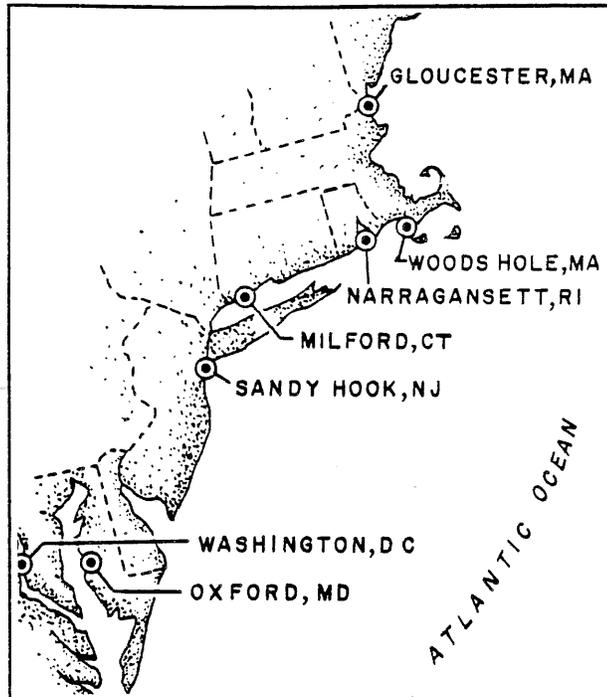


NEFC

Northeast Fisheries Center

NEWS

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JUNE 1978

RESOURCE ASSESSMENT DIVISION.	1
MARINE ECOSYSTEMS DIVISION.	4
MANNED UNDERSEA RESEARCH AND TECHNOLOGY PROGRAM.	12
DIVISION OF ENVIRONMENTAL ASSESSMENT.	12
AQUACULTURE DIVISION.	17
PATHOBIOLOGY DIVISION.	20
RESOURCE UTILIZATION DIVISION.	23
NATIONAL SYSTEMATICS LABORATORY.	27
ATLANTIC ENVIRONMENTAL GROUP.	28



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



RESOURCE ASSESSMENT DIVISION

Resource Surveys Investigation

During June the investigational staff completed all aspects of data processing for the 1978 spring bottom trawl survey. Work continued on the processing of the large backlog of data collected on foreign vessels earlier this year.

Survey, electronics, and gear personnel were involved during the month with preparing for the heavy load of summer and fall surveys.

We have been assisting biologists from the State of Massachusetts in the development of a statewide coastal finfish assessment program. Earlier cooperative efforts centered around sampling design and scheduling of the new series. Recent work during June, following completion of the first State cruise, involved data processing methods. We are developing auditing procedures and making coding changes that are required by the State while assuring continued compatibility with NMFS ongoing offshore and coastal assessment programs.

Age and Growth Investigation

Judy Penttila completed programs for the HP-67 calculator to produce von Bertalanffy growth equations for length and weight, based on Allen's method. Copies of the programs, with instructions, are available to anyone interested in obtaining them.

Gary Shephard completed a series of back calculations on growth zones from summer flounder scales and fin-ray sections and obtained essentially similar growth curves. Growth marks on fin-ray sections are much easier to interpret than those on scales, and might provide a better means for aging this species. Fin-rays will be collected from other flounders to learn if they are a better age determinant than scales or otoliths. Goosefish fin-ray sections have also been examined and contain well defined rings. Otoliths from this species are not very useful for aging due to constant shifting of the otolith in the sacculus, causing erratic ring formation.

Mike Campbell has been preparing microsections of vertebrae from smooth and spiny dogfish as a method for aging this species. Only smooth dogfish show any significant zones. Other staining methods will be attempted when more spiny dogfish samples are available.

Age samples completed during the month were: redfish (first quarter 1977 commercial subsamples); Atlantic herring (Albatross IV Cruise No. AL 78-04); red hake (Albatross IV Cruises No. AL 70-03 and No. AL 70-06); and scup (second quarter 1978 commercial samples).

Sandy Hook Investigation

The survey of the 1978 spring Atlantic mackerel (Scomber scombrus) fishery continued through the second week of June. At that time, mackerel left Long Island Sound. They had left other Middle Atlantic coastal waters by late May. Data were received from all cooperating State personnel by mid-June. Preliminary estimates of landings for New Jersey and Delaware have been completed, and Long Island, NY, landings data are being analyzed.

Following completion of the spring mackerel survey, field sampling was initiated to determine the ratio of day to night bluefish catches aboard party boats. Field samplers are interviewing fishermen and captains aboard vessels at sea on 16 bluefish (Pomatomus saltatrix) trips and 2 summer flounder (Paralichthys dentatus) trips per week. Samplers are determining the numbers and sizes of fishes caught by anglers and collecting bluefish ovaries and scales for age and growth analysis. Preliminary observations for bluefish fecundity indicate between

one and four million eggs for fish between 50 and 80 cm fork length. They are also collecting summer flounder scales and fin-rays for age and growth analysis.

Approximately 10,800 maturity observations from the 1978 spring bottom trawl survey have been processed through the ADP system. Initial computer programs were run for analysis of age and growth of scup (Stenotomus chrysops) collected during NMFS research vessel cruises during 1975 and 1976 in the Middle Atlantic Bight.

Fishery Analysis Investigation

Steve Murawski began an assessment of ocean quahog populations in the Middle Atlantic Bight, and completed an evaluation of ocean quahog length-weight relationships. He also participated with John Ropes and Fred Serchuk in the planning of a July cruise to mark ocean quahogs for age and growth studies.

Assessment activity on ICNAF Subarea 5 redfish continued during June under the direction of Ralph Mayo. Redfish age-length keys from both spring and autumn bottom-trawl surveys from 1975 to 1977 have been audited and stored on computer files. Helen Markesteyn has used these files and the commercial biostatistics to run the length-age programs to estimate by age group the number of fish landed in the US redfish fishery. The analysis indicates that almost 40% of the redfish landed in 1977 were from the 1971 year class. Liz Bevacqua has run a number of plots on the Tektronix CRT terminal depicting areal distribution of redfish catch in the Gulf of Maine for various ports, vessel sizes, and seasons.

Ralph Mayo and Bill Callahan provided data for the following individual requests: (1) Chatham, MA, catches by gear and species during 1968-77 (for Jack Mahoney, Northeast Regional Office); (2) New England fishing catches by port and species during 1964-77 (for Kathy King, Nantucket (MA) Planning Commission); (3) groundfish catches during January-March 1978 by vessel size, fishing area, and value (for Joe Mueller, Northeast Regional Office); (4) New England monthly commercial catch data during 1964-77 (for Richard Ibara, Southeastern Massachusetts University); (5) Atlantic cod catches for 1976 by area, season, and the number of unique vessels in the fishery (for Investigation personnel); and (6) tapes of Atlantic cod catch data for 1965-77 by stock area (for Investigation personnel).

Paul Gleason has been assisting Thurston Burns in updating American lobster catch records from the early 1970's. Paul also spent 2 wk at sea aboard the R/V Shamrock participating in sea-sampling activity. A cruise report on this trip is currently being prepared.

Maureen Griffin has been developing some cutting and aging techniques for ocean quahogs, and summarizing sea scallop data relevant to the early life history of the species.

Paul Wood continued to supervise and coordinate NEFC sea-sampling trip activity. Four sampling trips were completed in June. Vessels participating in the program during the month included the F/V Shamrock, F/V Yellowbird, F/V Yankee Capt.'s, and F/V Merganser. To date, 11 sea-sampling trips have been accomplished during 1978. Paul participated on 16 June as a sea sampler aboard the F/V Yellowbird, a day-trip scalloper out of Chatham, MA. Paul also continued assessment of sea scallops and red crabs.

Harold Foster resumed work on evaluating various recreational catch estimates for the Georges Bank Atlantic cod stock, and ran virtual population analyses using the estimated recreational and commercial catch data.

Marj Aelion organized and reviewed yearly data for shellfish cruises, and continued to analyze ocean quahog survey data.

Fred Serchuk devoted much of his time during the month to preparation of a sea scallop assessment and activities related to regional fishery management council stock assessment matters, particularly for groundfishes and red crabs.

Preparation of additional Atlantic cod and shellfish analyses continued during the month.

Fishery Systems Investigation

During June 1978 all members of the Investigation worked on stock assessments intended to provide an updated description of the current status of exploited fish stocks. The stocks considered include: Gulf of Maine Atlantic herring, Georges Bank - southern New England Atlantic herring, southern New England yellowtail flounder, Georges Bank yellowtail flounder, Cape Cod yellowtail flounder, Loligo sp. squid, Illex sp. squid, and other flounders. In addition, members of the Investigation continued to interact with fishery management councils and the US delegation negotiating fishing boundaries on Georges Bank with Canada. Some specific activities are reviewed below.

Gordon Waring reviewed spring bottom trawl survey data on Atlantic herring. The data were collected on research vessel surveys on the Albatross IV, Argus, and Anton Dohrn. Gordon also continued laboratory work on the fecundity of little skates. He also completed work on an ICES paper titled "Assessment and Management of the Georges Bank Herring Fishery," by V.C. Anthony and G. Waring.

Margaret McBride analyzed spring bottom trawl survey data on yellowtail flounder. She also calculated estimates of the age composition of yellowtail flounder taken in the industrial fishery.

Otis Jackson helped in the Center's response to several special requests for computer runs on commercial data files. He also worked on a new virtual population analysis program which should greatly increase efficiency of the Division in implementing assessments.

Anne Lange updated squid and other flounder assessments. She also completed two manuscripts describing prior work on squid fisheries.

Meetings, Talks, Visitors, Publicity

Michael Sissenwine attended the Soviet-American Symposium on the Main Factors Which Govern Functioning of Marine Ecosystems. The Symposium was held in Tallin, USSR, during 5-9 June 1978. This trip also involved brief stopovers in Moscow and Paris. The US delegation was generally impressed by the number of prestigious Soviet marine scientists at the meeting.

Ralph Mayo attended the monthly meeting of the New England Fishery Management Council in Portland, ME, on 6 and 7 June.

A paper entitled "An Assessment of the Butterfish Population Off the Northwestern Atlantic Coast" was presented by Steve Murawski at the Southern New England Chapter meeting of the American Fisheries Society at the University of Rhode Island on 7 June.

Steve Murawski attended the Surf Clam Subpanel meeting of the Mid-Atlantic Fishery Management Council in Dover, DE, on 9 June to provide information on future surf clam assessment cruises.

On 9 June, Fred Serchuk and Brad Brown met with Bob Morton, Program Coordinator, New Hampshire Oceanographic Foundation, in Woods Hole to review groundfish assessment activities and the role of the Resource Assessment Division in developing fishery management plans.

Anne Lange replaced Emory Anderson as the NEFC's representative on the US delegation negotiating boundaries with Canada on Georges Bank. On 10 June she attended a US delegation meeting in Boston and between 18 and 20 June she attended a US-Canadian delegation meeting in Ottawa, Canada.

Fred Serchuk presented a stock assessment review at a groundfish seminar sponsored by the Economic Resources Center, Gloucester Fisheries Association, in Gloucester, MA, on 15 June.

