

NORTHEAST FISHERIES CENTER

NEWSLETTER

JANUARY-FEBRUARY 1982

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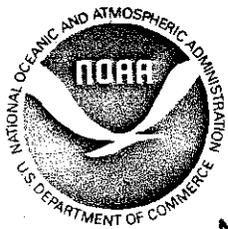
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US DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE



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"NORTHEAST FISHERIES CENTER NEWSLETTER"

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NORTHEAST FISHERIES STATISTICS

by

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INTRODUCTION

Jonathan Swift, the famous Englishman, once noted that there are three types of lies--big, little, and statistical. It is the job of the Fishery Statistics Investigation to disprove the latter by collecting, summarizing, and reporting thorough, accurate, and timely information on the marine fisheries of the northeastern United States. These efforts support the National Marine Fisheries Service's goals of: (1) conserving and managing marine, highly migratory, and anadromous fisheries resources for the maximum benefit of the United States; and (2) maximizing the economic and social benefits from United States fishery resources by contributing to the stability and growth of the nation's fishing industry.

This "spotlight" looks at the Investigation's job from the standpoint of mandate, organization, activities, and uses.

MANDATE

Various Federal laws authorize and require collection, summarization, and reporting of fisheries data. The most often used authority is the Fish and Wildlife Act of 1956, which states:

The Secretary of Commerce shall conduct continuing investigations, prepare and disseminate information and make periodic reports to the public, to the President, and to Congress with respect to: the production and flow to market of fish and fishery products domestically produced, and also those produced by foreign producers which affect the domestic fisheries; ...and the collection and dissemination of statistics on commercial and sport fishing... [16 U.S.C. 742(d)]

The most important recent authority is the Magnuson Fishery Conservation and Management Act of 1976, which requires for all fishery management plans:

Information regarding the type and quantity of fishing gear used, catch by species in numbers of fish or weight thereof, areas in which fishing was engaged in, time of fishing, number of hauls, and the estimated processing capacity of, and the actual processing capacity utilized by United States fish processors. [16 U.S.C. 1853(a)(5)]

Other collection, summarization, and reporting requirements emanate from other acts, including:

Fish and Wildlife Coordination Act of 1934; 16 U.S.C. 661

Fishery Market News Service Act of 1937; 50 Stat. 296

Agricultural Marketing Act of 1946; 7 U.S.C. 1621

Farrington Act of 1947; 16 U.S.C. 758

Atlantic Coast Fish Study for Development and Protection of Fish Resources Act of 1950; 16 U.S.C. 760

Tuna Convention Act of 1950; 16 U.S.C. 951

Agricultural Trade Development and Assistance Act of 1954; 7 U.S.C. 1704

Marine Migratory Sportfish Act of 1959; 16 U.S.C. 760

State Commercial Fisheries Research and Development Projects Act of 1964; 16 U.S.C. 779

Atlantic Tunas Convention Act of 1975; 16 U.S.C. 971

ORGANIZATION

To carry out its functions of data compilation and dissemination, the Fishery Statistics Investigation employs 22 full-time permanent and six part-time permanent or temporary personnel located at the Sandy Hook, Woods Hole, and Oxford Laboratories and in 14 field offices covering the Northeast's coast from Rockland, Maine, to Hampton, Virginia (Figure 1). In addition to collecting data through its own staff, the Investigation contracts for data directly with, or receives data indirectly (joint State/Federal efforts) through Maine, New Hampshire, Massachusetts, New York, New Jersey, Maryland, and Virginia. Many of the state-agency data-collection efforts are funded by State Commercial Fisheries Research and Development Projects Act grants which are reviewed by Fishery Statistics Investigation personnel. The Investigation also contracts for data collection or closely associated work with the Southeastern Maine Vocational Technical Institute and the Hampton (Virginia) Institute.

These efforts by the Fishery Statistics Investigation, cooperating state agencies, and contractors produce the largest source of fisheries data within the Northeast Fisheries Center.

ACTIVITIES

The collection of thorough, accurate, and timely landings data is the top priority for the Investigation's field personnel. Collections occur daily, weekly, monthly, or annually at all Northeast fishing ports based on the relative importance of the port. Collections assume one of several levels of detail and come from one of two basic sources.

Weighouts

The first level and source of data is the dealer weighout record. This record is a copy of the transaction between the fisherman and the dealer who purchases the fish. The Northeast Fisheries Center provides record forms to all cooperating dealers, and Investigation personnel transpose data from other dealers onto the Center's record forms, so that all data are collected on two standard forms (Figures 2a and 2b). The basic data include the port, county, state, date, weight, and value of each species landed. Dealer and vessel names are used only for ease of processing and correcting data and are then eliminated from the record to assure confidentiality of the dealer and vessel captain.

After the data are collected from the dealers, they are coded, tabulated, and submitted on a monthly schedule to the Center's Automatic Data Processing (ADP) Unit at the Woods Hole Laboratory. Strict adherence to this monthly schedule is required of all Investigation personnel since approximately 300 000 records are submitted each year. These dealer weighout records provide the necessary information for subsequently computing the total landings and values of the Northeast's fisheries (Figure 3).

Interviews

The second level and source of data is the vessel captain interview. Each of the Investigation's field agents interviews as many captains as possible, consistent with other work demands and the geographical dispersion of his/her assigned ports. The field agents collect on an interview worksheet the same data as they do on the dealer weighout records, except that there is no dealer name, plus they collect new data on fishing locations, gear, and effort (days, tows, sets, etc., as appropriate). Agents then transfer these data to the corresponding weighout record to complete a combined weighout-interview record.

As with weighout data, interview data are coded, tabulated, and submitted to the ADP Unit on a strict schedule. These interviews are used, among other things, to prorate the landings of noninterviewed vessels among the various fishing grounds, permitting an estimate of the total landings and values for each statistical area (discussed later).

Fishing Trip Records

A third level of data is the fishing trip record which is maintained voluntarily by some fishermen. In response to the requests of fisheries managers for even more detailed fisheries data, the Investigation's field agents are increasingly encouraging, and the fishermen are increasingly volunteering, participation in recording tow-by-tow or set-by-set information. In cooperation with fishermen and fisheries managers, the Investigation is developing new forms for fishermen to record this information. Figure 4 depicts key elements of the draft forms.

These records will be either collected by Investigational field agents at the end of a fishing trip or mailed by fishermen directly to the ADP Unit. These tow-by-tow or set-by-set records will supplement or replace the interview records, especially in remote areas where the existing staff has difficulty in obtaining enough interviews.

Samples

Another level of data are biological samples. To assess the status of a stock it is essential to determine the age/size distribution, sex ratio, and growth rate of the harvested portion of the stock. Consequently, the Investigation's field agents sample 200 fish of each species for each 1000 metric tons landed during each quarter of the year from each management area (discussed later). For each fish, the agents take length measurements, make sex observations, and collect scales or otoliths. Additionally, the agents collect biological specimens and samples for a variety of special nonassessment studies conducted by governmental agencies, academic institutions, private industry, and the general public.

Surveys

Another level of data are the processed-products surveys. These surveys document employment, production, and disposition of the landings. While many of these surveys are conducted by mail, it is frequently necessary to follow up on some by personal contact with fishery processors.

As with landings data, processed-products data are submitted on strict schedules so that various data reports can be published monthly, quarterly, or annually. However, these data are submitted to the Service's Office of Science and Environment in Washington, D.C., rather than the Center's ADP Unit in Woods Hole.

Other

In addition to collecting the basic landings, biological, and industrial data, the Investigation's field agents provide other services. They pay for any fish tags turned into their offices for which there is a reward, and then route the tags through the Sandy Hook Laboratory to the original tagging agency for compensation. Rapid payment to fishermen for returned tags provides a genuine incentive for them to return the tags, which in turn ensures better returns for any tagging agency, whether federal, state, foreign, or private. Many agents phone in daily landings and values figures to the Service's Northeast Regional Office personnel in New York and Boston, so that the daily and weekly Fishery Market News Reports mailed from those cities contain the latest figures. All agents monitor the coming and going of all fishing vessels so that the number of vessels participating in any one fishery is always known. They also respond to numerous requests for information from the fishing industry, government agencies, academic institutions, and consulting firms.

USES

After the basic landings data are collected, coded, computerized, audited, and summarized, they are stored in two places for further use.

Summaries

Data stored in Washington, D.C., at the Service's Office of Science and Environment are retrievable by species, month, state, county, gear, and water-body code. Water-body codes (WBC's) are two-digit numbers assigned to areas as

small as a portion of a tributary to Chesapeake Bay. These WBC's are the codes used by the Investigation's field agents to complete their interview records. These WBC's should not be confused with the statistical-area codes (SAC's). Some of the three-digit SAC's appear in the second-from-the-left depiction in Figure 4. These SAC's are the codes used by fishermen to maintain their voluntary fishing trip records.

The Office of Science and Environment uses these data to summarize the landings of each species in each state during each month. The Office prints these summaries and the Fishery Statistics Investigation distributes them to the regional fishery management councils, state fishery management agencies, university fishery instructors and researchers, and others concerned with the Northeast's fisheries. These summaries are condensed so that individual records of fishermen and dealers remain confidential.

Assessments

Data stored in Woods Hole at the Center's ADP Unit are similarly retrievable. However, the Center's stock assessment scientists subject these data to a detailed analysis. For instance, an assessment scientist might be interested in determining the effect of changing the cod-end mesh size on the Atlantic cod catch of medium-sized trawlers on northeastern Georges Bank. The scientist, by carefully sorting the data with the right combination of codes, could determine the relative catches of similar-sized vessels fishing similar areas towing different-sized nets. Thus, the effect on landings and economic return to the fishermen, processors, and retailers, could be predicted. Scientists also apply a detailed analyses of these landings data to evaluation of environmental/economic impact statements, and the assignment of economic values to specific fisheries and fishing areas.

Publications

The collection, storage, and use of fisheries data are essential for the Service's activities. However, the data are also provided for the public's use through various publications. The daily and weekly Fishery Market News Reports ("New York Green Sheet" and "Boston Blue Sheet") are prepared and mailed daily by the Service's Northeast Regional Office in Gloucester, Massachusetts, carrying morning landings and values phoned in by the Investigation's field agents. Monthly bulletins prepared and issued by the Service's Office of Science and Environment in Washington, D.C., that may carry Investigation-collected data include: Shrimp Landings, Frozen Fishery Products (also published annually), Fish Meal and Oil (also published annually), and Operation Price Watch. Annual publications include: Canned Fishery Products; Industrial Fishery Products; Production of Fish Fillets and Steaks; Processed Fishery Products; Fish Sticks, Fish Portions, and Breaded Shrimp (also published quarterly); Imports and Exports of Fishery Products; New England Fisheries; Middle Atlantic Fisheries; and Chesapeake Fisheries. Irregular reports include: Shellfish Market Review, Food Fish Market Review, and Fish Meal and Oil Review.

An annual summary of all landings and economic data, Fisheries of the United States, is published each April and covers the previous calendar year. A detailed report of state-by-state landings and economic data, Fishery Statistics of the United States, is also published annually and comes out at a later date.

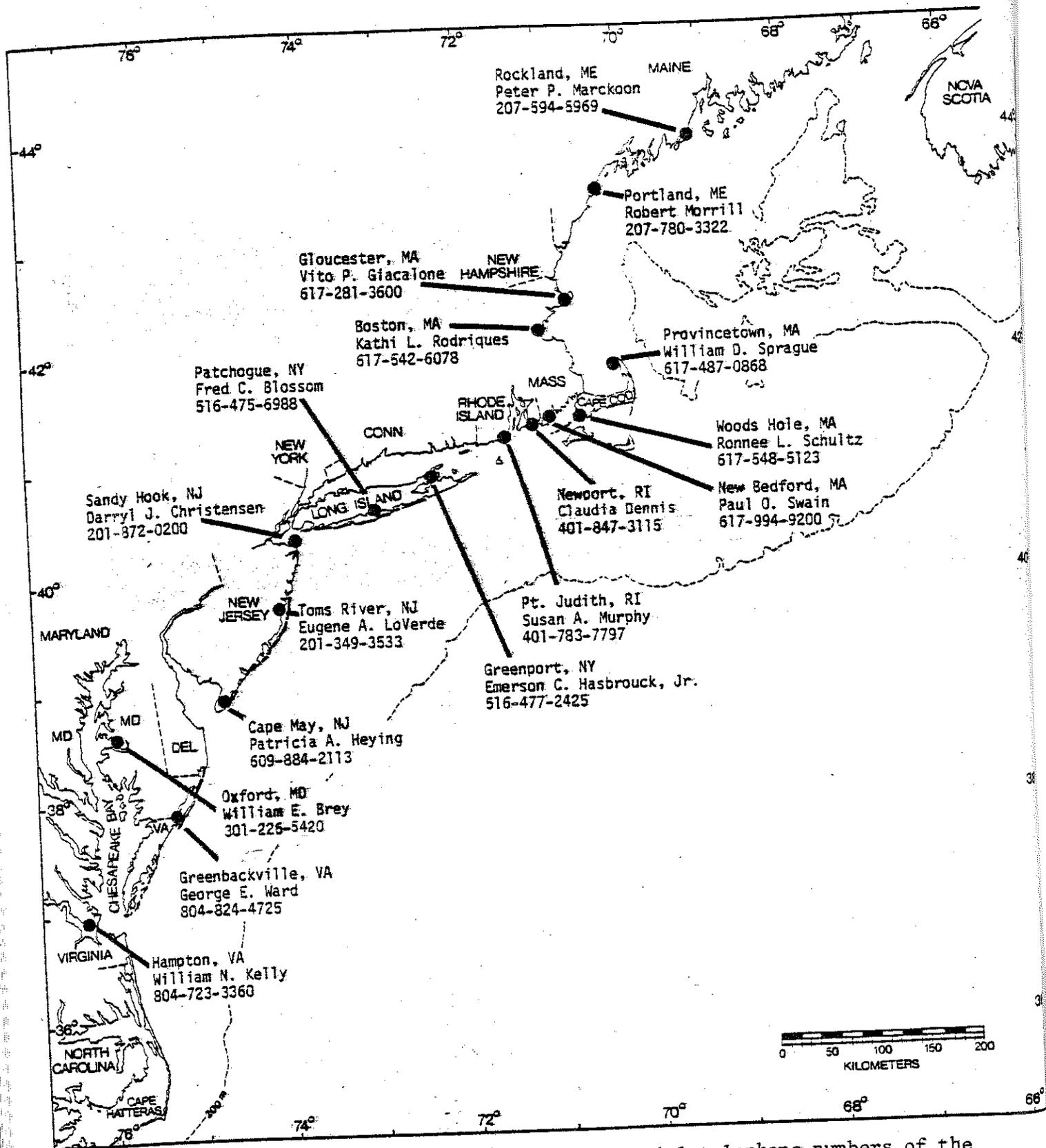


Figure 1. Locations, key personnel, and commercial telephone numbers of the Fishery Statistics Investigation.

