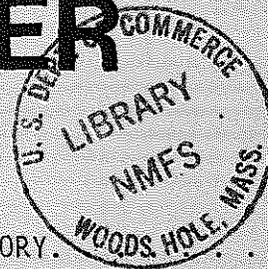




NORTHEAST FISHERIES CENTER

NEWSLETTER

NOVEMBER-DECEMBER 1981



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



NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
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A LOOK AT NMFS's
NATIONAL SYSTEMATICS LABORATORY

by

Bruce B. Collette, Acting Laboratory Director
National Systematics Laboratory

INTRODUCTION

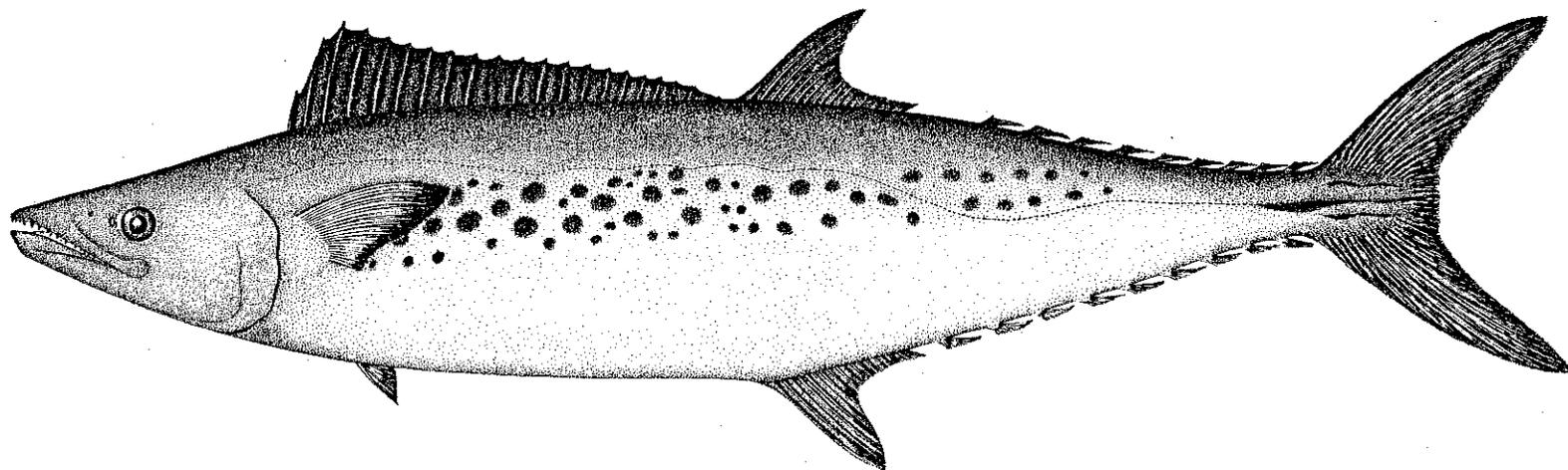
Systematics is basic to most other biological research. Without proper identification and classification, it is virtually impossible to study other species characteristics or to manage important biological resources.

The primary function of the National Systematics Laboratory--located within the National Museum of Natural History in Washington, D.C.--is to study the systematics of marine fishes and crustaceans of economic or ecological significance. Our major efforts deal with describing morphology and anatomy, measuring variation, and comparing samples. The resulting information permits us to define and distinguish the species and other taxonomic categories, and to classify them according to perceived evolutionary relationships. Other efforts deal with naming new species, preparing faunal guides, describing faunal diversity, charting geographic and bathymetric distributions, and analyzing the function of anatomical structures.

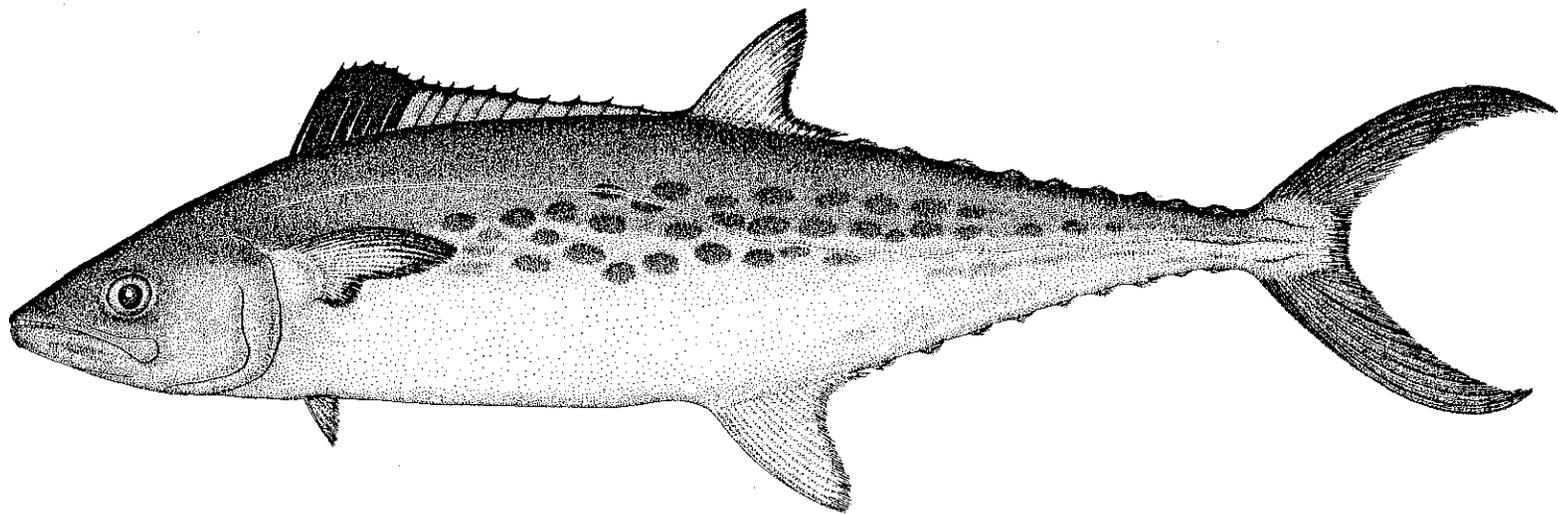
The four objectives of the Laboratory are to:

- (1) Prepare taxonomic revisions that are sufficiently comprehensive to aid biologists in making identifications and conducting ecological studies. Along with this, study anatomy for classifying species.
- (2) Conduct studies on faunal systematics by integrating new findings with existing knowledge.
- (3) Participate actively in preparing regional field guides such as the continuing series, Species Identification Sheets for Fishery Purposes, published by the United Nations' Food and Agriculture Organization (FAO), and the various checklists sponsored by the United Nations' Educational, Scientific, and Cultural Organization.
- (4) Provide, upon request, specialized information for NMFS, other federal and state agencies, private industry, academic institutions, and the general public.

For the last decade, four investigations--each with one scientist having prime responsibility--have comprised the Laboratory's research program: Pelagic Fishes (Dr. Bruce B. Collette), Benthic Fishes (Dr. Daniel M. Cohen), Penaeoid Shrimps (Dr. Isabel C. Canet), and Crabs and Other Decapod Crustaceans (Dr. Austin B. Williams).



a



b

-2-

Two species of Spanish mackerels discovered by National Systematics Laboratory scientists
(a. = Scomberomorus munroi; b. = Scomberomorus brasiliensis).

PELAGIC FISHES

Pelagic fishes live in the highly productive surface layer of the ocean where species tend to grow large, range widely, and be extremely important to man. Our studies particularly emphasize the anatomy and systematics of scombroids, the group that includes the tunas, Spanish mackerels, bonitos, and mackerels. Although many of the scombroid species have been known for a long time and much has been written about them, detailed anatomical descriptions and comparisons are few, incorrect scientific names are often used, geographical ranges for many are not precisely delimited, and poorly documented classifications are current.

Dr. Collette and colleagues have addressed such problems for the giant tunas and bonitos found around the world through a series of monographs and papers (see Fishery Bulletin, 1964 and 1975). They are now studying the Spanish mackerels (Scomberomorus spp.). A stable nomenclature is particularly needed for this latter group of fishes, as it constitutes an important recreational and commercial fishery resource in the southeastern United States and other parts of the world. Six years of research on this genus have led to establishing the number of valid species as 18, including two which were previously unrecognized, S. brasiliensis from the Atlantic coast of Central and South America, and S. munroi from Papua New Guinea and northern Australia.

To make the findings of our scombroid studies more useful to more people, we have written the sections on Scombridae for the FAO's Species Identification Sheets for Fishery Purposes for the western Central Atlantic, eastern Central Atlantic, eastern Indian Ocean/western Central Pacific, and western Indian Ocean. In response to a request from the Southeast Fisheries Center, we prepared a field guide to the tunas, billfishes, and other species taken by pelagic longline in the western Atlantic. (see NOAA Technical Report, NMFS Circular 435.) This guide facilitates rapid and accurate identification of fishes taken during longline operations by foreign fishing vessels operating within the U.S. Fishery Conservation Zone.

We also study the halfbeaks (family Hemiramphidae) and needlefishes (family Belontiidae), abundant fishes which are important prey for larger commercially and recreationally important species, and which, themselves, are locally important as food and bait. Monographs on these two families are being prepared for the series, Fishes of the Western North Atlantic.

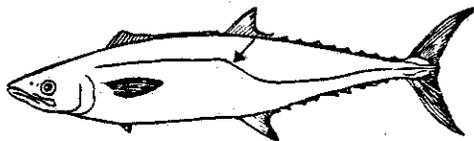
BENTHIC FISHES

The commercial fishing industry has two remaining frontiers--the outer continental shelf and deeper waters. Industry has exploited much of the former habitat, but the latter habitat (continental slope, basins, and trenches) remains virtually untouched. The fishes of these habitats, particularly the latter, appear to have a low reproductive potential. Thus, basic biological information, beginning with systematics, will be needed before significant fishing starts.

Our studies have dealt with the classification and biology of fishes from these outer continental shelf and deeper water habitats, emphasizing the important gadiforms, or codfishes, many species of which are abundant in deep water and which, along with the ophidioids, or cusk eels and their relatives (also being studied), dominate the fish fauna of the continental slope. Monographs on these fishes are also being prepared for the series, Fishes of the Western North Atlantic.

KEY TO THE SPECIES OF SCOMBEROMORUS OCCURRING IN THE AREA

Lateral line abruptly curving downward below second dorsal fin; sides a uniform silver gray in adults; no more than 10 total gill rakers on first arch.

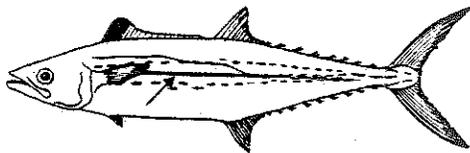


Scomberomorus cavalla
King mackerel

Lateral line gradually curving downward toward caudal keel; yellow spots or dark streaks on sides; usually 10 or more gill rakers on first arch.

Yellow to bronze spots, no streaks or lines, on sides; maxilla extends to a point under or posterior to the fleshy margin of the orbit; pectoral fin scaly only at base.

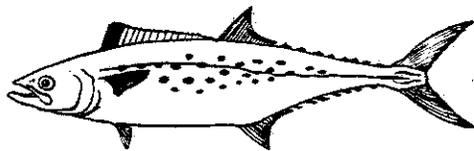
Yellow to bronze spots above and below a mid-lateral row of streaks or lines of variable length; maxilla extends to a point at or between the posterior margin of the pupil and fleshy orbit; pectoral fin covered with scales.



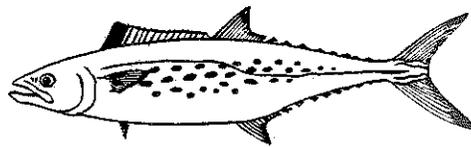
Scomberomorus regalis
Cero

Found in waters off the Atlantic coast of the U. S. and in the Gulf of Mexico; total vertebrae 50 to 53.

Found in waters off the Caribbean coast of Central America and off the Atlantic coast of South America; total vertebrae 47 to 49.



Scomberomorus maculatus
Spanish mackerel



Scomberomorus brasiliensis
Serra spanish mackerel

Key to species of Spanish mackerels (genus Scomberomorus) in the western Atlantic.

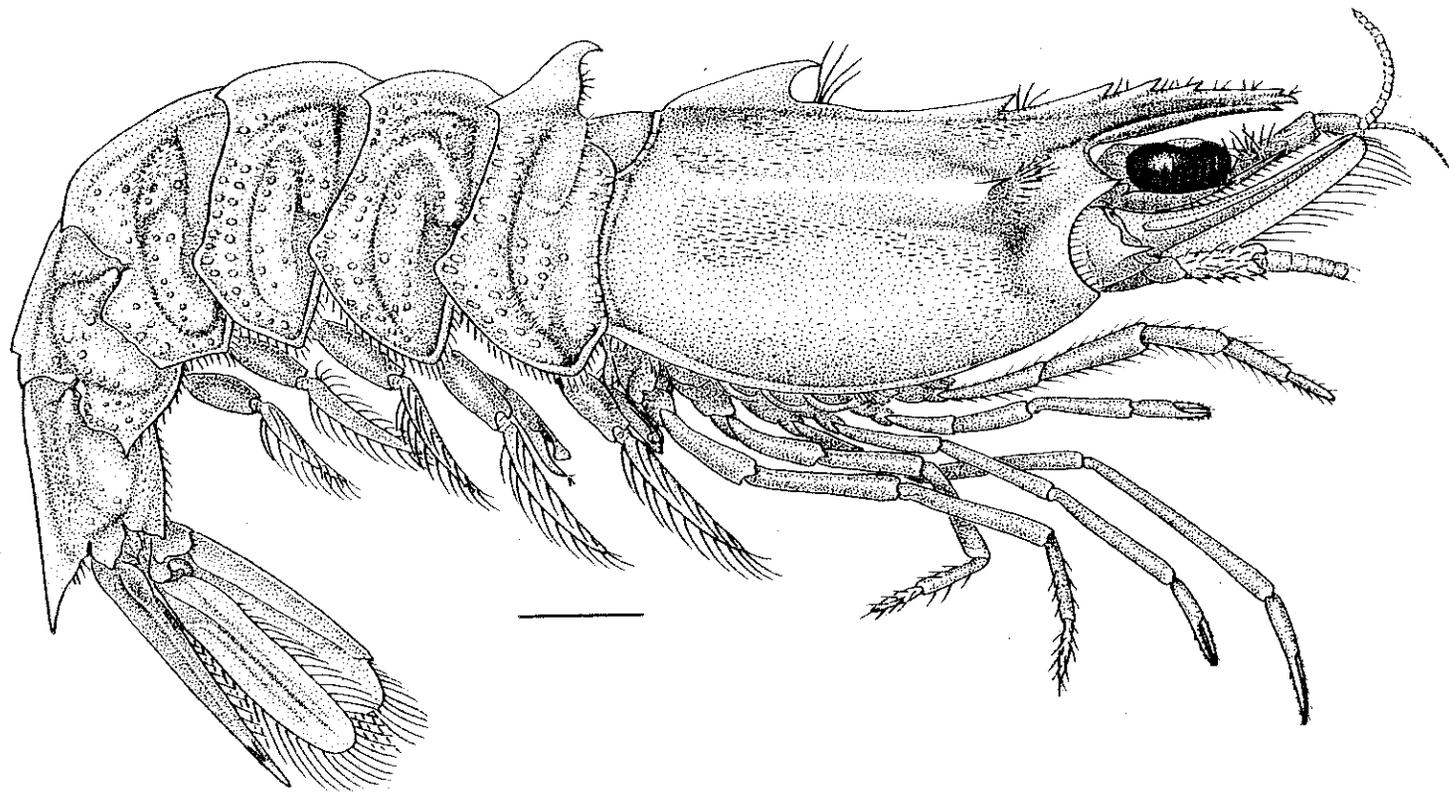
The study has included groups of deep-living pelagic fishes. The NMFS Marine Resources Monitoring, Assessment, and Prediction Program and the California Cooperative Oceanic Fisheries Investigation have shown that early stages of these fishes can be common constituents of the ichthyoplankton taken during egg and larval surveys in the shallower waters on the continental shelf. Proper identification of these eggs and larvae depends upon the classification and nomenclature of adult fishes.

This investigation ended with the transfer of Dr. Cohen to the NMFS Seattle Laboratory.

PENAEOID SHRIMPS

The shrimp fishery, based mainly on penaeoid species, is the most valuable segment of the U.S. fishing industry. In 1980, Americans landed 208 million pounds of shrimps, and imported 256 million pounds more. Over 433 million pounds of the total were consumed in this country. To satisfy this great demand, previously unexploited species have been added to the list of commercially sought shrimps, and new beds have been exploited in areas both near and far and in waters both shallow and deep--all within the past few years. Wise management efforts and meaningful ecological and physiological studies necessitate a thorough knowledge of the systematics of these shrimps. To provide such basic information, we direct our research toward species identification and definition, classification of higher taxonomic categories, morphology, phylogenetic relationships, distribution, and aspects of reproduction. Major accomplishments include revisions of the western Atlantic shrimps of the genus *Penaeus* (see Fishery Bulletin, 1969) and five genera of solenocerid shrimps (see Fishery Bulletin, 1977).

One major ongoing project is our comprehensive study of the American Pacific "rock shrimps" of the genus *Sicyonia*. After several decades of discarding rock shrimp from their catches, commercial fishermen are targeting their efforts on members of this genus, both in the western Atlantic and the eastern Pacific. Because of the rock shrimps' hard stony shells, many thought they would be rejected by the public; however, not only is the present production readily marketed, but quite a few consumers prefer rock shrimps over the thinner-shelled species. Whereas western Atlantic members of the genus have been the object of previous investigations, virtually nothing is known of the biology of the eastern Pacific species. The available information is, for the most part, limited to original descriptions of the species (scattered in literature published before the 1940's) and locality records. The need for our ongoing study became apparent when we found a previously unnamed species to be common in shallow water throughout the long stretch from Baja California Sur to the Gulf of Panama. To facilitate rapid and accurate identifications and to stimulate further biological studies, we are describing in detail each of the 12 species occurring from Monterey Bay to Callao, Peru, including diagnostic features, finer taxonomic characters, and intraspecific variation of many characters. Phylogenetic relationships and geographic/bathymetric ranges are being investigated, and ecological data are being assembled. Detailed illustrations will accompany the descriptions.



Sicyonia martini, a species of rock shrimp discovered by a National Systematics Laboratory scientist. Drawing by Maria M. Diéguez.

