

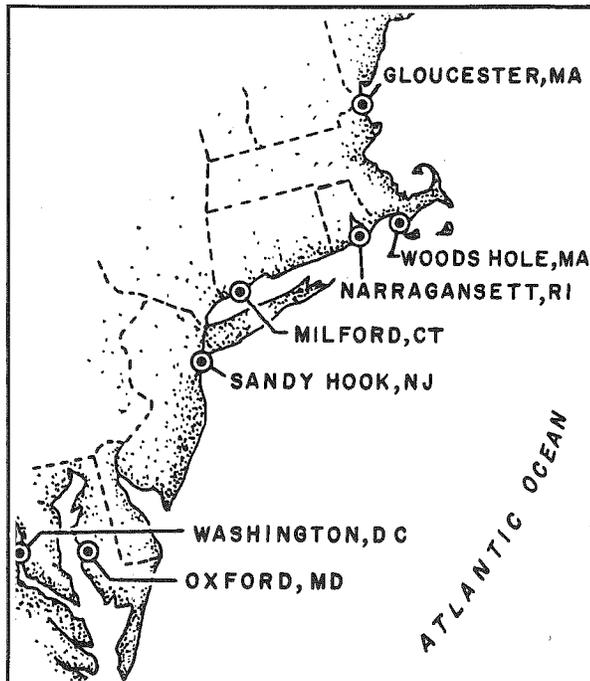
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# NEFC

Northeast Fisheries Center

# NEWS

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MARCH 1979

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US DEPARTMENT OF COMMERCE  
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WOODS HOLE, MASSACHUSETTS

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## CENTER DIRECTORATE

### Environmental Management Office

Dr. Sindermann participated in several meetings of a NOAA pollution monitoring planning group, held in Rockville, MD. A preliminary status report was drafted for consideration by the Assistant Administrator for Fisheries.

### Fisheries Utilization Office

Louis Ronsivalli participated in the preparation of early drafts of the Fisheries Development Task Force Report. The document is based, to a large extent, on over 20 background papers and analyses prepared by members of the various elements of NMFS in Washington, DC. The purpose of this report is to permit an evaluation of the role of the federal government in fishery development activities, the level and scope of such government involvement, and the impact of fishery development activities on the nation.

### Special Scientific Investigations Office

Arthur Posgay finished assembling all the sea scallop growth data reported by other authors for comparison with our results and arranged all the records of tagged shell returns for ADP processing. He also started to assemble the data for a working document for a May meeting of the ICES Working Group on North Atlantic Salmon.

### Special Technical Projects Office

Most of this month was spent in preparing for sea scallop gear research. A meeting was held at the NEFC on 23 March to decide on the goals and approach. In attendance were members of the New England Fishery Management Council Sea Scallop Oversight Committee and scallop industry advisors. It was decided that with the limited funding and manpower available we should concentrate our efforts on preliminary observations of commercial and survey drags. The work will be performed using the gear research vessel Rorqual and divers equipped with underwater color television.

Progress was also made on completing the data analysis for the trawl mesh study, designing the clam-dredge power cable, updating the R/V Albatross IV data logger, and obtaining routine trawl mensuration capabilities. Ten requests for technical information were processed.

## RESOURCE ASSESSMENT DIVISION

### Resource Surveys Investigation

On 11 March, the FRG R/V Anton Dohrn returned to Woods Hole after completing a trawl survey of bottom and pelagic fish. Gordon Waring was the US Chief of Party and the area surveyed extended from the western Gulf of Maine to the New York Bight, including Georges Bank.

The spring bottom trawl survey began on 20 March when the R/V Delaware II (Tom Azarovitz, Chief Scientist) departed Woods Hole. The planned area of operation is from Cape Lookout, NC, to Cape May, NJ. The Albatross IV (Henry Jensen, Chief Scientist) departed Woods Hole on 30 March to conduct the Georges Bank segment of the spring bottom trawl survey.

Pat Twohig installed an acoustic trawl mensuration system aboard the Delaware II for testing during the spring bottom trawl survey. The system will be used to monitor the headrope height of the net at selected stations. Eventually the system will be used on a regular basis on all bottom trawl surveys to evaluate continually trawl performance. Specifications for the design of a new trawl mensuration cable were issued to five manufacturing companies for bidding. This new cable will be less expensive than the present cable we are now using.

An echosounder, Loran "C", and other shipboard electronic equipment were overhauled and installed on the Rorqual, by Pat Twohig, to prepare it for use in the LAMPEX program which is scheduled to start on 17 April.

A hydroacoustical seminar was organized for and attended by NEFC and Woods Hole Oceanographic Institution (WHOI) personnel which displayed the latest technology from SIMRAD Corp. for sonar fish detecting and computerized situation displays.

## Fishery Biology Investigation

### Age and Growth

Kris Kantola finished summarizing and coding haddock samples from the 1978 fall bottom trawl survey and sent the age sheets to ADP for keypunching. She also aged, summarized, coded, and sent age sheets to ADP for pollock samples from the 1978 spring bottom trawl survey. She then began aging the 1978 fall bottom trawl survey pollock samples.

Vi Gifford completed aging and summarizing commercial redfish samples from the fourth quarter of 1976. She also completed sectioning 640 commercial redfish samples from 1969 and aged 40 samples from the first quarter of that year. These samples are being aged in an attempt to clarify the relative strengths of the 1963, 1964, and 1965 year classes. Vi also worked with Kris Kantola, checking her aging on the 1978 fall bottom trawl survey pollock samples.

Gary Shepherd continued working on his paper on the age and growth of summer flounder.

Judy Penttila worked with Tom Hotz from the Massachusetts Division of Marine Fisheries to complete the aging of Atlantic cod samples from the 1978 spring bottom trawl survey. She also worked with Gary Shepherd on his summer flounder paper. She, along with Ambrose Jearld, attended another meeting at the Narragansett Laboratory on approaches to the problems of automatically aging haddock scales.

### Shellfish

John Ropes sent to the editors of the National Shellfish Association a final revision of a paper soon to be published. The paper is concerned with sexual maturity of soft clams. He also submitted a final revised copy of a technical report on clams and scallops. In addition to these final revised manuscripts submitted, John has two papers circulating for in-house review.

John spent several hours this month exercising custodian functions in the cottage. The results are, he is now in a new office, his former office is used by Loretta O'Brien for all mollusk aging work, the basement storage area has been

tidied, most surplus equipment has been secured at Otis Air Force Base, and new shelves were built for storing aged samples.

Loretta O'Brien developed a technique for producing thin sections of surf clam shells. Improvised by use of Plexiglass, slides bearing sections are held in place on a vibrating lap machine. Loretta also worked with Dr. Arthur Merrill on a scallop project and with Steve Morrison on shellfish.

### Finfish

Laurie Savelkoul completed aging and summarizing red hake otoliths of the 1978 summer bottom trawl survey. She has almost completed sectioning for the 1978 fall bottom trawl survey.

Cathy Rearden has begun work on the age data archiving project this month and continued spending several hours per week with Joan Palmer on a research project. She has nearly completed aging and summarizing butterfish of the 1978 spring and summer bottom trawl surveys.

Michael Campbell has continued to work on a scup growth paper. He also worked with Fred Nichy on a construction project in the aquarium.

Louise Dery aged about 400 commercial Atlantic herring otoliths and a small sample from the Anton Dohrn Cruise No. 79-01. She has completed aging and summarizing silver hake from the 1978 summer bottom trawl survey. She and Cathy Rearden went to the Sandy Hook Laboratory for several days to consult with Stuart Wilk on bluefish aging. Louise also worked with Ambrose Jearld on aging red hake otoliths.

### Sandy Hook Investigation

Darryl Christensen completed a report for the Mid-Atlantic Fishery Management Council on "A Survey of the 1978 Spring Recreational Fishery for Atlantic Mackerel, Scomber scombrus, in the Middle Atlantic Region." He completed the first draft of a report describing the age composition of Atlantic mackerel recreational catches and submitted it for review. He completed the first draft of a manuscript on composition of catches made by New Jersey party-boat anglers fishing for summer flounder and submitted it for review. Working with John Clifford and the Sandy Hook ADP Unit, Darryl made revisions and corrections to estimates of the catch of non-target species made by party-boat anglers fishing for bluefish.

Wally Morse participated on the spring bottom trawl survey from 20 March to 6 April.

### Fishery Analysis Investigation

Paul Wood summarized 1978 commercial landings, size-frequency, and effort data on Atlantic cod and sea scallops, and initiated collation and analysis of the 1978 sea sampling data.

Steve Murawski and Fred Serchuk prepared draft assessment manuscripts on the status of Middle Atlantic surf clam and ocean quahog populations. Time was also spent organizing an ocean quahog paper for presentation at the Northeast Fish and Wildlife Conference in April.

Maureen Griffin participated in the first leg of the spring bottom trawl survey during 21 March - 6 April, and Rhett Lewis participated in the second leg of the survey beginning on 28 March.

Liz Bevacqua began assessment analysis on scup data collected from both survey and commercial sources.

Joan Palmer and Fred Serchuk began analysis of spring and autumn bottom trawl survey catch data for Georges Bank and Gulf of Maine Atlantic cod to evaluate the underlying probability density function of catch over time.

#### Fishery Assessment Investigation

Emory Anderson completed a manuscript on by-catch of pelagic sharks, swordfish, and other large pelagic species by foreign trawlers in the US Fishery Conservation Zone during 1978. He also assisted Marvin Grosslein in editing final drafts of attachments to the protocol document of the US-USSR scientific meeting held in Moscow during February 1979.

Steve Clark and Vaughn Anthony (Maine Department of Marine Resources) completed a northern shrimp assessment paper for inclusion in the Proceedings of the First International Pandalid Shrimp Workshop held in Kodiak, AK, in February. Steve also assisted in completing a revision of the current draft fishery management plan (FMP) for the Gulf of Maine northern shrimp fishery.

Emma Henderson continued summer flounder assessment and prepared a progress report on groundfish modeling work for the New England Fishery Management Council.

Frank Almeida examined catch-at-age of silver hake in industrial fisheries and continued yield-per-recruit analyses, mesh selection studies, and stock identification work on this species. He also completed preliminary stock production modeling studies for bluefish.

Thurston Burns initiated work to update the 1978 pollock assessment which included compilation and transmission of catch and catch-effort data by area and gear type to Cole and Storey Associates for use in preparation of a pollock management plan. Thurston also completed editing and storage of commercial length-frequency records for 1978 and reviewed the current American lobster management plan in cooperation with Steve Clark.

Pat Carter completed a series of catch-effort analyses for pollock and haddock for 1978 and initiated organization and editing of historical catch-effort data files for these species.

Jeffrey Floyd was aboard Albatross IV Cruise No. AL 79-03 beginning 26 March for the spring bottom trawl survey. Jeffrey also continued work on measuring silver hake for the stock identification study.

Hillary Herring participated in the spring bottom trawl survey on Delaware II Cruise No. DE 79-04 beginning 20 March. Hillary continued processing commercial length-frequency samples and worked further on red hake biostatistics.