PURCHASES FROM FISHING VESSELS (Northeast)

DEALER					DATE	
NAME OF VESSEL					VESSEL NUMBER	
PORT CODE	COUNTY CODE	DATE SAILED	DATE LANDED	GEAR	GROUNDS	
DAYS ABSENT	DAYS FISHED	TRIPS	LOG/INTERVIEW	DEPTH		
PRORATE	FISHING ZONE	A	B	C	D	
SPECIES AND GRADE		CODE	POUNDS LANDED	PRICE PER POUND	SUBTOTAL DOLLARS CENTS	
COD	Large	0811				
	Market	0813				
	Scrod	0814				
CUSK		0960				
HADDOCK	Large	1470				
	Scrod	1475				
HAKE	Red	1520				
	White	1530				
OCEAN PERCH	(Red fish)	2400				
POLLOCK		2691				
WHITING	Round	5090				
	Dressed	5093				
WOLFISH (Catfish)		5120				
GREY SOLE	Large	1221				
	Small	1222				
LEMON SOLE		1201				
YELLOWTAIL	Large	1231				
	Small	1232				
BLACKBACK	Large	1202				
	Small	1203				
CAB	Large	1241				
	Small	1242				
FLUKE	Large	1210				
	Medium	1212				
	Small	1214				
BLUEFISH	Gutted	0292				
BUTTERFISH	Large	0510				
	Medium	0515				
	Small	0516				
HERRING, SEA		1685				
MACXEREL		2120				
SCUP	Large	3290				
	Medium	3292				
	Small	3293				
SEA BASS	Large	3351				
	Small	3355				
STRIPED BASS		4180				
TAUTOG		4380				
TILEFISH		4470				
SHRIMP		7360				
LOBSTER	Large	7274				
	Select	7273				
SCALLOPS, SEA		8009				
SQUID		8030				
OTHER FOR FOOD		5250				
OTHER FOR REDUCTION		3290				
TOTAL						

NOTE: Individual reports are confidential and only summary data are released.

Figure 2a. Standard form used for data collection on the more northerly occurring species in the Northeast.

**PURCHASES FROM FISHING VESSELS
CHESAPEAKE STATES**

DEALER						DATE
NAME OF VESSEL						VESSEL NUMBER
PORT CODE	COUNTY CODE	DATE SAILED	DATE LANDED	GEAR	GROUNDS	
DAYS ABSENT	DAYS FISHED	TRIPS	LOG/INTERVIEW		DEPTH	
PRORATE	FISHING ZONE	A	B	C	D	
SPECIES AND GRADE		CODE	NUMBER OF POUNDS PURCHASED	PRICE PER POUND	SUBTOTAL DOLLARS CENTS	
BLUEFISH	Round	0231				
	Gutted	0232				
BUTTERFISH	Large	0510				
	Medium	0515				
	Small	0516				
BLACKBACKS		1200				
FLUKE	Jumbo	1218				
	Large	1210				
	Medium	1212				
	Small	1214				
KING WHITING	(King fish)	1970				
LING	(Red hake)	1520				
MACKEREL	(Boston)	2120				
	Large	3290				
FORGY	Medium	3292				
	Small	3293				
	Large	3351				
SEA BASS	Medium	3353				
	Small	3355				
	Large	4180				
STRIPED BASS	Small	4180				
		3446				
WEAKFISH		3446				
WHITING	(Round)	5090				
CONCHS		7750				
LOBSTERS	Large	7274				
	Select	7273				
	Small	7272				
SEA SCALLOPS		8009				
SQUID		8030				
TOTAL						

NOTE: Individual reports are confidential and only summary data are released.

Figure 2b. Standard form used for data collection on the more southerly occurring species in the Northeast.

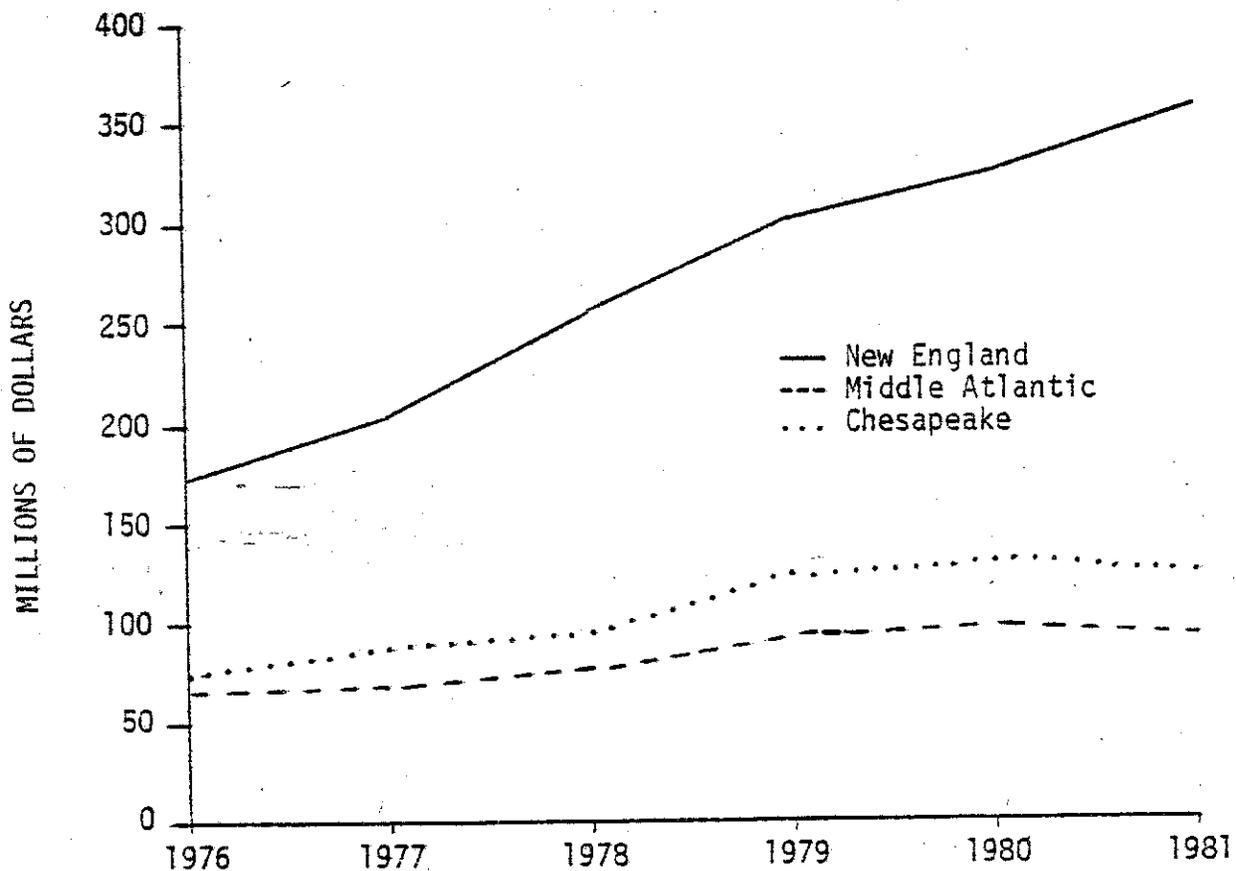
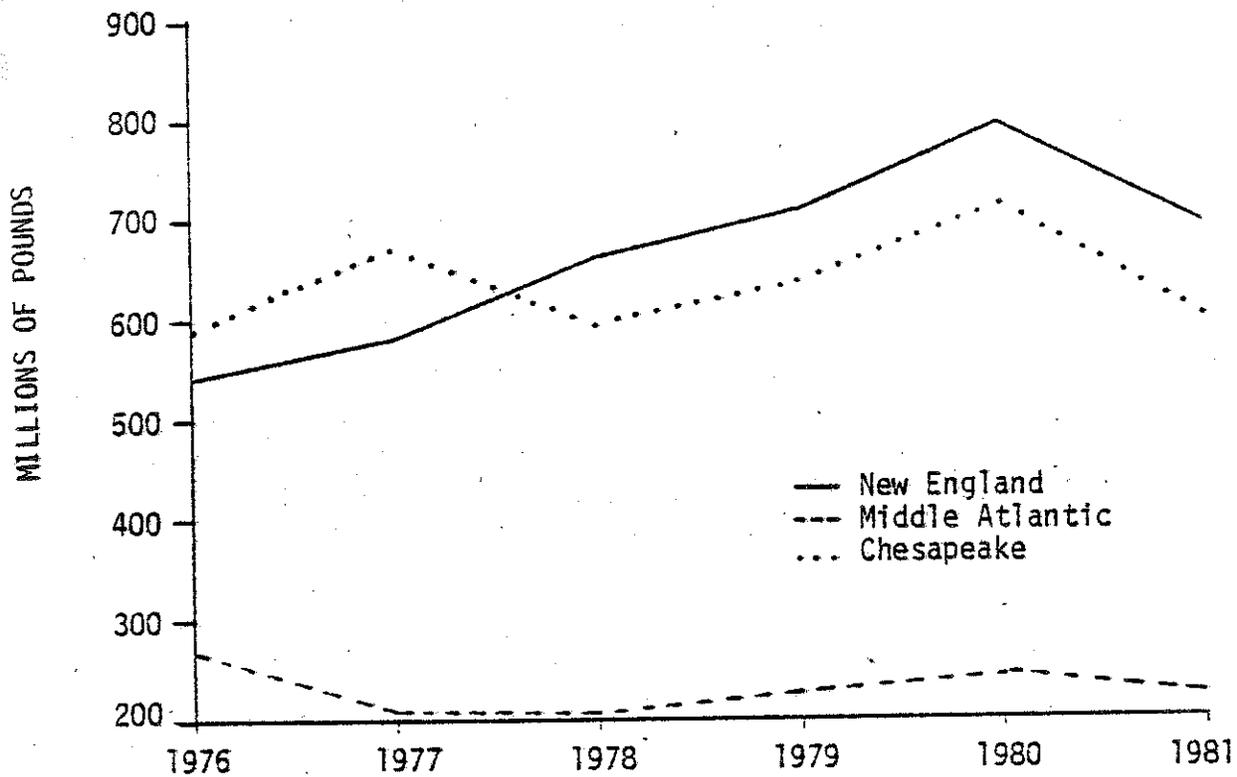


Figure 3. Recent total landings (above) and values (below) for the Northeast's fisheries.

CENTER DIRECTORATE

Fishery Technology

The Resource Utilization Division is completing a research plan designed to evaluate the quality of U.S.-produced seafoods nationwide. This is in response to a General Accounting Office recommendation to the Secretary of Commerce that NOAA initiate a comprehensive study to assess the quality of U.S.-produced seafoods for domestic and foreign consumption.

Bob Learson and Pesi Amaria participated in the 21 February Massachusetts Fisherman's Forum in Buzzards Bay. They spoke on: (1) fish handling at sea--maintaining fish quality, and (2) the economic factors relative to fish quality.

Special Scientific Projects

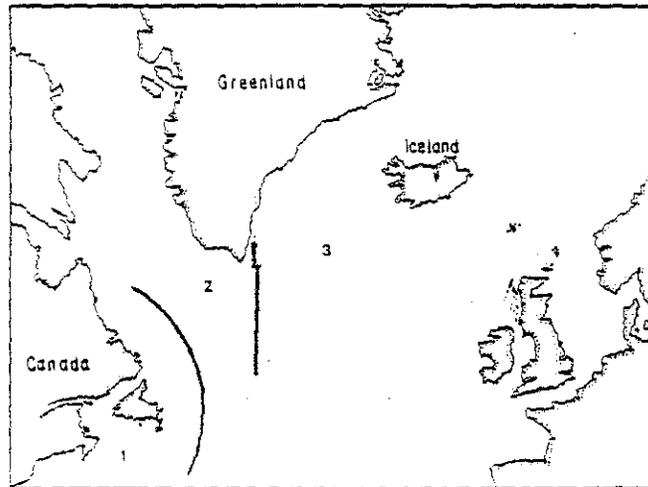
Canada, Denmark, the European Economic Community (EEC), Iceland, Norway, and the United States have signed a draft agreement to establish an international convention called the North Atlantic Salmon Conservation Organization (NASCO). The draft resulted from a diplomatic conference in Reykjavik, Iceland, during January. Sweden was represented at the conference, too.

The purposes of NASCO will be to promote the acquisition, analysis, and dissemination of scientific information pertaining to Atlantic salmon stocks and to promote conservation, restoration, enhancement, and rational management of salmon stocks in the North Atlantic through international cooperation. As presently conceived, there would be a main body, the Council, that would have three Regional Commissions: North American, West Greenland, and North-East Atlantic (see figure at top of next page).

The convention was open for signature on 2 March and will remain open until 31 August 1982. Just before the opening, Greenland announced its intention to pull out of the EEC. The significance of this action relative to the new convention is uncertain.

The efforts to establish this international organization stem from the high-seas fishery for salmon during the 1960's off West Greenland. Tagging experiments showed that salmon in the area were of North American and European origin. Quotas for the fishery were established under the International Commission for the Northwest Atlantic Fisheries, but when this body was reorganized in 1978, salmon were specifically excluded from its jurisdiction. The fishery now operates under a quota negotiated by Canada and the EEC.

The North Atlantic Salmon Working Group of the International Council for the Exploration of the Sea now reviews data from the Greenland fishery and from home-water fisheries, and considers measures for managing the West Greenland fishery. Bernard Skud of the Narragansett Laboratory is the U.S. Member of the Working Group. The Working Group will meet in Copenhagen, in April 1982 to discuss the Greenland fishery and review data from the Faroese high-seas fishery in the eastern North Atlantic. The latter fishery has developed in only the past few years. The Working Group has recently been requested to provide scientific advice on the Faroese fishery which would create a sound basis for management considerations. The impact of the Faroese and Greenland fisheries on the home-water stocks will be a major concern of the new convention and the analyses of the Working Group during past years will provide a base for future deliberations.



NASCO regions: (1) North American, (2) West Greenland, and (3) North-East Atlantic.
(Reprinted by permission of the International Atlantic Salmon Foundation.)

Special Technical Projects

A major effort during the period was designing and constructing a conference center in the existing exhibit area of the Woods Hole Aquarium. The end result provides for the aquarium to remain open to the public with exhibits, a 1000-ft² conference room, an information office, and a projection room/video studio.

Work continued on two manuscripts: "Mesh Size and New England Groundfish," and "Fisheries Engineering and Its Role in Resource Utilization."

Projects in the formation stage include shrimp survey gear development, gill net research, clam dredge design to reduce transatlantic cable breaks, and some scallop gear work.

RESOURCE ASSESSMENT DIVISION

Because of the demands of moving all personnel and office equipment from leased office space at the Marine Biological Laboratory in Woods Hole to the Center's Woods Hole Laboratory and to leased office space at Homeport in nearby Falmouth, no report will be included in this issue. The January-February report will be included in the March-April issue.

MANNED UNDERSEA RESEARCH AND TECHNOLOGY PROGRAM

During September 1981 through February 1982, MURT personnel conducted studies in the following six areas.