A paper entitled "Assessment and Status of the Sea Scallop (*Placopecten magellanicus*) Population off the Northeast Coast of the United States" by F. M. Serchuk, P.W. Wood, B. E. Brown, and J. A. Posgay was given as an invited presentation by Fred Serchuk at the joint annual SINA-NSA meeting in New Orleans on 19 June. Fred also served as a panelist in a technical session of the annual SINA meeting entitled "Surf Clam/Quahog Management Plan - Future Outlook," and presented a review of the data, methodologies, and analyses used in the surf clam and ocean quahog resource assessments. Fred also met with representatives of the sea clam industry to discuss recent regional fishery management council actions regarding the surf clam and ocean quahog fisheries at the Sea Clam Meeting at New Orleans on 18 June.

Steve Clark coordinated a tour of the Woods Hole Laboratory by the Gloucester (MA) Fishermen's Wives Association on 19 June.

Steve Clark lectured on fishery population dynamics and related subjects at the Shoals Marine Laboratory (Appledore Island, ME) on 22 and 23 June.

Mike Sissenwine attended the Center's Board of Directors meeting during 26-30 June in Boothbay Harbor, ME. Because of the controversial nature of the current groundfish management regulations, he was also required to comment on the biological significance of several pending amendments to those regulations.

Fred Serchuk attended the meeting of the New England Fishery Management Council on 28 and 29 June in North Dartmouth, MA.

Gordon Waring attended a New England Fishery Management Council meeting at South Dartmouth, MA.

Manuscripts

Anderson, E.D. 1978. Resource implications of an expanded USA silver hake fishery. NMFS, NEFC, Woods Hole Lab. Ref. No. 78-34.

Clark, S. H. Application of bottom trawl survey data to fish stock assessments. Fisheries. (S)

Clark, S.H., T. S. Burns, and B. P. Hayden. 1978. An assessment of the Scotian Shelf, Gulf of Maine, and Georges Bank pollock stock. NMFS, NEFC, Woods Hole Lab. Ref. No. 78-37.

MARINE ECOSYSTEMS DIVISION

Ecosystem Dynamics Investigation

Ecosystem Dynamics Task Group

The Ecosystem Dynamics Task Group began work on development of an ecosystem model for simulating effects of multispecies interactions and alternative management strategies on the finfish biomass. A mathematician (Gil Walters, University of Wisconsin) and a computer programming graduate student (Wendell Hahm, University of Rhode Island) joined the group this summer, and all are working in conjunction with Emma Henderson and Mike Sissenwine of the Resource Assessment Division on an in-depth review of a candidate model developed at the Northwest and Alaska Fisheries Center (the so-called "bulk biomass" model). A subcomponent of this model will involve multispecies prey-predator interactions and the Ecosystem Dynamics Task Group is working closely with those in the Benthic Dynamics Investigation who are studying food chains. Ed Cohen, Gil Walters, and Mike Pennington are evaluating various feeding models and comparing theoretical energy requirements with empirical estimates derived from field data. Ed Cohen and Gil Walters also studied another ecosystem model developed for evaluation of possible management strategies for a krill fishery in the Antarctic.

Work is continuing on the description of the primary production cycle on Georges Bank (Ed Cohen) and on the fish distribution monograph for the New York Bight Atlas (Marv Grosslein). Mike Pennington continued his detailed examination of Atlantic herring data from trawl surveys, particularly age distribution by individual sampling strata, in an attempt to develop an improved recruitment predictor.

Recruitment Processes Group

The Group is now at the point in its analysis of the larval herring data base of being able to estimate spawning stock size by back calculation from larval production data for the 1968-77 seasons in the three main areas of the offshore surveys -- Georges Bank-Nantucket Shoals, western Gulf of Maine, and southwestern Nova Scotia (Lurcher Shoals area). Larval data from 56 surveys are included in the analysis. Primarily two methods have been used to calculate the initial production of larvae for the various subareas and 10 seasons: (1) the expanded area and day method of Sette and Ahlstrom, and (2) the normal curve approximation method of Saville. Average larval growth and mortality rates also have been estimated for each season and subarea, where sufficient data were available, and have been used to correct larval abundance estimates for stage duration and mortality, to estimate more accurately the initial larval production. The larval production estimates look quite good, particularly in the Georges Bank-Nantucket Shoals area where the best coverage has been maintained, and appear fairly consistent within each spawning season based on any of the various methods used in the calculations. This is very encouraging, and means that, given adequate data on the size and reproductive potential of the spawning stock each year, it should be possible to detect major variations in egg mortality and/or hatching success. Estimates of larval herring production for 1972-77 are fairly well correlated with virtual population analysis spawning stock estimates on Georges Bank, especially if it is assumed that an unusually high proportion (60% versus 20% which is normally assumed) of the 1970 year class spawned at age 3. There is some evidence for this change, but the group hopes to have more definitive data on age at maturity (for 1968-75) in the near future from West Germany. Prior to 1972, larval production on Georges Bank appears to have been much lower relative to spawning stock size than in the more recent period, which implies that egg survival may have been much lower when the density of spawners was higher. Larval growth and mortality estimates have been compared between years and subareas to provide a better understanding of the link between growth and mortality and of possible critical periods for survival. Initial abundance of larvae (September-December) does not appear to be correlated with year-class success. However from the 5-yr time series of overwinter (December-February) surveys, highest larval survival was observed for the 1975 year class, and evidence from the juvenile herring fishery suggests this may have been the strongest year class observed since the 1970 year class. A relationship between overwinter survival rate of herring larvae in the Sheepscot estuary and year-class success in the Maine juvenile herring fisheries has been reported by Graham. It remains to be seen whether this pattern holds for Georges Bank--it will be three more years before we have a measure of the strength of the 1977 year class on Georges Bank.

Calculations should be finished in the next couple of weeks and thereafter it is a matter of putting a text together summarizing the findings. A document should be available by the end of August 1978. Marv Grosslein met with Greg Lough and Joe Graham last week to review the status of the US data on larval herring. It was decided that there was little to be gained by attempting to combine Graham's inshore data directly with the offshore data. However, it will be useful to compare trends for comparable years and Joe agreed to try to summarize all his data by the end of the summer.

Work is continuing on analysis of larval herring gut contents and zooplankton in fine-mesh samples. Roz Cohen is estimating coefficients for avoidance and escapement of zooplankters based on comparisons between 0.333-mm and 0.165-mm mesh samples. Dave Potter began a comprehensive summary of temperature data in relation to various size groups of herring larvae for the entire time series of surveys, as a basis for improving estimates of time of spawning and hatching in each year.

Benthic Dynamics Investigation

Analysis of the quantitative macrobenthos data for the Georges Bank - Gulf of Maine region was continued. Emphasis was given to the molluscan fauna; the Sca-phopoda section for a report describing the distribution of these fauna was completed. Also, good progress was made in assembling information for an analysis of the distribution of bivalve mollusks.

A food habits - feeding chronology study was carried out aboard the R/V Albatross IV from 31 May to 2 June in the area south of Martha's Vineyard. Altogether 1,103 fish guts were collected with silver hake (510), alewives (191), and Atlantic herring (163) predominating. Numbers of fish were frozen for length-weight and digestive tract measurements and these analyses are now in progress. The juvenile fishes from the 1969-72 data base have been selected out and the data updated on new long sheets which are now being keypunched. Rich Langton prepared a talk based on the report, "Recent Fluctuations in Pelagic Fish Stocks of the Northwest Atlantic. . .," by Grosslein, Langton, and Sissenwine. This talk will be presented at the ICES symposium next month (July).

Preliminary arrangements have been made for participation in the larval herring patch study this fall. Our contribution would consist of the collection of pelagic fish and the study of their food habits.

Analysis of the benthic ring-net samples from the Argo Merchant oil spill area is progressing on schedule.

Fishery Oceanography Investigation

Most of June was devoted to preparations for, participation in, and cleaning up gear and data after Albatross IV Cruise No. AL 78-06, a hydrographic cruise to the Northeast Channel, Georges Basin, and the slope-water region. The four major accomplishments are discussed below.

First, the two ENDECO tethered current meters set in the Northeast Channel in March were recovered intact, despite very thick fog. Preliminary examination of the tapes indicates that both instruments obtained complete records although the surface instrument showed evidence of having been hit by a vessel and tangled in the mooring line for part of the time. ENDECO is currently running the tapes through the routine data reduction programs.

Second, seven north-south sections were made across the northern edge of Georges Bank from the Northeast Channel to 67°07'W. Sections were spaced approximately 10 mi apart and stations were 6 mi apart with XBT's in between, so that thorough coverage was obtained of the region where the larval herring patch study is to take place this fall. A mass of water colder than 5°C was identified along the edge of the Bank and its boundaries were mapped.

Third, drogued buoys equipped with lights and radar reflectors were tracked for 3 days in the patch study region. The operation went very well, but there was no bad weather for a real test. Six drogues were deployed. Two, located in an area of heavy Canadian scalloping activity along the edge of the Bank, disappeared within a few hours. The other four were tracked for several tidal cycles. A clear pattern of tidal rotation superimposed upon eastward flow of 5-9 mi/day was seen. The exercise provided a good basis for planning the drogue work in the patch study.

Fourth, a section of STD stations interspersed with XBT's was made from the Northeast Peak of Georges Bank into the center of a large Gulf Stream ring that was impinging on the southern edge of the Bank. XBT's were taken hourly as the ship steamed back to Woods Hole from the ring center.

Other work at sea included Anne Dorkins and Steve Fogg sailing on Albatross IV for the first leg of the June-July MARMAP cruise. Steve Ramp returned from the Atlantis II Polymode mooring-setting cruise.

On 28 June a Gloucester trawler skipper brought back three of the glass floats from the mooring that was set in the Northeast Channel in September 1976 and was never recovered. He had dragged them up while working on the northern edge of Georges Bank about 60 mi west of the mooring site. The floats, two of which were broken, and attached hardware have been returned to Woods Hole and are being examined for clues to the fate of the rest of the mooring.

Jim King, a 1978 graduate of Falmouth High School, began work for the Investigation as a NOAA Junior Fellow. He will begin courses at the Georgia Institute of Technology in the fall. Tom Laughton returned to take the place of Steve Fogg who is returning to Northwestern University until January.

Apex Predators Investigation

During June approximately 500 sharks were tagged and we received word of the following nine recaptures: one blacktip, one mako, one bonnethead, one dusky, and five blue sharks. The blacktip was at liberty 175 days and traveled 42 mi east from Key West, FL, to Marathon, FL. The mako was tagged on the Wieczno Cruise No. 77-03. It was at liberty 447 days (14.9 mo) and traveled 249 mi north from Cape Hatteras. The bonnethead and dusky sharks were at liberty for less than 2 mo and traveled less than 100 mi. Of the five blue shark recaptures, one had a WHOI "H" tag, which was removed and replaced with one of the NMFS "M" tags. This shark was at liberty 389 days and was taken off Long Island within 40 mi of where it was tagged. Three blue sharks were out 328, 206, and 77 days, and traveled less than 200 mi. The last recovery came from a blue tagged off Long Island and recaptured off Dominica, WI (1800 mi in 365 days).

