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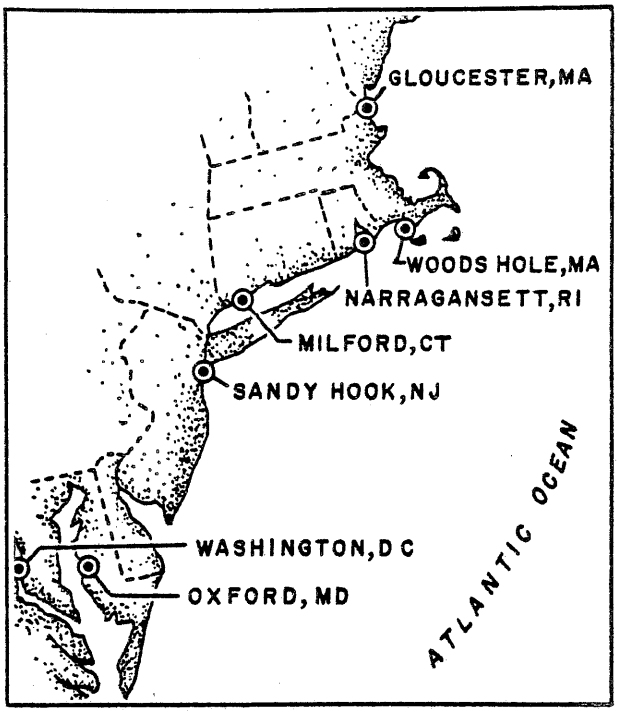
NEWS



OCTOBER 1978

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

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NORTHEAST FISHERIES CENTER
WOODS HOLE, MASSACHUSETTS

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SUBMISSIONS TO THE "NEFC NEWS" ARE PREPARED BY THE AFOREMENTIONED RESEARCH ADMINISTRATORS, AND COMPILED AND EDITED BY JON A. GIBSON, TECHNICAL WRITER-EDITOR, NEFC.

CENTER DIRECTORATE

Art Merrill (with Dr. David Franz) is developing several manuscripts on the number of molluscan species found in the Middle Atlantic Bight, the distributional patterns of these species, and the relationships of these patterns to worldwide distributional patterns of molluscan species.

The report on the third mesh experiment was completed by Ron Smolowitz and distributed. The fourth mesh experiment was conducted aboard the F/V Valkyrie and F/V Patton out of New Bedford, MA, from 6 to 13 October. Each vessel then made a second trip using the large mesh only.

Arrangements were made by Ron Smolowitz with Frank Ansuini of the Ledgemont Laboratory of Kennecott Copper Corp. to test degradable links in the Woods Hole Laboratory aquarium.

The new clam dredge system, under the coordination of Ron Smolowitz, is moving along on schedule.

Fourteen requests for technical information were processed by Ron Smolowitz during the month.

The newly created NMFS Office of Habitat Protection (F7), headed by Ken Roberts, asked the NEFC to prepare a NOAA/NMFS position paper in opposition to the siting of an oil refinery by the Pittston Company (of New York) at Eastport, ME. F7 felt that the navigational risks associated with the site were major and that unique and valuable species and species associations were potentially threatened (krill, right whales, etc.). Much of the information necessary to develop the paper was previously gathered by the Northeast Regional Office's Environmental Assessment Branch. Jon Gibson solicited input from about 20 NEFC scientists on various aspects of the potential environmental impact of the refinery, combined the already existing data base, and produced a draft paper for F7.

Meetings, Talks, Visitors, Publicity

A meeting was held on 19 October with National Ocean Survey (NOS) people from the Office of Fleet Operations and the Atlantic Marine Center to resolve mutual problems with regard to the Albatross IV and Delaware II. Agreements were made via Ron Smolowitz on the clam dredge, data logger, net mensuration, NEFC ship support, and other areas.

A joint US/Canada meeting on lobster research was attended by Ron Smolowitz from 23 to 27 October and a paper on lobster gear research was given.

Manuscripts

Gibson, J. A. 1978. National Oceanic and Atmospheric Administration and National Marine Fisheries Service position in opposition to the siting of an oil refinery by the Pittston Company of New York at Eastport, Maine. NMFS, NEFC Woods Hole Lab. Ref. No. 78-50. 72 p.

Smolowitz, R. A., Brancaleone, and G. Brancaleone. 1978. New England mesh selectivity studies, experiment three, offshore groundfish. NMFS, NEFC Woods Hole Lab. Ref. No. 78-48. 39 p.

Smolowitz, R., and F. M. Serchuk. 1978. Recent USA lobster trap gear research: applications and implications. Workshop on Lobster Management-Biology, St. Andrews, NB, 24-26 October 1978. 7 p.

RESOURCE ASSESSMENT DIVISION

Resource Surveys Investigation

During October the fall survey progressed from the New York Bight easterly and northerly into the Gulf of Maine. On 6 October, the Delaware II arrived in Woods Hole after completing the second part of the survey, the area from Hudson Canyon to the southeast part of Georges Bank and a portion of the Northea Peak (Malcolm Silverman, Chief Scientist). The third part lasted from 10 to 20 October (Chuck Byrne, Chief Scientist); completed were the northern part of Georges Bank, the Northeast Peak, and the southern portion of the Gulf of Maine. The fourth part started on 24 October and is scheduled to be completed early in November.

Tom Azarovitz and Jim Crossen participated in a hydroacoustical survey aboard the Federal Republic of Germany's R/V Anton Dohrn during 19-24 October. The survey area extended from Cape Cod, along the northern edge of Georges Bank, to Browns Bank.

Heavy involvement was required of the electronics group to meet the demands of the larval Atlantic herring patch study which involves, in addition to Albatross IV, a number of foreign vessels.

Age and Growth Investigation

Judy Penttila, Kris Kantola, and Vi Gifford spent much time selecting the 180 haddock scale samples needed to comply with the specifications for the development of the computer programs to be used for an image processor for automatically aging fish scales. Photographs of the selected scale samples wer made by Gary Shepard. Each sample will be annotated with description and position of each check and annulus, circuli content, edge type, and aging quali

Cathy Rearden participated on the third part of the Delaware II (Cruise No DE 78-06) bottom trawl survey. Laura Savelkoul logged the age samples collected on the second and third parts of the survey and impressed about 1,000 yellowtai flounder scale samples.

Age samples completed during October were: silver hake from Albatross IV Cruise No. AL 77-12 (1,697 otoliths); Atlantic herring from commercial samples (990 otoliths) and from Albatross IV Cruise No. AL 78-07 and Delaware II Cruise No. DE 78-05 (74 otoliths); and butterfish from Albatross IV Cruise No. AL 77-07 (129 otoliths).

Sandy Hook Investigation

John Clifford completed coding of creel census data from the 1978 summer bluefish survey and began proofreading printouts of the data for keypunch erro

Darryl Christensen completed a draft of a report of recreational Atlantic mackerel catch estimates for the Mid-Atlantic Fisheries Management Council. Copies of the draft were sent to co-authors from participating state agencies for their review. Darryl also continued working with the Sandy Hook Laborator ADP unit to incorporate confidence intervals about the 1975-77 creel survey da

Wally Morse participated on several bottom trawl surveys aboard the Albatross IV. Wally and Philip Scott continued efforts toward establishing a maturity data base.

Fishery Analysis Investigation

Ralph Mayo, Liz Bevacqua, and Brenda Fields continued Gulf of Maine redfish assessment analyses in preparation for a 1978 redfish assessment report. Liz Bevacqua performed yield-per-recruit determination; her results suggest that maximum redfish yield per recruit is achieved with a cod-end mesh size of 3.5 inches (corresponding to an age of first capture of 5-6 yr) at fishing mortality levels (F values) of 0.4-0.5. The mesh size commonly used now in the redfish fishery (2.5 inches) provides maximum yield per recruit at an F level that is less than 0.2, a fishing mortality well below that now applied in the fishery. Brenda Fields has been calculating numbers of fish at age in the 1953 redfish landings to derive a catch curve for comparison with data from the current fishery.

Ralph also completed the United Nation's Food and Agriculture Organization Statlant 21B report for 1977, which is now undergoing final audits prior to submission. A report on Ralph's sea-sampling activities aboard the F/V Francis J. O'Hara (22 September-1 October) was also prepared, and indicates that discards were relatively minor, amounting to less than 5% of the total haul weight.

Steve Murawski completed analysis of historical shellfish resource survey data relevant to Mid-Atlantic ocean quahog populations. Trends in relative abundance, distribution, and population composition (size-frequencies) were evaluated. Steve also initiated efforts to design the surf clam/ocean quahog resource surveys scheduled for 1-21 December (using the present 48-inch wide clam dredge) and January-February (using the new 60-inch wide clam dredge).

Bill Callahan continued to update and revise the commercial vessel history computer file. Bill provided data for the following requests: (1) Statlant 21B report information (for Ralph Mayo); (2) Atlantic cod commercial catch and effort data by vessel class and stock area for 1965-77 (for Fred Serchuk); and (3) 1977 Atlantic cod, haddock, and yellowtail flounder catch and effort data (for the Statistics Branch of the Northeast Regional Office).

Harold Foster and Joan Palmer participated in the fourth part of the fall 1978 bottom trawl survey during 24 October-3 November. Harold also began tabulation of Gulf of Maine Atlantic cod landings data and resumed effort on an updated virtual population analysis (VPA) for Georges Bank Atlantic cod populations.

Fred Serchuk and Paul Wood continued sea scallop catch and effort analyses, as well as examination of the 1978 sea scallop survey results for the 1978 sea scallop assessment report. Both American and Canadian data are being analyzed. Paul assisted in auditing and correcting the August 1978 US sea scallop cruise data prior to their storage on magnetic tape.

Fred Serchuk began analysis of both domestic and foreign Atlantic cod catch and effort data for 1965-77 for the Georges Bank and Gulf of Maine stocks. Yearly catch-per-effort statistics have been examined by country, tonnage-class category, and fishing gear.

Liz Bevacqua left the Investigation during October when her appointment expired. It is hoped that Liz can be reappointed as quickly as possible.

