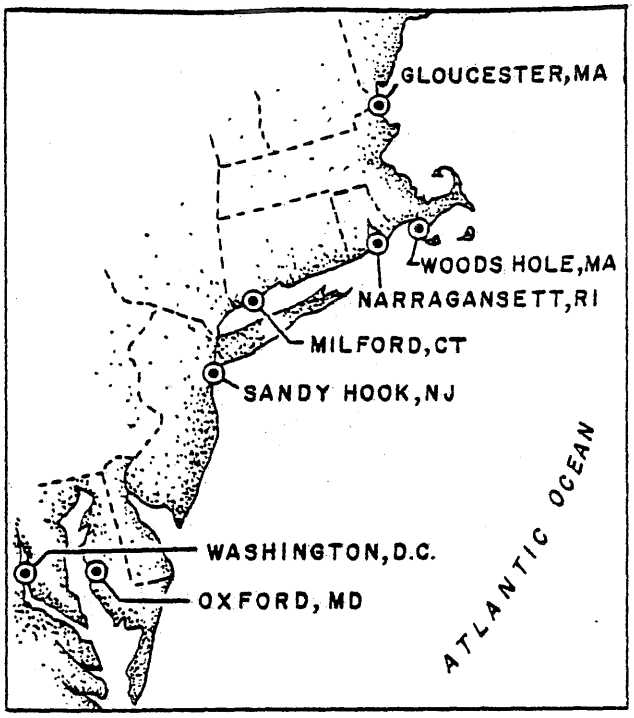
# NEFC

Northeast Fisheries Center

# NEWS






MONTHLY NARRATIVE REPORT
SEPTEMBER 1977



Editor, Jon A. Gibson

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

## RESOURCE ASSESSMENT DIVISION

### Resource Surveys Investigation

The second part of the scallop survey was completed during 6-16 September aboard Albatross IV. A total of 173 randomly selected stations was sampled between Block Island and Cape Hatteras (Tom Azarovitz, Chief Scientist).

Linda Despres was the US participant in a survey aboard the Polish R/V Wieczno to locate concentrations of pre-spawning Atlantic herring. Operations were conducted in the area bounded by Stellwagen Bank, Cultivator Shoal, and Nantucket Shoal. Significant concentrations of herring were not found; a total of only 387 herring was caught in 38 bottom trawl tows (30-min duration).

A mid-water trawl survey was conducted with Delaware II during 6-9 September off New Jersey (Stuart Wilk, Chief Scientist) to experiment with rigging and properly operating a mid-water trawl, and determine the ability of the net to catch recreationally important fishes in areas of known occurrence. The first objective was essentially achieved although the trawl, an old German-designed net, was excessively damaged during the experiment as a result of the poor condition of the webbing. Very few fish were caught.

A trawl mensuration cruise was completed aboard Delaware II during 13-22 September in waters south of Martha's Vineyard (Malcolm Silverman, Chief Scientist). The purpose of this work was to measure headrope height and wingspread of three No. 41 and three No. 36 trawls to check the conformity of their performance for use in standard bottom trawl surveys.

The first leg (Hudson Canyon-Cape Hatteras) of the autumn bottom trawl survey began on 26 September (Charles Byrne, Chief Scientist) aboard Delaware II.

Fishermen's Reports were completed in almost record time for the summer bottom trawl survey and the September scallop survey thanks to the hard work of Eva Montiero. Data processing of all the surveys completed during the summer is well underway.

### Age and Growth Investigation

A contract is being negotiated with Southeastern Massachusetts University (SMU) to age summer flounder, butterfish, and scup. Three SMU students who will be employed at the Woods Hole Laboratory during summer vacation will be aging these species. Aging of Atlantic herring will also be done under contract with the State of Maine at the Boothbay Harbor Laboratory.

### Fisheries Statistics Investigation

Investigational personnel participated in a series of survey cruises: (1) Paul Wood on a sea scallop cruise during 6-16 September; (2) Thurston Burns on the first leg of the fall bottom trawl survey; and (3) Thurston, Frank Almeida, and Gordon Waring on the international Atlantic herring tagging program aboard the USSR R/V Yubileiniy. With respect to statistical programs, Bob Boeri completed the disc file assembly of US commercial length-frequency samples for all species sampled during 1973-1976. This will provide directly accessible sampled materials for the biostatistics program under current revision by Otis

Jackson. Pam Lanham completed a proration of foreign-vessel-caught yellowtail flounder for 1963-1976 by using the surveillance fleet observations to the east and west of 69° W longitude. Pam is also plotting the distribution of yellowtail flounders observed in the bottom trawl surveys since 1963. Ralph Mayo completed the annual estimate of yellowtail flounder discards for submission to ICNAF as well as one-quarter degree square summaries of US catches in the vicinity of the Argo Merchant oil spill. Gene Heyerdahl and Anne Lange worked on 5-yr summaries since 1955 for the major stocks of interest to the US and Canada to be used during the ongoing US/Canadian bilateral negotiations. Bill Callahan continued his work of building a computerized data base for the ICNAF statistics. For ICNAF Subareas 5 and 6 foreign catch reports are available by species back to 1960 while the US reports extended back to 1952. New analytical tool development include a program to provide a preliminary catch summary for survey data written by Paul Wood for the HP 67, calculator, and a sampling-efficiency analyses based on the pattern of landings written by Harold Foster and Bob Boeri. Assistance provided to the Fisheries Analysis Investigation included Atlantic herring and Atlantic mackerel spring survey index updates for 1967-1977 (Anne Lange), and Atlantic cod, squid, and butterfish stock assessment summaries (Paul Wood, Anne Lange, Steve Murawski, and Gordon Waring). Maureen Griffin and Anne Lange completed the processing of the squid samples from last month's US/Japanese survey and a new squid length-weight equation has been estimated for both Illex and Loligo for use in the survey programs. Anne is also updating the survey plots for squid. New England Fishery Management Council activities required extensive summaries of Atlantic cod catches to estimate the impact of adjusting the bycatch regulations following the closure of the directed fisheries (Bill Callahan, Otis Jackson, and Ralph Mayo), a job that could not have been completed in the time required without the personal support and priority attention given to the task by the Woods Hole computer staff. Ralph also completed the editing and assembly of the training manual for the foreign vessel observer program. Sections were also provided by Louise Dery, Bob Livingstone, Anne Lange, John Nicolas, and Roger Theroux. Anne Lange presented an MBL seminar for Boston University students on the status of the squid stocks. Gene Heyerdahl attended the NEFC Board of Directors meeting in Gloucester to report on the developmental status of fishery information systems throughout all NMFS regions and present an organizational model for an information system in the Northeast.

## Sandy Hook Investigation

The final part of a three-part trawl survey for recreational fisheries was completed in September. This survey utilized a mid-water trawl.

A 2-mo survey of the summer recreational Atlantic cod fishery of Long Island, New York, was completed in September. Analysis of the data was initiated.

Processing of data collected during a 2-yr New Jersey creel survey of charter and party boats continued during September. All of the interview data have been coded, keypunched, audited, corrected, and listed.

## Fisheries Analysis Investigation

Mike Sissenwine attended a meeting of the Working Group on Hudson River Environmental Impact Studies sponsored by the EPA and Consolidated Edison of New York at Peakskill, New York, on 26-27 September.

A paper prepared by Mike Sissenwine and Ed Bowman entitled, "Fishing Power of Two Bottom Trawls Towed by Research Vessels Off the Northeast Coast of the USA During Day and Night." was presented at the ICES meeting recently held in Reykjavik, Iceland.

Fred Serchuk and Steve Clark prepared a paper entitled, "Prediction and Assessment of the Bycatch of Cod Taken During September-December 1977 from the Gulf of Maine and Georges Bank Cod Stocks (Woods Hole Laboratory Reference 77-20).

Fred Serchuk, Paul Wood, Steve Clark, and Brad Brown continued analysis of Atlantic cod data in preparation of an assessment document on the Georges Bank and Gulf of Maine cod stocks.

Brad Brown and Steve Clark attended the September meeting of the New England Fishery Management Council held in Peabody, Massachusetts, and provided the council with information on cod and related assessments.

Vaughn Anthony attended the S & S meeting of the Mid-Atlantic Fishery Management Council in Ocean City, Maryland, on September 27-28.

Vaughn Anthony attended the American Fisheries Society meeting in Vancouver, British Columbia, and presented a paper on research needs under extended jurisdiction.

Meetings, Talks, Visitors, Publicity

John Nicolas, Henry Jensen, and Emory Anderson participated in meetings on 13-14 September with Paul Sund (PEG, Tiburon, California) and Lt. Mercer (NWAFC) and assorted investigators from the East Coast discussing marine mammal research and possible ADP capabilities and processing of mammals sightings on the East Coast.

Henry Jensen attended a course on "Effective Supervision" during 19-23 September in Gloucester and also completed "Supervision and Group Performance" during 26-29 September in Woods Hole.

