steimle met with Paul Eisen (MESA New York Bight Project), Tony Pacheco, and Dr. Carl Sindermann on 6 December to discuss the availability of benthic data concerning the New York Bight. The existing data sets were reviewed and plans made to provide MESA with those data sets which are available.

Dr. Pearce met with principal research supervisors at the EPA Environmental Research Laboratory, Narragansett, RI, on 6 December to plan for a workshop in early January. This workshop will consider the ways in which research personnel of the NEFC and EPA Laboratory can cooperate, especially in terms of the developing Ocean Pulse program. It was agreed that the workshop would be held 10-11 January 1978 at the EPA facility. It was further agreed that representatives from all major research tasks within the Center would participate in the workshop.

On 8 December, Frank Steimle met with John Pearce and Carl Sindermann to review and revise the Ocean Pulse Program Development Plan.

On 9 December Bob Reid attended a meeting of the American Geophypsical Union in San Francisco, where he presented a paper on physical, chemical, and biological impacts of spoil disposal at the New London (CT) dredging and spoiling sites.

Dr. John Pearce met with the Scientific and Statistical Committee, Mid-Atlantic Fishery Management Council, on 13 December at Sandy Hook Laboratory. On the same day he also gave a presentation concerned with the implementation of the Ocean Pulse program to the regional representatives of the Environmental Assessment Branch, NMFS.

On 14-15 December the Mid-Atlantic Fishery Management Council met at Sandy Hook Laboratory for their monthly meetings. The meetings were held in the Nelson Benedict Conference Room which provided more than adequate space for these public sessions.

Dr. Pearce met with the Center Directorate on 14-15 December to review the current PDP for the Ocean Pulse program. Several suggestions were made, particularly in regard to the event logic diagram. Based on input from this Center review the PDP was revised and the event logic diagram redeveloped and printed commercially. Copies of the Ocean Pulse PDP have been forwarded to Washington for review. Early comments have already been received from the Washington Environmental Assessment Division office and these are being considered for future revisions in the planning document.

Several meetings have been held with Division of Environmental Assessment research personnel in order to plan the upcoming operational test phase (OTP) Ocean Pulse cruise aboard the Researcher. Planning for this unique cruise will allow several research disciplines to participate

simultaneously aboard the vessel.

Douglas Wenzloff and Vincent Zdanowicz attended the Eastern Analytical Symposium in New York City.

Manuscripts

Dawson, M. A., E. Gould, F. P. Thurberg, and A. Calabrese. 1977. Physiological response of juvenile striped bass, Morone saxatilus, to low levels of cadmium and mercury. Ches. Sci. 18: 353-359. (P)

Dudley, S., J. A. Babinchak, and J. T. Graikoski. 1977. Enumeration and distribution of bacterial populations of Long Island Sound. Mar. Pollut. Bull. 8: 285-287. (P)

MacKenzie, Jr., C. 1977. Predation on hard clam (Mercenaria mercenaria) populations. Trans. Am. Fish. Soc. 106: 530-537. (P)

Nelson, D. A., A. Calabrese, and J. R. MacInnes. 1977. Mercury stress on juvenile bay scallops, Argopecten irradians, under various salinity-temperature regimes. Mar. Biol. 43: 293-297. (P)

Nitkowski, M. S., S. Dudley, and J. T. Graikoski. 1977. Identification and characterization of lipolytic and proteolytic bacteria isolated from marine sediments. Mar. Pollut. Bull. 8: 276-279. (P)

Pearce, J. B. 1977. The importance of fisheries research in understanding marine ecosystems. Proceedings of the Symposium on Coastal Recreation Resources in an Urbanizing Environment, 12-14 April 1976, Hyannis, MA, pp. 41-45. (P)

Dawson, M. A. Hematological effects of long-term mercury exposure and subsequent periods of recovery upon the winter flounder, Pseudopleuronectes americanus. Proceedings of the Symposium on Marine Pollution on Functional Response. (S)