Fishery Assessment Investigation

Emory Anderson completed the 1978 assessment of the Northwest Atlantic mackerel stock with Bill Overholtz. Steve Clark participated in an assessment workshop of the Northern Shrimp Scientific Committee in Gloucester, MA. Frank Almeida is currently conducting stock identification studies on silver hake and has updated historical catch- and weight-at-age data files for future VPA. Frank is also revising earlier 1978 silver and red hake assessments using updated catch statistics and age-length keys. He further participated in the International Herring Tagging Program on the Maine Coast with Thurston Burns. Bill Overholtz participated in Atlantic herring and groundfish survey work aboard the Anton Dohrn during 1-19 October, and has subsequently been involved with haddock and Atlantic mackerel assessment work. Hillary Herring and Jim Baker participated in the NEFC autumn bottom trawl survey during 24 October-3 November; Hillary has also been involved with red hake assessment work, while Jim has assisted Frank Almeida with silver hake stock assessments and stock identification studies. Joe Wade has been engaged in collecting morphometric data on silver hake for use in stock identification studies. Emma Henderson has been working with New England Regional Fishery Management Council staff members to develop bioeconomic models of New England groundfish fisheries.

Fishery Systems Investigation

The Atlantic herring tagging experiment dominated the time of the Fishery Systems Investigation during October. During the month, nightly tagging trips (weather permitting) were made from Gloucester, MA, aboard the 52-ft purse seiner Eva Grace. The Eva Grace was chartered from the Stinson Canning Company for the specific purpose of Atlantic herring tagging. While the weather was generally good for purse seining operations, adult spawning Atlantic herring were sparse. To date, approximately 6,000 spawning fish have been tagged during trips from Gloucester, far fewer than were anticipated. Approximately 10,000 younger fish were tagged earlier this autumn during trips of the Eva Grace from Boothbay, ME. The herring tagging experiment is being conducted in cooperation with the Maine Division of Marine Resources. The following personnel have participated in the program to date: Gordon Waring; Margaret McBride; Rhett Lewis; Kathy Rodrigues; Thurston Burns; and Frank Almeida. The program will continue until approximately 15 November.

Anne Lange has continued to participate in American-Canadian negotiations to mediate the boundary dispute. She serves as a scientific advisor to NMFS and State Department negotiating teams.

Meetings, Talks, Visitors, Publicity

Steve Murawski and Anne Lange attended a public hearing on the fishery management plans for squids, Atlantic mackerel, and butterfish conducted on 3 October at Point Judith, RI.

Mike Sissenwine and Steve Clark attended the 66th Statutory Meeting of the International Council for the Exploration of the Sea (ICES) during 2-7 October, where Steve served as US representative during the Shellfish Committee Meeting. Steve also presented a paper by Clark, Cleary, and Burns titled "A Review of the Northwest Atlantic Pollock Resource" during the Demersal Fish Committee Meeting. Several hundred scientific papers were presented during these meetings in Copenhagen, Denmark, which covered a broad range of subjects

including demersal fish, shellfish, pelagic fish, mariculture, biological oceanography, hydrology, and several other topics. A complete list of paper titles is available from Mike.

Emory Anderson attended the monthly meeting of the Middle Atlantic Fishery Management Council's S&S Committee in Clairmont, DE, on 6 October.

Don Flescher participated in the Plymouth Fishermen's Harvest Festival on 9 October in Plymouth, MA, and the Eighth Anniversary NOAA Open House held on 13 October at the Atlantic Marine Center in Norfolk, VA.

Stuart Wilk presented a paper titled "Biology and Ecology of the Weakfish (Cynoscion regalis)" at a Colloquium on the Biology and Management of Red Drum and Sea Trouts sponsored by the Gulf and Atlantic States Marine Fisheries Commissions in Tampa, FL, during 16 to 20 October. At the same meeting, Steve Clark presented the results of the northern shrimp assessment to the Northern Shrimp Section of the Atlantic Commission. Thurston Burns and Steve Clark attended the joint US-Canada Workshop on Lobster Management - Biology at St. Andrews, NB, during 24-26 October, where Thurston presented a paper by Burns and Clark titled "Application of Bottom Trawl Survey Data to Offshore Lobster Assessments."

Eight people from the Resource Surveys Investigation were able to attend Fish Expo in Boston for 1 day. They were: Henry Jensen; Malcolm Silverman; Don Flescher; John Messersmith; Eva Montiero; Evelyn Howe; Pat Twohig; and Chuck Byrne.

Steve Murawski attended the New England Regional Fishery Management Council's Management Regulations Review Team Meeting (to discuss groundfish regulations) in Gloucester, MA, on 26 October.

Emma Henderson attended the Third Consultative Meeting between NMFS and foreign fisheries officials on 31 October and 1 November.

Manuscripts

Anderson, E. D., and W. J. Overholtz. 1978. Status of the Northwest Atlantic mackerel stock - 1978. NMFS, NEFC Woods Hole Lab. Ref. No. 78-49. 28 p.

Burns, T. S., and S. H. Clark. 1978. Application of bottom trawl survey data to offshore lobster assessments. Workshop on Lobster Management - Biology, St. Andrews, NB, 24-26 October 1978. 23 p.

Smolowitz, R. J., and F. M. Serchuk. 1978. Recent USA lobster trap gear research: applications and implications. Workshop on Lobster Management-Biology, St. Andrews, NB, 24-26 October 1978. 7 p.

MARINE ECOSYSTEMS DIVISION

Benthic Dynamics Investigation

Preparation of a fishery management plan for the deepsea red crab was one of the principal activities conducted this month. This plan is being written in collaboration with other NMFS personnel and the New England Regional Fishery Management Council staff. Good progress has been made in dealing with those sections of the plan for which information is available. The absence of data pertaining to such critical aspects as growth rates, mortality rates, etc., has hampered progress in preparing those and related sections. In a

related matter, Roland Wigley collaborated with Fred Serchuk in writing a short manuscript titled "Deep-Sea Red Crab, Geryon quinquedens, Smith, 1879." This report will be submitted for publication in the New York Bight Atlas Series.

Food habits research required a large amount of field work this month. The Soviet R/V Belogorsk cruise, conducted for the purpose of determining the food habits of demersal fishes and the diurnal feeding chronology of two fish species and two squid species, extended from early September until early this month. Collections of fish and squid were obtained from the Southern New England-Georges Bank region, and the feeding chronology samples were taken at one location on the southwestern part of Georges Bank. A report on this cruise was prepared by Ray Bowman. Rich Langton is participating in a cruise on the Canadian R/V Canso Condor. This vessel is sampling fish for food habits studies in the Georges Bank-Gulf of Maine region. Primary targets for study are the predators on Atlantic herring eggs, spawning adult herring, and herring larvae. This cruise is being conducted in close coordination with the larval Atlantic herring patch study, which is currently in progress. Laboratory work included updating the 1969-72 gadid and flatfish data bases, and auditing the 1975 food habits data base.

Apex Predators Investigation

Eighteen tags were recovered from six species of sharks during October. Longest time at liberty was 814 days by a hammerhead which was tagged off North Carolina and recovered south of Norfolk Canyon. A tiger shark tagged southeast of Fire Island, NY, during our first cooperative tagging experiment at the 1976 Bay Shore Shark Tournament was recaptured 812 days later in the same area. Of the 12 blue sharks recaptured the longest time at liberty was 465 days. The greatest distance traveled was 287 mi in 65 days. This female blue was tagged by a NMFS fishery observer. Two of these blue sharks were retagged and released. To date, 21 tagged sharks have been recovered and retagged by fishermen participating in the tagging program.

Staff biologists conducted a longline cruise aboard the Polish R/V Wieczno from 26 September to 12 October in the area from Georges Bank to the offings of Cape Hatteras, NC. Thirty longline sets resulted in a catch of 272 fish of 13 species. Ninety-five fish were tagged, the remainder were taken aboard for food and reproductive studies. A trawl-longline experiment to study predator-prey interactions was conducted over a 4-day period 32 km south of Montauk Point, NY. Of 55 sharks examined during the experiment, 16 contained food. Preliminary analysis showed two sharks were obviously feeding on species found in trawl catches. Eighty-four stomachs of sharks and swordfish collected at offshore longline stations contained squid, predominantly of the genus Illex.

Ecosystem Dynamics Investigation

Ecosystem Dynamics

Wendell Hahm continued work on the structure of GEORGE II, the nonlinear deterministic version of the multispecies model for Georges Bank. A report was prepared on the status of the model, and Marv Grosslein presented the report at the Board of Directors meeting on 18 October. On 30 October, an informal workshop was held in Woods Hole primarily to consider some of the theoretical

concepts in the Ursin model and particularly prey-predator dynamics. Participants included Jan Beyer (Danish Institute of Fishery and Marine Research), Marv Grosslein, Wendell Hahm, Mike Pennington, Mike Sissenwine, Emma Henderson, Brad Brown, and Dick Hennemuth.

Pat Carter transferred to the Resource Assessment Division and in turn Brian Hayden was assigned to the Ecosystem Dynamics Investigation to assist with data processing and model development. Brian Hayden and Wendell Hahm began working with Rich Langton and Ray Bowman on development of retrieval subroutines and output formats for the 1973-76 series of fish food habits data which are needed as inputs for GEORGE.

Mike Pennington revised an earlier paper on use of a Gompertz curve to describe growth of larval Atlantic herring based on plankton samples taken at sea. He showed that certain of the parameters of the Gompertz model can be assumed to be constant for the whole larval population and thus that both mean and median growth can be described by a Gompertz-type curve. Techniques of fitting the curve to empirical data are described and shown to apply equally well to most of the commonly used growth curves. Mike worked with Bob Livingstone on haddock fecundity data; computer plots of fecundity samples from Georges Bank were made for the period of 1969-73, and analysis of the series showed no significant differences in fecundity-at-length during the years in this period. Also, Mike continued refining the statistical methods involved in constructing confidence limits about survey abundance indices.

Recruitment Processes

The larval Atlantic herring patch study got off to a good start with five countries (USA, Canada, Poland, FRG, and USSR) and eight vessels participating. Spawning appears to have been sparse and late again this year on Georges Bank, and Atlantic herring larvae had not been found on northeastern Georges Bank by the end of the month; however, studies of currents, hydrography, and plankton communities over the traditional herring spawning areas were progressing well. A number of interesting features were observed including a persistent and prominent "front" across northeastern Georges Bank which appeared to separate Gulf of Maine and Georges Bank plankton communities. Also, a very dense and well-defined patch of chaetognaths was observed to be almost stationary over a period of more than 1 wk. Sampling of the vertical distribution of zooplankton in this patch, on either side of the front, and in the general area, is proceeding according to contingency plans with MOCNESS gear on both Albatross IV and Anton Dohrn.