Don Flescher is in the process of developing a series of slides which illustrate the full range of survey activities and procedures, particularly those aboard ship.

Andrew Thoms transferred from the Sandy Hook Laboratory to the Woods Hole Laboratory, which completed the move of all survey personnel to Woods Hole.

Emory Anderson attended a meeting of the New England Fishery Management Council on 8 September in Peabody, Massachusetts, in order to answer questions regarding the silver hake assessments.

MARINE ECOSYSTEMS DIVISION

Oceanography Investigation

The Oceanography Investigation completed Albatross IV Cruise No. 77-09 (19-25 September). The principal objective was recovery of three current-meter moorings in the Northeast Channel and their replacement with three new moorings. All nine of the current meters which had been in the water since June were recovered in good condition. They have been sent to the Physical Oceanography Laboratory at Nova University for reconditioning and preliminary data processing. Credit for the successful operation is due the ship's officers and crew for expert handling of the vessel and equipment in heavy seas.

In addition to the current-meter work, a detailed XBT section across the Northeast Channel, with observations roughly every 2 mi, was accomplished while the ship was jogging slowly into a northeast gale in the early stages of the trip. Also, 18 STD stations were made: a section across Northeast Channel; a section through the deep part of Georges Basin; and a section across the Great South Channel inside the sill. Dissolved oxygen analyses at 12 depths on each station were run on board, and salinity samples were bottled for analysis ashore.

Larry Brand, a doctoral candidate in biology at Woods Hole Oceanographic Institution, came along on the cruise to gather samples for his dissertation on evolution in phytoplankton.

The failure of a side-scan sonar unit leased from E.G.&G. Environmental Services, Inc., was a major disappointment. It was hoped to use the gear to learn what, if anything, remains in place for the original No. 3 mooring that was not recovered last spring. The sonar tested fine on deck but did not work in the water, presumably because of a short circuit in the cable. The hydrographic work was not as extensive as planned because of 2 days lost to bad weather at the beginning of the cruise and breakdown of one of the ship's main engines near the end. With speed reduced to 8 knots it was necessary to eliminate several planned stations, and others were cut out later when a generator quit.

During the month a volumetric temperature/salinity census of the five deep basins of the Gulf of Maine was completed. Observations were made during Albatross IV Cruise No. 76-03 in May 1976. Tom Laughton is tabulating the data.

## Ichthyoplankton Investigation

We are preparing for our second year of MARMAP plankton surveys of shelf and slope waters from Cape Hatteras to the Scotian Shelf. The first of six surveys is scheduled to begin on 10 October aboard the USSR R/V Argus. During the past fiscal year members of the Ichthyoplankton Investigation logged nearly 900 man-days at sea in completing the most intensive series of survey cruises ever undertaken in the western North Atlantic. In FY 1977 we collected 2,200 plankton samples with the 60-cm bongo, 1,818 neuston samples, as well as ancillary biological and environmental data. During September we completed work on a backlog of 750 salinity samples collected in the Mid-Atlantic Bight this spring. We have completed work on collections for one March and two April surveys, and we are now working on May samples.

## Plankton Ecology Investigation

A research document examining feeding relationships between larval fish and zooplankton communities was finalized. This paper along with several others documenting the research activities at the NEFC (Narragansett Laboratory, particularly) were presented at the Annual Statutory Meeting of ICES in Reykjavik, Iceland.

A 2-wk zooplankton workshop was held during 6-15 September at the Narragansett Laboratory. The workshop objectives were to review existing zooplankton sorting protocols in an effort to arrive at an optimum sorting strategy. Procedures and methodologies now being used at the laboratory and at the Polich Plankton Sorting Center were presented and discussed. A revised protocol which in practice would yield one sample per person per day was designed. A detailed analysis is

underway at both facilities to evaluate the new protocol. Five biologists from the staff of the Polish center (in Szczecin, Poland) attended and contributed significantly to the workshop's success. The Polish staff's stay was highlighted by a visit to Dr. George Grice's laboratory at the Woods Hole Oceanographic Institution (WHOI), lunch hosted by Drs. Grice and Wiebe at WHOI's Clarke Laboratory, a tour of the NEFC's Fisheries Aquarium and the Whaling Museum (New Bedford, Massachusetts). Time out was taken one Saturday for a shopping spree in Boston in the rain. The visit of the Polich scientists was extremely beneficial to both laboratories through exchange of reference material, jointly finding solutions to common problems and promotion of scientific and personal friendships.

Jack Green (NEFC) and Bob Marak (MARMAP) attended an American microscopists meeting in Boston. They reviewed state-of-the-art image analysis techniques for possible application to plankton analysis. As a result, the Joyce Loebel Company arranged for a 1-wk "in house" demonstration of their Magi Scan System. During that week the system was effectively used to count, measure, (longest dimension), and produce size-frequency histograms of raw plankton samples, and prepared aliquots of copepods, fish larvae, and fish eggs. The potential of this approach in the field of planktonology was recognized over a year ago by Dr. Perry Jefferies (URI). The NEFC and Dr. Jefferies have submitted a joint proposal to Sea Grant to support a research program aimed at developing a systematic application of image-scanning techniques to plankton sorting and identification operations.

## Biostatistics

During September work continued on the data from four cruises: Albatross IV Cruise No. 77-02, Goerlitz Cruise No. 77-01, Nogliki Cruise No. 77-02, and Annandale Cruise No. 77-01. The station data from the Yubileiniy Cruise No. 77-02 were prepared for entry into the computer system. Zooplankton data summaries and plots of the displacement volumes of small organisms (<2.5 cm) and of the standing crop (No./$10m^2$) of Calanus finmarchicus were produced for the zooplankton data from Albatross IV Cruise No. 75-02. The zooplankton data from the Belogorsk Cruise No. 75-02 are now being keypunched and will be processed in the same manner as the data for the Albatross IV Cruise No. 75-02. The data from the ichthyoplankton data logs for the Albatross IV Cruises No. 75-14 and No. 76-01 were entered into the computer and are being edited prior to merging the data into the master files for these cruises. Larval herring data from the 0.505-mm mesh bongo nets for the Belogorsk Cruises No. 75-02 and No. 75-03 were entered into the computer and are being quality controlled. Personnel in the biostatistics group were involved in various aspects of the workshop with the five Polish scientists from the sorting center in Szczecin.

The comparison of the wet displacement volumes with the dry weights for zooplankton samples from Georges Bank during the fall of 1971-1975 revealed several stations as outliers. These stations were reanalyzed for errors in measurement or calculation and the resulting changes in the values were incorporated into an updated comparison of these measures. The results of this comparison are still being analyzed and should be useful in establishing the protocol for future analysis of zooplankton samples.

A large set of larval ichthyoplankton data records which were received from the Polish Plankton Sorting Center is being prepared for keypunching for subsequent entry into the computer where the data will be merged with the master files which have already been created for these cruises.

A preliminary master summary table of the disposition of all plankton samples gathered by the center since 1971 was prepared prior to the meeting of the Board of Directors. This table includes the vessel, cruise, inclusive dates, type of cruise, number of stations, gear used, samples sorted, and the status of the data processing. This table will be updated on a regular basis.

US-USSR Joint MARMAP Surveys

Master station records, zooplankton sample logs, and expendable bathythermograph logs from the R/V Yubileiniy Ecosystem monitoring Cruise No. 77-02 (Part I) were quality controlled in preparation for entering their data in the MIS at Narragansett. A cruise report was also drafted for Part I of the cruise which covered the Gulf of Maine, Georges Bank, and southern New England. Plankton samples were archived at Davisville, Rhode Island.

Jack Green will participate in the third joint US-USSR ecosystem monitoring cruise during 10-24 October (Part I) aboard the Soviet R/V Argus. Jerry Prezioso will participate in Part II of the cruise during 24 October-10 November 1977. Donna Busch, Janet Murphy, Jerry Prezioso, Jack Green, David Bearse, Tom Plichta, and Lorrie Sullivan are taking basic Russian at the Narragansett Laboratory for 8 wk in order to improve communication and cooperation with Soviet scientists and crew on future ecosystem monitoring cruises aboard Soviet vessels. More bongo-net cod ends designed by Jerry Prezioso were produced to be used on larval Atlantic herring MARMAP cruises.

US-Poland Joint Fisheries Research

Lorrie Sullivan participated in a joint US-Polish cruise on the R/V Wieczno from 17 September to 3 October to collect stomachs and determine maturities of fish species on Georges Bank. Fish examined included haddock, Atlantic cod, silver hake, red hake, white hake, pollock, longhorn sculpin, big skate, ocean pout, Atlantic herring, spiny dogfish, squid, sea raven, winter flounder, bluefish, Atlantic halibut, American plaice, cusk, and thorny skate.