CRABS AND OTHER DECAPOD CRUSTACEANS

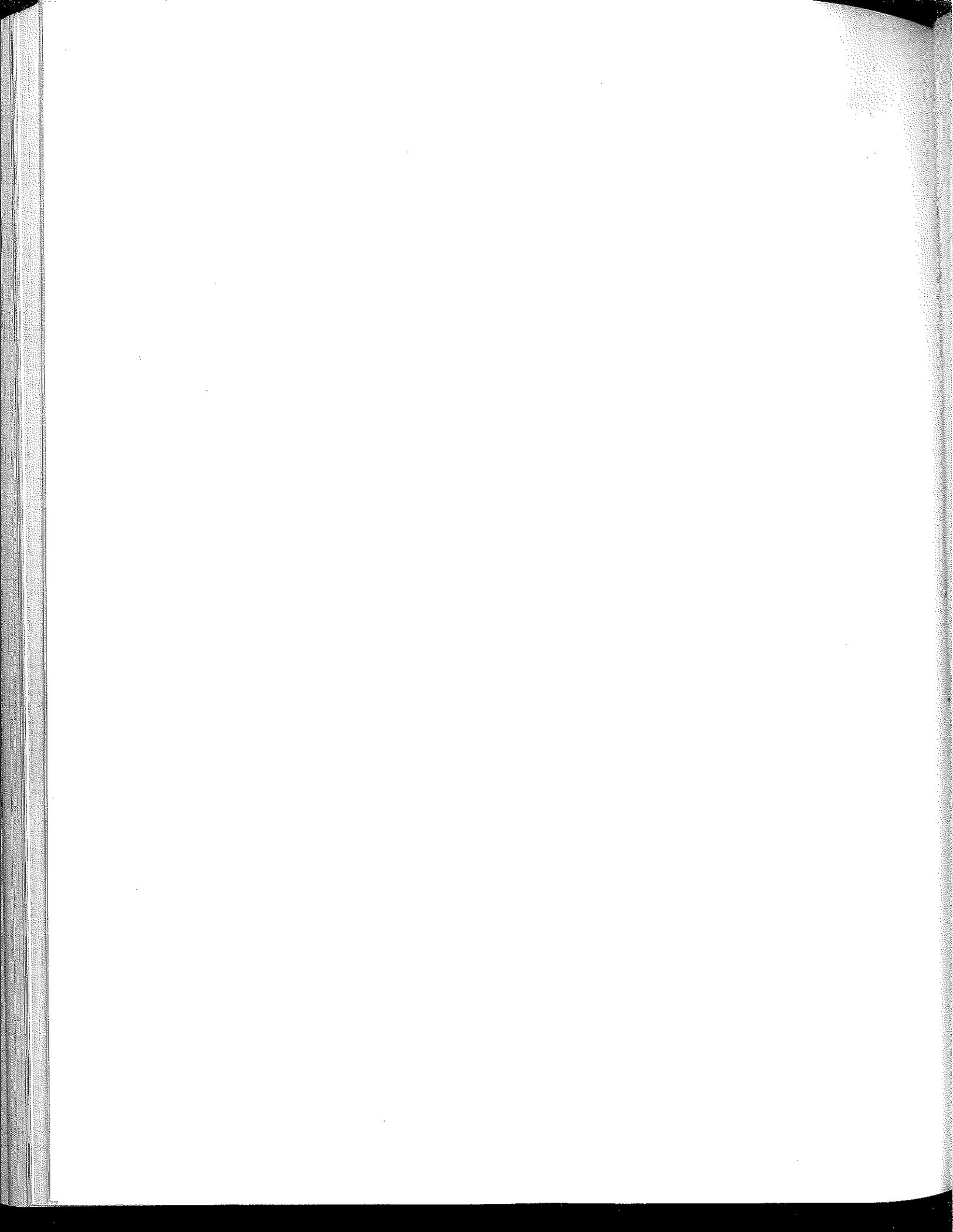
This investigation deals with crabs of the world and decapod crustaceans of the temperate western North Atlantic, focusing on those species associated with estuarine and nearshore circulation systems (which, incidentally, are those species with the most commercial and recreational significance). Studies are complete or are in progress on anatomy, taxonomy, phylogeny, distribution, species diversity, community structure, and other aspects of biology. The information produced by these studies is particularly valuable to NOAA and to scientists who are attempting to characterize the U.S. east coast estuarine and nearshore biotas for multiple-use management directed toward food harvesting, recreation activities, commercial shipping, urban and industrial development, etc.

One major completed project was the revision of the 14 species of swimming crabs of the genus *Callinectes* (see Fishery Bulletin, 1973) which includes the very important blue crab (*Callinectes sapidus*). Also recently completed is a comprehensive, illustrated review of the shrimps, lobsters, and crabs of the temperate waters of the U.S. east coast. This monograph treats 341 species, includes a general systematic discussion of the major groups, and analyzes their zoogeographic affinities. A general key to families is followed by family, subfamily, generic, and specific accounts, with keys to categories below the family level scattered through the text. Each species account includes abbreviated synonymy, recognition characters, figure(s), measurements, habitat, type-locality, known range, and, as data permit, discussion of variation, color, and general remarks on life history and ecology. Selected literature through 1979 is cited. Publication is planned as a book.

SERVICES

The primary services of the National Systematics Laboratory are to provide expert identifications of the fishes and crustaceans with which we deal, and to furnish specialized biological information on these animals. We are continually being contacted by the Food and Drug Administration, U.S. Customs Service, and members of the fishing industry concerning common and scientific names of fishes and crustaceans being imported from all over the world.

In addition, we provide information to visitors and assist them in use of the national collections. We review manuscripts for scientific journals and for colleagues in NMFS and academia. We evaluate research proposals for the National Science Foundation and other agencies. Finally, we assist the curatorial staffs of the Divisions of Fishes and Crustaceans of the National Museum of Natural History with curation and loans, especially of material collected on exploratory fishing cruises by NMFS and its predecessor agencies.



CENTER DIRECTORATE

Fishery Technology

Don Gadbois of the Resource Utilization Division/Gloucester Laboratory has recently completed his analysis of the polychlorinated biphenyl (PCB) content of a variety of popular finfishes taken from the inland and coastal waters of the United States. Except for a few samples taken from one of the nation's rivers that is heavily laden with PCB's (i.e., the Hudson River), all samples contained much less than the Food and Drug Administration's allowable limit of 5 ppm.

RESOURCE ASSESSMENT DIVISION

Resource Surveys Investigation

The autumn bottom trawl survey was completed on 6 November with the NOAA R/V's Delaware II and Albatross IV. Both ships subsequently conducted vessel comparison studies and Atlantic herring spawning investigations. Henry Jensen and Ralph Mayo were the respective Chief Scientists. John Nicolas, Dennis Hansford, and Eva Montiero were also participants.

Malcolm Silverman participated in a gear-testing cruise aboard the Delaware II during 7-17 December. Equipment tested included a prototype of a bottom salinity sampler connected to the trawl headrope, and a LORAN C plotter that produces real-time cruise tracks.

Linda Despres-Patanjo returned to Woods Hole on 4 November from a cruise aboard the French R/V Thalassa, sponsored by the International Council for the Exploration of the Sea (ICES), which surveyed diseased fish along the French coast.

Charles Byrne and Ira Palmer participated in an Atlantic saury survey aboard the Soviet R/V Boguslav, returning to Woods Hole on 11 November.

Jim Crossen continued preparations for a January 1982 hydroacoustic experiment on Delaware II and the Admiral Arciszewski, the latter a Polish research vessel engaged in cooperative studies with the NEFC.

Elizabeth Bevacqua completed a course in FORTRAN 77 offered in Woods Hole. Dennis Hansford completed the basic SCUBA diving course conducted at the Massachusetts Maritime Academy in Buzzards Bay.

The staff completed processing and computer-tape entry of the 1981 autumn bottom trawl survey's data prior to the termination of the Sigma 7 computer in December.

Fishery Biology Investigation

Age and Growth

Vi Gifford summarized first and second quarter 1975 commercial redfish samples (881 fish) and provided these data to Fishery Assessment Investigation personnel. Vi

and Kris Andrade completed aging second quarter 1975 commercial redfish samples (429 fish) and completed initial age determinations for third and fourth quarter 1975 commercial redfish samples. Vi also supervised the transfer of samples from the walk-in freezer, undergoing repair, to the chest freezer. During this transfer, Ira Palmer and Jim Fletcher sorted and catalogued--in consecutive station order-- sea scallop shell samples from Albatross IV Cruise No. AL 80-06.

Kris Andrade aged and summarized third quarter 1981 commercial haddock samples (513 fish). These data as well as those from third quarter 1981 commercial pollock aging samples were forwarded to Fishery Assessment Investigation personnel. Kris also conducted a literature search for a pollock age validation study to be conducted with Ambrose Jearld.

Jim Fletcher scrubbed sea scallop shells from 1977 and 1980 surveys (1500 shells). He also thin-sectioned and photographed 108 surf clam shells and prepared an additional 63 shells for sectioning.

Ruben Millor, before termination of his stay-in-school appointment, impressed 313 haddock samples and 427 yellowtail flounder samples.

Judy Penttila summarized first-year growth data on Atlantic cod and haddock. Judy completed age analysis of yellowtail flounder samples from Albatross IV Cruise No. AL 79-08 (summer) and from seven Massachusetts Division of Marine Fisheries inshore surveys. A total of 331 fish were analyzed for ages. Judy also checked Doris Jimenez's aging of third quarter 1981 commercial Atlantic cod samples (555 fish), and completed age sample expanded sheets for Atlantic cod collected in the summer survey on Delaware II Cruise No. DE 81-04.

Finfish

Sherry Sass and Annette Mitchell prepared tanks and food cultures for summer flounder rearing studies. Sherry and Annette visited with the U.S. Geological Survey to learn scanning electron microscope techniques.

Butterfish age samples from 1979 summer and autumn cruises were rechecked and corrected where necessary.

Leslie DeFillipis completed sectioning red hake otoliths from the 1981 spring survey and silver hake otoliths from the 1981 autumn survey.

Louise Dery completed aging and summarization of red and silver hake samples from the 1981 spring survey. She also checked summer flounder samples from all 1981 surveys. Additionally, Louise analyzed back-calculation data for European hake, and processed Atlantic mackerel samples from 1981 surveys.

Shellfish

John Ropes prepared thin sections of surf clam shells received from the Milford Laboratory for examination of age lines. However, these lines were poorly revealed by this technique. The more time-consuming procedure of sectioning, imbedding, grinding, polishing, etching, and applying an acetate sheet to the shells produced superior images for microscopic examination. The Milford clams, grown under lab

conditions and ranging between 40 and 62 mm in shell length, will be used to define the formation of the earliest age/growth lines in the species.

John also prepared 54 shells of marked ocean quahogs recaptured in 1980 for an examination of age lines in acetate peels. Growth increments prior to and after marking are to be analyzed.

John participated in the 1981 autumn bottom trawl survey during the first 2 wk of November.

Sabrina Rowe, a student volunteer from Fairfield (Connecticut) University, arrived at the Woods Hole Laboratory on 28 December to assist John in preparing bivalve specimens for aging until her return to school in late January.

Final surf clam ages were completed for Delmarva samples collected in the 1981 surf clam survey (Delaware II Cruise No. DE 80-01).

Experimental and Educational Outreach Investigation

Experiments

A diseased 16-lb American lobster was dissected and samples removed for examination by Dr. Carol Reinisch of the Tufts University School of Medicine. Analyses will be performed with assistance from personnel at the Oxford Laboratory. Portions of the liver were severely degenerated.

A common bacterium found in large numbers throughout the Woods Hole Laboratory's seawater system has been recently identified as belonging to the genus Pelonema by Dr. John Sieforth of the Department of Bacteriology and Oceanography at the University of Rhode Island. Dr. Sieforth will supervise a graduate student who will attempt to describe the species. This bacterium is one of the major components of the biological filter in the sand filtering system.

Otoliths from spot (Leiostomus xanthurus) were examined for Ichthyological Associates, Inc., to confirm their age results.

Starfish are being maintained to determine the efficacy of various dyes as aides in identifying starfish for studying movements of wild populations.

Experiments on the effects of ration size on growth were initiated using age 0 scup and black sea bass collected in 1981. The studies will run for 2 yr to also evaluate the impact of diet on maturation. Black sea bass are ideal study specimens since they are protandrous hermaphrodites with all fish maturing as females.

Mike Campbell constructed tank partitions for the scup and black sea bass studies and for an experiment on liver weight changes related to food restrictions to begin in January or February.

Seven small smooth dogfish were tagged with Dennison dart tags to identify individuals used in growth/food ration studies and to evaluate the feasibility of using dart tags for this species. Dart-tagged scup developed chronic ulcerations around the tag insertion site. This is caused by the undulating tag motion during fish activity and results from the stiff monofilament center strand of the tag. Dart tags have been attached to eight little skates for the same type of study.

Digestion rate studies on 1981-year-class pollock were incorporated into a study on first-year annulus formation for Marvin Grosslein of the Marine Ecosystems Division. Five young-of-the-year pollock will be sacrificed sequentially over the next 4 mo for data on digestion rates and age structure.

Education

Eleven classes visited the Woods Hole Aquarium; lecture tours varied from 1 to 2½ hr, depending on student age-level and interests. The Woods Hole Laboratory's Educational Program has recently been listed with the Massachusetts Department of Education as a learning center for gifted and talented students.

Fishery Assessment Investigation and Senior Assessment Scientists

Mike Sissenwine continued research activities on the biological productivity of early-life-stage fishes in order to refine the energy budget for Georges Bank. Mike also worked on studies aimed at estimating population size from relative abundance data measured with error. This latter work is being conducted with Jeremy Collie of the Woods Hole Oceanographic Institution.

Emory Anderson was involved in planning activities for the cooperative US-Poland Atlantic mackerel research to be conducted in winter 1982. Emory completed the 1982 Atlantic mackerel assessment and reviewed the Fishery Management Plan for squids, Atlantic mackerel, and butterfish for the Northeast Regional Office. Additionally, Emory responded to informational requests from NMFS management personnel and academic and industry representatives for data on bluefish, Atlantic mackerel, and butterfish.

Brad Brown, Vaughn Anthony, Emory Anderson, and Mike Sissenwine participated in meetings of the Woods Hole Laboratory Space Committee to locate suitable office space for the Resource Assessment Division since their lease at the Marine Biological Laboratory building expires at the end of March 1982.

Vaughn Anthony completed the final preparation of the Resource Assessment Division's "1981 Status-of-the-Stocks Report."

Steve Clark completed, with Ralph Mayo and Loretta O'Brien, an assessment of the Scotian Shelf, Gulf of Maine, and Georges Bank pollock stock. Steve also completed an assessment report on the Gulf of Maine northern shrimp which was submitted to the Northwest Atlantic Fisheries Organization (NAFO) as a Scientific Council research document. Also, Steve completed final revisions to a haddock manuscript prepared with Bill Overholtz and Richard Hennemuth. Steve continued his studies on growth and mortality of northern shrimp with assistance from Alfonza Thrower, and on historical trends in haddock growth with help from Wendy Sylvia.

Fred Serchuk, with assistance from Bob Rak, continued assessment analyses for sea scallops. Fred spent a great deal of effort in responding to management requests from NMFS personnel, Regional Fishery Management Council staffs, industry personnel, and Canadian assessment scientists for specific sea scallop data and analyses. Fred also reviewed the Final Fishery Management Plan for Atlantic Sea Scallops, providing comments to the Northeast Regional Office's Fishery Management Division.

Mike Fogarty continued analyses of American lobster assessment data. Mike participated in a sea-sampling trip aboard the F/V Quest during 4-5 November. He also reviewed a State-Federal Program contract report for the Northeast Regional Office's Federal Aid Branch, and prepared materials on the problems associated with fishery stability for presentation to the New England Fishery Management Council. Bill Overholtz and Joan Palmer also worked on this latter project with Mike.

Gordon Waring analyzed Atlantic herring tagging data in preparation for a meeting with Canadian assessment scientists on herring and herring tagging. He also began preparation of a spiny dogfish report summarizing the status of this species. Gordon provided information on spiny dogfish and butterfish to a number of industry and government personnel.

Steve Murawski initiated work on a detailed ocean quahog assessment based on commercial catch per unit of effort, on length frequencies, and on research survey data. He continued research on the geographical distribution of ocean quahogs with the assistance of Darryl Moore, a cooperative education student from Hampton Institute. Steve also continued his work on harvest models for multispecies production units. Additionally, Steve reviewed a State-Federal Program report for the Federal Aid Branch.

Anne Lange made planning arrangements for American participation in a joint NAFO squid cruise with Japan and Canada aboard the Japanese R/V Kaiyo Maru. Anne also organized and participated in a 1-day training session for two new NMFS Foreign Fishery Observers.

Harold Foster participated in the autumn 1981 bottom trawl survey during 2-13 November aboard the Delaware II. Harold completed a FORTRAN 77 course offered at the Woods Hole Oceanographic Institution on 17 December and completed an elementary statistics course offered by Bridgewater State College.

Stu Wilk edited two manuscripts for submission to the NOAA Technical Memorandum NMFS-F/NEC series.

Bill Overholtz continued his efforts on analysis, validation, and completion of a Georges Bank multispecies model.

Several staff personnel were involved during both months in the VAX computer conversion team efforts.

Publications

CLARK, S. H. Recent trends in the Gulf of Maine northern shrimp fishery. Northw. Atl. Fish. Org., Sci. Coun. Res. Doc. 81/XI/148. 23 p. (P)

CLARK, S. H. Use of trawl survey data in assessments. Doubleday, W. G.; Rivard, D. ed. Bottom trawl surveys. Can. Spec. Pub. Fish. Aquat. Sci. 58:82-92; 1981. (P)

CLARK, S. H.; OVERHOLTZ, W. J.; HENNEMUTH, R. C. Review and assessment of the Georges Bank and Gulf of Maine haddock fishery. J. Northw. Atl. Fish. Sci. 3 (In press.) (A)

- MURAWSKI, S.A.; ROPES, J. W.; SERCHUK, F.M. Population biology of the ocean quahog in the Middle Atlantic Bight. J. Shellfish. Res. 1(1): 120. (Abstract.) (P)
- ROPES, J. W.; MURAWSKI, S.A. Size and age at sexual maturity of ocean quahogs, *Arctica islandica* Linne, from a deep oceanic site. J. Shellfish Res. 1(1): 122. (Abstract.) (P)
- WILK, S. J. A review of the fisheries for Atlantic croaker, spot, and weakfish, 1940-1979. Clepper, H. ed. Marine recreational fisheries VI: proceedings of a symposium. Washington, D.C.: Sport Fishing Institute; 1981:15-27. (P)
- WILK, S. J. Weakfish--prospectus for management. Proceedings of the 40th Annual Meeting: supplement to the proceedings. Atlantic States Marine Fisheries Commission, 15 p. (In press.) (A)
- WILK, S. J.; BROWN, B. E. A description of those fisheries which take place in the western North Atlantic between the U.S.-Canadian border and North Carolina, which presently have or potentially could have user group allocation conflicts. Rome, Italy: U.N. Food and Agriculture Organization, European Inland Fisheries Advisory Commission. 60 p. (In press.) (A)

Reports

- ANDERSON, E. D. Status of the Northwest Atlantic mackerel stock--1981. Woods Hole Lab. Ref. Doc. No. 81-38;1981. 40 p.
- LANGE, A.M.T.; NICHY, F.; DEMO, C. Preliminary investigations of laboratory growth studies of the squid *Loligo pealei* (LeSueur). Woods Hole Lab. Ref. Doc. No. 81-39;1981. 13 p.

MANNED UNDERSEA RESEARCH AND TECHNOLOGY PROGRAM

No report received. The September through December reports may be included in the January-February issue.

MARINE ECOSYSTEMS DIVISION

Ichthyoplankton Investigation

Sand lance larvae were again the numerically dominant taxon off northeastern United States during winter 1981. We estimated their abundance at 5.1600×10^{12} larvae at the time of our February-March survey. The Southern New England subarea continued to be the principal area of abundance, with highest concentrations around Nantucket Shoals. Total abundance estimates for the Middle Atlantic Bight (0.879×10^{12}), Southern New England (3.955×10^{12}), and Georges Bank (0.308×10^{12}) subareas were comparable to those for the 1976-78 period, slightly more than half of the peak 1979 estimate, and more than three times greater than the winter 1980 estimate.

There has been support from within the Center for the formation of an ad-hoc group to discuss year-one growth of selected coastal fishes. The group convened in the conference room at the Narragansett Laboratory on 12 January 1982. Participants were urged to come prepared to present and discuss their aging methods and results, as well as pertinent literature. Discussions focused on year-one growth of silver hake, Atlantic cod, haddock, and Atlantic herring.

Mother nature was most uncooperative during our late autumn (and last of 1981) ichthyoplankton survey, part of the Marine Monitoring, Assessment, and Prediction program I (MARMAP I). High winds and heavy seas forced the Albatross IV to return to port on four occasions, costing us some 10 days of ship time. As a result, we occupied only 90 (51%) stations in the Gulf of Maine, Georges Bank, and (eastern end of) Southern New England subareas. Shelf waters west and south of Nantucket Shoals were not surveyed. Field Party Chief responsibilities were passed from John Sibunka to Pete Berrien to Joe Kane during the three-part cruise. Other representatives of this Investigation included Doris Finan, Carolyn Griswold, Ray Maurer, Jerry prezioso, and Jackie Frisella. Preliminary observations of bongo net samples taken on Georges Bank again revealed no Atlantic herring larvae. Based on our results over the past two spawning seasons, it is evident that herring spawning activity on the Bank has reached its lowest level in the past 25 yr.