#### Fishery Systems Investigation

Gordon Waring served as US Chief of Party on the cooperative US-FRG trawl survey aboard the Anton Dohrn during 23 February - 9 March 1979. The area covered included Georges Bank, the western Gulf of Maine, and Southern New England west to Ambrose Light. The objective was to determine the winter distribution and relative abundance of bottom and pelagic fish stocks with special attention to Atlantic herring and Atlantic mackerel. A total of 10,955 herring were collected at 59 stations. The largest catch occurred in Massachusetts Bay and numbered 4,332 fish. A total of 4,798 mackerel were taken, all in Southern New England waters. Significant catches of young-of-the-year haddock were taken in the eastern portion of Georges Bank. The largest single catch amounted to 11,560 individuals.

Gordon Waring, Margaret McBride, and Anne Lange continued routine assessment work on Atlantic herring, yellowtail flounder, and squid, respectively. Anne Lange continued reviewing material pertinent to US-Canadian negotiations on boundaries across Georges Bank.

#### Meetings, Talks, Visitors, Publicity

Stuart Wilk attended a workshop on marine recreational fisheries programs in Washington, DC, from February 27 to March 1. He attended three fact-finding hearings sponsored by the Mid-Atlantic Fishery Management Council regarding bluefish management needs held at Rockville Center, NY, on 12 March; Belmar, NJ, on 13 March; and Barnegat, NJ, on 19 March. On 22 March, he met with Dave Deuel from the Washington Office and Bruce Freeman from the Northeast Regional Office to discuss status and use of historical bluefish data sets.

Steve Murawski attended the Mid-Atlantic Fishery Management Council meeting in Ronkonkomo, NY, on 14 and 15 March to discuss recent surf clam and ocean quahog assessment results. Steve also reviewed these results for Resource Assessment Division personnel on 9 March at the Woods Hole Laboratory.

Fred Serchuk attended a meeting of the New England Fishery Management Council's Groundfish Oversight Committee on 5 March in Peabody, MA, and also attended the March meeting of the Council itself on 14 and 15 March in Peabody. Paul Wood also attended this latter meeting.

Paul Wood and Fred Serchuk met with the New England Fishery Management Council Sea Scallop Oversight Committee at the Woods Hole Laboratory on 23 March to discuss future sea scallop gear research.

Paul Wood also met with Dan Shick and Chris Davis of the Maine Department of Marine Resources on 13 March to discuss sea sampling procedures.

Ralph Mayo reviewed recent redfish assessment results with Resource Assessment Division personnel on 8 March at the Woods Hole Laboratory.

Fred Serchuk met with Archie Ginn of the MARMAP Audit Team on 21 March to review the Division's assessment procedures and techniques. Fred also attended an IYABA meeting in Gloucester, MA, on 20 March.

Steve Murawski, Paul Wood, and Fred Serchuk met with Chris Mantzaris and Ruth Rehfus of the Northeast Regional Office Environmental Assessment Branch to discuss potential conflicts of oil leasing tracts and shellfish resource areas on 23 March at the Woods Hole Laboratory.

Fred Serchuk presented talks on stock assessment and extended jurisdiction to undergraduate classes from Massachusetts Maritime Academy and Paul Smith College on 29 March at the Woods Hole Laboratory.

Ron Lundstrom from the Gloucester Laboratory met at the Woods Hole Laboratory on 23 March with Emory Anderson, Frank Almeida, Brad Brown, and others to discuss application of isoelectric focusing techniques to silver hake stock identification.

Emory Anderson attended the US Department of Commerce Management Seminar during 26-30 March in Gaithersburg, MD.

Steve Clark participated in a workshop in Galveston, TX, on 7 and 8 March to develop research guidelines for assessment of the potential impact of salt-dome brine disposal on panaeid shrimp populations in the western Gulf of Mexico. He also participated in a Northern Shrimp Scientific Committee workshop held on 23 March in Gloucester, MA, to finalize revisions to the current draft FMP for northern shrimp.

Emma Henderson met with C. P. Patil of Pennsylvania State University on 2 March to discuss current contract research projects.

Mike Sissenwine attended a Groundfish Oversight Committee meeting of the New England Fishery Management Council in Peabody, MA, on 5 March. During the meeting, proposed amendments to the groundfish FMP were discussed.

Mike Sissenwine and Gordon Waring met with fisheries managers on the Washington Office staff of NMFS on 28 March to discuss pending amendments to the Atlantic herring FMP.

#### Manuscripts

Clark, S. H., and V. C. Anthony. An assessment of the Gulf of Maine northern shrimp resource. Proc. First Intern. Pandalid Shrimp Work. Kodiak, AK. 13-15 February 1979. 21 p. (S)

Lange, A. M. T., and K. L. Johnson. 1979. Dorsal mantle length - total weight relationship of squid (Loligo pealei and Illex illecebrosus) from the Northwest Atlantic, off the coast of the United States. ICNAF Res. Doc. 79/II/4.

Murawski, S. A., and F. M. Serchuk. 1979. An assessment of offshore surf clam, Spisula solidissima, populations off the Middle Atlantic Coast of the United States. NMFS, NEFC, Woods Hole Lab. Ref. No. 79-13. 36 p.

Waring, G. T., M. P. Sissenwine, and H. Dornheim. 1979. The spring 1978 age composition of herring stocks of the northeastern USA. ICNAF Res. Doc. 79/VI/4.

#### MARINE ECOSYSTEMS DIVISION

##### Ecosystem Dynamics Investigation

Work continued on development of the multispecies model GEORGE. Wendell Hahm focused on the structure of the model and in conjunction with Brian Hayden continued preliminary scanning of food habits data by producing plots and histograms of prey types and weights by size of predator (major finfish species). Ed Cohen continued work on estimating food consumption by finfish. In particular, he attempted to partition daily rations by prey types, using Mike Pennington's feeding equation and digestion rates from the literature.

Marv Grosslein completed final editing of the 1978 joint US-USSR research report, and the paper on NEFC ecosystem research in the Northwest Atlantic presented at the International Ecological Congress satellite program in statistical ecology (Parma, Italy, August 1978). On 23 March, he attended a Scientific and Statistical (S&S) Committee meeting for the New England Fishery Management Council.

A meeting was held of the NEFC modeling group to set up an agenda for the workshop with Ursin and Daan following the larval fish symposium.

Mike Pennington and Jim Kirkley (Resource Assessment Division) completed a manuscript on effects of management on Georges Bank yellowtail flounder. Also, Mike assisted Ray Bowman with statistical analysis of food habits data.

## Recruitment Processes

Most efforts were directed toward completion of papers for the larval fish symposium. Greg Lough was senior author of a comprehensive summary of the ICNAF larval Atlantic herring time series, and George Bolz was senior author of a short paper on ichthyoplankton based on 1974-76 ICNAF surveys. Mike Pennington collaborated with Pete Berrien on a paper estimating egg production and biomass of Atlantic mackerel, and he also reviewed a paper on a larval growth model by Saila and Lough and assisted those authors with corrections in mathematical formulations. In addition, Mike and Bob Livingstone completed a first draft of a paper on fecundity of Georges Bank haddock, and Mike began working jointly with Wally Smith on an analysis of the statistical sampling errors associated with subsampling eggs from MARMAP ichthyoplankton samples.

## Benthic Dynamics Investigation

An analysis of the distributional aspects of benthic amphipods, completed this month, explained some previous findings pertaining to their importance as food for demersal fishes. John Dickinson, Roland Wigley, Richard Brodeur, and Susan Ledger-Brown completed the first draft of a comprehensive report describing the quantitative distribution of 101 species of benthic amphipods inhabiting the Middle Atlantic Bight. Title of the report is, "Distribution of Gammarid Amphipod Crustacea in the Middle Atlantic Bight Region." Previously, we found these amphipods to be one of the most common foods of demersal fishes, particularly young-of-the-year fishes. This distributional study, in which the geographic, bathymetric, and bottom sediment relationships are emphasized, helps to explain why these organisms are such important fish foods. Other work conducted this month dealt with the biomass and density of macrobenthos from continental shelf areas south of Nantucket and Martha's Vineyard, and also with the distribution of bivalve mollusks based on samples taken along the eastern coast of the US from Canada southward to Florida.

Fish food habits work consisted of various tasks. A major project, continued from last month, was the analysis of flatfish stomach content data. Summary listings of the data were prepared using six different options to express the information for each predator with regard to cruise, strata set, year, sex, etc. Ray Bowman continued work on the juvenile haddock data. A draft of the manuscript was completed and circulated among several people for comments. Ray is planning to prepare a poster on this work for display at the larval fish symposium. Preparations for the spring bottom trawl survey, all four legs, are complete. Jim Towns will be at sea from 28 March to 9 April, and Ray Bowman will be at sea during 12-26 April. Progress is being made on computer programs for data listing and analysis. Rich Langton and Wendell Hahm will be preparing a detailed schedule for this task.

## Fishery Oceanography Investigation

The Nantucket Shoals flux experiment mooring array was set in place in March as scheduled. This is a yearlong cooperative effort to measure the transport of water, heat, salt, and nutrients between Middle Atlantic Bight and the Gulf of Maine-Georges Bank region. Woods Hole Oceanographic Institution (WHOI), University of New Hampshire, US Geological Survey (USGS), and NEFC are cooperating. The array includes five subsurface current meter moorings, six

instrumented surface moorings, five surface marker floats without instruments, three subsurface pressure sensors, and one instrumented tripod, distributed at six locations on a line crossing the continental shelf south of Nantucket.

One mooring was set out by USGS in an early March R/V Oceanus cruise (No. 56). On the next Oceanus cruise (No. 57), Steve Ramp, Derek Sutton, and Red Wright went along to help set the equipment at the other five locations with John Vermersch of WHOI as chief scientist. Operations went smoothly despite bad weather, and expendable bathythermograph (XBT) and salinity-temperature-depth (STD) sections along the line of moorings were also obtained.

Notices of the mooring locations and characteristics have been sent to the US Coast Guard, the Northeast Regional Office for transmittal to foreign fishermen, and ICES, and one is being distributed to regional commercial fishermen by Ron Schultz.

In other field work, Steve Fogg and Tim Cain took part in the March MARMAP cruise on Delaware II.

Our AMF deck gear for communicating with subsurface releases was checked out by Gil Dering and loaned to Dr. John Milliman of WHOI for an (unsuccessful) attempt to locate and recover a deepsea mooring in the Mediterranean Sea.

Several important meetings took place during the month. Ron Schlitz and Gil Dering attended the Fifth STD/Ocean Systems Conference in San Diego, CA, where Ron chaired a session. Ron also gave a seminar on the larval Atlantic herring patch study at the SWFC in La Jolla, CA, and visited Texas A&M University and the SEFC's Panama City Laboratory on the way home to arrange for loan of a new telecommunications directional receiver to help track drogues in NEFC cruises later this spring and summer.

