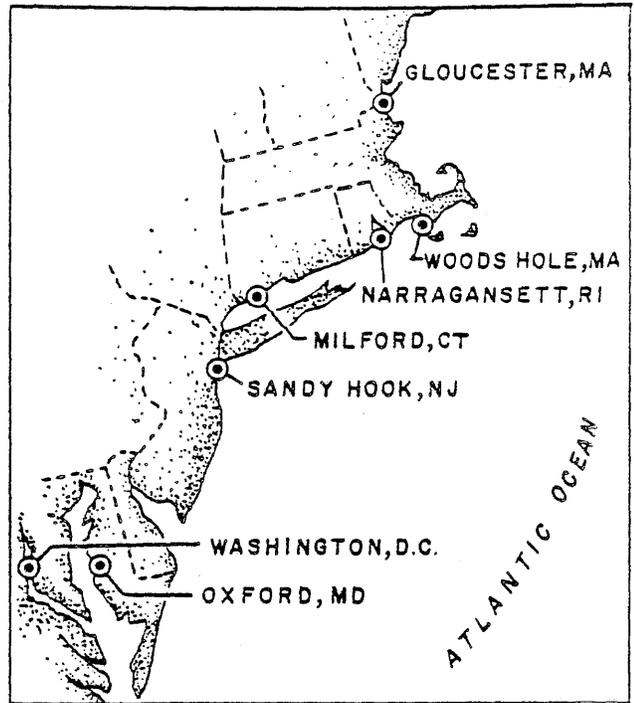


NEFC

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NEWS

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MONTHLY NARRATIVE REPORT MARCH 1978

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Editor, Jon A. Gibson



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



RESOURCE ASSESSMENT DIVISION

Resource Surveys Investigation

The third and last part of the Atlantic mackerel, squid, and Atlantic herring cruise was completed aboard the USSR R/V Argus (3-23 March, Anne Lange, chief of US party). The mackerel survey was completed as scheduled but the squid experiments were never completed because of a realignment of cruise priorities by Soviet officials. They decided to continue looking for mackerel in an exploratory manner. A somewhat abbreviated Atlantic herring cruise aboard the Polish R/V Wieczno was conducted from 11 to 20 March (Linda Despres, chief scientist). During the cruise, trawl stations were made in southern New England and Massachusetts Bay. The two parts of an Atlantic herring cruise aboard the FRG R/V Anton Dohrn were completed in March (Thurston Burns and Gordon Waring, chief scientists, parts I and II, respectively). During the cruise trawl stations were made in southern New England and on Georges Bank. The coordinated cruises of the Argus, Anton Dohrn, Wieczno, and Albatross IV provided almost continuous monitoring of Atlantic herring populations this winter.

The first part of the four-part spring bottom trawl survey was completed in March aboard the Albatross IV (Chuck Byrne, chief scientist).

The auditing of the Sandy Hook cruise data for BLM was completed in March by Malcolm Silverman and Chuck Byrne. The investigation is making a special effort to expedite the processing of past cruise data. Data collected on the first part of the spring survey was ready for keypunching 2 days after the cruise ended.

Jim Crossen of the investigation's electronics group calibrated the USSR R/V Argus and FRG R/V Anton Dohrn hydroacoustic equipment at dockside in Woods Hole in March. Center divers assisted in the positioning of the hydrophone under the vessels' transducers. Plans and preparations for a hydroacoustic experiment aboard the Argus in April have been made. The hydroacoustic work is part of a contract the center has with the C.S. Draper Laboratory in Cambridge, MA.

Age and Growth Investigation

Fred Nichy attended a Silver Hake Age Workshop held in Dartmouth, NS. Other countries present were Canada, USSR, and Cuba. Results of the meeting show greater uniformity in aging silver hake among participating countries. This is the first time Cuba was represented because of their growing interest in this species. An otolith exchange will be maintained in lieu of convening anymore workshops, and recommendations will be made to ICNAF to initiate sampling of young silver hake to obtain representative length data. Fred Nichy will prepare the first sample for the otolith exchange, and also review once more the possibility of using scales instead of otoliths. Because of the reduction in age of the silver hake population to fish mostly under 4-yr old, scales might prove to be useful. Previous studies indicated scales have only limited value in aging older silver hake.

The following summaries of age determinations indicate the strength of the 1975 haddock year class:

| | | Commercial Samples (Quarters I-III, 1977)* | | | | | | | | | | | | | |
|--------|---|--|-------|----|-----|-----|-----|---|----|---|----|----|----|----|-----|
| Age | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14+ |
| Number | 0 | 0 | 1,506 | 90 | 373 | 339 | 230 | 2 | 36 | 2 | 2 | 6 | 0 | 83 | 0 |
| Age | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14+ |
| Number | 0 | 42 | 364 | 57 | 120 | 81 | 119 | 0 | 14 | 0 | 0 | 0 | 2 | 10 | 5 |

The 1975 year class does not appear as strong in the spring survey data as in the commercial sample data due to the stratified sampling procedure used which results in a more even distribution. However, the above table does show that the scrod of commercial landings are almost exclusively from the 1975 year class.

Judy Penttila has completed developing Atlantic cod age-length frequency summaries for Albatross IV research Cruises No. 75-03, 75-12, and 76-02 for growth studies. She also assisted Ray Bowman in preparing growth curves for 17 species for his food analyses studies.

Jeff Floyd prepared photographs of sea scallop shells and ligaments for use in age studies.

Age samples completed were: (1) sea scallops (Santa Cruz, Bountiful, Sea Tick, Navigator, one discard sample from Cap'n Bill IV); (2) red hake (Albatross IV Cruise No. 71-05, Albatross IV Cruise No. 71-06); (3) Atlantic herring (commercial landings totaling 787 samples); (4) summer flounder (Quarter I, 1977: 747 samples); and (5) scup (300 research and commercial samples).

Sandy Hook Investigation

Stuart Wilk participated in a joint USA-USSR squid and Atlantic mackerel trawl survey cruise aboard the Argus. He also attended the 3rd Annual Sportfish Symposium and participated in a Cornell Sea Grant-sponsored workshop on Marine Recreational Fisheries.

Darryl Christensen participated in the cooperative USA-FRG spring Atlantic herring survey aboard the Anton Dohrn.

Revisions of computer programs for analysis of the New Jersey creel census were completed.

Fishery Analysis Investigation

No report received. Report will be included in next month's issue.

Fishery Assessment Investigation

Steve Clark organized and developed a sea sampling program aboard US commercial vessels. This involved several trips to Gloucester, MA, to contact fishermen, training of CETA students in sampling procedures, procuring equipment, and participating in a 1-day sampling trip aboard a vessel out of Gloucester on 12 March. A report describing the sea sampling program is now in progress.

Steve Clark and Emory Anderson participated in further analysis and documentation of the Georges Bank-Gulf of Maine haddock stock status to be used by the New England Regional Fishery Management Council in setting a revised optimum yield (OY) for 1978. Steve drafted a report dealing with US shellfish research and related activities in 1977 for submission to ICES.

Emma Henderson was at the Northwest and Alaska Fisheries Center in Seattle, WA, during 20-24 March meeting with Felix Favorite and Taivo Laevzsta to discuss their ecosystem models, BBM and DYNUMES, in preparation for adapting these for use at NEFC. Emma was also preparing and running computer programs to analyze summer flounder age and catch data, and planning further analysis of red hake age-length data.

Frank Almeida and Thurston Burns were aboard the FRB R/V Anton Dohrn during 28 February-12 March for a spring juvenile herring trawl survey conducted on Georges Bank and contiguous waters. Frank completed the 1977 biostatistics for silver hake and Thurston completed those for pollock. Frank also participated in a training session held at the Woods Hole Laboratory on 20-23 March in the use of the data base management system used for the NMFS national computer time-sharing through the FISHNET contract.

Bill Overholtz participated in a sea sampling trip aboard the F/V Tremont out of Boston, MA, during 15-23 March and prepared a report on that activity. He has continued work on assembling the data base for a new haddock virtual population analysis (VPA). Various personnel in the investigation prepared sections of the US Research Report to ICNAF for 1977.

Brian Hayden has been working on survey data for pollock and prepared a growth curve using spring and autumn data for 1970-76.

Emory Anderson returned on 8 March from meetings in Poland and Denmark. On 15 March he attended a meeting of the New England Council's S&S Committee in Peabody, MA, to hear a presentation on a herring model developed at Harvard University, and also attended a briefing in Boston of the US delegation to the US-Canada negotiations. Emory was in Norfolk, VA during 28-31 March to attend the Marine Recreational Fisheries Symposium and a workshop on research needs in marine recreational fisheries sponsored by the Cornell University Sea Grant program.

Fisheries Systems Investigation

Assessment activity continued during March under the handicap of a heavy travel and meeting schedule. Anne Lange and Gordon Waring were at sea for approximately 2 wk each on the Anton Dohrn and Argus, respectively. The Anton Dohrn and several other 1978 cruises have indicated a return of Atlantic herring to Georges Bank. During autumn 1977, several cruises were unable to locate herring.