Despite the rather disappointing coverage on our final survey of the year, we can look back on our accomplishments during 1981 with considerable satisfaction. This was our fifth consecutive year of year-round MARMAP I survey activity, making our program the most successful mesoscale plankton survey ever conducted in the western North Atlantic. Although, for the first time since 1977, foreign participation was not forthcoming, we were at sea during 11 mo of the year, participating in 10 surveys which produced some 2014 samples via 61-cm bongo nets. This was a team effort and all who contributed deserve credit for our collective accomplishments.

Larval Fish Dynamics Investigation

Experimental Studies

Several adult summer flounder were induced to spawn by injection of carp pituitary extract. Several thousand live yolk-sac-stage larvae were supplied to the Resource Assessment Division's Fishery Biology Investigation for studies of aging using otolith rings. A group of summer flounder larvae maintained at the Narragansett Laboratory are being sampled daily. Suitable wild plankton is extremely scarce locally and we hope to supplement feeding of larvae with cultured rotifers. Results from studies on the cryogenic preservation of summer flounder sperm are encouraging. The percentage fertilization and percentage hatch of eggs fertilized with sperm preserved for up to 8 days at -70°C were identical to that observed for fresh sperm.

Biochemical analysis of young-of-the-year striped bass collected from the Hudson, Nanticoke, and Potomac Rivers for swimming stamina studies is in progress. Results from the plankton analyses of the bottle samples from the Soviet R/V Evrika cruise are being transcribed to computer data files for statistical analyses. These data sets include 40 000 entries.

Adult sand lance, collected during the second week of November from the lower Merrimack River Estuary, spawned in the lab in early December. Data on fecundity and development at four temperatures are being collected. Adult females lost 30-40% of their wet weight upon spawning. The duration of embryonic stage appears to be relatively long. The first larvae hatched at 10°C after 25 days. Preparations are being made for collection of adult sand lance from Nantucket Shoals.

A second group of summer flounder were induced to spawn with hormone injection. Standard viability test results using cultured rotifers as a food source gave high survival rates. Several thousand fertilized eggs were sent live to the Resource

Assessment Division at the Woods Hole Laboratory for studies of aging. Several hundred summer flounder are being grown out to metamorphosis at the Narragansett Laboratory for these studies.

Population Processes

Manuscript revisions were made by Greg Lough for larval Atlantic herring abundance and mortality estimates for the 1971-77 seasons, and by Roz Cohen for larval Atlantic herring food habits for the 1974-76 seasons. Roz also continued work on the zooplankton data report stemming from 1971-77 data collected under the auspices of the International Commission for the Northwest Atlantic Fisheries (ICNAF) and met with Janet Murphy to complete work on the copepod identification manual. George Bolz continued work on developing growth curves for Atlantic cod and haddock larvae based on otolith growth increments. Dave Potter developed 17 computational routines on the Hewlett-Packard Model No. HP-85 computer to summarize larval fish food habits data into standard tables and graphs. He also aided Cabell Davis and Alan Hulbert (the latter with the Manned Undersea Research and Technology Program) with HP-85 programming for their data presentation. A good proportion of Dave's time this month was spent devising space allocation plans as a member of the Woods Hole Laboratory Space Committee.

Randy Goodlett completed the identification of zooplankton in selected samples from last April's larval dynamics cruise (Albatross IV Cruise No. AL 81-03). Peter Donnelly continued processing samples from Albatross IV Cruise No. AL 81-05, another larval dynamics cruise, and participated on Soviet R/V Boguslav Cruise No. 81-02, a warm-core ring study during 19 November-3 December.

Hal Merry and Peter Donnelly met on two occasions with Canberra Corporation engineers to work out interfacing problems with our HIAC PC-320 particle size analyzer and their multichannel analyzer (MCA). The combined system functioned well and will provide us with real-time, at-sea analytical capability for in-situ profiling of the water column to characterize plankton particle-size distribution in larval fish feeding studies. Hal completed the specifications and required paperwork for acquisition of the MCA. This month he also installed our Loran C plotting system on the NEFC's R/V Gloria Michelle, and repaired two MARMAP meter blocks for John Sibunka.

Fishery Oceanography Investigation

During November the Fishery Oceanography Investigation completed studies with scientists from both the Polish R/V Wieczno and the Soviet R/V Stvor. Andrzej Majewicz of the Polish Sea Fisheries Institute in Gdynia worked on rings he had observed off Peru and Brazil to compare with our own ring studies. Anatoly Bendik, the Chief Scientist on the Stvor, met with David Mountain and Ron Schlitz to discuss the results from the Stvor surveys. These data will provide a rare view of the whole slope-water region from Cape Hatteras to Georges Bank, including the remnants of two warm-core rings.

The first leg of Albatross IV Cruise No. AL 81-14, a MARMAP survey, was completed by Dan Patanjo, Chris Nadeau, and Ted Baker (the latter a research scientist from the Lamont Doherty Geophysical Observatory) making the hydrographic observations. Ted also collected water samples for oxygen-18 isotope analysis.

Ron Schlitz presented a report on the warm-core ring cruise (Albatross IV Cruise No. AL 81-11) at an informal seminar that is held weekly by the ring study investigators. The discussion indicated that our results will complement those from the other investigators quite well.

Sam Nickerson analyzed salinity samples from the Stvor cruise and the recent bottom trawl survey (Delaware II Cruise No. DE 81-06).

Steve Ramp is beginning to learn the new VAX computer system and is overseeing the conversion of the Investigation's programs and data tapes to VAX's compatible format.

During December the second and third parts of Albatross IV Cruise No. AL 81-14 were completed. Tom Laughton, Dan Patanjo, and Dana Densmore made the hydrographic measurements on the second leg while Dana, Chris Nadeau, and David Mountain worked on the third leg.

On 2 December, David Mountain and Ron Schlitz met with the editors of the planned Georges Bank book and with others who are contributing to the physical oceanography section of the book. They will coordinate a chapter in that section concerning the implications of the water circulation and residence time for the biology on Georges Bank.

David and Ron also met with Ron Smolowitz and Helen Mustafa on 1 December to develop a plan for NEFC use of the ATS satellite communication system. This system was tested and used by the Investigation during the warm-core ring cruise last October.

The expendable bathythermographs for use in 1982 by most NEFC personnel have been obtained and readied for distribution. Those users have been notified and encouraged to arrange picking up their probes through Tom Laughton.

Derek Sutton undertook efforts to have all of the Investigation's surface guard buoys completed to a uniform design and readied for current-meter mooring deployments in the spring.

Steve Ramp, with help from Dan Patanjo, Derek Sutton, and Jim King, coordinated the conversion of the Investigation's data tapes and programs from the Sigma 7 to the new VAX computer.

Apex Predators Investigation

Chuck Stillwell, Nancy Kohler, John Hoey, and Allen Lintala participated in a cruise aboard the Wieczno that terminated on 9 November. The primary focus of the cruise was to examine stomach contents of large apex predators (i.e., sharks, swordfish, and bluefin tuna) as they migrated offshore from the shelf and slope waters. Stomach contents from 65 blue sharks indicated this species fed predominantly on squid, the pelagic octopus Alloposus mollis, and a variety of fish species. Of the three makos captured, two stomachs contained squid and fish remains, while the last was empty. No swordfish or tuna were captured during the cruise.

During November and December Chuck Stillwell and Nancy Kohler prepared a paper on feeding habits of swordfish to be given at the American Fisheries Society's North-east Division meeting in April 1982. Computer programs were written to summarize and analyze the information for their paper.

Analysis of age and growth of the shortfin mako was completed in November; a first draft of the resultant manuscript was sent to Dr. Eric Prince, convenor of the Age and Growth Workshop in Miami, Florida, where it is to be presented in February. Wes Pratt found that two vertebral rings are laid down per year and he suspects these may be migration marks. In December, several canned computer programs for length-frequency analysis (i.e., NORMSEP, ENORMSEP, and ELEFAN II) were received and subjected to preliminary evaluation. A final literature search was initiated for recent and obscure growth citations.

In November we received information on 24 recaptures including 12 blue sharks, 5 sandbar sharks, 2 tiger sharks, 2 swordfish, and 1 each from a silky shark, dusky shark, and spiny dogfish. Eleven of these were at liberty for more than 1 yr with the longest time resulting from a tagged spiny dogfish. The tag was found loose in a shrimp trawl off Georgia 13 yr after tagging in Block Island Sound. Four additional recaptures were at liberty for over 3 yr; these included two swordfish (3 and 6 yr, respectively), a sandbar shark (4.2 yr), and a tiger shark (3.3 yr). One of the swordfish was recaptured in the same area on Georges Bank, the other traveled from Georges Bank to Florida. The sandbar shark was tagged off Montauk and was recaptured off Mexico (2016 mi). Another sandbar shark traversed the Gulf of Mexico from Alabama to Vera Cruz, Mexico, while the remaining three sandbar recaptures showed movement between the Mid-Atlantic region and the Cape Hatteras area. One tiger shark moved from the coast of Long Island to Miami Beach. The other tiger shark, free for 741 days (2 yr), traveled from Bermuda to the Dry Tortugas in the Gulf of Mexico. Most of the 12 blue shark recaptures showed localized movements off the coast of the northeastern United States. Four, however, were noteworthy recaptures. One moved from the Gulf of Maine to Lydonia Canyon off Georges Bank, our first evidence of movements out of the Gulf of Maine. Another traveled from off Nantucket to Nova Scotia, while a third, free for 372 days, traveled 2880 mi from New Jersey to Rabat, Morocco. We are also attempting to verify tagging information on a blue shark recaptured off the coast of Newfoundland. This recapture is interesting because the tag was issued to a Portuguese big-game fishing club and was very likely tagged off the coast of Portugal.

In December we received information on four recaptures composed of three blue sharks and one dusky shark. Two of the blue sharks were out less than 70 days and showed localized movements within the Middle Atlantic Bight. The other blue, tagged in the dumping grounds southeast of Block Island, was free for 454 days (1.24 yr) and traveled 1640 mi southeast to Dominica in the West Indies. The dusky was free for 473 days (1.3 yr) and traveled from Virginia Beach to Jacksonville, Florida.

During December the recapture coding for 1981 was completed and we began assembling our annual newsletter, The Shark Tagger, for distribution in March to cooperative fishermen.

Ecosystem Dynamics Investigation

In November, Ed Cohen conducted further study of Andersen's food habits model in preparation for a visit by Erik Ursin in December.

From 1 to 4 December, a modeling workshop was held in Woods Hole with Erik Ursin from the Danish Institute for Fisheries and Marine Research. Ed Cohen, Marv Grosslein, Mike Pennington, and Jeremy Collie (the latter from the Woods Hole

Oceanographic Institution) worked with Dr. Ursin on K. P. Andersen's new model for calculating food preference parameters and estimating size distributions of prey in the environment based on stomach contents. The group discussed hypotheses and derivations of equations not fully developed in the latest Andersen-Ursin papers (delivered at the 69th Statutory Meeting of the International Council for the Exploration of the Sea), and Dr. Ursin made additional runs of the model on the Sigma 7 using our food habits data on Georges Bank Atlantic cod and silver hake. The preliminary results suggested unexpected low levels of food consumption for smaller size categories of both cod and hake, which indicates that either our general assumptions about growth versus size are incorrect or there are unknown errors in the stomach-content data such as size-dependent regurgitation bias. We now have a reasonable understanding of the assumptions and form of the model and plan to explore its properties further on the VAX computer. It should be noted that ultimate confirmation of the model requires some independent data on absolute size frequencies of prey in the environment for comparison with the size frequencies observed in fish stomachs.

In November Ray Bowman completed a draft of a paper on comparisons of stomach contents of Atlantic mackerel from Cape Ann, Cape Cod, and Nantucket. Ray and Bill Michaels worked on analysis of qualitative versus quantitative stomach sampling protocols implemented in 1981, and made preparations for a food habits cruise in December.

Ray Bowman, Tom Morris, and Bill Michaels conducted a special food habits survey (Delaware II Cruise No. DE 81-08) from 7 to 17 December, to obtain further information on feeding of key fish predators including silver hake and spiny dogfish. Data were also collected on sources of error such as regurgitation frequency versus depth, and samples were obtained for evaluating the qualitative sampling protocol. In addition, Ray tested a digital scale which appears to have sufficient accuracy for weighing stomach contents of large fishes at sea. Ray continued work on a summary of the 1973-76 food habits data for 17 species of fish collected on MARMAP II surveys; he also prepared a detailed outline of a paper on diel feeding patterns of flounders.

Wendell Hahn completed the transfer of all programs related to GEORGE from the Sigma 7 to VAX compatible tapes. He also made a series of statistical runs needed for revision of the 1980 paper that he and Langton prepared on prey size preferences for Georges Bank fish.

Roger Theroux and John Hauser concentrated on completing the conversion and transfer of some Divisional programs and data files from the Sigma 7 to the VAX computer in Woods Hole; these included programs for food habits and zooplankton as well as data files on fish food habits, zooplankton, and benthic invertebrates. The conversion and transfer of the benthic files in particular involved a great deal of work by the Woods Hole Laboratory's Automatic Data Processing Unit personnel Ed Handy and Johnny Blevins, and their contributions are gratefully acknowledged.

Ed Cohen worked on several manuscripts including the paper on the nitrogen budget for the Gulf of Maine (submitted to the Journal of Biological Oceanography) and a paper with David Mountain on the effect of water residence time on plankton populations of Georges Bank (an abstract submitted to the American Geophysical Union/American Society of Limnologists and Oceanographers, AGU/ASLO, meeting).

Marv Grosslein reviewed several manuscripts and research proposals for Woods Hole Oceanographic Institution investigators.

Roger Theroux completed revisions of the bivalve manuscript, based on review comments. He also reviewed the suitability of water management units with respect to benthic populations as outlined in the Northeast Regional Action Plan.

Mike Pennington revised his paper on statistical estimates of abundance based on the delta distribution for MARMAP surveys, and resubmitted it to Biometrics, following the reviewers comments. Mike also reviewed the statistical methods in the latest version of the bottom trawl survey analysis program.

Mike Pennington continued work on the model for estimating food consumption (daily rations) of fish from stomach contents, and he revised the paper on variability in stomach content weights for presentation (by Richard Langton) at the "Gutshop '81" meeting in California in December.

Ed Cohen continued work on predator-prey interactions and presented results of our studies on silver hake at "Gutshop '81," at the NMFS Northwest and Alaska Fisheries Center, and at the University of Washington.

Charlie Wheeler completed sorting American lobster larvae and small fishes from the summer series of neuston surveys in Buzzards Bay and Vineyard Sound, and made two sets of traps (5 and 25 November) for green crabs in Sippewissett Marsh. He also continued the routine recording of air and water temperatures in Woods Hole, noting that October 1981 was the coldest October in 20 yr.

Tom Morris and Randy Goodlett split 505 plankton samples from the Stvor, which were collected on a series of cross-shelf transects on the cruises in support of the warm-core ring studies. Tom also collected additional samples of fourspot flounder needed to finish up his study of mouth morphology versus feeding behavior of flounders.

Plankton Ecology Investigation

Donna Busch and Jack Green completed compiling a briefing book for cooperative research discussions between NEFC scientists and AtlantNIRO scientists in Kaliningrad, U.S.S.R.

Donna Busch and Dave Mountain submitted an abstract on "Phytoplankton Biomass and Physical Conditions on Georges Bank in an Area of Larval Cod and Haddock Concentrations," and Donna and Greg Lough submitted an abstract on "Effect of Spring Thermal Stratification in the Georges Bank Area on the Vertical Distribution of Plankton-Larval Fish," for presentation at the AGU/ASLO meeting in February 1982.

During November, Carolyn Griswold reviewed and prepared comments on the Draft Environmental Impact Statement for OCS Sale No. 52.

During 16-25 November, Carolyn Griswold participated in a MARMAP I cruise on board the Albatross IV where she collected some special samples of soft-bodied invertebrates to test alternate preservation techniques, as part of a study of larval fish predation by jellies. On 30 November, she collected additional samples in Narragansett Bay from the University of Rhode Island's (URI) R/V Dulcinea.

During December Carolyn Griswold plotted distribution and abundance of larval and juvenile cephalopods taken on six 1980-81 cruises. She prepared a draft report entitled, "Gelatinous Zooplankton: Preservation Procedures, Problems, and Recommendations." On 8 December she met with Anne Lange and Canadian scientists in Woods Hole to discuss the plots and future cooperation between the Marine Ecosystems and Resource Assessment Divisions on larval and juvenile squid distribution and abundance. Carolyn will start attempting to identify the squid taken on MARMAP and other cooperative cruises.

Jack Green has worked on analysis of the Evrika pump samples through much of the month of November.

Joe Kane completed early in November a final revision of his manuscript on net volume-dry weight relationships, and spent the rest of the month on the analysis of larval stomach data from Evrika Cruise No. 80-02.

Paul Fofonoff participated in the final cruise aboard the Stvor for the season. Back in the lab, he has been continuing his identification and illustration series for microzooplankton.

Joe Kane and Jack Green have been working on larval fish feeding and prey selection for Atlantic cod and haddock from Evrika Cruise No. 80-02. Jack provided a preliminary sketch of patterns of zooplankton to Jim Thomas for presentation before a meeting of NASA, Brookhaven National Laboratory, and Bigelow Laboratory of Ocean Sciences personnel involved in the Nantucket Shoal experiment. Jack also compared plankton volumes collected with different types of gear, including MARMAP bongo nets. Joe Kane was Chief Scientist on Albatross IV Cruise No. AL 81-04, Part III. Paul Fofonoff began analysis of pump samples from Albatross IV Cruise No. AL 81-03.

Image Analysis

Information on the Image Analysis System and its use for counting and sizing plankton was provided to Anthony Jones of San Diego State University. Mr. Jones is studying ichthyoplankton dynamics in the southern California area.

Ray Maurer participated in the winter MARMAP survey during 30 November-11 December (Albatross IV Cruise No. AL 81-14). High densities of siphonophores (Nanomia cara) were encountered in the Gulf of Maine. At several stations "siphonophore slime" on the hydrowire prevented messengers from tripping Niskin bottles.

Biostatistics

Lorrie Sullivan extracted larval abundance information from the 1977-80 MARMAP and ICNAF larval Atlantic herring cruises. She also updated category errors in eight cruise master files and generated six station activity summaries for Carolyn Griswold's larval squid plots. Lorrie Sullivan drafted and revised a manuscript on American plaice in the Gulf of Maine. She also worked with Sue Koelb of the University of West Florida's Systems Support Group, debugging Version 6 of the Generalized Reformatting System. This version allows complete Boolean selection of data in a master file and complete extraction of individual length-frequency pairs.

Ronna Lupovitz (who joined us on 2 November) learned the intricacies of the MARMAP Information System rapidly and loaded, quality checked, edited, and merged into master files the station and experiment data for the DL8105 and AL8107 master files, and ichthyoplankton data for the EK8006 master file.

Julien Goulet reviewed a table segment problem with the Atlantic Environmental Group and the System Support Group (SSG) staff. The SSG staff implemented the agreed-upon solution. Julien also reviewed a paper on dumping sewage sludge at Deepwater Dumpsite 106.

Julien Goulet, Peggy Lamoureux, and Robert Payne (the latter from the Environmental Protection Agency) met with Bob Thompson of the U.S. General Services Administration to discuss upgrading of phone systems.

Lorrie Sullivan, Tom Plichta, Ronna Lupovitz, and Julien Goulet met with Wally Morse and Ken Sherman on 9 November to discuss the analysis of ichthyoplankton data and the support provided by the Biostatistics Group.

Julien Goulet spent considerable time drafting a data base design for the marine ecosystem data base. He also brought keypunching samples to URI's Graduate School of Oceanography (GSO) to obtain cost estimates, and consulted with the Apex Predator's Investigation on the statistics of a modal separation program for studying shark populations by year class.

Arrangements were made with the GSO to have keypunching done for zooplankton data-count logs. The quality control of zooplankton logs received from Poland will be moved from the Sandy Hook Laboratory to the Narragansett Laboratory. This should provide smoother, more efficient data flow, as we can tap these Laboratories' plankton experts for resolution of quality control problems.