Georges Bank and Submarine Canyon Monitoring Regarding Oil/Natural Gas
Exploration and Production and the Northeast Monitoring Program

Approximately 10 000 quantitative photographs (7 m^2 per photo) of the sea floor and its associated megabenthic fauna and animal habitats were analyzed along with 54 hr of audio tapes to document species distribution, abundance, population structure, habitat preference, and general behavior and ecology; community structure (species diversity); and surficial geological/sedimentary features (indicating bottom-water current conditions) from six site-specific monitoring stations on Georges Bank (depths of 75-90 m) and in Lydonia and Oceanographer Submarine Canyons (depths of 135-300 m). In addition, pollutant analyses were run on substrate and animal samples. Infaunal samples from two of the monitoring stations were sorted and the data analyzed. The following results were obtained:

1. Twelve species dominated the megabenthic fauna characterizing the two Georges Bank stations (burrowing anemone, northern starfish, Jonah crab, hermit crab, sea scallop, red hake, silver hake, Atlantic cod, ocean pout, longhorn sculpin, fourspot flounder, and little skate) during midsummer 1981. Habitat type is uniformly a coarse sand/shell fragment substrate with very low relief.
2. Seventeen species (burrowing anemone, northern starfish, American lobster, Jonah crab, galatheid crab, hermit crab, shell-less hermit crab, sea scallop, silver hake, ocean pout, conger eel, goosefish, northern searobin, blackbelly redfish, fourspot flounder, Atlantic hagfish, and tilefish) dominated the megabenthic population in Lydonia Canyon in midsummer. Habitat type varies from: (1) relatively flat, featureless bottom of clay with a thin veneer of silt/gravel/cobble overlay, to (2) gently sloping bottom of sand or clay with a boulder overlay, to (3) steeply sloping bottom of exposed clay substrate heavily excavated by a variety of crustaceans and finfish.
3. Twenty-six species (burrowing anemone, rock anemone, northern starfish, sea scallop, American lobster, Cancer crab, galatheid crab, Bathynectes crab, hermit crab, shell-less hermit crab, northern deep-water prawn, silver hake, white hake, ocean pout, conger eel, goosefish, little skate, fourspot flounder, Gulf Stream flounder, northern searobin, blackbelly redfish, cunner, tilefish, and Atlantic hagfish) dominated the megabenthic population in Oceanographer Canyon. Habitat type ranged from those described above for Lydonia Canyon to a steeply sloping bottom covered with a very dense array of medium-to-large-sized boulders and rock outcrops.
4. Species abundance for midsummer 1981 was, with few exceptions, similar to the 1980 abundance levels, especially with regard to the "key indicator species" (burrowing anemone, rock anemone, northern starfish, sea scallop, Jonah crab, ocean pout, white hake, tilefish, blackbelly redfish, and American lobster). Special emphasis in this baseline and monitoring study is being given to the sea scallop, Jonah crab, American lobster, and tilefish.

5. Animal-habitat associations remained unchanged as did the nature of their distributions (random versus contagious) for midsummer 1980 and 1981.
6. Tissue-bound levels of contaminants (biogenic and petrogenic hydrocarbons, polychlorinated biphenyls (PCB's), and the heavy metals barium, cadmium, copper, chromium, mercury, lead, and zinc) from American lobsters, sea scallops, Jonah crabs, and tilefish were unchanged from the levels measured in 1980. Petrogenic hydrocarbons occurred in trace (0.10 ppm) or nondetectable (0.05 ppm) concentrations (wet weight). PCB's were nondetectable. Heavy metals in edible tissues occurred in relatively low concentrations, generally less than 1 ppm, with the exception of copper (10-30 ppm) and zinc (5-70 ppm). Scallop viscera was relatively high in cadmium (22-30 ppm). Contaminant levels in surface sediments were consistently low to nondetectable, again similar to the 1980 findings.
7. Analysis of 24 replicated infaunal samples collected in-situ on Georges Bank and in Lydonia Canyon produced a total of 73 species and approximately 13 000 individuals per square meter (Georges Bank) and 112 species and 6000 individuals per square meter (Lydonia Canyon). Tube-building polychaete worms and amphipod crustaceans were the dominant groups at both stations. The results of a gear-calibration experiment showed that both the manned submersible and Albatross IV sampling procedures yielded the same dominant species definitions for both sampling stations.
8. Extensive photographic records of sedimentary features in the axis, tributaries, and walls of Lydonia and Oceanographer Canyons were analyzed. Considerable evidence exists to support the hypotheses that: (1) canyon heads are basically erosional areas swept by strong and variable bottom currents, and (2) the deeper portions of the canyons serve as "sinks" or "repositories" for bottom-carried sediments and entrained contaminants (should they exist). The longevity of particulates in the canyon heads may be very short or long depending on the "flush time," which is unknown.
9. Bathymetric data detailing the heads of Lydonia and Oceanographer Canyons were analyzed. High-resolution bathymetric maps of these entire canyons have been generated through our cooperative studies with the U.S. Geological Survey.
10. Eight years of photographic records of mud anemone populations, associated fauna, and habitat types were analyzed and an assessment made of the relative importance of this species in providing shelter, etc., for other megabenthic fauna.

Inshore Monitoring Regarding the Northeast Monitoring Program

Two diving cruises were made to Pigeon Hill on Jeffreys Ledge in the Gulf of Maine to revisit and monitor this site. Three days were spent in October to retrieve colonization panels, make biological collections, and photograph quantitatively the permanent vertical and horizontal transects.

Pigeon Hill was again revisited in February for additional collections of colonization panels, biological collections, and photographic surveys.

Fiscal year 1982 represents the fourth consecutive year of baseline definitions at Pigeon Hill which represents a "pristine" site within the Gulf of Maine. This year's series of cruises have permitted an estimate of seasonal variations in species abundance, community structure, etc., of the ocean floor plant and animal populations on this very rugged, bedrock/boulder bottom.

Colonization panels have been retrieved during the fall, winter, and spring seasons to assess colonization/growth patterns. Summer samples will be collected in June 1982.

Samples of anemones and sea stars from the Block Island monitoring station and algae from Pigeon Hill were analyzed for heavy metals. These data are now being studied.

Deep-sea Camera System

A 35-mm deep-sea camera and strobe system was purchased and fitted to a surface-lowered cage (fabricated by MURT personnel). The system, with a 20 000-ft depth capability and 750-frame film capacity was field tested in January at our Georges Bank and Lydonia Canyon monitoring stations from the Albatross IV. Minor operational problems were solved and moderately successful photographic documentation, representing megabenthic population status during winter conditions, was achieved. The camera will be used on future Northeast Monitoring Program cruises to: (1) gather "cold season" data at the Georges Bank and submarine canyon monitoring stations, and (2) document sediment/water interface conditions at other Northeast Monitoring Program stations. Funding support for this system came from NOAA's Undersea Research Program Office.

Manned Submersible Program Proposals

A MURT proposal for manned-submersible dive-system support was prepared and submitted to NOAA's Undersea Research Program Office for in-situ studies at Northeast Monitoring Program stations on Georges Bank and associated canyons. The proposal was reviewed along with six other NOAA/academia proposals competing for limited submersible funds for fiscal year 1982. The Georges Bank and associated canyons proposal received a top priority rating, resulting in 12 days of submersible-support ship time in July 1982. The submersible Johnson-Sea-Link and support ship R/V Johnson of the Harbor Branch Foundation will be used.

A similar proposal for Alvin/Lulu dive time was prepared with resulting support for a 10-day cruise to Oceanographer Canyon in September 1982. This cruise will cover the "deep" portions of the Northeast Monitoring Program study compared to the "shallow" coverage for the Johnson-Sea-Link dive system.

National Study of Submersible-Science Requirements

A final report from the University National Oceanographic Laboratory System (UNOLS) has been published covering a broad array of subjects concerning short-term and long-term national needs for manned submersible systems. Of special importance in this report is a definition of continental margin (shelf and slope) science requirements requiring manned submersibles. MURT personnel played a major role in this 2-yr study, funded by NOAA, UNOLS, and the National Science Foundation.

Cooperative Undersea Studies with Academia and States

A meeting was held with Dr. Lance Stewart of the University of Connecticut to discuss their cooperative role in Northeast Monitoring Program dive studies at Block Island and Brenton Reef, Rhode Island Sound. Cooperative studies are scheduled to begin in June 1982.

Cooperative studies on gill-net fishing characteristics were discussed with Arnold Carr of the Massachusetts Division of Marine Fisheries. The NEFC was approached for assistance in this proposed study, scheduled to begin in June or July 1982.

NOAA Dive Program Certification and Diver Training

Newell conducted a variety of diver training and certification courses nationally, including: (1) hyperbaric chamber operator's courses, (2) dive master-operational diver training courses, and (3) certification of the Hawaiian Regional Undersea Program-Diving Operations.

Manuscripts

Manuscripts in preparation include "Biology and Geology of Veatch Submarine Canyon"; "Biology and Geology of Heads of Georges Bank Submarine Canyons"; "Pre-drilling Baselines of the Megabenthic Fauna and Their Habitats of Georges Bank and Lydonia and Oceanographer Canyons"; "Trace Metal and Hydrocarbon Levels of Selected Marine Species From Inshore and Offshore Monitoring Sites (Georges Bank, Submarine Canyons, Jeffreys Ledge, and Block Island)"; "Oceanographer Canyon -- Submarine Topography, Sediment Distribution, and Fauna of the Northern Part"; "Distribution, Abundance, and Related Ecology of the Mud Anemone Forests of the New England Continental Shelf and Submarine Canyons"; and "Descriptive and Functional Ecology of the Macrobenthos of Horizontal and Vertical Substrates at a Pristine, Offshore, Rocky Pinnacle in the Gulf of Maine."

Publications

ABLE, K.; GRIMES, C.; COOPER, R.; UZMANN, J. Habitat construction by tilefish, Lopholatilus chamaeleonticeps, at Hudson Submarine Canyon in the Mid-Atlantic Bight. Mar. Biol.;1981. (P)

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HULBERT, A.; PECCI, K. Descriptive and functional ecology of the macrobenthos of Jeffreys Ledge (Pigeon Hill), Gulf of Maine. Contribution to Annual NEMP report on the health of the northeastern coastal waters of the United States, 1981. NOAA Tech. Mem. NMFS-F/NEC. (A)

MARINE ECOSYSTEMS DIVISION

Ecosystem Dynamics Investigation

Ed Cohen and Marv Grosslein completed the final draft of the paper on "Food Consumption by Silver Hake with Implications for Recruitment" and submitted it for publication to the Washington State Sea Grant Press.

Ed and Marv also worked with Mike Sissenwine on an update of the Georges Bank energy budget with a focus on energy flow through prerecruit fish; a resulting paper entitled, "Structure of the Georges Bank Ecosystem," will be presented by Mike at the International Council for the Exploration of the Sea's (ICES) Symposium on Biological Productivity of Continental Shelves. Implications from this paper are that predation mortality on post-larval stages of 0-group fish must be a major factor in controlling recruitment fluctuations.

Mike Pennington completed an extension of his ICES paper on estimating fish food consumption from stomach contents. The revision provides a more generalized estimator of consumption where gut evacuation rate is simply proportional to stomach contents raised to a power, and the paper clarifies differences and underlying similarities among various consumption models in the current literature. Mike Pennington began revision of his paper on the variability, over both space and time, of ichthyoplankton data collected on Marine Resources Monitoring, Assessment, and Prediction Program (MARMAP) surveys. Mike also began a special ad-hoc assignment for the Northeast Regional Office, investigating the possibility of using sampling techniques for collecting fishery market data for the "Market News" service.

Ray Bowman completed final revisions to Woods Hole Laboratory Reference Documents No.'s 81-23 and 81-31, dealing with fish feeding studies; these reports (in "Reports" section) are now available for distribution. Ray and Bill Michaels completed an inventory of all MARMAP II data on fish stomach contents for 17 major fish species by fish size and area based on the 1973-76 series of quantitative collections. Ray also drafted a new streamlined protocol for processing gut-content data in the lab. The new method was tried on silver hake, Atlantic cod, and spiny dogfish obtained in 1981. The new method provides more information at lower cost on dominant prey organisms. Bill Michaels, Tom Morris, and Charles Wheeler are working as a team to evaluate this new protocol which should significantly reduce processing time per fish stomach. Tom also worked on further updates to the literature file on fish feeding.

Roger Theroux continued work on the northern benthic invertebrate biomass report and completed the 200 black-and-white photographic prints of final figures and tables for the organic carbon section of the report. Roger also made revisions to tables and figures for the paper on East Coast bivalves, which was accepted for publication as an NOAA Technical Report, NMFS Special Scientific Report - Fisheries. Also, Roger learned that the paper on "Comparisons of Megafauna Estimates with Submersible vs. Camera Sled vs. Otter Trawl" in the 1977 Marine Fisheries Review was selected for honorable recognition by the Outstanding Publications Awards Subcommittee of the NMFS Publications Advisory Committee. Authors of that paper were J. Uzmann, R. Cooper, R. Theroux, and R. Wigley. Roger assisted with planning and construction of the new Woods Hole Laboratory conference room and provided Andy Shepard of the Manned Undersea Research and Technology Program (MURT) with access to data from the benthic files on burrowing anemones.

Charlie Wheeler completed the first draft of his report on the 1981 American lobster larval surveys, noting that larval abundance in 1981 was lower than any year since 1976--whereas Vineyard Sound showed an increase over 1980, the first year of the survey in that area. Charlie also completed a summary of the 1979-81

data on green crabs in Woods Hole marshes, and began work on a report of this study. He continued work on the report of 20 yr of daily temperature and weather observations in Woods Hole.

Ed Cohen worked with Dave Mountain and Ron Schlitz on preparation of reports on: (1) the nitrogen budget of the Gulf of Maine, and (2) the effect of water residence time on plankton population levels on Georges Bank, for the 16-19 February meeting of the American Geophysical Union and the American Society of Limnologists and Oceanographers (AGU/ASLO). Ed and Wendall Hahm worked on the conversion of the multispecies model GEORGE to the VAX computer in Woods Hole and made preliminary runs for debugging, familiarization, and examining sensitivity of the model to various parameters controlling feeding and recruitment.

John Hauser completed writing a program for processing and analysis of CTD (conductivity, temperature, and depth) data on the VAX and began learning the coding used in the program for GEORGE. John also continued work on conversion of ecosystem files and programs to the VAX system. Brian Hayden converted a program (for the VAX) to produce predator/prey weight ratios, and wrote a new program to retrieve records for a specified predator and generated listings for major fish predators. Brian also began conversion of programs for producing length-frequency plots from the food-chain data base.

Fishery Oceanography Investigation

During January, the Fishery Oceanography Investigation said goodbye to Derek Sutton of the NOAA Corps; he is being transferred to the NOAA Ship Ferrel. Before leaving, Derek was awarded a NOAA Special Act Award for his development of a pressure-activated sampling bottle. Ron Schlitz and Tom Laughton continued analysis of the data from the warm-core ring cruise last October. As part of this analysis Ron has worked with John Hauser to develop software on the VAX to read the raw CTD data types.

Dan Patanjo has completed the "1981 Cruise Summary and Equipment List" and copies may be obtained by contacting him. Steve Ramp and Dan Patanjo received training in the operation of the new VAX computer. Gil Dering and Sam Nickerson attended a 2-day training session at the Woods Hole Oceanographic Institution (WHOI) given by Guildline on the operation and maintenance of the Guildline salinometer. Ron Schlitz and David Mountain completed contributions to a Northeast Monitoring Program "Physical Oceanography Summary" being coordinated by Mert Ingham.