On 5 June a basking shark (6 m in length) was harpooned south of Block Island and towed to Warwick, RI. We examined the animal and took morphometrics and samples of stomach contents, reproductive organs, and vertebrae. The shark was an immature female. Its stomach contained 9.3 liters of plankton which was identified as being primarily copepods. The dominant species were Centropages typicus and Temora longicornus. Approximately 5% of the stomach contents were Atlantic mackerel eggs (estimated number was 545,000).

Chuck Stillwell and Nancy Kohler conducted a longline cruise aboard the R/V Geronimo off western Long Island during 14-21 June. Objectives were to examine stomachs of large sharks and to tag sharks prior to the annual Bay Shore (NY) Mako Tournament. A total of 89 fish (five species) were caught on 10 longline sets. The principal species were sandbar (37), blue (35), mako (6), and white sharks (2). Sixty-eight fish were tagged. Stomachs of those examined were empty or nearly so. Bluefish remains, skate, and fish eggs were among the identifiable items. Vertebral samples and morphometric measurements were taken and the entire digestive system was removed from selected specimens for later analysis.

We attended the annual Bay Shore (NY) Mako Tournament on 24 and 25 June. One hundred-fifty boats caught approximately 450 sharks of which 160 were tagged, 154 were brought in, and 136 were released untagged. All fish brought in were weighed, measured, and examined internally for food and reproduction studies. Results of stomach analysis showed mako sharks were feeding primarily on large bluefish (93% of the makos contained large bluefish in the 10-15 lb size range). Blue and sandbar sharks contained a variety of prey including red hake, skate, dogfish, and Cancer crab. In general, very little food (excluding bait) was present in the stomachs

of species other than mako sharks. Preliminary analyses of the catch per unit of effort show fewer sharks were caught this year than in 1977. In part this may have been due to: (1) cooler water temperatures on the fishing grounds; (2) a lack of wind required for good chumming; and (3) many boats spending more time traveling further offshore. In addition to our studies, other scientists and graduate students coordinate through us to obtain biological samples at the tournament. This year scientists from the University of Connecticut, Rutgers University, CW Post College, Toronto University, and the University of Rhode Island were in attendance.

ADP work on the historical data base for sharks was reinstated this month. Tagging and recovery data for 1965-76 have now been keypunched and verified. All indications are that we will be in "real time" in monitoring this data base by mid-August. Application programs are being written and Larry Lindgren has made good progress in assembling, verifying, and initiating preliminary analysis of results.

Histological sectioning of reproductive tissues collected during the past 3 yr was started with the arrival of both summer aid and Alan Lintala. Tissues from three cruises (Diane Marie, 1977; Wieczno, 1977; and Weiczno, 1978) have been embedded and partially sectioned.

The semiannual tagging newsletter covering the period of January through June was sent to about 2,000 cooperative taggers. Included in this mailing was a new tagging instruction booklet that we prepared. The booklet was printed free of charge by the Bay Shore (NY) Tuna Club.

Larval Physiology and Biochemistry Investigation

Preliminary experiments have been initiated to assess critically the natural mortality of zooplanktonic prey organisms associated with larval fish feeding studies. Factors under study include the influences of temperature, concentration of animals, time, and diurnal differences. Adult scup are currently being induced to spawn. Larvae will be used in early "critical period" mortality studies to determine daily rates of death at constant prey and temperature conditions. Preparations were made for completion of the summer flounder biochemical sex determination study using electrophoresis started last summer. A paper dealing with the growth of Atlantic cod larvae at four different prey concentrations and RNA-DNA ratios is in preparation.

Ichthyoplankton Investigation

We continue to be busy with field work. The fifth in our annual series of six ichthyoplankton surveys from Cape Hatteras to the Gulf of Maine is in progress and Tom McKenney recently returned from a cruise to Deepwater Dumpsite 106. At the same time, laboratory work continues to keep pace. We recently received from the Sorting Center in Szczecin, Poland, ichthyoplankton sorting records and larval length sheets for the first two surveys of the year.

Milestones for the fourth quarter of the BLM contract are generally in line with scheduled completion dates. Some activities continue to progress ahead of schedule, while others are lagging. Steps have been taken to give priority status to those activities in the latter category so that the contract can be completed on a timely basis.

Susan Roberts, Fishery Biologist, resigned effective 9th June.

Plankton Ecology Investigation

Biostatistics Unit

The MARMAP Information System (MIS) is in operating order once again, and data processing efforts have been resumed on the BLM contract data, Polish Sorting

Center data, and recent cruise data. Through an extension of the R&D contract with Dr. Harold Petersen at the University of Rhode Island, training sessions for those personnel responsible for the operation and maintenance of the MIS began on 26 June. This training began with a solid week of half-day sessions through the end of June and will be followed with semiweekly meetings in July.

The Biostatistics Unit moved into one of the trailers at the Narragansett Laboratory during June. This brings together most of the personnel involved with the computerized data processing system for MARMAP Survey I data. Lorrie Sullivan participated in the first cruise aboard the Soviet vessel Aliot (Cruise No. 78-01) during 20-29 June.

On 15 June, Dave Bearse of the Biostatistics Unit met at Woods Hole with Mert Ingham and Jack Jossi of AEG and Gene Heyerdahl, Regional Data Base Coordinator. The meeting was held to discuss the alternatives for AEG and the Biostatistics Unit for dealing with their data processing needs during the coming fiscal year in view of the severe GSA restrictions. Personnel restrictions were discussed and emphasis was placed on the difficulty in maintaining continuity during an interim period prior to the implementation of a regional system.

Plankton Hydrography Unit

Jack Green has completed a theoretical food-budget calculation for Atlantic herring of the Gulf of Maine based on consideration of metabolism, growth, and reproduction. The calculations indicate that herring require from 6.4 to 5.5 times the body weight per year as utilizable food with a trend towards a decreasing ratio of food to body weight with increasing age.

Analysis of temperature distribution and stratification in relation to zooplankton species composition and abundance in the Gulf of Maine - Georges Bank area during the spring and fall is continuing.

Biomass Group

Jeanne Burns and Doris Petrie resigned.

Image Analysis Project

Robert Marak, former Chief of the MARMAP Field Group in Narragansett, RI, has joined the Plankton Ecology Investigation. Responsibilities of his new assignment include coordination of plankton cruise activities, directing research on food habits of larval fish, being the acting liaison officer to the Polish Sorting Center, and developing automated systems for counting and sizing planktonic organisms.

A meeting was held on 19 June in the Challenger Room on the Bay Campus of the University of Rhode Island to review progress on the NOAA/NMFS/URI contract for developing an automated plankton identification system. Attendees included: Bob Marak, NEFC; Ken Sherman, NEFC; Ray Maurer, NEFC; Alex Poularikas, URI (Engineering); Perry Jeffries, URI (Oceanography); and Bill Johnson, URI (Oceanography). Computer software necessary to provide feature count, longest dimension, breadth, area, perimeter, elongation ratio, and area per squared perimeter has been assembled by the Engineering Department. In addition, a scanner has been fitted to a Wild-M5 stereoscope made available by NMFS. Methods of image enhancement were discussed including a laser lens used to sharpen edges and staining to increase the contrast of images. Ray Maurer presented results of a preliminary stain experiment. Of five stains examined, methyl blue was the most effective in increasing the contrast of features, especially chitinous exoskeletons, when viewed with substage light. Bill Johnson has been assembling a catalog of basic zooplankton shapes from the literature. Morphometric measurements taken from these shapes using the NMFS scanner, will be used by Bill for the initial attempts at discriminant function analysis.

Roz Cohen, Cabel Davis, and Mary Nolf visited the image analysis laboratory on 28 June. They were interested in matching size distributions from manual measurements to scanner measurements. A number of methodological problems were encountered with these fine-mesh (0.165-mm) samples. However, we were successful in separating all copepodite stages of Pseudocalanus from presorted samples using the area measurement.

New applications continually emerge for image analysis. Ray Maurer spent 2 days productively working with Reed Armstrong (AEG) measuring dye patches from aerial photographs. Reed is conducting dye experiments to determine diffusion rates in the marine environment in the vicinity of the Buccaneer Oil Field, western Gulf of Mexico. This is a seasonal study sponsored by EPA. A useful set of data was produced from which Reed has calculated and characterized dispersion. Image analysis proved to be an extremely fast and accurate tool for measuring the irregular patch outlines.

Plankton Sorting Group

Zooplankton samples processed in June included collections from Georges Bank, the Gulf of Maine, and southern New England, during July through September 1977. Samples from southern New England contained more slope water species and considerable amounts of aggravating phaeocysts. The sorting and identification have been time consuming as the number of copepod species averages 20 per sample as compared to Georges Bank or Gulf of Maine where the samples are usually limited to five species. New identifications included the species: Temora turbinata, Lucicutia flavicornus, Eucheata pubera, and Eucalanus attenuatus. Despite the variety of species, the dominant organism at 98% of the stations was Centropages typicus.

Meetings, Talks, Visitors, Publicity

Ken Sherman has returned from a European trip which included participation in the development of bilateral fisheries research with scientists in Poland, Federal Republic of Germany, German Democratic Republic, and the Soviet Union. He also attended the ICES Working Group Meeting on Larval Fish Distributions in Copenhagen and the SCOR/SCAR meeting of Antarctic specialists in Kiel.

The Narragansett Laboratory had several visitors on 19 June including: Walther Kuhnhold from FAO, Rome, Italy; James Walsh, Deputy Administrator of NOAA; Alfred Anderson, OAGC, NOAA; and Chris Carty, Boulder, CO, NOAA laboratory.

Dave Wallace paid a brief visit to the Narragansett Laboratory on 2 June.

Ken Sherman attended the June Board of Directors meeting at Boothbay Harbor, ME, during 26-30 June.

Marv Grosslein participated in a 2-day meeting, 20-21 June, of the Science and Statistical Committee for the New England Fishery Management Council; the subject was development of long-term management objectives for the New England fishery and critique of available management options. There was a unanimous view that a multispecies approach would be required as part of a successful management scheme.

Ed Cohen attended a US-USSR symposium on marine ecosystems and presented a description of the energy budget for Georges Bank. On the same trip he visited Rodney Jones at Aberdeen, Scotland, to discuss our respective approaches to modeling energy flow.

Greg Lough and Marv Grosslein met with Joe Graham (Boothbay Harbor Laboratory) to coordinate plans for summarizing larval Atlantic herring data for the Gulf of Maine.

The Ecosystem Dynamics Task Group met with John Walsh (Brookhaven National

Laboratory) and discussed modeling techniques, and also exchanged notes on current results of primary production studies on Georges Bank.

Geoffrey Laurence attended the V-2, V-6 Symposium on Factors Controlling Production as part of the joint USA-USSR World Oceans Program in Tallin, USSR, where he presented a paper on "A Stochastic Dynamic Model of Larval Fish Growth and Mortality." He also attended the 41st Annual Meeting of the American Society of Limnology and Oceanography in Victoria, BC, where he presented a paper on "A Controlled Environmental Chamber for Monitoring Growth and Survival of Larval Fishes."