Gordon Waring met with Vaughn Anthony in Boothbay Harbor, ME during 7-9 March. They discussed problems to be dealt with in the next herring assessment. Michael Sissenwine attended a meeting of the Irish Sea and Bristol Channel Working Group of ICES in Lowestoft, England, 13-18 March. He also prepared a review paper with Brad Brown and Judy Hoskins entitled, "Brief History and State of the Art of Fish Production Models and Their Application to Fisheries Management off the Northeastern United States." The paper was presented at the Climate and Fisheries Workshop at the University of Rhode Island during 29-31 March. This paper will be revised for publication in the report of the workshop.

Members of the investigation also attended several meetings of the New England Regional Fisheries Management Council or of its committees.

Manuscripts

Clark, S. H. 1978. Application of bottom trawl survey data to fish stock assessments. NEFC Woods Hole Lab. Ref. No. 78-21.

Sindermann, C. J., J. J. Ziskowski, and V. T. Anderson. 1978. A guide for recognition of some disease conditions and abnormalities in marine fish. NEFC Tech. Ser. Rep. No. 14.

Almeida, F. P. 1978. Silver hake: a description of the stocks comprising the management unit. NEFC Woods Hole Lab. Ref. No. 78-18.

Anderson, E. D. 1978. Assessment of the Northwest Atlantic mackerel stock. NOAA Tech. Rep. NMFS SSRF. (S)

Anderson, E. D., and B. B. Ackerman. 1978. Comparison of USA spring bottom trawl survey abundance indices for Atlantic mackerel based on day, night, and total catches. ICNAF Sel. Pap. No. 3: 45-48. (P)

MARINE ECOSYSTEMS DIVISION

Larval Physiology and Biochemistry Investigation

Experiments determining growth and survival of larval Atlantic cod as influenced by prey density have been completed and the data are being analyzed. Studies of larval haddock and cod growth and survival in a competitive situation where both species are together under the same experimental conditions have been initiated.

Studies of the daily mortality rate of winter flounder larvae are in progress with a newly designed rearing system that allows the collection and enumeration of dead larvae. Experiments on larval cod growth, and on RNA, DNA, and protein content at four plankton densities have been completed, and the data are being analyzed. The cooperative study with EPA on the effects of oil exposure during gonad maturation on winter flounder eggs and larvae was continued through the month.

Ecosystem Dynamics Investigation

Mike Pennington and Marv Grosslein continued analysis of statistical properties of trawl survey data. Relationships between means and variances (and the negative binomial parameter k) for experimental survey hauls of varying duration suggest that the underlying spatial distributions of fish on the shelf are fairly stable (in a statistical sense) and that the optimum duration of haul with the standard trawl is between 15 and 30 min for most species in terms of the coefficient of variation of mean catch per haul. Mike has also developed a better procedure for estimating confidence limits about mean catch-per-haul indices when a transformation still leaves the catch data highly skewed. This procedure is being evaluated first on Atlantic herring survey data in line with Mike's special assignment to assist the Resource Assessment Division for the remainder of this year; the technique may prove to have wide applicability for contagious distributions in general.

Grosslein (in conjunction with Rich Langton, Mike Sissenwine, and Brad Brown) began work on a paper evaluating the possible role of species interactions in the biomass changes of pelagic and demersal fishes off the northeastern US. Gross measures of food consumption, feeding interactions, and energy requirements for the Georges Bank area are being compared with biomass changes and growth parameters as a basis for judging the reasonableness of several hypotheses concerning interactions between major pelagic and demersal species. Ed Cohen and Pat Carter continued work on the nutrient and chlorophyll data from 1975-1976; analysis of this series is now about 50 percent complete.

Recruitment Processes

The Albatross IV Cruise No. 78-01 Atlantic larval herring survey of the Georges Bank-Nantucket Shoals area was conducted by the Recruitment Processes Group during 14 February-7 March 1978. George Bolz was chief scientist on the first part of the standard survey and Greg Lough was chief scientist on the second part of the standard survey and MOCNESS. The abundance and distribution of Atlantic herring larvae collected on the standard survey grid stations appeared to be similar to those of February 1977. Low numbers (1-10 larvae per haul) were observed on central Georges Bank and Nantucket Shoals. Sand lance (Ammodytes spp.) larvae were prevalent throughout the study area with high concentrations of recently hatched larvae mostly in the Nantucket Shoals area. Surface water temperatures observed on Georges Bank this February (1978) were similar (4-5°C) to those of last February (1977), but a few degrees warmer in the Nantucket Shoals area. February 1976 surface water temperatures were about 1°C warmer than February 1978 throughout the Georges Bank-Nantucket Shoals area. Special sampling included 33 hauls made for a bongo-haul speed comparison test to evaluate day-night avoidance of herring and sand lance larvae collected by ICNAF 3.5 knot hauls vs MARMAP 1.5 knot hauls. A fine-scale grid of standard stations (34 stations that were 5-mi apart) was covered in a 24-hr period where larvae were known to occur in the northern South Channel area to examine their fine-scale distribution and to select a station suitable for MOCNESS deployment. Eight MOCNESS hauls were successfully made within a 24-hr period in the approximate center of the fine-scale grid (41°00'N lat, 69°12'W long, 65-m bottom depth) an approaching storm precluded further sampling and the ship anchored off Provincetown for 6 days. Herring and sand lance larvae from this survey are presently being processed at the Woods Hole Laboratory. The standard station larval herring data will be incorporated into the 1977 season's estimate of production, growth, and mortality needed by the Regional Fishery Management Councils. George Bolz is continuing the basic data analysis of the 56-cruise larval herring data base.

Slow progress is being made on the larval herring gut content-condition factor measurements by Roz Cohen and Judy Lettes, and the processing of the fourth winter survey, Albatross IV Cruise No. 74-13, is about one-half done. A number of additional runs have been made on existing condition factor measurements using multivariate analysis. Roz Cohen upgraded her analytical capabilities for such analysis by completing two short-term federally-sponsored statistics courses (basic programming; correlation and regression) given in Boston last month. Work is also progressing by Timothy Cole and Cabell Davis on the fine mesh (0.165-mm) zooplankton samples for the 1975 and 1976 larval herring seasons to be able to link larval gut content-condition factor, growth, and mortality data for at least these two seasons.

Robert Livingstone participated in the Anton Dohrn's Cruise No. 78-01 (juvenile herring survey) during 29 February-12 March, and collected maturity samples on over 1,000 gadids. Results showed haddock on Georges Bank to be in 7.5% spawning condition, 26% ripe, 40% developing, and 19% immature. Susan Bonnyman, biologist from Bedford Institute of Oceanography under Pat Lett, visited us during 22-28 March to learn about our techniques of aging larval fish based on daily growth rings in their otoliths. Roz Cohen and Peter Hamer will be assisted by her during her visit. The report of the January 1978 meeting of the Georges Bank Larval Herring Patch Study, Fall 1978, was completed by Greg Lough and will be distributed in April.

Fishery Oceanography Investigation

Primary emphasis in March was on Albatross IV Cruise No. 78-03, a current-meter and hydrography cruise in the Northeast Channel and its vicinity. We successfully retrieved all three moorings that had been set in September 1977 with eight current meters. In their places we set three new moorings with three current meters on each. A depth sensor was added on the northernmost mooring, just below the subsurface float, to monitor vertical excursions related to the strong current flow. In addition, a fourth mooring was set out midway between the northern and middle standard positions. The fourth mooring has surface flotation and includes two ENDECO tethered current meters, one at 100 m in depth and the other at about 5 m in depth. The two ENDECO instruments were loaned to the NEFC by the manufacturer as a demonstration of their usefulness in the wave zone and in strong current regimes. They will be recovered in June 1978; the standard array will be recovered in September of this year.

The recovered instruments will be serviced by Gil Dering and prepared for the next setting. This will avoid the cost, risk, and time loss involved in shipping the meters to Florida for reconditioning. All eight instruments appeared to be in good condition and tape cassettes appeared to have operated properly. A further look at the data will begin shortly.

Also on the cruise, we made 20 STD stations in the Northeast Channel and in the slope water offshore, and 97 XBTs, including a closely spaced XBT section along the axis of the channel. Unfortunately, the STD tape recorder did not function properly so we do not have any complete records, but we do have values recorded at discrete depths on each station. Gil Dering has since located and fixed the problem -- a failed chip on one of the circuit boards. It is hoped that our new Tektronics graphics calculator will be functioning during the June cruise so that we can catch and fix such problems at sea.

Ann Dorkins and Dan Patanjo also spent time at sea on Delaware II Cruise No. 78-02; the second leg of the early winter MARMAP survey. Time not spent at sea or in preparation and post-cruise activities was devoted to: (1) preparing figures and papers for the spring meetings of the American Geophysical Union in April; (2) analyzing salinities from bottom trawl surveys and MARMAP and hydrography cruises; (3) plotting data from larval herring cruises; (4) cleaning up our XBT backlog with NODC; and (5) completing the March SOOP run report and working on annual summaries for Annales Biologique.