Dr. Ronald Trites and Dr. Daniel Ware of the Bedford Institute of Oceanography visited NEFC for 2 days to work on the special Atlantic herring patch study session of the Gulf of Maine workshop to be held in Halifax, NS, in May. The Fishery Oceanography Investigation will present five papers at the workshop, two of them in the special session.

Red Wright took part in a weeklong workshop at WHOI to prepare a final proposal to the International Decade of Ocean Exploration (IDOE) program through the National Science Foundation for a 3-yr study of biological, chemical, and physical processes in warm-core rings.

Tim Cain attended a meeting of the NEFC EEO Committee at the Milford Laboratory and was elected Presiding Officer.

Steve Fogg completed his Co-op quarter at NEFC and has returned to Northeastern University. Tom Laughton has taken his place.

### Ichthyoplankton Investigation

Because of a siege of bad weather, the winter survey on Delaware II fell short of meeting its objectives. To complete sampling on Georges Bank and the Gulf of Maine, Tom Morris, Bill Brennan, and Tom McKenney joined the scientific party on Albatross IV, which is currently conducting the spring bottom trawl survey in the western North Atlantic. Sand lance, Ammodytes spp., larvae dominated the ichthyoplankton throughout that part of the survey completed on Delaware II, which included shelf and slope waters of the entire Middle Atlantic Bight and the western third of Georges Bank. Reports from Albatross IV indicate that they are the numerically dominant larvae on the eastern half of Georges Bank as well.

Contributions to the ICES Early Life History of Fish Symposium at Woods Hole scheduled for the first week in April were completed. They include: an assessment of the Atlantic mackerel stocks based on egg production by Pete Berrien, Anne Naplin, and Mike Pennington; and poster presentations by Art Kendall and Dave Gordon, Cindy Obenchain, Anne Naplin, and Mike Fahay.

Wally Smith attended the weeklong Management Seminar sponsored by the US Department of Commerce in Gaithersburg, MD.

## Plankton Ecology Investigation

### Biostatistics

During March, all the 1978 MARMAP zooplankton data were loaded onto CALL files (editable files). About 50% of the editing was completed. Seven fish summaries (FISHSUM from the MARMAP Information System (MIS)) were produced for Dr. Stefan Grimm in Gdynia, Poland. Six fish summaries were produced for Greg Lough of the Woods Hole Laboratory. IOCS, Inc., finished the coding for the data extraction module (URUNREFM). Tests were run and several bugs corrected. Testing of the SYMVU package was completed, and production of SYMVU maps for Ammodytes spp. data was begun. The plots of data for the Bureau of Land Management (BLM) are nearing completion and should be finished in about 1 mo.

Severe disk storage and tape handling problems at the University of Rhode Island (URI) computer continue to plague us. The URI facility is set up to service academic functions and not the large-scale production functions that we need. The SYSCODES table of the MIS developed a glitch (apparently an undocumented limit on the number of code groups). This was resolved after some pain. A problem also developed with user passwords and all passwords were changed to improve system security.

A contract review meeting was held on 1 March. Personnel from IOCS, Inc.; General Services Administration; Atlantic Environmental Group; Narragansett Laboratory; and the Woods Hole Laboratory attended. Procedures and specifications for the remainder of the contract period were discussed, as well as accomplishments and problems encountered to date.

Julien Goulet met at the Woods Hole Laboratory on 6 March with Ecosystem Dynamics Investigation members to discuss problems in processing of ICNAF zooplankton data.

On 8 March, Julien Goulet met with Fishery Oceanography Investigation members at the Woods Hole Laboratory to discuss the status of MARMAP hydrographic data. Julien also met with George Heimerdinger of the National Oceanographic Data Center (NODC) to discuss data interfacing between the Narragansett Laboratory and NODC.

Cindy Jones met at the Woods Hole Laboratory on 22 March with Mike Pennington to discuss biostatistical analytic procedures.

Dr. Tilman Pommeranz (Kiel, Germany) and Dr. Antonio Dicenta visited the Biostatistics Unit for a briefing on the capabilities of the MIS and the advantages/disadvantages of using a data-base management system versus a unit-file processing system for relatively small volumes of data.

Doice Carrington, the General Services Administration contracting officer for the IOCS, Inc., contract, visited on 9 March and again on 23 March to discuss the interface between the Narragansett Laboratory and IOCS, Inc.

## Plankton Sorting

Sorting and identification of the invertebrate samples from the 1977-78 monitoring series have been completed with R/V Belogorsk Cruise No. 78-04. Future cruises will be processed by the Polish Sorting Center.

We are now working on the ichthyoplankton from neuston samples collected on R/V Argus Cruise No. 78-04. The Mid-Atlantic area samples have contained few fish with the exception of two stations where Ammodytes spp. numbered over 100. Several stations had large numbers of fish eggs (20,000+) tentatively identified as belonging to the family Scombridae.

## Larval Physiology and Biochemistry Investigation

Studies of the influence of activity on metabolic level of winter flounder larvae continued, but were slowed by technical problems with the respirometer equipment. Research on establishing daily mortality rates at different feeding levels and the estimation of hourly feeding rates of individual larvae continued. Further studies of the kinetics of the tetrazolium reduction method for measurement of respiratory electron transport system activity were conducted with winter flounder. The effects of Triton-x-100 concentration on the rates of both enzymatic and chemical reduction of the tetrazolium dye were also studied.

A major part of the month's work was devoted to organizing three written and oral presentations for the Symposium on the Early Life History of Fish in Woods Hole in April.

## Meetings, Talks, Visitors, Publicity

During the month of March, Danny O'Neil of the University of Rhode Island continued to measure shape and absolute size of preserved plankton specimens as viewed with a TV system. Using these measurements from actual specimens a set of classifying criteria will be developed.

On 7 March, a pattern recognition meeting was held at the Narragansett Laboratory to review pattern recognition's role in ecosystems research. Of primary concern was the development of a semiautomatic technique for aging fish from growth rings on scales and otoliths. Brad Brown and Judy Penttila expressed the needs of the Age and Growth Task within the Fishery Biology Investigation and reviewed proposals under consideration. Among those present were: Luther Bivins (NOAA), Dr. Alex Poularikas (URI), Dr. Vance McCullough (Raytheon, Inc.), Dr. Jack Suomala (MIT), and Dr. Perry Jeffries (URI).

Dr. Antonio Dicenta of Madrid, Spain, and Dr. Tilman Pommeranz of FRG, attendees of the Early Life History of Fish Symposium arrived early to review and discuss the ongoing ecosystems research at the Narragansett Laboratory. Of particular interest was the image scanning system and the data management system (MIS).

Ray Maurer prepared a poster for presentation at the Early Life History of Fish Symposium, highlighting results of studies on the trophodynamic relationships between larval fish communities and their zooplankton prey on Georges Bank. Results presented indicate a high degree of feeding overlap among co-occurring first-feeding Atlantic cod and haddock larvae. Over 800 larvae of nine important species were examined in this study.

All members of the Plankton Ecology Investigation helped prepare for the Early Life History of Fish Symposium, serving on various committees.

Bob Marak attended a LAMPEX meeting at the University of Delaware on 9 March. Plans were made for coordinating the overflights with sea-truth measurement of chlorophyll.

Dr. J. E. Beyer of Copenhagen, Denmark, visited the Narragansett Laboratory the last part of March while preparing a paper for the Early Life History of Fish Symposium to be coauthored with G. C. Laurence.

Kenneth Sherman attended the NEFC Board of Directors meeting at Oxford, MD; he attended a meeting of the Planning Group for the upcoming Symposium on the Use of Remote Sensing and Marine Ecosystems Studies on 12 March, and on 16 March he attended a meeting at New Bedford with Arthur Merrill to discuss staffing at the Narragansett Laboratory.

On 22 March, the Benthic Dynamics Investigation reviewed our MARMAP activities with Steven Forman and Archie Ginn of NOAA's Office of Program Evaluation and Budget.

During the month of March there has been a biweekly in-house seminar series presented by the House Committee at Narragansett Laboratory. Grayson Wood (AEG) is the seminar coordinator. The following seminars were conducted during March.

Colton, Jack - 9 March - Some Unanswered Questions Regarding the Early Life History of Fishes.

Buckley, Larry - 23 March - Changes in Protein, DNA, and RNA in Developing Cod and Winter Flounder Larvae.

#### Manuscripts

Howells, C., C. Karp, and R. Langton. Occurrence of a rare mantis shrimp, Platysquilla enodis (Manning, 1962), in the Middle Atlantic Bight Region. *Crustaceana*. (A).

Laurence, G. C. 1978. Larval length-weight relations for seven species of Northwest Atlantic fishes reared in the laboratory. *Fish. Bull.*, U.S., 76(4):890-895. (P)

Smigielski, A. S. 1978. Induced spawning and larval rearing of the yellowtail flounder, Limanda ferruginea. *Fish. Bull.*, U.S., 76(4): 931-936. (P)

Colton, J. B., W. G. Smith, A. W. Kendall, Jr., P. Berrien, and M. Fahay 1978. Principal spawning areas and times of marine fishes, Cape Sable to Cape Hatteras. *Fish. Bull.*, U.S., 76(4):911-915. (P)

Beyer, J. E., and G. C. Laurence. 1979. Modelling growth and mortality of larval herring, Clupea harengus. ICES/ELH Symp./M:6.

Laurence, G. C. 1979. Modelling, an esoteric or potentially utilitarian approach to understand larval fish dynamics? Chairman's overview talk for ICES Early Life History of Fish Symposium held in Woods Hole, MA, during 2-5 April.

Sherman, K., and G. Grice. 1979. ICES biological oceanography report.

## MANNED UNDERSEA RESEARCH AND TECHNOLOGY PROGRAM

Preparations are underway for five field programs beginning in May. Squid spawning-post spawning mortality; scallop dredge calibration; Ocean Pulse research at Jeffreys Ledge, Cashes Ledge, and Oceanographer Canyon; submarine canyon geology and ecology (Oceanographer and Hudson Canyons); and clam dredge calibration are the areas of research to be addressed.

Dick Cooper participated in several meetings with the NOAA Diving Safety Board and the NOAA Board of Inquiry (fatal diving accident last winter off New York) on changes in the NOAA diving program with regard to training, certification, administration, and funding. Cooper also presented a talk to the Man and the Sea Conference in Philadelphia, PA.

### DIVISION OF ENVIRONMENTAL ASSESSMENT

#### Behavior of Marine Fishes and Invertebrates Investigation

As part of the Investigation's cooperative research with Battelle, Pacific Northwest Laboratories, experiments are being conducted to investigate the effects of oiled sediments on the selection and use of shelters by the red hake. Shelter has been shown to be an important ecological factor in the life history of the red hake and may play a role in determining its distribution in the natural environment. Experimental design will permit the selection of oiled or clean sediment with or without shelters, thus permitting assessment of the role of shelter association in the avoidance of contaminated sediments and general distribution in the experimental tanks. Additional parameters will include 24-hr weathering of the Prudhoe Bay crude oil and test concentrations of 1,000 ppm. Experiments are now in progress using juvenile animals less than 16.0 cm in total length. Preliminary observations have indicated inactivity during the day and activity during the night so observations will be conducted over a 24-hr period for 5 days to determine possible variations in response to oiled sediments due to this day-night rhythmicity. Following the 5-day exposure, animals will be tested for any reduction in sensitivity to known concentrations of freeze-dried clam extract to measure feeding capability using experimental techniques previously established in this laboratory.