Roland Wigley attended a meeting of the Scientific and Statistical Committee of the New England Fishery Management Council on 21 June 1978.

Jack Casey, et al., were interviewed by several newspapers and radio and television stations regarding sharks. The news media were particularly interested in reports of large white sharks off Montauk, NY, but sharks in general and NMFS studies were also covered.

Mike Fahay participated in the poster session at the Annual Meeting of the Society of Ichthyologists and Herpetologists in Tempe, AZ. His presentation was on, "Distinguishing the Postlarvae of Two Sympatric Species of Merluccius in the Western North Atlantic."

On 7 June Jack Casey, Jack Colton, Carolyn Griswold, Tom Halavik, Bob Marak, Wes Pratt, Al Smigielski, Chuck Stillwell, and Lorrie Sullivan attended a workshop of the Southern New England Chapter of the American Fisheries Society at the Faculty Center, URI.

Carolyn Griswold attended a COMS conference on "Formulating Marine Policy: Limitations to Rational Decision-Making" at the Bay Campus, URI, during 19-21 June.

An executive committee meeting for the 108th Annual American Fisheries Society was held at URI on 20 June. Carolyn Griswold attended for Ken Sherman. Final details for the meeting and the open house on the Bay Campus were discussed.

On 30 June Carolyn Griswold attended a meeting sponsored by the Commonwealth of Massachusetts to discuss a draft study plan prepared by BLM for the Mid and North Atlantic OCS.

Red Wright attended a meeting called by BLM to evaluate the latest environmental studies proposal for the continental shelf.

Manuscripts

Laurence, G.C., T. A. Halavik, B. R. Burns, and A. S. Smigielski. An environmental chamber for monitoring "in situ" growth and survival of larval fishes. *Trans. Amer. Fish. Soc.* (S)

Laurence, G.C., and J. E. Beyer. A stochastic, dynamic model of growth and mortality of winter flounder larvae (Pseudopleuronectes americanus) reared in the laboratory under experimental conditions. *Proceedings of the V-2, V-6 Symposium on the Study of Main Factors which Govern the Functioning of Marine Ecosystems, Tallin, USSR.* June 1978. 34 p. mimeo. (S)

Sherman, K. MARMAP, a fisheries ecosystem study in the Northwest Atlantic: fluctuations in ichthyoplankton-zooplankton components and their potential for impact on the system. *Proceedings of the V-2, V-6 Symposium on the Study of Main Factors which Govern the Functioning of Marine Ecosystems, Tallin, USSR.* June 1978. 88 p. mimeo. (S)

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

MANNED UNDERSEA RESEARCH AND TECHNOLOGY PROGRAM

The MURT dive team completed 14 work dives including direct support to MESA and NOS. Cliff Newell and Roger Clifford completed Navy-sponsored training in the use of the so-called "VIM" suit, a 1-at hard suit which eliminates decompression problems associated with SCUBA and hard-hat diving.

A two-man diver decompression bell was designed and fabricated for use in planned mixed-gas diving operations during upcoming Atlantic herring spawning studies in September and October. This unit will be placed at appropriate depths by a two-point moor at selected dive sites to permit safe, comfortable decompression stops from relatively deep and extended-duration dives.

Kevin McCarthy completed analysis of a large series of underwater photographs of bottom communities at Jeffrys Ledge and Pigeon Hill, the latter a proposed Ocean Pulse station. The analysis included species identifications and descriptions of interspecific relations within the community. The results have been compiled in the form of a pictorial atlas with an introduction discussing the basic community. In connection with continuing studies in this area, considerable progress has been made with development of an underwater camera and grid system which will be used for quantitative studies of bottom communities at selected Ocean Pulse stations.

Dick Cooper and Joe Uzmann participated in sea trials of the Mermaid II submersible system in Long Island Sound and offshore at Block Canyon. The Mermaid system was a candidate for upcoming submersible dives at Wilmington and Baltimore Canyons; sea trials were equivocal, however, and the bid was let to Martech and the Perry PC-14B system, a proven entity.

We continued development of several manuscripts including studies on lobster ecology, sand lance biology, submarine canyon ecology and geology, and offshore trap-catch analysis.

DIVISION OF ENVIRONMENTAL ASSESSMENT

Behavior of Marine Fishes and Invertebrates Investigation

Thresholds for the chemosensory detection of a natural food extract by red hake, Urophycis chuss, have been established. Behavioral criteria, previously established from observations of the hake's feeding behavior in large aquaria, were used to determine the concentration levels at which hake respond. The detection capability of these animals proved to be highly sensitive, ranging from 10^{-7} to 10^{-12} g of food extract per liter of seawater. While fish were able to detect very dilute concentrations of a food extract, actual initiation of feeding behavior was at a much higher level, on the order of 1 g/l. The establishment of these thresholds is an important first step in uncovering the mechanisms involved in foraging behavior of this species. This work also provides a baseline from which to examine the effects of petroleum hydrocarbons on chemosensory-mediated behaviors.

Coastal Ecosystems Investigation

Sample processing this month concentrated on materials* from the 1976 anoxia area off New Jersey. We are continuing an analysis of: (1) extent and severity of initial impacts; (2) degree to which opportunistic polychaetes (called "spaghet mud" by fishermen whose nets were clogged by these worms) initially recolonized affected areas; and (3) sequence and timing of return to preanoxia conditions for various taxa. This study will give a good indication of how continental shelf benthos would react to other large-scale events, such as oil spills, and will begin the process of developing response protocols to oil spills and sudden releases of

toxic substances. We are resampling the anoxia area on a July Delaware II cruise, during which we will also conduct extensive surveys of surf clam spatfall seabed oxygen consumption.

Other activities included: (1) work on samples from selected Ocean Pulse strata occupied on the recent Researcher cruise; (2) completion of biomass measurements for benthic macrofauna from Block Island Sound; (3) completion of the benthic data set for a MESA reconnaissance survey; and (4) supplying information on dredging effects to a research group studying such impacts near Bristol Bay, AK, for the North Pacific Fishery Management Council. We continued our work on an atlas of the benthic invertebrates of the New York Bight, and on reports and papers concerning anoxia, oyster management, and interaction of fisheries with offshore oil production.

Environmental Chemistry Investigation

A rental atomic absorption instrument (PE 460) continues to cause problems. It will be necessary to obtain a replacement. Methodologies for seawater analyses of metals are still not finalized and techniques remain to be developed. We collected water samples at most Ocean Pulse strata on the Researcher cruise recently and it appears that some of our metal data on these samples are lost because of high readings in the blank (control) samples.

The Varian gas chromatograph that we hope to use for hydrocarbon work finally seems to be operational. We have had to have a local supplier of capillary columns come in and install the column for us. Evidently, his knowledge of how to straighten the end of the column was what was needed since it has worked fine since he installed it. Virginia Stout of NMFS, Seattle, kindly sent a fish sample to us that she has analyzed for PCB's; this should be most useful for us to intercalibrate our procedures as we continue to develop our program for halogenated hydrocarbons.

Biological Oceanography of Stressed Environments Investigation

Susan Barker, Amy Fischer, Stephen Ward, and Christine Evans continued the phytoplankton baseline survey aboard the Albatross IV from 20 June to 1 July. This was the fifth cruise for FY 78. Sixty-five stations were completed between Cape Hatteras and New York. The total number of depths sampled for chlorophyll and phaeopigment was 458, resulting in 916 samples to be analyzed at the Sandy Hook Laboratory. Secchi disc measurements were made at 33 stations. In addition to normal activities, this cruise served as a training cruise for Sue Barker, Amy Fischer, and Steve Ward, for determining the effects of freezing and storage on chlorophyll concentrations at six stations. Phytoplankton samples were collected at 16 stations between Delaware Bay and New York to continue monitoring the algal blooms.

The Ocean Chemistry Subtask is in the process of having the autoanalyzer interfaced with the computer for automatic calculation of nutrient concentrations. A program has been written to compute nutrient concentrations from the source data. These source data for the Advance II and Albatross IV cruises are now being entered for permanent storage on minidiskette data files for the Wang computer so that the earlier nutrient data will be in a format compatible to the new system scheduled for installation in mid-July.

Physiological Effects of Pollutant Stress Investigation

Physioecology

Two experiments to measure the effects of heavy metals on embryos and larvae of the American oyster were performed this month. One was a short-term (48-hr)

test to determine the toxicity of zinc to oyster embryos at nine different salinity-temperature regimes. The second was a long-term (up to 10 days) test to determine the effect of silver on oyster larvae, also at nine different salinity-temperature regimes.

Surf clams were spawned twice this month. The embryos are being exposed to seven heavy metals, individually. Development of the embryos was so poor that no data from the first two experiments could be used.

Work continued with ultramicrorespirometers to determine the effect of 0.0033 ug/l of Hg on oyster larvae respiration.

Physiological Effects

Blood samples were obtained from 20 windowpanes (Scophthalmus aquosus) initiating a study on seasonal hematological changes. Winter flounders (Pseudopleuronectes americanus) were also sampled from four stations in Long Island Sound. In each case, hemoglobin and hematocrit were measured immediately. Plasma samples were frozen for later measurement of osmolality, sodium, potassium, and calcium.

Work continues on studies of heavy-metal effects on bivalve mollusks. A second metal, nickel, was introduced into the system this month.

Two series of cadmium-exposed lobsters and one series of oil-exposed sea scallops (see "Biochemical Effects" section for exposure details) were examined this month for pollutant-induced changes in gill-tissue oxygen consumption and serum ions. The results of the two studies are being analyzed.

Biochemical Effects

Two series of lobster cadmium exposures (6 ppb, 30 days) were taken down: the first was followed by a 7-day holding period in low-salinity water (17%) during which the experimental lobsters were not allowed to clear, but kept at 6 ppb of Cd. The low-salinity water was static, aerated, and changed every other day. The second exposure series was followed by a similar 7-day holding period, but in ambient rather than low-salinity seawater. Antennal glands, heart, gonads, and skeletal muscle were excised, packaged, and stored at -80°C for biochemical examination. Hearts from the low-salinity experiment are currently being tested for a variety of enzyme activities.

Also taken down was an experimental exposure of sea scallops to 100 ppb of No. 2 crude oil, performed by Jim Lake of the EPA's Narragansett Laboratory. The animals were supplied by the Woods Hole Laboratory. Mr. Lake kept several scallops for chemical uptake analyses, sending the rest to us at the Milford Laboratory. We prepared the frozen gill-tissue homogenates and sampled adductor muscle tissue. The gill homogenates were subsequently thawed, and a comparison was made of centrifugation versus filtration through cheesecloth (as for shipboard analyses). Data are presently being calculated.

Regressing gonads from both winter flounders and windowpanes were also examined as part of the ongoing study of seasonal metabolic changes in the gonads of these two fish species. The winter flounder is used extensively in our metal-stress experiments, and the windowpane is a ubiquitous species that promises to be an important indicator animal for Ocean Pulse.

Work continued on the flounder gonad manuscript. Michele Cox of the Sandy Hook Laboratory is preparing the graphs for publication.