O'Reilly, J. E., and J. P. Thomas. The measurement and contribution of phytoplankton-released dissolved organic matter to total primary productivity in estuarine and coastal waters of the New York Bight, U.S.A. Abstract. Amer. Soc. Limnol. Oceanogr., 41st Ann. Mtg., Victoria, British Columbia, 19-22 June 1978. (S)

Thomas, J. P., J. E. O'Reilly, and C. N. Robertson. Total plankton respiration in the coastal waters of the New York Bight, U.S.A. Abstract. Amer. Soc. Limnol. Oceanogr., 41st Ann. Mtg., Victoria, British Columbia, 19-22 June 1978. (S)

Thurberg, F. P., and R. O. Goodlet. Low dissolved oxygen concentrations and surf clams - a laboratory study. NOAA Professional Paper on Anoxia. (S)

AQUACULTURE DIVISION

Spawning and Rearing of Mollusks Investigation

A study of the feeding requirements of juvenile surf clams has been undertaken. Five groups of clams have been fed different concentrations of algal cells. The best growth rate at 22°C over a 2-wk period was attained at an algal concentration of 400,000 cells per milliliter in 6 liters, fed once daily. An experiment testing continuous vs. discontinuous feeding has revealed that the clearing rate is greatly reduced in clams maintained in a medium with constant food level. Further work is planned to determine the effect of continuous vs. discontinous feeding on growth.

The final successful spawning of surf clams held at 10°C since June 1977 was effected on 7 December 1977. Many of the larvae were abnormal and heavy mortality occurred during the first week of culture. Several thousand surviving larvae were raised to metamorphosis and are currently several millimeters in length and growing in heated seawater with the addition of cultured algae.

Earlier experiments on factors influencing the well-being of oyster larvae, Crassostrea virginica, in culture showed that mortality of the larvae during their development was almost always much higher in 1-liter cultures than in 15-liter cultures. Growth was also usually slower in the 1-liter cultures. These experiments suggested that there may be a minimum culture volume for best survival and growth of the larvae below which the larvae are adversely affected. Recent experiments demonstrated that the volume is probably below 7.5 liters because no difference in mortality or growth was found between larvae reared in 7.5-liter and 15-liter volumes.

A sand filter has been employed in devising a system to induce gametogenesis in bivalves out of their normal cycle. Sand-filtered seawater heated to 15°C and mass-cultured algae are supplied to adult surf clams, Spisula solidissima, in a once-through flowing system. In previous unsuccessful attempts to condition Spisula, heavy siltation of the culture trays seemed to create an unhealthy environment with much mortality. The survival rate in the new sand filter system has been 100% during the last month.

Aspects of Nutritional Requirements of Mollusks Investigation

Species that we have been culturing in a reduced-nutrient-concentration medium in test tubes or small flasks were subcultured into larger volumes, i.e., 1500 cc, to determine if the more economical medium would also support good densities in larger culture volumes. Reducing the concentration of vitamin B_{12} to 50%, 25%, and 12% of that normally used in the growth medium had no significant effect on the maximum densities produced by Phaeodactylum tricornutum, Isochrysis galbana, Isochrysis paradoxica, Monochrysis lutheri, and Tetraselmis maculata.

Subcultures of our strains in the stock culture collection have proceeded on schedule. We have recently noted that certain diatoms in the collection have not yielded high densities and appear to need frequent subculturing. Therefore, we conducted some experiments in which the pH was varied over a small range (pH 7.0-8.5) to determine if a change in our normal media (pH 8) could correct the problem. Unfortunately, the results are not definitive since the lower pH values were considerably altered after sterilization of the medium. Nevertheless, we observed that of the 17 strains tested, about 8 of them seemed to be slightly improved in the medium with lowest pH.

Two students have entered on their tour of duty; Mr. Barry Stein of Northeastern University and Mr. Brian Kershner of Central Connecticut State College. These students are receiving training in algal mass culture work. Mr. Gary Wikfors, a graduate student of the University of Bridgeport, has accepted a part-time temporary appointment as a research assistant in this investigation.