David Mountain and Ron Schlitz attended a meeting (7-10 January) at WHOI on the Warm-Core Ring Project. The results from the cruises of last fall were presented and the plans for the first cruise this spring were discussed. Ron presented the NEFC results. Ron Schlitz and David Mountain attended a conference on current measurements sponsored by the Institute of Electrical and Electronic Engineers. The assurance of data quality was the major topic of concern. Developing current measurement systems was also discussed. David Mountain and Ron Schlitz participated in two sessions to organize the Georges Bank book. They are coordinating a chapter within the physical oceanographic section dealing with the biological implications of the general circulation and residence time on the Bank.

Catherine Jewell joined the Investigation during February. She is a cooperative education student from Southampton College and will be helping with the analysis of samples from the MARMAP I survey cruises. The first MARMAP I survey of the year, Albatross IV Cruise No. AL 82-02, completed one leg with Dana Densmore, Ted Baker, and Jock Danforth making the hydrographic measurements. Ted and Jock are from the Lamont-Doherty Geological Observatory and collected water samples for ^{18}O isotope analysis.

Tom Laughton is coordinating the modification of the Investigation's surface marker buoys used with current-meter moorings. The changes will make the buoys uniform in design and provide for better weight distribution and easier handling. Art Allen is beginning to analyze the hydrographic data from the MARMAP I surveys on Delaware II Cruise No. DE 78-02 and Soviet R/V Argus Cruise No. 78-04, for comparison with analyses of the zooplankton and ichthyoplankton results from the same surveys.

Ichthyoplankton Investigation

We were not actively engaged in field work during January, so the hiatus offered Bob Halpin the opportunity to complete field equipment inventories and see that all is in readiness for the series of MARMAP surveys that lie ahead. Bob spent 3 days at the Sandy Hook Laboratory learning established techniques for calibrating our time-depth recorders. These calibrations will in the future be done at Woods Hole rather than at Sandy Hook. At the close of the month preparations were underway for the February-March survey on Albatross IV.

The break in seagoing activities allowed all of us to concentrate on lab aspects of our research. Wally Smith began an analysis of ichthyoplankton collections taken in the New York Bight over the past 5 yr, as part of an NEFC effort to assess the status of marine organisms in the vicinity of offshore dumpsites for industrial and domestic waste products. Pete Berrien, John Sibunka, and Wally Morse made significant progress in deriving estimates of adult spawning biomass for silver hake, bluefish, and sand lance, respectively. Don McMillan continued to collate information on distribution and abundance of larvae representing 13 species of flatfishes. Myron Silverman completed figures and tables depicting annual changes in the distribution and abundance of larval silver hake, yellowtail flounder, and Atlantic mackerel taken on MARMAP surveys between 1977 and 1981. He is currently working on bluefish and hakes of the genus Urophycis. Mike Fahay continued to assess and incorporate reviewer's suggestions into his guide to the identification of larval fishes and Tom McKenney completed a thorough quality control of all larvae and log sheets received from the American-Polish Plankton Sorting and Identification Center in late autumn. Doris Finan, Patty Schaeffer, and Alyce Wells provided support in ongoing lab activities.

We sailed on 15 February on Albatross IV to begin our midwinter MARMAP I survey, starting in the Gulf of Maine. John Sibunka and Pete Berrien represented this Investigation. Predictably, weather impacted on sampling success and we occupied only 34, or 66%, of the planned stations. The most serious sampling shortfalls occurred in the northwestern and central parts of the Gulf. Ichthyoplankton catches were extremely light, with larval sand lance and Atlantic herring seeming to be the most commonly occurring species. At the close of the month, all equipment was in readiness for loading on Delaware II for the spring bottom trawl survey which begins in early March off North Carolina. Doris Finan and Bob Halpin will participate on the first leg of the trawl survey to collect plankton samples.

In the lab, we continued to pursue initiatives described last month. We are making good progress in mapping ichthyoplankton data collected since 1977. In addition to dumpsite-related work, Wally Smith and Alyce Wells prepared several figures depicting the spatial and temporal distributions of Atlantic herring and sand lance larvae as they relate to chlorophyll-a concentrations, zooplankton biomass, and each other, for use by the Center Director in a presentation.

Larval Dynamics Investigation

Experimental Studies

Studies of larval sand lance growth and development were continued. Mean times to 50% hatch were 25, 39, 51, and 61 days at 10°, 7°, 4°, and 2°C, respectively. Feeding trials were conducted at 5°, 7°, and 10°C at plankton densities of 0, 0.2, 0.5, and 1 plankter per milliliter. Sand lance larvae survived for about 14 days after hatching without food at all three temperatures. Some survival and growth were observed at 0.2 plankters per milliliter at all three temperatures. Good correlations were observed between plankton density and larval RNA-DNA ratio. The relationships between temperature, plankton density, RNA-DNA ratio, and growth rate of larval sand lance are being studied.

Geoff Laurence attended a precruise meeting at the Woods Hole Laboratory discussing strategy for the upcoming larval process-oriented and warm-core ring cruises. Geoff and Larry Buckley also attended a meeting for Northeast Monitoring Program principal investigators held at the Milford Laboratory.

Geoff Laurence worked on organizing a workshop on lab studies of larval fish feeding which he is to chair at the 6th Annual Larval Fish Conference, held at the University of Maryland's Chesapeake Biological Laboratory.

Population Processes

Greg Lough attended "Ocean Sciences" the AGU/ASLO joint meeting held in San Antonio, Texas, during 16-19 February, and presented two talks based on the results of the spring 1981 larval dynamics cruises. George Bolz made final revisions on the ichthyoplankton manuscript based on data collected under the auspices of the International Commission for the Northwest Atlantic Fisheries (ICNAF) and continued work on the Atlantic cod-haddock otolith growth study. Dave Potter is making final revisions to a manuscript (NAFO Scientific Council Research Document 80/IX/133) on the vertical distribution of larval Atlantic herring and their prey, and he has completed computer entry of the MOCNESS (multiple opening-closing net and environmental sensing system) tow data for Albatross IV Cruise No. AL 78-13, "Larval Herring Patch Study." Dave also completed his assignment on the Woods Hole Laboratory Space Committee to design and construct a conference room within the Aquarium exhibit area. Several days were spent aiding Alan Hulbert and Charles Gross (MURT) with manuscript graphics on our HP-85 system.

Roz Cohen completed a first draft of a data report on the 0.333-mm-mesh-collected zooplankton (from the ICNAF time series of surveys), and intermittently worked with Janet Murphy on the final revisions of the copepod identification manual. She began a WHOI course in evolutionary demography this month, continued a literature review for her Ph.D. thesis proposal, and spent some time helping Philip LeBlanc with zooplankton identification and the use of the Zeiss compound microscope. Peter Donnelly and Philip LeBlanc continued sorting and identifying MOCNESS ichthyoplankton from last spring's cruises.

Hal Merry designed modifications of our HIAC particle-size analyzer in order to use the sensors in an in-situ mode for continuous, real-time vertical profiling of the microplankton during our upcoming May cruise. He also repaired the MURT's underwater photometer and repaired four meter blocks for the Delaware II's MARMAP cruise.

A precruise meeting was held on 24 February by members of the Larval Fish Dynamics Investigation and Fishery Oceanography Investigation to work out details of the spring and summer warm-core ring cruises. Hal Merry and Dave Potter have started the extensive logistical preparation in support of these cruises.

Plankton Ecology Investigation

Tom Plichta, Paul Fofonoff, and Julien Goulet are preparing 1978-79 zooplankton volume and abundance data for plotting of contour maps using the Yale computer mapping package.

Sorting of plankton-pump samples from Albatross IV Cruise No. AL 81-03 is nearing completion. Composition and abundance of microzooplankton appear to vary sharply with depth. Densities of zooplankton averaged four-to-eight times greater at 60 m than at 5 m. Rotifers as well as nauplii and copepodites of Acartia, Microsetella, Oithona, and Centropages comprised a much greater fraction of the zooplankton at 5 and 20 m than at 40 and 60 m, while suctorians as well as nauplii and copepodites of Calanus and Pseudocalanus showed the reverse pattern. In most samples, tintinnids, rotifers, and suctorians, taken together, composed more than 50% of the zooplankton numbers.

During January and February, Donna Busch worked on presentations with David Mountain and with Greg Lough for the AGU/ASLO meeting in San Antonio, Texas, held during 16-19 February (for titles see the "Travel, Meetings, and Presentations" section). Donna also reviewed a paper for the Fishery Bulletin.

Biostatistics

A minor revision to the Generalized Reformatting System (GRS) was implemented. This revision provides for using flowmeter readings whenever possible in calculating haul factors, but setting a flag when certain bounds are exceeded. Prior to this, when the bounds were exceeded, a secondary formula was used.

Most of the month of January was spent on extracting data from the MARMAP Information System using the GRS. Zooplankton counts and displacement volumes for 1978 and 1979 were extracted. Larval length data for 1977 and 1978 were extracted. All the extracted data sets are in the Statistical Analysis System format on tape. The entire larval length data base, going back to 1975, will be extracted.

The DOMINANCE program, which produces rank, dominance, and delta-mean statistics, has been revised. The revised program uses less than 1/2 of the computer resources used by the old program. The System Support Group helped implement a link from the EPA computer to the National Earth Satellite Service (NESS) computer. When fully debugged, the EPA-PDP11 will receive daily outputs of ocean surface temperature produced by NESS. The outputs will be in the format of printer plots. They will be printed and stored on disk for further analysis.

Tom Plichta spent most of January on jury duty.

Julien Goulet helped Janet Hess become familiar with accessing the EROS (Earth Resources Observation System) data base to search for availability of remotely sensed data.

He revised again the data-base design document for the Marine Ecosystem Data Base after reviewing the design with Jack Jossi.

Displacement volume, zooplankton abundance, and ichthyoplankton abundance data from 1977-80 master files for the New York Bight area were extracted. Ken Sherman was provided with listings and statistical summaries from these data.

The quality control of ichthyoplankton data has been returned to the Ichthyoplankton Investigation.

Image Analysis

Dr. Mark Berman of the University of Rhode Island's (URI) Graduate School of Oceanography (GSO) completed preliminary analysis of the structure of plankton communities along transects from the Providence River to Block Island and across Massachusetts Bay from Boston to Provincetown. His findings reveal increasing faunal complexity as transects proceed offshore. The complexity of community structure, measured by the Image Scanning System, includes an increase in modal frequency and shift in primary size components to larger organisms as well as a strong diversity gradient from estuarine to coastal environments.

Ray Maurer attended two presentations on warm-core rings. Dana Kester (GSO) suggested a strong association exists between ring occurrence and the directed effort of the squid fishery along the slope/shelf front. An informal discussion held by M. Flierl highlighted his mesoscale physical model of ring hydrodynamics. Ray Maurer and Bob Marak attended a tow-tank test of a model of the Isaacs-Kidd midwater trawl conducted by the NMFS-URI Cooperative Fisheries Engineering Unit. Analysis of videotape and photographic records will determine the trawl's performance at speeds of 3-5 knots.

Jerry Prezioso participated on the cooperative American-Canadian-Japanese squid survey on the Japanese R/V Kaiyo Maru from 7 February to 5 March. Catches using different nets were compared to determine the appropriate gear for capturing juvenile squid. Jerry Prezioso and Ray Maurer prepared an outline of a paper on the application of image analysis for counting and sizing krill. Ray Maurer transferred all krill data to the GSO computer for statistical analysis.

Apex Predators Investigation

In January we received information on the recapture of a swordfish, a dusky shark, and a shortfin mako. The swordfish was at liberty for 22 mo and remained near the Dry Tortugas in the Gulf of Mexico. The mako traveled from Aransas Pass, Texas, to Pensacola, Florida, (453 mi) in 40 mo. The dusky was tagged off Virginia and recaptured off Jacksonville, Florida, 15 mo later.

Seven shark recaptures were received in February, including four blue sharks, a shortfin mako, a silky shark, and a spiny dogfish. Two blues were recovered after 1 and 3 mo after traveling 30 and 214 mi. The other two blues were at liberty 7 and 30 mo and traveled in excess of 2300 mi to the recovery site over 1000 mi east of Barbados and Trinidad. The mako was at liberty for 4.7 yr and traveled 1647 mi from North Carolina to 600 mi northeast of Barbados. The silky was tagged off the east coast of Florida and was recaptured in the Bay of Cabanos, Cuba, (310 mi) after 7 mo. The spiny dogfish was at liberty for 13 yr and moved 360 mi from Block Island, Rhode Island, to the recovery site at Kill Devil Hills, North Carolina.

Final summaries of the 153 recaptures from 1981 were prepared for our newsletter, The Shark Tagger, along with the summaries for the 1981 tagging season. Rough drafts of the newsletter were reviewed and the final layout was completed by the end of January. Allen Lintala and Nancy Kohler completed a final mock-up and delivered it to the printer in February. Final galley copies will be ready for approval and review by mid-March.

Final drafts of the sandbar shark and shortfin mako age-and-growth papers were completed in January. Jack Casey, Chuck Stillwell, and Wes Pratt attended the Age and Growth Workshop at the NMFS Miami Laboratory in February. Jack and Wes presented their papers at the meeting to an international audience.

Chuck Stillwell and Nancy Kohler continued work on the food habits of the swordfish. A preliminary draft of this work was prepared and Chuck is scheduled to present it in April at the Northeast Fish and Wildlife Conference. John Hoey prepared a first draft of "An Analysis of Directed Pelagic Longline Fisheries in the Western North Atlantic." All 1981 data were entered and verified, and system programs were updated. Mike Couturier continued to convert our present automatic data processing programs and data bases from the URI system to formats compatible with the EPA system. Histological preparations of shark reproductive tissue collected in 1981 were processed on a continuing basis by our histologist, Allen Lintala. Chuck Stillwell gave 15 hr of lectures on shark biology to senior students from the St. Georges School in Newport, Rhode Island. Classes were held aboard the school's sailing yawl, the R/V Geronimo.

Wes Pratt gave a noontime lecture on "The Age and Growth of the Mako Shark" at the URI Bay Campus. Nancy Kohler presented a talk on "The Stomach Evacuation Rate in the Blue Shark" as part of a graduate student seminar series held at the URI Bay Campus.

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- LAURENCE, G. C. Overview--modelling--an esoteric or potentially utilitarian approach to understanding larval fish dynamics? Rapp. P.-V. Reun. Cons. Int. Explor. Mer 178:3-6;1981. (P)
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- LOUGH, R. G.; BOLZ, G. R.; GROSSLEIN, M. D.; POTTER, D. C. Abundance and survival of sea herring (Clupea harengus L.) larvae in relation to environmental factors, spawning stock size and recruitment for the Georges Bank area, 1968-77. Rapp. P.-V. Reun. Cons. Int. Explor. Mer 178:220-222;1981. (P)
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RESOURCE UTILIZATION DIVISION

Processing and Preservation Investigation

Frozen Fish

The study to determine the shelf life of frozen U.S. Grade A haddock held in the new Vendo freezer-dispenser is continuing. After 8 mo, 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 taste-test panel.

The study to determine the storage stability of frozen fish fillets at various temperatures is continuing.