#### Biological Oceanography of Stressed Environments Investigation

During March, considerable effort was devoted to further planning and coordination of the Large Area Marine Productivity Experiment (LAMPEX) anticipated to occur in mid-April 1979. Twenty-three vessels and seventeen different institutions from Chesapeake Bay to the northern Gulf of Maine and Georges Bank are slated to participate. The National Aeronautics and Space Administration (NASA) Langley Research Center will overfly the area with two aircraft, a U-2 at 65,000 ft and a C-130 aircraft at 10,000 ft, to obtain remotely sensed data using cameras and multispectral and ocean color scanners. Additional information will be gleaned from the LANDSAT satellite during this same experiment. The NEFC is responsible for acquisition of sea truth to calibrate the remote sensors. The objective of the program is to test the feasibility, on a larger scale than ever before tested, of mapping via remote sensing chlorophyll a and total suspended solids distributed in the continental shelf waters off the northeastern US.

Analysis of the data obtained from the Ocean Pulse Program's Jeffreys Ledge-Pigeon Hill station concerning the effects of hypoxia upon echinoderms and subsequent changes in the O:N ratio has been completed and an informal report is in preparation. Computer analysis of the historic seabed oxygen consumption data to determine chemical oxygen consumption ratios by the sediment continues. These data will provide a biological-to-chemical oxygen consumption ratio and may prove of value in monitoring natural or man-induced changes in the seafloor environment. The placement of in situ incubators at the Ocean Pulse Program's surf clam station off Rockaway Beach, NY, was terminated due to unanticipated zero visibility on the bottom, and surface supplied equipment had not been assembled on the R/V Kyma. The object of the dive was to determine oxygen consumption ratios and O:N ratios for the surf clams inhabiting the site. An opaque, stringy, flocculent material was noted at about 4-6 m in depth where the visibility was approximately 1 m. This material was collected and targeted for microbiological analysis. Bottom temperature was 1°C.

Myra Cohn and Dr. Harold G. Marshall (the latter of Old Dominion University in Norfolk, VA) have received samples for phytoplankton analysis from cruises in October 1978, December 1978, and March 1979. The sample backlog is currently being examined to determine numbers and kinds of phytoplankton cells present at the various stations on these cruises. Subsequent samples will be provided from cruises scheduled in May, June-July, and September 1979. As part of the investigation, sample results are being prepared for ADP by Mrs. Cohn, with coding of names of organisms according to the NODC code being the first step. We will be able to obtain figures for the total number of individuals, total number of taxa, diversity index, relative abundance, equitability, species associations per station and per cruise, and changes from station to station or from date to date, enabling us to discuss overall community structure, seasonal changes and trends, and to coordinate these with other Ocean Pulse Program variables.

#### Coastal Ecosystems Investigation

Frank Steimle was assigned to coordinate NEFC's response to a possible spill of the pesticide MOCAP contained in the hold of a damaged freighter off the mouth of Chesapeake Bay. Bob Reid (6-9 March) and Dave Radosh (12-16 March) traveled to Norfolk, VA, to assist NOAA's Regional Response Team (RRT) in the study. Our early benthos sampling around the freighter disclosed no obvious effects of the MOCAP, which is extremely toxic to crustaceans. The MOCAP was later pumped into barges for disposal at Deepwater Dumpsite (DWD) 106. We had prepared to accompany a barge to DWD 106 to measure impacts of disposal there when the RRT decided to terminate the study. Frank Steimle assisted in diverting an Albatross IV cruise to monitor dumping of a bargeload of the MOCAP at DWD 106.

Bob Reid and Greg Parker again participated in AEG's study of currents at DWD 106, using radio-direction-finding equipment to track drogued buoys deployed at the dumpsite. Bob also furthered planning of the Ocean Pulse benthic monitoring program, and began establishing a committee of benthic ecologists to steer the Ocean Pulse studies. Frank Steimle worked on revising the Ocean Pulse planning document and on completing the second newsletter; he and Jan Caracciolo continued preparing a New York Bight benthic atlas and an assessment of dumping impacts to New York Bight apex benthos. Calorimetric analyses of selected species from the first two Ocean Pulse cruises were completed, and a list of the benthic species most important in fish food webs was compiled (in consultation with the Benthic Dynamics Investigation). Future Ocean Pulse benthic energetics studies will

concentrate on these species. Preparations were made for the April Ocean Pulse cruise aboard the R/V Advance II, and we began planning for the July cruise.

Ann Frame completed a second draft of a paper on new species of amphipods of the genus Acanthohaustorius from the New York Bight. Clyde MacKenzie analyzed benthic macrofauna samples from fished versus unfished ocean quahog beds, and continued preparation of an extensive paper on clam management.

Sukwoo Chang worked on a statistical manual for Ocean Pulse studies. Sukwoo also reviewed a Virginia Institute of Marine Science (VIMS) report to the BLM on the community structure and on the food habits of Middle Atlantic fishes.

### Environmental Chemistry Investigation

We began analyses for heavy metals in sediments collected during the September 1978 Ocean Pulse survey aboard the Albatross IV. Floor plans for the heavy metal analytical lab at the Sandy Hook Laboratory were drawn. The Perkin Elmer 5000 atomic absorption heavy metal analyzer was moved from the Milford Laboratory to the Sandy Hook Laboratory.

Thirty samples (striped bass, surf clam, sea scallop, blue mussel, plankton, sediment) from polluted and unpolluted areas were collected and sent to the National Analytical Facility for hydrocarbon analyses as part of our Marine Ecosystems Analysis Program (MESA) contract.

Calculations of nutrient concentrations were completed on samples collected during Advance II Cruise No. AD 77-01 and Albatross IV Cruise No. AL 77-05 which surveyed Georges Bank and the New York Bight. Progress continued on the construction of an ultraviolet (UV) digestion module which will be attached to the Technicon Autoanalyzer. The UV module will allow us to measure routinely organic nitrogen and phosphorus in seawater samples.

Members of the Environmental Chemistry Investigation participated in the February-March Marine Resources Monitoring, Assessment, and Prediction Program (MARMAP) survey aboard the Delaware II. Chlorophyll concentration was measured in approximately 1,700 samples of netplankton and nanoplankton. A contour map depicting the distribution of total chlorophyll concentration in coastal waters between Cape Hatteras and the Gulf of Maine was constructed.

Chlorophyll was most abundant (3-6 mg/m<sup>3</sup>) on the inner half of the shelf between New Jersey and Virginia, south of Cape Cod, and between Cape Cod and the shelf break. Phytoplankters greater than 20  $\mu$  (netplankton) were dominant over the smaller nanoplankton throughout most of the survey area. Primary productivity was measured at 22 stations (1,320 samples). The <sup>14</sup>C activity in these samples is presently being measured on the liquid scintillation counter.

Preparation continued for the joint NMFS/NASA LAMPEX experiment during 17-19 April. Twenty chlorophyll "field kits" were constructed. These will be used by participants in the LAMPEX experiment. J. O'Reilly and C. Evans met with P. Falkowski (Brookhaven National Laboratory) to intercalibrate nine fluorometers which will be used during the LAMPEX study.

Andrew Draxler presented a paper titled "Anaerobic Biochemical Processes During the 1976 Dysaerobia in the New York Bight" at the Middle Atlantic regional meeting of the American Chemical Society (ACS). A group from the ACS meeting visited the Sandy Hook Laboratory.

## Physiological Effects of Pollutant Stress Investigation

### Physioecology

Work with slipper limpets exposed to silver continued this month. The young adult pair (F<sub>1</sub> generation) exposed to 10 ppb of silver that had produced three broods prior to this reporting period, produced two more egg masses and released one of the egg masses. Three other paired young adults (F<sub>1</sub> generation) exposed to 10 ppb of silver have developed egg masses. One young juvenile pair exposed to silver at the 1-ppb level has produced eggs.

Oyster larvae respiration experiments were started up again. The use of microrespirometers to measure larval respiration has had mixed success. The most successful respirometer has worked on 4 out of 12 attempts, while another respirometer has not worked at all.

The 75-day copper exposure experiment, using Macoma sp. clams, was completed and the tissues of clams sampled periodically throughout the experiment are now being analyzed for copper uptake.

A 10-day experiment to determine the effect of silver on embryos and larvae of the American oyster under various salinity-temperature regimes was performed this month.

Some time was spent preparing posters for a presentation to be made by J. R. MacInnes at the Northeast Fish and Wildlife Conference to be held in Providence, RI, during 1-4 April.

Some blue mussels were collected from the field for future spawning studies in the laboratory.

A trip to East Matunuck Beach in Rhode Island was very successful in collecting surf clams. About 176 clams were collected. These clams will be our stock for the year.

The remainder of the month was spent in cleaning three proportional diluters that were used to expose winter flounder to lead as Pb(NO<sub>3</sub>)<sub>2</sub>.

Richard Greig, Chemist, was transferred from the Environmental Chemistry Investigation to this investigation effective 11 March. He will provide us with the necessary analytical support for our heavy-metal pollutant exposure research and will begin to refine and develop methodologies for pollutants in seawater, including heavy metals and organics. Sample analyses performed this month included the weekly monitoring of exposure diluters for silver and lead to determine proper diluter operation. We also took gill, liver, kidney, blood, and muscle samples from 180 winter flounder which had been exposed to lead for 60 days (see "Biochemical Effects") for uptake analyses.

### Physiological Effects

Gill-tissue oxygen consumption measurements and a variety of hematological tests were completed on 108 winter flounder exposed to lead. These fish were exposed to 0, 25, or 50 ppb of lead for 60 days prior to study (see "Biochemical Effects"). Preliminary results indicate a pronounced reduction in oxygen consumption after lead exposure. These findings will be related to biochemical studies and tissue-uptake measurements at a later date.

The recent break in cold weather has allowed us to replenish our rock crab supply and we are continuing with a study of effects of environmental variables on heart and gill-bailer activity. Arsenic, cadmium, and silver were tested this month at several different temperatures.

The winter Ocean Pulse cruise, conducted during this reporting period, was largely a failure due to bad weather and several ship mechanical problems.

We are now preparing to participate in a rescheduled cruise on the Advance II in April.

### Biochemical Effects

Biochemical testing for the past 2 mo has been primarily with tissues from the experimental series in which winter flounder were exposed to 50 ppb of lead (as nitrate) for 2 mo, with a subsequent 2-day holding period in low-salinity (17 ppt) seawater for half of the control fish and half of the 50-ppb Pb-exposed fish. No lead was added to the low-salinity tanks, permitting a 2-day "clearing" during the low-salinity stress. During each experimental take-down (three exposure series in all), the livers were excised, homogenized, and worked up immediately for testing delta-aminolevulinic acid dehydratase activity (ALAD), a liver enzyme specifically inhibited by exposure to lead. Acid supernates from each test series were assayed later each week for porphobilinogen (end-product) content. During the three take-down days, kidneys and heart were also excised, then frozen for later testing. Work is already in progress on the kidneys.