Anaerobic Bacteriology/Metabolism

Laboratory work this past month was directed towards the characterization and identification of the bacterial isolates obtained during the recent cruise of the Researcher.

Travel to Charleston, SC, resulted in the initiation of a cooperative experi-

ment with the Southeast Fisheries Center on the possible growth of, and toxin production by, Type E botulinum organisms in heated oyster meats.

Ocean Pulse Activities

This Investigation initiated an Ocean Pulse sampling program in Long Island Sound this month. The intent of these activities is to develop physiological, biochemical, and bacteriological methodologies to be used in future Ocean Pulse research.

Coastal Monitoring, Assessment, and Prediction Investigation

Sampling with a neuston net for larval stages of lobsters in Buzzards Bay began in early May and will continue until the pelagic phases are completed, about 1 August. Larvae appeared somewhat later in 1978 than in 1977 and 1976, probably because of slower warming of the water. Also, in 1978 the proportion of stage IV larvae has been much greater. Up to 600 stage IV larvae have been taken in a single sampling of the six stations occupied in Buzzards Bay. The maximum number of stage I larvae taken in any sampling series was only 32 specimens. Reasons for this comparative scarcity are unclear, but transport of larvae by wind could be a factor. Fred Lux is assisted in this work by Duane Del'Amico, a summer student from the State University of New York at Buffalo.

Coordination of southern New England lobster larvae field sampling activities was arranged at a meeting of the Cape Cod Canal Electric Plant Technical Committee on 15 May and another meeting of all participants at the Raytheon Oceanic Services office in Portsmouth, RI, on 2 June. The group will meet again in August or September to summarize the composite results of sampling for the season throughout southern New England.

A manuscript by Larry Davis entitled "Bottom-Water Temperature Trends from Cape Cod to Cape Hatteras during Spring and Autumn, 1964-1976" was returned from the NMFS Scientific Editor and is being revised for publication in the NMFS SSRF series. Most of the revision involves expansion and documentation of the section on biothermal relationships of several finfish in the Middle Atlantic Bight.

Inshore-offshore exchange of nutrients and contaminants in relation to fisheries have been discussed within this project since these topics were addressed at the Coastal Shelf-Estuarine Coupling Workshop held at URI in May. Although not a consensus, the most persistent theme at the meeting involved the southerly transport of freshwater runoff from the estuaries and the concurrent inshore flow of saltwater into the estuaries of the eastern coast of the United States. The rates of exchange of nutrients and contaminants in this complex system are difficult to estimate but must be reckoned with for an understanding of man's impact on the coastal environment.

Toward this end, a program integrating studies of the utilization of nutrients, neutralization or containment of contaminants and disease organisms, and production of harvestable surpluses of marine plants and animals must be pursued if the deleterious impact of man on the environment is to be controlled or reduced. Conflicts arising from diverse efforts to address the ambivalent problems stemming from the simultaneous eutrophication and contamination of coastal waters by dumping of organic and chemical wastes into the rivers and ocean must be integrated into corrective measures that treat the related problems of the whole coastal ecological system. Plans toward these goals, within the scope of the proposed Ocean Pulse program, are being prepared for inshore and offshore waters around Cape Cod.

Meetings, Talks, Visitors, Publicity

On 23 June, Mr. William C. Phoel, while on annual leave, met with Mr. Peter

Black of the National Hurricane and Experimental Laboratory, Miami, FL, to discuss the effects of hurricanes upon the marine environment. That same afternoon, Mr. Phoel presented a seminar at the NOAA Atlantic Oceanographic and Meteorological Laboratory concerning the effects of Hurricane Belle upon the 1976 anoxic water mass off Atlantic City, NJ.

Investigation personnel attended the "Focus on Understanding" and "Encounter with Reverse Discrimination" courses presented at the Milford Laboratory on 2, 3, and 5 June.

Miss Edith Gould attended an Awards Committee meeting at the Woods Hole Laboratory on 3 June.

Tom Wilhelm presented a seminar on the feasibility of splitting benthic samples on 5 June.

On 6 June, Bob Reid met with US EPA, BLM, and oil industry representatives in Edison, NJ, to review information from an oil consortium in regard to monitoring exploratory drilling impacts off New Jersey.

Mr. John MacInnes attended the Southern New England Chapter of the American Fisheries Society meeting in Narragansett, RI, on 7 June.

On 12-14 June, Dr. Jack Pearce, Bob Reid, Frank Steimle, Jan Caracciolo, and Ann Frame met with three Virginia Institute of Marine Science biologists (Donald Boesch, Marcia Bowen, and Gary Caston) to discuss taxonomic problems and analysis of New York Bight benthic data sets. Dr. Boesch has responsibility to review all benthic data for the New York Bight under a contract with MESA.

Material has been assembled for the panel display for the annual meeting of the American Fisheries Society in August at Narragansett, RI.

Dr. James Thomas presented two papers at the American Society of Limnology and Oceanography meetings in Victoria, BC, during 19-22 June.

Dr. Anthony Calabrese attended the National Shellfisheries Association meeting in New Orleans during 19-21 June.

Mr. William Phoel collaborated with Dr. J. Morgan Wells of the Manned Undersea Science and Technology (MUST) Office on 22 and 23 June. The subject of the collaboration was a forthcoming paper concerning in situ investigations with the BOD and COD of sewage sludge.

John Pearce, Fred Thurberg, John Graikowski, Frank Steimle, and Bob Reid attended a meeting at the State University of New York (SUNY) at Stony Brook on 23 June to review Ocean Pulse progress and how research at SUNY and other universities might be integrated into Ocean Pulse. Presentations were made in regard to the results of the recent Researcher/Ocean Pulse cruise.

During 5-10 June, Dr. John Pearce participated in an ICES working group meeting concerned with biological research in response to major oil spills and sudden release of other toxic substances. The meeting was held at the CNEXO Laboratory in Brest, France. Prior to the formal ICES meeting, participants were able to hear presentations by French investigators based on their research following the grounding of the tanker, Amoco Cadiz. The ICES participants were also able to visit the areas affected by the Amoco Cadiz sinking. Formal proceedings of this meeting are being prepared based on notes provided by the participants.

On 16 June, Dr. Pearce presented a seminar at the Marine Science Institute of the University of Connecticut. Dr. Pearce described past research conducted by scientists of NEFC which was concerned with evaluating the impact of certain human activities on living marine resources. The seminar culminated in a discussion of the Ocean Pulse program and how various academic investigators are participating in the program.

During 27-30 June, Dr. Pearce participated in the NEFC Board of Directors meeting held at Boothbay Harbor, ME. During the meetings he reviewed recent progress made within the Division of Environmental Assessment as well as discussing the current status of the Ocean Pulse program. Dr. Pearce introduced an issue paper concerned with how the NEFC should respond to major spills of oil and other toxic substances. A document concerned with oil spill responses and how

such activities relate to the Ocean Pulse program is being prepared.

Manuscripts

Olla, B. L., A. J. Bejda, and A. D. Martin. Seasonal dispersal and habitat selection of cunner, Tautogolabrus adspersus, and young tautog, Tautoga onitis. Fish. Bull., US. (S)

Olla, B. L., A. L. Studholme, and W. H. Pearson. Behavior as a measure of adaptation. Proceedings of the Symposium on Physiology and Biochemistry of Aquatic Animals. In press.

AQUACULTURE DIVISION

Aspects of Nutritional Requirements of Mollusks Investigation

Experimental work in several Investigation tasks is in progress. Daily growth increments of six algal species were evaluated to determine whether a reduction in the iron concentration of our routine growth medium could be tolerated. Similarly, a reduction in the nitrate concentration below that value determined to be minimally acceptable in previous experiments was evaluated for its effect on the maximum population size. The results indicate that these reduced nutrient concentrations are generally well tolerated.

Recent studies with zinc, cadmium, and copper have thus far indicated that the toxicity of cadmium at any particular concentration increases as the number of cells in the population decreases.

Since the liquid nitrogen apparatus has been repaired, efforts have been directed at calibrating the equipment so that the freezing rates are four times faster than what we have used in previous experiments. When the calibration is completed we plan to determine the viability of algal cells when frozen at a faster rate than we have previously used.

We are also conducting some experiments with oyster veligers in order to continue and perhaps corroborate the experiments of the last season. Our previous studies showed that certain seawater treatments had a detrimental effect on larval growth. Some of these findings have been confirmed, but now larvae are behaving differently in some of the experimental variables.

Harvest from the mass cultures amounted to 2,173 liters of algae, despite several failures in the cooling system. These algal foods were distributed to other Investigations as follows: Spawning and Rearing of Mollusks, 770 liters; Aquacultural Genetics, 535 liters; Physiological Effects of Pollutant Stress (Physioecology Subtask), 581 liters; and Control of Larval Diseases, 111 liters. In addition, open tanks of mixed algal species are maintained for a constant-flow food supply. Stock culture species were subcultured on schedule. Requests for algal starter cultures were received from, and sent to, the Marine Research Co. and the Pigeon Point Hatchery.

Spawning and Rearing of Mollusks Investigation

Growth of several size classes of Spisula sp. in our tank farm this year is illustrated by the following table:

Initial length(mm) (5/4/78)	Current length(mm) (6/29/78)	Increase in Length (%)
10.2	28.0	174
15.3	32.9	115
24.3	37.9	55
29.9	43.2	44
36.8	49.2	33

By plotting the percent change in length against the initial length, it is evident that the rate of linear growth decreases with increasing initial length. Surf clams in the largest size group were observed spawning after two biweekly cleanings of the tank. It is uncertain how gametogenesis affects growth.

Groups of 50 juvenile surf clams averaging 27.6 mm in length have been maintained in seawater at various flow rates. It has been determined that clams in this experiment fed on the natural phytoplankton most efficiently at 750 ml/min. At flow rates both faster and slower, food utilization was reduced. This was determined by calculating the ratio of phytoplankton used and the amount of phytoplankton available as measured fluorometrically. The quantity available is a function of flow rate and retention time in each tray.

Five-millimeter surf clams have been successfully rid of epizootic fouling organisms by exposing them to a 5% solution of sodium hypochlorite for 5 min. No apparent adverse effects were observed among the treated clams several days later.

Two populations of bay scallop larvae reared in June have yielded results that indicate that the problems we have experienced with the species for about 2 mo have subsided. Development of eggs to the larval stage for these populations approached more normal levels and bacterial and water problems associated with metamorphosing larvae did not appear. Consequently, a few million juveniles have been produced and our experimentation with juvenile grow-out strategies can continue.

We placed a group of hatchery-reared juvenile scallops into our outdoor pumped raceway system in early May to look at the growth potential of these animals over an entire growing season. The water temperature during the 6 wk that these scallops have been in that system has increased from 11°C to 19°C. The animals have increased in average length from 4.6 mm to 10.3 mm and have shown a 15-fold increase in volume.