In addition, Red Wright took part in the Woods Hole Workshop on Opportunities in Marine Science for faculty members from predominantly black colleges, and went with Marv Grosslein and Mike Sissenwine to the Climate and Fisheries Workshop at the University of Rhode Island. A new Northeastern Co-op student, Steven Fogg, arrived in the last week of the month to replace Raymond Cloutier. Steve will stay through June.

Ichthyoplankton Investigation

We completed sorting and identification of all fish larvae from the winter MARMAP survey. Preparations are underway for the spring study and an Ocean Pulse cruise. At present, Tom Morris is at sea on R/V Argus, participating in a cooperative study with Brookhaven National Laboratory.

Sand lance larvae continued to dominate the ichthyoplankton community in the Middle Atlantic Bight and Georges Bank during the winter of 1977. The areal distribution in the bight was similar to that in 1976, but on Georges Bank it was considerably reduced. Whereas concentrations were found over most of Georges Bank in 1976, both the eastern limit and the center of abundance occurred on and around Nantucket Shoals in 1977. The percent of positive tows in waters off southern New England and Georges Bank in February decreased from 92% in 1976 to 39% in 1977. Despite the apparent reduction in the extent of their distribution, larvae of this small forage species continued to be the most abundant larvae taken on coastal surveys from Cape Hatteras to the Gulf of Maine.

Plankton Ecology Investigation

Plankton Sorting Group

Six samples taken at the site of the Ocean Barge 250 gasoline spill off Rhode Island were examined and the major taxa were listed.

Effort is directed toward processing samples from the 1977 MARMAP cruises for a paper to be presented at the next ICES meeting. The area under study includes the Gulf of Maine, Georges Bank, and the Middle Atlantic Bight. To meet the specific needs of the analysis, a new sorting protocol was designed which provides numbers of species by station with an average rate of 2.5 samples/person/day. We have completed samples from the Middle Atlantic Bight for March, April, and May. This includes running wet displacement volume readings for Goerlitz Cruise No. 77-01 and Albatross IV Cruise No. 77-02.

Data from the 1971-1975 Georges Bank spring and fall surveys are being processed for various research papers.

Biostatistics Unit

Data processing efforts were divided between the BLM contract data for Sandy Hook and ichthyoplankton data from the Polish Sorting Center. Processing was halted on 24 March to allow the programmers in the Biostatistics Unit to convert all data files and program files to a new computer account number. This step was necessitated by the impending conclusion of the research and development contract with the University of Rhode Island. The termination of the R&D contract on 31 March means that we will be using the MARMAP Information System (MIS) as-is until a long-term solution is evolved for data processing needs within the NEFC. The system should become operational again for routine data processing by the middle of April, barring any problem in loading the programs onto the system using the new account number.

Jerry Prezioso of the Biostatistics Unit and Joe Kane of the Plankton Sorting Group participated in Delaware II Cruise No. 78-02. Lorrie Sullivan and Jack Green assisted in the juvenile herring studies aboard the Anton Dohrn Cruise No. 78-01. Donna Busch is aboard the Argus Cruise No. 78-02 to study productivity along with the Soviet and Brookhaven scientists. Lorrie Sullivan made a 1-day trip on the Albatross IV Cruise No. 78-04 on 30 March 1978 to demonstrate trawl, plankton, and hydrographic survey techniques to participants of a NOAA-sponsored "Workshop on Opportunities in Marine Science."

On 31 March 1978, Dave Bearse, Lorrie Sullivan, Tom Plichta, and Mark Nally of Narragansett met with Art Kendall, John LeBaron, Myron Silverman, and Pat Rosenberg of Sandy Hook at the NMFS laboratory in Milford to discuss data processing within the division. Primary emphasis during the meeting was placed on the new log sheets for recording data at sea. These forms were reviewed and revised and should be available for use in May. Several logistic and technical data processing topics were discussed relative to the BLM contract data and the current MARMAP Survey I data.

Image Analyses Project

A joint proposal with URI to apply image analysis and pattern recognition to routine plankton analysis was reviewed by Luther Bivins (Office of Ocean Engineering, NOAA).

The first step in incorporating image analysis techniques to plankton work was taken at the Narragansett Laboratory this past month. Hal Marrat, an engineer from Bausch and Lomb, tested and internally calibrated the small system which was purchased to count and size plankton. Mark Nally, on loan from the Biostatistics Unit, modified the histogram program to produce a length frequency format for copepods. The NOAA Office of Ocean Engineering plans to support our joint work with Perry Jeffries of URI, on adapting image analysis systems to plankton sorting. The research and development phase will require approximately \$300,000, to be allocated over a 3-yr period (1978-1980). A paper describing image analysis and its possible applications to plankton research will be presented at the upcoming IYABA meeting.

Environmental Assessments

On 17, 18, and 19 March, Carolyn Griswold, Thomas McKenney, and Robert Benway took part in an environmental damage assessment survey off Watch Hill Point, RI, following the grounding of the Ocean Barge 250 and subsequent spill of 685,458 gal of gasoline. Efforts were coordinated with Jim Quinn and Sheldon Pratt of URI and Jim Lake of EPA. A joint report is being prepared on the results of the survey.

On 22 March Carolyn Griswold attended a meeting of the BLM Biological Task Force in Boston, MA. State representatives from Pennsylvania, Delaware, Maryland, New Jersey, Connecticut, and Massachusetts were present. Much of the meeting was spent explaining the function and authority of the task force. It was noted that some recommendations made by the task force were included in the call for bids for the North Atlantic Outer Continental Shelf Oil and Gas Lease Sale No. 42 published in the Federal Register 42 (251) on 30 December 1977.

Benthic Dynamics Investigation

Updating of the New England macrobenthic invertebrate fauna data was continued. A section on Aschelminthes for a report on the distribution of this New England fauna was completed. A computer plot program "Ben Plot" has been modified to increase the rate of benthic data output.

Analysis of the 1969-1972 food habits data base for the Pleuronectiformes was continued, and the preliminary analysis of juvenile haddock food habits data was completed. The benthic code tape -- taxon code number vs prey name -- was updated. Richard Langton is collaborating with several other Center staff members on a study of recent fluctuations in pelagic fish stocks on Georges Bank. This study is part of the Center's ICES program. Ray Bowman is working with the Center Director on a special assignment involving fish growth and feeding strategies. They have established length-weight equations and von Bertalanffy growth equations for the 25 most abundant fish species. Additional samples of

fish stomachs were collected for special purposes aboard the R/V Argus and R/V Anton Dohrn.

The cruise of R/V Albatross IV that was scheduled for February and canceled because of bad weather, has been rescheduled for late May and early June. Primary objective of this cruise will be to determine the food habits and feeding chronology of a few selected fish species.

Apex Predators Investigation

The newsletter summarizing the results of the cooperative shark tagging program for 1977 was published and distributed to about 2,000 fishermen. A research cruise aboard the Wieczno departed on 21 March for 20 days. The purpose of the cruise is to tag apex predators, obtain biological samples for food and reproductive studies, and to conduct sonic tagging experiments in cooperation with WHOI. Several recaptures from tagged sharks were returned during the month. The most interesting one was from a blue shark that was tagged off Long Island and recaptured off Grenada, BWI, after having traveled 1,841 mi after 257 days at liberty.

Meetings, Talks, Visitors, Publicity

Richard Langton visited the University of Delaware, College of Marine Studies, at Lewes, DE, to participate in a graduate student's advisory committee meeting. Wes Pratt presented a lecture on the reproduction of sharks at the Boston Sea Rovers Conference on 11 March. Jack Casey attended a Mid-Atlantic Council sub-committee meeting on sharks to assist in developing the final fisheries management plan for sharks. Jack Casey presented a paper on apex predators entitled, "Offshore Fisheries in the Mid-Atlantic Bight." at the 3rd Marine Recreation Fisheries Conference in Norfolk, VA. Dr. Jan Beyer of the Danish Institute of Fishery and Marine Research spent 10 days at Narragansett working with Dr. Laurence on stochastic modeling of larval fish survival. Joel Bodammer of NMFS Oxford laboratory spent 2 wk in Narragansett with Geoffrey Laurence preparing larval fish specimens for histopathology studies.

Kenneth Sherman attended the Board of Directors meeting at Woods Hole the week of 6 March. On 15 March, Luther Bivins (NOAA Office of Ocean Engineering), Alex Poularikas (URI), and Perry Jeffries (URI), met with Kenneth Sherman and Ray Maurer at the Narragansett Laboratory to discuss the application of image analysis technology to plankton sorting. Marv Grosslein attended an S&S committee meeting for the New England Council on 15 March at Peabody; he presented reports on the status of knowledge regarding mesh selection for silver hake, origin and impact of the 1976 anoxic conditions on sea scallops in the Mid-Atlantic, and current research at NEFC directed toward multispecies interactions. On 16 March, Kenneth Sherman met with Wally Smith, Art Kendall, Marv Grosslein, and Ed Cohen at Narragansett regarding MARMAP mesoscale and microscale sampling for 1978 and 1979, and ADP problems. On 23 March, Kenneth Sherman and Carolyn Griswold met with Jim Quinn at URI regarding the gasoline spill (Ocean Barge 250). Steve Boscaj of TV Channel 10 (Providence) visited the Narragansett Laboratory to cover the research effort underway to assess damage of the Ocean Barge 250 gasoline spill off Watch Hill, RI. On 28 March, Dr. Laevastu visited the Narragansett Laboratory. Kenneth Sherman participated in a special meeting dealing with "Opportunities in Marine Sciences," for minority students.