Aquacultural Genetics Investigation

Mutagenics

Cytological, Cytogenetic, and Embryological Development of Atlantic Mackerel Eggs Over the New York Bight-MESA Contract

Annandale 1977 stations, like Westward 1974 stations, show different profiles for mackerel egg parameters analyzed. Variation in egg characteristics, as measured cytologically, may in fact be as marked a station characteristic in the bight as species composition or any other station characteristic. A northeast peripheral station and the Sandy Hook-Rockaway Inlet station remain, as further analyses of several development stages are made, as extremes in terms of egg viability. Also prominent are the marked differences in egg moribundity or viability between the neuston- and bongo-sampled eggs of Station 24 to the south and east of the bight apex. The bongo sample contained eggs with embryos just about all dead or moribund; the neuston-sampled eggs had embryos in active chromosome division and cells in sharply contrasting better development. Few mackerel eggs were present in the neuston sample and were all at early division stages; those of the bongo sample were far more numerous and had both early and later development stages.

Station differences in mackerel egg moribundity, as observed

cytologically or projected on the basis of the embryo's chromosomes and mitoses, do not appear to be related simply to the physical parameters measured. Synergisms between natural variables and contaminants may, however, be important factors.

The Atlantic Resource Assessment Group has assumed responsibility for the physical oceanographic measurements made in conjunction with these mackerel egg studies. Bight waters at the time the Annandale 1977 cruise collected mackerel eggs were colder than a prior 20-yr average. This may have been a contributing factor to the presence over the entire bight of a sizeable incidence of abnormal double-invaginating gastrular embryos and their absence in 1974 when temperatures were substantially warmer. Although commercial fish hatcheries have observed such, particularly in trout eggs, they have not been able to link its occurrence to temperature. Rather, it appears in trout to be related to genetic defects carried in overly inbred cultured strains. Abnormal mackerel gastrulae do not appear to be more common at sample stations with coolest water. Synergisms may be a contributing factor. Since station numbers were rather low to allow time for heavy sampling for egg and water chemistry, this matter of the seemingly random occurrence of twinning mackerel embryos in May 1977 may not be resolvable.

Cytological, Cytogenetic, and Embryological Studies of the Effects of Dumping at DWD 106 on Fish Eggs - National Ocean Survey Contract

Plankton samples collected at DWD 106 last July were not adequate in terms of the numbers of fish eggs sampled and their presence in control and out-of-plume samples for definitive statements to be made with regard to the effects of dumps on fish eggs at the water surface. However, samples did indicate some obvious trends consistent for three different egg species, all developing in surface waters and over five of the early development stages of the fish eggs, from spawning to the tail-bud stage. Sewage sludge and acid waste alike may be quite toxic to earliest stage eggs present in the waste plumes, as evidenced by severe cytotoxic-like effects on the chromosome and mitotic apparatus of the dividing embryos. Sewage sludge may be less toxic to the later stages of the still early development period than the acid-iron waste. The acid-iron waste itself seems to have a diminished effect on these later stages but one still demonstrable. Also, embryo malformations appear likewise to be higher at these later stages in the acid-iron plume than in the sludge plume or at a control station.

The decided advantage of being able to sample in an identified waste plume lessens the need for extensive sampling and station analyses over an entire area of equivocal spotty contamination, and makes easier final interpretation of field data on fish eggs. However, sample inadequacies resulted largely from inadequate out-of-plume samples, once the dump was made, and too few comparison samples prior to the dumps, a situation caused seemingly by the necessity of keeping track of the plume.

S. Stiles and E. Losee attended the World Mariculture Society meeting in Atlanta and made presentations. E. Losee talked on the hereditary aspect of growth rate in oyster larvae and juveniles. S. Stiles gave a demonstration of the studies being conducted on hybridization and inbreeding. Papers will be

published in the Proceedings of the World Mariculture Society. At this meeting a limited number of preprints was distributed of the National Academy Report, Aquaculture in the US, to which A. Longwell contributed as a member of the Committee on Science and Technology advising on genetics.