Aquacultural Genetics Investigation

Experimental Inbreeding-Hybridization of the Commercial American Oyster

Ten new inbred-outbred crosses of full sibs were made in a continuing study on inbreeding in the American oyster (for the ultimate purpose of hybridizing inbreds). In spite of marked inbreeding depression observed as poor survival and growth in averages of all 31 inbreds versus 25 outcrosses, larvae from some of the inbred cultures grew and survived to metamorphosis as well as outbred controls. Cultures with larvae surviving to metamorphosis totalled approximately 26% for inbreds and 56% for outbreds. Percent development to the straight-hinge larval stage was about the same for inbreds (41.8%) and outbreds (39.97%). There was also little difference in the percentage of dead larvae at days 2 and 7. By day 14, mortality in the inbreds was significantly higher than in the outbreds (Student's "t" test), indicative of inbreeding depression. Outbreds outgrew inbreds by day 7 and continued to average several microns greater in larval length through day 28, when most of the cultures reached setting.

Mass Selection of the Commercial American Oyster

Selected oysters of the 1976 year class in the mass selection experiment are continuing to be spawned to produce the first generation of selected offspring.

the crosses of the high-growth line, three crosses of the low-growth line, and two crosses of the control line have now been made. All crosses have produced spat. This year we are using crushed oyster shell as cultch to avoid the problems with crowding we have encountered in the past 2 yr when using whole scallop shells as cultch. The method of spat collection appears satisfactory although actual numbers of spat collected are lower than the previous 2 yr. The young 1973 year-class spat from all three lines have been moved to the outdoor seawater raceway system. They are receiving UV-light-treated water to prevent shell oysters from setting in the tanks. A series of experiments comparing growth rates among the lines is continuing. Five comparisons have been made to date. In only one comparison did the high-line larvae grow significantly faster than their contemporary controls. More comparisons will be made.

Cytological and Cytogenetic Studies of Planktonic Fish Eggs

Atlantic mackerel eggs were collected this May on a 10-day cruise (MESA-sponsored) into the New York Bight extending out to the tip of Long Island and much of the Bight. Physical oceanographic measurements were made at about 70 stations, and plankton tows at 20 stations. Plankton was fixed for cytogenetic study of mackerel eggs, and for heavy metal and hydrocarbon analytical analyses. Waterlayer and surface water was also sampled at each station where plankton was sampled. Water samples were taken for selected heavy metal and hydrocarbon analyses. The cruise coincided with a stormy period and for the 10 days actually spent at sea several days were spent in port. However, all desired collections were made with ample supporting physical oceanography. Mackerel eggs were collected at most of the pre-designated stations. These eggs were largely in early developmental stages. Ray Maurer of the Narragansett Laboratory assisted the investigation through his expertise in plankton sampling. Station egg samples were also systematically fixed for special microscopy (see below). Colchicine treatment of eggs for karyotyping of individual chromosomes yielded nothing, as insufficient numbers of later-stage eggs were available.

Fish egg collections (other species) were made on the recent Ocean Pulse cruise. Staff members also participated in a June cruise to Deepwater Dumpsite 106 (National Ocean Survey contract). Unfortunately, no fish eggs were collected in the vicinity of DWD 106. Our contract studies for this year then will revolve almost exclusively about laboratory studies of the effects of one of the waste materials commonly dumped at DWD 106. A collection of Fundulus sp. has been purchased to provide fish eggs which will be used in short-term cytogenetic bioassays.

Samples of fourbeard rockling eggs taken in waters contaminated by the Rhode Island gasoline spill, and in follow-up cruises, are under study. It is anticipated that the work will be completed in about 6 wk.

The recent acquisition of a rapid-scanning electron microscope at the Milford Laboratory makes it possible now to include chorion condition of the planktonic fish eggs among the developmental, cytological, and cytogenetic parameters already being measured on field collections of eggs.

Meetings, Talks, Visitors, Publicity

Jo Ellen Baird attended a seminar entitled "Focus on Understanding," and Lavenna Ukeles attended one on reverse discrimination.

Sheila Stiles presented a talk entitled "Experimental Inbreeding in the American Oyster," at the meeting of the Southern New England Chapter of the American Fisheries Society held on 7 June at the University of Rhode Island. She also spoke on "Approaches to Inbreeding in the Commercial American Oyster, Crassostrea virginica," at the meeting of the Genetics Society of Canada held during the summer at Dalhousie University in Halifax.

Sheila Stiles spent a day discussing aquaculture techniques, in general, and cytogenetic and gynogenesis aspects of aquacultural genetics, in particular, with Stan Allan, a visiting graduate research assistant from the University of Maine.

Other visitors to the Milford Laboratory included a biology class from Fairfield (CT) University; Messrs. Paul Shave and Daniel Neal of the Northeast Marine Environmental Institution, Monument Beach, MA; and Mr. John Hampton of Blount Seafoods, Warren, RI.

Sheila Stiles conducted a tour of the Milford Laboratory for an adult basic education class from New Haven, CT. Additional seed scallops have been provided to the Wampanoag Fisheries Project on Martha's Vineyard, MA.

Manuscripts

Babinchak, J. A., and R. Ukeles. 1978. Epifluorescence microscopy, a technique for the study of feeding in Crassostrea virginica veliger larvae. Mar. Biol. (A)

PATHOBIOLOGY DIVISION

Comparative Pathobiology Investigation

Two hundred-fifty oysters, Crassostrea virginica, from five areas of Delaware Bay were examined as part of a semiannual survey for "MSX" (Minchinia nelsoni). "MSX" infections were noted at Over-the-Bar (10%), Silver Bed (34%), Ridge (28%), Bowers Beach (52%), and Munsy (60%). The levels of infection are slightly higher than previous years; major mortalities are not likely since the oysters appear to be resistant to the parasites' presence.

Samples of Macoma balthica (for histology) were collected from two areas in the Tred Avon River, Foxhole (neoplastic area) and Double Mills (control area). Sediments were collected for chemical analysis from nine areas of the Tred Avon River from Easton Point to the mouth of the river. Sediments as well as Macoma tissues collected in May have been delivered to the Food and Drug Administration for chemical analysis.

The M. balthica feeding-transplantation experiment in recirculated aquaria has been in progress for 4 wk. Mortality is negligible so far (less than 2%), and there are no significant differences in mortalities between experimental and control tanks. A cytologic method for the diagnosis of neoplastic cells has been developed using hemolymph taken from living clams. Cells suspended in basic salt solution are allowed to settle on slides coated with polylysine. The slides are air-dried and stained with H&E. Examinations have been completed in 75 clams, four had relatively early cases of neoplasms. These animals will be used for transplantation of neoplastic cells to normal animals.

Results of Ames-tested tissues from clams, oysters, plankton, and fish have been received from England. Mutagenic activity was demonstrated in oysters from: (1) Wards Point, Raritan Bay, NJ; (2) Piscataqua River, ME; and (3) Wreck Shoal, James River, VA. Mutagenic activity also was noted in fish livers and shrimp from sewage and acid dumps at DWD 106. Seventeen samples were negative, including oysters, clams, and plankton from various locations. Thirty-five additional samples have been extracted for Ames testing and will be sent to England in the near future.

Preparation of clean copy for the monograph on the normal histology of the blue crab, Callinectes sapidus, continues. Numbering of figures and preparation of figure legends have been completed. There are 300 figures, 50 of which are electron micrographs. The body of the manuscript will be about 250 pages.

Examination of newly prepared electron microscope material and review of electron micrographs from previously prepared tissues show that all species of blue crab viruses occur as double or triple infections, and that it is more usual for them to occur in this way than as single infections. The only virus that ever

occurred as a single infection (in two of five animals whose tissues were examined by EM) was the picornalike virus. The rhabdovirus, in particular, is associated with the other viruses, and occurred in 11 of those 11 animals that also had the reovirus. Most of the crabs had been held in the laboratory at least 2 wk before dissection, or had been inoculated with tissues from other crabs infected with viruses. Some of them may have acquired one or another of their multiple infections in the laboratory during the holding period. However, the crabs with a single picornalike virus infection had been in the laboratory 36 and 42 days.

Additional collections of sera from diseased, "whirling" Atlantic menhaden, Brevoortia tyrannus, were made early this month. Efforts to obtain normal fish for control sera and tissues were only minimally successful. Most of the fish captured were too small to bleed and obtain the requisite amount of serum. Sera were obtained from five normal fish; additional collections from larger menhaden are planned for next month.

Investigation of the possible causes of tumors and oviduct lesions of striped bass, Morone saxatilis, is proceeding slowly. At present, the lesions are being studied and a possible correlation with intestinal helminth infestation is being examined.

We are still awaiting identification by the Narragansett Laboratory of fishes collected at DWD 106. Ammodytes larvae collected from two Ocean Pulse stations are being screened for gross abnormalities and lesions. Adult Ammodytes will be screened for skeletal lesions as soon as X-ray film is obtained.

During the month, the histology laboratory sectioned 786 blocks and stained 327 slides from a large variety of marine fishes, crustaceans, and mollusks.

Disease and Environmental Stress Investigation

Five cruises (6, 7, 14, 20, and 27 June) were conducted in Sandy Hook/ Raritan Bay to collect winter flounder, Pseudopleuronectes americanus. A total of 1,027 winter flounder were examined for the presence of fin rot disease. Only 6/1,027 (0.6%) fish had fin rot. Of the 1,027 winter flounder examined, 438 were young-of-the-year (YOY); none of the YOY fish had epidermal papillomas. Three cruises were conducted at the sewage sludge site in the New York Bight apex (16, 21, and 28 June) and 338 winter flounder were examined; only 7/338 (2.0%) had fin rot. None of 217 YOY winter flounder had epidermal papillomas. Only one fish from Sandy Hook/Raritan Bay had lymphocystis; no fish with lymphocystis were obtained from the sewage sludge area.

Efforts have been directed toward the completion of the electron microscopic studies on fin erosion in winter flounder. A complete analysis and electron micrograph record of experiments involving the exposure of winter flounder to sodium flouride have been made and indicate that acantholysis and excessive glycogen were observed in the distal fin epithelium after 9 hr of exposure to 0.015M NaF. The changes observed from application of NaF to the fin tissues mimic some of the characteristics found in wild fish tissues obtained from the New York Bight and Sandy Hook areas. An analysis of control tissues obtained from fish captured in Great Bay has also been completed and examination of fin tissues (dorsal, anal, and caudal) from 10 animals fixed in three different ways clearly indicates that the acantholytic condition observed in fish exposed to NaF and in wild fish is not the result of fixation or mechanical artifact. The selection of fin tissues from animals possibly exhibiting very early signs of fin erosion has been both difficult and subjective. Specimens were chosen on the basis of subtle irregularities in the skin (i.e., melanization or lightening, folding, and nonhemorrhaging depressions along the distal fin border) occurring in 34 fish captured on survey cruises offshore in the New York Bight or in the Sandy Hook Bay area. Extensive light microscopic observations on these specimens have indicated that foci of acantholytic tissue were present in the fins of 19 animals and that these lesions were similar in appearance to those found in fin tissues of five aquarium-held winter flounder believed to have "active" or nonregressive cases of fin erosion

disease, the progress of which was being monitored at the Sandy Hook Laboratory. In almost all instances, the lesions observed in the epidermis could be correlated with congestion of blood vessels or hemorrhage in the underlying dermis. At present, selected examples of what may represent the early stages of fin erosion disease in winter flounder are being examined with the electron microscope to see if the accumulation of glycogen observed in some of the specimens (non-experimental) is a reasonably constant feature and to document other cytopathological changes.