Larval Physiology and Biochemistry Investigation

Atlantic herring eggs obtained from a tagging operation out of Gloucester, MA, conducted by the Resource Assessment Division are currently being incubated. The larvae will be used in feeding and biochemical experiments. Drs. Beyer and Laurence made changes extensively and developed further the stochastic barrier model of larval fish growth and survival. Tom Halavik and Al Smigielski participated in a 2-wk cruise aboard the Woods Hole Oceanographic Institution's (WHOI) R/V Atlantis II as part of the larval Atlantic herring patch study.

Measurement of the RNA, DNA, and protein content of Atlantic herring eggs and larvae was begun. Preparations were made for nitrogen utilization studies

and measurement of respiratory electron transport activity. To date we have been unable to demonstrate a consistent difference in the serum electrophoresis profiles of male and female summer flounder. This is probably due to the state of development of the ovaries. We are currently fractionating summer flounder serum on a Sephadex G-200 column.

Ichthyoplankton Investigation

At the end of October the first MARMAP (Marine Resources Monitoring, Assessment, and Prediction Program) survey of FY 79 came to a close. Exceptionally fine autumn weather held through the month, and for the first time in memory, our autumn survey was not interrupted by bad weather. Other factors did, however, take their toll, and, as a result, we occupied only 128 of the 185 stations that make up a survey. John Sibunka, Field Party Chief, reported that fish larvae catches were light and that very few Atlantic herring larvae were collected on Georges Bank in advance of the patch study, which began about 1 wk after the MARMAP survey. Doris Finan is participating in the patch study. She is a member of the scientific party on the Anton Dohrn.

All Bureau of Land Management (BLM)-related activities this month, and for the remainder of the year, will center on compiling the BLM contract report, which summarizes our historical ichthyoplankton collections in the Middle Atlantic Bight. We are also working hand-in-hand with the ADP unit to expedite reformatting. This is proving to be a time-consuming operation and progress has been slow to date.

Fishery Oceanography Investigation

The first half of the month was occupied chiefly with final preparations for the cooperative larval Atlantic herring patch study, which began operations at sea in mid-October. Tom Laughton was in charge of preparing 35 drogues, all equipped with radar and flashing lights, and most with radios. Ron Schlitz arranged for the radio transmitters and shipboard receivers which arrived from various parts of the US within a few days of sailing.

Gil Dering and Tom Laughton reconditioned the nine current meters recovered from the Northeast Channel in September; they will go back in the water next spring in the Nantucket Shoals flux experiment planned in cooperation with WHOI and the US Geological Survey's Atlantic-Gulf of Mexico Branch. Steve Ramp got a first look at the current meter plots from the second setting in Northeast Channel. They showed considerably weaker flow than in the first setting, which was in the wintertime, and the mean flow on the southern side of the channel was directed out of the Gulf of Maine, with inward flow at the middle and northern moorings. Analysis continues, but it is clear that there is strong seasonal variability in the deep flow through the Channel.

Ron Kirschner prepared the September report on the Ship of Opportunity Program temperature sections across the Gulf of Maine, and Sam Nickerson continued plotting temperature data from the bottom trawl surveys.

Plankton Ecology Investigation

A summary of Atlantic cod spawning areas and seasons was prepared upon request from the New England Regional Fishery Management Council.

A report was prepared regarding the possible effects of oil contamination to zooplankton populations in Maine's Quoddy Region. This report will form part of a NOAA/NMFS position paper on the proposed siting of an oil refinery at Eastport, ME, by the Pittston Company of New York.

The processing of invertebrate samples from Albatross IV Cruise No. AL 78-07 (July) is continuing. We have completed stations from the Southern New England area.

Melissa Hughes has joined the plankton group on a 1040 appointment. She is a graduate student from the University of Rhode Island (URI).

A seminar was presented by Vivian Bottelho to the students and faculty of the Marine Biology Department of Roger Williams College. It dealt with her duties as a student assistant in the plankton laboratory and her work at sea aboard the Delaware II.

Several research cruises were conducted during the month of October as a part of the larval Atlantic herring patch study. Lorrie Sullivan participated in Wieczno Cruise No. 78-04 and Jerry Prezioso sailed on the Anton Dohrn.

Robert Marak is at the Polish Plankton Sorting Center in Szczecin, Poland, where he is initiating a series of cooperative research projects. The first of these will focus on the food habits of larval gadids and Ammodytes sp. Senator Claiborne Pell and NOAA Administrator Richard Frank were given a brief demonstration of the image analysis system while touring the laboratory facility on 25 October.

Ray Maurer completed a progress report which summarizes initial experiments with the image analysis system. Image enhancement and calibration procedures have been included in a preliminary counting and sizing protocol, based on measurements of 300 copepods. The first application of counting and sizing with the system was completed by Gary Johnson (URI). Gary studied the size structure of plankton populations in the Nantucket Shoals area. One-half of the 0.333-mm mesh bongo net samples from a micro-scale survey conducted in February 1978 were analyzed. Field sizes of 100 organisms were measured at about 6X magnification. A review of this experiment suggests that the resolution should be increased. A revised protocol has been proposed working with 50 organisms in the ocular field at about 12X magnification. A new multi-chambered sample dish has been designed that will allow a 500-organism aliquot to be displayed in 10 chambers with approximately 50 organisms per chamber. This approach reduces the time required to separate manually any touching features.

Biostatistics

On 1 October the involvement of URI in the MARMAP Information System (MIS) ended. The Biostatistics Unit is now fully responsible for maintaining the MIS for users at the Narragansett Laboratory, Atlantic Environmental Group, and Sandy Hook Laboratory. Input/Output Computer Services (IOCS) of Waltham, MA, has been contracted by the Regional Data Base Coordinator (Gene Heyerdahl) through the Government Services Administration (GSA) to evaluate and maintain the MIS. Their task will be to support the operation and maintain the MIS while providing detailed input pertaining to the future modifications of the MIS required for implementation within the NMFS Northeast Regional Fisheries Information System. IOCS has hired two former members of the Biostatistics Unit to work as computer programmers on this project. Oke Lundin began work for IOCS at the Narragansett Laboratory on 16 October and Dan Geary will begin on 6 November. Dave Bearse met in Narragansett with representatives from the

ADP branch of the GSA's Boston Office to discuss the implementation of the contract with IOCS. Doice Carrington of GSA has been assigned to oversee the contract for GSA and to assist in the systems analysis aspects of the evaluation of the MIS.

The processing of data by the Biostatistics Unit has revolved around three major projects. The BLM contract data have commanded most of our attention. Efforts have also been directed at the cruise data for 1978 which are coming to us on keypunched cards rather than on OPSCAN forms. We are still developing the computer programs to process this card data and are now able to read in the data from the new "MARMAP Bridge Logs." Significant programming efforts are continuing in this area to deal with the other types of card data. The other concern has been to enter the necessary historical data into the MIS to match up with the organism data which have been received from the Polish Plankton Sorting Center.

Meetings, Talks, Visitors, Publicity

From 30 September through 12 October, Ken Sherman attended ICES meetings at Copenhagen, Denmark; and then attended meetings in Poland and England until 22 October. He then flew to Washington, DC, to receive a Silver Medal from the Department of Commerce on 23 October. Ken Sherman attended meetings at Georgetown, SC, from 25 October through 28 October on advanced concepts in ocean measurements.

Mary Braisted was on Delaware II Cruise No. DE 78-06 from 10 to 24 October for the bottom trawl survey.

On 25 October, Donna Busch and Mert Ingham met with Bori Olla at the Sandy Hook Laboratory to discuss the ecological factors determining Atlantic mackerel distribution and migration.

For 2 wk in October, Slava Sushin, planktologist from AtlantNIRO in Kaliningrad, USSR, visited the Narragansett Laboratory to work with Jack Green and Donna Busch on evaluating the at-sea methods used by Soviet scientists and laboratory methods used by the NEFC to obtain rapid estimates of zooplankton biomass and relative abundance of dominant zooplankton species.

On 25 October, the Narragansett Laboratory was visited by Richard Frank and US Senator Claiborne Pell. They were briefed on the research programs and met with members of the staff.

On 28 October, Lars Henroth of the Academy of Sciences (Sweden), arrived at the Narragansett Laboratory to spend 3 wk comparing sampling methods data analysis and interpretation used by scientists working on fisheries ecosystem problems in the Baltic with those used by NEFC scientists working on similar problems in the Northwest Atlantic.

On 20 October, Carolyn Griswold attended an oil spill workshop at the Alton Jones Campus of URI. The workshop focused on the Marine Ecosystem Research Laboratory (MERL) oil studies, and EPA's (Narragansett) projects which included a paper on the Ocean Barge 250 gasoline spill and a presentation on the Amoco Cadiz.

Carolyn Griswold attended a meeting of the BLM Biological Task Force (BTF) on 25 October in Washington, DC. The BTF was informed by the Department of the Interior's outer continental shelf coordinator that the decision had just been made to attach stipulations to all lease areas for the Mid-Atlantic. This means that surveys, or special studies, could be required for any block at any time from the exploration through the production phase. The BTF recommended

that no special surveys be required until results of the BLM canyon assessment survey are completed sometime early in 1979.

Donna Busch measured primary production in the Georges Bank-Southern New England-Gulf of Maine areas from 5 to 20 October as a part of a joint US-USSR MARMAP cruise aboard the Belogorsk.

Mike Pennington attended a 2-day meeting of the American Statistical Association in Rochester, NY.

Marv Grosslein reviewed an NEFC report compiled by Jon Gibson on probable environmental impacts of an oil refinery at Eastport, ME; and also prepared a report on FY 78 highlights in the Ecosystem Dynamics Investigation for the annual report to the Atlantic States Marine Fisheries Commission. Dr. Grosslein also served as Center host on 16 October for five visiting Norwegian scientists representing the newly established Norwegian Fisheries Research Council; and he attended the New England Regional Fishery Management Council meeting on 23 October.

Roland Wigley met with the Executive Director and two members of the New England Regional Fishery Management Council staff, together with representatives from the Northeast Regional Office's Fishery Management Division. The meeting was held to review progress made to date on the red crab management plan and discuss future work.

Red Wright was part of the US delegation to the 66th Statutory Meeting of ICES in Copenhagen, Denmark, as a member of the Hydrography Committee. He took part also in the meetings of the Working Groups on Shelf Seas Hydrography and Oceanic Hydrography and sat in on a special session to plan a patch study in the southern North Sea in early 1980. He delivered two papers, one by Steve Ramp and John Vermersch of WHOI on the results of the first setting of current meters in the Northeast Channel, and one by Ed Cohen and Red Wright on the possible causes of the extremely high primary productivity on Georges Bank.

Red Wright also attended a meeting of the Advisory Board for E.G.&G. Environmental Consultants who are carrying out the BLM's physical oceanography program on Georges Bank, and at the end of the month was in Boston to receive training in supervision.