Manuscripts

Longwell, A. 1977. A genetic look at fish eggs and oil. Oceanus 20:46-58.

PATHOBIOLOGY DIVISION

Comparative Pathobiology Investigation

Diagnostic services were provided for state agencies and private enterprise in Connecticut, Rhode Island, and Maine. Minchinia sp. parasites were observed in oysters, Crassostrea virginica, from these three states. Individuals concerned were informed of the risks involved in transplanting oysters containing serious oyster pathogens. Considerable time was spent teaching molluscan pathology to Ms. Pil Ae Kang of the Republic of Korea. Ms. Kang will be at the Oxford Laboratory for several months. A new fixative for molluscan tissues has been developed. The fixative contains glutaraldehyde, formalin, phosphate buffer, and seawater. The fixative provides superior fixation of paraffin-embedded tissues, good fixation for ultrastructural cytology, and ease of preparation. Fixed tissues can be stained in a variety of ways and can be stored indefinitely without loss of ultrastructural integrity. The preliminary draft of the monograph on the normal histology of the blue crab, Callinectes sapidus, has been completed. To date, 80 pages have been typed in clean copy -- approximately one-fourth of the entire monograph. Revisions and additions based on the examination of specially-stained slides have been included in the completed draft. Revisions and additions based on the examination of thin-sections prepared for transmission electron microscopy will be included shortly. A procedure used to demonstrate ferric iron on tissue sections has shown that this metal is present in several locations in the blue crab. Excess iron is apparently excreted into parts of the new cuticle when it is developing in premolt crabs. More surprising was the presence of considerable amounts of iron in the reserve cells, which store various materials, including hemocyanin. In some crustaceans these cells have been found to absorb various dyes, colloidal, and otherwise. Thus, they have been thought, perhaps, to have an excretory as well as a reserve function. Storage excretion of iron may be taking place in the reserve cells. It would be of interest to study effects of physiological distress on the reserve cells at the ultrastructural level, since abnormal and/or excess materials produced during disease might be stored by reserve cells as well as being excreted by more usual means. Tissue sections from diseased menhaden from Chesapeake Bay recently were compared with sections taken by Dr.Richard Wolke from diseased menhaden in Narragansett Bay, RI. Although fish from both areas exhibited the typical behavior of moribund "spinning" or "whirling" menhaden, the observed tissue lesions differed markedly. This may indicate that the frequently observed mortalities of this species probably have different etiologies.

Summer flounder, Paralichthys dentatus, larvae have been fixed for study of the enigmatic "rodlet" cell. Much has been published on the distribution of this cell in tissues of individual fish and in different fishes. There is much speculation on its origin and function. This probably is the first attempt to establish the presence of "rodlet" cells in recently-hatched fish. During the month, the histology laboratory sectioned 1,641 blocks and stained 1,442 slides from a large variety of marine fishes, crustaceans, and mollusks.

Disease and Environmental Stress Investigation

Weather conditions seriously limited the number of fin rot surveillance cruises in December. No cruises were made in Sandy Hook/Raritan Bay. Two cruises were made in the New York Bight apex (8 and 16 December) and one in Great Bay, New Jersey (14 December). In all, 121 winter flounder, Pseudopleuronectes americanus, were examined for fin rot disease, 3 (2.4%) had fin rot. Of 500 red hake examined, 100 (20%) had somatic epidermal ulcers of unknown etiology. Several hake with these hemorrhagic ulcers will be examined microscopically. Transmission and scanning electron microscope observations of winter flounder with laboratory-induced fin rot are being reviewed. In some fish exposed to 0.015 ppm of NaF (no longer than 24 hr), the fin tissues show marked degeneration and sloughing. Some changes resemble those observed in fish collected from areas in which fin rot disease is prevalent. Extensive cell separation (acantholysis) is apparent in the basal region of the skin. A modification has been made to standard bacterial diagnostic media which permits growth of the bacterium isolated from kidney tissue of moribund Long Island Sound striped bass. Addition of a small amount of agar to produce a semi-solid medium allows a good growth of the organism. The agar reduces oxygen diffusion to the medium; the organisms appear to be microaerophilic.