The sensory evaluations by the Laboratory taste-test panel of the frozen Grade A fish stored at 0°F (-18°C) and -20°F (-28°C) for 8 mo showed the Atlantic cod, haddock, pollock, and yellowtail flounder to be fair to good. The ocean perch stored at -20°F (-28°C) was graded as borderline to fair. Of these samples, only three received a Grade A score, and the remainder were Grade B or lower. Fish fillets stored at 20°F (13°C) were rated as fair to good after 2 mo of storage by the Laboratory taste-test panel. A USDC inspector graded these samples as below Grade A.

The second draft of the report on the frozen fish quality program was prepared, reviewed, and is being rewritten to include the suggestions made by the reviewers.

Blue Crab Storage

Organoleptic testing is continuing on blue crab meat pasteurized in oxygen-impermeable and oxygen-permeable plastic pouches. After 4 mo of refrigerated storage, both samples do not differ significantly from commercially pasteurized canned controls, but the appearance of the plastic-packaged meats is superior to the canned controls in every taste test.

Sorbate Preservation

Three experiments in which 1-day-old (two experiments) and 3-day-old dressed Atlantic cod were held in chilled seawater containing 0.5% potassium sorbate (KS) were completed. Sensory analysis showed that the dressed fish treated with KS, as well as the fillets cut from them, had a 15-26% longer shelf life than conventionally iced controls.

Flavor Enhancers

Experiments designed to determine whether the addition of artificial crab meat flavoring enhances the flavor of machine-extracted crab meat are in progress.

Analytical Testing

Samples have been sent to several gas-liquid chromatograph (liquid phase) manufacturers in an attempt to purchase a new capillary column for fatty acid analyses. We have had to curtail this work because the regular column is no longer working.

New tuna samples have just arrived for the species identification work, but they have not yet been worked up.

Engineering

Further discussion of waste heat in New England fishing vessels was held with Professor Whitney. He promised to arrange his project priorities by the middle of March to determine if we can carry out this project in the near future. In the meantime, our energy recovery project has been diverted to the heating system of the NEFC's R/V Gloria Michelle. Heat transfer calculations for the entire vessel were done, and heating requirements were determined. A system similar to that of the F/V Italian Gold (much of which is already installed) has been designed for the vessel and drawings have been prepared.

Several unit heaters were repaired and the new overhead distilled water system is being installed. Parts were ordered to complete the freezer.

The final design of the solar hot-water system is being reviewed at Rockwell International and approval is expected very soon.

A new safety interlock has been installed in the marine products development irradiator. This additional safety switch has been installed upon request of the Nuclear Regulatory Commission. The system centers around the cell door, i.e., the source cannot be raised if the cell door is open. Also, the source will automatically be lowered if the cell door is accidentally (or otherwise) opened while the source is up.

In addition, a spool valve has been repaired. This valve is in the main conveyer system. It was leaking considerable air while operating, thus reducing available air to the loading cylinders. The repair was accomplished simply--just the machining of a new hammer to closer tolerances to fit the appropriate depression in the cast end plate of the valve.

Presently, the annual property inventory is being taken. The property card file is being updated to conform to the property list. Necessary action will be taken on obsolete and/or unusable and damaged equipment.

Diagrams and charts are being drawn up to accompany the paper on the temperature profile of the Vendo food freezer.

Product Quality Investigation

We welcome Dr. Linda Racicot of the University of Massachusetts Marine Station. Dr. Racicot will be stationed for 1 yr at the Gloucester Laboratory where she will be working with Ron Lundstrom on textural toughening in frozen red hake.

After nearly 3 yr of part-time work by Betty Tuhkunen, Ron Lundstrom, and Mike Allsup, an impasse has been reached on the project to develop a method of larval species identification based on isoelectric focusing. We have been unable to obtain sufficient protein from the smallest of larvae to produce a pattern that is dark enough to see clearly. The current trend in isoelectric focusing is the use of even thinner gels and smaller amounts of sample to save money on carrier ampholyte costs. With this trend has come new staining techniques suitable for detecting the smaller amounts of protein. We will continue to evaluate the suitability of these new techniques for detecting larval fish proteins. At this time, we are about to begin a new line of research to investigate application of monoclonal antibodies for an immunological species identification technique. The application of monoclonal antibodies to larval fish identification will also be evaluated.

By using laser diffraction measurements, comparison of sarcomere lengths of muscle fibers from raw red hake stored for 3 mo at either +20°F or -20°F did not show any significant difference. The texture of the sample stored at +20°F, however, was considerably tougher. These preliminary results suggest two possibilities: (1) Unlike red mammalian muscle in which sarcomere length is related to the animal's size, processing condition, and textural assessment, the texture of fish muscle may not be related to sarcomere length. In the latter case, textural changes may be principally due to protein-protein interaction in which the overall protein structure is not affected. (2) The method needs to be scrutinized in order to rule out any effects of the fixative in affecting sarcomere length.

Betty Tuhkunen made counts for aerobes and putrefactive anaerobes in samples of canned crab meat.

The final samples for the frozen storage study of skin-on dogfish fillets and belly flaps prepared from fish held for different periods of time on ice prior to freezing were tested after 55 and 60 wk at 0°F. Air-packaged samples showed extreme yellow discoloration, and the odor of rancidity was very apparent even in the frozen raw samples. The odor and appearance of frozen raw vacuum-packaged samples remained excellent and unchanged throughout the storage period. However, rancidity was noticeable in the cooked samples and flavor and odor scores of the vacuum-packaged fish were only slightly higher than those of the air-packaged fish. Taste-test panelists detected little difference between freshly frozen fish and fish held on ice for 11 days before freezing.

Dogfish stored at 0°F as frozen blocks prepared from skinless fillets and belly flaps and as batter-breaded sticks were examined after 15 and 20 wk of storage. The block prepared from fillets without erythorbate treatment showed the first signs of slight yellow discoloration after 20 wk; however, even greater discoloration was found in the breaded sticks after only 15 wk of storage. Rancidity developed very rapidly in the breaded sticks and a thiobarbituric acid value of greater than 11 was found in the 15-wk-old sticks. Rancidity in the blocks is proceeding much more slowly and erythorbate treatment is protecting both fillets and blocks.

Preparations are underway to initiate a study to determine the extension of the iced storage life of skin-on Atlantic cod fillets exposed to 100 krad of gamma irradiation. The additional effects of sorbate treatment, vacuum packaging, and a controlled atmosphere of 60% carbon dioxide will also be examined. Samples will be monitored periodically by sensory evaluation, microbiological and chemical testing and by pH and Torrymeter measurements.

Barbara Rasco, a graduate student from the University of Massachusetts Marine Station, spent 2 days at the Gloucester Laboratory investigating the use of preparative isoelectric focusing as a method for purification of dogfish lipase.

Ron Lundstrom completed identification of 60 unknown fish samples for the Food and Drug Administration (Boston District Office). All samples were identified using the official method of the Association of Official Analytical Chemists, based on polyacrylamide gel isoelectric focusing. Ron Lundstrom and Bob Learson met with officials of the FDA and U.S. Justice Department concerning these identifications.

Ron Lundstrom identified 12 unknown salmon samples by isoelectric focusing for Glenn Kiel of the NMFS Western Inspection Office in Bell, California. All 12 samples were identified as chum salmon.

A final report ("Comparative Flavor Differences Among Shad Taken from Several Different Locations") of a cooperative study between the Gloucester Laboratory and the U.S. Fish and Wildlife Service (Delaware River Fishery Program) was completed.

Joe Licciardello reviewed a manuscript for the Journal of Food Science.

Joe Licciardello met with Jerry Prickett of the New England Fishery Development Foundation to discuss design of a project to improve quality of seafood landed and processed in the New Bedford area.

Product Safety Investigation

Casco Bay (Maine) Sediments

All sediment extracts were analyzed in duplicate for polynuclear aromatic hydrocarbons (PAH's) on the Perkin-Elmer Series 3B high-performance liquid chromatograph. Detection of PAH's was accomplished by an ultraviolet (UV) detector connected in series with a fluorescent detector. UV and fluorescent chromatograms were carefully analyzed, data entered, and results calculated. Interpretations of results were completed.

Work-up of all samples for polychlorinated biphenyls (PCB's) has been completed. A new reagent, tetrabutylammonium sulfite, is being employed for the removal of sulfur interference instead of copper powder prior to gas-liquid chromatographic analysis.

Targeted Finfish and Shellfish

Fifty samples for PAH analysis were composited and homogenized. Samples were composed of red hake, silver hake, winter flounder, windowpane, fourspot flounder, and American lobster. Samples were collected from the New York Bight region and Long Island Sound. Isolation of PAH's was accomplished for 35 samples. Twenty-four samples have been analyzed by high-performance liquid chromatography.

Environmental Protection Agency Interaction

Don Gadbois met with Dr. Andrarde and Mr. Taylor of the Environmental Protection Agency in Lexington, Massachusetts, to discuss PCB analysis of sediment samples. He also met with Dr. Norwood of the Environmental Protection Agency laboratory in Narragansett, Rhode Island, to discuss PAH confirmation by gas chromatography mass spectrometry, and with Ann Alford of the Environmental Protection Agency laboratory in Cincinnati, Ohio, on the matter of participating in an intercalibration exercise of PCB's in sediments. Samples are being sent out this week and this Laboratory will participate as soon as the sediment extracts have been analyzed by gas-liquid chromatography.

High-Resolution Chromatography

A 25-m X 0.31-m i.d. fused silica column of cross-linked SE-54 was received from Hewlett-Packard. The new column will be used in the 5992B mass spectrometer for the separation and confirmation of PAH's. A direct column injector accessory was also ordered for the mass spectrometer in conjunction for the PAH work.

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 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. A proposed "Draft Instructions for Grading Fresh or Frozen Shrimp" is being prepared.

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's 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."

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.

Gloucester Laboratory Technical Note No. 17, "Definitions and Measurements of Bone Defect," was prepared. Copies are available to interested persons.

An initial draft of a "Proposed U.S. Standards for Grades of Frozen Lobsters" has been prepared, and it is now being reviewed. This document is based on a Codex-recommended international standard.

NMFS/URI Cooperative Fisheries Engineering Unit

The 1/10 scale model of the NEFC's "Yankee 36" bottom survey trawl has been finished and initial tests have been run in the University of Rhode Island (URI) Ocean Engineering Department's tow tank. The tests included runs at various scale speeds, bridle lengths, and with two types of ground gear. When the data from these tests are available, a comparison with full-scale measurements will be made to determine the correlation between model and full scale.

Work has begun on instrumentation for measurement of the vessel and gear parameters necessary for the gear studies that we have planned. The measurements from these instruments will be fed through a dedicated microprocessor and to an on-board Hewlett-Packard HP 85 computer which is on order. In addition, we are investigating the engineering software available in various URI departments. Several programs for the finite analysis of structures are being studied to determine their usefulness for vessel structures such as gallows, booms, clam-dredge ramps, etc.

Renewed interest in juvenile fish samplers has been expressed, and a fisheries student from France may be coming to work with us on this project.

The demersal pair trawling project with dissimilar vessels has been held up by the malfunction of one of the new load cells.

The transportation of equipment from Gloucester to Narragansett is continuing with quite a bit of vessel-related material still remaining to be moved. A meeting concerning the fisheries engineering arrangement was held at URI in early January.

Our Unit, the URI Marine Advisory Service, and the University of Connecticut have put together a proposal to the New England Marine Advisory Committee to demonstrate and document the use of color echosounders on various bottom types.

Vessel Operations

The NEFC's R/V Rorqual has been transferred to the State of Rhode Island, and the URI Ocean Engineering Department will use parts as spares for their T-boat, the Shock.

The Gloria Michelle carried out Cruise No. 82-01, sand lance collection, and Cruise No. 82-02, tagged seal tracking. A new exhaust system and muffler were installed, and additional work on the electrical system and interior finish were accomplished between cruises. Her new berth is at the Public Health Service dock in Allen's Harbor, North Kingstown, Rhode Island.

Technical Assistance

Information and technical assistance were provided in the following areas: freezing lobsters; U.S. fish exports to Canada; MSX disease in oysters; fishery exhibits; dogfish; flounders; eels; gillnetting; salting and pickling herring; utilization of shrimp shells; Tempco pumps; cooling of fish chowder; frozen scallop species identification by isoelectric focusing; freeze-drying sarcoplasmic protein extracts from fish; labeling requirements for Atlantic cod, haddock, and scrod; identification of species in canned tuna; fish species identification services available in Florida; mercaptoethanol and dithiothreitol; species identification by disc electrophoresis; hermit crabs; rigor mortis and fish quality; preservatives for fish; proximate composition of conger eel; the capelin fishery; fresh fish quality program at the Gloucester Laboratory; decontaminating seawater by irradiation treatment; spiny lobster tails; saberizing (deep skinning) mackerel; packaging fresh fish; food irradiation; U.S. Grade A program for fresh fish fillets; mixing species

in minced fish products; vacuum packaging of fish fillets; the seafood processing industry; fish frames; parasites in fish; polyphosphates in seafoods; minced fish; natural sodium content of Atlantic cod and flounder fillets; consumer education material; measurement of thaw drip; recovering bones from filleting leftovers; sources of flounder fillets; the Journal of the Tokyo University of Fisheries; canned pilchard; grading fish dockside and improving quality of fish on the vessels; Russian substitute for caviar; canned pollock; parasites; line trawling for Atlantic cod and haddock; shrimp; grading fresh and frozen salmon; ocean pout; bottom trawls; Scottish seining; longlining; and hydraulic clam dredges.

Publications

BAKER, D.; VAN TWUYVER, R. Recovery of waste heat in a New England fishing vessel. The Fish Boat; February 1982. (P)

KRZYNOWEK, J.; WIGGIN, K.; DONAHUE, P. Commercial potential for cultured surf clams (60 mm). Shellfish Res. (S)

LICCIARDELLO, J. J. Microbial aspects of minced fish. Martin, R. E. ed. Proceedings of the Third National Technical Seminar on Mechanical Recovery and Utilization of Fish Flesh. 1982:458-476. (P)

WIGGIN, K.; KRZYNOWEK, J. Identification of cooked and frozen shellfish species by agarose isoelectric focusing. J. Assoc. Off. Anal. Chem. (S)

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, experiments are being conducted to examine the hake's ability to detect and mitigate the effects of anoxic conditions. To date, these experiments have shown that these animals are capable of both detecting and avoiding decreasing concentrations of oxygen. Detection was indicated by an increase in overall activity and a reduction of both food searching and agonistic behavior with the change in these behaviors peaking when oxygen in the bottom water had decreased to about 50% saturation. As the oxygen concentration continued to drop, the fish began moving up into the more highly oxygenated water column with all fish swimming just below the surface at concentrations \leq 25% saturation. Additional experiments are in progress.

Bori L. Olla has recently returned from Egypt where he reviewed Egyptian Academy of Oceanography and Fisheries programs--funded by the U.S. Environmental Protection Agency (EPA)--entitled "Investigation of Level and Effects of Pollutants in Saline Lakes and Littoral Marine Environments." Over the past 3 yr, besides reviewing the programs for the EPA, he has been an advisor to a number of Egyptian scientists who are working under the auspices of the program, helping them to design future research initiatives for the Mediterranean, Red Sea, and several inland saltwater lakes.