Lorrie Sullivan is studying Polish at Providence College to improve communication with personnel aboard R/V Wieczno during joint cruises and to use on occasions when we interact with personnel from the Polish Plankton Sorting Center. Two Polish scientists from the sorting center resided at Lorrie Sullivan's home while they attended a plankton workshop at the Narragansett Laboratory.

Benthic Dynamics Investigation

Augmentation and updating of the benthic invertebrate density and biomass data base for the Gulf of Maine-Georges Bank region was continued, using the EDIT Processor at WHOI Information Processing Center. A report on the collection data and environmental measurements is in an advanced stage of preparation. Assembling and checking of the data files pertaining to bivalve mollusks were continued.

A report entitled, "Food Habits of Fish and Squid Found in the Vicinity of the Argo Merchant Oil Spill, August 1977," was written by Ray Bowman. In addition to the descriptions of the food habits of fishes, it identifies two pathways by which Argo Merchant oil may enter the marine food chain that leads directly to man: (1) gammaridean amphipods--finfish (such as Atlantic cod)--man; (2) copepods--American sand lance--finfish (such as Atlantic cod)--man. R/V Wieczno departed Woods Hole on 17 September for the Atlantic herring spawning grounds on Georges Bank. Purpose of this cruise is to collect stomachs of the herring and stomachs of fish and invertebrate predators on both the herring eggs and the adult spawning herring.

Richard Langton spent the last week in September at Rockport, Massachusetts, training with the Manned Undersea Research and Technology group. Preparations are being made for a study of herring spawning behavior on Jeffreys Ledge.

## Ecosystem Dynamics Investigation

The Ecosystem Dynamics Task Group completed a preliminary summary of the productivity data from the 1976 series of larval herring cruises. Ed Cohen and Pat Carter calculated mean carbon production and chlorophyll concentrations for each cruise and together with historical data constructed a seasonal primary production curve for Georges Bank. Although the seasonal coverage is incomplete, the overall magnitude of primary production (about 500 g $C/m^2/yr$) is substantially higher than that reported by Riley for Georges Bank in the 1940's. These higher values have been consistently observed in all the $C^{-14}$ work done throughout the year on Georges Bank over the past several years; therefore, the difference cannot be attributed to an unusually heavy bloom in one or two seasons. Analysis of the 1975 series of cruises was recently completed (on contract) by the Bigelow Laboratory and their estimates of annual carbon production are quite comparable to those observed in 1976.

Mike Pennington and Ed Cohen worked with Andrew Rosenberg fitting various growth models to the larval herring aged with otolith rings. The growth data have been put into a file on the WHOI computer and regression models of the statistical program package (SPSS) are being run directly from the fisheries building via the new computer terminal. So far, results agree closely with other growth estimates from both field and laboratory studies.

## Recruitment Processes

The Recruitment Processes Task Group has been busy with preparations for the 1977 Georges Bank larval Atlantic herring studies which begin next month. Cruise plans were written and logistic arrangements made for four cruises: Wieczno, 4-24 October; Anton Dohrn, 31 October-18 November; Albatross IV, 28 November-17 December; and Albatross IV, 15 February-8 March, 1978, to monitor production, dispersal, growth, and mortality of herring larvae. There is considerable interest in the magnitude and distribution of the 1977 larval production, particularly in view of the extremely poor production observed in 1976. The low production last year may have been due to unusually high egg mortality or possibly to a geographic shift in spawning locations.

The construction of our Multiple Opening-Closing Sampler--Environmental Sensoring System (MOCNESS) has been completed under contract to WHOI. Two 1/2-day test cruises on Asterias were completed with WHOI and NEFC personnel (Greg Lough, Pat Twohig, James Crossen, George Bolz, Bob Halpin, Andrew Rosenberg, and Ed Cohen). Preparations have been underway for a full-scale test of MOCNESS on Albatross IV at the end of this month, but the test was cancelled due to engine breakdown on the ship. The first use of MOCNESS to look at the vertical distribution of herring larvae and their prey organisms in relation to water structure will be on the November Anton Dohrn survey. Experiments also are planned for the December and February surveys.

## Larval Physiology Investigation

Plasma protein electrophoretic profiles are currently being conducted on summer flounder adults. If successful, this process will enable these fish to be sexed with accuracy prior to hormone-induced spawning. Dr. Laurence attended the 12th European Marine Biology Symposium in Stirling, Scotland, and spent 1 wk at the Danish Institute for Fishery and Marine Research, Copenhagen, Denmark, cooperating with Dr. Jan Beyer on the development of stochastic models of larval fish survival. He also attended a 1-wk course in Woods Hole on supervision and group performance. Work is continuing on the manuscript describing the results of the controlled environmental chamber experiments with winter flounder larvae.

Preliminary studies with the fluorescamine method for the measurement of dissolved and particulate primary amines in seawater and the luciferase method for determination of ATP were begun. Measurements of protease activity in the digestive tract of the killifish (Fundulis sp.) were made in preparation for work with summer flounder larvae.

## Apex Predators Investigation

During September nearly 200 sharks were released under the cooperative tagging program. This was fewer releases than in either of the previous three months and reflects the normal seasonal reduction in offshore fishing activity along the Northeast Coast. Seventeen tagged fish were recaptured and the tags returned. These recaptures included two returns from sharks tagged aboard the R/V Wieczno--one of which was a blue shark tagged in 1976 off Cape Hatteras and recaptured in the Sargasso Sea by a Taiwanese longliner (1,400 mi from the tagging site). Another interesting recapture came from a swordfish tagged by a commercial longliner in the Gulf of Mexico. It was recaptured after 3.5 yr near Corsair Canyon on Georges Bank. This is the longest distance (2,000 mi) recorded for a tagged swordfish and first evidence to show movement of this species between the Gulf of Mexico and the Atlantic. At tagging the fish was estimated at 25 lb and at recapture it was estimated to weigh 190 lb.

Efforts to establish the ADP data base of tagging information are nearly complete. Verification of data from over 8,600 sport-tagged sharks was completed in September. These data together with those collected from sharks tagged during the research cruises between 1966 and 1975 are now ready for ADP analysis. Further verification of keypunch data for an additional 8,000 sport-tagged sharks has been interrupted temporarily because of personnel cutbacks.

Stomachs collected from apex predators by commercial longliners (from Georges Bank to the offings of Delaware Bay) for food habit studies indicate squid was the principal food item in several species including sharks and swordfish. Illex was the most commonly occurring genus.

Wes Pratt participated in a 2-wk cooperative mission with Richard Cooper and the MURT team on Jeffreys Ledge. The mission involved training with the KMB-8 diving system and studies of herring spawning and bottom ecology of the area.

Measurements and biological samples from six giant bluefin tuna were obtained in cooperation with the SEFC. A report summarizing the results of the Bay Shore Tournament (1965-1977) was prepared for the ICES meeting.

Meetings, Talks, Visitors, Publicity

A meeting of the Marine Ecosystem Division was held at Narragansett on 15 September. Discussion was concerned with planning for the 1978 MARMAP surveys and zero-based budget submissions for 1979. Ken Sherman attended the Board of Directors meeting in Gloucester during 19-23 September; he attended the ICES meeting in Iceland from 26 September to 1 October, and participated in discussions of joint research on the continental shelf with staff of the Oceanographic Division of the Brookhaven National Laboratory. Luther Bivins and John H. Cawley of the NOAA Office of Engineering Development visited the Narragansett Laboratory on 16 September.

Jack Casey lectured to the Dallas Zoological Society during September.

Roland Wigley attended the Marine Ecosystems Division meeting at Narragansett on 15 September for the purpose of discussing budgets and programs.

Ray Bowman participated in Part I of the Fall Groundfish Survey aboard the R/V Delaware II. Stomach samples of priority species of finfish were collected between Cape Hatteras and southern New England.

Jerry Prezioso is taking Introduction to Computer Science at the University of Rhode Island.

Red Wright spent the last week of the month in a supervisory training course at the WHOI Quissett Campus in Woods Hole. Earlier he spent a day in Sandy Hook working out cruise tracks and other details of the MARMAP cruises that begin in October, and a day in Narragansett at a division budget session.

Wally Smith and Art Kendall met with Red Wright and Jim Thomas at Sandy Hook on 11 September to discuss sampling protocol and determine divisions of labor for MARMAP cruises scheduled for FY 1978.

Wally Smith and Art Kendall attended a Marine Ecosystems Division planning meeting at Narragansett on 15 September.

Cindy deGorgue departed for a 1-yr university assignment at University of Massachusetts, Amherst.

Doris Finen is at the SWFC in La Jolla, California, attending Dr. E. H. Ahlstrom's course on larval fish taxonomy.

The NEFC's Marine Ecosystems Division Annual Report to the Atlantic States Marine Fisheries Commission was submitted.

The final Argo Merchant report to EPA is now being prepared.