Histological data for rock crabs, Cancer irroratus, collected during the molting period for adult males have been analyzed and summarized. Two nearshore areas Sandy Hook Bay, NJ, and Delaware Bay-Ocean City, MD, were sampled to obtain newly molted specimens, and one station near Ambrose Light (sewage sludge) was sampled to obtain animals that had not migrated shoreward. The nearshore stations yielded 173 animals of which 95% were males. In contrast, 76 animals were taken at the Ambrose station and only 15% were males. The results suggest that the ratio of males to females in some areas may vary significantly with the season of the year. Microscopic observations showed that diatom infestations in the gill lamellae are excellent indicators of animals that have failed to molt during the molting season. Among 106 crabs collected in Sandy Hook Bay, 25 had gill diatoms and all were males. Among 76 crabs collected at the Ambrose station, 8 had diatoms and 7 were males. In most instances the crabs with moderate-to-heavy diatom infestations also had similar infestations with external bacteria and associated debris or silt. Diatoms were not observed in gills of crabs from the Delaware Bay-Ocean City area but more specimens are needed. Gill fouling among females is minimal and nodule formation in gill tissues was noted in 26-61% of the animals.

Aquaculture: Control of Larval Diseases Investigation

Ultraviolet light (UV) studies comparing oyster (Crassostrea virginica) larval cultures reared to setting in UV-treated seawater with those reared in non-UV-treated seawater have begun. Results indicate that oyster larvae reared in UV-treated seawater do at least as well as, if not better than, those reared in non-UV-treated seawater.

Disinfection and quarantine studies with the 300-gal ozone-UV system indicate that an 80-min dose of 0.9-3.96 mg/l of dissolved ozone is sufficient to inactivate three shellfish and one finfish pathogen. Normal bacterial flora are also completely eliminated.

Cytochemical tests are being used to determine the relative disease-fighting ability of larval oysters. Cytochemical staining for acid phosphatase will mark the number of lysosomes containing the acid phosphatase enzyme within a phagocytic cell and will, therefore, indicate the relative ability of that cell to dispose of engulfed foreign particles, such as bacteria and viruses. The phagocytes of 4-wk-old oyster larvae have a mean of only 2.5 lysosomes (containing acid phosphatase) per cell, whereas adult oyster phagocytes contain 40.5 lysosomes per cell. This suggests that the larvae have a disease-fighting mechanism which may be far less efficient than that of adult animals. Testing with additional cytochemical reactions should help to clarify this observation further.

Agglutination reactions were determined using antiserum against the bacterium causing the 1977 mortalities of striped bass in Long Island Sound. Cross-absorption studies show that the organism is identical with the Paasteurella piscicida isolate which caused heavy mortalities in white perch and striped bass in Chesapeake Bay in 1963. This is the only confirmed outbreak of the disease in this country since the initial 1963 episode. However, the disease has appeared in cultured yellowtail in Japan.

Meetings, Talks, Visitors, Publicity

Dr. Rosenfield attended a dinner meeting of the Maryland Sea Grant Board, on

5 June, at College Park, MD. Dr. Rosenfield and Ms. Brubaker traveled to Washington, DC, during 6-8 June to meet with Dr. John Briggs and Dr. John Harshbarger and their secretaries to work on plans for the Society for Invertebrate Pathology meeting to be held in Prague, Czechoslovakia, in September. On 8 June, Dr. Rosenfield met with Dr. Rita Colwell, Maryland Sea Grant, to discuss future projects for Sea Grant. Dr. Rosenfield and Dr. Blogoslawski participated in the National Shellfisheries Association Annual Meeting in New Orleans, LA, during 18-22 June. Dr. Rosenfield, Dr. Murchelano, Mr. Newman, and Ms. MacLean traveled to SUNY, Stony Brook, NY, on 23 June to participate in an "Ocean Pulse" workshop. Dr. Rosenfield participated in the NEFC Board of Directors meeting at Boothbay Harbor, ME, during 27-30 June.

Dr. Murchelano met with Dr. Robohm at Milford, CT, on 22 June to discuss research on infectious diseases of marine fishes.

Dr. Johnson participated in the Aquavet course presented at the Marine Biological Laboratory, Woods Hole, MA, on 14 June. She gave lectures and conducted a laboratory session on the normal histology and on diseases of the blue crab. Dr. Blogoslawski met and discussed affirmative action employment with Dr. Mack Felton, Chairman, Biology Department, Southern University, New Orleans, LA. Ms. Sandra Cassanelli participated in the Kelez cruise to DWD 106 during 10-17 June.

The following joined the Oxford Laboratory staff for the summer: Mr. Anthony Laudadio, Revere, MA, to assist Mr. Kern; Ms. Ann Charles, Cohasset, MA, to assist Mr. Newman; Ms. Patrice Hambleton, Boxman, MD, to assist in the histology laboratory during Ms. Dorothy Howard's absence; and Ms. Shawn MacLaughlin, Easton, MD, to assist with the Registry of Marine Pathology. Mr. Peter Pandley, a Work-Study cooperative student from Central Connecticut State College began his 6-mo tour of duty in the pathobiology staff at the Milford Laboratory on 26 June. Mr. Robert Ison, a volunteer from the Foundation School, Orange, CT, left the pathobiology staff at Milford after assisting us for the past 6 mo.

Visitors to the Oxford Laboratory included members of the Frostburg State College General Ecology Class on 1 June; Boy Scout Troop 447, Rockville, MD, on 3 June; Dr. Pieter VanVolkensburg, New York Department of Environmental Health, during 5-7 June for conferring with Drs. Rosenfield and Johnson, Mr. Farley, and Mr. Kern about shellfish health problems for the State of New York. Other visitors were Dr. V. Pravdic, Center for Marine Research, Zagreb, Yugoslavia, and Dr. Andrew McEarlean, EPA, University of Maryland, Cambridge, MD, on 19 June; Ms. Joanne McQuade, Office of the Mayor, Baltimore, MD, and Mr. and Mrs. John Andrews, Daphne, OK, on 24 June; Dr. Victorino Garrido, Division de Proteccion Recursos, SAG, Santiago, Chile, and Mr. Dan Hunt, FDA, Washington, DC, on 28 June; Mr. Thomas E. Morris, Horn Point Environmental Laboratory, Newark, DE, and Mr. Chuck Weinkam, Horn Point Environmental Laboratory, Ocean City, MD, on 29 June. Mr. Fred Kern and Mr. Bruce Harke spoke to the Talbot County (Easton), MD, Youth Conservation Corps and gave them a tour of the Oxford Laboratory on 30 June.

Manuscripts

Brown, C. Ultraviolet light - an effective disinfectant for shellfish hatcheries. Los Angeles Symposium Proceedings of the International Ozone Institute. (S)

RESOURCE UTILIZATION DIVISION

Resources Development and Improvement Investigations

Sampling and Harvesting Gear Development

Considerable effort this month was directed towards the development of a new Center shellfish assessment system. The source of operational problems with

the electrical cable winch has been determined; the winch has been redesigned and new components are on order. Design of the new dredge has been completed and drawings are in production. The design process included a trip to New Jersey to study existing commercial designs. Work has also progressed on dredge instrumentation design.

Only 2 days of testing were possible on the experimental beam trawl due to the heavy work schedule in other areas. Cleanup work on the R/V Rorqual also slowed this month.

Processing Engineering

During this month the work on the automated squid-processing equipment was concentrated on refining the evisceration phase of the operation.

The fish transfer device of the silver hake processing machine was found to have an open circuit. This was corrected and the machine was returned to service. A critical examination of the machine was made, and several other items appeared about to give trouble. These were greased, adjusted, or corrected. The machine was given a final trial run with one of the plant owners present. He was very much interested with the operation and asked many pertinent questions concerning the machine.

The Product Quality, Safety, and Standards Investigations have requested assistance in developing an inspection aid to measure press drip from fish blocks. The work that has been done on the design of a press for squeezing the water out of a fish block was given careful scrutiny to find out if we had enough data to build a versatile unit to meet the requirements.

It was decided to obtain more information on a press where the parameters were known and where a study of results could be compared and evaluated. It was suggested that the tuna press might be satisfactory since it has a Blackhawk Portapower hand-operated power supply with a gauge reading up to 3,000 psi. It also has a set of stainless steel cylinders and pistons for holding samples of fish while squeezing out the entrained water.

An intensive program of testing was organized to document the results of the tests. This may be the basis of new standards since most laboratories already have a tuna press and can adapt their equipment to carry out the new standards method.

Storage Study of Mytilus edulis

Replicate samples of mussels sent to the Werby Labs corroborated our micro Kjeldahl results. It appears that the Kjeldahl method will have to be used on the mussel samples, as turbidity in the extracts causes problems with the Auto Analyzer biuret method and the BioRad method. It is too early to determine if the past year's protein values can be salvaged and/or correlated to the new Kjeldahl values.

Fresh mussels were not available this month. Taste tests were postponed until such time as fresh mussels could be obtained for controls.

Squid

The second draft of a paper on "Pair Trawling for Squid" is being revised. Contributions on squid processing are being written for inclusion in a paper on "The Mechanization of Squid Processing."

Guaranteed Quality Program

Raw odor evaluation studies were continued on 52-34°F stored fresh Atlantic

cod fillets. Standard deviations, overall and for each storage day, were determined for those 12 panelists who appeared to be most acute in their ability to estimate correctly the storage age of the fillets. Of these, the six most acute panelists have an average standard deviation of 1.48, their range being 1.25 to + 1.59. The results are being evaluated further.

Overall, the results indicate that our panelists tend to reject fresh cod fillets at about the eighth or ninth day of storage. This is about the storage time that the fillets become Grade B and Substandard, respectively.

We have been asked to advise a Philadelphia-based concern about a fresh-fish marketing program that it has developed for the State of Virginia. The project involves shipping fresh seafoods overseas. The consultants are experts in air cargo shipping worldwide, but know nothing about seafood handling.

New Product Development

The final adjustments were made on the LaPine heading and gutting machine that is in the commercial fish processing plant in East Boston. Due to the fish cutter's strike, the processor was delayed in his move to his new plant. From all indications, the new plant should be operational in about 10 days, after which we will try the equipment under commercial conditions.

Preparations are being made to start processing fish in retort pouches shortly.

Enough fish salad made from minced silver hake was prepared for samples to be distributed to attendees of the Toward Tomorrow Show held at the University of Massachusetts at Amherst. Again, this product was very well received by those who consumed it.

Product Quality, Safety, and Standards Investigations

Product Quality

A study was conducted to evaluate the performance of the Torrymeter for judging the quality of iced haddock. Meter readings are in the process of being correlated with bacterial, chemical, and organoleptic data.

Mike Allsup has been reorganizing the pilot plant and is in the process of building two drain tables prior to relocating the small sink.

A contract has been awarded to Instron Corporation for the purchase of a Model 1132 Universal Testing Machine for the objective evaluation of texture. Delivery is expected by mid-August.