Biological Oceanography of Stressed Ecosystems Investigation

Work continued on the NEFC's Coastal Habitat Assessment, Research, and Monitoring Program. A meeting on 19 January at the University of Massachusetts at Amherst

was attended by Jim Thomas and Craig Robertson. Purpose of the meeting was to familiarize participants with the process and problems of handling computer images. A listing of airport coordinates from northern Delaware to southern Massachusetts necessary for the geometric correction of the computer images, was submitted to Jack Finn at the University of Massachusetts. Work is progressing on vegetative maps of coastal New Jersey, New York, and Connecticut.

In January, Helen Mustafa and Jim Thomas visited Dr. Warren Hovis of the National Earth Satellite Service to examine the Coastal Zone Color Scanner (CZCS) East Coast Level I browse file. Based on this examination, 193 Level I scenes were requested for processing to Level II. These scenes will be used to demonstrate the effectiveness of the CZCS when compared with an intensive series of cruises accomplished over the continental shelf between Cape Hatteras and Nova Scotia from 1978 to the present. Additionally, these data should elucidate the annual cycle of primary production in these surface waters.

The Seabed Metabolism Subtask provided data for a report on the 12-mi sewage sludge dumpsite, and finished its annual report for the first annual Northeast Monitoring Program (NEMP)/Ocean Pulse Program (OPP) workshop, held at the Milford Laboratory. Biological-to-chemical seabed oxygen consumption ratios have been calculated and plotted for all cruises from which these data were obtained. Peter Kube completed the NOAA Operational Diver Course held in Norfolk, Virginia.

Phytoplankton sample bottles were provided for a January-February cruise on the Japanese R/V Kaiyo Maru to obtain samples from the Scotian Shelf and other offshore areas where our sampling is sparse. Samples for phytoplankton species composition are also being obtained on a February-March cruise between Cape Hatteras and Nova Scotia. In conjunction with the State of New Jersey, sediment samples were examined for the presence of Gonyaulax tamarensis cysts. No cysts have been identified yet.

Assay of 17 samples was completed in January by the Phytoplankton Potential and Bloom Subtask. Nitrogen was usually the most critical nutrient with phosphorus responsible for secondary growth limitation. In two samples, however, nitrogen limitation was equalled by that of phosphorus, and in two other samples, phosphorus was more critical to growth than nitrogen. February was devoted to preparing a paper for the first annual NEMP/OPP workshop. At the meeting, assay results from two monitoring cruises were presented which illustrated the complex and changeable nature of chemical water quality in Northeast waters.

The first annual NEMP/OPP workshop was attended by Myra Cohn, John Mahoney, Bill Phoel, Craig Robertson, and Jim Thomas. Harold Marshall and Myra Cohn jointly presented a paper on phytoplankton community structure in the northeastern U.S. coastal waters; John Mahoney presented a paper on phytoplankton growth potentials in these same waters; Bill Phoel presented a paper on seabed metabolism in the NEMP area; Craig Robertson presented preliminary findings of the Nantucket Shoals experiment which occurred during May 1981; and Jim Thomas presented a review of the Superflux Program.

Coastal Ecosystems Investigation

Benthic Community Structure

Most of our effort was spent in preparing our annual report on benthic data collected for NEMP/OPP, and in carrying out the winter benthic sampling of NEMP/OPP sites. Dave Radosh, Steve Fromm, and Rutgers University volunteer Christa Facciola collected sediments and benthos from 28 sites throughout northeastern waters. We

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coordinated with the Center's Manned Undersea Research and Technology Program, which began tests of a remote camera to document small-to-medium-scale bottom topography, and distribution/abundance of mobile epifauna, at our sites.

The annual report notes that: (1) the New York Bight sewage accumulation site remains the most contaminant-impacted of our NEMP/OPP stations, followed by the sewage sludge dumpsite; (2) at two stations in the Chesapeake Bay plume, 5 and 20 nautical miles south of the Bay mouth, presence of the same stress-tolerant species as in the Bight apex indicates a plume influence; (3) presumably impacted stations in Massachusetts Bay and just south of Narragansett Bay had "healthy" species richness and composition; (4) no major trends in these variables (or in densities of sensitive amphipod species) were seen in the 8 yr of existing data for the New York Bight apex or the 4-25 yr of data for our other sites; and (5) 1981 surf clam spatfall at two inshore Bight stations was similar to 1979 spatfall, but roughly an order of magnitude less than in 1980. (Predation removes almost all juvenile clams in most years. In both lab and field studies, clams burrowed as quickly into sludge-contaminated sands as into cleaner sands.)

Clyde MacKenzie completed a manuscript on the lack of effects of commercial dredging of ocean quahogs on shelf benthos. Bob Reid continued preparation of a report on the New York Bight benthic monitoring, and collaborated with the Environmental Chemistry Investigation to develop a matrix correlating data on fauna, sediments, and contaminants for the Bight.

We provided Dr. Gerry Pesch of the EPA's Narragansett Laboratory with information on polychaete distribution and abundance in the New York Bight apex, for his studies on genetic effects of contamination. Advice and equipment were given to Mark Clough of the U.S. Fish and Wildlife Service, who is assessing potential effects of dredging in the Arthur Kill on overwintering blue crab populations. We collected sediment samples from throughout the NEMP/OPP area for enumeration of diatom resting spores by Dr. Liz Cosper of the Lamont-Doherty Geological Observatory.

Benthic Energetics

We continued developing our life history file for dominant or ecologically important benthic macrofauna. Formats have been drafted to computerize this file so as to be able to integrate rapidly information contained in this file with other data files to speed up impact and trend analyses. We also made draft contributions to the Center's first draft of 12-mi-site characterizations, including fish feeding data, benthic biomass distributions and community structure, and a summary of impacts to the benthic community. We have almost completed determining the biomass of benthic macrofauna from the 1973 New York Bight apex survey to assist in identifying long-term trends and variability in biomass distribution as related to waste dumping and fish distributions. Most of these data have been added to our Automatic Data Processing (ADP) files. Ms. Dorothy Jeffress began the second part of a course in elementary computer programs that will enable us to increase our user interaction capability with our ADP files.

In February, we provided two large samples of whole haddock to Paul Boehm, an analytical chemist with Energy Resources Company, Inc., who will investigate the variability characteristics of different sample sizes using individual fish and parts of fish tissues. We hope this study will improve our estimation of the number of samples required to detect adequately the petroleum hydrocarbon contaminants on Georges Bank and to understand better the nature of the variability found in existing data.

Frank Steimle has begun to compile and analyze data to develop a section of the book on Georges Bank. His contribution will be an estimation and discussion of benthic invertebrate productivity as it relates to total energy flow.

Ocean Pulse Program Coordination

Frank Steimle and Denise Holloman planned and coordinated the OPP's winter monitoring cruise that sampled over 80 stations with the Albatross IV during January-February. We began planning and coordinating the spring monitoring cruise scheduled for the end of March and early April. Frank and Denise planned and assisted in the coordination of the first annual NEMP/OPP workshop during 24-26 February that brought together most of the researchers involved in the program to make short presentations of their 1981 results and participate in general discussions of how these results can be used to develop the second annual NEMP/OPP report on the health of the Northeast marine environment and resources.

Environmental Chemistry Investigation

We assembled our first MARMAP-OPP nutrient data base (covering 1979 through March 1980). This data base contains 4153 records, or 19 600 individual analyses of nitrite, nitrate, ammonium, phosphate, and silicate made over an annual cycle. We constructed annual curves (for 18 regions between Cape Hatteras and Nova Scotia) of each nutrient and the fraction of dissolved organic nitrogen as ammonium in surface and bottom layers of the water column. Cross-shelf profiles of nutrients measured on selected transects were computer contoured. Three major patterns emerged from these analyses: (1) the main source of nitrogen available to phytoplankton to sustain the high levels of primary productivity of several regions in summer ($>1 \text{ gm-C/m}^2/\text{d}$) is recycled nitrogen-ammonium; (2) shelf-slope interactions supply nitrate to the bottom water of the outer and middle shelf, making this nitrogen available for new production upon destratification of the water column or vertical mixing; and (3) the data suggest an estuarine (human) impact in nitrogen availability on the continental shelf from the New York Bight apex southward, although this finding is more tentative than the first two because it is expressed in the variability of the monitoring index rather than its magnitude. Nutrient data (~ 800 samples) collected by the Biological Oceanography of Stressed Ecosystems Investigation during our cooperative study of nutrient flux from the benthos were computer coded. Also, we analyzed nutrients in about 250 samples of seawater used in John Mahoney's study of phytoplankton growth potential.

Al Matte trained volunteers responsible for collecting nutrients during the spring MARMAP survey on Albatross IV Cruise No. AL 82-02. This survey is underway at present. Jim Nickels is measuring primary production; Cynthia Muchant and Dave Burdick are measuring chlorophyll concentrations.

Dave Burdick, Cynthia Muchant, and Bob Fitzgerald measured chlorophyll-a in netplankton and nannoplankton samples (840 biomass estimates) collected during the OPP survey on Albatross IV Cruise No. AL 82-01. Jim Nickels and Tom Finneran measured phytoplankton production of organic carbon at 23 stations during this survey.

Monthly sampling of sea scallops off Asbury Park continued as part of the cooperative study (D. Gould and V. Zdanowicz) of trace metal levels and biochemistry of animals from this site. T. Ruiz participated on the aforementioned OPP survey, and collected 200 sediment samples and 210 scallop tissue samples.

Jay O'Reilly and Donna Busch submitted a paper to the Symposium on Biological Productivity of Continental Shelves in the Temperate Zone of the North Atlantic, held in Kiel, Federal Republic of Germany. The title of the paper is "The Annual Cycle of Phytoplankton Primary Production (Netplankton, Nannoplankton and Released Dissolved Organic Carbon) for the Northwestern Atlantic Shelf (Mid-Atlantic Bight, Georges Bank, and Gulf of Maine)." M. Sissenwine (Woods Hole) delivered this paper in Kiel after a briefing from J. O'Reilly in late February.

All members of this Investigation spent considerable time finishing its annual NEMP/OPP report. Chapters and authors are: (I) "Trace Metals in Sediments and Biota," by V. Zdanowicz and T. Ruiz; (II) "Nutrient Analyses, Intercomparison Between Brookhaven National Laboratory and Sandy Hook Laboratory," by A. Matte; (III) "Nutrient Baselines," by R. Waldhauer, A. Matte, A. Draxler, and I. Desvousges; (IV) "Preliminary Analysis of Annual Inorganic Nitrogen Cycles," by A. Draxler and R. Waldhauer; (V) "Phytoplankton Biomass (Chlorophyll a) Distribution Over the Northwest Atlantic Continental Shelf: Cape Hatteras to Nova Scotia," by C. Evans; and (VI) "Revised Estimates of Annual Phytoplankton Production for 14 Subareas of the Northwest Atlantic Continental Shelf," by J. O'Reilly and D. Busch. A. Draxler, J. O'Reilly, V. Zdanowicz, and C. Zetlin presented summaries of work at the NEMP/OPP annual workshop held at the Milford Laboratory in late February.

Environmental Statistics Investigation

Development of methods for study of multiple-factor bioassay problems continues. Particularly emphasized is appropriate interpretation of synergistic and antagonistic effects; for example, observed physiological phenomena influenced by dosage of several heavy metals.

We continued the pattern analysis of the trace-heavy-metal body burdens in New York Bight finfish and shellfish. The technique used is a canonical correlation analysis. We have modified packaged computer programs to obtain better interpretation of the results. Ongoing statistical consulting for various investigations in NEMP/OPP continued, particularly on the Long Island Sound benthic community study, the prevalence of anomalies in sand lance study, and the exposure of Crepidula fornicata and blue mussels to silver and copper studies.

Physiological Effects of Pollutant Stress Investigation

Physioecology

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

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

A diluter was calibrated and metal turned on for the Physiology Subtask. American lobsters are being exposed to 0, 5, and 10 $\mu\text{g}/\text{l}$ of cadmium.

Adult blue mussels were spawned and an embryo experiment was set up. The embryos are being exposed to eight heavy metals individually to determine LC_{50} values.

We participated in the OPP survey on Albatross IV Cruise No. AL 82-01 from 25 January to 12 February.

Physiology

David Nelson and Joe Pereira participated in the aforementioned cruise, performing some hematological tests aboard ship and collecting plasma samples for later analysis in the lab. Measurements of sodium, potassium, calcium, and total osmolality of plasma samples are in progress. Analysis of samples from earlier cruises has been completed.

Preparations were begun in February to add measurements of osmotic fragility to our suite of measurements for flounder red blood cells. Methods will be tested on the next OPP survey.

Considerable time was spent preparing for and attending the NEMP/OPP workshop and review.

Biochemistry

Biochemical analyses were completed for sea scallop adductor muscle samples from last summer's Albatross IV Cruise No. AL 81-06, the annual sea scallop survey. Analysis was begun and is continuing on samples collected during last September's OPP survey on Albatross IV Cruise No. AL 81-10. The New Jersey monthly collections of sea scallop kidney and adductor from a single population were delivered on dry ice in mid-January to the Milford Laboratory from Sandy Hook's Environmental Chemistry Investigation, with whom we are collaborating on this seasonal study. Kidney analysis has been completed, and work on the adductor samples is scheduled to begin in mid-April.

During the recent OPP survey on Albatross IV Cruise No. AL 82-01 (30 January-12 February), sea scallop tissues were collected from the Gulf of Maine deepwater station; no other sea scallop sampling derived from that cruise.

Also completed were data analysis and interpretive reports for sea scallop samples collected during last year's winter and spring bottom trawl surveys on Delaware II Cruises No. DE 81-01 (January) and DE 81-02 (April and May). Particularly low glycogen levels were found in animals collected from sites north of the "mud patch" in January (when levels were normally low) and from areas southeast of the outer Hudson Valley in April, during phytoplankton bloom. Biochemical data for animals from the latter areas indicate populations under no especial metabolic stress but very much in need of building up glycogen reserves for gamete maturation, if they are to spawn successfully in September.

A good part of this reporting period was spent in preparing presentations to and OPP review by the Center Board of Directors and to the NEMP/OPP workshop held at the Milford Laboratory during 24-26 February.

Anaerobic Bacteriology

OPP activities included participation in the January survey on Albatross IV Cruise No. AL 82-01. Sediments and waters were obtained for analysis for Clostridium perfringens and Vibrio spp. Twelve sea scallops were obtained for clostridial analysis. The Vibrio numbers were low, as we have previously observed during the colder months. C. perfringens counts, although still elevated in sediments, are showing a tendency to be lower in winter months. Some 60 isolates were obtained for speciation.

Most other activities were related to preparation for the first annual NEMP/OPP workshop the end of February and various manuscripts.

Chemistry

Most of this reporting period was devoted to routine analyses, such as metals analyses of fish held in metal-exposure systems and PCB analyses of various tissue samples obtained last fall.

A procedure found in the literature for isolating a copper-binding protein synthesized by mussels when exposed to copper will be examined for its usefulness in our metal-exposure work.