Prior to the three flounder lead and low salinity experimental exposures, bivalve (ocean quahogs, surf clams, and horse mussels) adductor muscles from earlier bottom trawl surveys, were analyzed as were the balance of sea scallop samples from Ocean Pulse cruises. Optimal protocols were worked out for several enzymes for these animals, as well as for American lobster and rock crab hearts.

### Anaerobic Bacteriology/Metabolism

Ocean Pulse activities included participation in the third, but shortened, cruise for sample collection of bottom sediments. Samples from the three stations were worked up in the laboratory. Clostridium perfringens, as well as some other still unidentified Clostridium types, were present in the sediments. No vibrios were detected with our methodology.

A third cooperative experiment at the SEFC's Charleston Laboratory was completed during 13-15 March. The purpose was to confirm previous results on the outgrowth potential of C. botulinum Type E in heated oysters.

Collaboration with a graduate student from the University of Bridgeport is continuing on the presence of C. perfringens in blue mussels from Long Island Sound.

### Meetings, Talks, Visitors, Publicity

On 7 March, Frank Steimle met with Reed Armstrong (AEG) to discuss dissolved oxygen monitoring plans in the New York Bight for 1979 and use of AEG's current drogues in the Ocean Pulse Program.

Christine Evans attended the LAMPEX planning meeting held at the University of Delaware on 9 March.

On Saturday, 17 March, Frank Steimle presented a paper on "Ongoing Environmental Assessment, Monitoring, and Research under the Ocean Pulse Program" at the 3rd Man and the Sea Symposium held at Temple University in Philadelphia, PA.

Frank Steimle also attended a meeting of the New York Bight Advisory Committee and EPA's Edison, NJ, laboratory to review the total monitoring and research effort (for anoxia) of all agencies in 1979.

Dr. F. Thurberg attended the NEFC IYABA Committee meeting at the Gloucester Laboratory on 20 March.

On 21 March, Frank Steimle met with Merton Ingham (AEG) and discussed new insights into the 1976 anoxia, ocean dumping at DWD 106, and use of current drogues as part of Ocean Pulse.

Dr. A. Calabrese attended a MESA Program Committee meeting on 23 March for the symposium on "Ecological Effects of Environmental Stress."

Frank Steimle visited the Advance II on 27 and 28 March in Wilmington, NC, to ascertain suitability of the vessel for Ocean Pulse work.

Christine Evans and Claire Steimle met with Dr. James Nagle of Drew University to establish a cooperative volunteer program.

Bori Olla presented a seminar at the School of Oceanography at Oregon State University on comparative aspects of the influence of temperature on the behavior of marine fishes.

On Tuesday, 6 March, Dr. John Pearce participated in an NEFC Consolidation Committee meeting at Narragansett.

On Friday, 9 March, Dr. Pearce met with personnel from the NASA Langley Research Center, University of Delaware, and NEFC to finalize operational plans for the NASA-NEFC LAMPEX project. Division personnel participating in this meeting included Dr. James Thomas, Ms. Christine Evans, and Mr. Craig Robertson.

During 13-15 March, Dr. Pearce participated in the working group meeting on oil spill responses sponsored by the International Council for the Exploration of the Sea (ICES) at Charlottenlund, Denmark. Representatives from 14 nations worked to finalize an oil spill response plan which would indicate the protocols to be followed in the event of a major oil spill. The protocols included pre-spill operations that are necessary to damage assessment following oil spills, as well as the immediate response necessary for damage assessment, mitigation, and information of use to on-scene coordinators. Finally, the working group considered long-term studies that are necessary to understand the effects of sudden, acute oil spills on living marine resources.

During 17-19 March, Dr. Pearce met with scientists at the Marine Biological Association of the United Kingdom (UK) and the National Environmental Research Center at Plymouth, England. Informal seminars and discussions were held in regard to ongoing environmental studies in the UK and US. Special attention was paid to current monitoring-type studies that are being conducted in Great Britain, as well as modeling studies of important estuarine and coastal waters such as the Bristol Channel.

On 20 March, Dr. Pearce participated in a 3-day ICES meeting on Effects of Sand and Gravel Extraction on Living Resources. The meeting was held at the Netherlands North Sea Directorate, The Hague. Scientists from nine nations discussed the possible effects of sand and gravel mining on important North Sea and Channel herring spawning grounds. Considerable discussion was given to extending the frame of references of this working group to include the impacts of dredging and spoiling. A comprehensive report is being completed and should be available in May.

During 26-28 March, Dr. Pearce participated in the NEFC Board of Directors meeting held at the Milford Laboratory.

## Manuscripts

- Mahoney, J. B., and F. W. Steimle, Jr. 1979. A mass mortality of marine animals associated with a bloom of Ceratium tripos in the New York Bight. Pages 225-230 in D. L. Taylor and H. H. Seliger, eds. Proc. 2nd Internat. Conf. Toxic Dinoflagellate Blooms. Elsevier-North Holland, Inc., New York. (P)
- Pearce, J., J. Caracciolo, R. Greig, D. Wenzloff, and F. Steimle, Jr. 1979. Benthic fauna and heavy metal burdens in marine organisms and sediments of a continental slope dumpsite off the Northeast Coast of the United States (Deepwater Dumpsite 106). *Ambio Spec. Rep. No. 6.* (P)
- Pearson, W. H., and B. L. Olla. 1979. Detection of naphthalene by the blue crab, Callinectes sapidus. *Estuaries* 2:64-65. (P)
- Winn, H. E., and B. L. Olla, eds. 1979. Behavior of marine animals: current perspectives in research. Vol. 3. Cetaceans. Plenum Publishing Corp., New York. (P)

## AQUACULTURE DIVISION

### Aquacultural Genetics Investigation

#### Experimental Breeding of Oysters

Sorting and measuring of the 1978 year-class oysters are completed. A total of 47,651 oysters were produced last year. These oysters comprise the F<sub>1</sub> generation of the mass selection experiments for rapid growth. There are 24,026 oysters in the high line, 20,000 oysters in the low line, and 6,341 oysters in the control line. These animals will be grown out for another summer before definite statements about relative growth rate can be made.

Crosses for family selection of meat weight are being made. During March, nine crosses in the high line, three crosses in the low line, and six crosses in the control line were made. Studies in larval selection for rapid growth are underway. Six crosses in the fast-setting line and ten crosses in the slow-setting line have been made.

Studies continued this month with interspecies hybrid crosses between the American oyster and the Japanese oyster C. gigas. Hybrid larvae have survived to the late umbo stage. C. gigas control larvae grew well and survived to metamorphosis. While the American and Japanese oysters did not exhibit obvious differences in appearance as larvae, recently metamorphosed animals, approximately 1 mm in length, appear to be showing a difference in the angle of shell growth along the hinge line. This difference might be used as an aid in species identification at this stage, and for later stages, should it persist.

#### Spawning and Rearing of Mollusks Investigation

Laboratory-ripened bay scallops were successfully spawned three times in March. Development to the larval stage was typical of late-winter spawns, averaging about 25%. Heavy mortalities of larvae were experienced at days 8-10 for the first two larval groups. This occurred despite the addition of an antibiotic, although some

observed bacterial swarming implicates a bacterial pathogen as the causative agent. In cooperation with the Larval Diseases of Mollusks Investigation, we have been using some additional water treatment and a declining concentration antibiotic strategy in our most recent bay scallop larval population. Results are not yet apparent.

Despite our larval problems we have produced a few hundred juvenile bay scallops and these are being used in an experiment to test the relative value of cultured algae or natural phytoplankton as the sole food source of these small animals.

Two tests using fluorometry to monitor the loss of chlorophyll as an approximation of cell consumption by larval scallops have been completed. These experiments are optimization tests for algal use. As a general result, larvae in the size categories tested grew better at low-to-medium cell concentrations (10,000 to 50,000 cells/ml) than at high concentration (100,000 cells/ml). This trend held for all larval densities tested, 1-10 larvae/ml.

Growth data from surf clams cultured under experimental conditions, were evaluated to determine the maximum rate of growth through various size ranges. From these data, a curve has been constructed that illustrates this maximum growth rate from egg to a potentially marketable size of 55 mm in length. Under optimal culture conditions, the curve predicts growth to market size in less than 8 mo. Growth from egg to 15 mm reflects rearing within the laboratory, utilizing cultured algae as a food source, and temperature increases. The remainder of the curve represents culture in a pumped raceway system that relies on ambient phytoplankton levels and temperature to support growth. This theoretical curve will be used for comparison in evaluating new culture methodologies for the surf clam.

#### Nutritional Requirements of Mollusks Investigation

Experimental work is now devoted largely to feeding studies in larvae of the American oyster. We are investigating the utilization of lyophilized Isochrysis galbana as a larval food. Experimental controls consist of: (1) feeding larvae axenic cultures of living I. galbana cells; and (2) feeding lyophilized filtered seawater particles. The addition of food to beakers with larvae was staggered into three intervals over the 8-hr daytime period, rather than as a single addition of food material. Freeze-dried particles were macerated by hand in a glass mortar and pestle then filtered through a 35-mesh Nitex screen, which resulted in more or less uniform particle size distribution. Larvae utilized in these studies had already attained a size of 119  $\mu$  by being fed live food for the first several days of development. By using larvae larger than the unfed straight-hinge veliger, it was hoped that the size of the mouth would not severely limit the utilization of many dried food particles larger than 3  $\mu$ . Experimental data of replicate experiments were consistent and the variation in size between duplicate samples was minimal. The growth of the larvae was followed over a 10-day period, together with observations on the uptake and utilization of the food. Larvae presented with dry salts displayed no growth during the experiment, although mortality was not excessive (average of 22%). Feeding with living materials resulted in a 97.3  $\mu$  size increase, while with dried algae, the increase was less than half as much, 36.8  $\mu$ . In experiments in which the dried algae were supplemented with a soluble nutrient source, vitamins and trace metals, the growth attained was not increased. Numerous aspects of this problem are of interest and remain to be investigated.

## Manuscripts

Babinchak, J., and R. Ukeles. 1979. Epifluorescence microscopy, a technique for the study of feeding in Crassostrea virginica veliger larvae. Mar. Biol. 51(1):69-76. (P)

## PATHOBIOLOGY DIVISION

### Comparative Shellfish Pathology Investigation

The rough draft was completed of "Diseases Caused by Viruses, Rickettsiae, Bacteria and Fungi," to be included in Biology of the Crustacea. During the writing of this chapter it became evident that bacterial disease of crustaceans is usually, if not always, stress-related. On the other hand, fungi are responsible for severe epizootics in natural populations of freshwater and marine crustaceans. Many of the causative fungi are at least partially adapted parasites and may exhibit marked host specificity. To date, diseases reported to occur in cultured crustaceans have been due to opportunistic pathogens (both bacterial and fungal) that could cause "epizootics" due to poor holding conditions and lack of knowledge of good holding practices. Such disease probably can be alleviated by establishment of good husbandry practices. Naturally adapted parasites, if introduced into culture systems, probably will prove more difficult to control. Further, non-endemic species of crustaceans introduced for use in aquaculture may bring their adapted parasites which might prove capable of causing fatal disease in native crustacean species that are not adapted to the parasite.