Carolyn Rogers attended a meeting of the BLM Biological Task Group in Washington, D.C., on 14 September. The committee discussed recommendations to the USGS Oil and Gas Supervisor for Mid-Atlantic Sale #40. Information pertaining to fishery resources of Georges Bank and Nantucket Shoals was presented. The next meeting to be held the end of October and will include a regional EPA member and states' representatives.

List of Reports Presented to ICES

Laurence, G. C. Comparative growth, respiration and delayed feeding abilities of larval cod (Gadus morhua) and haddock (Melanogrammus aeglefinus) as influenced by temperature during laboratory studies. C.M.1977/L:31.

Buckley, L. Biochemical changes during ontogenesis of the winter flounder (Pseudopleuronectes americanus) and the effect of starvation. C.M.1977/L:29.

Rosenberg, A. A., and R. G. Lough. A preliminary report on the age and growth of larval herring (Clupea harengus) from daily growth increments in otoliths. C.M.1977/L:26.

Dubé, G.P., R.G. Lough, and R.E. Cohen. Zooplankton composition, abundance and distribution on Georges Bank during February 1975 and 1976. C.M.1977/L:27.

Sherman, K., R. Maurer, R. Byron, and D. Bearse. Relationship between larval fish communities and zooplankton prey species in an offshore spawning ground. C.M.1977/L:28.

Green, J., J.B. Colton, and D. Bearse. Estimates of zooplankton production on Georges Bank. C.M.1977/L:30.

Casey, J. The occurrence of large sharks off northeastern U.S.: results of monitoring an annual shark fishing tournament at Bay Shore, New York, 1965-1977. C.M.1977/H:42.

Sherman, K. ed. The Argo Merchant oil spill and fishery resources of Nantucket Shoals: A preliminary assessment of impact. C.M.1977/E:58.

MANNED UNDERSEA RESEARCH AND TECHNOLOGY PROGRAM

The DSRV Alvin was employed during 6-15 September for a preliminary survey of the geology and biology of Atlantis Submarine Canyon on the outer continental shelf. Because of bad weather, only four dives of an eight-dive schedule could be completed; these dives, as in previous operations with Alvin, ranged from 100 to 1,000 fathoms and provided both qualitative and quantitative overviews of the continental slope fauna. Weather days were dedicated to a detailed bathymetric survey of the canyon proper during which time some 180 nautical miles were continuously profiled.

The sixth annual Atlantic herring egg-bed survey began 22 September. This operation employs the charter vessels R/V Atlantic Twin and F/V Barbara L. The Atlantic Twin will serve as a diver scientist support boat for various diving activities while the Barbara L. will be the primary platform for dredge sampling and trawling operations. This operation is projected through 20 October 1977.

## RESOURCE UTILIZATION DIVISION

### Finfish Resources Development and Improvement Investigation

#### Guaranteed Quality Program

Under this program we have introduced an underutilized species of finfish for two successive months with extremely disapproving consumer acceptance. We have offered attractively packaged large silver hake (whiting) fillets as the least costly fish item of six species -- all of US Grade A quality. The two stores involved did no advertising and did not use any point-of-sale promotion for the whiting. We are convinced that no underutilized fish or shellfish can be successfully introduced to the public without a good, sound marketing approach.

### Shellfish Resources Development and Improvement Investigation

Taste-test results on precooked and raw breaded squid strips show that the product is highly acceptable after 6 mo of frozen storage. After 4 mo of storage at -20°F, roller-extracted red crabmeat reformed into lumps with calcium alginate has maintained good (7.2 on a 9-point scale) organoleptic quality. Aerobic plate counts have remained at a low level, dropping from 0-time figures of $7.45 \times 10^3$ APC/g to $4.65 \times 10^2$ APC/g at 20°C and $7.40 \times 10^3$ APC/g to $6.25 \times 10^2$ APC/g at 37°C.

Taste tests on fresh mussels shucked raw and cooked showed no significant difference in quality for the months of May-September. After 1 mo of frozen storage, the quality drops but then levels off. This initial drop is more pronounced for the raw shucked mussels than for the fully steamed, shucked mussels. There has been no change in lipid composition of mussel meats as extracted by the Bligh and Dyer techniques after 4 mo of storage at 0°C. Protein content in the fresh mussels fluctuates from month to month. The range was 6.5 g/100g for raw mussels in August to 9.3 g/100g in July, and 5.2 g for cooked mussels in May to 13.8 g/100g in July.

### Product Safety and Standardization Investigation

Activities focused on preparation for the next meeting of the Codex Alimentarious Committee on Fish and Fish Products. We prepared a report on acceptability of mixed fillet/mince blocks to summarize work to date. We are continuing to evaluate bone detection methods and determination of thaw drip in fish blocks.

### Product Quality and Safety Investigation

A solution containing 14 N-nitrosocompounds at a concentration of 0.5µg/ml was made up. This solution is being used to spike whitefish samples and as the calibration mixture for GLC analysis. Work on the isolation and analysis of volatile N-nitrosamines in hot-smoked whitefish fortified at the 5-ppb level has been completed. The data and statistical analyses have been sent to Dr. Fazio of the FDA. Some selected whitefish extracts were brought down to Dr. David Fine of the Thermo Electron Corporation for analysis by GC-TEA.

## Southern New England Fisheries Development Program

Certain storage studies are still continuing and during this period scheduled organoleptic and chemical tests were conducted on: (1) minced whiting stocks and blocks, which had been treated with various antioxidants and held 42 wk at +5°F; (2) minced whiting-quahog blocks held 64 wk at -5°F; and (3) minced whiting blocks prepared at either warm or cool temperature and held 4 mo at 0°F. The apparatus required for purification of the formaldehyde-dimethylamine-forming enzyme extracted from whiting livers is being set up and calibrated. A study to determine the effect of chlorine treatment on the refrigerated shelf life of Atlantic cod fillets was completed. A qualitative and quantitative identification of the microbial spoilage flora is underway to determine whether the chlorine treatment caused a shift in the flora.

## Fisheries Engineering Investigation

The fabrication and assembly of the squid-processing machine has shown a good advancement in the past month. The two counter-running feed conveyors, which accept the two parts of the squid after the head and tentacles have been severed from the mantle, have been mounted and checked out. The carrier bars on the trolley conveyor have been revised for more efficient handling of the mantle. The trolley conveyor has been modified to improve its operation at the speeds at which it will be run. The stripping belts that remove the mantle from the carrier bars after the skinning operation have been assembled and installed. The adjustable frames that support the two skinning whips have been installed. Work is now centered on the drive system so that the various components can be tried under power.

## Gear Research Investigation

A report is in progress detailing the results of last month's Delaware II dredge-testing cruise. Recommendations are being made to modify and repair equipment as well as change and refine fishing methods. A second story is being planned for the former Gear Base Building on Gloucester's State Fish Pier. Mike Corbett is the Contracting Officer's Technical Representative (COTR) and is currently meeting with the architect and construction firms for the contract. Al Blott is working on a report for the NEFDP discussing the squid pair-trawling equipment conducted in the spring of 1977 in Nantucket Sound. Vern Nulk completed the preparation of the primary sorter for the Fisheries Engineering Investigation. John Kenney continues assisting the Fisheries Engineering Investigation full-time in the design and construction of the modified squid-processing machine.

## Technical Assistance

Information furnished this month covered paralytic shellfish poisoning, commercial freezing of lobsters, making salmon caviar, smoking of fish, and commercial development of a minced fish product developed at the Gloucester Laboratory. Assistance was also given to: Mr. R.J.H. Pannell of White Stevenson,

Ltd., in Reigate, Surrey, England, for a continuous process for smoking fish; Tony Scola of Gloucester for trawl construction; Parsons Brinckenhoff of Quede & Douglas in Boston for Gloucester Harbor development, unloading, and processing techniques; and Jack Farrell of Gloucester Story Museum for sampling equipment.

## Meetings, Talks, Visitors, Publicity

Messrs. F. Ivey and J.C. Hickey of the Monsanto Co., St. Louis, visited to discuss use of potassium sorbate as a preservative in fish.

Prof. H.O. Hultin of the University of Massachusetts visited to discuss procedure for purification of the formaldehyde-dimethylamine-forming enzyme found in gadoid species.

The 22nd Annual Atlantic Fisheries Technological Conference was held in Halifax, Nova Scotia during 28-31 August. Held in conjunction with the World Fishing Exhibition, this year's conference had the theme of "global fisheries technology." One hundred seventy-five technologists from 12 countries participated in the conference representing Japan, Norway, Poland, Iceland, West Germany, South Africa, Italy, Scotland, England, Barbados, Canada, and the United States. The Gloucester Laboratory was represented by Fred King, Kurt Wilhelm, Joe Licciardello, Bob Learson, and John Peters. Joe Licciardello was appointed to the Conference Executive Committee for a 3-yr term, replacing Bob Learson whose term expired. Next year's conference will be held in Virginia, probably the Williamsburg area, hosted by Virginia Polytechnical Institute (VPI) and chaired by Dr. George Flick from the Department of Food Science.