On 29 March, Susan Bonnyman, of the Bedford Institute of Oceanography in Nova Scotia visited the Narragansett Laboratory. Kenneth Sherman, Geoffrey Laurence, and Jerry Prezioso attended an IYABA meeting at Woods Hole on 30 March. Also on 30 March, Donald Malins of the NWAFC's Environmental Conservation Division, visited the Narragansett Laboratory.

Manuscripts

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

Laurence, G. Larval length-weight relations for seven species of Northwest Atlantic fishes. Fish. Bull. (A)

Pratt, H. W. Reproduction in the blue shark (Prionace glauca L.) Fish. Bull. (A)

MANNED UNDERSEA RESEARCH AND TECHNOLOGY PROGRAM

No report received; report will be included in next month's issue.

DIVISION OF ENVIRONMENTAL ASSESSMENT

Behavior of Marine Fishes and Invertebrates Investigation

We completed the analysis of data on the effects of elevated temperature on early embryonic development of tautog, Tautoga onitis, with gametes derived from parents also exposed to high temperatures. A manuscript is being prepared for journal submission. The results of this study indicate that as incubation temperatures rose above 24.0°C, embryos at 24 hr developed deformities, such as stunting, enlarged organs, and body curvatures. These persisted until incubation temperatures reached 26.3(+0.2)°C, when the majority of 24-hr eggs proved to be dead, containing no embryos, merely necrotic yolk masses.

Results indicated that parental exposure to high temperature has a major impact on embryonic development. When incubation and parental temperatures were lowered to pre-test acclimation levels of about 20.0°C, high egg mortality persisted for 3 days. Further evidence for the residual effects of parental exposure was that a small percentage of embryos continued to develop abnormally for up to 19 days after the temperature stress was removed.

Biological Oceanography of Stressed Environments Investigation

Dr. James Thomas, Jay O'Reilly, and Craig Robertson participated in the fourth MESA Synoptic Investigations in Nutrient Cycling (SINC) cruise in the New York Bight apex from 5 to 16 March. Again drogue buoys were set and used to follow and sample a specific parcel of water. The water mass was followed for several days and sampled day and night to determine changes that occurred with time as the water moved away from the estuary. Sandy Hook personnel were particularly responsible for determining total and dissolved components of primary productivity as well as total plankton respiration and photosynthetically

available radiation and submarine extinction coefficients, pH, alkalinity, and the standing stocks of dissolved oxygen and dissolved organic carbon. Portions of these data and data from our March-April and June-July 1977 cruises in the New York Bight and over Georges Bank are to be presented at the NEFC symposium to be held at Woods Hole in April 1978.

Phytoplankton Biomass Survey (PBS) subtask recently completed a cruise on the FRS Delaware II in conjunction with the MARMAP program between Cape Hatteras and the Gulf of Maine. Collections were made at 132 stations, including transects off the mouths of major estuaries, resulting in 1,722 chlorophyll a samples which were returned to Sandy Hook for analyses. Of these, 40 stations have been analyzed.

Data from the USSR Argus cruise (October-November 1977) have been partially plotted. Surface values of total chlorophyll have been contoured. Values generally ranged from 0.5 to 2.5 mg of chlorophyll a per cubic meter with higher values located off: (1) Portland, ME; (2) just east of Cape Cod; and (3) on the outer continental shelf off Chesapeake Bay. Chlorophyll a was unexpectedly low in the New York Bight. We will continue measurements to see how this pattern changes with each season and to see if parts of this pattern have any stability from year to year. These data and data from the NOS Mt. Mitchell and Kelez cruises of November-December 1977 are to be presented by Ms. Chris Evans at the NEFC symposium in Woods Hole.

The taxonomic work by Ms. Myra Cohn on phytoplankton populations in the New York Metropolitan Area has increased our understanding of phytoplankton population structure by demonstrating that chlorophytes and microflagellates dominate the New York area waters in terms of numbers while the much larger-sized diatoms provide the greatest number of different species. These data are also to be presented at the NEFC symposium in April.

Seabed oxygen consumption data from our cruises in the New York Bight and over Georges Bank during March-April and June-July 1977 are being analyzed in preparation for presentation by Bill Phoel at the NEFC symposium.

Nutrient analyses by Ruth Waldhauer and Al Matte of deepwater dumpsite seawater samples collected by Dr. Tom O'Connor were completed and a memo reporting the results was sent on 10 March. Unusually high concentrations of nitrate were measured. Dr. O'Connor phoned on 30 March to report that he learned that the filters used in the sample collection had been prewashed in nitric acid and therefore invalidated the nitrate analysis. The values for phosphate and silicate, however, were valid. Seawater samples were collected by Jay O'Reilly, Jim Thomas, and Craig Robertson on the start of the SINC cruise to evaluate the effects of filtration and storage on nutrient samples. The first sample set shows a standard deviation of 1.67 on a mean peak height of 19.24 for nitrate with unfiltered water while filtered water shows a standard deviation of 0.65 with a mean of 18.76.

Data reduction of nutrients from the Advance II and Albatross IV cruises, as well as assembly of the ultraviolet irradiation system for organic nutrients, continued.

Coastal Ecosystems Investigation

We completed a draft final report on the benthos of potential oil-producing areas in the Baltimore Canyon Trough (BCT). This report will be submitted to the Bureau of Land Management (BLM), to contribute to the development of environmental baselines against which to assess impacts of oil exploration and producti

in the BCT. We also sent to BLM a quarterly report on activities of the other tasks (finfish, ichthyoplankton, and pathobiology) involved in NMFS' portion of baseline development for the BCT.

Other activities included: (1) preparation of a report on available benthic data from the vicinity of Watch Hill, RI, to help assess impacts of a gasoline spill there; (2) input of data to a NOAA report to EPA on resources and water quality of the Middle Atlantic Bight; this may guide EPA in determining whether/where sewage treatment requirements can be relaxed; (3) continuation of work on MESA "monitoring" cruise data and "recon" cruise data and samples; (4) preparation of benthic abundance and distribution charts for New York Bight apex benthic atlas; (5) coordination of the upcoming interdisciplinary (12 scientists from 8 investigations) Ocean Pulse cruise aboard the Researcher; and (6) testing several sample-splitting devices for feasibility of reducing processing time by sorting aliquots of benthic samples.

Coastal Monitoring, Analysis, and Prediction Investigation

Upon request through channels from Washington, DC, a response was prepared regarding the needs and feasibility of emergency studies of the status of American lobster stocks and ecological damage caused in Massachusetts by the severe storm of 6-8 February 1978. The request originated with Secretary Evelyn Murphy of the Massachusetts Office of Environmental Affairs.

Copies of NEFC Laboratory Reference No. 78-15 entitled, "Fisheries Resources of the Cape Cod and Massachusetts Bay Region," by Lux and Kelly were sent to Allen Peterson, Director of the Massachusetts Division of Marine Fisheries, for comments from his staff. The manuscript will soon be submitted for publication.

Samples of ichthyoplankton collected in spring 1976 with neuston and bongo sampling gear aboard Albatross IV and Spirit of '76 are being sorted by Marine Research, Inc., under contract. Processing is reported to be progressing well and data summaries will soon be available.

Small otter trawls and neuston sampling gear were assembled to begin ichthyoplankton and contaminant sampling in Buzzards Bay in April. Neuston sampling for lobster larvae will be continued in Buzzards Bay (May through August) for the third year in cooperation with the Massachusetts Division of Marine Fisheries and the Cape Cod Canal Electric Power Plant.

Larry Davis completed the final draft of a manuscript entitled, "Bottom-water Temperatures from Cape Cod to Cape Hatteras during the Spring and Autumn, 1964-1976," and it is proceeding through the editorial process for publication.

At the request of Jack Holston, New England Regional Fishery Management Council, preliminary drafts (descriptive) of Fishery Management Plans for Pollock and Redfish were reviewed by Fred Lux and George Kelly, respectively. The plans were prepared by TRIGOM for the Council.

Physiological Effects of Pollutant Stress Investigation

Physioecology

Surf clams (Spisula solidissima) were spawned this month and the embryos exposed for 24 hr to seven heavy metals (As, Cd, Cu, Pb, Hg, Ni, Ag, and Zn), individually. The samples are now being examined.

A study of the effect of mercury, as $HgCl_2$, on larval oyster respiration was initiated this month. Measurements of larval respiration will be made at

specified intervals during a 14-day exposure period. This study is designed also to ascertain whether a Gilson differential respirometer can be used to measure larval respiration, rather than the ultramicrorespirometers we have used in the past.