In preparation for "Ocean Pulse" activities, sediment samples from 25-50 m offshore of the Long Island Coast were cultured for marine amoebae. The collections were made on board the NOAA vessel Kelez at stations which ranged from 84 to 300 ft deep. Eleven genera of amoebae were grown and identified: Paramoeba, Mayorella, Vexillifera, Triaenamoeba, Flabellula, Platyamoeba, Clydonella, Hyalodiscus, Unda, Stygamoeba, and Rhizamoeba. Several unidentified small heliozoans and limax-type amoebae also were recovered from the sea bottom. Eight of the 11 genera were recovered at the 300-ft station, and all of them previously were found in surface water from Chincoteague Bay, VA. In marked contrast, only four genera were found among 15 sediment samples collected in the Gulf of Mexico. The four genera were: Acanthamoeba, Paramoeba, Clydonella, and Platyamoeba. Paramoeba eilhardi, the type species of the genus Paramoeba, was found for the first time in US waters in our studies. Information on the diversity and species composition of amoebae of marine sediments is being gathered in order to provide previously unknown historical data on their occurrence in the benthos.

Aquaculture - Control of Larval Disease Investigation

Cell-wall antigens from another bacterial pathogen of oyster larvae (LIOF-4) have been prepared by sonic disruption of the organisms, differential centrifugation and sucrose density gradient centrifugation. The antigens will

be used to prepare fluorescent antibody reagents for rapid identification of suspect organisms. LIOF-4 is a Vibrio species which caused heavy mortalities of oyster larvae at Long Island Oyster Farms in 1976. Earlier bacteriological studies of ultraviolet light-treated seawater suggested that the Aquafine UV unit was capable of effecting a total kill of the tested bacterial pathogens when the seawater flow rate through the unit was 4 ℓ/min. Recent studies, however, indicate that this is not the case. These studies reveal that some cells are able to repair their damaged DNA and start multiplying within 24 hr. Characterization of bacteria isolated 24 hr after UV treatment is in progress to determine whether or not mutation occurred frequently due to ultraviolet irradiation.

Standard coliform tests of some surf clams, Spisula solidissima, which were held in Milford and Rhode Island seawater during a trial depuration test were completed. Clams held in Milford exceeded the NSSP standard for coliforms by 260 per 100 grams of sample. Rhode Island clams showed values of 20 coliforms per 100 grams meats which are within the range of acceptability for harvestable shellfish. Total plate counts for Milford clams were $1.6X10^4$/gram and for Rhode Island clams $4.2X10^4$/grams. Both counts were also within NSSP standards ($5X10^5$/gram).

Meetings, Talks, Visitors, Publicity

Dr. Rosenfield attended the Toxic Substances Control Conference in Washington, DC, on 8 December. Dr. Rosenfield, Ms. Sharen MacLean, and Mr. Jay Lewis attended a meeting of the Helminthological Society at Beltsville, MD, 9 December. Dr. Rosenfield traveled to Crisfield, MD, to meet with personnel of the NMFS Food and Technical Services on 31 December.

Dr. Murchelano discussed BLM ADP at Sandy Hook, NJ, on 9 December.

Dr. Blogoslawski and Mr. Robohm attended a joint meeting of New England Food and Drug Officials Association (NEFDOA) and the Northeast Shellfish Sanitation Association (NESSA) in Hartford, CT, 30 November-2 December. Dr. Blogoslawski presented an overview of Aquaculture and Pathobiology research programs to attendees of the NESSA section.

Ms. Pil Ae Kang, Korea, arrived at Oxford Laboratory 5 December. She is on temporary assignment from the Korean Fisheries Research and Development Agency to study molluscan pathology. She will be studying here and at some of the other NMFS laboratories for approximately 5 mo.