Two new CONFER (electronic message system) modules were implemented by Gene Heyerdahl--one for NEFC laboratory directors and division chiefs, and one for administrative personnel. These two CONFER modules, and the existing one for the Northeast Regional Fisheries Information System Technical Advisory Group, will be monitored daily. Julien Goulet conducted a training session on CONFER.

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RESOURCE UTILIZATION DIVISION

NMFS/URI Cooperative Fisheries Engineering Unit

Now that our (i.e., the NEFC component of the NMFS/URI Cooperative Fisheries Engineering Unit) office furniture and most of our supplies have been moved, we are now officially and physically located at the Bay Campus of the University of Rhode Island (URI). The first of many planned cooperative studies in gear research will begin in mid-January. This work in pair trawling will involve both URI's M/V Gail Ann and NEFC's R/V Gloria Michelle.

The month of September was spent outfitting the Gloria Michelle for midwater trawling operations. Major efforts included the fabrication and installation of: mounting beds for the main winch and net reel, the gallows frame, the main hydraulic system, and a new hydraulic steering system with an autopilot.

Most of October saw the Gloria Michelle in Woods Hole for further outfitting. While finishing touches were put on earlier installations, new equipment, including a third-wire winch package, the associated hydraulics and sounder, a Loran C receiver and plotter, and an underwater video recording system, was installed. All systems received their final checkout by the end of the month, and with few exceptions, all were ready for service.

During the week of 26 October, the Gloria Michelle supported NEFC diving operations at Pigeon Hill off Cape Ann, Massachusetts.

Between 3 November and 4 December, the Gloria Michelle was on Nantucket Shoals and at the Massachusetts Bay Dumpsite. A new midwater trawl was calibrated using the net sounder, and gear handling procedures were worked out. Then an acoustical survey for Atlantic herring was conducted, during which a tow and/or an underwater camera drop was made each time a significant target appeared on the sounder.

Sampling at the Massachusetts Bay Dumpsite--at the request of the Environmental Protection Agency--included fishing gill nets, handlines, and jigging with rod and reel. For the second of two trips, we installed an hydraulic gill-net hauler which made it possible to set and haul the gill nets routinely.

While the Unit has been fishing and moving, a contractor has been constructing a model of the NEFC's Yankee No. 36 bottom survey trawl which will soon be tested in the tow tank.

Processing and Preservation Investigation

Frozen Fish Projects

The frozen fish quality assurance project was extended from 30 September 1981 to 31 January 1982.

The study to determine the shelf life of frozen U.S. Grade A haddock held in the innovative Vendo freezer-dispenser is continuing. After 6 mo in the freezer, the haddock was found to be Grade A by a U.S. Department of Commerce (USDC) inspector, and fair to good by the Gloucester Laboratory panel. Counterparts to these samples held in conventional freezer display cases in supermarkets have long since spoiled.

The taste-test results from the 0° and -20°F frozen fish storage study showed that after 6 mo of storage, all of the frozen samples (Atlantic cod, haddock, pollock, yellowtail flounder, and ocean perch) were graded as borderline to good by the Laboratory taste-test panel. Most of the fish samples were given a Grade A by a USDC inspector, but some received a Grade B score and one sample received a score of below Grade B.

Blue Crabs

Experiments are being conducted on the refrigerated shelf life and quality of blue crab meat packaged and pasteurized in air-permeable (polyethylene) and air-impermeable (Mylar) plastic pouches.

Squid Processing

Several contacts have been made with fishery scientists at the Fisheries Foreign Trade Office in Szczecin, Poland, concerning squid processing machinery. They have developed a prototype squid mantle and cleaning machine that they may be able to refine and export when the situation there returns to "normal."

Sorbate Preservation

Two experiments designed to yield data on the shelf life of dressed Atlantic cod held in chilled seawater containing 0.5% potassium sorbate and then in ice has been completed.

Sensory analysis shows that fish treated with potassium sorbate had a 15-20% longer shelf life than the conventionally iced control.

Preservative Dips

An experiment designed to test the preservative dip "Sopac," an experimental French preparation, was completed. Fresh Atlantic cod fillets were dipped in the preservative, packaged, and organoleptically tested against control fillets from the same lot. There was no significant difference in refrigerated shelf life between the two over a 9-day storage period.

Species Identification

The bonito-tuna species identification question is not yet resolved. Since we were planning to undertake the species identification problem in processed food after completion of the agarose work, these samples are very timely. While we await a new supply of tuna from Pascagoula, Mississippi, we are experimenting with new protein extraction techniques.

Fatty Acid and Sterol Analysis

We received a species of clam from the Bahamas from the Marine Biology Laboratory in Woods Hole, Massachusetts, for analysis of fatty acid and sterol composition. The analysis turned out to be far from routine. We are now doing extensive thin-layer and column chromatography on the sample in an attempt to identify some of the peaks from the gas chromatograph. At the same time, we are putting blue mussels through the same workup because of a large unidentified gas chromatograph peak that appears in samples of that species as well. We also analyzed seaweeds and detritus from Duxbury, Massachusetts, blue mussel beds.

In December, we smoked Atlantic salmon and are now analyzing the samples to ascertain any processing effects on the fatty acid profile. Samples have been sent to a column manufacturer so that we may choose a capillary column on which to analyze cis-trans fatty acids.

Engineering

Preliminary investigation into further recovery of waste energy in New England fishing vessels turned up rather barren when only one out of about ten companies which we contacted sent in the requested information. What it did show is that using a heat exchanger and small steam turbine with an electric generator to produce electricity would be rather expensive.

A meeting was held with Steve Strong of Solar Design Associates; Tom Ricci, Project Monitor of Rockwell International; Dr. Gerald R. Guinn, a consultant for Alabama Solar Energy Center; and Dan Baker, Bob Van Twuyver, and Tony Bocelle of NMFS to go over the required design review and engineering acceptance prior to sending out bids. The review was extremely comprehensive.

A 10-day round-the-clock monitoring of the temperature of the Vendo freezer and stored product has been accomplished. The assimilation of the data is underway to correlate varying box temperatures with interior and surface product temperatures. Further correlation will be attempted with taste-test scores as conducted by Joe Mendelsohn.

An improperly operating loading air cylinder in the conveying system of the marine products development irradiator has been corrected. A bronze bushing was machined and inserted into the cylinder. The operation of package transfer from the high-speed conveyor to the low-speed conveyor can now be conducted smoothly with no malfunction on the part of the loading cylinder.

Facilities and Safety

The new 85-gal, high-capacity, hot-water heater has been installed and tested.

We are continuing work on the overhead distilled water distribution system; one tank has been made up, and we are waiting for parts to complete the system.

The unit heaters in the pilot plant and in one of the offices have been repaired.

Manuscripts

The first draft was completed of "Identification of Cooked and Frozen Shellfish Species by Agarose Isoelectric Focusing," by Kate Wiggin.

Product Quality Investigation

A storage study at +20°F was initiated with red hake fillet blocks packaged either in air in 4-mil polyethylene, nylon EVA, or retort pouch bags, or vacuum packed in 4-mil polyethylene. A vacuum-packed reference control stored at -20°F was also included. This study is designed to ascertain the effect of the oxygen permeability of the packaging material on the texture of frozen red hake. Textural changes are being monitored at 5-day intervals by sensory evaluation, by Instron shear-force measurements, and by dimethylamine, trimethylamine, trimethylamine oxide, formaldehyde, and extractable protein nitrogen content.

In a preliminary experiment to identify sources of variation in fish muscle sarcomere length (a parametric measurement possibly associated with textural toughening), six muscle samples were analyzed by laser diffraction from each of eight red hake that had been iced about 4 days. Analysis of variance indicated there was no difference in sarcomere length from muscle taken from left or right side of the fish; but for individual fish, an increase in sarcomere length due to location was observed, proceeding from head to tail. Sarcomere length for a particular muscle was also found to increase with increasing length of the fish. Thus, if sarcomere length is to be correlated with textural quality, an empirical method will have to be devised.

Three suspect abalone samples submitted for identification by the Arizona Attorney General's Financial Fraud Division were shown by isoelectric focusing to be a squid species, Dosidicus gigas. Another dozen suspect abalone samples submitted for identification by the NMFS Charleston Laboratory were also found to be Dosidicus gigas.

Of 24 salmon steaks submitted for identification by the Pascagoula Laboratory, 14 were found to be chum salmon and 10 were found to be coho salmon.

Two samples of Greenland halibut submitted for comparison by agarose gel iso-electric focusing were shown to have the same sarcoplasmic protein pattern.

Samples of spiny dogfish stored for 50 wk at 0°F as vacuum-packed or air-packed skin-on fillets and belly flaps were examined. Panelists are still showing a preference for vacuum-packed samples over air-packed ones; however, no such preference for the freshly frozen samples over the samples held 11 days on ice prior to freezing is apparent. Most samples now are close to or below the level of acceptability. Ammonia levels remain low in all samples, but rancidity is being detected by some panelists even in vacuum-packed samples.

Dogfish stored at 0°F as frozen blocks prepared from skinless fillets and belly flaps and as batter-breaded sticks were examined after 5 wk of storage. All samples are presented to the panel as fried batter-breaded sticks. Scores for samples prepared from blocks of both fillets and belly flaps were high (7.0 or above), and panelists showed no preference for erythorbate-treated samples or controls. Samples stored as batter-breaded sticks, however, were rated lower by the panel.

Frozen red hake stored at -20 and -80°F for 106 wk for the time-temperature tolerance study were examined. Both of these samples are still acceptable.

Samples of breaded pollock portions, submitted by the USDC Inspection Branch for quality assessment, were analyzed for bacterial content (total plate count), ammonia content, and sensory rating.

Kurt Wilhelm spent a day at Golden Eye Seafoods to assist the company with technical difficulties they were having with minced fish production.

Ron Lundstrom reviewed a manuscript on fish species identification being considered for publication in Electrophoresis, the journal of the Electrophoresis Society.

Joe Licciardello reviewed four journal manuscripts: "Ethanol Accumulations in Muscle Tissue as a Chemical Indicator of Fish Decay," for the Journal of Food Biochemistry; "Chilled and Frozen Storage Stability of the Purple Hinge Rock Scallop, Hinnites multirugosus," for the Journal of Food Science; "Microbiological Examination of Fresh Fish Packaged in Carbon Dioxide for Retail Outlets in the Midwest," ibid.; and "Chemical Changes in Irradiated Fish: A Review," for Marine Fisheries Review.

Product Safety Investigation

Polynuclear Aromatic Hydrocarbon Analyses of Casco Bay Sediments

Forty-six sediment samples were worked up for polynuclear aromatic hydrocarbons. Thirty-four of the above sediment samples were analyzed in duplicate on the Perkin-Elmer Series 3B high-performance liquid chromatograph. The resultant ultraviolet and fluorescent spectra were interpreted and concentrations of 16 polynuclear aromatic hydrocarbons were determined.

During this period, the solvent program for the high-performance liquid chromatograph was modified to eliminate artifacts in the ultraviolet and fluorescence spectra. Also, Method 12 and Program "CONCCALC" were modified to enhance the collection of data generated from the fluorescence detector and to facilitate past run calculations of polynuclear aromatic hydrocarbons.

Polychlorinated Biphenyl Analyses of Casco Bay Sediments

All materials for the workup of sediment samples have been purchased, and a new water bath for concentrating samples under nitrogen was designed and built by Mr. Maney.

Sediment samples were collected at Cranes Beach (Ipswich, Massachusetts) to be used as controls. Four of these controls were fortified with various concentrations of Aroclor 1254, worked up, and analyzed by gas-liquid chromatography. Recoveries were greater than 85%.

Workup of sediment samples from Casco Bay, Maine, has begun using the new method. Analysis of some of these extracts indicates the presence of sulfur. Sulfur interferes in the analysis of polychlorinated biphenyls. The sulfur will be eliminated in the final extract by reaction with copper.

Analyses of Liver Extracts

The remaining liver samples of striped bass previously worked up were analyzed by gas-liquid chromatography. Some of these extracts necessitated reconcentration and reanalysis to be within the proper range of the standard.

A final report on our findings has been prepared.

Gas Chromatography-Mass Spectrometry

The Hewlett Packard 5992B gas chromatograph-mass spectrometer is being converted from a packed column to a capillary column system. The new system will be used to confirm the presence of polynuclear aromatic hydrocarbons in fish and sediment extracts. Operation of National Institutes of Health-Environmental Protection Agency Chemical Information System's mass-spectral offline search system is operational and working successfully.

Manuscripts

Three manuscripts were submitted for internal review. Two of these have already been submitted to the appropriate journal for consideration and review.

Product Standards and Specifications Investigation

Revised drafts of "Proposed U.S. General Standards for Grades of Fresh or Frozen Fish Steaks" and "Proposed U.S. General Standards for Grades of Shrimp" are being reviewed by the NMFS Central Office. They will be published as "Notices of Proposed Rulemakings" in the Federal Register. A revised "Draft Inspectors Instructions for Grading Fresh or Frozen Fish Steaks" has been prepared to accompany the proposed rulemaking.

An initial draft of a "Proposed U.S. General Standards for Grades of Frozen Fish Portions and Fish Sticks" has received valued comments which are being resolved.

A final report from the U.S. Army Natick Laboratories, a contract with NMFS, is now being published by the National Technical Information Service. Its title is "Consumer and Instrumental Edibility Measures for Grouping of Fish Species." F. J. King was the Regional Project Coordinator for this contract.

The Gloucester Laboratory is participating in the development of a proposed standard for headed and gutted salmon, both fresh and frozen. We are responsible for the preparation of the technical drafts.

A market research and analysis survey questionnaire for fresh and frozen fish fillets was sent to a number of producers and food service operators as part of the revision of the federal specification for fish, both chilled and frozen. Telephone calls were made to those companies not returning the forms.

The "Commercial Item Description (CID) for Canned Salmon" was sent to users and producers for review and comment.

We have recently received notice that the U.S. Department of Agriculture will purchase canned chunk light tuna in water for the Indian Needy Family Program using the "Commercial Item Description for Canned Tuna" developed at the Gloucester Laboratory.

A form letter and a copy of the CID for fish sticks and portions were sent to a random list of food service operators as part of a market research and analysis study of the product.

Technical Assistance

Editor's Note: The information for this section was inadvertently omitted during the typing of the September-October report. That information is included below.

September-October

Information and technical assistance were provided in the following areas: sources of marketing materials; the Northeast Shellfish Sanitation Association; scallop dredges; eels; sardines; truck transport of frozen seafoods; labeling of preservatives and mixed species of fish; U.S. Department of Commerce sampling plans; butterfish; dried salt cod; common and scientific names of New England flatfish; labeling of "light chunk sardines" (pilchard); method of lipid analysis; fish smoking preservation of smoked bluefish; Bligh-Dyer method of fat analysis; frozen storage life of halibut; freezing lobsters; dogfish by-products; bluefish utilization; bacterial standards for scallops; irradiation of fresh fish; action levels for toxic substances in seafoods; bacterial standards for seafoods; fish handlers' disease; storage problems with mixed-species minced blocks; Torrymeter; fisheries statistics; meat-bone separator manufacturers; use of controlled-atmosphere fish storage; potential hazards of consuming raw fish; objective texture measurements of fish muscle; crab claw cutting machines; cooking and storing lobsters; quality criteria for fresh and frozen fish; U.S. firms that produce fish blocks; squid proc-

essing technology; traps and processing of red crabs; salting and pickling of fish; handling and processing ocean quahogs; novel products from minced fish; and ocean quahog products.

November-December

Information and technical assistance were provided in the following areas: lobsters; fishing safety; softening fish bones; eels; brining fish; shellfish sanitation; seafood processing industry; USDC inspection, design of frozen fish storage study; converting fish frames to fish cakes; disposal of acrylamide solutions; the Torrymeter; microbiology of minced fish production; waste heat recovery; storage and shipment of live lobsters; insulated containers; squid cutting machine; mercury in dogfish; calico scallops; histamine in fish; fish composition; superchilling; oxidation-reduction potential; growth of Clostridium botulinum; thawing fish and the rigor mortis-textural relationship; and sand eels.

Publications

BAKER, D. W.; VAN TWUYVER, R. Recovery of waste energy in a New England fishing vessel. Fish Boat. (A)

DIVISION OF ENVIRONMENTAL ASSESSMENT

Behavior of Marine Fishes and Invertebrates Investigation

As part of our ongoing study of the life habits and ecological requirements of juvenile red hake, field collections of juveniles associated with sea scallops, as well as fish appearing in the Sandy Hook Bay during December, were made in order to verify previous estimates of recruitment and growth. Recruitment showed basically the same trend with the peak occurring from mid-October to mid-November. However, juveniles first began to appear in August approximately 1-mo earlier than previously observed. Fish collected in Sandy Hook Bay in December averaged about 180 mm (TL). When compared to a mean length of 32 mm for the August recruits, a growth rate of approximately 1.22% per day is shown, which falls within the range of our earlier observations, indicating that sizes of 25 cm to >30 cm by the next spawning season are not unreasonable.

Biological Oceanography of Stressed Ecosystems Investigation

The Seabed Metabolism Subunit continued to release data obtained on cruises in March, June, July, August, and September this year with special emphasis on separating the total seabed oxygen consumption rate into its biological and chemical components. As the data were analyzed, work began on the Ocean Pulse Program/Northeast Monitoring Program annual report. We also completed the calculations of nutrient regeneration rates at specific sites in Sandy Hook and Raritan Bays. These rates were obtained by both the shipboard method and the in-situ incubation method; the results will be compared.

In November, Bill Phoel completed the NOAA-sponsored Emergency Medical Technician course and assisted in training NOAA divers in recompression-chamber therapy at the NOAA Diver Training Facility in Miami, Florida.

A batch of 18 seawater samples was examined for chemical water quality by legal bioassay. For the most part, results were similar to those from other recent assay runs. Nitrogen, followed by phosphorus, was the most important nutrient limiting phytoplankton growth. Also obvious was severe growth limitation due to trace metal deficiency. The latter is suspected, however, more likely to reflect a problem in assay technique than the environmental situation. Loss of trace metal when the samples were filtered at sea before freezing is the most likely possibility. These samples were filtered with fiberglass prefilters stacked on 0.45- μm membrane filters. The membrane filter was used to remove bacteria and small particles which could alter the chemical content of the sample, especially in freezing. Uniform metal deficiency was not observed in previous sample series which were filtered with just the fiberglass filter (effective matrix opening 0.7 μm). Loss of iron on the filter is probably what occurred since supplementation of the seawater with iron in the assays relieved the metal deficiency. Starting with the next run, the assay will include a test of the seawater with just iron supplementation. It is planned to continue assay of the samples already collected since the results on all nutrients except metals are reliable. The apparent filtration problem will have to be examined before additional sample collection.

Other activities during this time frame included preparation of the Ocean Pulse Program/Northeast Monitoring Program annual report and preparation of a note with Myron Silverman, "Pictorial Documentation of Fin Necrosis of Marine Fishes in the New York Bight." The latter report "salvages" previously unpublished photographs of diseased specimens from former studies of "fin rot" in local waters.

During November and December, eight SYMAP computer printouts of phytoplankton community structure were produced with the aid of John LeBaron. The production of these SYMAP's was made possible by a program recently developed by Jay O'Reilly, Anthony Pacheco, and Andy Draxler. The SYMAP's are being used to illustrate the Ocean Pulse Program/Northeast Monitoring Program annual report as well as a part of the joint annual report produced by Dr. Harold Marshall (Old Dominion University) and Myra Cohn. During this same period, 88 phytoplankton samples were collected from locations over the continental shelf from Cape Hatteras to Nova Scotia.

During late December, Jim Thomas and Helen Mustafa examined the NASA Goddard Space Flight Center's catalogue of Coastal Zone Color Scanner scenes available and deemed worthy of processing. From this catalogue Jim selected over 500 orbits of imagery to be examined in a Level I browse file. The browse file will be used to determine which scenes the NEFC will request from the Nimbus Experiment Team for further processing at Level II.