# ENVIRONMENTAL ASSESSMENT DIVISION

## Behavior of Marine Fishes and Invertebrates Investigation

Thresholds for the detection of naphthalene and methyl naphthalene in the blue crab, Callinectes sapidus, have been established. Similar behavioral procedures are being used to establish thresholds for other compounds. We anticipate that continued support for this research will be forthcoming from ERDA.

Adult bluefish, Pomatomus saltatrix, have been captured and are being held in the laboratory. Tests will begin shortly on the effects of thermal edges on their behavior as related to body temperature. These tests are based on earlier promising results with juvenile bluefish in regard to determining the distribution of these animals in relation to natural thermal barriers.

## Biological Oceanography of Stressed Environments Investigation

During the month of September work continued on the revision and illustration of our chapter, "Maintenance of Anoxic Conditions of the New Jersey Coast During the Summer of 1976." Data from our contribution to the sludge tracking and acoustical experiment (STAX II) accomplished during July 1976 was re-plotted and submitted for development of illustrations in preparation for a report to MESA. Data from our Advance II cruise in the New York Bight and over Georges Bank during March-April 1977, was entered into the computer for data analysis prior to plotting. Water column respiration data from our synoptic investigations during nutrient

cycling (SINC) cruises in May and July 1977, were computerized and graphed for presentation at a MESA-sponsored meeting at Lamont-Doherty Geophysical Observatory (LDGO) on 26 September 1977. Attending that meeting were Dr. James Thomas, Jay O'Reilly, and Craig Robertson from the NEFC. Others in attendance were Dr. Joel O'Connor (MESA), Gary Mayer (MESA), Dr. Tom Malone (LDGO), Dr. Myra Charvin (LDGO), Dr. Carol Litchfield (Rutgers), Joe Zindulus (Rutgers), and Dr. Garside (Bigelow).

## Coastal Ecosystems Investigation

We continued processing benthic macrofauna samples from the Baltimore Canyon Trough (BCT) to contribute to the baseline biological data being developed for BLM. A monthly report on NEFC's overall efforts in the BCT studies was submitted to BLM.

Clyde MacKenzie analyzed samples of current year-class surf clams taken by divers inside and outside the swath of NEFC's hydraulic dredge (collected on the August Delaware II-Rorqual cruise). The 2.0-2.5 mm clams were much less abundant in the swath than outside it. (There was a mean of 1.0/2.5 $dm^2$ inside the swath, a mean of 5.1/2.5 $dm^2$ outside the swath, and five samples in each area.) It is likely that some clams in the swath are buried below the depth of sampling, while others are scattered outside the swath.

Another in a series of monthly New York Bight hydrographic monitoring cruises was completed aboard the Delaware II. Forty stations were sampled and the bottom-water oxygen levels appeared stable.

Work continued on the MESA benthic atlas manuscript documenting the impact of the 1976 anoxia phenomenon on the benthos of the New York Bight, and three manuscripts reporting the results of the MESA-sponsored benthic collections. Plans are being developed for Ocean Pulse activities next spring as well as revising the Ocean Pulse planning document.

## Coastal Monitoring, Assessment, and Prediction Investigation (COMAP)

Fred Lux, George Kelly, and Jack Pearce attended a meeting of an Ad Hoc Committee on Lobster Larvae Sampling in Southern New England held in Woods Hole on 15 September. The committee is an outgrowth of ichthyoplankton sampling begun by Marine Research, Inc., in Cape Cod Bay in 1974 under the aegis of the Pilgrim Power Plant. The meeting was attended by persons from the Massachusetts Division of Marine Fisheries, Pilgrim Power Plant, Canal Power Plant, Raytheon Marine Research Laboratory, EPA Regional Office, and the New England Power Co. The purpose of the meeting was for each of four field-sampling groups to report on the results of sampling lobster larvae with neuston nets from May through August 1977 in the waters of Cape Cod Bay, Cape Cod Canal, Buzzards Bay, and off Charlestown, Rhode Island.

The results of sampling of each group were consistent with the data collected by Fred Lux in Buzzards Bay which were reported in the August narrative report, and were very similar to the results of the 1976 survey. The greatest numbers and highest concentrations of young lobsters were found in the northeastern portion of Buzzards Bay, and it appears that this area is well suited for further studies of the survival of later stage larvae as they move to the bottom to live.

George Kelly assisted Dr. Edwards and Dr. Ridgway in several meetings with persons from the Manomet Bird Observatory and New England Aquarium discussing proposals for marine mammal research on the Atlantic Coast. Potential funding for such studies was included in the congressional budgetary supplement for FY 1978. Kelly also participated in meetings with Paul Sund at the Woods Hole Laboratory on 13-14 September discussing the NMFS Ships of Opportunity Program, particularly in reference to the East Coast marine mammal sighting network. Representatives were present from the College of the Atlantic, New England Aquarium, New York Zoological Society, Manomet Bird Observatory, University of Rhode Island, and Woods Hole Oceanographic Institution.

Routine activities proceeded on schedule.

At the request of Dr. John R. Haugh, Division of Biomedical and Environmental Research, ERDA, Washington, D.C., George Kelly reviewed a proposal entitled "A Proposal for the Study of Pelagic Distribution of Birds over Georges Bank and Adjacent Waters," submitted to ERDA by Manomet Bird Observatory for funding over an 18-mo period. A strong endorsement of the proposal was sent to Dr. Haugh.

## Environmental Chemistry Investigation

Samples of surf clam, blue mussel, striped bass, and flounder were collected from various areas of the New York Bight for shipment to the National Analytical Laboratory in Seattle, Washington, as part of our contractual work with MESA on organic contaminants in various biota and environmental samples of the New York Bight.

A new gas chromatograph (GC) was ordered which will be used for petroleum hydrocarbon work later in FY 1978. The GC will probably take 6-8 wk for delivery; another GC was ordered several weeks ago which we plan to use for PCB and other chlorinated hydrocarbon analyses. However, the Perkin Elmer Company has not, as yet, obtained approval for their electron-capture detector for this particular instrument and thus we do not have a delivery data to receive it and begin to use it.

A study on the uptake of Ag, Cd, and Cu by oysters, surf clams, and quahogs was completed this month. These data are being analyzed.

## Physiological Effects of Pollutant Stress Investigation (PEPS)

### Physioecology

Studies are continuing on the effects of heavy metals, both individually and in combination, on embryos and larvae of the American oyster, Crassostrea virginica, under optimal environmental conditions and at various salinity-temperature regimes.

Tests are also continuing to determine the combined effects of copper and zinc on juvenile bay scallops, Argopecten irradians.

### Physiological Effects

This subtask participated in a 1-wk cruise on the Delaware II. Our principal experimental work during the cruise was to examine the role of cadmium on seabed oxygen consumption in cooperation with Dr. Thomas' Biological Oceanography of Stressed Environments Investigation.

A study on the effects of arsenic on bivalve mollusks was initiated this month. Blue mussels (Mytilus edulis) were exposed to six concentrations of arsenic (0.1 to 10.0 ppm) at 15 and 25 °/oo salinities. This study will continue with other bivalve species and at other salinities.

A considerable portion of this period was spent finishing a backlog of blood samples that had accumulated over the summer while we waited for delivery of a set of standards from the manufacturer.

Biochemical Effects

Biochemical testing has been completed on antennal glands and skeletal muscle of cadmium-exposed lobsters (30 days, 6 ppb) that were subsequently cleared for 7 days at either ambient (28 °/oo) or low (17 °/oo) salinity. Work is now in progress on the gonads from these experiments. Statistical analysis of the data thus far points to several overall conclusions: (1) Some clearing occurred in the CD-exposed animals during the 7 days in clean water at either salinity; for instance, the loss of Mg sensitivity in antennal gland G6PdH, a significant effect in Cd-exposed lobsters, was no longer clear-cut, and the increase in heart AAT was no longer significant; (2) Cadmium-induced elevation of enzyme activity was greater at ambient salinity than at low salinity in heart muscle preparation, whereas the reverse was true for skeletal muscle; (3) Cadmium-induced increase in heart LDH activity occurred only in the absence of low-salinity stress, which depressed LDH activity in the controls. The same was true for heart GPI; (4) MDH induction occurred in all tissues of Cd-stressed animals, and also in control animals under low-salinity stress; (5) Skeletal muscle showed most strikingly the effects of low-salinity stress, with a very high significant elevation of MDH and concomitant depression of LDH. This observation is true for both control and Cd-exposed animals. The MDH:LDH ratio gives indication of being a good index of stress: the higher the ratio the greater the stress, the order of which in all tissues from these experiments is Cd/low salinity > Control/low salinity>> Cd/ambient-salinity> control/ambient salinity. We are trying to identify such indicators of stress for use in our developing Ocean Pulse program.

Whole-body homogenates were made of the four leptocephali from the sewage dumpsite, taken during the DWD 106 exercise. The methodology proved to be feasible; our immediate need is to obtain greater numbers of specimens for statistical purposes.