Mr. Michael Corbett, Supervisory Mechanical Engineer, Gloucester Laboratory, visited the Oxford Laboratory 12 and 13 December. He inspected the physical plant and advised Dr. Rosenfield and Mr. O'Connell concerning improvements that could be made and how to accomplish them. Dr. Peter Wagner, University of Maryland, Horn Point Center, met with Dr. Rosenfield to discuss a proposed student work experience program the State of Maryland is promoting. Other visitors included Mr. John Hackney, Georgetown University, Department of Biology, Dr. William Hargis, VIMS, and Mr. John Hainsler, a student interested in oceanography, who toured the laboratory.

Manuscripts

Bovee, E. F., and T. Sawyer. Key to the marine amoebae. (A)

MacLean, S., and C. Ruddell. In Press. Hematadinium. J. Parasitol. (A)

Blogoslawski, W. Bacterial disinfection in shellfish hatchery disease control. A paper to be presented at the World Mariculture Society meeting, 2-6 January. (A)

RESOURCE UTILIZATION DIVISION

Resources Development and Improvement Investigations

Fisheries Engineering

Design of a small beam trawl for inshore dragging and juvenile sampling is complete and construction of a prototype is underway.

Specifications and a sketch of a small net reel are in progress. Assistance is being provided to a boat owner and the net reel manufacturer in tailoring the reel to the vessel and adapting it to the existing hydraulic system.

Some of our film footage on lobster behavior in and around pots has been shown by Arnie Carr of the State of Massachusetts to interested groups. He has come back with a number of suggestions for developing the footage into an informational film.

Facilities Engineering

Activities in supplying facilities engineering to the Center included: supervision of the second-floor addition to the Gloucester State Fish Pier building; assistance to the Oxford Laboratory on a number of facility problems - air conditioning, electrical systems, leaking windows, and space utilization; investigation into the delayed installation of the new rear entry for the Woods Hole Laboratory; and a meeting at Woods Hole with the architectural firm preparing major renovation plans for the White House.

Squid Skinning and Eviscerating Machine

The design of fixtures to process squid has a great deal of emphasis on maintaining the squid under control at all times. In the skinning operation, the squid rides on the carrier belt and is forced under a smooth plate with a cross slot in it. The rotating whips are mounted directly above this slot and miss touching the metal by a small fraction of an inch. When the squid passes under the slot, the flesh bulges up and the whips strip off the skin on top. This concept is being tested.

The squid could then run under a hold-down belt which carries it around a pulley so that it emerges with the unskinned side of the mantle now upward and ready to be skinned with a second set of whips.

Other fixtures that are in the design stage are an orientor for turning the squid so that the tail fins are located for removal, and an air powered set of knives which will cut loose the fins from the mantle.

Primary Fish Sorter

In checking out the operation of the Primary Fish Sorter, we found that a large number of fish were getting hung up in the outlet gates of the inner and outer drums. This condition is untenable, so we have designed a device to clear the fish out of the gates in one revolution. The testing of grading and sorting performance is continuing.

Crab Species Identification

The isoelectric focusing technique (IEF) was tested on various samples of canned crab meat with very interesting results. A sample of pasteurized crab meat, product of Mexico, had the identical focusing pattern as a known sample of blue crab (*Callinectes sapidus*). A Japanese brand of Dungeness crab (*Cancer magister*) tested against a known sample of European edible crab (*Cancer pagurus*) presented the same problem experienced with rock (*Cancer irroratus*) and Jonah (*Cancer borealis*) crabs. The prominent bands and the ones that are very reproducible from plate to plate are identical. Species differences are only apparent with proteins that are present in minute amounts. Depending on operating conditions, these proteins may or may not appear on every plate indicating that identification among closely related species may not be possible using the technique. We also tested two samples of crab meat produced in Formosa. One sample was labeled "crabmeat" and indicated no particular species except for a picture of a swimming (Portunid) crab on the label. The second sample stated "Formosan crab" and a picture of a snow crab on the label. A visual examination indicated that the meats were similar and were not snow crab. The IEF technique also indicated that the samples were similar and neither snow crab nor blue crab. This looks like a case of gross misrepresentation and consumer deception.