The NEFC's Coastal Habitat Assessment, Research, and Monitoring Program continues to progress. Contact was established by Craig Robertson with Dr. William Kennard at the University of Connecticut to request his assistance in determining suitable test sites for the State of Connecticut. With his aid several potentially promising sites have been identified and final sites will be selected in the near future. Final test sites for the States of New Jersey and New York have been identified; aerial photographs, U.S. Geological Survey maps, and wetlands inventory maps for these areas have been ordered.

Bob Pawlowski, Frank Steimle, and Jim Thomas from the Center, along with Ruth Rehfus and Bob Lippson from the Northeast Regional Office and Bob Smith and Jim Chambers from the NMFS Office of Habitat Protection, attended two Regional Action Plan meetings, one at Sandy Hook and one at Gloucester, for the purpose of making joint plans between the Center and the Regional and Central Offices.

Coastal Ecosystems Investigation

Benthic Community Structure

Steve Fromm, Ann Frame, Dave Radosh, and Bob Reid spent most of the period in preparing three reports: (1) our first annual report on monitoring contaminants and their effects on benthos of the New York Bight (We worked with the Environmental Chemistry Investigation to develop a matrix correlating 37 faunal, sediment, and contaminant variables in order to help determine which contaminants might be important in structuring faunal assemblages, and perhaps to streamline our sampling by eliminating redundant variables.); (2) our task's annual report on Ocean Pulse Program monitoring results (Data were assembled and analyzed concerning species richness, species composition (via cluster analysis), and trends in amphipods and other dominant species at Ocean Pulse sites.); and (3) the NEFC staff study (We contributed to sections on the benthos typical of the New York Bight and on anthropogenic impacts to the benthos, including estimated losses of amphipods in the Christiaensen Basin and possible consequences at higher trophic levels.).

Bob Reid chaired a session on status of environmental quality in Middle Atlantic estuaries at the biennial Estuarine Research Federation meeting in Lincoln City, Oregon, and presented a paper on long-term fluctuations in the benthos of Long Island Sound. Bob also participated on a panel attempting to identify priority contaminants in the Hudson-Raritan estuary system, at the Battelle Columbus Laboratories in Duxbury, Massachusetts.

Dave Radosh and Clyde MacKenzie worked on a report describing their experiments on the ability of surf clams to burrow in contaminated (from the sewage sludge dumpsite) versus uncontaminated sediments. Dave also worked on a manuscript on the effects of anoxia on benthic invertebrates, and Clyde completed a draft of a paper comparing populations of benthic invertebrates in areas which had been fished for ocean quahogs and in unfished areas. Clyde was presented with an award for the best publication appearing in a 1977 issue of Marine Fisheries Review--"Development of an Aquaculture Program for Rehabilitation of Damaged Oyster Reefs in Mississippi."

Benthic Energetics/Ocean Pulse Program Coordination

Jan Ward: (1) contributed to proofing the New York Bight benthic fauna atlas (as part of the NOAA Environmental Research Laboratories' Marine Ecosystems Analyses (MESA) Program), (2) proofed the final draft of the Caracciola and Steimle New York Bight apex atlas, (3) developed an assessment of life history characteristics of dominant species at Ocean Pulse Program stations for the Northeast Monitoring Program annual report, and (4) prepared a working draft of a report on community structure and dumping impacts analysis for the NEFC staff's 12-mile-dumpsite characterization.

Dot Jeffress: (1) completed the three-credit course "Introduction to Data Processing," and (2) continued working on biomass data from the first quarterly MESA New York Bight apex cruise, entered all completed data into the computer, and assisted

proofing and preparing data for a formatted output to help the NEFC staff's 12-mile-dumpsite characterization.

Frank Steimle: (1) worked on developing a Regional Action Plan for the Center, (2) planned and supervised the Ocean Pulse Program's biological-effects survey aboard the Delaware II from 16 to 25 November, (3) trained and supervised NOAA Corps Officer Denise Hollomon who has been attached to the Sandy Hook Laboratory to act as Operations Officer for the Ocean Pulse and Northeast Monitoring Programs, (4) made final revisions and proofed a manuscript on feeding habits of fish associated with artificial reefs, and (5) supervised for the Division Chief the initial coordination of the NEFC staff study of the 12-mile dumpsite.

Northeast Monitoring Program Operations

Northeast Monitoring Program management meetings were held in Washington, D.C., on 4 and 5 November and at Sandy Hook, New Jersey, on 7 and 8 December. As a result of these discussions, planning and organization of the first annual Northeast Monitoring Program Workshop commenced. This workshop will be held at the Milford Laboratory during 23-25 February 1982. The purpose of the workshop will be to provide an opportunity for each principal investigator to present a summary of his/her findings. At present, 25 annual reports have been received from participating investigators.

A successful biological-effects survey cruise was conducted aboard the Delaware II in November with Denise Hollomon participating as Chief Scientist. Planning and organization of the Northeast Monitoring Program's January-February cruise on the Albatross IV have begun.

Environmental Statistics Investigation

The Environmental Statistics Investigation continued development of a data base system design for the Northeast Monitoring Program. A stratification technique of the monitoring area is underway using water-column hydrographic data as a basic system design. The draft manuscript of both studies is documented as Sandy Hook Laboratory Report No.'s 81-36 and 81-37, respectively.

Development of a method for multiple-factor bioassay problems on synergistic and antagonistic effects of pollutants and heavy metal loads is in progress.

The statistical analysis on silver and copper effects on blue mussels (Mytilus edulis) and slipper limpets (Crepidula fornicata) has been performed for the Physiological Effects of Pollutant Stress Investigation. The temporal and spatial factors of the Long Island Sound benthic community have been analyzed for the Coastal Ecosystems Investigation.

Environmental Chemistry Investigation

Data on nitrate, nitrite, ammonium, phosphate, and silicate concentrations in seawater samples from 13 surveys [conducted as part of both the Marine Resources Monitoring, Assessment, and Prediction Program (MARMAP) and the Ocean Pulse Program] in 1979 and 1 survey in 1980 were submitted to the Sandy Hook Laboratory Automatic Data Processing (ADP) Unit for keypunching. The resulting "off-line" listings of these data were proofed and the data are ready to be calculated using the nutrient algorithm.

Ruth Waldhauer and Ingrid Devouges completed analyses for ammonium nitrogen for the 305 seawater samples collected during the MARMAP survey on Albatross IV Cruise No. AL 81-14. They also completed about 660 analyses of samples collected by Bill Phoel (Biological Oceanography of Stressed Ecosystems Investigation) during his New York Bight study in which he compared the rate of nutrient flux from sediments taken with the multiple corer with benthic nutrient flux rates measured using in-situ bell jars. Mr. Andrew Draxler of this Investigation and Mr. Phoel have made measurements of benthic nutrient flux rates throughout the New York Bight and Georges Bank during five Ocean Pulse Program surveys using the multiple-corer method. These measurements will be used to determine the importance of the seabed as a source of nutrients required by the very active phytoplankton in the overlying water column.

Al Matte trained student volunteers who were responsible for collecting, filtering, and preserving seawater samples for nutrient analysis on the first leg of the MARMAP survey on Albatross IV Cruise No. AL 81-14. Jim Nichols and a student volunteer served on the second leg. Al Matte and Jim Nichols staffed leg three.

Salinities were determined for samples collected during the Ocean Pulse Program survey on Albatross IV Cruise No. AL 81-10; the data were submitted to the ADP Unit.

Bob Fitzgerald and Dave Burdick, a new member of the Chlorophyll Subtask, measured phytoplankton biomass concentration throughout the water column to the 100-m depth at 88 stations, during the November-December MARMAP survey (Albatross IV Cruise No. AL 81-14). Chlorophyll-a concentration was measured in netplankton (<20 m) at the 915 depths sampled.

Jim Nichols and Tom Burdick, a new member of the Carbon-14 Productivity Subtask, measured rates of phytoplankton production at 29 stations during the aforementioned survey.

During this period, work in the trace metals lab centered on data reduction in preparation for the second annual Northeast Monitoring Program annual report and the upcoming (February) meeting to be held at the Milford Laboratory. Computer-generated contour maps (SYMAP) of the distribution of six trace metals in sediments of the New York Bight collected during the August Northeast Monitoring Program survey (Albatross IV Cruise No. AL 81-09) were prepared. Data on trace metal concentrations in sediments, sediment particle size, total organic carbon, total organic nitrogen, polychlorinated biphenyls, and coprostanol concentrations in sediments collected during the benthic contaminants monitoring survey of the New York Bight (NOAA R/V Kelez Cruise No. KE 80-07) were merged in a computer file along with benthic community attributes (species richness, diversity, species density, species composition, etc.). We began to correlate elements of this merged file. Also, computer contour maps of 16 variables from the file were made.

A report, "A Summary of Chlorophyll Measurements Made During the Wieczno 80-02 Survey," Sandy Hook Laboratory Report No. 81-33 by Evans-Zetlin and O'Reilly, was completed and sent to Marianna Pastuszek via the Chief Scientists aboard the Wieczno.

Physiological Effects of Pollutant Stress Investigation

Physioecology

Adult and subadult blue mussels exposed to 0, 5, 25, and 50 mg/l of copper (as chloride) for 1 yr in a diluter system were sampled and the experiment was terminated. One group of samples was given to the Chemistry Subtask for metal analysis, a second group to Paul Yevich of the EPA's Narragansett Laboratory for histopathological examination, and a third group to Dr. Stephen George of the Institute of Marine Biochemistry in Aberdeen, Scotland, for x-ray microprobe analysis to determine localization and speciation of silver in the mussels.

Adult blue mussels held in ambient seawater in a diluter system continue to be sampled biweekly for copper analysis, in an attempt to monitor biologically the background levels of copper in our seawater system, and to determine any seasonal changes in copper uptake in mussels.

Surf clams exposed to 0, 1, 5, and 10 mg/l of silver for 1 yr were sampled and the experiment was terminated. One group of samples was given to the Chemistry Subtask for analysis of body burdens of silver and copper, and another group to Yevich for histopathological examination.

Adult blue mussels, subadult surf clams, and subadult bay scallops continue to be exposed to copper at 0, 2, 10 and 20 mg/l in a diluter system, to establish a time-dose mortality response curve. Animals are examined daily and dead ones are removed and properly noted.

Physiology

The Ocean Pulse Program samples collected on the 1980 and 1981 Kelez cruises were analyzed and tabulated this reporting period and a new set of samples collected on the fall cruise of the Delaware II. December collections were made in Long Island Sound, but the November sampling was canceled because the NEFC's R/V Shang Wheeler was in for repairs most of the month.

Four-hundred striped bass were sent to the Milford Laboratory from the U.S. Fish and Wildlife Service hatchery in North Carolina, and will be used for pollutant-related lab studies this winter. A 60-day mercury exposure with windowpane, completed this month, is part of our Long Island Sound monitoring program. We are continuing the Narragansett Bay blue mussel study with the EPA, but expect that winter weather and icing will soon postpone further sampling until spring.

A considerable portion of this reporting period was also spent on the preparation of the Northeast Monitoring Program/Ocean Pulse Program annual report, especially the extensive figure and chart section.

Biochemistry

During this bimonthly reporting period, the Biochemistry Subtask participated in the Ocean Pulse Program survey on Delaware II Cruise No. DE 81-07, during 16-25 November. Although it was not possible to sample the deepwater station in the Gulf of Maine (for which we need sediment and water data), or to obtain sea scallops from the Cape Cod station despite two trawling efforts, we were fortunate in getting

specimens from other stations of special interest: the Block Island midshelf, outer Hudson Valley, and Baltimore Canyon. We shared kidney samples with the Environmental Chemistry Investigation in order to have support data on heavy metal concentrations in this tissue, to help evaluate the biochemical data.

At the bench, biochemical analyses were performed on sea scallop adductor muscle samples from resource surveys on Delaware II Cruise No. DE 81-02 and Albatross IV Cruise No. AL 81-06. Analyses of kidneys were done for samples from Ocean Pulse Program surveys on Albatross IV Cruise No. AL 81-10 and Delaware II Cruise No. DE 81-07.

A considerable time was devoted to writing reports, the bulk of it in preparing Biochemistry's input to the Northeast Monitoring Program annual report for 1981.

Anaerobic Bacteriology

Considerable time was spent in preparation of the Northeast Monitoring Program/Ocean Pulse Program annual report and on the New York Bight Monitoring Program Annual Report.

Evaluation of data on the distribution of Clostridium perfringens in sediments in the New York Bight indicates a greater dispersion of sewage sludge from the dumpsite than previously indicated by fecal coliform indices, which do not necessarily correlate with the presence of bacterial pathogens of concern. The distribution of Vibrio spp. (V. cholerae, V. parahaemolyticus, lactose (+) halophilic species) most directly relates to nutrient loading and changes in temperature, and not necessarily to sewage pollution.

In the Long Island Sound monitoring study, the distribution of C. perfringens in sediments correlated with ambient temperatures except at the most polluted station, where an inverse relation was observed with numbers and sediment temperature, lower counts being observed at that station during the summer sampling when the temperature was the highest.

Chemistry

A cooperative study was initiated this reporting period with Dr. Marvin Freadman of the University of Massachusetts. He is using swimming tunnel respirometers to study the effect of water quality on locomotor capacity in striped bass. Bass have been collected from impacted (Hudson-Raritan estuary) and non-impacted (Edenton, North Carolina, bass hatchery) areas for these studies. We are providing chemical analyses for heavy metals and polychlorinated biphenyls (PCB's) in tissues of these fish and in water samples from the impacted area. An attempt will be made to associate levels of pollutants either in the fish themselves or in the test-water medium, with changes in locomotor behavior that may affect the migratory patterns of this species.

Attempts have been made over the last several months to collect stomach contents of windowpane from an impacted station and a non-impacted station in Long Island Sound as part of this Investigation's Long Island Sound monitoring study. Stomach contents of these fish will be analyzed for PCB's to determine whether fish from these two areas might be assimilating PCB's through their food. Our November collection from the non-impacted station provided 10 samples of stomach contents from 30 fish captured. Samples will be collected later from the impacted station.

Analyses of the concentrations of metal being added to diluter systems continue. Analyses of metals in tissues of animals previously exposed in these systems continue on schedule.

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AQUACULTURE DIVISION

Aquacultural Genetics Investigation

Genetic Effects of Contaminants on Marine Fish

Roughly 300 yolk-sac membranes and seven embryos from Atlantic mackerel and cunner were examined for chromosome and mitotic abnormalities as part of a joint study

initiated by West German scientists. This study is intended to examine associations between gonad body burdens of particular pollutants and embryonic development.

The procedures for using the micronucleus test for chromosome mutation on the immature erythrocyte of the fish head kidney have been worked out: incidences in these cells were calculated for 60 windowpane and 60 Atlantic cod kidneys collected on Ocean Pulse Program cruises. Incidences are significantly higher in the immature unreleased erythrocyte ($\pm 10/1000$) than in the mature circulating erythrocyte ($\pm 3/1000$). Kidney tissue instead of blood smears will be employed in any future monitoring. Mitotic abnormalities indicative of chromosome mutation and the forerunner of micronuclei were calculated for several of these fish. These incidences more than account for the numbers of micronuclei observed. Experimental studies utilizing this test must account for any mitotic-inhibiting effects which will alter blood cell ratios. The means of handling this were also worked out for fish.

By using a series of Atlantic salmon fixed daily throughout their embryonic and larval periods, the ontogeny of fish blood is still being followed, relying on procedures necessary for the micronucleus test, and on microdissection. Embryonic and larval fish sometimes have incidences of chromosome mutation exceeding those ever observed in the immature erythrocytes of adult hematopoiesis (up to $\pm 80/1000$ blood cells). It is believed that experimental adaptations of the test would be more sensitive if conducted on larval fish. Monitoring with larval phases would probably also be more sensitive if adequate samples could be obtained. The convenience of using adults, however, remains an important factor. About 100 larval fish (mostly red hake) have so far been examined from six or so sample sites of the Ocean Pulse Program.

An aromatic hydrocarbon [benzo(a)pyrene] and a reference direct mutagen are being used in experimental studies on chromosome mutation employing the micronucleus test. Other experimental and/or methodologic work is being done on the sperm mutation test and sister-chromatid exchange with a view to ultimate field applications to sexually mature fish or more site-intensive studies, respectively.

In November, A. Longwell contributed to a background paper at a Florida workshop held as part of the National Academy of Sciences' review of petroleum in the marine environment. Contributions were made by the Aquacultural Genetics Investigation to the report of the NEFC's ad-hoc Atlantic mackerel study committee.

Genetics and Breeding of the American Oyster

The second selected generation of American oysters in the several-generation selection experiment for growth rate is now being measured. These juvenile oysters are then to be again selected into high-growth and low-growth lines for breeding a third selected generation. This experiment should continue to provide new information for each oyster generation on the extent and duration of response of these oysters under prevailing culture conditions.

Preliminary analyses comparing growth of local juvenile control oysters and juvenile hybrid oysters (the latter from crosses of geographically separated populations) revealed no consistently significant differences. Earlier data on larval growth similarly indicate no consistently significant differences at the larval stage, although the local juvenile controls displayed a slight growth advantage.

past experiments comparing juvenile growth showed hybrids to be intermediate between the faster-growing local controls and the slower-growing nonlocal controls in the local environment.

Subsamples of these hybrid and local populations are being used in grow-out experiments. To date, no substantial difference in size has been measured between the groups. Other stock utilized in the grow-out experiments includes various year classes of full-sib families for inbreeding. As before, the offshore grow-out site is yielding a greater increase in size (length, width, and weight) of oysters than more inshore locations.

Aspects of Nutritional Requirements of Mollusks Investigation

Oyster Feeding Experiments

A series of feeding experiments was conducted with small oysters (about 2 cm). The organism tested as a food source was a freshwater cryptomonad flagellate adapted to tolerate 30% seawater in the growth medium. Since this flagellate stores a great deal of starch, we speculated that it would be a good food source. Groups of 50 oysters were placed on screens in the molluscan rearing chambers and food cells were offered daily at three different cell densities; an unfed control was also provided. Oysters from two feeding regimes were observed and weighed weekly for 6 wk; those oysters from the third feeding regime and the unfed group were observed and weighed weekly for 13 wk. Although there was only one dead animal of the 200 tested, the oysters did not increase in weight. An unexpected observation was that the shells of animals given this food source acquired a unique yellow iridescent appearance. This may have been an effect of the algal growth medium or of cells adhering to the shell; the causative factors will require further study. The apparent conclusion is that this flagellate cannot fill the nutritional requirements of the oysters. To examine further this hypothesis, oysters from the same source were given a known valuable nutritional diet--Tetraselmis maculata. These oysters also showed no growth; therefore, results of experiments with the cryptomonad may have been influenced by abnormal test animals, and additional experiments should be conducted.

Spawning and Rearing of Mollusks Investigation

Experiments are in progress to assess the nutritional requirements of young surf clams (Spisula solidissima). Groups of 10-mm clams all showed significant growth on diets of the algae Monochrysis and Isochrysis or a mixture of Phaeodactylum and Dunaliella. Further experiments have shown that growth is comparable whether clams are maintained at a constant algal cell concentration or fed only periodically. (The latter situation is more economical in terms of the amounts of algae necessary.) Clams have also been reared at different concentrations of algae and minimum levels have been established. Filtration rates of clams in the different treatments have been measured and there is a direct correlation between filtration activity and the concentration to which they were exposed. An attempt is being made to relate the physiological activity level of filtration with the measured growth of clams in the different treatments.

A major portion of the program effort this period was spent on final sampling and data workup for the extensive grow-out experiment with bay scallops (Argopecten irradians) in lantern nets in Long Island Sound. About 10 000 shell-height measure-

ments and almost 6000 weight measurements were made to assess the effects of stocking density, net position, and handling frequency on scallops grown in this manner. The final results are still under analysis; however, preliminary observations indicate that single-season growth to market size is attainable in this type of intensive culture system.