Sarah Roderick has nearly completed a comparison of sarcoplasmic proteins from 14 species of fish by isoelectric focusing. The protein extracts were compared on commercially prepared polyacrylamide gels containing pH 4.0-6.5 or pH 3.5-9.5 ampholytes. Protein samples were also compared in our own formula pH 3.5-5.0, pH 4.0-6.0, and pH 3.5-10.0 polyacrylamide gels. Several protein-staining methods were evaluated with a 0.2% Fast Green FCF solution being the fastest and easiest to handle for routine use. The results of this study will be submitted for publication.

We wish to welcome aboard Mike D'Epiro and Matt MacConnell, both are college students and will be working at the Gloucester Laboratory during the summer.

Product Safety

Workup of cold-smoked Atlantic salmon and hot-smoked lake whitefish samples has been completed. Some of the whitefish samples are being spiked at the 5 and 100 ppb level for GC-MS analysis. The Perkin-Elmer gas chromatograph has been returned from the factory. New digital, analog, and power supply boards were installed. The instrument was calibrated and is being tested in this laboratory

for performance. Eighty extracts will have to be analyzed by GLC as soon as the instrument is tested. Don Gadbois met with Dr. Moreau of Biomeasure in regard to the status of the GC-MS work. Evaluation of the work shows that our samples can be confirmed at the 5 ppb level and lower. He is now ready to analyze our whitefish samples. A meeting to review the nitrosamine data and to reach an agreement on what new data FDA will need to finalize the whitefish petition will be arranged with FDA, Dr. Moreau, Dr. Ecklund, and Tom Billy.

Product Standardization

Work is continuing on a research study of cook drip and press drip methodology and objective measurement of bone in fillets and fish blocks. A USDC inspector has been assigned to work on this project for a limited time. An attempt has been made to modify the tuna press currently used to determine the press weight of canned tuna for evaluating press drip of fish blocks and fillets.

An inspector's instructions and score sheet for use with the Codex (international) Standard for Quick Frozen Lobsters have been developed. It is intended that this document will be used for lot inspection of imports and for inspection of lobsters for military purchases. It will also be used by companies under inspection desiring to use an inspection mark on their lobster products in lieu of a company specification.

Plans are being coordinated for a Codex Working Group meeting on battered and breaded fish sticks and portions to be held in Boston, during 25-28 September.

Technical Assistance, Visitors, Meetings, Training

Technical Assistance

We responded to inquiries on the following: examination and bacterial counting of abnormal quahogs for FDA; analytical test procedures for proximate analysis; storage stability of hake; source of fish blocks; time-temperature requirement for fishery products; composition of scup and tautog; standards for crab meat; prevalence of parasites in Atlantic cod fillets; photographs on fish blocks; pair trawling for Atlantic herring; immersion heater and controls; refrigeration chillers for seawater systems; Atlantic menhaden; otter boards; safety and air conditioning; lobster fishing off Massachusetts; nomenclature of fish; freezing and packaging material for swordfish; volatiles in fish; meat-bone separators; labeling of fish caught in Malaysian waters; protein in ocean quahogs; cooking and smoking fish; processing fish roe; salting and pickling fish; use of fish waste; building a home-type smokehouse, identification of four species of flatfish; utilization of rock and Jonah crabs; processing of red crabs; mechanized processing of rock and Jonah crabs; maintenance of squid quality; utilization and processing of squid; fish processing and preservation; record keeping for fishermen; Massachusetts fish landings; fish handling at sea; Gloucester Laboratory activities; fish unloading systems; cutting boards; eels; sanitation; and plant construction.

Visitors

Visitors included: Ms. Kathy Straubel and three students from Newburyport Middle School; Mrs. Becky Bernie, Gloucester Fisherman's Wives, to obtain materials for a fish display; Dr. Kevin Whittle, Torrey Research Station, to give a talk on blue whiting and to obtain information on fish blocks and minced fish; and Donald Lynch, H.P. Hood and Sons, to discuss Laboratory programs.

Meetings

Dr. Perry Lane met with Gerald Haegele and state, university, and business

leaders to discuss proposals for commercial fishing activities in Wisconsin. At a second meeting with commercial fishermen, information was given on fishery cooperatives.

Elinor Ravesi and Dr. Perry Lane set up and manned an exhibit at the "Towards Tomorrow 78" show at the University of Massachusetts, which dealt with alternative use of resources and drew 18,000 people during 3 days. About 2,800 samples of minced whiting (silver hake) salad, red crab salad, and marinated squid were distributed.

Ron Lundstrom presented a talk on the use of isoelectric focusing for fish species identification on 7 June at a workshop meeting of the American Fisheries Society, Southern New England Chapter, in Rhode Island.

John Ryan participated in the 1 June meeting of the NEFC's Awards Committee in Woods Hole.

John Ryan and Fred King participated in a meeting on 15 June at the US Army Natick Research and Development Command with representatives of the Food Sciences Division. Jim Brooker and Jim Rasekh represented the Washington Office. The topic was the use of objective means of determining the proposed edibility characteristics to be used for identifying seafood products.

Burt Tinker and Kurt Wilhelm visited the Stonington Lobster Coop, Stonington, ME, to determine technical assistance required to improve product quality and processing efficiency.

Kurt Wilhelm and Mary Ann Perry visited the Stonington rock crab processing plant to evaluate its processing methods and to suggest improvements in their procedures. Suggestions were made on how to improve efficiency in the handling of live crabs, cook-room operations and sanitation, picking procedures, and the disposal of waste material.

NATIONAL SYSTEMATICS LABORATORY

Benthic Fishes

A manuscript was revised on the taxonomy of North Atlantic rocklings.

Pelagic Fishes

Research continued on the anatomy of the Spanish mackerels and on Indo-West Pacific halfbeaks.

Shrimps

Work progressed on a paper presenting the first record from Australia of the cosmopolitan penaeid genus Solenocera, based on material submitted for study by the Australian Fisheries Department.

Research continued on the systematics of American Pacific penaeoids and on the genus Penaeopsis.

Other Crustaceans

Preparation continued of a guide to temperate-water decapod crustaceans of the US east coast.

Meetings, Talks, Visitors, Publicity

Dr. N. V. Parin of the P. O. Shirshov Institute of Oceanology in Moscow, USSR, returned to the USSR after a visit to the US for 6 wk, most of which was spent working with Dr. B. B. Collette on epipelagic fish systematics. Other visitors included Alan Davidson from London and Barbara Peters of Time-Life, both of whom

are writing fish cookbooks, and Mr. Gregg Small of the University of Maine.

Drs. Cohen and Collette attended the annual meeting of the American Society of Ichthyologists and Herpetologists in Phoenix, AZ. Collette serves as Secretary to the Society, Cohen was elected to the Board of Governors. Cohen attended the NEFC Board of Director's meeting in Boothbay Harbor, ME.

Manuscripts

Collette, B.B., and N. V. Parin. Five new species of halfbeaks (Hemiramphidae) from the Indo-West Pacific. Proc. Biol. Soc. Washington. (A)

Collette, B.B., and J. L. Russo. Introduction to the Spanish mackerels, genus Scomberomorus. Proc. Spanish Mackerel Colloquium. (A)

ATLANTIC ENVIRONMENTAL GROUP

Ocean Monitoring and Climatology Task Group

During June the cooperative Ship of Opportunity Program obtained nine XBT transects, two in the Gulf of Maine, two across the southern New England shelf along the 71°W meridian, two across the shelf and slope off New York, one off Norfolk, and two enroute to and from the Tail of the Banks off Newfoundland from New London (one north of Georges Bank, the other south). Also, continuous plankton and temperature records at 10 m were obtained along one of the Gulf of Maine routes and the transect of the shelf and slope off New York, and a continuous plankton record was collected northeastward from Norfolk, VA. Contact was made with Coast Guard Group Headquarters in Portland, ME, and Boston, MA, to arrange for the radio transmission of digitized XBT data from the Marine Evangeline and Caribou Reefer, both of which transit the Gulf of Maine.

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 July "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 mid-May a warm-core eddy was off southern Georges Bank, centered at 39°15'N, 68°35'W. Another eddy was situated to the ENE at 39°00'N, 65°39'W, after undergoing reconnection with the Gulf Stream and reseparation as a larger eddy. The western-most of the two eddies was positioned with its northern edge extending into Hydrographer Canyon in mid-June. A strong, persistent eastward current was reported by a fisherman operating on the west side of the Canyon on 11 June.

Ocean Dumping Task Group

During the past month preparations were completed for the 11-17 June cruise effort to DWD 106 aboard the George B. Kelez which departed from New York City. The cruise conducted extensive biological sampling (neuston and bongo tows), including neuston sampling from a metal-free net system. Samples collected with the metal-free net system will be analyzed for trace metals at the Milford Laboratory. Industrial waste from the American Cyanamid facility at Linden, NJ, was dumped at the dumpsite on 16 June. The waste was tracked for about 36 hr using a fluorescent dye tracer and two towable fluorometers from the Johns Hopkins University Applied Physics Laboratory. Water samples to be used for total metal analysis by the Chemical Oceanography Department at the University of Rhode Island were also collected.

A proposal was generated to study the long-term drift at DWD 106 using radio-sonde drogued buoys beginning in the late summer or early fall of 1978. A copy of this proposal has been supplied to the program office in Rockville. Long-term

drift data from DWD 106 during the various seasons together with dispersion data from waste-dumping experiments should assist in understanding the ultimate fate of wastes dumped at the site.

Meetings, Talks, Visitors, Publicity

Steve Cook attended a meeting of the NEFC Awards Committee at Woods Hole on 1 June.

Jim Bisagni participated in a cruise aboard the George B. Kelez from 10 June to 17 June to Deepwater Dumpsite 106.

On 8 and 9 June, Mert Ingham attended a conference on fishery climatology at Beaufort, NC.

Mert Ingham attended an Ocean Pulse Program briefing held at MESA, Stony Brook, Long Island, NY, on 22 and 23 June.

During the week of 26-30 June, Mert Ingham attended the NEFC Board of Directors meeting at Boothbay Harbor, ME.

On 26 June, Daniel Smith and Carl Gardner traveled to Norfolk, VA, and Morehead City, NC, to brief personnel on the use of the XBT launcher-recorder and continuous plankton recorder.

Woody Chamberlin visited Gloucester, MA, on 19 June to attend a demonstration of "Green Thumb Box" at the Northeast Regional Office.

Reed Armstrong gave a presentation on physical oceanography to the fifth grade at Hamilton Elementary School, Wickford, RI, on 6 June.

Manuscripts

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

Cook, S. K. Water column thermal structure across the shelf and slope southeast of Sandy Hook, NJ in 1977. Annales Biologiques. (S)

Crist, R. W., and J. L. Chamberlin. Bottom temperatures on the continental shelf and slope south of New England during 1977. Annales Biologiques. (S)

Gunn, J. T. Variation in the shelf water front position in 1977 from Georges Bank to Cape Romain. Annales Biologiques. (S)

Mizenko, D., and J. L. Chamberlin. Gulf Stream anticyclonic eddies (warm-core rings) off the northeastern United States during 1977. Annales Biologiques. (S)