Utilization of Small Surf Clams

In cooperation with the Milford Laboratory, meat recovery and organoleptic analyses were conducted on cultured surf clams. These clams averaged about 30 grams in weight and were from 44 to 66 mm in length. Meat recovery (drained weight, after washing) was about 24 percent. The meats were organoleptically tested raw on the half shell, steamed, and fried. In all cases, the panelists judged the products highly acceptable.

Product Quality, Safety, and Standards Investigation

Product Safety

The formation of N-nitrosamines from the interaction of nitrite and secondary and tertiary amines is well documented, and their presence in various fishery products has been detected and confirmed in this laboratory

and elsewhere. The carcinogenic properties of volatile N-nitrosamines have been established; and, consequently, it is important to ensure that the concentration present in fishery products is below a level which is hazardous to man. Animal studies are in progress elsewhere to determine the effects of low concentrations of nitrosamines in the diet and to identify, if possible, guidelines for maximum permissible levels.

As the analytical method for traces of nitrosamines in food is time consuming and sophisticated, the number of samples which can be analyzed is limited. Therefore, while we are aiming for an overall assessment, it has been necessary to concentrate our efforts on commercially important species of smoked fish which have variable contents of nitrite (0 - 200 ppm) and amine and which could by interaction give rise to nitrosamines.

Over 70 samples of cold-smoked king salmon (red and white) have been examined for the presence of volatile N-nitrosamines. These samples had been brined with various concentrations of nitrite and chloride. They were then smoked at 85°F for 18 hr, vacuum packed, and stored at 34°F for 21 days. The nitrite, chloride, and percent water-phase salt concentration were also determined in each of these samples. The most frequently occurring nitrosamine was N-nitrosodimethylamine at a concentration of less than 5 parts per billion. Its presence will be confirmed using high resolution gc-mass spectrometry.

In instances where a nitrosamine is suspected, recovery values are adjusted by fortifying the cold-smoked salmon at the appropriate level.

Product Quality

Whiting blocks made from either minced flesh or intact fillets were still judged as acceptable in flavor and texture after two and one-half year's storage at -5°F. The fillet blocks were rated higher than the minced blocks. This demonstrates that with proper temperature control, stabilization of whiting blocks can be achieved. However, the attitude of industry people is that strict temperature control is not feasible throughout the various channels of distribution; and, therefore, some other method of stabilization, such as use of chemical additives, will have to be developed.

Experiments utilizing ultrafiltration to purify the dimethylamine-formaldehyde-forming enzyme from whiting liver are being repeated. A new assay procedure for the enzyme has been worked out which is subject to fewer interferences than previously published methods.

Product Standardization

A rule-making notice on the general fillet grade standard was drafted and sent to F22. This notice describes our resolution of several comments received from consumers, consumer organizations, and industry groups as a result of publishing a proposed rule-making notice in the Federal Register recently.

A unified shrimp standard covering all forms of shrimp except breaded shrimp has been prepared and will be sent to Regional Supervisory Chiefs for review and comments before being reviewed by industry and consumer groups. It represents a new approach in standards development, being based upon the

attributes concept rather than a scoring system. This concept, based upon sound statistical principles, provides a greater degree of reliability for acceptance or rejection with respect to specified requirements.

Technical Assistance, Visitors, Meetings, and Training

During this period, assistance was provided to Professor Norman Heidelbaugh of Texas A&M on apparatus for studying thermal inactivation of viruses, and to Mr. Gerald Garman, Sales Manager, Weyerhaeuser Company, on packaging minced whiting blocks.

Technical information on processing and marketing of squid was given to Mr. Fred Dwyer of Seafood Marketing, Inc., of Hingham, MA.

Dr. Herbert Hultin of the University of Massachusetts Marine Laboratory visited the Laboratory to discuss our suggestion of decolorizing minced fish enzymatically as a possible Sea Grant project.