Manuscripts

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

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MANNED UNDERSEA RESEARCH AND TECHNOLOGY PROGRAM

No report received. September and October reports will be included in the November issue.

DIVISION OF ENVIRONMENTAL ASSESSMENT

Behavior of Marine Fishes and Invertebrates Investigation

As part of our ongoing studies on the response of adult bluefish to thermal discontinuities, we are examining a physiological change, i.e., body temperature, which would possibly occur during excursions across a thermal edge. In these experiments, free-swimming fish are exposed to abrupt changes in water temperature with body temperature being monitored remotely via an ultrasonic thermistor located in the stomach. Results from tests to date in which temperature changes were from 15° to 10°C showed that a minimum of 30 min was required for body temperatures of 1,000-g fish to reach equilibrium with the lower temperature. We are continuing these experiments with fish of varying sizes to determine the relationship of fish size to the rate of body temperature change. Another aspect of these studies currently underway is to determine the limit to which the body temperature of a fish can be lowered without loss of orientation. In a preliminary test in which a fish (856 g) was transferred from 15° to 7°C, loss of equilibrium occurred as the body temperature dropped below 8.5°C. These tests are continuing, examining whether body size and/or prior acclimation temperature affects the lower limit. Results from these studies will be correlated with those from studies examining behavioral responses of adult bluefish to thermal edges being conducted in our 32,000-gal experimental aquarium.

Coastal Ecosystems Investigation

We completed the second full-scale Ocean Pulse cruise aboard Albatross IV on 9 October. A total of 28 stations between Chesapeake Bay and the Canadian border were occupied. As on the first (April-May) cruise, we were able to obtain the desired samples and measurements at almost all stations. Other field work involved assisting the Environmental Chemistry Investigation in obtaining various organisms from Raritan Bay and the New York Bight apex for contaminant analyses, and demonstrating Ocean Pulse sampling methods in the apex sewage sludge disposal area to an author from New Times magazine.

Laboratory sample processing concentrated on samples collected along the Hudson Shelf Valley in 1974 to clarify impacts of contaminants on macrobenthos for the Environmental Research Laboratories' Marine Ecosystem Analysis Program (MESA). Selected samples from the New Jersey coastal anoxia/recolonization survey and the Long Island Sound long-term study were also worked up. Other activities included: (1) assessment of possible impacts associated with dredging in the area of the proposed Eastport, ME, oil refinery; (2) completion of an

experiment tracking radiosonde buoys deployed at Deepwater Dumpsite 106 by the Atlantic Environmental Group; (3) continued work on a distribution-life history atlas of apex invertebrates; and (4) continued planning and coordinating for the Ocean Pulse program.

Physiological Effects of Pollutant Stress Investigation

Physioecology

A second long-term experiment (10 days) on the effects of silver as the nitrate on oyster embryos and larvae at nine different salinity-temperature regimes was terminated after the third day because of high abnormalities among the control larvae.

A long-term (45 days of exposure and subsequent 30 days of depuration) exposure of copper as the chloride to the deposit-feeding clam Macoma balthica was completed this month. There were 100% and 95% mortalities at the 50 and 25 ppb exposure levels, respectively. At the end of 45 days of exposure, 5-ppb-exposed clams had significantly higher respiratory rates than controls, but at the end of 30-day depuration no significant differences were observed, indicating full recovery.

Ocean Pulse

The Physiological Effects, Biochemical Effects, and Anaerobic Bacteriology/Metabolism Subtasks were quite active this month in Ocean Pulse.

A major portion of the month was spent working on samples and data which had been processed and collected on the recent Ocean Pulse cruise on the Albatross IV. Tissues from a large number of teleosts (160) and invertebrates (235) were taken for biochemical analyses. These analyses focus on enzymes of carbohydrate metabolism and other stress-related enzymes. In addition, 100 euphausid shrimp were taken for exploratory studies. Respiratory studies were made on 101 teleosts and 141 invertebrates, while hematological studies were made on 115 teleosts and 174 invertebrates. During the first leg of the cruise, nine sediment samples were obtained for bacteriological analysis, primarily for the Clostridium group (perfringens). During the second leg, samples were obtained from 13 stations for analysis. These included top and bottom waters from all stations and sediments from 10 stations. In addition, animals from selected stations were analyzed for toxin-producing anaerobes. Bacteriological analysis was performed aboard the vessel during the second leg for anaerobes and facultative anaerobes belonging to the Clostridium and Vibrio groups of bacteria. In addition, enrichments in a special medium were made for the SO_4-reducing and H_2S-producing group of anaerobes (gram-negative rods). Analysis included both qualitative and quantitative aspects, with acquisition of isolates for further identification and characterization at the laboratory. Samples from all of the above collections are still being analyzed and some data are now being compiled and entered into a baseline study of the present condition of marine species at 25 Ocean Pulse stations.

Environmental Chemistry Investigation

We have a small contract with the NOAA Ocean Dumping Program on the determination of trace metal levels in plankton collected in the vicinity of Deepwater

Dumpsite 106. Samples of plankton were collected in June 1978 on the R/V Kelez. The main purpose of the collections was to study the use of experimental nets designed to minimize contamination with the usual gear used to collect plankton. Samples were collected with the experimental gear and conventional gear used by Narragansett Laboratory personnel. In addition, samples collected by the conventional gear were preserved with formaldehyde as well as the usual method of freezing. Therefore, three parameters of collection and/or preservation were examined in this study. This month we analyzed these plankton samples for Ag, Cd, Cr, Cu, Ni, and Pb. Although the results have not been fully completed for transmittal to the Ocean Dumping Program, a preliminary indication is that very little difference in metal content was observed for all three collection or preservation techniques. However, only five separate collections could be directly compared, and thus, the Ocean Dumping Program coordinators may want to do another experiment with more sample comparisons this year.

Biological Oceanography of Stressed Environments Investigation

In October, aboard the Belogorsk, measurements of phytoplankton productivity were made at 42 stations in conjunction with the ichthyoplankton-oceanography-chlorophyll survey between Cape Hatteras and Nova Scotia. Jay O'Reilly and Donna Busch made ^{14}C measurements on the first leg of the cruise (Georges Bank-Gulf of Maine). Steve Ward and Joe Cane made measurements on the second leg (New York Bight to Cape May). The ^{14}C samples from the August Belogorsk cruise were counted on the liquid scintillation counter and data coding commenced.

Susan Barker, William Hogelin, and Christine Evans participated in the first phytoplankton biomass survey (PBS) for FY79. One hundred-thirty stations were sampled. All samples were processed in the field. Phytoplankton samples were collected for Myra Cohn at 25 coastal stations and also for Dr. Marshall of Old Dominion University at 50 transect stations. Analysis of chlorophyll samples from the July 1978 Albatross IV cruise continued. Samples collected since July 1978 have been processed at sea.

The first phase of installation of the data logger has been completed. At present the total voltage output from the Technician Autoanalyzer has successfully been recorded. A computer program is being developed to select the data points from the total voltage output and to reduce this information to nutrient concentrations.

As part of the Ocean Pulse program, Bill Phoel and Andy Draxler conducted diving bell jar experiments at Jeffreys Ledge measuring: (1) respiration of selected animals and substrata; and (2) attendant nutrient chemistry values. Figures for a paper on nutrient distributions in Lower New York Bay and adjacent coastal waters were completed and photographed.

Meetings, Talks, Visitors, Publicity

On 6 September, Drs. John Pearce, Carl Sindermann, and James Thomas met with Dr. Joel O'Connor and Gary Mayer to consider preparation of proposals by NEFC to be submitted to MESA for funding in FY79. The proposals from the Division of Environmental Assessment were to be concerned with collection of samples for heavy metals and organic analyses, as well as for determination of

heavy metals in selected organisms that might be collected as part of the Ocean Pulse program. Also, a proposal was to be prepared in regard to the SINC/MESA program.

Dr. Pearce and Frank Steimle met with Dr. Alex Malahoff, NOS, on 14 September to develop further the cooperative efforts between the NOS Ocean Dumping Program and the NEFC Ocean Pulse Program. Discussions were held in regard to joint participation in individual cruises and other matters related to cooperation between the two programs.

On 15 September, Dr. Pearce met with Mr. George Mannina, a staff assistant for the House of Representatives' Merchant Marine and Fisheries Committee. This Committee is interested in information relating to long-range environmental assessment programs, especially those concerned with microconstituents in the marine environment and living resources.

Dr. James Thomas met with EPA and American Petroleum Institute officials on 15 September to formalize research activities that will be conducted in relation to controlled ocean spills of oil to be conducted in the New York Bight in FY79-80. Dr. Thomas anticipates investigating the effects of oil on phytoplankton respiration.

On 18 and 19 September, Drs. Pearce and Sindermann participated in the NEFC News Media Workshop held in Woods Hole. Dr. Pearce presented an overview of the various research activities being conducted by the Division of Environmental Assessment.

On 27 September, Dr. Pearce met with Drs. Glenn Paulson and Robert Tucker, New Jersey Department of Environmental Protection (NJDEP), and Drs. Robert Ellis and Steven Esser, New Jersey Marine Sciences Consortium (NJMSC). These meetings were concerned with mutual research to be conducted by NJDEP, NJMSC, and NEFC as part of the Ocean Pulse Program.

Dr. Pearce participated in the ICES 66th Statutory Meeting during 2-6 October at Copenhagen, Denmark. Dr. Pearce presented six papers that had been submitted by American authors and was the second US representative to the Environmental Quality Committee sessions. In addition to formal papers, the sessions considered: (1) oil spill response protocols; (2) the upcoming ICES workshop concerned with biological effects monitoring in February 1979 at Beaufort, NC; and (3) the important matter of maintaining water quality in coastal zones, especially those likely to be used for mariculture purposes. During the Environmental Quality Committee sessions over 50 papers were presented by representatives from 14 nations.

Miss Edith Gould participated in the 13th European Marine Biology Symposium during 27 September-4 October at the Isle of Man, United Kingdom, where she gave a paper titled "Changing Enzyme Activities in the Maturing Gonads of the Winter Flounder Pseudopleuronectes americanus." She later visited the Institute of Marine Biochemistry, NERC, in Aberdeen, Scotland.

Dave Radosh and Andy Draxler traveled to the NWAFC's Seattle Laboratory for an advanced "Diving Techniques for Scientists" course held during 2-6 October.