In a cooperative exercise, adductor muscles from sea scallops (Placopecten magellanicus), taken during the fall scallop assessment survey cruise, were excised, packaged, and well frozen for our use by scientists (Tom Azarovitz, Bill Overholtz) at the Woods Hole facility. These tissue samples are now at Milford, and will provide material for seasonal profiles of baseline metabolic activity for this important species.

Anaerobic Bacteriology/Metabolism

In addition to work on previous studies and preparation of manuscripts, laboratory activity was devoted to the isolation and characterization of the gram-negative sulfate-reducing and toxicogenic anaerobes obtained from sediments. Background information was also researched on how best to detect quantitively hydrogen sulfide production in culture media. It would appear that the ion-sensing electrodes could have applicability in this area.

## Meetings, Talks, Visitors, Publicity

Bob Reid attended a TDP planning session at Milford; a meeting with EPA, MESA, and oil industry representatives at Edison, New Jersey, to discuss surveys monitoring effects of exploratory oil drilling off New Jersey; and a meeting of the Scientific and Statistical Committee of the Mid-Atlantic Fishery Management Council at Ocean City, Maryland.

Dr. Anthony Calabrese attended the 12th European Marine Biology Symposium in Stirling, Scotland, on 5-12 September where he presented a paper on metal effects on oyster larvae.

Dr. Jerry Hannan of the Navy Research Laboratory visited the Sandy Hook Laboratory on 7 September to present a seminar on his research using algal species as indicators of environmental stress, especially in relation to the possible toxic effects of contaminated harbor dredging spoils. He also discussed possible cooperative research between his investigation and the NEFC Ocean Pulse program.

Dr. Pearce participated in Dr. Frank Cantelmo's Ph.D. examination at the City University of New York on 8 September. Dr. Cantelmo conducted a study of benthic meiofauna in inter- and subtidal sediments of Sandy Hook Bay from 1975 to 1976. This research was important in showing the relationships between the distribution and abundance of benthic meiofauna and various chemical/physical parameters such as reduced dissolved oxygen, hydrogen sulfide, and grain-size of sediments. Research facilities were made available at the Sandy Hook facility.

Margaret Dawson attended the New York Academy of Sciences Conference on Calcium Transport and Cell Function in New York City on 7 and 8 September.

On Thursday, 15 September, Dr. Pearce met with George Kelly (COMAP Investigation) at Woods Hole to brief various industry, state, and academic members of a special review panel about the Ocean Pulse program. The review panel has been concerned with the possible effects of electric generating facilities on lobsters and other important marine species. Ocean Pulse could provide the broad base information needed in the context of site specific situations of interest to the panel.

Mr. Richard Greig met with MESA personnel, Drs. Pearce and Sindermann, and Mr. Pacheco on 16 September to discuss Environmental Chemistry Investigation proposals to MESA for New York Bight work in FY 1978.

Dr. Frederick Thurberg served as a member of the University of New Hampshire-University of Maine Sea Grant Site-Visit Team at Durham, New Hampshire, on 19-22 September.

Frank Steimle participated in a panel discussion on the impact of coastal pollution on fisheries, particularly in reference to the New York Bight. This panel also included Dr. Richard Dewling (EPA, Region II), Mr. John Bryson (Mid-Atlantic Fishery Management Council), and Capt. John Larson (a commercial fisherman from New Jersey) and was presented on WOR Radio, New York, in a program hosted by Sherry Henry on 22 September.

Dr. Pearce presented three papers to the Fisheries Improvement Committee of the International Council for the Exploration of the Sea (ICES). The papers were concerned with: (1) heavy metals in finfish and shellfish from the Mid-Atlantic Bight; (2) the mining of marine sands and gravels in ICNAF areas of North America; and (3) the developing Ocean Pulse program to establish baselines in regard to contaminants, physiological responses, genetic abnormalities, incidence

of pathology, and other environmental data. The 65th Statutory Meeting of ICES was held in Iceland. The Fisheries Improvement Committee was replaced by a new committee, the Environmental Quality Committee. Dr. Pearce was named one of two US members to the new committee.

David Nelson attended the International Aquatic Invertebrate Bioassay Symposium at Virginia Polytechnic Institute in Blackburg, Virginia during 26-30 September.

Manuscripts

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Mahoney, J. B., and J. J. A. McLaughlin. 1977. The association of phytoflagellate blooms in Lower New York Bay with hypertrophication. J. exp. mar. Biol. Ecol. 28: 53-65. (P)

Pearce, J. B., J. V. Caracciolo, and F. W. Steimle. 1977. Final report on benthic infauna of Deepwater Dumpsite 106 and adjacent areas, pp. 465-480. In: Vol II, Baseline Report of Environmental Conditions in Deepwater Dumpsite 106. NOAA Dumpsite Evaluation Report 77-1. (P)

Sindermann, C. J., and F. W. Steimle. 1977. Oxygen depletion and mass mortalities of shellfish in the Middle Atlantic Bight of the United States in 1976. Report to ICES, C.M.1977/E:13, Fisheries Improvement Committee, Ref. Shellfish and Benthos Comm., 27 pp. (A)

Wenzloff, D. R., R. A. Greig, A. Merrill, and J. Ropes. Trace metals in two bivalve molluscs of the Mid-Atlantic Coast of the United States. Fish. Bull. (A)

MacInnes, J. R., and A. Calabrese. Response of embryos of the American oyster, Crassostrea virginica, to heavy metals at different temperatures. (S)

Pearce, J., L. Rogers, J. Caracciolo, and M. Halsey. Distribution and abundance of benthic organisms in the New York Bight Apex, five seasonal cruises, August 1973 through September 1974. MESA Data Report Series. (S)

Pearson, W., and B. Olla. The detection of naphthalene by the blue crab, Callinectes sapidus. Mar. Pollut. Bull. (S)

## AQUACULTURE DIVISION

### Spawning and Rearing of Mollusks Investigation

We are continuing to experiment with two materials that the literature reports are incorporated into the shell matrix of bivalves and are effective tags for the identification of shellfish. We are attempting to tag bay scallops and surf clams with tetracycline phosphate, a material that fluoresces yellow-orange under UV light. No appreciable tag has been observed to this point. On the other hand, some positive results have been achieved with Alizarin sulfate. Bay scallops held at a concentration of 100 ppm for 80 hr showed some marked (red) growth. Surf clams exposed to Alizarin sulfate produced a 2-mm wide purple band that was still visible 2-mo later.

Experiments designed to study the algal clearing rates of the surf clam, Spisula, have shown that the average filtering efficiency per animal significantly drops as the number of animals held in the tray increases. Results indicate that crowding a system with many animals can hinder the overall growth of the population. Using fluorometric analysis of seawater for chlorphyll-a content, the flow rates of seawater can be determined to optimize the food availability to bivalves, based on the ambient chlorophyll levels.

A preliminary analysis was undertaken to determine the operating costs of our pumped raceway system. It has been determined that at 5.5¢/kw hour it costs $11.47 to supply a tank with 50 l/min of seawater for 1 mo. At this rate, it appears that pumping cost should not be prohibitive in economically operating a grow-out facility.

### Aqacultural Genetics Investigation

#### Inbreeding and Hybridization

Larvae of additional oyster lines for full-sib crosses have reached the setting stage in recent weeks. However, these spat do not seem to be surviving as well as those from crosses made in the spring. A pink stain associated with a bacterial pathogen which causes mass mortalities of oyster larvae has been observed in several of the rearing containers.

Experiments utilizing various concentrations of EDTA for controlling fertilization in oysters for potential use in mass hybridization are continuing.

Hybrid spat were tested for biochemical differences against Crassostrea virginica adults and spat and C. gigas adults in an initial electrophoresis experiment. Further experimentation is needed in this area before results can be interpreted. However, total protein seems to show more than staining for LDH. Analysis of preliminary environmental tolerance trials with hybrid larvae revealed generally better growth and survival of local controls under temperature-stress conditions in the local environment. Intraspecific hybrids of Virginia and Long Island Sound C. virginica performed better than the interspecific hybrid larvae. Set was obtained in both the intraspecific or geographic hybrids and local hybrid controls at the normal temperature by approximately the same date; however, spat survived only in local controls at the normal temperature. No set was obtained in cold temperature groups for either hybrids or hybrid controls. Hybrid larvae grew slightly better at the cold temperature than non-hybrid controls. Rather early setting was observed in two replicates of controls at the high temperature. The hybrid culture at the high temperature was next to set.

Interspecific hybrid larvae, while not surviving well compared to hybrid controls, showed differences within their group of slightly better survival at temperature extremes than at the normal rearing temperature. Set was obtained only in local hybrid controls at all temperatures. However, spat survived only in hybrid controls at the normal temperature. There was virtually no growth of hybrid larvae at any temperature. A hybrid control at the normal temperature and a hybrid control at the high temperature reached setting at the same date. There was an obvious delay to time of setting by a week of the hybrid controls at the cold temperature.