Experiments to determine the effects of metals on bivalve embryos and larvae under various experimental regimes were resumed this month. Considerable time was spent on statistical treatment of experimental data obtained during the past 2 mo, using response surface methods and factorial analysis. Becoming familiar with a BOX-2 computer program, which will greatly improve our processing of data obtained from multifactorial experiments, occupied much of our time.

Physiological Effects

Winter flounder, Pseudopleuronectes americanus, exposed to 10 ppb cadmium for 60 days with a 15 or 45-day recovery period were sacrificed for respiratory and hematological testing. Blood samples were also taken from 54 striped bass following exposure to 1 and 10 ppb mercury for 60 days. Measurements were made of hematocrit, hemoglobin, and red cell count. Plasma samples from both species of fish were frozen for later measurements of sodium, potassium, calcium, and osmolality.

Studies continued on the effects of silver on the metabolism of bivalves.

Biochemical Effects

Work this month has been primarily with winter flounder gonads. Animals in a recent experimental series, in which winter flounder exposed to 10 ppb Cd were allowed to recover in clean water for 0, 15, or 45 days, had gonads of varying degrees of maturation. Some of the early kidney data hinted at a greater susceptibility to cadmium-induced metabolic perturbation in fish with immature gonads. We have therefore undertaken a study of metabolic patterns in the developing gonads of winter flounder of both sexes. Dr. Douglas Tolderlund, of the Coast Guard Academy, New London, has been especially helpful in obtaining specimens, and we have also used the Shang Wheeler to fish just outside Milford Harbor. A considerable amount of data has already been generated and is presently being analyzed.

Anaerobic Bacteriology/Metabolism

Laboratory work this past month was limited to studies on the growth characteristics and media evaluation for the several hydrogen sulfide-producing anaerobic isolates. The isolates can be maintained under anaerobic conditions in stock culture and some variation is noted in H₂S production.

Some time was spent in planning for the forthcoming April-May cruise of the R/V Researcher.

Meetings, Talks, Visitors, Publicity

Dr. Frederick Thurberg served on the University of Rhode Island Sea Grant Site-Review Team, 27 February-1 March, and participated in a Center IYABA meeting on 29-30 March at Woods Hole.

On 6-9 March, Dr. John Pearce participated in the NEFC Board of Directors meeting held at Woods Hole. Following this meeting Drs. Robert Edwards and John Pearce traveled to Washington, DC, to meet with Dr. Donald Martineau in regard

to plans for the Ocean Pulse program. The meeting with Dr. Martineau resulted in the development of a working group meeting with Oceanic and Atmospheric Service (OAS) personnel.

Frank Steimle attended an EPA Region III meeting in Annapolis, MD, on 8-9 March where he made a presentation on the Ocean Pulse program and participated in a review of other environmental monitoring programs in the Middle Atlantic Bight.

Dr. Anthony Calabrese and Mr. David Nelson attended an American Society of Testing Materials subcommittee meeting in Narragansett, RI, on 14 March.

On 16 March Dr. John Pearce and Mr. John Babinchak participated in a New York Sea Grant workshop concerned with planning for long-range NOAA environmental studies. This meeting was an outgrowth from the earlier meeting held in Bay St. Louis during the summer of 1977. The meeting was an attempt to develop inputs from the academic community as well as from other governmental agencies in regard to future NOAA environmental research.

On Monday, 20 March, participants in an upcoming Ocean Pulse cruise aboard the R/V Researcher met at Sandy Hook Laboratory to discuss details necessary in developing cruise plans and to establish research protocol aboard the Researcher.

On 22 March, Dr. Pearce met with Drs. Alex Malahoff, Tom O'Connor, and Kihlo Park (OAS) to discuss further cooperative programs between the NEFC and OAS. These programs will be developed into a coordinated/cooperative Ocean Pulse program with OAS personnel having the lead responsibilities for physical, geological, and chemical oceanography. The NEFC will have the lead in biological effects monitoring studies and baseline ecological and fishery measurements.

Bill Phoel presented a paper "A Diving System for Polluted Waters" at the 6th Biannual International Diving Symposium, "The Working Diver - 1978", sponsored by the US Navy, ASME, MTS, and Battelle's Columbus Laboratories. The paper is to be published in the proceedings.

Dr. John Nelson, microbiology professor, University of Bridgeport, visited with Dr. John Graikoski to discuss bacteriological aspects of dredging and spoils disposal and Long Island Sound microbiology in general.

Manuscripts

MacKenzie, C. L., Jr. 1977. Sea anemone predation on larval oysters in Chesapeake Bay (Maryland). Proc. Natl. Shellfish Assoc. 67:113-117. (P)

MacKenzie, C. L., Jr., and A. S. Merrill. 1977. Observations of sea scallop stocks on Georges Bank and Middle Atlantic Shelf in 1975. Proc. Natl. Shellfish Assoc. 67:120. (Abstract). (P)

Waldhauer, R., A. Matte, and R. Tucker. 1978. Lead and copper in the waters of Raritan and Lower New York Bays. Mar. Poll. Bull. 9(2): 38-42. (P)

Pearson, W. H., and B. L. Olla. Detection of naphthalene by the blue crab, Callinectes sapidus. Estuaries. (A)

Pearce, J. B. Marine sand and gravel production in areas off the northeast coast of the United States. Mar. Poll. Bull. (A)

Mahoney, J. B., and J. A. McLaughlin. Salinity influence in phytoflagellate blooms in Lower New York Bay and adjacent waters. Appl. Environ. Microbiol. (S)

AQUACULTURE DIVISION

Aquacultural Genetics Investigation

Selection Experiments on the Commercial American Oyster

Spawning of foundation stocks from the mass selection experiment continues. All three lines -- high, low, and control -- have now been spawned. Spat have been collected from high-line and control-line larval cultures spawned in February. Succeeding high-line and control-line larval cultures are now approaching setting size. A series of experiments comparing growth rates among the three lines is being conducted. Initial results are not definitive, but generally indicate that larger adults produce faster growing larvae.

Inbreeding and Outbreeding Experiments on the Commercial American Oyster

Efforts were concentrated this month on initiating F_2 inbred cultures of the commercial American oyster, Crassostrea virginica. F_1 full-sibs from all six of the conditioned lines, year class 1976, spawned for single pair crossing to produce F_2 inbred progeny and outbred controls. Larvae from the first group of cultures, which consisted of nine inbred crosses from line 37 and a single outcross with a female from line 36, did not survive past day 14. However, larvae from contemporary foundation crosses have survived to setting. Larvae from the second and third groups of spawners from lines 38, 41, 42, and 43 have survived at least to day 14 and some to day 21. However, early results indicate effects of inbreeding depression manifested as low survival of, and little growth in inbred larvae compared to outcross controls. Similar marked inbreeding depression in the F_2 was found in past smaller-scale studies by Longwell and Stiles in 1973, on the American oyster utilizing full-sibs.

Cytology and Cytogenetics of Developing Fish Eggs - Environmental Effects

A large study of Atlantic mackerel eggs collected from the New York Bight in May 1977 is being concluded and will be reported next month.

Spawning and Rearing of Mollusks Investigation

Spawning has been induced in bay scallops, Argopecten irradians, ripened under various experimental conditions. The best egg production was obtained from groups conditioned at 15°C in flowing water, followed by production at 20°C . Scallops conditioned in a static system and fed on cultured algae have not spawned as yet.

Bay scallop larvae from an earlier spawning survived and grew well through metamorphosis. More than 90% of the original larvae were harvested from the larval system at setting size. About 70% of these metamorphosed in both a flow-through and a static system. Growth of the young juveniles was 37% better in the static system than in the flow-through system.

Surf clams, Spisula solidissima, resulting from the first successful spawning of 1978 are being reared so that we may supply the Gloucester Laboratory with young surf clams for consumer acceptability studies. Larvae from this spawning

were used in a feeding study to determine the algal food requirements of surf clams. It has been shown experimentally that 1-wk-old larvae grow faster at food levels higher than the standard 100,000 algal cells per liter of culture medium. In another experiment, larval cultures that had been fed at elevated levels had about 10% of the total number of larvae reach metamorphosis in 15 days. This is about 1-wk less than in control groups which were fed at standard levels.

Aspects of Nutritional Requirements of Mollusks Investigation

Experimental investigations are continuing in the same areas as reported in previous monthly reports. We are awaiting results of the recent liquid nitrogen cryopreservation experiments in which glycerol was used as a cryoprotectorant. In previous studies, this was the only cryoprotectorant that yielded a few viable cells of Isochrysis galbana. This would prove to be a great victory if the earlier result could be confirmed. Experiments, in which we explore the possibility of culturing the algal food species on a more dilute medium than the one presently used, are also in progress. Recent work has shown that the trace metal and iron concentrations in the present growth medium can be reduced, in addition to a reduction of the other medium components already demonstrated. These reductions do not affect population growth in the six algal species that were tested. Recent experiments on the toxicity of selenium to phytoplankters have shown that although growth of certain species is not affected by this element in high concentrations, a startling pigment change does occur in three species. A brown pigmented diatom turned bright red and two bright green chlorophytes became red-brown in color. Experiments on four species of phytoplankters for determination of upper tolerance limits to three metals (Cd, Zn, and Cu) were conducted in a natural seawater growth medium in contrast to previous work in an artificial seawater growth medium. Overall, response to Zn was similar in both media, but organisms were more sensitive to Cu and Cd in the natural, rather than the artificial seawater medium. These effects are probably due to the presence of a chelating agent in the natural seawater medium.