Mr. Austin Farley participated on a 2-wk cruise on the Anton Dohrn to collect tissues from mollusks and fishes for mutagenesis testing. Few mollusks were caught due to the type of gear used and the scarcity of squid at this time of the year, however, three stations in deep water near the Gulf Stream produced abundant numbers of Illex and Loligo. Squid, and livers of alewife, Atlantic cod, spiny dogfish, haddock, Atlantic herring, pollock, red hake, silver hake, summer flounder, winter flounder, and yellowtail flounder, as well as gonads from Atlantic cod, haddock, pollock, summer flounder, winter flounder, and yellowtail flounder were frozen for mutagenesis testing. Geographic, physical, and hydrographic data were recorded for each station and the resource assessment data also was obtained for future reference.

The recent dumping of the toxic chemical MOCAP near the mouth of Chesapeake Bay may have caused mortalities of planktonic organisms. Two staining methods for live/dead differentiation of zooplankton were tested in the laboratory to evaluate their usefulness in the field during critical situations, such as the MOCAP incident, or during routine studies, such as at DWD 106. Neutral red (vital stain) and aniline blue (mortal stain) were tested on live adult Palaemonetes and nauplii of Artemia. Both stains were tested on animals that were killed by immersion in 70% ethanol or 2% HCl solutions. Results of the neutral red staining were inconsistent with both Palaemonetes and Artemia. Live Palaemonetes did not stain at all with aniline blue, but HCl-killed specimens showed pale blue gills and deep blue staining in the oral region. These results were consistent only if specimens were refrigerated after fixation. Artemia nauplii, both live and killed, did not stain with aniline blue even after refrigeration.

In addition to modifying and testing a variety of special stains, the Histological Services Unit blocked 119 tissues, sectioned 430 blocks, and stained 488 slides from a variety of marine fishes, crustaceans, and mollusks.

#### Larval Diseases of Mollusks Investigation

Two cruises were conducted on the State of Connecticut's R/V Shellfish to sample the natural bacterial flora of shellfish beds located in Bridgeport, Milford, New Haven, Norwalk, and Stratford, CT. This is the initiation of a sampling project to isolate and identify natural bacterial pathogens of oyster larvae. Surface water, bottom water, and mud samples were taken and plated on isolation media. Isolates representative of the predominant bacterial flora then were used in oyster larval challenge experiments. This research will continue on a monthly basis for the next year.

Experiments on the toxicity of various fractions of a red pigment from a pathogenic Pseudomonas sp. are continuing. Attempts to isolate and identify a toxic metabolite isolated from a pathogenic Vibrio sp. also are continuing.

Studies on the development of techniques needed in examining immune responses in larval oysters are in progress. These include perfection and evaluation of an adequate iron-measurement system to detect ferritin uptake in phagocytes, testing of a technique for recovery of pure suspension of larval cells by enzymatic detachment of cells from collagen-treated surfaces, and analysis of the recovery of bacterial cell wall antigens by isoelectric focusing in polyacrylamide gels.

#### Microbial Ecology Investigation

Twenty-five rock crabs were collected from the New York Bight apex between Coney Island, NY, and Sandy Hook, NJ, in March 1979. The collection was made to obtain animals for heavy metal and pathology studies during the time of year that followed molting of adult males. Sixteen of the animals were papershells and nine were hardshells; all crabs ranged from 5.5 to 12.0 cm in carapace width. Previous studies by NEFC personnel showed that metal levels in sediments from the collection site were representative of "uncontaminated" offshore sediments, while within Sandy Hook and Raritan Bay, where molting occurred, copper in sediments ranged up to 1230 ppm, chromium to 260 ppm, lead to 985 ppm, and zinc to 815 ppm. Metal analyses of gills and hepatopancreas of the 25 crabs are planned in cooperation with Dick Greig of the Milford Laboratory to obtain new information on tissue levels as compared with ambient levels.

Additional cooperative work with the EPA's Annapolis, MD, field office is in progress to compare metal levels in rock crabs from sewage disposal sites 35 mi offshore from Maryland and Delaware. Data derived from heavy metal studies are to be tested statistically to evaluate correlations between metal concentrations, coliform-bacteria counts, sediment grain size, and black-gill color, with histopathology in rock crabs from impacted areas. The study as presently designed is being conducted on a small scale to determine if multiple parameter data will support definitive conclusions on the impact of environmental degradation on the health of benthic macroinvertebrates.

#### Fish Pathology Investigation

Two members of the Fish Pathology Investigation (Dr. Bodammer and Mr. Ziskowski) participated in a bottom trawl survey on the Anton Dohrn. The survey

began on 23 February and ended on 11 March. Random stations were sampled in strata from Georges Bank to the New York Bight. Our specific purpose on this survey was to obtain baseline data for the Ocean Pulse Program by documenting the frequency of external lesions and conducting postmortem examinations on selected western North Atlantic groundfishes.

During the 15-day cruise, 72 trawl stations were made and external observations made on 2,628 fishes. Internal examinations were made on 309 fishes. The fishes examined included Atlantic cod, haddock, Atlantic herring, Atlantic mackerel, pollock, red hake, winter flounder, and yellowtail flounder. The numbers of fish examined of each species are presented in Table 1. It is apparent that herring, haddock, yellowtail, and cod accounted for most of the fish examined.

With rare exception, all the external lesions observed are due to protozoan and metazoan parasites, although definitive diagnoses must await microscopic examination of sectioned tissues. Gill ectoparasites (cod and haddock) and melanized nodules (herring, mackerel, and pollock) in the integument, probably consisting of larval trematodes, were particularly abundant. Few fish were found with fin rot, lymphocystis, or pigmentation and skeletal anomalies. Pseudobranch lesions were noted in cod and haddock. Lesions were noted in internal organs but their causes will not be apparent until tissues are examined microscopically.

The Anton Dohrn provided an excellent laboratory for the conduct of careful external and internal postmortem examinations of fishes. The cruise covered an area which has been minimally impacted by man's activities and, therefore, should provide baseline data of some significance.

Table 1. Numbers of external and postmortem examinations of fishes collected on Anton Dohrn Cruise No. 79-01.

Species	No. of external examinations	No. of postmortem examinations
Atlantic cod	346	33
Haddock	504	56
Atlantic herring	899	60
Atlantic mackerel	109	30
Pollock	266	15
Red hake	98	15
Winter flounder	29	10
Yellowtail flounder	377	90
Total	2,628	309

#### Meetings, Talks, Visitors, Publicity

Dr. Rosenfield participated in the ICES Workshop on Monitoring Biological Effects of Pollution in the Sea. The Workshop was held during 26 February - 3 March at the Duke University Marine Laboratory at Beaufort, NC. Dr. Rosenfield and Dr. Murchelano attended the NEFC Board of Directors meeting which was held at the Milford Laboratory during 26-28 March.

Dr. Murchelano discussed implementation of a fish disease surveillance program with Resource Assessment Division staff at the Woods Hole Laboratory

on 13 and 14 March. He also presented a seminar on recognition of some diseases and anomalies of marine fishes.

Dr. Bodammer attended the IYABA meeting at the Gloucester Laboratory during 19-21 March.

Dr. Blogoslowski attended the course "Microprocessing Fundamentals," during 5-7 March in Hartford, CT.

Visitors to the Oxford Laboratory during the month of March included Dr. V. Dethlefsen of Cuxhaven of the FRG on 6 and 7 March, and Dr. B. Lubieniecki and Mr. M. Zawadski of the Sea Fisheries Institute in Gdynia, Poland, on 12 and 13 March.

The Congressional Underwater Explorers Group from Washington, DC, conducted an oyster assessment dive at Oxford, MD, on 31 March.

#### Manuscripts

Blogoslowski, W. J., M. E. Stewart, J. W. Hurst, Jr., and F. G. Kern III. Ozone detoxification of paralytic shellfish poison in the softshell clam (Mya arenaria). Toxicol. (A)

Brown, C. 1979. Shellfish hatcheries may benefit from using ultraviolet light. (Abstr.). NOAA Sci. Eng. News SEN-80. March 1979. (P)

Johnson, P. T., and C. A. Farley. A new enveloped helical virus from the crab, Callinectes sapidus. J. Invertebr. Pathol. (S)

Bovee, and T. K. Sawyer. 1979. Key to marine amoebae. (P)

Lewis, J., and T. K. Sawyer. Acanthamoeba tubiashi n. sp. Trans. Am. Microscop. Soc. (S)

#### RESOURCE UTILIZATION DIVISION

##### Fisheries Engineering Investigation

###### Sampling and Harvesting Gear Development

Work on the Rorqual has been progressing steadily and effectively. The entire engine has been put back together, and the electrical system and equipment are just about ready to go as well. There are a few small odds and ends (welding, antenna mounting, etc.) that will be completed this last week in March and barring any unforeseen events, everything will be ready to go on 1 April 1979.

Mike Corbett and Al Blott met with NEFC and Woods Hole Laboratory personnel and with the Sea Scallop Oversight Committee of the New England Fishery Management Council to determine the direction scallop gear research should take. As a result, we are in a crash program of refurbishing the Rorqual winch and deck equipment to handle an 8-ft New Bedford-style scallop drag. Planned for the month of May are a series of short cruises to study gear performance and gear-related scallop behavior. For direct observation, we will use divers with a hand-held color TV camera and a video recorder. Available literature indicates the drag may be only 10 - 20% efficient with gear-related mortality approaching

20%, meaning present gear could be killing a pound for every pound harvested. Further, in its present configuration, the gear is not significantly size selective when significant changes are made in the gear--for example, ring size increases from 4 inches to 5 inches diameter.

Al Blott assisted a small vessel out of Newburyport, MA, with the design of the deck and gear-handling equipment. This vessel will be test fishing our small beam trawl.

### Fisheries Engineering

The Rorqual and the Gloucester Laboratory will also participate in April in a joint NASA/NMFS LAMPEX project. The Rorqual will collect surface water samples for ground truth data while a C-130 and a U-2 simultaneously fly over and collect data. Judith Krzynowek is cooperating with us on this project by serving as chief scientist on the cruise and supervising all sampling procedures.

Tom Connors is in the process of writing a paper on the technical aspects of the minced flesh extruder for the application of chemical additives and antioxidants.

Dan Baker and Bob Van Twuyver assisted the Milford Laboratory with problems related to their laboratory seawater salinity-monitoring system and an emergency standby generator.

Dan also assisted a small processing plant by making air velocity measurements in their blast freezer and making recommendations for baffling to improve efficiency.