Publications

GREIG, R. A.; SAWYER, T. K.; LEWIS, E. J.; GALASSO, M. E. A study of metal concentrations in relation to gill color and pathology in the rock crab, Cancer irroratus. Arch. Environ. Contam. Toxicol. (A)

PENKOFF, S.; THURBERG, F. P. Changes in oxygen consumption of the American lobster, Homarus americanus, during the molt cycle. J. Comp. Biochem. Physiol. (A)

THURBERG, F. P. Sublethal physiological effects of mercury and cadmium on larval and juvenile lobsters, Homarus americanus. Mar. Biol. (A)

AQUACULTURE DIVISION

Aquacultural Genetics Investigation

Breeding

Second-generation progeny of American oysters (Crassostrea virginica) selected for fast and slow growth rate continue to be measured to determine if second-generation selection has been successful. Preliminary observations indicate a possible response to the selection. In five of seven comparisons of their parents from the high (fast) growth and low (slow) growth lines, the high-line oysters of the prior generation had demonstrated a significantly larger size in the juvenile stage. To date, nearly 25 000 animals in 94 trays have been measured.

Other animals selected for meat weights are overwintering in South Carolina. Commencing this spring, these animals will be spawned and their condition compared with that of controls which remained in the local area. Some oysters were brought back from South Carolina to be conditioned for spawning. These, as well as oysters from Massachusetts, will be used in experimental crosses with the local Long Island Sound oysters. Oysters from another area in the Connecticut vicinity spawned in our first out-of-season spawning attempt for 1982 and were used in the two types of hybrid and the two types of control crosses.

Measurements of growth in juvenile hybrid and control stock were entered into computer files for eventual analysis. Analysis of the earlier grow-out experiment is near completion and appears to confirm nonstatistical impressions.

Natural Variation in Molluscan Populations

Oysters from different geographic populations continue to be processed and their protein patterns analyzed with isoelectric focusing techniques. Cytogenetic examinations of eggs from several geographical populations were made. Tentative species of another pelecypod mollusk, the blue mussel (Mytilus edulis), revealed a most common and probable haploid chromosome number of 14 in the prometaphase I stage

of meiosis. This study was undertaken at the request of a University of Colorado researcher (Dr. J. Mitton) who earlier observed morphological and biochemical differences among some of the mussel groups. Cytogenetic investigations can aid in identifying and evaluating differences among populations and species at the chromosome level. Genetic differences among mussel populations can influence the outcome of bioassay or monitoring employing these common mollusks.

Cytological and Cytogenetic Measures of Pollution Effects

Experimental and field findings resulting from an adaptation of the micronucleus test for chromosome mutation to marine fish were summarized for an Ocean Pulse Program review. The dose-response experiment employing kidney tissue is still underway. Also planned is a similar experiment intended to test the applicability of the sperm abnormality test for gene mutation to marine fish. The most interesting result of the work employing the micronucleus test to the field has been the demonstration of high micronuclear (mutation rate) incidences in red hake larval blood in a cluster of sites in the New York Bight. Further south, and along Long Island, no larvae with high outlying incidences were sampled, and incidences were similarly low. Other species' larvae sampled in coastal areas may be showing reductions in hematopoietic potential as well.

The possibilities of making some measures of any influence of pollution or particular contaminants on the quantity of germ-line primordial cells in fish larvae and their incidences of chromosome mutation are now being explored.

On the ongoing joint research cruise on a Polish fishing vessel, hematopoietic tissue of Atlantic mackerel is being taken for estimates of chromosome mutation before and after fish enter polluted coastal waters. Samples are also being taken for analytical chemical analyses of aromatic and chlorinated hydrocarbons and heavy metals. Biological studies are employing a short-term at-sea culture of hematopoietic tissue for sister-chromatid exchange analyses, and the micronucleus test on immature erythrocytes. Karyotype analyses should demonstrate the basic chromosome complement of this interesting oceanic species.

Spawning and Rearing of Mollusks Investigation

Analysis of our extensive 1981 grow-out experiment with bay scallops (Argopecten irradians) in lantern nets was completed and a manuscript prepared. Densities up to 750 scallops per square meter at market size (>50 mm) were achieved in a single growing season. Total adductor muscle yields from nets increased with increasing density up to densities of 1500/m² where muscle yields peaked at 5 kg/m². The handling portion of the experiment showed that one mid-season handling to remove predators, to adjust scallop densities, and to allow net cleaning produced results at least as good as or better than more frequent handling. Nets unhandled until harvest suffered large predator mortality and other losses due to silt buildup in an attached mussel layer. Lantern net culture of bay scallops appears to be an effective method for grow-out.

In a cooperative experiment with researchers with the South Carolina Wildlife and Marine Resources Department, a group of juvenile surf clams (Spisula solidissima) spawned at the Milford Laboratory was transplanted to a raceway system near Charleston. Between September 1981 and February 1982, the clams grew from 10 mm to 24 mm in length. This rate of growth compares favorably with that recorded in Milford with similar-sized clams during the spring and summer. The primary growing seasons are reversed between north and south. Seawater temperatures in excess of 30°C occur

summer in South Carolina, which would prove lethal to surf clams. In the north, growth ceases in winter due to reduced temperature. A potential for an extended or dual growing season for young surf clams is therefore possible by transplantation.

Shells of juvenile surf clams reared in Milford have been sectioned by the Fishery Biology Investigation in Woods Hole. An attempt is being made to relate the occurrence of rings in the shell to reproduction, growth, and culture conditions.

Aspects of Nutritional Requirements of Mollusks Investigation

Oysters

A population of small native American oysters was maintained in the continuous-flow rearing chamber. Although these animals have reached a size of about 2-3 cm, they have not increased in weight during the past several months. Several animals were dissected to determine if any obvious pathology conditions could explain these recent events, but none were found. The animals were also starved for a few days and then fed various volumes of food in an effort to stimulate utilization of the food supply. We are planning to hold these oysters until the warmer weather to learn if the season could be affecting an increase in oyster weight.

Two populations of oyster larvae (spawned on 9 and 17 February) are being reared in small tanks. We are anticipating a good population of set oysters to be used in additional feeding experiments.

Semicontinuous Mass Cultures

A harvest of 2491 liters of juvenile algal foods and 3659 liters of larval algal foods was extracted from the algal culture system. This harvest represents an excellent productivity that was improved over the previous 2 mo even though six culture carboys have been removed from the system for a special experimental purpose (see following paragraph). The harvested algae were distributed to Investigations as follows: Spawning and Rearing of Mollusks, 2269 liters; Aquacultural Genetics, 2077 liters; Diseases of Larval Mollusks, 74 liters; and Physiological Effects of Pollutant Stress, 150 liters.

A new formulation for an algal culture medium has been developed in which the nutrient additives have been reduced to one-half to one-quarter the concentration used in our routine growth medium. Numerous experiments were conducted in test tubes and flasks to evaluate the growth response to the new formulation. We had confidence that this new formulation was satisfactory, but decided to test it in carboy culture on three algal species, Dunaliella euchlora, Tetraselmis maculata, and Isochrysis galbana. Culture density compares favorably to that obtained in the routine culture carboys.

Stock Culture Collection

Subcultures of algae in the collection were conducted on schedule. Axenic starter cultures were sent to the following upon their request: Paul Chanley of the Mayaguez Marine Station of the University of Puerto Rico, Reuben Valdez of the Shinnecock Oyster Hatchery, and Earl R. Huskey Enterprises.

Four manuscripts from the editors of Fishery Bulletin and Marine Ecology-Progress Series were submitted to Dr. Ukeles for review.

Publications

- MERCALDO, R. S.; RHODES, E. W. Influence of reduced salinity on the bay scallop, Argopecten irradians, at various temperatures. J. Shellfish Res. (S)
- WIKFORS, G.; UKELES, R. Growth and adaptation of estuarine unicellular algae in media with excess copper, cadmium or zinc, and effects of metal-contaminated algal food on Crassostrea virginica larvae. Mar. Ecol.-Prog. Ser. 7:191-206, 1982. (P)

PATHOBIOLOGY DIVISION

Comparative Invertebrate Pathology Investigation

Past observations of euphausiids collected in the open ocean and in the vicinity of the 106-mi dumpsite revealed high prevalences of focal gill melanization in certain species. Analysis of data from these field collections indicated no direct correlation of the occurrence of gill melanization with the dumping of industrial or sewage wastes. Examination of more recent field-collected specimens suggests a correlation in presence of suctorian ciliates with the occurrence of focal gill melanization.

However, in other studies, pathologic melanization in crustaceans has been shown to result from exposure to various organic chemicals and heavy metals as well as in response to parasitic infections. Therefore, lab experiments were designed to test the effects of specific industrial wastes on the gills of shrimp. In these experiments, Palaemonetes pugio was used as the model since euphausiids are delicate and difficult to maintain in captivity.

Animals were exposed to concentrations of acid-iron waste experienced in the field. They showed no overt signs of gill melanization after a 3-, 7-, and 30-day exposure. Gill tissues have been preserved and are being processed for histologic and ultrastructural examination. Examinations at the light and ultrastructural levels of these preparations may reveal information on more subtle effects in the cellular and subcellular structures of gills exposed to industrial wastes.

Examination of specimens collected on the Northeast Monitoring Program's August-September cruise has been completed and data have been tabulated. We examined 1302 specimens. Amphipod species and their parasites, as previously found and reported, were present again in the expected locations. In addition, a turbellarian worm was relatively common in Ampelisca agassizi from three stations. This worm is either the same as, or closely related to, the European Kronborgia amphipodicola, which was described from ampeliscids from Danish waters. K. amphipodicola, which invariably causes sterility of its host, was estimated to have reduced the breeding population of Ampelisca macrocephala by 50% in Oresund in the early 1960's. In the present samples, such high rates of parasitism were not found. The tendency of the turbellarian to occur in large numbers only locally (like K. amphipodicola) suggests that it most probably is of importance as a mortality factor only in isolated instances.

Analysis of data gathered during six cruises and concerned with two parasites--the host-specific microsporidian of A. agassizi and the non-host-specific Hematodinium-like parasite--occupied much of the reporting period. These analyses and tables and other visual aids on crustacean target species were used in preparing material for presentation at the Northeast Monitoring Program/Ocean Pulse Program workshop held at the Milford Laboratory during 24-26 February.

Spatial and temporal data on gross pathology were compiled for several samples of blue mussels (Mytilus edulis) collected from Northeast coastal sites. Histochemical data on copper in these samples were also compiled. Mussels show generally poorer condition in areas north of Cape Cod and also higher levels of copper in the kidney. Heavy metal levels seem to be highest in the late summer and fall and lowest in late winter through spring. American oysters (Crassostrea virginica) which were examined using this histochemical technique for heavy metals show this same seasonality. They also show heavy accumulations of metallic salts in hemocytes throughout their systems which reflect direct relationships with acute inflammation, infiltration, perivascular cuffing, occlusion of vessels, and diapedesis. Heavily degraded areas such as Raritan Bay show severe pathological conditions, while effects are minimal in cleaner areas such as Great Bay. Mussels accumulate metallic salts only in the kidney epithelium which in intense accumulations seems to be associated with metal-positive concretions or "stones." No evidence was seen in other tissues or blood cells in mussels.

Information on diseases, on disease control and diagnosis, and on state, federal, and international laws pertaining to introductions of shellfish was presented to representatives of the New England States at a workshop of the Northeast States Shellfish Transport and Disease Control Working Group from 2 to 5 February. Documents outlining shellfish management zones based on infectious agents in clams, mussels, and oysters in the Northeast and Middle Atlantic regions were also presented. Considerable progress was made toward developing cooperative regional guidelines on the introduction of shellfish at this workshop.

A substantial amount of time was spent preparing materials for presentation at the first annual Northeast Monitoring Program/Ocean Pulse Program workshop to be held 24-26 February at the Milford Laboratory. Information on the distribution of pathology and parasites in three species of ocean mollusks and other molluscan target species was presented at the workshop.

Diagnostic services were provided to the University of Rhode Island and pertained to the identification of parasitic lesions in sea scallops.

Pen shells (Pinna sp.) from Mexico were examined for parasites and pathology at the request of the California Department of Fish and Game.

Diseases of Larval Mollusks Investigation

On 18 February, we conducted a 2nd Connecticut-New York Hatchery Disease Workshop. Eleven individuals, representing Bluepoints Co., Inc., Shinnecock Tribe Oyster Project, Long Island Oyster Farms, and Frank M. Flower and Sons participated in the workshop. The day consisted of a morning seminar presented by Drs. Blogoslawski, Robohm, and Brown, and afternoon demonstrations of lab procedures used by each of the individual laboratories.

Biochemical tests were completed on bacteria isolated from Long Island Sound samples obtained at a natural shellfish bed off Stratford, Connecticut, in August and December. Genus classification of 32 isolates from the August sampling cruise placed bacteria in the following categories: 19 Vibrio, 5 Flavobacterium, 4 Achromobacter, 1 Pseudomonas, 1 Micrococcus, 1 Aeromonas, and 1 unclassifiable. Genus categories for 23 isolates taken in December were: 11 Vibrio, 5 Achromobacter, 4 Pseudomonas, and 3 Flavobacterium.

On 7 January and 22 February, bacterial sampling was done on oyster shells dredged from the Stratford site and a New Haven site. Bacteria were: (1) lifted from the shell with a cotton swab and then rubbed onto a Petri plate containing growth medium, (2) placed on a plate of growth medium by direct contact with shell,

and (3) removed from the shell by shaking a small piece of shell in sterile seawater broth and then plated on agar at a dilution of 10%. Plating media consisted of OZR and TCBS agars. January shell isolates from the Stratford site consisted of 14 Vibrio and 1 Achromobacter, while those from the New Haven site consisted of 10 Vibrio, 4 Flavobacterium, 3 Achromobacter and 2 Pseudomonas. Pathogenicity of these isolates was tested in two oyster larval challenge experiments during February. Results will be reported in a future narrative.

With the availability of conditioned oysters and fertilized oyster eggs, larval studies have been resumed. One such study tests the efficacy of carbon filtration in controlling disease. Seawater that has been filtered through 10- μ orlon filters, then 1- μ m orlon filters, subjected to carbon filtration to remove organic materials, and finally irradiated with ultraviolet (UV) light is used in this work. Theoretically, the UV light should be more effective on seawater lacking organic material. The larval cultures are being sampled for growth and survival at 1-, 2-, and 3-wk intervals.

A new batch of the Vibrio toxin under study has been concentrated. Research on the toxin will be completed with this batch. A study to determine whether magnesium sulfate will chelate out the toxin is underway.

Reexamination of biochemical reactions for 65 marine bacteria tested with the Minitek bacterial differentiation system was necessary because some reactions seemed to be affected by ingredients in a modified basal medium used with the system. Fifty of the isolates have been retested using the manufacturer's basal medium supplemented with 2.5% sodium chloride. Results on the remaining 15 isolates should be available for comparison within the next 2 wk.

Further improvements were made in a chemical-spectrofluorometric method for counting molluscan phagocytes in monolayers. Reliability in cell counts was found to be affected by the lysing agent used to solubilize the cell protein. Sodium dodecyl sulfate (0.1%) was found to be about 20% more effective than Triton X-100 (0.1%) in lysing cells. It also has no apparent adverse effects on the reagents used in the fluorogenic reaction system.