During this month the algal mass culture units yielded a harvest of 1,141.5 liters of larval food and 1,235.8 liters of juvenile foods. These harvests were distributed to the various investigations as follows: 670 liters to Aquacultural Genetics, 972 liters to Spawning and Rearing of Mollusks, 57 liters to Aquaculture Control of Larval Disease, and 515 liters to Physiological Effects of Pollutant Stress. Stock cultures were subcultured on schedule.

Samples of cultures were sent to Dr. G. Anderson, University of Mississippi, and Mr. Andre LaBonte, Florida. Mr. William DiNatale, a Northeastern student, has entered on a 3-mo assignment to replace Mr. Barry Stein.

(Editor's Note: The first two paragraphs of this investigation's contribution to the January 1978 Monthly Narrative Report were inadvertently and inaccurately changed during editing. Those paragraphs should have read as follows:

"Experiments were conducted to determine the tolerance limits of four species of phytoplankters to essential trace metals that are also potentially toxic pollutants. Fourteen concentrations of $ZnCl_2$ ranging from .025 mg% to 6.0 mg% were examined. Tolerance to metals appear to be relatively high, e.g., a concentration of 3-5 mg% once resulted in a growth inhibition of only about 43% for three species and only 17% for another.

Ten concentrations of $CuCl_2$ ranging from 0.2 ug% to 50 mg% were tested. At 5.0 mg% two species reacted with only about 11% inhibition and two species were not affected. At 50 mg%, however, three species demonstrated 64% growth inhibition and one species 28%. Additional experiments are in progress.")

Meetings, Talks, Visitors, Publicity

E. Rhodes participated in a bay scallop workshop in Waterford, CT, that focused on problems with both artificial and natural production of the species.

R. Goldberg attended the second workshop on Waste Heat Utilization for Aquaculture at Rutgers University, New Brunswick, NJ.

Visitors included: personnel from the Institute for Anguilliform Research, University of Bridgeport; C. Graham Hurlburt, Blue Gold Sea Farms, Portsmouth, RI; Blount Sea Food, Warren, RI; and Mrs. Pil-Ae Kang, Fisheries Research and Development Agency, South Korea.

PATHOBIOLOGY DIVISION

Comparative Pathobiology Investigation

Four species of mollusks from Departure Bay, BC, were examined histologically to determine possible causes of localized mass mortalities. Pacific oysters, Crassostrea gigas; blue mussels, Mytilus edulis; little neck clams, Protothaca staminea; and butter clams, Saxidomus giganteus, were examined. The butter clams were infected heavily with a nematopsis-like sporozoan -- several of the mussels and the little neck clams have invasive neoplasms. The neoplasms resemble those previously found in blue mussels from Yaquina Bay, Oregon. Additional samples have been requested to determine more accurately if there is any relationship between the histologic findings and the observed mortalities.

The January sample of oysters, Crassostrea virginica, from the James River, VA, has been examined. No histologic differences were noted between oysters from upriver (Kepone-contaminated area) and from downriver (control area). Approximately 90% of clams, Rangia cuneata, obtained from James Island were dead; no inflammatory or other lesions were found in these clams. Kepone levels in oysters sampled in November varied from 180 ppb (downriver) to 280 ppb (upriver). In January downriver oysters contained 500 ppb and upriver oysters contained 180 ppb Kepone.

Preparation of figures (primarily photographs) for the monograph on the normal histology of the blue crab, Callinectes sapidus, continues. More than one-half of the pictures now are completed; however, all figure legends and labeling of the photographs yet must be completed.

Appropriately fixed larval Atlantic cod, Gadus morhua, were obtained from the Narragansett Laboratory to augment a reference collection consisting of "normal" larval fishes. This collection will be invaluable in assessing the utility of histopathology for disease diagnosis of larval fishes from degraded environments.

Attempts to obtain local striped bass, Morone saxatilis, with oviduct lesions are continuing. Individuals at striped bass hatcheries in North Carolina (FWS) and Rhode Island (URI) have been contacted and informed of the laboratory's needs. The Maryland Marine Police will provide ripe female striped bass that are confiscated because of illegal fishing.

During the month, the histology laboratory sectioned 1,459 blocks and stained 1,072 slides from a large variety of marine fishes, crustaceans, and mollusks.

Disease and Environmental Stress Investigation

Four cruises were made in the New York Bight to monitor the prevalence of winter flounder, Pseudopleuronectes americanus, with fin rot disease. Cruises

to Sandy Hook/Raritan Bay on 8 and 21 March provided 1,238 winter flounder. Only eight fish (0.6%) had fin rot disease. Of the 1,238 winter flounder taken from Sandy Hook/Raritan Bay, 726 were young of the year (YOY); none had epidermal papillomas. The sewage sludge area of the bight apex was sampled on 22 March; none of 143 winter flounder had fin rot and none of 73 YOY had epidermal papillomas. On 16 March, 143 winter flounder from Great Bay, NJ, were examined. None of the fish had fin rot disease and none of 32 YOY had epidermal papillomas.

Experiments were conducted on newly-hatched winter flounder larvae at the NMFS laboratory in Narragansett, RI, with the help of Mrs. Dianne Everich (EPA, Narragansett). The larvae were exposed to 250 and 500 ppb water-soluble fraction of EXXON #2 fuel oil for varying periods of time and then fixed for electron microscopic studies. Control animals and those to be used for studies of normal morphogenesis were maintained under two different culture conditions: (1) in 2-liter battery jars comparable to those used in bioassay experiments; and (2) in a large aquarium typical of the type normally used to rear these animals. Winter flounder larvae in these critical stages of development are very sensitive to environmental contaminants as well as undergoing a particularly difficult period in physiological growth. A number of larvae died after 24 hr in the 500-ppb exposure group, and examination of fixed specimens may provide insights on the effects of petroleum hydrocarbons. Considerable attention will be focused on the effects of oil on the successful initiation of feeding in larvae that survived the 500-ppb exposure as compared to control larvae which were actively feeding at the termination of the experiment.

Rock crabs, Cancer irroratus, were collected in Delaware Bay and near Rehoboth Beach, DE, to compare gill condition of newly molted adult males with conditions previously recorded for molting specimens from Sandy Hook and Raritan Bays, NJ. Histological studies will provide additional data on gill condition in animals from ocean-dumping stations and stations where impact from dumping is minimal. Considerable time was spent on manuscript preparation. One manuscript summarizes all data on rock crabs that have been accumulated since 1973. A second manuscript summarizes findings with hermit crabs which were collected during Argo Merchant oil spill cruises.

Aquaculture: Control of Larval Disease Investigation

Studies on the red pseudomonad are being hampered by a change in the pigmentation of the microorganisms. The bacterium is being passed through oyster larvae in order to restore the original pigmentation. Assembly of the ozone-ultraviolet disinfection system continues. One piece of equipment yet has not been delivered, therefore completion will be somewhat delayed. Much of this reporting period was spent in manuscript and associated artwork preparation.

Since the larval cells of oysters appear unable to engulf and digest microorganisms, attempts are being made to determine whether they secrete lytic enzymes as a means of defense. During the past month efforts have focused on a system to show enzymatic activity around cells embedded in purified agar gels. The gels contain substrates of starch, protein, or lipid to allow demonstration of amylase, proteinase, and lipase activity after application of the appropriate developing reagents. Problems in establishing the system have required range-finding experiments in gel concentration, substrate concentration, cell culture reagents, and antibiotics to limit bacterial overgrowth. Hopefully, within the next month, it will be possible to determine whether the glass-attaching motile cells of very young animals are capable of lytic activity.

Meetings, Talks, Visitors, Publicity

Dr. Rosenfield attended the Board of Directors meeting in Milford, CT, during 6-10 March. Dr. Rosenfield and C. A. Farley attended an Ocean Pulse meeting at Sandy Hook, NJ, on 20 March. Dr. Rosenfield attended an Ocean Pulse meeting at Woods Hole, MA, on 23 March. On 24 March, he spoke to the Massachusetts Shellfish Officers Association, held at Woods Hole, MA, and met with Dr. Edwards. On 27 March, he attended the Regional Office staff meeting and discussed research contract activities with Mr. Cannon.

Dr. Murchelano presented a seminar in the Department of Microbiology at the University of Maryland, College Park, MD, on 10 March. He also participated in a workshop on "Opportunities in Marine Science" at Woods Hole, MA, on 28 and 29 March.

Dr. Johnson attended the "Crab Climatology" meeting at College Park, MD, on 7 and 8 March.

Dr. Bodammer traveled to the NMFS Narragansett Laboratory, RI, during 13-21 March. He attended a IYABA planning meeting at Woods Hole, MA, on 29 and 30 March.

Ms. Sharon MacLean attended a conference on "Expanding the Role of Women in Science," sponsored by the New York Academy of Science in New York during 6-8 March."