These preliminary results were somewhat expected since local parental strains and populations are usually so well adapted to the local environment even if certain environmental components are varied. Other components will be varied in future experiments. Additional tests will be conducted with temperature.

Heritability

Larval data from the three heritability studies initiated last spring have been analyzed to obtain heritability estimates for larval growth rate. All heritability estimates were based on half-sib correlation analysis. Larvae were measured at weekly intervals during the 21-day larval stage, and in all cases 100 individuals from each half-sib family were measured to produce the necessary data. Variation in heritability estimates is expected and can partly be accounted for by nongenetic maternal effects during the larval stage. These estimates indicate the portion of oyster larval growth rate that is due to additive genotype. From these results it appears that a selection program for faster growing larvae should be successful.

Aspects of Nutritional Requirements of Mollusks Investigation

We are conducting final experiments for our first project in the investigation of cryopreservation of unicellular algae. Our results show that it is indeed possible to freeze and to preserve certain species at -70°C and -196°C. The longest low temperature storing period that we have tested in our experiments is about 60-80 days. We would like to prepare additional samples to test for viability after storage for much longer periods of time. A manuscript that describes our cryopreservation studies to date is in preparation.

We are continuing with our larval studies and are now working on a technique never before used in feeding studies. Using the natural fluorescence of the algal cell it is possible to study the uptake of food cells microscopically and study its digestion within the stomach of the larvae. We have already observed the very rapid lysis of Monochrysis lutheri cells as opposed to the non-lysis of Chlorella cells. This observation provides the first good explanation as to why larvae do grow on the former species and not on the latter.

Subculturing of the 101 strains of algae in the stock culture collection on various types of media has proceeded on schedule. We are attempting to separate the ciliate contaminant in the strain of Isochrysis that we received from the CNEXO station in Tahiti. A process of differential filtration has not yielded good results as yet, but we will continue with this, as well as other techniques to purify this strain of Isochrysis. We are experimenting with the strain of diatom clone T-77 in which we have observed a very unusual colony formation. The formation of this type of colony appears to be dependent upon a component in the growth medium since it appears only in one type of medium. Our earlier report indicated that we suspected that calcium was the agent responsible for inducing the colony formation, but our more recent detailed experiments do not continue to support this hypothesis.

Galley proofs were corrected of the manuscript submitted for publication in the Proceedings of the ICES meeting in Brest, France, during May 1977. A manucript was reviewed for the editor of the Journal of Phycology. Cultures were sent to the following upon their request: R. J. Connell, Jr., New Jersey; S. Kraul, Kahuku Sea Food Plantation, Hawaii; CNEXO Station, Tahiti.

## Meetings, Talks, Visitors, Publicity

We have provided scallop seed to the College of Marine Studies at the University of Delaware; the Wampanoag Indian project at Martha's Vineyard, Massachusetts; the Battelle Institute at Duxbury, Massachusetts; and the Little Harbor Laboratory, Guilford, Connecticut.

Ed Rhodes and Ron Goldberg assembled and presented a display of local marine invertebrates and vertebrates at the New Haven Seacoast Celebration on 17 September.

Visitors included Explorer Post One of Bridgeport, Connecticut, sponsored by the University of Bridgeport; Kenneth Haines, University of Texas Marine Science Institute, St. Croix, Virgin Islands; Kenneth Chew, University of Washington, Seattle, Washington; William Green, Aqua Technology, Guilford, Connecticut.

## PATHOBIOLOGY DIVISION

### Comparative Pathobiology Investigation

Paraffin-embedded tissues from Korean oysters (Crassostrea gigas) with gonadal lesions were deparaffinized and examined with electron microscopy. Similar lesions in American oysters (Crassostrea virginica) are known to have a viral etiology. The lesions in the Korean oysters also contain viral particles; however, they are smaller (approximately 40 nm) than the viral particles observed in American oysters (approximately 53 nm). Both viruses appear to belong to the family, Papovaviridae. Soft-shell clams (Mya arenaria) containing paralytic shellfish poison (PSP) were examined histologically to determine if inactivation of the toxin by ozone gas caused lesions in the clams. Based on the clams examined to date, ozonized PSP-containing clams do not differ histologically from non-ozonized clams. Diagnostic services were provided to six organizations requesting histologic examination of mollusks. Preparation of the guide to normal histology of the blue crab, Callinectes sapidus, continues. Sections on the circulatory system and hemopoietic tissue have been completed. Because of the continuous acquisition of new information, a more sophisticated view of sections written earlier is possible. Therefore, there has been considerable rewriting and many additions have been made to the manuscript. Several passages were made, using tissues from sick or dying blue crabs that were provided by a Tilghman Island crab processor. Based on the examination of paraffin-embedded tissues, all crabs were infected with virus. Electron microscopy will be used to identify the virus present. Apparently, both Reo-like virus and Picorna-like virus were involved. Larvae of the shrimp, Penaeus vanneni, being raised by a commercial aquaculture company in Costa Rica were forwarded to the Oxford Laboratory for microscopic examination. Protozoeal larvae had been undergoing mortality and a ciliate was the suspected cause. No parasites or other disease agents were found in the tissues or on the cuticle of the 20 larvae received. Considerable time was spent sorting fish samples taken in neuston, plankton,

and mid-water trawls at Deepwater Dumpsite 106. Only myctophids were present in large numbers at both dump and control stations. Of these, only those taken in neuston tows were in good condition; fish taken with other sampling gear were considerably damaged. Subsamples of the neuston-collected myctophids will be examined histologically; they are currently being processed. It is believed, however, that the 6-9 hr exposure time to the dumped materials is much too short for the fish to develop any histologic lesions. During the month, the histology laboratory sectioned 1,635 blocks, and stained 1,258 slides from a large variety of marine fishes, crustaceans, and mollusks.

Disease and Environmental Stress Investigation

Much time was spent collating and evaluating the 1973-1977 data on fin rot prevalence in New York Bight winter flounder. During this period there has been a substantial decline in fin rot prevalence; however, there has been no decrease in the amount of sewage sludge dumped. Laboratory experiments failed to conclusively demonstrate either infectivity or fatal progression of fin rot disease in winter flounder. Fin rot-diseased winter flounder placed in laboratory aquaria for as long as 1 mo at ambient summer water temperatures do not die. Apparently normal winter flounder placed in laboratory aquaria with diseased fish do not contract fin rot. Fin rot (usually caudal fin only) can develop in apparently normal winter flounder placed in laboratory aquaria. Transmission electron microscope studies of the chemoreceptors of blue crabs experimentally exposed to copper (1.0 ppm) for 48 hr clearly show that the integrity of the chemoreceptive sensilla is disrupted. Microtubules (dendrites) and the supporting cell processes are fragmented and displaced to the periphery of the hair tube. Cellular membrane degeneration is extensive and some sensilla show a complete loss of all cytoplasmic elements. Since neuronal transmission of these sensory cells would be blocked by substantially less severe cytologic damage, chemoreceptors from crabs exposed to 50 and 100 µg/l of $CuSO_4$ will be examined. Large collections of the rock crab, Cancer irroratus, were made during a recent scallop cruise conducted by the Resource Assessment Division. Gross examinations were made of 629 rock crabs, 388 Jonah crabs, Cancer borealis, and 12 lobsters, Homarus americanus. One hundred individuals were fixed for histological study. There were 89 stations sampled and 52 of them were over 60 m deep. Upon completion of the microscopic examinations and collation of the data, it will be possible for the first time to compare gill fouling in nearshore and offshore populations of the rock crab. Sufficient gross and microscopic observations have been made to permit a detailed numerical analysis of the gill condition of rock crabs from the New York Bight and contiguous areas. Spatial and temporal influences on the black-gill condition will be determined from a data base of over 4,000 animals.

Aquaculture: Disease of Larval Mollusks Investigation

Acetone extracts of pigments produced by a red pseudomonad which is pathogenic to shellfish larvae, its yellow mutant, and a nonpathogenic white bacterium, were added to 48 hr larval oyster cultures. The white bacterial extract produced no adverse effect to oyster larvae when compared with controls. Data on the effects of the red and yellow extracts are presently being assessed. If these pigments cause mortality or adverse effects to oyster larvae, some of the unresolved mass mortalities of shellfish larvae may be explainable. The pigments were

separated on thin-layer chromatographic plates. Apparently, the yellow pigment moves with the red pigment as spotting the red produced a clear yellow front. We plan to purify the pigments and use them to challenge larvae.

We completed data assessment and prepared a preliminary report to John Hurst, State of Maine Marine Laboratory, Boothbay Harbor, Maine, on successful ozone inactivation of PSP-contaminated Mya arenaria. In the experiment, Mya specimens containing 254 µg of toxin per 100 g of meats were detoxified to safe limits for consumption in 48 hr using 1.5 ppm and 0.5 ppm of dissolved ozone residual. The treated clams were examined by the physiology task group and histopathology investigators. The results indicate that ozone does not adversely affect gill or gut tissues.