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PATHOBIOLOGY DIVISION

Comparative Invertebrate Pathology Investigation

In a comparative molluscan pathology project, samples of blue mussels were received from Searsport, Maine (two sites); Damariscotta River, Maine; Wachapreague, Virginia; and Virginia Beach, Virginia. The first site in Searsport is the routine sampling site located within the old spontaneous JP-5 oil spill. The second site is one where an experimental oil spill was recently performed. Mussels from both sites were collected and evaluated for gross signs of disease and condition index. Animals from the old spill site showed condition indexes of 50% fat, 42% medium, and 2% watery. Pearls were evident in 40%. The experimental spill site mussels showed condition indexes of 22% fat, 76% medium, and 2% watery. Interestingly, pearls were found in 60% of these mussels. These sites are to be monitored in the future for any changes.

Preliminary evaluation of gross pathology data in blue mussels from all coastal monitoring areas (Maine to Virginia) shows seasonal variation in condition with the best in spring and summer and the worst in fall and winter. Maine mussels show the worst condition of any area and also the heaviest occurrence of pearls which decrease to insignificant levels in more southern sample areas. Pinnotherid crabs appear to be abundant only in one area in Falmouth, Maine. The Damariscotta River mussels appear to be in the worst condition and show high prevalences of pearls and greenish color. Mussels from south of Raritan Bay demonstrate nothing remarkable in the way of gross lesions, poor condition, or macroparasites.

Data management dictionaries for geographic sites, gametogenesis, set size, organ systems, gross pathology and macroparasites, histopathology, microparasites, hematology, and degree of time involvement have been developed for computer entry.

With the development of the data storage programs as reported in the last issue of this newsletter, information collected from earlier ocean shellfish cruises was reevaluated and prepared for entry into our automatic data processing system. So far, all of the 1980 surf clam and sea scallop pathology information, as well as most of the ocean quahog information, have been processed and stored in the Northeast Monitoring Program's (NEMP) computer system. The effort to reevaluate data and make them compatible for computer entry continues.

A single sea scallop sample from the State of Maine, supplied by Stuart Sherburne, was examined to confirm the continued presence of bacterial-related multifocal abscesses. Even though the tissues were badly decomposed prior to fixation, characteristic lesions indicate the continued presence of the disease in inshore scallop populations.

In our crustacean pathology studies, sections from more than 100 pleopods and ovaries of samples of Alaskan blue king crabs taken during the NMFS Kodiak Laboratory winter survey were examined histologically and a report was prepared and sent to that Laboratory.

Amphipod material from the July 1981 NEMP cruise has now been examined histologically. More than 1400 specimens were involved, and patterns of parasitism were much as in previous material. Sectioned amphipods from the August-September NEMP cruise are presently being examined. Amphipods from four stations sampled on the

November cruise are also available, have been identified, and will be prepared for histological processing.

The histology lab was very productive this reporting period, producing approximately 2500 stained slides of various fish and shellfish tissues to resident pathologists for histological examination.

Fish Pathology Investigation

The Arthur Kill is a very polluted channel connecting Raritan Bay with the Hudson River. Shore-based petroleum and other heavy industries in New Jersey and on Staten Island have discharged toxic substances into the Kill for many years. If resident fish are affected by these substances, the fish may be useful in the evaluation of techniques appropriate for monitoring fish health in less ecologically altered environments.

There is some experimental evidence that hepatic and splenic melanin-macrophage centers (MMC's) increase in size and number in stressed fish, i.e., malnourished fish and those with certain infectious diseases. There also is circumstantial evidence that hepatocellular neoplasms (hepatomas) of certain pleuronectid fishes may be induced by high concentrations of petrochemicals in the sediments in which the fish reside. Arthur Kill fish, therefore, represent appropriate animals to test to hypotheses: (1) flatfish inhabiting a severely polluted environment have more numerous and larger MMC's than fish from nonpolluted environments; and (2) flatfish inhabiting an environment substantially contaminated with petrochemicals have more preneoplastic and neoplastic hepatic lesions than fish from environments without petrochemical contaminants.

To date, 107 flatfishes (89 winter flounder, 13 summer flounder, and 5 hogchoker) have been obtained from the Arthur Kill. All hepatic tissues have been sectioned and examined with light microscopy. The number and size of the MMC's in these fish do not appear greater than those noted in the same species from other environments. No hepatomas were found; however, several fish had morphologically aberrant hepatic parenchymal cells. In many fish, the hepatocytes were vacuolated, presumably due to their lipid or glycogen content. Some fish had focal hepatitis and/or focal hepatocellular necrosis. It is not possible to evaluate the health significance of the lesions observed; however, none have significantly altered hepatic morphology. Although the MMC's do not appear useful in monitoring fish health, it may be worthwhile to evaluate hepatic morphology in fishes from areas with known petrochemical contamination.

Trawling for ulcerated red hake resumed in the New York Bight on 8 December. John Ziskowski examined 281 hake from Raritan Bay and the Bight apex; 8 (2.8%) had ulcers. On 15 and 29 December, attempts were made to obtain additional fish for bacteriologic, histologic, and immunologic studies. On both dates, the NEFC's R/V Kyma arrived on station only to have to abort its mission and return to the dock. On 15 December, trawling was not possible because of the failure of the hydraulic winch (broken shaft); on 29 December, high seas and strong winds precluded fishing. Sampling red hake continues to be an elusive and frustrating task.

The second edition of the Catalog of Slide Accessions of the Registry of Marine Pathology was mailed during the first week of December.

The data base on skeletal anomalies of Ammodytes sp./spp. from the Northwest Atlantic was made current, and statistical analysis of the data was initiated. This necessitated additional time in learning computer operation and use of the 1022 system. Some method of statistically correlating Ammodytes data with physical-chemical data collected on NEMP-Ocean Pulse Program cruises yet must be devised.

Mr. Newman, as chairman of a Center working group on Atlantic mackerel, convened meetings to discuss monitoring and research activities related to studying the causes of variability in Atlantic mackerel populations. The meetings were held at the Milford Laboratory and in Baltimore. A first draft of the working group's recommendations has been prepared and distributed to its members and to the Center Director.

Samples of olfactory tissue from the butterfish have been received from the first leg of the autumn bottom trawl survey (Delaware Bay to Cape Fear). The samples are being sorted by sampling strata. Soon, selected tissues will be prepared for examination by light microscopy. Initially, the tissues will be evaluated for the presence of lesions induced by environmental pollutants.

Light and electron microscope studies on the effects of copper on the olfactory tissue and neuromasts of striped bass larvae exposed to 150, 100, and 75 ppb of Cu^{++} for 24 hr have been completed. No cytopathology was observed in either of these organs. Examination of the cornea in fish exposed to 150 ppb of Cu^{++} revealed that surficial cells are sloughing, leaving the underlying membrane exposed to the external environment. Presently, the corneas of fish exposed to lesser concentrations are being examined to determine whether they are similarly affected.

A new study on the blood cells of the yellowtail flounder has been initiated which will focus on an ultrastructural analysis of a possible hemolytic disease in this species. Blood samples were collected on a recent NEMP cruise and soon will be processed for electron microscopic examination.

In efforts to determine a measurable sublethal effect of parasites on finfish health, data collected and published on an intraerythrocytic parasite in Atlantic mackerel were reexamined. Data collected over a 3-yr period on mackerel migrating off Chincoteague, Virginia, were used to calculate the condition factor of infected and uninfected fish. The condition factor (C) is the traditional formula used by fisheries biologists, relating length to weight. A total of 200 fish were weighed and measured, then had their blood smears examined for the presence of the parasite. If any differences in C were to be observed, they were expected to be between uninfected and heavily infected fish. Of the 200 fish examined, 129 were uninfected and 26 were heavily infected; the calculated mean C's in each group were 1.2 and 1.0, respectively. The difference is significant at $p < 0.01$ (Student's t-test). Several factors affect C values, e.g., age and nutritional status of the fish sampled. Despite the possible effect of these variables, uncontrolled in this calculation, the data suggest that the parasite may be responsible for the lower C in the infected fish. Consequently, C is one factor to be determined from data collected during the proposed comprehensive Atlantic mackerel surveys this winter.

Diseases of Larval Mollusks Investigation

Bacteria of the genus Vibrio are widely recognized as important pathogens of marine animals. One of the eight characteristics necessary to place bacteria in this

genus is a positive oxidase reaction. We have encountered negative reactions in bacteria which by all other criteria should be classified as Vibrio sp. After testing these and other organisms by four different oxidase testing procedures following initial growth on several basal media, we have found that bacteria originally classified as oxidase negative may be, in fact, oxidase positive. The most consistent positive reactions were achieved after growth on Mueller-Hinton agar that was modified by addition of 2.5% NaCl and 2.4 mM Hepes buffer, and then tested by the Kovacs filter-paper oxidase test. One organism would not grow on the Mueller-Hinton agar, but was oxidase positive after growth on a trypticase yeast-extract seawater agar, containing 2.4 mM Hepes buffer and subsequently tested by the Kovacs plate method or the BBL Taxo disc method. Classification of marine pathogens can be made more reliable by incorporation of these findings.

As part of the 2-yr Long Island microbiological distribution study, four shellfish pathogens were isolated from the Stratford, Connecticut, site. These four isolates have been put through an extensive series of biochemical tests to determine if any have unusual characteristics. An additional 1-yr study is in progress, the purpose of which is to try to recover and determine frequency of occurrence and distribution of these pathogens at Stratford.

Plankton tows from the first six Long Island cruises were taken from the Stratford site to isolate microbial organisms associated with bivalve larvae. The highest density of bivalve larvae occurred on the 12 June cruise, with an average of 132 larvae per milliliter. This then dropped by the 22 June cruise to about 36 larvae. On 29 June, this continued to drop to about nine larvae. It increased in July and then dropped in August and even more in September to only six larvae. On 1 December, the seventh Stratford cruise was completed. Twenty-five isolates were taken and will be put through biochemical testing procedures.

The 36 isolates taken from the 23 September 1981 (sixth) Stratford cruise have now been identified to genus. They are as follows: 15 Vibrio, 7 Flavobacterium, 7 Pseudomonas, 4 Aeromonas, and 3 Achromobacter. This is the first occurrence of Aeromonas in any of our samples.

High mortality problems continue at Marine Bioservices in South Bristol, Maine. On 13 February 1981, the Pathobiology Division received water samples which were plated on 80 agar plates of both OZR and TCBS. Twenty bacterial isolates were taken and checked for pathogenicity. They proved to be nonpathogenic when exposed to American oyster larvae. These organisms have been tested biochemically and their genera determined as follows: eight Vibrio, five Achromobacter, three Flavobacterium, and two Pseudomonas; two cultures died.

In collaborative studies on fishery products preservation with colleagues from Alaska, it was found that ozone, bubbled into water which was then frozen, could be held for a number of days and be measured as a residual component in the ice. This work is continuing at the Milford Laboratory for the method appears very promising to enhance the preservation capacity of ice.

On 1 December, State of Connecticut aquaculture personnel collected hard clams from two sites in Bayview near Milford. One collection was from the center and one from the outer regions of the area. At the State's request, these were tested for the presence of coliforms. No coliforms were found in these samples. However, this

area provided a clam with a possible tumor. The specimen was sent to the Oxford Laboratory for pathological analysis.

Development of systems to improve microbial characterization and identification continued. A modified basal medium used with the Minitek bacterial differentiation system improved the correlation between standard tests and the more rapid Minitek tests for some biochemical reactions when tested against 65 marine bacteria. However, the seawater used in the modified basal medium may inhibit some of the reactions. An earlier modification, involving the simple introduction of NaCl to the Minitek base broth, provided higher correlation for some of the tests. A repeat of several of these tests will be necessary to determine whether selective use of one or the other modification with appropriate biochemical discs will allow further improvements in the test system.

Further exotoxin characterizations of a *Vibrio* species isolated earlier from American oyster larvae are being completed. Data collected from experiments using Sephadex column chromatography in combination with polyacrylamide gel electrophoresis were plotted against several known proteins to estimate the molecular weight of the toxin. Preliminary studies show the purified toxin to have a molecular weight of 68 000. Carbohydrate determinations were conducted on select fractions of the Sephadex column eluant.

Bioassays are being conducted with soft-shell clams to elucidate the effect of the toxic crude filtrate versus the living bacterium. Similar experiments are being scheduled for American oyster larvae.

Growth studies of seawater bacteria on estuarine agar continue.

Microbial Ecology and Parasitology Investigation

Summarization of all data analyzed to date on black gills in the Atlantic rock crab has shown that an overall 4% incidence occurs in specimens collected from Sandy Hook and Lower Bay, New Jersey. The incidence decreases to near zero when collections coincide with molting activity from late December to early May, and increases up to 7% when intermolt crabs are caught just before or shortly after their annual molt. Similar results have been obtained with specimens caught near Ambrose Light and the New York Bight sewage disposal site, but there are two seasons when the incidence is influenced by molting activity. Collections made in the ocean during April-June often yielded large numbers of crabs with clean gills that probably had migrated seaward after molting in the bays. Later, from July to September, collections yielded large numbers of crabs that had recently molted in the ocean. Observations on over 4000 crabs during 1973-81 have shown that surveys on gill blackening must be timed according to differences in molting activity and migratory patterns between ocean and bay crabs. Surveys at the ocean stations during 1979-81 often yielded very small numbers of crabs at a historical station located near the sewage site. Catch data suggest that perhaps the sludge blanket has spread laterally and crabs have dispersed away from the dumpsite periphery. Further surveys to reexamine the grid sampling sites used by the NOAA Marine Ecosystems Analysis Program are necessary to determine whether changes have occurred in the spatial distribution of the species.

Atlantic rock crabs were examined for black gills during November and December 1981 (see the following table). Results on the incidence of blackening agreed with those from previous years. Collections in Sandy Hook Bay were timed to obtain crabs

prior to the start of winter molting activity when the incidence of discolored or blackened gills would be expected to be high. Collections at the sewage site were timed to obtain crabs that would remain in the ocean during the winter or had not yet migrated shoreward. A third collection was made in the ocean near the mouth of Sandy Hook Bay to obtain migrating crabs that were on their way shoreward prior to molt. The third collection was made to collect crabs that had moved from points located throughout the New York Bight apex, not necessarily from only ocean disposal sites. Crabs caught from the Bay and disposal site stations were noted to have deposits of black sludge, sometimes visible only after the dorsal carapace was removed. The black sludge line conformed to shape and size of the suture line between the dorsal and ventral carapace and was noted in several crabs with clean gills. The incidence of "black suture" is included in the data tabulated below:

Location	No. crabs (a)	Gill condition			Black suture
		Clean	Discolored	Black	
Sandy Hook Bay	65	22(34%)	40(61%)	3(5%)	20(31%)
Bay mouth	29	23(79%)	5(17%)	1(4%)	0(0%)
Sewage site	20	11(55%)	7(35%)	2(10%)	9(45%)

(a) Sandy Hook Bay--57 males, 8 females.
 Bay mouth--28 males, 1 female.
 Sewage site--17 males, 3 females.

The presence of carapace suture blackening will be taken into account in future surveys because of its relatively high incidence in the Bay and near the sewage disposal site.

Gills and hepatopancreas (digestive gland) from 19 Atlantic rock crabs are being processed for histological study of tissue pathology and gill-fouling microorganisms (i.e., bacteria, diatoms, protozoans, and copepods). Microscopic examination of gills from crabs collected in the Hudson Valley shelf has been completed. Approximately 50% of crabs examined were infected with an unknown parasite tentatively considered to be a microsporidian. The high incidence of the parasite was remarkable since observations on approximately 2000 crabs examined previously from the Sandy Hook Bay and sewage disposal site stations have shown an incidence of 5% or less. Similarly, approximately 50% of the crabs had copepods infesting their gills, in contrast to 0-20% of those from the other sites. Further collections from the Hudson Valley shelf will be made to determine whether there are seasonal differences in the incidence of copepods and probable microsporidians. The Hudson Valley is of interest since it has been reported to have a remarkably high total-organic-carbon to total-carbon ratio, and has bottom sediments composed of black mud and silt. Low fecal coliform counts reported from bottom sediments by other investigators suggest that the valley may act as a sink for aged sewage sludge and other environmental contaminants.

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NATIONAL SYSTEMATICS LABORATORY

Systematics of Fishes

Progress on the revision of the Spanish mackerels included completing sections on soft anatomy, neurocranium, palatine arch, and hyoid arch, and beginning the section on osteology. Analysis of variance was completed for the geographic variation sections of the revision of the needlefish genus Potomorrhaphis.

Systematics of Crustaceans

Preparation continued on a monograph on eastern Pacific rock shrimps (genus Sicyonia) which includes systematics, morphology, phylogenetic relations, geographic and bathymetric distributions, ecology, full bibliographic references, and commercial value. A study was initiated of a new shrimp of the genus Hymenopenaeus from Old Bahama Channel, western Atlantic, taken by the Harvard-Havana Expedition. A draft was prepared on a manuscript on a new species of shrimp of the genus Mesopenaeus from the Indian Ocean, coauthored with Boris G. Ivanov of the Soviet Union's All-Union Research Institute for Marine Fisheries and Oceanography in Moscow. We collaborated with workers at Duke University and the Gulf Coast Research Laboratory on a study of the systematic status of "forms" of the oyster bar mud crab (Panopeus herbstii). Mud shrimps of the eastern Pacific were studied.

Scientific Services

A proposal was reviewed for the National Science Foundation (Biological Research Resources).

Two drafts of the report from the Conference on Voucher Specimens were reviewed for the editors. A manuscript on the effect of pH on sex ratio in a cichlid, one on relationships of ostraciid fishes, and one on reproductive efforts in brachyuran crabs were reviewed for the authors. Two crustacean manuscripts were reviewed for the Journal of Crustacean Biology, one for the Proceedings of the Biological Society of Washington, and one for the Estuarine Research Federation Conference Proceedings. Manuscripts on fishes were reviewed for Science and Copeia.

Dr. Dennis C. Lees, a senior marine biologist with Dames and Moore Co., was provided information relative to the SAFAT-Kuwait project. Mr. Dennes R. Lassyy of the National Coastal Ecosystems Team, U.S. Fish and Wildlife Service, in Slidell, Louisiana, and Mr. Leslie Robinson of the Joseph Slavin Co. in Washington, D.C., was provided with information on importation of fisheries products. Ms. Biruta M. Akerbergs, an illustrator with the Smithsonian Institution's Department of Entomology, was given information. Information on Galapagos halfbeaks was furnished to Mr. Jack Grove. Information on Samoan halfbeaks and needlefishes was furnished to Mr. Richard Wass. Assistance was given to Dr. Horton Hobbs and Mr. W. Hart of the Smithsonian Institution's Department of Invertebrate Zoology in constructing and evaluating computer-generated phylogenetic trees.

Expert identification of lobster tails for evidence in legal proceedings was furnished to Richard Cano of the NMFS Inspection Service Branch. Several lots of halfbeaks and needlefishes were identified for Mr. T. Adamson of the Los Angeles County Museum. Crustacean identifications were provided for Dr. Dennis Hedgecock of the University of California at Davis, Peter F. Sheridan of the NMFS Galveston Lab

(mud shrimp), Dr. Judith Blake of the Audubon Society of Rhode Island (rare tropical crab found near Portsmouth, Rhode Island), and Dr. Harlan Dean of the University of Delaware and University of Costa Rica (crabs and shrimps from Gulf of Nicoya, Costa Rica).

Loans and exchanges of various gadiform fishes were made for the National Museum of Natural History to Dr. Donn E. Rosen from the American Museum of Natural History.

A list of changes in names and classification for Bigelow and Schroeder's Fishes of the Gulf of Maine was prepared for the Harvard University Museum of Comparative Zoology.

Publications

COLLETTE, B. B. Review: Synopses of biological data on eight species of scombrids. Bayliff, W. H. ed. *Copeia* 1982(1). (A)

COLLETTE, B. B. Mangrove fishes of New Guinea. Proc. 2nd Int. Symp. Biol. Manage. Mangroves. Junk, W. ed. (A)

COLLETTE, B. B.; SMITH, B. R. Bluefin tuna, Thunnus thynnus orientalis, from the Gulf of Papua. *Jap. J. Ichthy.* 28(2):166-168;1981. (P)

WILLIAMS, A. B.; CHACE, F. A. Jr. A new caridean shrimp of the family Bresiliidae from thermal vents of the Galapagos Rift. *J. Crustacean Biol.* (S)

ATLANTIC ENVIRONMENTAL GROUP

Ocean Monitoring and Climatology Task

Magnetic tape records of historic listings of hydrographic data for the western North Atlantic (Cape Hatteras to Georges Bank, 70 one-degree squares) were acquired from the archives of the NOAA National Oceanographic Data Center and have been sorted into files by water mass (shelf, slope, and Gulf Stream waters) and by geographic area. The data within each subdivision are now being examined to describe the annual cycles of temperature, salinity, and density in order to determine the dynamic requirements for alongshore and cross-frontal exchange and mixing.