Visitors to the Oxford Laboratory included Mrs. Tina Manatos and sons Mike and Nick from Bethesda, MD. Her husband is an employee of the Department of Commerce in Washington, DC. On 27 March Mr. Paul Olsen from the New Jersey Department of Environmental Protection visited the laboratory. Dr. Frederick Bank, Johns Hopkins University, brought his class to tour the laboratory. The staff also presented lectures to the class.

Manuscripts

Blogoslawski, W. J., and M. E. Stewart. 1977. Detoxification of marine poisons by ozone gas. In: A. Bettencourt, ed. Proceedings 3rd Congress International Ozone Institute. International Ozone Institute, Paris, France. (P)

Blogoslawski, W. J., and C. Brown. Use of ozone in crustacean disease prevention. Presented in April 1977 at the Crustacean Health Workshop, Galveston, Texas. (Draft prepared)

Blogoslawski, W. J., M. E. Stewart, J. W. Hurst, Jr., and F. G. Kern. Ozone detoxification of paralytic shellfish poison in Mya arenaria. (Submitted for review).

Bodammer, J. E. Preliminary observations on the cytopathological effects of copper sulfate on the chemoreceptors of Callinectes sapidus. In: Proceedings of the Symposium on "Pollution and Physiology of Marine Organisms." (A)

Bodammer, J. E. 1977. Cytological observations on the blood and hemopoietic tissue in the crab, Callinectes sapidus. I. The fine structure of hemocytes from intermolt animals. Cell Tissue Res. 187:79-96. (P)

Newman, M. A. Pathology associated with Cryptobia infection in a summer flounder (Paralichthys dentatus). J. Wildl. Dis. (July, 1978) (A)

Sawyer, T. K., and S. A. MacLean. Some protozoan diseases of decapod crustaceans. Proceedings of the Fish Health Workshop, Easton, MD. In: R. A. Murchelano and A. Rosenfield, eds. 2nd Annual Eastern Fish Health Workshop. (S)

Sawyer, T. K. Microscopic observations on vertebrates and invertebrates collected near the Argo Merchant oil spill. Argo Merchant Oil Spill Symposium, Narragansett, RI. (A)

RESOURCE UTILIZATION DIVISION

Resources Development and Improvement Investigations

Sampling and Harvesting Gear Development

Al Blott finished the design of a beam trawl, and it is now being assembled. It is expected to be ready to fish sometime next month. The 65-ft R/V Rorqual was transferred here at the Gloucester Laboratory this month from the Sandy Hook Laboratory. The fisheries engineers brought it up over a weekend. It is a welcome addition to the laboratory and will serve primarily as a much needed gear development platform. Vern Nulk began development work on a shellfish dredge odometer system. Dan Baker completed preliminary testing of the primary sorter and is preparing a report on his findings. Al Blott participated in the Woods Hole Laboratory's cod-end mesh selection study, making a trip aboard the F/V Metacomet. Bob Van Twuyver joined our group this month on a part-time basis. He has made a number of recommendations for upgrading and increasing the versatility of the laboratory's refrigeration system that are now under consideration.

Vern Nulk completed the design of an experimental lobster pot, and materials are on hand to begin construction.

Facilities Engineering

The major renovation of the NMFS building on the Gloucester State Fish Pier has been completed on the inside and the building is now occupied. There has been a manufacturer's delay on the exterior siding, and installation is not expected for 6 - 8 wk.

Processing Engineering

The following represent some of the concepts being investigated for the mechanical processing of squid. The operation picks up two squid at a time and places them on a cleated conveyor with the head and tentacles lying on a plain belt. The belt moves forward 6 inches at a time and stops in a 2-sec cycle. An air-operated guillotine then cuts off two heads with one blow. The head and tentacles are then guided down a chute to the inlet of a vacuum conveyor where they are picked up and transferred intact to a storage facility or a secondary processing operation.

The mantles continue down the conveyor and are picked up by a pair of transfer carrier bars. They are transferred out of the cleated belt and placed between the knife dies of the tail fin remover. This device consists of a steel rule die blade bent to a prescribed curve and secured in a backing block. The second part is a hard plastic cutting block against which the knife cuts. When the squid is in place, air cylinders bring the knife and block together to cut off the tail fins. As with the heads and tentacles, the tail fins are picked up by vacuum and transferred to storage or processing away from the machine. Other concepts being tested include the opening of the mantles, the removal of the pen and viscera by vacuum and die knife, and the transfer to the Jensen Skinner for skinning.

Species Identification

The frozen crab meat submitted (last month's report) as an unknown appears to be king crab meat. This will be substantiated when the unknown and verified king crab meat are both focused by isoelectric focusing. Identification was tentatively made by comparison of the unknown's focusing pattern to a pattern of known crab meat done in May 1977 on a slightly different gel.

Storage Study of *Mytilus edulis*

Badly needed help has arrived in the person of Kate Wiggin in time to do the composite analysis on the frozen stored mussels. No fresh mussels have yet been available for March. All raw samples were discarded, as the cooked samples were yielding similar and more practical information. Only June, August, October, November, and December-cooked samples are still in the storage study. All others were discarded. The criterion for rejection was two or more consecutive months of taste panel ratings at the borderline level. The Auto Analyzer biuret method with a correction for sample turbidity continues to be used for protein determinations.

The micro Kjildahl equipment has arrived on loan from the Milford Laboratory and missing pieces have been ordered for it.

Reformed Crab Meat

A 9-mo frozen storage study on alginate formed crab meat lumps was completed. The results indicated that throughout the storage period the alginate treated lumps were not significantly different from freshly made control lumps--with the exception of texture, after 1 mo of storage.

Aerobic plate counts for the stored samples were very low; none being over 4,000 per gram.

Squid

Work was completed on an experiment comparing the amount of skin removed from squid when skinned on the Jensen (fish fillet) Skinner and when manually skinned.

Guaranteed Quality Program

The final report on Phase III of the Guaranteed Quality Program is now in the review stage and industry comments have been received. We are still awaiting comments from other units of NMFS. Work has started on the training of an odor evaluation panel. To date, all laboratory personnel have been asked to participate, and the results of their judgments are being evaluated statistically. When this preliminary work is done, the most acute panelists will be asked to serve on a panel concerned with our fresh fish projects. Presently, the work is being hampered by the restrictions on the taking of Atlantic cod.

New Product Development

Our laboratory-developed machine for heading and cleaning small fish has been moved to a commercial fish processing plant. It is being set up and will be checked out for trial under commercial conditions. Reverse butterfly whiting (silver hake) and minced whiting blocks will be prepared for an exploratory marketing study.

Product Quality, Safety, and Standards Investigations

Product Quality

Results of both sensory and chemical tests conducted after 10 mo storage at 0°F on minced whiting (silver hake) blocks made from either large fish or small fish indicated no significant difference in quality.

Taste panelists could not discern any quality differences among Atlantic cod fillet blocks containing either 0, 10, 20, or 30% minced cod after 48 wk storage at 0°F. In the case of stored fish sticks containing the same percentages of mince as above, the sticks containing 30% mince were scored lowest in flavor and texture.

A preliminary study with iced cod, haddock, and pollock has indicated a positive response of the Torrymeter to loss in quality. A comprehensive investigation is now planned to evaluate the precision and reliability of this instrument for measuring quality of fresh fish.

An old GC unit is being reactivated and refurbished for measuring trimethylamine and dimethylamine in conjunction with the study on enzymatic degradation of trimethylamine oxide during frozen storage of minced whiting.

Product Safety

Three samples of fish franks were received from the Seattle Laboratory. One sample was a frankfurter consisting of no fish flesh (control) while the other two had 20 and 30% fish respectively. One half of the samples were further processed by being cooked in hot water for 10 min. The samples were then blended and weighed out. Isolation and analysis of each of these samples for the possible presence of volatile N-nitrosamines were completed. Each of these samples was done in duplicate.

Isolation and analysis of selected cold-smoked salmon extracts and the GC-MS work of selected spiked whitefish extracts are continuing.

Product Standardization

The proposed standard for minced fish blocks is at the Washington, DC, office awaiting publication in the Federal Register.

The revision of the frozen fried scallop standard has been cleared for publication in the Federal Register as a Notice of Proposed Rule Making.

The revision of the unified fillet standard has been transmitted to the Washington, DC, office for publication in the Federal Register. It covers all freshwater and marine species both fresh and frozen, except for the species for which standards now exist.

Technical Assistance, Visitors, Meetings, and Training

John Ryan visited the US Army Research and Development Command at Natick to discuss the Federal Specifications program for fishery products. A proposal to introduce the underutilized species of fish to the military as a replacement for the Atlantic cod, haddock, and yellowtail flounder now being purchased was studied. We expect to be given the responsibility for the development of Federal Specifications for fishery products as a result of a study by an Interagency Committee for Federal Procurement of Food Products.

Burt Tinker and Bob Learson travelled to Orono and Stonington, ME, to review the progress made on the NEFDP rock crab processing contract. The Stonington plant has been refurbished and some of the equipment is being installed. It is hoped that the first processing tests will start in late April.