On 10 October, Dr. Pearce met with EPA and NOAA officials at Boulder, CO, to review the results of the Philadelphia meetings held in late August on responses to major oil spills. In addition, attendees at the Boulder meeting prepared for a familiarization/training workshop to be held at Santa Barbara, CA, in late November. This workshop will test specific aspects of scientific responses to oil spills.

During 16-19 October, Dr. Pearce participated in the NEFC Board of Directors meetings held at the Sandy Hook Laboratory. He presented an overview of the accomplishments of the Division of Environmental Assessment during the past fiscal year, stressing the implementation of the Ocean Pulse Program and the successful completion of two Ocean Pulse cruises.

Ann Frame participated in a course on Supervision and Group Performance given at Rockville, MD, during 16-20 October.

Dr. Anthony Calabrese attended a MESA meeting on 17 October in New York.

David Nelson participated in the 3rd Symposium on Aquatic Toxicology during 17-20 October in New Orleans. He gave a paper titled "The Effect of Time, Temperature, and Salinity on the Toxicity of Mercury to Embryos of the American Oyster, Crassostrea virginica."

On 18 October, Frank Steimle attended a New York Bight Advisory Committee meeting at the EPA laboratory in Edison, NJ, where he presented an update of NEFC dissolved oxygen and phytoplankton monitoring efforts in the New York Bight.

On Friday, 20 October, Drs. Pearce and Sindermann participated in the Sea Grant review rehearsal presented by the New Jersey Marine Sciences Consortium. Over 20 proposals were presented and reviewed by staff personnel at the Sandy Hook Laboratory.

During 22-28 October, Dr. Pearce participated in the International Workshop on Monitoring Environmental Materials and Specimen Banking held in West Berlin. This important workshop brought together scientists from 13 nations. Dr. Pearce was the only representative from NOAA/NMFS at the meeting. In addition, US scientists and administrators from EPA, US Fish and Wildlife Service, and National Bureau of Standards were present. Because of an emergency, Dr. Pearce served as an unscheduled session leader and rapporteur. The workshop was convened to develop protocols for monitoring heavy metals, organic pollutants, and other toxic substances in aquatic and terrestrial environments. Moreover, protocols were to be developed in regard to long-term storage of samples for future analyses.

Frank Steimle presented a lecture on Ocean Pulse at Sandy Hook Laboratory's annual open house on 27 October.

On 30 October, Bob Reid attended a meeting at the State University of New York at Stony Brook to discuss the feasibility of back-filling borrow pits in Lower Bay (just south of New York City) with dredge spoils from New York Harbor.

Dr. Thomas and Craig Robertson participated in a MESA/SINC meeting on 30 October at Lamont-Doherty Geological Observatory and presented preliminary results for the final report. Dr. Thomas participated in the National Sea Grant Program site visit for the New Jersey Marine Sciences Consortium during 31 October-2 November at Princeton, NJ.

Dr. John Mahoney participated in and presented a paper at the Second International Conference on Toxic Dinoflagellate Blooms during 31 October-5 November at Miami, FL. The paper presented was titled "A Mass Mortality of Marine Animals Associated with a Bloom of Ceratium tripos in the New York Bight" and co-authored by Frank Steimle. Dr. Mahoney also participated during this conference in a workshop concerned with anoxia and chaired by Dr. T. Smayda.

Al Matte attended a computer course in New York City sponsored by the University of Chicago.

Manuscripts

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AQUACULTURE DIVISION

Spawning and Rearing of Mollusks Investigation

The growth of a population of 8-16 mm surf clams has been studied in a multifactorial experiment comparing stocking density and flow rate. Groups of 50, 100, and 200 clams were maintained in 15-liter trays with 250, 500, 750, and 1,000 ml/min flow rates of seawater. By analyzing the average length data, it is evident after 6 wk that both stocking density and flow rate limit growth. At the ambient levels of available phytoplankton, flow rates at 15-20 ml/min/clam produced the fastest growth. Clams receiving 5 ml/min of seawater and less grew significantly less than clams in other treatments. Fluorometric analysis of incoming and outgoing seawater in the individual treatments indicates a greater utilization of available phytoplankton per clam at the higher flow rates and lower densities. From this information it is inferred that flow rate, as well as amount of phytoplankton available, influences growth.

The second half of October was an excellent growth period for bay scallops held in our pumped raceway system. Chlorophyll levels were high and although temperatures averaged only 15°C, biomass increases of 250% occurred in uncrowded populations in a 2-wk period.

Growth plots for bay scallops based on biweekly samples from the raceway system indicate rapid growth during July, August, and early September. Peak growth rate occurred in mid-July. We will attempt to identify temperature and food components for these growth periods. Scallops introduced into this system in May at a 5-mm average length now average 50 mm in length and we will shortly determine meat yields.

An additional 5,000 laboratory-reared bay scallops were planted in the Pequonnock River in Groton, CT. Some of these are being held at two stations in mesh cages. We hope to get some late fall growth measurements from these and determine winter survival.

Aquacultural Genetics Investigation

Genetic and Breeding Studies of the Commercial American Oyster

Measurements are being taken on oysters involved in a study examining the relationship between larval and spat growth rates. A significant positive relationship was found among oysters that set earliest and their size at 6 mo

of age. These same animals are now 18 mo of age and are being examined to determine if this relationship holds constant as the oysters approach market size.

Preliminary measurements and counts on the 1978 year-class oysters are now being made. From these measurements it will be determined if the offspring from the three selection lines-- high growth, low growth, and unselected lines-- differ in their growth rates at 8 mo of age.

Hybrid larvae from crosses between local and Gulf Coast American oysters may be exhibiting heterosis for survival, as they continue to grow and survive to metamorphosis, while several local contemporary control groups have failed to do as well this late in the year.

Some concentrations of an antibiotic used routinely in oyster culture induce larval abnormalities. Similar results were found with some concentrations of EDTA (ethylenedinitrilo-tetraacetic acid). EDTA has been tested as a potential means to control fertilization for mass hybridization.

Along with Dr. John Ryther, Woods Hole Oceanographic Institution, A. Longwell is a US representative to the newly formed Mariculture Committee of ICES. An effort is being made to establish within this group a special Working Group in Genetics. At the past October statutory meeting in Copenhagen, it was agreed by the Committee that a position paper on the role of genetics in mariculture be prepared for reading before the group at the next statutory meeting to be held in Poland in October 1979. In preparing this position paper, A. Longwell will be working with English, Norwegian, Canadian, and other scientists. Further, it was decided that experience papers in genetics be solicited for presentation. On the basis of these presentations the committee will vote as to whether it should establish a formal Working Group in Genetics, the function of which would be to hold a symposium and advise the Mariculture Committee on genetic and breeding matters in mariculture. On the basis of such, the Mariculture Committee would make more formal recommendations regarding the whole matter of genetics in mariculture.

Field and Laboratory Studies of the Cytology and Cytogenetics of Marine Fish Eggs

An independently conducted statistical study contracted by MESA with Dr. S. Overton, Head of the Statistics Department of Oregon State University, showed significant correlations between New York Bight station incidences of cytological-cytogenetic indicators of Atlantic mackerel egg health, normalcy of embryo development, and contaminant levels in plankton and water. Heavy metals and specific toxic hydrocarbons were measured. This report is now being studied and a combined statistical-biological-chemical report is to be prepared. In the meantime, a 1978 collection of Atlantic mackerel eggs, plankton, and water samples from similar Bight stations is under study. The new samples should increase the sample size of stations with a full complement of chemical and biological analyses. A limiting factor in the first correlative study was the number of stations which could be fully analyzed chemically.

Laboratory studies of the effects of Dupont Chemical waste on the cytology and cytogenetics of early Fundulus embryos continue. To circumvent problems of extreme hardiness of Fundulus eggs, poor contaminant uptake, and low solubility of the waste in seawater, microinjections of the material into the yolk sac of eggs are being made. Also, uptake is being forced by placing eggs in freshwater for a period.

A report titled "Promise and Problems of Egg-Cytological Methods for Assessing Impacts of Ocean Dumping on the Planktonic Eggs of Fish" was prepared for the Ocean Dumping Symposium sponsored by the National Ocean Survey.

Cytological studies of contaminant effects on the cells and mitoses of fish embryos are now being extended to include more specifics on individual chromosomes. Fundulus eggs are being used in trial studies for procedures to be followed on Ocean Pulse and other cruises.

With the recent purchase and installation of a rapid-scanning electron microscope at the Milford Laboratory, profiles of the chorion condition of field-sampled fish eggs are being conducted, along with their cytological and cytogenetic studies. Early evidence indicates that abnormal chorion conditions are probably not a post-mortem effect alone. Contaminants damaging the egg membrane are likely to affect its permeability, thereby increasing the measured toxicity of even other contaminants in complexly contaminated waters.

Cursory cytogenetic examination of eggs and embryos of the slipper limpet (Crepidula fornicata) indicates that cytogenetics may also be a useful tool for studying damaging effects of contaminants at the chromosome level in this shellfish (cooperative study with the Physiological Effects of Pollutant Stress Investigation).

Aspects of Nutritional Requirements of Mollusks Investigation

Studies have been completed on the effect of heavy metals (zinc, cadmium, and copper) on algal growth response. Toxic levels of each chemical were found for four algal species. The effect of less than toxic concentrations on the growth rate of each species was observed and the possibility of slowly adapting each species to concentrations higher than those initially tolerated was studied. Briefly summarized, the most important observations were twofold. We now have experimental evidence to show that micro-algae have the capacity to adapt their tolerances to certain metal concentrations with a gradual exposure to increasing concentrations over a period of time. These observations suggest that, at least with micro-algae, single exposures to certain metals do not yield accurate information on maximum tolerance levels. The second, even more important result of this work is that we have critical experimental evidence (perhaps the first of its kind) to support an oft-repeated ecological idea, that is, pollutants can have a magnified toxic effect via the food chain. Our experimental work has shown that micro-algae can accumulate concentrations of metals that will convert a normally good food organism into a toxic one without affecting the behavior of the algae.

We regard these studies to be highly significant to the valid interpretation of ecological studies on the effects of heavy metal contamination of aquatic environments. Preparations for publication of these results are being made.

Dr. Ukeles was invited to review a manuscript by the editors of Science and also two Sea Grant proposals.

Meetings, Talks, Visitors, Publicity

Ed Rhodes presented a talk on bay scallop research at the New England Estuarine Research Society meeting in Woods Hole, MA, and gave an aquaculture presentation at the Atlantic Fisheries Biologists meeting in Mystic, CT.

The Milford Laboratory hosted a class of 25 special education students from the New Haven (CT) Public School System.