The announcements of eddy conditions in the Georges Bank-Middle Atlantic Bight area, depicted on pages 52 and 53, were sent to the Commander of the Atlantic Area for the U.S. Coast Guard for publication in the December 1981 and January 1982 issues of the Atlantic Notice to Fishermen.

The cooperative Ship of Opportunity Program obtained 11 expendable bathythermograph (XBT) transects and two continuous plankton recorder (CPR) transects in November-December: two XBT transects in the Gulf of Maine, two XBT transects off Southern New England, five XBT and two CPR transects across the shelf and slope off New York, and two XBT transects across the Gulf of Mexico.

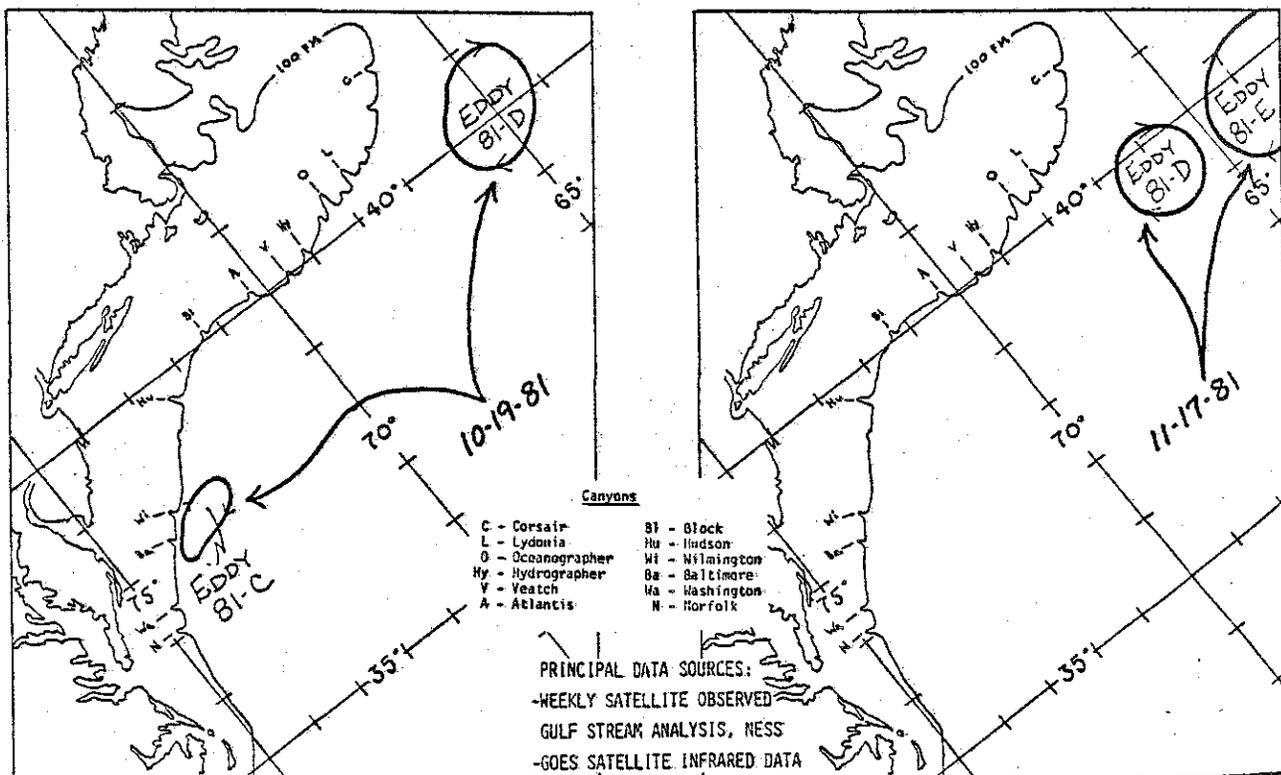
GULF STREAM EDDY LOCATIONS

The Atlantic Environmental Group of the National Marine Fisheries Service reports that two warm core Gulf Stream eddies were present off the northeast coast of the United States in mid-November.

Eddy 81-D was last observed during the first week in November when it was centered near 39.6 N, 70.8 W. At that time a large Gulf Stream meander was located south of the eddy. Since that time cloud cover has prevented eddy observations in that area. If the eddy was not resorbed by the large Gulf Stream meander, Eddy 81-D may have moved southwest about 100 km (55 nm) to a center position southeast of Lydonia Canyon. Eddy 81-E formed south of Emerald Bank, Nova Scotia, during the first week in November. The eddy now has a center position of 39.7 N, 63.3 W and is located southeast of Corsair Canyon and far offshore of the 100 fm line.

During the next 30 days Eddy 81-D may travel west to a center position south of Oceanographer Canyon; Eddy 81-E may move west to a center position south of Corsair Canyon.

Fishermen are requested to report unusual conditions or catches occurring in the vicinity of these eddies to the Director, Atlantic Environmental Group, National Marine Fisheries Service, RR 7, South Ferry Road, Narragansett, Rhode Island 02882, by mail. Updates on eddy positions and general information on Gulf Stream eddies may be obtained by calling the Atlantic Environmental Group (401-789-9326).



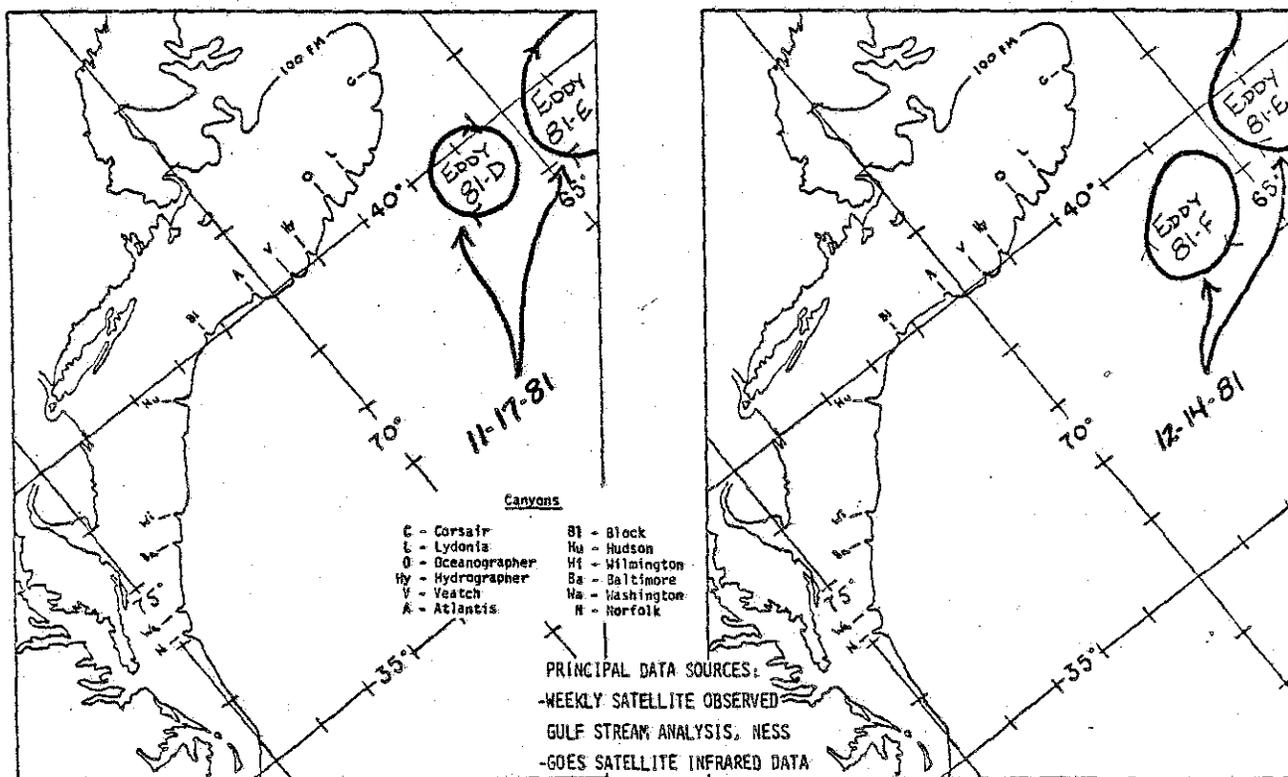
GULF STREAM EDDY LOCATIONS

The Atlantic Environmental Group of the National Marine Fisheries Service reports that two warm core Gulf Stream eddies were present off the northeast coast of the United States in mid-December.

During the last 30 days the study area was frequently hidden by cloud cover. Eddy 81-D may have been resorbed by the Gulf Stream in late November near 39.5°N, 66.3°W. Eddy 81-E travelled west about 21 km (11 nm) and now has a center position near 39.6°N, 63.6°W. The eddy is still located southeast of Corsair Canyon and far offshore of the 100-fm line. Eddy 81-F detached from the Gulf Stream in early December near 39.0°N, 66.2°W. The eddy is now located near 38.9°N, 66.2°W, southeast of Lydonia Canyon.

During the next 30 days Eddy 81-F may move west to a center position south of Oceanographer Canyon; Eddy 81-E may travel west to a location south of Corsair Canyon.

Fishermen are requested to report unusual conditions or catches occurring in the vicinity of these eddies to the Director, Atlantic Environmental Group, National Marine Fisheries Service, RR 7, South Ferry Road, Narragansett, Rhode Island 02882, by mail. Updates on eddy positions and general information on Gulf Stream eddies may be obtained by calling the Atlantic Environmental Group (401-789-9326).



Publications

- CRIST, R. WYLIE; CHAMBERLIN, J. L. Bottom temperatures on the continental shelf and slope south of New England during 1980. Ann. Biol. 37. (A)
- CHAMBERLIN, J. L. Application of satellite infrared data to analysis of ocean frontal movements and water mass interactions off the Northeast Coast. Northw. Atl. Fish. Org., Sci. Stud. (S)
- FITZGERALD, J. L.; CHAMBERLIN, J. L. Anticyclonic warm core Gulf Stream eddies off the northeastern United States during 1980. Ann. Biol. 37. (A)
- HILLAND, J. E. Variation in the shelf water front position in 1980 from Georges Bank to Cape Romain. Ann. Biol. 37. (A)
- HUGHES, M. M.; COOK, S. K. Water column thermal structure across the shelf and slope southeast of Sandy Hook, New Jersey in 1980. Ann. Biol. 37. (A)
- INGHAM, M. C.; McLAIN, D. R. Sea-surface temperatures in the northwestern Atlantic in 1980. Ann. Biol. 37. (A)
- INGHAM, M. C. Weather conditions and trends in the Maine-Virginia coastal and off-shore area during 1970-79. Northw. Atl. Fish. Org., Sci. Stud. (S)

TRAVEL, MEETINGS, AND PRESENTATIONS

Resource Assessment Division

During 1-6 November, Vaughn Anthony attended a meeting of the ICES Advisory Committee for Fisheries Management, held in Copenhagen, Denmark.

On 2 November, Stu Wilk met with NMFS Central Office and Northeast Regional Office staff in Washington, D.C., to discuss the issue of "Habitat Protection and Marine Recreational Fisheries--A New Alliance?"

During 2-5 November, Mike Sissenwine attended an Ecotoxicology Workshop, sponsored by Cornell University, in Ithaca, New York.

On 3 November, Stu Wilk met in Washington, D.C., with NMFS Central Office personnel to discuss recreational fishery issues, status of the National Recreational Fishing Survey, and various State-Federal Program management efforts.

On 4 November, Emory Anderson and Stu Wilk attended the Mid-Atlantic Fishery Management Council's Scientific and Statistical (S&S) Committee meeting in Philadelphia, Pennsylvania.

During 4-6 November, Steve Clark attended the Atlantic States Marine Fisheries Commission (ASMFC) Northern Shrimp Technical Committee meeting in Salem, Massachusetts.

During 9-11 November, Mike Sissenwine attended a workshop on "Uncertainty in Fishery Economics," held at the University of Rhode Island, and presented a talk on "The Uncertain Environment of Fishery Scientists and Fishery Managers."

On 12 November, Steve Clark attended a joint meeting of the ASMFC's Northern Shrimp Section and its Northern Shrimp Technical Committee, held in Portsmouth, New Hampshire.

On 18 November, Mike Sissenwine attended a meeting of the New England Fishery Management Council's S&S Committee.

During 20-21 November, Steve Clark attended the Northern Shrimp Aging Workshop, sponsored by the Northwest Atlantic Fisheries Organization (NAFO), held in Halifax, Canada.

During 23-25 November, Steve Clark attended a special meeting of the NAFO Scientific Council in Halifax, Canada.

On 24 November, Emory Anderson attended a meeting of the Northeast Regional Office's Fishery Management Plan Review Team for Squid, Mackerel, and Butterfish, held in Gloucester, Massachusetts.

On 25 November, Anne Lange attended a debriefing meeting of NMFS Foreign Fishery Observers at Otis Air Force Base in Bourne, Massachusetts.

During 30 November-1 December, Mike Sissenwine attended a meeting with NMFS Central Office personnel in Washington, D.C., on the Interim Groundfish Fishery Management Plan.

On 2 December, many Division personnel attended the Southern New England Chapter meeting of the American Fisheries Society in Sturbridge, Massachusetts. Don Flescher and Louise Dery presented talks on "Photography at Sea" and "Summer Flounder Growth," respectively.

During 2-3 December, Steve Murawski and Mike Sissenwine attended a meeting of the Northeast Fishery Management Task Force in Saugus, Massachusetts.

During 8-9 December, many Division staff attended a meeting between American and Canadian assessment scientists on joint research efforts, held in Woods Hole, Massachusetts. Vaughn Anthony was the American chairperson for this meeting.

On 8 December, Mike Sissenwine presented a talk on "Stability as a Management Objective" to the New England Fishery Management Council in Saugus, Massachusetts.

On 14 December, Anne Lange met in Gloucester, Massachusetts, with U.S. State Department and Northeast Regional Office staff to discuss potential biological and economic data needs for the American-Canadian boundary dispute litigation.

On 15 December, Stu Wilk presented a talk at the NMFS Central Office on "Almost Everything You Wanted to Know About Bluefish But Were Afraid to Ask." News media and conservation community representatives attended.

On 16 December, Fred Serchuk, Vaughn Anthony, Brad Brown, and Mike Sissenwine met with staff of the New England Fishery Management Council in Woods Hole for an informal review of the Sea Scallop Fishery Management Plan.

On 30 December, Brad Brown and other staff members met with Jack Suomala of the C. S. Draper Laboratories to discuss hydroacoustic experiments planned for January 1982, with focus upon Atlantic herring wintering areas.

Marine Ecosystems Division

T. Halavik and A. Smigielski presented a paper on "Biological and Technical Aspects of Larval Fish Rearing," at the American Fisheries Society Workshop on Care and Handling of Fish for Culture, Display, and Research, held on 23 June 1981 at Boston, Massachusetts.

A. S. Smigielski contributed to two papers, "Start Feeding-First Feeding of Larvae," and "Disease Monitoring and Control," at a meeting on the research status and potential of cod rearing in the North Atlantic, held at Svanøy, Norway, during 2-9 August 1981.

During 13-25 November, Ken Sherman attended meetings to renew cooperative agreements for scientific research at the All-Union Research Institute for Marine Fisheries and Oceanography in Moscow, U.S.S.R., and with the staff of the Sea Fisheries Institution in Warsaw, Poland.

On 17 November, Hal Merry and Peter Donnelly traveled to Meriden, Connecticut, to meet with engineers from Canberra Corporation to work on interfacing our HIAC PC-320 particle-size analyzer with their multichannel analyzer.

On 18 November, Marv Grosslein attended a meeting of the Editorial Committee for the Georges Bank book.

During 1-4 December, Ed Cohen, Mike Pennington, Marv Grosslein, and Jeremy Collie (the latter from Woods Hole Oceanographic Institution) worked with Erik Ursin on a new food habits model by Anderson.

On 2 December, Carolyn Griswold, Jerry Prezioso, Wes Pratt, and Lorrie Sullivan traveled to Sturbridge, Massachusetts, to attend a meeting of the Southern New England Chapter of the American Fisheries Society. Wes Pratt gave a presentation of his partially completed work on "Age and Growth of the Shortfin Mako, Isurus oxyrinchus."

On 3 December, Hal Merry, Dave Potter, and Greg Lough met with representatives of Guildline Instruments, Inc., for a demonstration of their portable CSTD (conductivity-salinity-temperature-depth) system in Woods Hole.

On 3 December, Roger Theroux presented a lecture on invertebrate identification and types of invertebrates encountered, to a group of NMFS Foreign Fishery Observers assigned to the Northeast Region.

During 7-9 December, Ed Cohen presented a paper on "Food Consumption by Silver Hake on Georges Bank with Implications for Recruitment," at the Fish Food Habit Studies Workshop ("Gutshop '81") at Pacific Grove, California. Mike Pennington, Ray Bowman, and Rich Langton also presented a paper at the "Gutshop '81" meeting, "Variability of the Weight of Stomach Contents of Fish and Its Implications for Food Studies."

On 8 and 9 December, Marv Grosslein and Greg Lough participated in the joint American-Canadian fishery research meetings held in Woods Hole.

During 10-12 December, Ed Cohen consulted with NMFS Northwest and Alaska Fisheries Center and University of Washington personnel on predator-prey models relevant to our Georges Bank modeling.

On 10 December, Ken Sherman and other NEFC personnel met with representatives from the Environmental Protection Agency regarding remote sensing.

On 16 December, Ken Sherman, Geoff Laurence, and others from the Narragansett Laboratory met with Jack Gentile and Dick Latimer of the Environmental Protection Agency.

During 16-18 December, Hal Merry and Peter Donnelly met in Woods Hole with engineers from Canberra Electric Corporation to test their multichannel analyzer interfacing with our HIAC PC-320 particle-size analyzer.

On 30 December, Marv Grosslein conferred with Rick Price of the Woods Hole Oceanographic Institution on base maps for the Georges Bank book.

Resource Utilization Division

Fred King participated in a meeting of the New England Fisheries Institute.

Perry Lane attended meetings of the New England Marine Advisory Service (NEMAS) Long Range Planning Committee, the NEMAS Board of Directors, and the New England Fisheries Steering Committee.

Division of Environmental Assessment

During 4-5 November, Dr. Pearce participated in a Northeast Monitoring Program management meeting in Washington, D.C. F. Steimle and F. Thurberg also attended. This meeting was concerned with the development of the second annual report for the program, as well as with the organization of the first annual workshop. The workshop will involve all participants in the Ocean Pulse and Northeast Monitoring Programs, and the proceedings of the workshop will provide input for a significant part of the annual report for 1981.

On 9 November, a meeting was held at the Sandy Hook Laboratory on Regional Action Plans. Dr. Pearce, Dr. Sindermann, and Frank Steimle, as well as individuals from the Oxford and Woods Hole Laboratories and the Northeast Regional Office, participated.

On Friday, 13 November, Dr. Pearce gave a lecture to a University of Rhode Island graduate course. The course, taught by Dr. Harold Marshall, deals with marine pollution and marine habitats. During this lecture, Dr. Pearce discussed the health of the Baltic and North Seas. On 25 November, Dr. Pearce again lectured to the class, comparing conditions in the Middle Atlantic Bight with those of the Baltic and North Seas.

Bob Reid participated in a Hudson-Raritan Estuarine Project-sponsored meeting to identify priority contaminants of that system, at the Battelle-Columbus Laboratories in Duxbury, Massachusetts, on 15 and 16 November.