A task force from the Washington, DC, office, headed by Joe Slavin, was in New England to investigate potential areas where fishery development could help the local industry by placing more emphasis on species other than cod and haddock e.g., increasing demand for whiting or squid. Several meetings were held with the local fishermen to obtain their ideas and recommendations.

Al Blott and Vern Nulk attended the Rhode Island Fishermen's Forum in Pt. Judith, RI.

Mike Corbett and Al Blott attended the Maine Fishermen's Forum in Rockland.

Al Blott attended, in an advisory capacity, a showing of NMFS gear films at the St. Peter's Club in Gloucester.

Vern Nulk attended a "Diesel Engine Workshop" at the University of Rhode Island.

John Ryan participated in an Equal Opportunity Meeting of Center personnel at the Milford Laboratory on 7 March 1978.

Fred King presented a review of the nomenclature of fish at the Army Natick Research and Development Command on 22 March 1978.

Mr. James Brooker, Staff Assistant, Seafood Quality and Inspection Division, visited the laboratory to discuss the status of the various projects of our standardization program.

S. Falk and G. Goltzos of Teckton, Inc., visited to discuss cryogenic freezing of seafoods.

Technical assistance this month went to: James Knott, Coatings Engineering Corp., Sudbury (loan of a time-lapse lobster behavior film); Dick Bodin, Bodin Fisheries, Bayfield, WI (refrigeration, liquid nitrogen, CO, and freon freezers); Walter T. Kalil, Jr., Boat Owner, Newburyport (guidance on rigging and deck equipment for dragging with a 36-ft lobster boat); Mr. Frank Harrington, Nickerson International, Tewksbury, MA (labeling of crab meat); Mr. Frank Wetmore, Bay

Trading Co., Gloucester, MA (processing of Jonah crabs, whole cooked crab); Mr. Mark Silva, E.E.L., Inc., North Dartmouth, MA (processing of eels); and 20 lb of skinned Illex illecebrosus were sent to Dr. Shenouda of the General Foods Corporation, Tarrytown, NY.

We also furnished information on the following subjects: life history of lobster; manner of identifying lobster pots; mummichogs; edibility of Pacific geoduck; names for 13 fishes of Asian waters; caloric value of lobster meat; misbranding of ocean pout as Soli; recipes for mussels; distinction in labeling for bay and sea scallops; commercial sizes of lobsters; common names for foreign fish; practicality of rearing lobsters in freshwater; mercury in fish; alternate name for ocean pout; quality of breaded oysters; military purchases of pollock fillets and processing and handling practices for smoked eels.

Manuscripts

An article entitled, "Ocean Quahaug Takes Supply Spotlight as Surf Clams Dwindle," coauthored by A. Bakal (Foster D. Snell, Inc), W. F. Rathjen, and J. M. Mendelsohn was published in the February 1978 issue of Food Product Development.

Kaylor, J. D. 1978. Smelt. Encyclopedia of Food Science. Avi Publishing Company, Inc. pp. 699-700.

NATIONAL SYSTEMATICS LABORATORY

Benthic Fishes

Work continued on a presentation of the current status of the systematics of gadiform fishes for discussion at a workshop on the systematics of cold-water marine fishes. Films taken at a deepwater thermal vent area near the Galapagos Islands were reviewed to help in planning future research in the area.

Pelagic Fishes

Research continued on the taxonomy of an undescribed species of Spanish mackerel from New Guinea; analyses of morphometric data was completed and several specimens were dissected. A preliminary draft was completed of a manuscript describing (jointly with the Soviet ichthyologist N.V. Parin) four unnamed species of Indo-West Pacific halfbeaks.

Shrimps

Dr. Isabel Canet studied penaeoid shrimps at the California Academy of Sciences in San Francisco and the Los Angeles County Museum. She also traveled to the Marine Station of the Environmental Research Laboratory of the University of Arizona and the University of Sonora at Puerto Peñasco, Mexico, where she (1) observed the operations involved in the culture of shrimps; (2) assembled a large series of reared postlarvae; and (3) obtained impregnated females of various species of Penaeus. Dr. Canet continued to Guatemala where she secured representatives of various sizes of all commercial shrimps in the area and organized, with the cooperation of the Fisheries Department, a sampling program to obtain postlarval Penaeus throughout the year.

Other Crustaceans

Work continued on the preparation of a guide to the temperate water decapod crustaceans of the US east coast.

Meetings, Talks, Visitors, Publicity

Dr. Canet presented a seminar at Puerto Peñasco on, "The Morphology and Dehiscence of the Spermatophore of the White Shrimps." Dr. Collette attended a Mackerel Colloquium at the Annual Meeting of the Gulf States Marine Fisheries Commission in Brownsville, TX, where he presented an introductory paper entitled, "Review of the Spanish Mackerels (Genus Scomberomorus)," coauthored with J. L. Russo.

The East Coast Benthic Assemblage was attended by Dr. Cohen on 18 and 19 March at College Park, MD. Papers were given on a wide variety of topics ranging from descriptive to theoretical and including reefs and rocks, mud, life histories and dispersal, recruitment, paleoecology, and the deepsea. Participants were mainly academic with many students. Federal ecologists were conspicuously absent.

Visitors to the laboratory included Dr. R. Shipp of the University of South Alabama, Dr. Jack Corliss of Oregon State University, Mr. Gary Herbst of the University of Wisconsin, and Mr. Don Bourne of Marine Research, Inc., Falmouth, MA.

Manuscripts

Small, G. A review of the bathyal fish genus Antimora (Moridae: Gadiformes). Fish. Bull. (S)

Williams, A. Transfer to Pseudomedeus of the xanthid crab Micropanope distinctus Rathbun. Proc. Biol. Soc. Washington. (S)

ATLANTIC ENVIRONMENTAL GROUP

Ocean Monitoring and Climatology Task Group

During March the cooperative Ship of Opportunity Program obtained seven XBT transects, two in the Gulf of Maine, one across the southern New England shelf along the 71°W meridian, one from New London, CT, to Cape Sable, NS, one across the shelf and slope off New York, one off Cape Hatteras, and one in the Gulf of Mexico. The Caribou Reefer is once again participating in the program and we hope to obtain monthly XBT transects and tows of the continuous plankton recorder from Cape Ann, MA, to Cape Sable, NS, from that vessel.

Data Analysis Product No. 9, which describes a 30-yr (1946-75) time series of sea surface temperature and wind data added to the MARMAP Information System (MIS) data base, was released in late March. The data, held in MIS on magnetic tape and at AEG on microfilm, consist of monthly averages of temperature, wind velocity, wind speed, and computed wind stress, ordered by 1° square for the northwestern Atlantic between 30° and 45°N. The basic source of the data are observations taken from cooperating merchant and military ships, accumulated and processed by NOAA's National Climatic Center.

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 April Atlantic Notice to Fishermen, and also

was released to a mailing list of interested individuals at the same time. This report points out that during March no warm core eddies were observed, the first total absence observed since satellite monitoring began in 1972.

Ocean Dumping Task Group

The pilot monitoring effort of Deepwater Dumpsite 106 (temperature and salinity) has completed approximately 1 yr of coverage. The resulting data will be reported along with an evaluation of the program thus far. An updated version of the monthly XBT and surface sampling transect from New York Harbor to DWD 106 aboard the dumping tug will include XBT stations while the dumping operation is going on. This section of the XBT transect will be plotted on an enlarged scale to exactly determine the hydrographic regime into which the waste is being released. An annual report of these findings will be produced which will yield information along with other data on how much industrial waste was dumped into the various water masses.

Preparations for the scheduled cruise to DWD 106 during 5-14 April 1978 were completed.

Analyses of the data from the January 1978 cruise aboard the FRV Albatross IV (Cruise C502-AL-78) are partially completed.

Meetings, Talks, Visitors, Publicity

Reed Armstrong represented the Atlantic Environmental Group at the Northeast Fisheries Center Board of Directors meeting in Woods Hole during 6-9 March.

Woody Chamberlin and Mert Ingham represented the Atlantic Environmental Group at a NMFS fishery oceanography workshop held at the Pacific Environmental Group in Monterey, CA, during 6-10 March.

John Whitford, Talbot Murray, and Carl Gardner attended a 2-day seminar on the theory and use of XBT systems held by Sippican, Inc., in Marion, MA, on 20-21 March.

Mert Ingham attended a meeting to plan a cruise to sample Atlantic mackerel eggs and environmental variables, held at the Milford Laboratory on 27 March.

Mert Ingham attended a workshop on climate and fisheries conducted by the University of Rhode Island Center for Ocean Management studies on 29-31 March.

On 30 March Reed Armstrong attended a meeting of the IYABA group at Woods Hole, MA.

Manuscripts

Chamberlin, J. L. 1978. Passage of a Gulf Stream warm core eddy recorded by the vertical temperature array on a NOAA buoy. Gulfstream (NOAA). (A)

Cook, S. K. 1978. Expendable bathythermograph observations from the NMFS/MARAD Ship of Opportunity Program for 1975. NOAA Tech. Rep. NMFS SSRF. (A)