In August, A. Longwell attended the XIV International Congress of Genetics in Moscow which provided, among other things, a glimpse at fish genetics and breeding programs in the USSR. A short paper was presented which dealt with the methodology and early station variations in Atlantic mackerel egg viability in the New York Bight sample collection made on the May 1974 cruise of the sailing R/V Westward. A lengthier paper on the same and subsequent studies was presented at a special symposium sponsored by the Japanese Society of Scientific Fisheries on Recent Progress and Future Prospects of Fish Genetics and Genetic Improvements, held in Shimizu during October. Symposium papers are being published in a special volume under the auspices of the Japanese Academy of Sciences. At the October statutory meeting of ICES, A. Longwell also sat in on some sessions of the Contaminants Committee in preparation for involvement in its forthcoming symposium on biological monitoring.

Dr. Ukeles attended the First International Conference on Micro-Algal Productivity in Israel. A paper was presented titled "American Experience in the Mass Culture of Micro-Algae for Feeding Larvae of the American Oyster Crassostrea virginica."

PATHOBIOLOGY DIVISION

Comparative Pathobiology Investigation

The monthly samples of duck clams (Macoma balthica) were collected from Foxhole and Double Mills. Only one clam was collected from Double Mills after five dredge hauls; three dredge hauls were required to collect 50 clams from Foxhole. Sediment samples also were collected from both locations. Warm water temperatures have kept the clams deep in the sediments, making sampling difficult.

Preliminary results of the duck clam feeding experiments indicate subtle differences with respect to Labyrinthomyxa infections; however, histologic sections have not been examined yet.

A sample of American oysters from Delaware Bay contained an oyster with herpeslike Type A intranuclear inclusions in gonad epithelial cells. Tissues are being prepared for examination with transmission electron microscopy.

Studies of paraffin-embedded tissues of American lobsters infected with Aerococcus viridans var. homari, causative agent of gaffkemia, are continuing. Data have been collated and a lengthy informal report has been prepared for submission to the coinvestigator, Dr. James E. Stewart of the Canadian Fisheries Laboratory in Halifax, NS. Physiological studies performed previously at Dr. Stewart's laboratory indicated that gaffkemia is not a toxemia nor is the causative organism invasive in the tissues. The Halifax group concluded that general debility produced by the successful competition by the bacteria for glucose, etc. produced by the lobster was the cause of death. Histological findings are in agreement with this hypothesis. Other salient histological features of the disease include the following. The fixed phagocytes (macrophages) found interstitially in the hepatopancreas were heavily involved in sequestering bacteria, but neither they nor phagocytic hemocytes appeared to be capable of degrading the bacteria. Bacteria were present in large numbers in hemocyte aggregations that occurred in hemal sinuses throughout the lobster, as well as being held in the phagocytes. The hemopoietic tissue became hypertrophied in the later part of the disease, and its stem cells and the young hemocytes were also hypertrophied.

Laboratory studies of the pathology of Cryptobia infections in flatfishes are in progress. Ten summer flounder have been held in seawater aquaria for over 1 mo. These animals were each bled on two separate occasions and the fresh blood was examined for hemoparasites. None of these fish contained Cryptobia. Four of these animals received injections of plasma containing live Cryptobia which was taken from a hogchoker. If the summer flounder develop infections, they will be subjected to thermal stress to study the effects of temperature on the parasitemias and to see if clinical disease develops. Several hogchokers were also injected in the hopes of maintaining this source of infected blood.

During the month, 1,314 blocks were sectioned and 1,046 slides were stained from a large variety of marine fishes, crustaceans, and mollusks.

Disease and Environmental Stress Investigation

Considerable time was spent in preparing a draft manuscript titled "Gross and Histological Observations of Some Biota from Deepwater Dumpsite 106" to be presented at the International Ocean Dumping Symposium. The weeklong symposium sponsored by the National Ocean Survey was held at the W. Alton Jones Campus of the University of Rhode Island and focused on the physical, chemical, and biological research conducted at deepwater dumpsites in the Gulf of Mexico, off Puerto Rico, and at DWD 106.

Studies were conducted on striped bass phagocytic cell behavior based upon intraperitoneal challenge with Bacillus cereus. Based on information gained with similar studies on the winter flounder, the objective of this initial work is to prepare materials for light microscope examination. Both peroxidase and Wright's staining methods were used and an initial examination of the preparations indicates that three cell types predominate--two classes of granulocytes of markedly different size and one cell type of considerable size which is peroxidase-negative.

Rock crabs were collected during a recent EPA cruise to the Philadelphia/Camden sewage dumping site. Gills from 100 crabs were fixed for histological examination. Crabs were collected at water depths of approximately 120-200 ft in order to compare gill fouling organisms with those present on crabs from shallower waters of the New York Bight apex. The deeper water sites, sampled late in September, yielded both male and female crabs that were in the soft postmolt condition. Observations on molt condition showed that males and females molted at the same time in the deep water. In contrast, crabs from the shallow coastal waters of New York and New Jersey have shown a pattern where males move inshore to molt from December to April. Studies to date have shown that "black gill" and extensive gill fouling are influenced by seasonal differences in molting behavior. Evidence is beginning to accumulate which will show that important differences occur between nearshore and offshore populations of rock crabs.

Aquaculture - Control of Larval Disease Investigation

Fourteen bacteriological and ozone residual tests were performed in continued appraisal of the 300-gal quarantine treatment system. Most tests evaluated bactericidal activity and the efficiency of sterilization of effluent

containing hybrid crosses of local and Gulf Coast American oysters. Other tests measured ozone dose versus time in efforts to optimize treatment duration.

Data gathered recently suggest that there is something in seawater which is toxic to developing oyster embryos. The toxic substance appears to be removed by bacteria. When bacteria are eliminated from seawater (i.e., the seawater is irradiated with ultraviolet light), the embryos develop abnormally. Experiments conducted thus far indicate that, if after irradiation seawater is seeded with nonpathogenetic bacteria, the toxic material is removed and development proceeds normally. Studies also suggest that overnight storage of seawater followed by irradiation increases the rate of development.

In cooperative work with Dr. K. Kanungo of Western Connecticut State College, two attempts were made to establish cultured cell lines from larval oyster tissue. The first attempt failed due to microbial contaminant carryover from the larval tissue. In the second attempt, antibiotic purging of the larval digestive tract followed by surface decontamination with two bactericidal agents resulted in cell preparations that are alive and free of contaminants after 1 wk of cell culture. Thus far there is no evidence of cell division.

Work also continued on isolation of larval phagocytes and evaluation of phagocytic activity in larval cells. Uptake and digestion of bacteria by cells attached to plastic surfaces appear to be weak in comparison with that of adult cells.

Meetings, Talks, Visitors, Publicity

Dr. Rosenfield and Ms. MacLean attended the Atlantic Estuarine Research Society meeting at the Tidewater Inn in Easton, MD, during 5-6 October.

Drs. Rosenfield, Robohm, and Mr. Farley attended the Molluscan Cell Culture Workshop at Cornell University in Ithaca, NY, during 12-13 October; Mr. Farley presented a review of molluscan viruses.

Dr. Rosenfield attended the NEFC Board of Directors meeting at Sandy Hook, NJ, during 17-19 October.

Drs. Rosenfield and Murchelano participated in a Sea Grant site visit at the University of Maryland (College Park), on 25 October.

Dr. Murchelano attended the Seventh Joint Meeting of the United States --Japan Natural Resources Aquaculture Panel in Tokyo, Japan, during 2-10 October. He presented a paper on the objectives and accomplishments of the Registry of Marine Pathology.

Mr. Farley attended the Limulus conference held at the Marine Biological Laboratory in Woods Hole, MA, on 7 and 8 October.

Mr. Newman and Ms. MacLean attended the International Ocean Dumping Symposium at West Greenwich, RI, during 10-13 October. Both presented papers. Mr. Newman's paper was on "Finfish Studies at DWD-106;" Ms. MacLean's paper was on "Gross and Histological Observations of Some Biota from Deepwater Dumpsite 106."

Dr. Bodammer visited the NWAFC's Seattle Laboratory during 25-27 September, and presented a seminar on "Ultrastructural Studies of Fin Erosion Disease in Winter Flounder." He also visited Oregon State University at Corvallis on 28 and 29 September to discuss current research with investigators in the Department of Microbiology and the Department of Food Science and Technology.

Ms. Sandra Cassanelli participated in a research cruise aboard the R/V Anton Dohrn during 1-16 October.

Ms. Ortt and Mr. O'Connell attended an orientation workshop on the employment of the handicapped on the Eastern Shore held at the Chesapeake Center in Easton, MD, on 19 October. Ms. Ortt is Chairman of the Talbot County Chapter of the Governor's Committee to Promote Employment of the Handicapped.

Mr. Kern received a special achievement award for sustained superior performa

Ms. Charles was reemployed on a 130-working-day appointment effective 10 Octo

Visitors to the Oxford Laboratory during October included Dr. Fred Bang and Ms. Gilda Cardanosa, Johns Hopkins University Department of Pathobiology, Baltimor MD; Drs. John Harshbarger and S. C. Chang, Registry of Tumors of Lower Animals, Smithsonian Institution, Washington, DC; Mr. Herb Stern and Ms. Mary Laird, NEFC; and Dr. Carl Sindermann, Sandy Hook Laboratory.

Manuscripts

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Sawyer, T. K., P. Ghittino, S. Andruetto, P. Pernin, and M. Pussard. Vexillifera bacillipedes Page, 1969, an amphizoic amoeba of hatchery rainbow trout in Italy. Trans. Amer. Microsc. Soc. (S)

RESOURCE UTILIZATION DIVISION

Fisheries Engineering Investigation

Sampling and Harvesting Gear Development

Construction of the Center's new 60-inch shellfish assessment dredge, incorporating a submersible pumping system, has been completed, and the dredge is bein readied for shipping to Woods Hole. All component parts for the electrical cable winch are in-house and assembly has begun. Design of the modified Delaware II stern ramp handling system has been completed, and the construction contract is out on bids. Dredge instrumentation design work is underway. It's not expected that anything but the rudimentary instrumentation system will be available for th winter's cruise due to a shortage of personnel and lack of funding.

No progress was made this month on Rorqual renovation due to lack of operat funds.

A meeting was held to prepare specifications for a portable trawl mensuration system under development for the State of Massachusetts.

Our maintenance staff is continuing to assist in the construction of a small gear shed as time is available. The shed will house nets, fishing gear, and deck equipment.

Process Engineering

Calibration of freezer No. 4 of the Gloucester Laboratory's experimental freezer system is almost complete, and it has performed very well. It is capable of holding a constant temperature of $\pm$ 0.50 down to -10°F.