On 16 November, Dr. Pearce gave an evening lecture at New York University on benthic ecology and the importance of benthic organisms to marine fisheries and pollution studies. The course was sponsored by the American Littoral Society.

During 17-19 November, Dr. Pearce participated in a symposium on the health of the fisheries of the Great Lakes. This symposium was organized by the Great Lakes Fisheries Commission; it brought together scientists from Canada and the United States. The researchers represented all major federal and state agencies, as well as academic institutions involved in Great Lakes studies. Dr. Pearce gave a lecture on the Ocean Pulse Program and discussed current ICES programs concerned with the Baltic Sea. Out of this meeting will come a series of papers to be presented at ICES which will point out similarities between the health of the environment in the Great Lakes and the Baltic Sea.

Frank Steimle participated as a member of a development team for Regional Action Plans at a meeting in Gloucester, Massachusetts, on 30 November and 1 December.

A. Calabrese, F. Thurberg, and E. Gould participated in a symposium on "Pollution and Physiology of Marine Organisms," which was cosponsored by the Center and the University of South Carolina, and held at Columbia, South Carolina, during 1-3 December.

On Monday and Tuesday, 7 and 8 December, Dr. Pearce, F. Steimle, and R. Reid participated in a second management meeting concerned with the organization of the first annual workshop for the Northeast Monitoring Program. Major topics to be on the workshop agenda were finalized, chairpersons and rapporteurs were tentatively selected, and the way forward following the symposium for the development of the annual reports was discussed.

M. Dawson presented a paper at the American Society of Zoologists meeting held in Dallas during 28-31 December.

A. Calabrese attended several meetings with the Northeast Regional Office's Environmental Assessment Branch personnel and U.S. Army Corps of Engineers personnel.

Bob Reid and Jim Thomas attended the Estuarine Research Federation biennial meeting at Gleneden Beach, Oregon.

Aquaculture Division

A. Longwell presented a paper at a workshop of the National Academy of Science's review of petroleum in the marine environment, held in Clearwater Beach, Florida, during 9-13 November.

E. Rhodes met with personnel of the New England Aquarium in Boston, Massachusetts, on 23 November to discuss shellfish problems.

Pathobiology Division

Dr. Rosenfield and Mr. Farley attended a disease control conference regarding shellfish transportation on 4 and 5 November at Boothbay Harbor, Maine. Dr. Rosenfield participated in a workshop on maintaining biological diversity, held at the U.S. State Department during 16-18 November; Dr. Rosenfield attended the joint United States-

Peoples Republic of China Aquaculture Working Group meeting in Washington, D.C., on 11 December. Dr. Rosenfield attended the Maryland Sea Grant Advisory Board meeting on 16 December in Annapolis, Maryland.

Dr. Murchelano attended the United States-Japan Natural Resources Joint Agreement Aquaculture Panel field trip to the Milford Laboratory on 2 and 3 November.

Mr. Newman attended a Northeast Monitoring Program meeting on 3 November in Washington, D.C. On 4 November, Mr. Newman visited the National Fish Health Laboratory in Leetown, West Virginia, to develop cell lines for virus isolation.

Mrs. Hines participated in and presented a paper at the 10th Annual Federal Interagency Field Librarians Workshop at Seattle, Washington, during 17-19 November.

On 14 December, Dr. Biogoslowski participated as Chairman at an International Ozone Association meeting in Washington, D.C.

National Systematics Laboratory

Dr. Austin Williams was Program Chairman for and attended the Estuarine Research Federation biennial conference in Gleneden Beach, Oregon, from 1 to 7 November. He also visited the Northwest and Alaska Fisheries Center in Seattle to discuss the need for taxonomic research on North Pacific lithodid crabs. On 18 November, Dr. Williams participated in the U.S. State Department-Aid for International Development Conference on World Biotic Diversity.

Atlantic Environmental Group

Mert Ingham was asked to present a report on the impact of climate on marine fisheries by Dr. Norton Strommen, Chief Meteorologist of the U.S. Department of Agriculture. Accordingly, he attended the "82 Outlook" conference in Washington, D.C., during 2-4 November. He also attended a Northeast Monitoring Program management meeting in Washington, D.C., on 5 November and in Sandy Hook during 7-9 December.

Woody Chamberlin attended meetings of the warm-core ring study group in Woods Hole on 3 and 17 November.

SEMINARS

Resource Assessment Division

On 4 December, Bill Overholtz presented a talk at the Woods Hole Laboratory on recent multispecies ideas and research.

Pathobiology Division

Dr. Peter Takvorian, a research associate professor at Rutgers University, presented a seminar on "Field and Ultrastructural Aspects of Glugea stephani Infections in Winter Flounder" at the Oxford Laboratory on 7 December.

VISITORS

Resource Assessment Division

On 12 November, Mike Sissenwine met with John Beddington of York University (England) to discuss joint research activities.

On 11 December, Brad Brown met with Ken Coons, Director of the New England Fisheries Development Foundation.

On 14 December, Fred Serchuk met with Bob Otto, fishery biologist from the NMFS Kodiak Laboratory, on Northwest Atlantic crab research activities.

On 16 December, Brad Brown met with Dave Sampson, Maine Department of Marine Resources (MDMR), concerning ongoing MDMR research programs.

Mike Fogarty met with J. Annals, fishery biologist with the New Zealand Fisheries Research Division, concerning methods of estimating crustacean growth.

Marine Ecosystems Division

On 3 November, Randy Goodlett talked with Ed Backus of the Manomet (Massachusetts) Bird Observatory regarding zooplankton identification from bird stomachs.

On 2 December, Dick Latimer (with the Environmental Protection Agency's Narragansett Laboratory) and Jack Pearce visited with Ken Sherman concerning joint NEFC-EPA ocean disposal site studies.

On 11 December, Larry Buckley conducted a tour of the Narragansett Laboratory for Dr. Kehinde Odusanya from the Nigerian Department of Environment.

On 14 December, Bob Otto of the NMFS Kodiak Laboratory visited the Narragansett Laboratory.

Resource Utilization Division

Dr. David MacLean, Executive Director of the Association of Official Analytical Chemists, toured the Gloucester Laboratory and met with several researchers to discuss mutual areas of interest in seafood quality and safety.

Jeff Porter of Gloucester, Massachusetts, visited the Gloucester Laboratory for information on storing lobsters.

Dan Sortwell of ABIC International Consultants in Pine Brooke, New Jersey, visited with Perry Lane to discuss methods of presenting material on fish preservation to fishermen.

Aquaculture Division

On 3 November, Mr. Carlos Ramos of Greenwich, Connecticut, and the United States-Japan National Resources Joint Agreement Aquaculture Panel, consisting of B. Drucker, R. Murchelano, and C. Mahnken, visited the Milford Laboratory.

On 4 November, Dr. J. C. Cochard of the French National Center for the Exploitation of the Oceans in Brest, visited the Milford Laboratory.

Pathobiology Division

On 3 November, Dr. Robohm described the Milford Laboratory program on control of molluscan disease to six Japanese participants of the United States-Japan Natural Resources Joint Agreement Aquaculture Panel.

Visitors to the Oxford Laboratory during the reporting period were: Mr. and Mrs. George Cunningham, Mr. Tosin Chrostek, and Ms. Millie Callicum of the Smithsonian Institution in Washington, D.C.; Mrs. William Kirby of Waverly Farm in Trappe, Maryland; Mr. Maurice Zelman of the Food and Drug Administration in Rockville, Maryland; Mr. Steven Saverhoff of the Perkin Elmer Corp. in Rockville, Maryland; Dr. and Mrs. Peter Takvorian and Dr. Ann Cali of Rutgers University; Dr. Ian Morris of the University of Maryland's Center for Environmental & Estuarine Studies in Cambridge, Maryland; Dr. Conrad Mahnken of the NMFS Northwest and Alaska Fisheries Center in Manchester, Washington; and members of the United States-Japan Natural Resources Joint Agreement Aquaculture Panel (Takeshi Nose, Koji Wada, Akio Kanazawa, Shin-ichi Teshima, and Kouichi Ohwada).

National Systematics Laboratory

Dr. Collette was visited by Dr. John E. Randall (Bishop Museum, Honolulu), Dr. William Smith-Vaniz (Academy of Natural Sciences, Philadelphia), Dr. Robert K. Johnson (Field Museum of Natural History, Chicago), Dr. James Tyler (National Science Foundation), Dr. Sally Richardson (Gulf Coast Research Laboratory), Dr. Gary Sharp (UN Food and Agriculture Organization, Rome), and Ms. Diana Evans (International Union for the Conservation of Nature) and Dr. James Williams (U.S. Fish and Wildlife Service), the latter two to discuss endangered species.

Dr. Jorgen Nielsen (University of Copenhagen) studied ophidioids in the Laboratory and Dr. Daniel M. Cohen returned to the Laboratory to study North Pacific gadoids.

Dr. Izumi Nakamura (Kyoto University) completed a 1-yr post-doctoral fellowship studying scombroid fishes with Dr. Collette and Dr. Robert H. Gibbs, Jr. (Smithsonian Institution) at the Laboratory.

Dr. Williams was visited for a week by Dr. Richard Heard (Gulf Coast Research Laboratory).

UNIVERSITY AFFAIRS

Resource Assessment Division

On 1 December, Brad Brown and several other staff members met with the Statistical Ecology Group of Pennsylvania State University to discuss our cooperative research program.

During December, a draft memorandum of understanding with Hampton Institute of Marine Science was approved. Signing of the agreements will occur in January 1982.

A contract for research on catchability coefficients in trawl surveys was arranged with the Oregon State University fisheries department, with Dave Bernard and Al Tyler as principal investigators.

Cooperative student contracts were arranged with Southampton University, Rutgers University, University of Maryland-Eastern Shore, South Carolina State College, Savannah State College, and Tuskegee Institute.

On 22 December, many Division personnel attended a meeting with fisheries faculty members at the University of Massachusetts in Amherst to discuss increased cooperation between NEFC and University of Massachusetts fishery research activities.

On 23 December, Brad Brown and Mike Sissenwine met with a doctoral candidate from Iowa State University concerning use of NEFC data in a dissertation on survey sampling problems.

Anne Lange arranged with Wendy Gabriel, a fisheries faculty member at the University of Massachusetts, for a graduate student to perform an independent study on various assumptions and hypotheses concerning the life history of the short-finned squid (Illex illecebrosus).

During the autumn 1981 bottom trawl survey cruises, samples were collected for the following academic and research institutions: Virginia Institute of Marine Sciences (winter flounder, butterfish, tautog, spiny dogfish, and Atlantic croaker samples); Manomet Bird Observatory (marine bird observations); Bedford Institute of Oceanography (pollock samples); Grice Marine Laboratory, South Carolina (anthid samples); State University of New York at Stony Brook (yellowtail flounder samples); Harvard University (wood samples containing shipworms); Rutgers University (liperid and Atlantic hookear sculpin samples); Woods Hole Oceanographic Institution (myctophid samples); Massachusetts Lobster Hatchery, Martha's Vineyard (berried American lobster samples); Rutgers University (goosefish brain tumor samples); Hunter College, New York City (DNA samples from various finfish species); and University of Connecticut (northern searobin samples). Also, miscellaneous preserved samples were obtained for teaching collections for the Barnstable Middle School in Barnstable, Massachusetts; Phillipsburg High School in Phillipsburg, Pennsylvania; and Massachusetts Maritime Academy in Buzzards Bay, Massachusetts.

Marine Ecosystems Division

On 4 November, Roger Theroux met with Colleen Cavanaugh, a Harvard University graduate student, concerning carbon-dioxide-fixing bacteria in the pseudocoel of "gutless" bivalves.

On 5 November, Ken Sherman, Marv Grosslein, Brad Brown, Dick Hennemuth, Mike Sissenwine, and Howard Winn of the University of Rhode Island, met at the Narragansett Laboratory to discuss NEFC-URI cooperative programs for training graduate students in fishery ecology.

On 19 November, Dr. Melbourne Carriker of the University of Delaware and Professor Sara Newball of the Technical University del Magdalena in Columbia, South America, visited the Woods Hole Laboratory and discussed current benthic research with Roger Theroux. Roger also met with Dr. Roger Mann of the Woods Hole Oceanographic Institution about a proposed bivalve research workshop.

On 19 November, Ed Cohen presented a talk on estimating food consumption of fishes at the Woods Hole Oceanographic Institution's Biology Department seminar series.

On 23 November, Greg Lough and Marv Grosslein met with Drs. Jennifer Purcell and Laurence Madin of the Woods Hole Oceanographic Institution to discuss collaborative work regarding predation on fish larvae by coelenterates and chaetognaths.

In November, Mike Fahay and Pete Berrien talked to a fishery methods class from Rutgers University on the application of ichthyoplankton studies to fisheries research.

During November, Ray Maurer sent Image Analysis System information to Anthony Jones of San Diego State University.

On 1 and 2 December, Mike Pennington participated in meetings with Dr. C. P. Patil and colleagues from Pennsylvania State University regarding applied statistical approaches to ecosystem and fishery assessment data bases.

On 2 December, Roger Theroux assisted Treena Wellman of the Woods Hole Oceanographic Institution's Marine Policy Group with benthic invertebrate taxonomic codes.

On 11 December, Roger Theroux consulted with Ruth D. Turner of the Harvard University Museum of Comparative Zoology regarding a bivalve paper submitted to the Fishery Bulletin (U.S.).

On 22 December, Mark Berman of the University of Rhode Island met with members of the Marine Ecosystems Division to discuss the extension of his present research on the characterization of zooplankton communities across the shelf area using fine-mesh MARMAP samples taken along standard transect D.

Ray Maurer discussed the use of the Image Analysis System for counting and sizing plankton with Ed Mills of the Cornell University Biological Field Station. Ed is conducting research on factors affecting growth and survival of yellow perch larvae and juveniles in Oneida Lake, New York.

Don Maurer of the Southern California Ocean Studies Consortium requested information regarding discriminate algorithms which could be used to identify selectively pelagic polychaetes.

Division of Environmental Assessment

Michael Calabrese successfully defended his master's thesis at the University of Bridgeport on metabolic measurements of sea scallops under different water-flow conditions.

Pathobiology Division

Dr. Rosenfield met on 24 November with Dr. Ian Morris of the University of Maryland Center for Environmental & Estuarine Studies, to discuss future plans for cooperative study under terms of the NEFC/University of Maryland Joint Agreement.

Dr. Blogoslawski continued the paralytic shellfish poison work with Dr. Kuck and Father Elder at Fairfield University. He also met with Dr. Peter Pellegrino of Southern Connecticut State College to develop a master's thesis topic for Lisa Petti, a temporary employee at the Milford Laboratory.

On 21 December, Dr. Bruce Sidell of the University of Maine visited with Dr. Robohm at the Milford Laboratory and exchanged information on the use of antibiotics in the treatment of disease in lab-held fish.

National Systematics Laboratory

As Adjunct Professor, Dr. Williams evaluated written qualifying examination questions on crustaceans given to a Ph.D. candidate in zoology at the University of North Carolina, Chapel Hill.

PUBLIC AFFAIRS

Marine Ecosystems Division

On 30 December, Jerry Prezioso demonstrated the Image Analysis System for WLNE-TV, Channel 6, News during an interview with Bob Edwards and Ken Sherman for the evening news feature about the impact of martial law in Poland on ongoing fisheries research.

Personnel at the Narragansett and Woods Hole Laboratories participated in a collection of food, medicine, and clothing from the communities surrounding the Laboratories to be shipped to Poland and distributed by the Gdynia Laboratory of the Sea Fisheries Institute. One pickup-truck-load of food and two of clothing were collected in the Rhode Island area. The shipment arrived in Gdynia and was distributed in Szczecin and Gdynia on 10 December, three days prior to the imposition of martial law.

Division of Environmental Assessment

J. Graikoski gave a talk to the Fairfield County (Connecticut) Association of Sportsmen's Clubs on activities of the Milford Laboratory and the Ocean Pulse Program.

National Systematics Laboratory

Information on lunar rhythms in fishes was provided to a reporter from the Washington Post.

PERSONNEL

Marine Ecosystems Division

Ronna Lupovitz joined the Biostatistics Group and Kevin Kolodzy and Bob Sand joined the Systems Support Group at the Narragansett Laboratory in November.

Randy Goodlett terminated his temporary appointment with the Larval Fish Dynamics Investigation on 26 December to take a position as Director of the Pittsburgh Aquarium.

John Antonellis resigned just before Christmas. He was a dedicated technician who shouldered the responsibilities for maintaining our overworked field equipment and seeing that all was in readiness before sailing. Bob Halpin will assume his duties at the Woods Hole Laboratory. John will be missed, but at the same time, we are delighted to have someone with Bob's qualifications and experience to replace him.

Resource Utilization Division

We are pleased to welcome the latest addition to the NMFS/URI Cooperative Fisheries Engineering Unit, NOAA Corps Officer Lt. (jg.) Gary Bulmer. He transferred in October from an assignment aboard the NOAA R/V Townsend Cromwell working out of Hawaii. Gary attended Duke University and received a degree in biology from the Virginia Polytechnic Institute.

Fred King has been appointed Chairman of the Research and Development Associates' Specification Review Committee, A6, Canned Seafood, Shellfish and Seafood/Shellfish Products.

Pathobiology Division

Mrs. Marge Brush, a temporary clerk-stenographer at the Oxford Laboratory, resigned on 27 November.

Ms. Vivian Johnson, a temporary clerk-typist at the Oxford Laboratory, entered on duty on 30 November.

Mr. Gerhard Roland at the Milford Laboratory resigned on 14 December, completing a 2-yr tour of duty. Mr. Peter Pendoley returned to duty at the Milford Laboratory on that date and will be temporarily employed until April.

National Systematics Laboratory

Dr. Isabel Canet's 1977 revision of the shrimps of the family Solenoceridae was awarded an Honorable Mention in the competition for best paper published in the Fishery Bulletin (U.S.) in 1977.

EEO ACTIVITIES

Resource Assessment Division

Brad Brown assisted in drafting a set of affirmative action items required as a segment of the NMFS 5-yr affirmative action plan. These items have been sent to the NMFS Central Office and distributed to NEFC Division Chiefs and Laboratory Directors.

Steve Clark prepared a list of suggested EEO-related activities for possible inclusion in Merit Pay/General Workforce Performance Appraisal System Performance Plans, with other members of the Woods Hole Laboratory Affirmative Action Review Subcommittee.

The Woods Hole Laboratory Federal Women's Program sponsored two 4-hr workshops on "Time Management" on 4 and 5 November. The workshops were facilitated by Dr. Patricia Daniel, a private consultant for Organize Your Life.

Louise Dery, Sherry Sass, and William Douglas presented a workshop on 16 December at which the film "A Tale of O" was presented. Several Division staff members attended this workshop.

Sherry Sass compiled a set of statistics from U.S. Office of Personnel Management data on the status of women in the Woods Hole Laboratory.

On 17 November, the monthly meeting of the Woods Hole Laboratory EEO Committee was held.

Marine Ecosystems Division

On 13 November, Ray Bowman presented a review of Woods Hole Laboratory EEO Committee activities and related matters at the Woods Hole Laboratory staff meeting, and he also attended the monthly Woods Hole Laboratory EEO Committee meeting.

Donna Busch has been appointed as the Federal Women's Program Manager for the Narragansett Laboratory. She is replacing Christine Philpott who has served in that office for the past 3 yr.

Resource Utilization Division

Perry Lane attended a meeting of the Regional EEO Committee.

Division of Environmental Assessment

On 23 and 24 November, Craig Robertson visited three predominately minority collegiate institutions in Virginia to secure information on their scientific faculty, research equipment and capabilities, and any interests they have in marine-related topics. Conversations were held with Dr. Harvey Clark of Norfolk State University, Dr. Craig Ruddell of Hampton Institute, and Dr. Walter Bradley of Virginia Union University. All agreed to supply NMFS/NEFC with dossiers on faculty, facilities, and research interests by February 1982 in order that NMFS would be aware of their qualifications with respect to future contractual opportunities. Discussions on student cooperative education opportunities and NOAA's Upward Mobility Program were also initiated.