## Meetings, Talks, Visitors, Publicity

Dr. Rosenfield participated in two committee meetings of the Maryland Oyster Resource Expansion Task Force (MORE) in Annapolis, Maryland, on 1 September and 28 September; Dr. Rosenfield met with Mr. Joseph Csorba, Maryland Department of Economic Development, and Mr. Robert Pryor, Executive Director of Chesapeake Seafood Industrial Council, to discuss plans for a program on oyster seed recruitment for Chesapeake Bay on 15 September; on 16 September, Dr. Rosenfield met with Mr. John Cookson and Mr. Leo J. Fisher, NMFS, Mr. Dexter S. Haven, Virginia Institute of Marine Science, and Mr. Howard Hudnall, Mr. Edgar Miles, and Mr. James Wallace, Virginia Marine Resources Commission, to discuss the Virginia 88-309 program; Dr. Rosenfield and Dr. Murchelano attended the NEFC Board of Directors meeting in Gloucester, Massachusetts, on 19-21 September; Dr. Rosenfield attended a meeting of the University of Maryland Sea Grant Advisory Board at the Tidewater Inn, Easton, Maryland, on 29 September.

Dr. Murchelano discussed FY 1978 MESA research with Drs. O'Connor and Sindermann at Sandy Hook on 15 and 16 September.

Mr. Farley attended the Kepone Seminar in Easton, Maryland, on 20 and 21 September.

Dr. Blogoslawski presented a seminar entitled, "Ozone Inactivation of Dinoflagellate and Fish Toxins," to an ecology class at the University of Bridgeport.

Visitors in the laboratory during September included LCDR Carl R. Berman, Jr., NOAA ship George B. Kelez; Mr. Carter Hughlett, Department of Vocational Rehabilitation, Easton; Mr. Joseph M. Forns, Westinghouse Ocean Research, Annapolis; Mr. Joseph Bormel, Harbor Pollution Committee, Baltimore; Mr. Perry Klein, Tidewater Diving, Baltimore; and Mr. Art Tittel, Baltimore.

## Manuscripts

Blogoslawski, W. J. Observations on natural and induced epizootics of vibriosis in Crassostrea virginica larvae. J. Invert. Path. (A)

Bodammer, J. E. Hemocytes of the blue crab. J. Cell and Tissue Res. (S)

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## NATIONAL SYSTEMATICS LABORATORY

### Benthic Fishes

Research continued on the taxonomy of North Atlantic rockling. Currently under analysis are the morphometrics from throughout the range of the four-bearded rockling, Enchelyopus cimbrius. Work continued on an undescribed species of eelpout caught by the DSRV Alvin in a deepsea hotspring area near the Galapagos Islands.

### Pelagic Fishes

Work continued on a review of Indo-West Pacific halfbeaks.

### Penaeoid Shrimps

Studies continue on Indo-West Pacific shrimps. "The Guide to Temperate Water Decapod Crustaceans of the U.S. East Coast" is continuing to be worked on.

### Manuscripts

Cohen, D. M., and D. L. Pawson. Observations from the DSRV ALVIN on populations of benthic fishes and selected larger invertebrates in and near DWD-106. In: Vol. 2. Baseline Report of Environmental Conditions in Deepwater Dumpsite 106. NOAA Dumpsite Evaluation Report 77-1. U.S. Dept. of Commerce. p. 423-450. (P)

Cohen, D. M. Ten dives of the DSRV ALVIN in and near the DWD-106 dumpsite, 25 July - 3 August, 1975. Introduction, station data, general observations and conclusions. In: Vol. 3. Baseline Report of Environmental Conditions in Deepwater Dumpsite 106. NOAA Dumpsite Evaluation Report 77-1. U.S. Dept. of Commerce. p. 595-609. (P)

## ATLANTIC ENVIRONMENTAL GROUP

### Ocean Monitoring and Climatology Task Group

Computer-graphic portrayal of monthly average sea-surface temperature in $1^{o}$ (latitude, longitude) squares in the apex of the New York Bight for the period of 1949-1976 has been completed by the MARMAP Information System. This portrayal, prepared for Jack Casey's Apex Predators Investigation, was derived from Marine

Deck data purchased from the National Climatic Center, which included over 9,000 observations of sea-surface temperature. This portrayal also will be released to other NEFC scientists in the near future as a data analysis product.

An updated record (cost $1,300) of the meteorological observations taken at the Nantucket Island airport for the period of January 1948-May 1977 has been received from the National Climatic Center. The record contains hourly observations for 1948-1964 and tri-hourly observations for 1965-1977. This data record will be added to the MARMAP Information System data base and a graphical portrayal of relevant variables will be produced and released as a data analysis product at a later date.

During recent months, the strong currents of Gulf Stream eddies have been causing temporary or permanent losses of gear for red crab fishermen, as well as difficulty for deepwater lobster fishermen off the Middle Atlantic Coast. Woody Chamberlin has learned of three instances of gear loss, each associated with a different eddy. Mr. William D. Whipple, High Seas Corporation, Fall River, Massachusetts, lost 80% of his red crab gear at the end of August, south of the Hudson Canyon, when strong currents submerged the surface floats, causing them to deflate. He has so far recovered one of four trawls that were lost. The traps themselves had apparently not moved from where they were lost. Whipple, who was referred our way by Fred Lux, has provided us with the above information.

The following information concerning crab and lobster fishermen out of Delaware was received by telephone from Mr. Howard Seymour, Marine Extension Agent, University of Delaware, Lewes, Delaware: (1) all crab gear was lost north of Washington Canyon during the last week of June and the first week of July (the one boat lost 120 pots), but all gear was recovered 2 wk later when the surface floats were found 5 mi northwest of where they were set; and (2) all crab gear was again lost in the same area during the third week of September (3 boats lost 290 pots), but no recoveries have been reported at the time of this writing (5 October), because of bad weather; and (3) on both occasions when crab gear was lost, lobster fishermen at Norfolk Canyon as well as at Washington Canyon, encountered such strong currents, estimated at 2-3 knots, that their surface floats were held several feet or more below the surface, making location and recovery of gear difficult, and tripling the normal time to haul a string. The strong currents at Norfolk Canyon started about 4 days later than at Washington Canyon. The lobster fishermen have started using heavier line in their trawls and more scope in their float lines.

The fishermen blame the gear losses and difficulties on strong currents, rather than on interference by other vessels, and they say that they have not experienced comparable difficulty in past years. Wind has apparently not been an important factor in the currents, but in each of the three instances of gear loss, an eddy has been adjacent to the area of the loss. What has been happening is consistent with the prevalence of eddies this year -- about double the number in each of the previous 3 yr.

## Ocean Dumping Task Group

The report concerning the June 1976 cruise effort to DWD 106 (physical oceanography and dye experiment) aboard the USCGC Dallas has been completed in draft form. In the report, the hydrography of the area is discussed in detail with minimum dilutions of waste and dye also being discussed.

A second report relating satellite infrared imagery interpretations of the circulation in the vicinity of DWD 106 was also completed. The report discusses for 1976 the passage of anticyclonic Gulf Stream eddies through the dumpsite and the movement of the shelf/slope front. This report updates earlier work by Bisagni (Dumpsite Evaluation Report 76-1).

A successful monitoring transect was completed aboard the ocean tug M/V Crusader on 20-21 September. This and other cruise data are presently being worked up. Work has been initiated to try and collect zooplankton samples during future monitoring transects for heavy metal analysis.

Preparations have begun for the December 1977 cruise to DWD 106 aboard the R/V George B. Kelez during 5-9 December 1977.

## Meetings, Talks, Visitors, Publicity

Reed Armstrong attended a workshop for principal investigators in the EPA Oil Field Study, which was held in Galveston, Texas, on 8 September 1977.

On 8 September Mert Ingham and Jim Bisagni traveled to Rockville, Maryland, to confer with the Ocean Dumping Program staff in National Ocean Survey headquarters concerning the FY 1978 program for Deepwater Dumpsite 106.

Woody Chamberlin went to Newark, Delaware, to attend the Atlantic Oceanographic Program Planning Workshop held at the University of Delaware on 18-21 September 1977.

Mert Ingham attended a Center Board of Directors meeting in Gloucester, Massachusetts, on 19-22 September.

Reed Armstrong attended a meeting in Galveston, Texas, on 21 September to plan further research study of the Buccaneer Oil Field.

Mert Ingham attended a NOAA supervisory training course in Woods Hole, Massachusetts, on 26-30 September.

## Manuscripts


Armstrong, R. S. 1977. Climatic conditions related to the occurrence of anoxia in the waters off New Jersey during the summer of 1976. In: Compiled Reports of Workshops on the New Jersey Fish Kill. (P)

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

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

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

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

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

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

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