John Ryan participated in a meeting of the Awards Committee at the Woods Hole Laboratory on 1 December 1977.

Louis Ronsivalli, Bob Learson, and Alan Blott attended the NEFDP Task Group Meeting 16 October in Portsmouth, NH.

Two meetings were held at Woods Hole in preparation for the shellfish assessment cruise beginning next month. Members of the scientific party were instructed in ways to control fishing methods and conditions to improve the data collected. Rigging for the cruise is now underway.

NATIONAL SYSTEMATICS LABORATORY

Pelagic Fishes

Work continued on a field guide to species taken in the Atlantic pelagic longline fishery, on the anatomy and systematics of the Spanish mackerels, and on the systematics of Indo-West Pacific halfbeaks.

Benthic Fishes

Work began on the description of an undescribed species of the orphidiid genus Enchelybrotula from the Gulf of Panama.

Crustaceans

A draft was completed of a chapter on brachyuran crabs for a book on the pollution ecology of estuarine invertebrates.

Meetings, Talks, Visitors, Publicity

Visitors included Dr. Robert White of the NAS-NRC who was interested in background information on research in systematics and museum collections.

Manuscripts

Cohen, D. M. Review of Francis Day (1829-1889) and his collection of Indian fishes, by P. Whitehead and P. Talwar. Copeia. (A)

Williams, A. B., J. K. Shaw, and T. S. Hopkins. Stilbomastax, a new genus of spider crab (Majidae: Tychinae) from the West Indies region, with notes on American relatives. Proc. Biol. Soc. Wash. 90(4):884-893.

ATLANTIC ENVIRONMENTAL GROUP

Ocean Monitoring and Climatology Task Group

During December the cooperative Ship of Opportunity Program obtained five XBT transects; one in the Gulf of Maine, two off southern New England, and two across the continental shelf off New York. Efforts in the northern Gulf of Maine have been switched from the Bar Harbor-Yarmouth transect to the Portland-Yarmouth transect, because a change was made in routing of the Canadian National Railways ferry. The new routing is expected to be in force at least until 1981, yielding the potential for better data than would have been available on the Bar Harbor-Yarmouth transect. Efforts continued to obtain routine XBT and plankton recorder transects between Gloucester, MA, and Cape Sable, Nova Scotia, on the Caribou Reefer.

A one-page article concerning the location of Gulf Stream eddies adjacent to the continental shelf in the Middle Atlantic Bight and their potential impact on fishing operations was prepared for inclusion in the January issue of the US Coast Guard's Atlantic Notice to Fishermen. Articles will be prepared for subsequent issues also.

A list-out of all monthly mean stream flow data for tributaries to Chesapeake Bay and Delaware Bay was purchased from the US Geological Survey. These data will be used in the cooperative study of blue crab climatology presently ongoing, but copies of the data can be made available to other interested National Marine Fisheries Service scientists.

Ocean Dumping Task Group

The report concerning the physical oceanography and experimental studies at Deepwater Dumpsite 106 during July 1977 is in first draft form for review. The report contains data portrayals and interpretations of oceanographic sections, temperature-salinity data, temperature-oxygen data, and vertical profiling. An analysis of nephelometric data from an acid-iron waste dumping operation during the cruise is also discussed.

Preparations for the 30 January - 5 February 1978 cruise aboard the FRS Albatross IV are continuing. Jim Bisagni, along with Steven Congdon and Talbot Murray, visited the Albatross IV in drydock to better plan the cruise effort.

Manuscripts

Cook, S. K. In Press. Gulf Stream interaction with shelf water in the Cape Hatteras Area. Gulfstream (NOAA) (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)

NEFC PUBLICATIONS AND REPORTS

Recent papers by NEFC authors are noted in the final section of each laboratory, divisional, or programmatic write-up. Papers targeted for scientific journals are listed as "Publications;" all others are listed as "Reports." Publications are labeled as submitted, accepted, or published with an appropriate "S," "A," or "P" at the end of each entry. Reports are included only upon completion.

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