Testing of the prototype divergent roller system completed last month is currently underway. Sorting capabilities by size for various species are being determined.

Resources Development and Improvement Investigation

Storage of Blue Mussels

The September 1977 mussels were noteworthy in their unappealing appearance, lack of firm texture, and bitter taste. We had hoped for a repeat, but apparently missed this post-spawning stage this year. The quality (appearance, odor, flavor, and texture) of the September 1978 mussels was good.

Blue Crabs

An organoleptic test was run on pasteurized backfin lumpmeats and alginate-treated rolled blue crab meat lumps. The results show that both products were of good quality after 4 mo of storage; however, the texture of the alginate lumps differed significantly from that of the control (7.7 vs. 6.9). Steam-formed pasteurized crab lumps were spoiled after 3 mo of storage.

Retorted blue crab bodies cleaned of visceral remnants, legs, claws, and mouth parts were put through a Baader 696 meat-bone separator at a commercial plant. The separator drum had holes of about 1.2 mm in diameter, and the extruded meat was like a paste. Recovery of meat was 76%. These meats were combined with 3.5% sodium alginate in a 3:1 crab meat/alginate ratio and formed into lumps on the Boch extruder. The lumps were soaked in 5% calcium chloride for 60 min. After soaking, the lumps had a firm outer pellicle, but the inside remained mushy. Further work must be done on procedural techniques to make a more acceptable product.

The final draft of the blue crab progress report for 1978 was completed and submitted for review.

Rock Crab Processing

Kurt Wilhelm and Vincent Ampola tested a Baader 696 meat-bone separator under commercial conditions. The plant manager reported difficulty in feeding rock crabs into the machine and in cleaning the perforated drum. Our objectives included responding to these problems, determining the meat recovery from the crab processed by the machine, and analyzing the meat for shell content.

Whole crab sections fed into the machine often jammed due to the low clearance of the safety guard and the configuration of the belt and drum. With the use of a hand butchering apparatus, crab bodies were cut in halves which alleviated the jamming problem. The plant lacks effective equipment for cleaning the perforated drum. A minimum requirement would be to increase the water pressure.

Yield determinations were made with the waste from the handpicking operation, body sections, and leg tips. The meat yields based on the weight of material fed into the machine were 44.6% for the leg tips and 75.8% for the body sections. The meat contained 0.20% shell in the form of a fine grit.

Tests on the Baader will continue.

New Product Development

A new circuit control board was purchased and installed into the modified LaPine heading and cleaning machine. The old control board had short circuited due to excess water in the circuit board housing which probably occurred during the machine cleanup. The machine was put back into operation to complete the final runs under the contract.

Very fresh (day-boat/boxed-at-sea) silver hake (whiting) was brought to a Boston fish plant from Gloucester to be used in the operation of the heading and cleaning machine. In separate runs, about 130 lb of frozen minced whiting blocks and 290 lb of frozen pan-ready whiting were prepared. Both products will be evaluated shortly.

Our Bibun meat-bone separator was brought back to the Gloucester Laboratory. The commercial fish product processor found that he could prepare highly acceptable products from the minced fish collected from the meat-bone separator. A very good product was prepared from the napes produced from the Arenco filleting operation.

A new rubber belt was ordered for our Yanagiya meat-bone separator. Delivery is promised for about 15 November.

Surf Clams

Milford Laboratory-grown surf clams have been sent to the Woods Hole Laboratory for depuration. A sample was retrieved and brought to the Gloucester Laboratory for bacteriological analysis. If they are deemed fit for human consumption, they will be used as fresh control against surf clams held in frozen storage.

Antarctic Krill

The entire month has been spent on a priority assignment researching Antarctic krill as a resource, its harvesting and utilization, with emphasis upon its utilization. Present plans call for the preliminary report on or about 20 November.

Product Quality, Safety, and Standards Development Investigation

Product Quality

The evaluation of the Torrymeter on boxed iced whiting was completed. The results have not, as yet, been collated.

Breaded sand lance was examined after 10 wk of storage at 0°F. The product was still acceptable in flavor and texture. Vacuum packaging seems to have offered only a slight advantage, if any, at this time.

Whiting fillets obtained with the Arenco filleting machine were tested after 2 mo of storage at 0°F. There did not appear to be any difference between control samples and samples that were vacuum-packaged or deep-skinned or dipped in erythorbate solution.

Ron Lundstrom attended the 92nd Annual Meeting of the Association of Official Analytic Chemists (AOAC) and presented his associate referee report on fish species identification by thin-layer isoelectric focusing. This method will be collaboratively studied prior to next year's meeting to determine if photographs of the protein patterns can be used reliably to identify unknown samples. The methodology is currently being finalized and converted to AOAC terminology, and collaborators are now being solicited for the study.

An associate referee report on canned salmon identification by scale characteristics prompted us to try Judi Krzynowek's urea extraction - isoelectric focusing method on two samples of canned salmon. Using ampholine (pH of 3.5-10 and 3.5-5), we were unable to detect any differences in the protein patterns of red and pink salmon.

Supplies and equipment for the minced fish texture study have begun arriving. Some minor lab modifications are underway to accommodate the new instrumentation.

Joe Licciardello prepared a talk to be presented at the upcoming annual Atlantic Fisheries Technologists conference.

Mike Allsup is preparing for an expedition to the Antarctic to study krill harvesting and preservation.

Product Safety

Workup of commercial lake whitefish samples from Miami, Los Angeles, Boston, Washington, and Swampscott, MA, is complete. The analysis of the above extracts has been completed.

The High Performance Liquid Chromatography-Thermal Energy Analyzer (HPLC-TEA) analysis of various extracts of lake whitefish, spiked lake whitefish, and cold-smoked Chinook salmon is complete. A report of all the TEA work is being completed and will be submitted to FDA for review.

A smoked sable fish sample is being worked up by the multidetection method of FDA and vacuum distillation method of Fine. The vacuum distillation technique is being done at the Thermo Electron Corporation. Four extracts will be analyzed by GLC utilizing the TEA and Alkali Flame Ionization Detector (AFID). From the chromatograms, we will be able to determine whether it is possible to use the vacuum distillation technique for screening purposes.

The plumbing of the valve on the Sigma-1 gas chromatograph was reconfigured for use as a venting valve. In this mode, the solvent will be vented from the column to the hood. This will prevent damage to the filaments holding the rubidium source of the AFID and decrease its sensitivity as well.

Product Standardization

Comments received on the proposed unified shrimp standard are being resolved. A meeting with the USDA to discuss the inspection-by-attributes approach used in the shrimp standard has been scheduled for 14 November 1978.

Three comments have been received on the proposed revision of the US standards for frozen fried scallops. Background information is being gathered to resolve these comments.

On 12 October, Fred King visited a surimi processing plant in Golden Meadow, LA. He discussed the technology of its manufacture and end product specification with Mr. Hideo Adachi of the Tokyo Maruichi Shoji Co., Ltd., in Atlanta, GA; Mr. Fukuo Nukita of Hokuho Fisheries Co., Ltd. in Hokkaido, Japan; and others.

Results of the 6-mo project on determining moisture and objectionable bones in fillets and fish blocks are being reviewed for further study.

Technical Assistance

Gloucester Laboratory personnel provided information and assistance in the following areas: laboratory programs and activities, eels, energy uses in the fishing industry, salmon eggs for bait, mussel culture, gear for harvesting juvenile flounders, Scottish seining, educational opportunities for fishermen, source of food technology graduates, review of a Sea Grant project proposal, material for use in preparing a research proposal for the Great Lakes, grinding equipment for gurry, origin of orange color in scallop meats, scientific name for quahog, preservation by ionizing radiation, trade names for Pacific salmons, shipping fresh flukes to Japan, trade name for a New Zealand fish of the family Merlucciidae, scombroid poisoning, organization of a taste panel, identification of species of flounder, southern blue whiting, hakes, packaging materials for Mexican interests, underutilized species, Antarctic fish related to the john dory of Europe, whiting as hake, Australian fish of the family Merlucciidae, kelp and other marine algae, nutritional value of fish sticks, structure of US fishing industry, herring and herring industry, informing a foreign visitor (Martinique) about the US fish industry, red crab processing, canning of smoked fish chowder, squid, mussels, aquaculture, standards for grades of fish blocks and fillets, sizes and weights of scallop blocks, nutritive value of fish, determination of net contents for glazed shrimp, Fish Expo, polyphosphates, lobster paste, Torrymeter, Torry AFOS defroster, sillago species as whiting, canned surf clams, polyphosphates in scallops, calories in monkfish, oyster specifications, parasites, radiation, inspection of fillets, shelf life of fillets, and additives in fillets.

Meetings, Talks, Visitors, Publicity

Judi Krzynowek presented a paper titled "Identification of Species in Cooked Crabmeat" at the 92nd Annual Meeting of the Association of Official Analytical Chemists.

Joe Mendelsohn attended Fish Expo 78 in Boston, MA. Several new contacts were made with representatives from fish processing equipment companies and packaging companies.

Burt Tinker and Bob Learson attended the Annual Interstate Seafood Seminar during 17-19 October 1978 in Nags Head, NC. Bob presented a paper on "The Red Crab: Biology, Management, and Processing."

Dr. Perry Lane attended the annual meeting of the Sea Grant Directors in New Castle, NH; manned a NMFS booth at Fish Expo, coordinated the Gloucester Laboratory open house; and attended, in place of the Gloucester Laboratory Director, a meeting of the General Advisory Committee of the Essex Agricultural and Technical Institute.

Louis J. Ronsivalli delivered a paper on 26 October at the 2nd International Conference on Radiation Processing in Miami. His subject was "The Current View on the Potential of the Use of Ionizing Radiations to Preserve Seafoods." Then he participated in a question and answer session along with other speakers that had delivered papers on the potential of preserving other classes of foods with radiation. Speakers from foreign countries as well as from the FDA and other Federal agencies and from universities participated.

John Ryan participated in a training course on statistics during 11-13 October in Boston, MA. It was conducted by the Regional Training Center of the US Civil Service Commission.

Tom Freeman (Pfizer & Co.) and Jim Ackert (New England Fisheries Development Program) visited to discuss design of a machine for treating fish fillets with antioxidants.

Dr. Dave Iredale and Mr. Alan Friesen of the Freshwater Institute of Canada visited the Gloucester Laboratory to discuss the minced fish block standard.

Dr. Robert Young, Director of Unilever's Research and Development Lab in Aberdeen,Scotland, visited the Gloucester Laboratory and several fish processors in the area.