### Resource Development and Improvement Investigation

#### Quality Frozen Fish Fillets

Exploratory freezing-rate studies of fillets in aluminum trays over-wrapped with Saran or polyethylene have shown that in a carbon dioxide freezer tunnel, the fillets (approximately 1.5 lb per tray) were not completely frozen after 18 min in the tunnel. Air temperature was between  $-85^{\circ}$  and  $-90^{\circ}$  F in the tunnel. Along with studying the freezing rates, we have begun to get acquainted with the operation of the Hunter L colorimeter and Instron texture meter to follow the quality of frozen fish during storage. A trip to the US Army laboratory in Natick, MA, was made to speak with the people who are currently using these instruments to determine the fresh fish characteristics of various fish species. Although operation of these instruments is not complicated, sample preparation and prior handling could make a very large difference in results. In both instruments, the Natick people are still experimenting on the best way to introduce the sample fish to the machines.

Representatives from two packaging companies were contacted to write proposals for processing and storing US Grade A frozen fish.

#### New Product Development

At the US Army Natick, MA, laboratory, chipped fish from minced blocks was reformed and taste tested. The samples were prepared similarly to chipped beef and, as such, came out very rubbery. Work to improve the texture of the reformed minced fish is in progress.

### Industry Assistance

Several trips to a fish processor were made to help improve his operation. On the first trip, we measured the freezing rate of his product in his blast freezer. His product is packed in aluminum or paperboard trays, put into a master carton, and blast frozen. Our data show that his product is just barely frozen in 15 hr. With no holes to allow air through the master carton, it acts like an insulator. The results were shown to the processor and suggestions were made to improve the situation. Another experiment to help improve the freezing rate was also performed. In this experiment, the air flow around the master cartons was measured in various spots in the blast freezer. We found that the greatest flow of air was directed at a spot where no product was being held. An air-baffling system was suggested to direct the cold air to flow directly around the product. The processor agreed to install the baffles, and as soon as it is completed, a return trip is planned to recheck the air flow.

A sample of whole Texas shrimp, sent to us by a southern processor, was put through the Baader 696 meat/bone separator. The collected mince was dark red and unappealing. The quality of these shrimp was poor. If the shrimp were of better quality, the color would be much lighter. A frozen sample of the mince was sent back to Texas for evaluation.

### Thermal Processing of Flexible Pouches

Joe Mendelsohn and Kurt Wilhelm discussed thermal processing of flexible pouches with Dr. Gerald Schultz at the US Army laboratory in Natick, MA. Based on his experiences, he recommended several modifications of our process to better control the overriding pressure during the cool cycle. If the pressure in the retort drops, the bags will burst due to pressure within the bags.

Plans are being made for an industry demonstration and taste test of smoked salmon heat-processed in a retortable pouch. This is the only commercially available product heat-processed in a pouch.

### Northern Crab Processing

Mr. Steven Salamon and Mr. James McCanna of Warren, RI, delivered to the Gloucester Laboratory 100 hardshell and 100 softshell rock crabs which they had captured in Narragansett Bay on 6 March 1979.

Usually, when crabs are captured, there is a mixture of hard and soft crabs. By dividing the catch according to whether the crabs had recently molted, the crab meat extracted from two extremely different periods in the crab's life cycle can be compared.

The machine used for meat extraction was the Baader 696. The diameter of the holes in the perforated drum was 1.2 mm. To avoid possible damage to the belt and clogging of the holes in the perforated drum by shell particles, the claws of the hardshell crabs were not processed.

The crabs were cooked in boiling water for 10 min, not including the 8 min it took for the water to return to a boil after immersion of the crabs. After being cooked and cooled, the crabs were butchered on the Key crab-butchering apparatus, and the claws were separated from the body sections.

Yields of meat are shown in Table 2 below. During butchering, 49% of the after-cooking weight was lost from the more watery softshell crabs; the

waste from hardshell crabs was 36%. The yield from hardshell crab body sections was 26%; and from the softshell body sections, 19% of the live weight was recovered as minced crab meat. The recovery from the softshell claws was 7% of the live weight or 50% of the claw weight.

The meat recovered from the hardshell crab was grayish-white, dry, and had a cardboard-like taste. The texture was also moderately gritty. The meat from the softshell crabs was pink colored and had a sweet crab-like flavor. The meat was more watery, but not excessively so.

Table 2. Meat yields of hardshell and softshell rock crabs with a meat/bone separator.

Category	Percent of live weight	
	Hardshell <sup>(a)</sup>	Softshell <sup>(b)</sup>
Cooking loss	7	4
Butcher partitioning <sup>(c)</sup>		
Bodies and legs	45	37
Claws	19	14
Waste	36	49
Recovered meat		
Bodies and legs <sup>(d)</sup>	26	19
Claws <sup>(e)</sup>	-	7

(a) 0.54 lb average weight.

(b) 0.49 lb average weight.

(c) Equilibrated to 100%, or percent of after-cooking weight.

(d) 58 and 51% of body weight for hard and soft crabs, respectively.

(e) 50% of claw weight for soft crabs.

### Blue Crabs

A taste test was conducted on pasteurized, roller-extracted, and commercially picked blue crab meat stored at 34°F for 6 mo. The results show that the roller-extracted pasteurized meats were significantly superior to the commercially picked controls in appearance, odor, flavor, and texture. This test completes storage study No. 2 on pasteurized roller-extracted blue crab meat. Throughout the 6-mo study, the roller-extracted meats were significantly superior to the controls in all categories of appearance, odor, flavor, and texture. This experiment is to be repeated.

## Product Quality, Safety, and Standards Investigation

### Product Quality

Whiting blocks prepared from fillets processed by the Arenco SFA-4 filleting machine were still acceptable in flavor and texture after 3 mo of storage in 0°F. Normally skinned fillets were rated comparable to saberized (de-fatted) fillets. Antioxidant treatment or vacuum packaging have not improved flavor scores compared to control samples. A significant increase in dimethylamine and decrease in extractable protein nitrogen indicate that textural deterioration is beginning to occur.

Cownose ray still had a high degree of acceptability (good - very good) after 30 wk of storage at 0°F. The ammonia content has increased significantly, and the extractable protein nitrogen has decreased; however, these chemical changes have not affected the flavor or texture scores thus far.

As part of a cooperative study with the University of Massachusetts (Amherst) on frozen storage characteristics of red hake fillets, fish sticks were prepared from stored blocks (0°F) for analysis.

Professor Joe Regenstine of Cornell University and Professor Herb Hultin of the University of Massachusetts met with Joe Licciardello to formulate a comprehensive cooperative research program designed to study and, hopefully, solve the frozen red hake texture problem. The research proposal is being evaluated by the New England Fisheries Development Program.

Plans are well underway for a collaborative study of the species identification - isoelectric focusing method. Thus far, we have six collaborating laboratories and are awaiting replies from six-to-eight more. LKB Instruments Co. has obtained a supply of PAGplate isoelectric focusing gels from their parent company in Sweden and will provide them free of charge to collaborators. LKB has also been helpful in locating potential collaborators from several states who have the equipment and expertise to participate in the study.

Some progress has been made on gas liquid chromatography (GLC) method for simultaneous analysis of methylamines. A good separation of monomethylamine, dimethylamine, and trimethylamine was achieved on a 6-ft x 2-mm (I.D) glass column packed with Chromosorb 103. A direct extraction of the amines from neutralizing perchloric acid extracts of fish by n-amyl alcohol has worked very well. Since non-nitrogen containing co-extracted compounds are not detected using our nitrogen-phosphorus selective flame ionization detector, we can avoid the cumbersome steam distillation procedure normally used in the GLC analysis of amines.

Ron Lundstrom met with Drs. George Ridgway, Brad Brown, Emory Anderson, and others from the Woods Hole Laboratory to discuss the results of the isoelectric focusing analysis of silver hake populations. Although no differences were noted in soluble proteins from muscle or liver, there were a number of eye fluid samples that showed five additional bands with basic isoelectric points. Our small sampling program indicated that these extra bands were found in 40% of the Southern New England samples, 40% of the Georges Bank samples, and 9% of the Gulf of Maine samples. These samples will be reexamined using histochemical staining techniques for specific enzymes combined with isoelectric focusing to determine the nature of these differences.

#### Product Safety

Workup of retail samples of smoked kippered salmon, sablefish, and salted cod have been completed. A sample of smoked salmon fortified at the 1, 2, and 5-ppb levels with 14 N-nitrosamines has been worked up along with a control and analyzed by GLC. Fortified samples of sablefish (2 and 5 ppb) along with a control were given to Dr. Moreau of Biomeasure for confirmation analysis by gas chromatography-mass spectrometry.

A report on the determination of volatile N-nitrosamines in fish extracts by gas chromatography-mass spectrometry was given to Don Gadbois and Dr. Spohn of the Food and Drug Administration (FDA) for review. It is now possible to confirm individual N-nitrosamines by gas chromatography-mass spectrometry at the 5-ppb level in fish extracts to satisfy the stringent guidelines of FDA.

As little as 40 pg of material on the gas chromatograph column is needed for mass spectrometry detection. Selective ion monitoring of certain ions having previously been determined from the mass spectrum of each N-nitrosamine is the technique being used along with high resolution gas chromatography. A 50-m x 0.01-inch glass capillary column is being used to separate interfering compounds from N-nitrosamines.

Extracurricular time is being spent on reading reprints from the literature survey of nitrosamines and polychlorinated biphenyls.

An all-glass inlet splitter has been installed in the Perkin-Elmer 910 gas chromatograph along with a 25-m x 0.01-inch glass capillary column. Work will be done to optimize this system and achieve high efficiency separation of fish extracts.

The Sigma 10 has been repaired and is now operating normally.

#### Product Standardization

The proposed frozen minced fish block standard has been forwarded to the FDA for their review and comments before being submitted to the Federal Register for final publication. The FDA had several comments on the proposed rulemaking which have been resolved. The proposed revisions of the fried scallop standard and the unified fillet standard have been forwarded to the NMFS General Counsel for review before publication.

This month's Codex (international standards development) activity includes preparation of US comments for the proposed standards and codes of practice to be presented at the 13th Session of the Committee on Fish and Fishery Products in May.

We continue to participate in the comparative edibility study at the US Army's North American Research and Development Command (NARADCOM) in Natick, MA. This month we were able to provide a greater variety of fresh fish samples, thanks to improving weather conditions. We also discussed this study with NARADCOM's newly appointed consultants from the University of Massachusetts.