Dr. Jim Rasekh of the Seafood Quality and Inspection Division visited the Gloucester Laboratory to familiarize himself with our standardization program. He will spend the week of 30 October to 3 November becoming acquainted with the development of standards and specifications.

Dr. Nicolaus Antonacopoulus of the Federal Research Center for Fisheries in Hamburg, West Germany, and Mr. Hermann Hesse, of the Ministry of Food, Agriculture, and Forestry in Bonn, West Germany, visited to discuss objective tests.

Mr. Jag Gjerde of the Directorate of Fisheries in Bergen, Norway, was accompanied by Mr. Knut B. E. Nordness of Nordic Group, Inc., in Boston, MA, on a tour of the Gloucester Laboratory.

Mr. A. M. Lewis of Irwin & Johnson, Ltd., in Capetown, RSA, and Mr. R. R. deVilliers, also of RSA, visited the Gloucester Laboratory to exchange information on utilizing underused species of fish.

Mr. William Weber, Executive Director of the Gloucester Fisheries Commission visited to discuss our research program.

Capt. Tom Morse and Sea Grant representatives visited for a seminar on fisheries management and on the Gloucester fishing industry.

Mrs. Elizabeth Langton of Dynatech Corporation visited for information on research activities.

Mr. Neil Gleckstein, Manager of the NUVA aquaculture project and others, visited for information on mussel and flounder culture.

NATIONAL SYSTEMATICS LABORATORY

Shrimps Investigation

Work continued on the description of a new species of Penaeopsis from the Indian Ocean.

Other Crustaceans Investigation

Preparation continued of a guide to temperate-water decapod crustaceans of the US East Coast.

Pelagic Fishes Investigation

Sections of a manuscript on Indo-West Pacific halfbeaks were revised. Meristic data on Spanish mackerels from around the world was also summarized.

Benthic Fishes Investigation

During October, work focused on studying gadiform fishes in several Japanese fish collections, sorting unidentified specimens from Japanese exploratory fishing cruises, and arranging to borrow critical material for more detailed study and comparisons.

Meetings, Talks, Visitors, Publicity

Dr. Austin Williams served as co-convenor of a Symposium on the Composition and Evolution of Crustacean Faunas in Cold and Temperate Waters of The World Oceans. The symposium, at the Duke University Marine Laboratory, was also attended by Dr. Isabel Canet.

Dr. D. Cohen presented talks or seminars on the systematics of gadiform fishes in Tokyo and Kochi, Japan. He also participated as a member of an oceanography delegation visiting the People's Republic of China, where he presented lectures in Wuhan, Hangchow, and Tsingtao.

Visitors to the National Systematics Laboratory included Dr. Richard McCourt of the University of Arizona, Ms. Sonia Ortega of the Central Bank of Nicaragua, and Dr. Leighton Taylor of the Waikiki Aquarium in Honolulu.

ATLANTIC ENVIRONMENTAL GROUP

Ocean Monitoring and Climatology Investigation

During October the cooperative Ship of Opportunity Program obtained eight XBT transects, two in the Gulf of Maine, one across the Southern New England shelf along the 71°W meridian, two across the shelf and slope off New York, one off Norfolk, VA, and two in the Gulf of Mexico.

Continuous plankton (CPR) and temperature records at 10 m were obtained along one of the Gulf of Maine routes, and a continuous plankton record was taken northeastward from Norfolk, VA. The CPR sampling east of Norfolk began in August 1974, out of New York in January 1976, and in the Gulf of Maine in May 1977. Plankton identifications for these routes are complete through October 1977, September 1977, and February 1978, respectively. Examination of seasonal variations of phytoplankton and zooplankton is underway for all routes, and examination of annual variation for the Norfolk route is beginning. Neuston sampling in the US Coast Guard's Offshore Law Enforcement Patrol area resulted in 18 samples. This monthly program began in March 1975. Analyses for tar and plastics, larval fish, zooplankton displacement volume and dry weight, and

invertebrate length frequency are complete through 1976. Reexamination of the sampling design is underway in an attempt to reduce the number of stations sampled per month.

The first issue of a new quarterly publication, Coastal Oceanography and Climatology News, is scheduled for release in mid-November. The newsletter, produced by the University of Rhode Island's (URI) Center for Ocean Management Studies with support from Sea Grant and NSF, will serve as a means of timely dissemination of information regarding environmental and biological events, and research activities in US coastal waters. The first issue will include an article by Woody Chamberlin about the invasion of the slope water area by cold shelf water during spring and summer of 1978, and one by Steve Cook regarding the effect of the unusually cold winters of 1977 and 1978 on the "cold cell" in the Middle Atlantic Bight. Scientific editors for the newsletter are Perry Jeffries of the URI Graduate School of Oceanography and Mert Ingham of AEG.

A one-page report updating the location and configuration of warm-core Gulf Stream eddies adjacent to the continental shelf in the Middle Atlantic Bight was submitted for publication in the November Atlantic Notice to Fishermen, and also was released to a mailing list of interested individuals at the same time. The report describes the movement of three eddies southwestward along the edge of the shelf, in the period between mid-September and mid-October. Eddy S moved southwest about 9 nautical miles (nm) to a position east of Chesapeake Bay entrance, eddy U moved west-northwest about 45 nm to a position west-southwest of Hudson Canyon. Eddy W and X were reabsorbed by the Gulf Stream and a new eddy (A) developed in the last week of September south-southeast of Oceanographer Canyon. The center positions of the three eddies in mid-October were: S - 36°55'N, 73°45'W; U - 38°55'N, 70°50'W; and A - 39°30'N, 67°22'W. These eddies can be expected to continue moving westward or southwestward about parallel to the shelf edge at about 1-5 nm/day, until reabsorbed into the Gulf Stream.

Chamberlin and Crist have been preparing a report on the unusual distribution of cold shelf water off the New England and Middle Atlantic Coasts during the spring and summer of this year. During March, marked offshore displacement of the slope-shelf water front, extending southward nearly to Cape Hatteras, became apparent in the weekly Experimental Ocean Frontal Analysis charts of the US Naval Oceanographic Office and in infrared satellite imagery. The trend continued and became most accentuated during April. The front was generally 60-100 nm (110-184 km) farther offshore than had been seen in prior years back to 1973, when very high resolution infrared satellite imagery became available and made it practical to monitor the position of the front. Oceanographic data back to 1940 do not indicate such a general frontal displacement. Expendable bathythermograph (XBT) records indicate that shelf water overlaid slope water to a depth of about 50 m, and suggest that the volume of shelf water in the slope water area was too large to have been advected from the adjacent continental shelf. Furthermore, the surface thermal gradients in infrared satellite imagery strongly suggest westward flow into the Middle Atlantic region from the western Scotian Shelf area by way of the Gulf of Maine and southern margin of Georges Bank. From May through the summer, the front was nearer to shore than in March and April, but still generally beyond the limits seen in the infrared satellite imagery from prior years. Satellite infrared shows that: (1) flow of cold water from the western Scotian Shelf area into the slope water area south of Georges Bank started in early January; (2) shelf water also flowed southward from the

western Scotian Shelf during April to June; (3) a large, continuous area of relatively cold surface water appeared on Georges Bank and Nantucket Shoals in early May, persisted through most of the summer, and was in continuous or nearly continuous surface contact with the shelf water on Browns Bank throughout this period; (4) cold water entering the northern Gulf of Maine from the western Scotian Shelf apparently occupied a larger area of the Gulf during the early summer than in earlier years; (5) pulses of cool water apparently moved westward into the Southern New England and the Middle Atlantic shelf areas in July and September. A preliminary report on the subject will be presented at the Workshop on Meteorology and Physical Oceanography of the Middle Atlantic Bight on 15 November.

Ocean Dumping Investigation

The first radio direction-finding drogued buoy study at Deepwater Dumpsite (DWD) 106 was run between 28 September and 6 October. Preliminary results have shown that: (1) the radio signal emitted by the buoys is of sufficient strength for the study; (2) the radio receiving stations at Sandy Hook, NJ, and Cape Henlopen, DE, are situated at good locations for the study; and (3) future work may be able to show long-term drift of the water masses at DWD 106. Buoys drogued to different depths may show shear related to wind driven and non-wind driven currents. A report discussing the experiment will be produced and sent to the NOS program office. Future experiments are planned.

Data from the January 1978 cruise to DWD 106 have been quality controlled and presently are being portrayed and analyzed by Ms. Langone.

Core tubes were supplied to Lt. Duane C. Simpson for use aboard the Albatross IV at the Philadelphia sewage sludge site cruise. Analyses of these cores and other cores from the September sewage sludge site cruise may be completed by the URI Department of Geology. Involvement with the URI Department of Geology is also anticipated for future work at the sewage sludge site in April 1979. Their involvement, along with other plans regarding the April sewage sludge site cruise, were discussed at the 24 October meeting at EPA Region III in Philadelphia. Jim Bisagni, Kilho Park, Duane Simpson, and Mike Devine attended the meeting.

Meetings, Talks, Visitors, Publicity

Mert Ingham presented a seminar concerning AEG's research and monitoring activities to the Physical Oceanography Department of the URI Graduate School of Oceanography on 4 October.

Steve Cook went to New Orleans, LA, during 9-13 October to install an XBT system on board the Delta Sud and to review the Ship of Opportunity Program with Dr. Larry Rouse. He also attended a SEASAT meeting at Bay St. Louis, MS.

Jim Bisagni and Mert Ingham attended an international ocean dumping symposium at West Greenwich, RI, during 10-13 October sponsored by NOS and URI. Submitted in draft form was a paper titled "Physical Variability at an East Coast United States Offshore Dumpsite." The paper is presently being revised.

During 16-18 October, Woody Chamberlin went to Sandy Hook, NJ, to attend the NEFC Board of Directors meeting for AEG.

Jim Bisagni traveled to Philadelphia, PA, on 24 October for a meeting with Ocean Dumping Program members.

On 24 and 25 October, Steve Cook went to New York, NY, to meet with the Maritime Academy training representative to discuss the Gulf of Mexico tanker run. He also met with a representative of Texaco, Inc.

Mert Ingham visited the Sandy Hook Laboratory on 25 October to confer with Dr. Bori Olla and Ms. Donna Busch on possible cooperative studies of Atlantic mackerel distribution.

Steve Cook went to New Bedford, MA, on 26 October to confer with US Coast Guard personnel on board the Coast Guard cutter Unimak. He also visited Sippican Corporation in Marion, MA, and the Woods Hole Laboratory.

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