#### Technical Assistance

Division personnel provided information and technical assistance this month in the following areas: herring industry; shipboard sanitation; aquaculture-related projects; eels; oyster culture in Maine; rapid salting of fish; safety films; how to use underutilized species; health certificates for US exports of seafoods; the international conference to celebrate the 50th anniversary of the Torry Research Station; processing and handling of squid; availability of seafood products for a school-feeding program in Trinidad; determination of seafood content in coated products and in products whose "fish core" is not 100% seafood; underutilized species and the USDC Inspection Program; the occurrence of rigor in fish; Maryland bay scallops; blocks prepared from large napes; chilled seawater; Scottish seining; fish trap design; purse seining, handling and processing whiting and preparing new products; fish processing equipment; processing fish and the use of fish protein isolate in fish products; squid harvesting and handling; squid cleaning and cutting; skinning squid using enzymes; holding squid in chilled seawater; harvesting squid and the feasibility of marketing frozen breaded squid; fishing gear used in the squid fishery; sturgeons; incidence and significance of "codworms" (nematodes) in cod flesh; illustrations of three species of fish for a skilled wood carver; age of certain fish; commercial utilization

of skates; marine algae; aquaculture in Egypt; how to make fish roe products; ocean pout; imports of scallops from Indonesia; and where to inquire for attending short courses in radiological studies.

#### Meetings, Talks, Visitors, Publicity

Fred King discussed underutilized species and showed NMFS's new film strip "The Sleeping Giant" at the 22 March meeting of the New England Fisheries Institute.

Fred King attended a seminar on food labeling on 1 March in Laurel, MD. Representatives from FDA, Federal Trade Commission (FTC), and USDA summarized the recent series of public hearings on this subject.

John Ryan and Joe Carver attended a meeting of the Armed Forces Product Evaluation Committee (AFPEC) held on 8 March at NARADCOM. Canned salmon was among the items reviewed.

John Ryan presented a lecture on "Nutrition and Inspection of Seafoods" at the Gloucester Museum in Gloucester, MA. About 40 persons, students in the Dogtown College course on the fishing industry in Gloucester, attended the class.

John Ryan and Fred King participated in a workshop on standardization during 27 February-1 March in Washington, DC. It was sponsored by the Seafood Quality and Inspection Division. Representatives from USDA, DOD, FDA, Sea Grant, National Fisheries Institute (NFI), and National Food Processors Association (NFPA) also participated. It was an informative meeting and our group will be part of a task force preparing a paper on the role of the standardization program to be submitted to Tom Billy.

Perry Lane attended a reception and a meeting sponsored by the Gloucester Fishermens Wives Association for Lucy Sloan of the National Federation of Fishermen (NFF). The role of the NFF and fishing industry problems were the subjects for discussion.

Perry Lane attended a monthly meeting of the New England Fisheries Steering Committee and an evening meeting for members of the New England Aquarium.

Joe Mendelsohn attended the New England Fisheries Institute meeting where the slide show on underutilized fish species was presented.

The Gloucester Laboratory hosted an IYABA meeting.

John Kaylor attended a meeting in Washington, DC, this week to discuss the Pacific hake versus whiting controversy with Maynard Steinberg, Tom Billy, and Jim Brooker. A final NMFS position statement will be made to FDA before the deadline of 2 April.

Don Gadbois attended an interagency meeting between FDA and NMFS on 21 March in Washington, DC, to discuss the nitrosamine data in the whitefish petition and the GC-TEA and HPLC-TEA reports from the Thermo Electron Corp. From this meeting, it was determined that FDA is satisfied with the nitrosamine data. The petition will now be submitted to FDA and will be held in abeyance until a decision is reached on the nitrite controversy.

Don Gadbois also met with Tom Billy and John Emerson of the Washington Office to discuss what work is necessary to bring the nitrosamine work to an end. Some of this day was spent with Vern Kamps of the FDA laboratory discussing the Association of Official Analytical Chemists (AOAC) methodology for polychlorinated biphenyls.

Mike Allsup presented a seminar at the Gloucester Laboratory on his recent participation in the Polish krill expedition in Antarctica.

Perry Lane presented a 3-hr class on "Fisheries of the Northeast" and "Laboratory Research" as part of a course on fisheries technology given by Salem State College.

Mr. Richard Pritchard of the Morton Salt Company visited the Gloucester Laboratory to discuss sanitizing systems for use in the fishing industry.

Ms. Elizabeth Glayter, a Maine resident, visited the Gloucester Laboratory for information on the life cycle and habits of eels.

Judi Krzynowek and Kate Wiggin attended a course in electrophoresis of lipoproteins.

## NATIONAL SYSTEMATICS LABORATORY

### Benthic Fishes Investigation

A manuscript was completed clarifying the taxonomic status of two species of the gadiform family Moridae in the western North Pacific. Completed was a first draft of a revision of toadfishes of the genus Batrachoides.

### Pelagic Fishes Investigation

Research continued on the anatomy and taxonomy of the Spanish mackerel genus Scomberomorus.

### Shrimps Investigation

Studies were conducted on the variation in the ampho-Atlantic species Parapenaeus longirostris, the most important commercial shrimp in the Mediterranean. Continued also was research on the taxonomy of American Pacific Sicyonia.

### Crabs Investigation

A description was completed of a new species from Barbados, which represents a previously unknown family and genus. Work continued on a revision of the genus Latreillia.

### Meetings, Talks, Visitors, Publicity

Cohen attended a meeting at the National Academy of Sciences to discuss the final report of the Academy's oceanography delegation to the People's Republic of China. He also met at the National Science Foundation with a group to discuss future plans for work on the East Pacific thermal vent area.

Visitors included: K. Sulak of the Virginia Institute of Marine Science; C. E. Dawson of the Gulf Coast Research Laboratory; R. K. Johnson of the Field Museum of Natural History; K. Able of Rutgers University; F. Berry of the SEFC; E. Migliazza of Cornell University; M. Youngbluth of the Smithsonian Institution's Fort Pierce Bureau. Dr. Osamu Okamura of the University of Kochi arrived for a visit of several months studying macrourid fishes.

### Manuscripts

Collette, B. B. 1979. Adaptation and systematics of the mackerels and tunas. Pages 7-39 in G. Sharp, ed. The physiological ecology of tunas. Academic Press. (P)

Robins, C. R., D. M. Cohen, and C. H. Robins. The eels, Anguilla and Histiobranchus, photographed on the floor of the deep Atlantic in the Bahamas. Bull. Mar. Sci. (A)

## ATLANTIC ENVIRONMENTAL GROUP

### Ocean Monitoring and Climatology Investigation

Six XBT transects were obtained by the cooperative Ship of Opportunity Program during March, one in the Gulf of Maine, one across the Southern New England Shelf along the 71°W meridian, two across the shelf and slope off New York, and two in the Gulf of Mexico.

Continuous plankton recorder (CPR) transects were obtained from ships of opportunity in the Gulf of Maine, the shelf and slope off New York, and northeastward from Chesapeake Bay. Also, for the first time, a successful tow was made along a transect from Rhode Island Sound to the Baltimore Canyon area from a drilling supply vessel operating out of Quonset Point, RI. It is hoped that this transect will be occupied on a regular, monthly basis. The Gulf of Maine and Baltimore Canyon tows also successfully utilized temperature recorders mounted in the CPR's, yielding a continuous trace of water temperature at a 10-m depth.

The pronounced offshore extension of cold shelf water that occurred off the New England and Middle Atlantic Coasts in January and February subsided during March. Numerical plots of infrared data from the GOES-1 satellite for late March showed the offshore limit of shelf water at the surface (10°C isotherm) to be only about 10-40 nautical miles (nm) beyond the 200-m isobath south of Georges Bank. However, east of Delaware and northern Virginia the shelf water still extended up to 90 nm offshore of the 200-m isobath.

### Ocean Dumping Investigation

On 7 March 1979, six free-drifting radio direction finding (RDF) buoys were released at 38°51'N latitude and 72°15'W longitude by the USCGC Unimak. Three pairs of buoys were drogued at depths of 5, 10, and 30 m. Four XBT stations were conducted at and near the release point. All six buoys were located by RDF stations at Sandy Hook, NJ, and Cape Henlopen, DE. Large westward velocities were indicated based on initial bearings taken by both receiving stations. Buoy insertion points, data collection equipment, and handling are all presently under scrutiny to discover the reason for the apparently erroneous velocities. The experiment was terminated on 18 March. Wind data, both observed and inferred, will be analyzed and correlated with the buoy drifts and reported on in the future.

Final preparations are underway for the 16-25 April cruise to Deepwater Dumpsite 106 aboard the R/V Mt. Mitchell.

### Meetings, Talks, Visitors, Publicity

John Hartley traveled to Norfolk, VA, on 1 March to pick up data and a continuous plankton recorder.

Reed Armstrong and John Hartley visited the Sandy Hook Laboratory on 7 March to discuss the operation of the Radio Direction Finding System for tracking drifting buoys.

During 13-15 March, Jim Bisagni traveled to the Fifth Annual STD-Ocean Systems Conference and Workshop sponsored by Grundy Environmental Systems (formerly Plessey Environmental Systems) in San Diego, CA.

On 16 March, Steve Cook, Melissa Hughes, and Kathy Langone went to Portland, ME, to meet the Marine Evangeline. Steve calibrated the equipment and trained Melissa and Kathy to collect XBT data, which they successfully accomplished the following day.

On 21 March, Mert Ingham presented a seminar at the Sandy Hook Laboratory on environmental data available for fisheries climatology studies.

Jack Jossi met with the staff of the Fisheries Assessment Division, NMFS headquarters, on 21 March to discuss FY 79 funding for the undulating oceanographic recorder.

On 22 March, Jack Jossi visited the EDIS National Climatic Center (NCC) in Asheville, NC, to become acquainted with data availability and discuss options for AEG/NCC product generation.

On 23 March, Jim Bisagni and John Hartley met with Dr. John Boothroyd and Mr. Curtis Schmidt from the University of Rhode Island Department of Geology to discuss equipment and procedures to be used during the joint EPA-NOAA cruise to the Philadelphia sewage sludge dumpsite during 4-12 April.

From 26 to 29 March, Mert Ingham attended an NEFC Board of Directors meeting at the Milford Laboratory.

On 26 March, Jack Jossi met with Fisheries Division staff at the Virginia Institute of Marine Science (VIMS) to discuss the current AEG/VIMS contract for CPR collections and analysis.

Dick Parrish of the Pacific Environmental Group visited AEG on 29 and 30 March.

#### Manuscripts

Armstrong, R. S. Environmental assessment of an active oil field in the northwestern Gulf of Mexico. Current patterns and hydrography. Final report. (S)

Bisagni, J. J. July 1977 physical oceanographic studies at Deepwater Dumpsite 106. Deepwater Dumpsite 106 Assess. Rep. (S)

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

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

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

Ingham, M. C. In Press. Marine environmental conditions off the coast of the United States, Jan. 1977 - March 1978. Mar. Fish. Rev. 41:5. (A)

Jossi, J. W., and R. R. Marak. MARMAP survey manual. Contribution to NOAA Fisheries Technology Shipboard Manual. 43 p. (S)

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

Mizenko, D., and J. L. Chamberlin. Gulf Stream anticyclonic eddies and shelf water at Deepwater Dumpsite 106 during 1977. Deepwater Dumpsite 106 Assess. Rep. (S)

Murray, T. E. A summary of waste inputs to Deepwater Dumpsite 106 during 1976 and 1977. Deepwater Dumpsite 106 Assess. Rep. (S)