Work to produce reagents for serological detection of pathogenic bacteria continued during this reporting period. A rabbit injected with fish globulin purified by affinity chromatography failed to develop a rabbit antifish antibody (possibly because the globulin was degraded by the stringent conditions needed to elute it from the chromatography column). Hopefully, serum from a second rabbit, immunized with fish globulin adsorbed to rabbit cells, will contain the desired antibody.

In summer 1979 a bacterium (i.e., CA10) was isolated from a West Coast hatchery. It was subsequently found to be highly pathogenic to American oyster (Crassostrea virginica) larvae. As part of a cooperative project, the organism was sent to Dr. Colwell's lab at the University of Maryland. Dr. Howard Hada of the University of Maryland has provided needed DNA base ratio analysis on this bacterium. According to Dr. Hada, the CA10 organism has been positively identified within the Vibrio range (G+C% = 44.9%). He compared CA10 with 16 representative Vibrio species and seems to think that it may be a new species. He is continuing his work on CA10 to try to identify it. A joint publication is planned for this research with the University of Maryland.

Daily sampling for a yearlong bacteriological study comparing two types of media has been completed. The data will be analyzed completely as soon as colonies from the last set of plates have been isolated and identified. Bacteria thus far identified from flowing raw seawater have not included pathogenic types historically found in lab-reared oyster larval cultures. This suggests that the larval cultures act as incubators for certain bacteria. The pathogens are present in numbers too few to be isolated on plates, but they are able to grow in larval cultures.

In a special food preservation study, ozonized ice was examined further as a preservation method for fish. An experiment was set up using winter flounder collected from Long Island Sound which were: (1) filleted, (2) gutted and headed (cleaned), or (3) left whole. Ozonized ice was produced by treating seawater, distilled water, and tap water with ozone for 5 min and then freezing the treated water at -80°C as in a previous experiment.

Small square chunks of flesh were aseptically removed from the pigmented side of the flounder (except the fillets, where the sample was taken from the flesh side) and weighed for each fish used in the experiment. Each chunk was put into a 10% peptone dilution broth and plated on TCBS, OZR, and nutrient agar (NA) at dilutions of 10^{-2} and 10^{-3} . Each whole flounder was packed with ozonized ice (either distilled water or seawater) and wrapped separately. Cleaned fish and fillets were both packed with all three types of ozonized ice (distilled water, tap water, and seawater) in small polyethylene bags. Controls were run with the cleaned flounder using ice from a lab ice machine (freshwater ice). All bags were held in a 1°C refrigerator and the ice was replaced on days 3 and 5 when sampling for bacterial counts was done. Since initial results indicated that NA provided the highest bacterial counts, subsequent counting was performed with this medium.

Samples taken on days 5 and 10 showed substantial bacterial growth in all flounder tissue (filleted, cleaned, or whole) packed in freshwater ice. Little or no growth was found in samples packed in ozonized ice (distilled water, tap water, or seawater). However, all samples (ozonized or nonozonized) had a slightly objectionable odor after 9 days.

Fish Pathology Investigation

Ms. Linda Despres-Patanjo of the Resource Assessment Division (Woods Hole Laboratory) spent the week of 25 January at the Oxford Laboratory and was given instruction on the recognition of marine fish diseases and on procedures to be implemented on the 1982 spring bottom trawl survey. Ms. Despres-Patanjo is a willing and eager disciple without whom the integration of fish disease studies on bottom trawl surveys would be most difficult.

In cooperation with Linda Despres-Patanjo and John LeBaron and Dan Ralph of the Sandy Hook Laboratory, a new fish pathology logging system for bottom trawl surveys was developed. Sexual maturity and pathology observations will now be entered together on a field log sheet in a format that can be directly transcribed for computer entry in the lab. Computer programs were developed, using data from the 1981 fall bottom trawl survey, to summarize pathology observations on the basis of species, disease conditions, and location (inshore or offshore) of sampling strata. Prevalence data on all disease conditions now can be quickly entered, collated, and manipulated with the system 1022 program used. Hopefully, with the acquisition of additional disease data, geographic trends in prevalence may become discernible.

Analysis of 2 yr of data on skeletal anomalies in sand lance is almost complete. In the Northwest Atlantic there are two distinct areas of differing prevalence of skeletal anomalies. One area, east of longitude 72°W , which includes most of the bottom trawl survey strata north of Long Island, has an average stratum depth of 55 m and an average prevalence of fused vertebrae of 4.8%. The area west of longitude 72°W (south of Long Island) has an average station depth of 28 m and an average prevalence of fused vertebrae of 9.4%. In both areas there is a highly significant correlation between the percentage of fish with fused vertebrae and the depth at which they were caught, with the shallower stations yielding fish with greater numbers of anomalies. When the observed frequencies of anomalies are compared with

the expected frequencies by means of the Poisson distribution, a very poor match is obtained, indicating some contagiousness in the distribution of the anomalies. This poor fit also is apparent when a limited range of depths (12-33 m) is plotted, indicating that the occurrence of anomalies is contagious over and above that caused by variation in depth alone.

The distribution of skeletal anomalies appears to be related to the efflux of water from the major river systems along the coast.

A sample of southern flounder was received from the North Carolina Department of Natural Resources and Community Development. A large mortality of these fish occurred in December and January in Pamlico Sound. Histopathological examination revealed some inflammation in the pyloric caecae and possibly some focal pancreatic necrosis. Because no infectious organisms were apparent in histologic sections and no environmental perturbations or toxins could be implicated in the mortality, an attempt to isolate virus from these fish is in progress.

Scanning electron microscope observations on the corneas of striped bass larvae exposed to 150, 100, and 75 ppb of Cu^{++} for 24 hr have clearly shown lesions (cellular sloughing) of varying intensity in a concentration(dose)-dependent manner. Cornea sections are presently being examined with light and electron microscopy to characterize better the lesions. It has been noted (Blaxter 1977; Rice and Harris 1978) that fish larvae fail to feed effectively after exposure to copper at sub-lethal doses. The presence of corneal lesions may contribute to this impaired feeding ability.

Preliminary light microscopic observations on the erythrocytes of yellowtail flounder collected on Delaware II Cruise No. DE 81-07 (fall 1981) have shown a correlation between abnormalities observed in erythrocyte nuclei (pyknosis, karyorrhexis), abnormal cell shape, and greatly reduced hematocrit values (50% of average normal levels). Although the cause of this condition is not known, the possibility that an anemic disease is responsible is being explored. The erythrocytes are presently being examined with electron microscopy.

Members of the Fish Pathology Investigation attended the first annual Northeast Monitoring Program/Ocean Pulse Program workshop at the Milford Laboratory during 24-26 February.

The Histology Section prepared over 500 sections of fish, molluscan, and crustacean tissues for microscopic examination by resident pathologists. They prepared materials for making blood smears of fish to be sampled on forthcoming bottom trawl survey cruises as well as cruises "of opportunity." Ms. Roe has acquired the competency to examine fish blood smears for quality and presence of parasitic agents. Ms. Howard and Ms. Smith made considerable progress in preparing a manual on histological methods.

Microbial Ecology and Parasitology Investigation

In cooperative microbial ecology studies, Capt. Newt Adams of the U.S. Food and Drug Administration (FDA) collected sediments for Acanthamoeba and other microorganisms from 37 stations located within an area bounded by the Philadelphia dumpsite to the south and the Gulf of Maine to the north. Stations ranged from 2 to 133 m from shore, and from 14 to 355 m in depth. The sampling regime was designed to test previous results that showed a direct relationship between the distribution of pathogenic amoebae and sewage-associated bacteria. Ten stations along the 200-m line and ranging from the Gulf of Maine and Georges Bank to the Philadelphia dumpsite were all negative for amoebae and bacteria in the sediments. Six stations yielded Acanthamoeba species; all were within 23-61 m in depth and within 2 to 44

from shore. Except for the most distant station, No. 205 (Philadelphia site), all other positive stations ranged from 2 to 17 mi from shore. All positive stations, except No. 205, were also positive for enteric bacteria. The station routinely yielded enteric bacteria and amoebae during the time that the Philadelphia site was used for sewage disposal. Other cooperative studies with FDA and EPA have shown that the disappearance of viable enteric bacteria will serve as one of the earliest indications of recovery when ocean disposal of sewage is discontinued. Results from previous studies have shown that the amoebae thrive on dead bacteria and do not disappear when dumping is stopped. Future studies are expected to show that the frequency with which amoebae are recovered will decrease with time. The decrease will indicate that amoebae act as "vacuum cleaners" by consuming dead enteric bacteria on the seabottom. We hypothesize that amoebae should be progressively more difficult to isolate as they consume bacterial food organisms that are not replaced by sewage addition. Sediment samples provided by Capt. Adams provided the first evidence that pathogenic amoeba are not present at detectable levels in deep waters of the open ocean. Shoreward samples confirmed earlier observations that such protozoans are easily recoverable when enteric bacteria are present. Results of the study extend the known range of pathogenic amoebae in marine sediments northward to Cape Cod, Massachusetts.

Dr. Tom O'Connor collected two sediment samples during a recent February cruise to Puerto Rico. The samples were taken near an outfall used for disposing pharmaceutical wastes. Three species of Acanthamoeba and five-to-six other unidentified species of amoebae have been grown from the sediments and are now being studied to provide final identifications. Samples provided by Dr. O'Connor now extend the range of Acanthamoeba in marine sediments from Puerto Rico to Massachusetts.

Cooperative pathology and heavy metals studies with Richard Greig at the Milford Laboratory have produced several results that are now being considered in all Ocean Pulse and Northeast Monitoring Program activities. Microorganisms which foul gill surfaces (bacteria, diatoms, protozoans, copepods) are now used for markers to determine whether cruises coincide with molting activity or with inter-molt periods. Molting information is necessary in order to interpret the significance of copper in Atlantic rock crab gills. Copper has been found to range from 1.0 to 110 ppm (wet weight) in gill tissue, and up to 404 ppm in the hepatopancreas. Records of gill condition and molting activity indicate that the lowest gill values (1.0 to 20.0 ppm) are obtained in newly molted specimens. A collection of 30 crabs was made in Sandy Hook Bay in January when essentially all specimens were in the softshell or papershell, condition. Tissues are now being analyzed to determine if all of the newly molted specimens have the lower copper values. A study of all data on the incidence of gill blackening showed that the condition is observed most often during the months of October-December, subsequent to molting by ocean crabs and just prior to molting by crabs that have moved inshore. Preliminary data suggest that black gills and high metal levels are independent variables which act as distinct indicators of crustacean health.

Liver tissue from rainbow trout infected with PKD (proliferative kidney disease) was examined by transmission electron microscopy in cooperation with Dr. Bodammer. The causative organism, thought to be related to haplosporidan protozoans belonging to the genus Marteilia, has not been identified because spores have not been detected in fish tissues. We have found spherical bodies containing four probable presporangial stages and have obtained ultrastructural details of this life cycle stage.

The parasites typically are recognized as disease agents in European and Australian oysters and their probable occurrence in fish is a rather recent discovery that deserves further investigation.

Larval nematodes, probably belonging to the family Anisakidae, were collected from Atlantic herring and sent to us by Dr. Carl Sindermann. The nematodes will be examined and attempts will be made to identify them to provide reference specimens to assist in identifying worms from future collections. A preliminary inquiry has shown that at least five genera of anisakids are known to parasitize herring-- Anisakis, Acanthocheilus, Phocascaris, Thynnascaris, and Raphidascaris. Illustrations and measurements will be prepared for each type of larva to facilitate the identification of specimens provided by Dr. Sindermann.

Publications

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- TETTELBACH, S. T.; PETTI, L. M.; BLOGOSLAWSKI, W. J. Survey of Vibrio associated with a New Haven Harbor shellfish bed. Proc. Conf. Vibrios Environ. (S)

NATIONAL SYSTEMATICS LABORATORY

Systematics of Fishes

Progress was made on the revision of the Spanish mackerels, genus Scomberomorus; completed were sections of the manuscript on the opercular apparatus, vertebral number, dorsal and anal fin rays, and ribs; work began on the section on the pectoral girdle. Work was done on revising the manuscript on host-parasite relationships in scombrid copepods. Completed was the first draft of a revision of the needlefish genus Potamorrhaphis.

Systematics of Crustaceans

Preparation continued of a monograph on the American Pacific rock shrimps (genus Sicyonia) which includes systematics, morphology, phylogenetic relations, geographic and bathymetric distributions, ecology, bibliography, and commercial value.

A manuscript describing a new species of shrimp of the genus Mesopenaeus from the Indo-West Pacific was coauthored by Dr. B. G. Ivanov of the All-Union Research Institute of Marine Fisheries and Oceanography in Moscow.

In order to solve identification problems plaguing NMFS Inspection Offices, preparation of an illustrated guide to the identification of frozen lobster tails was initiated.

A draft manuscript section on taxonomy and distribution was prepared for a synopsis of biological data on the blue crab (Callinectes sapidus).

Research continued for the preparation of two manuscripts on the mud crab Panopeus herbstii, a composite species: "I. Populations in the Gulf of Mexico" (with R. Reames of Dauphin Island, Alabama), and "II. Populations in the Southeastern U.S." (with B. Sullivan, K. Miller, K. Singleton, and A. G. Scheer of the Duke University Marine Laboratory).

Specimens of mud shrimps (Upogebia) inhabiting the eastern Pacific were studied from collections at the U.S. National Museum of Natural History, California Academy of Science, Moss Laboratory, Allan Hancock Foundation, Scripps Institute of Oceanography, and San Diego Natural History Society. Of 16 species, only four were previously described. Species accounts are being prepared, including illustrations and a key to all members of the genus in the western hemisphere.

Scientific Services

Identification were made of: 23 lots of decapods from submarine canyons and the continental slope of the northeastern U.S. for D. T. Logan of the Lamont Doherty Geological Observatory at Columbia University; lobster tails for Glen W. Flieman of NMFS in Brunswick, Georgia, Glenn Kiel of the NMFS Western Inspection Office in Bell, California, L. Mondene of NMFS at the Norfolk Navy Yard, and S. Cauley of the NMFS Northeast Inspection Office at Elizabeth, New Jersey; caridean shrimps from San Salvador for D. Dowling of Hartwick College; Callinectes from Connecticut for D. J. Danila of the Millstone Environmental Laboratory at Waterford; shrimps from brackish waters of the Philippines for Dr. Inocencio A. Ronquillo, Chief of the Fisheries Research Division of the Bureau of Fisheries and Aquatic Resources in the Republic of the Philippines; and shrimps from Costa Rica for Dr. Marea Hatziolos of Yale University.

Information was provided to: W. Sullivan of NMFS (highly migratory species of fishes for the U.N. Law of the Sea Conference); U.S. Customs in New York and Seattle (identity of tunas); Food and Drug Administration (Greenland halibut and sardines); and U.S. Customs and NMFS Market News (Peruvian "pilchard").

Loans of fishes were made for the Smithsonian Institution to the Gulf Coast Research Laboratory, the Virginia Institute of Marine Sciences, and the University of Miami School of Marine Sciences.

Two proposals were reviewed for the Systematic Biology Program at the National Science Foundation.

Manuscripts were reviewed for the Bulletin of Marine Science, Journal of Crustacean Biology (3), Proceedings of the Biological Society of Washington, the French ichthyological journal Cybium, and for several colleagues.

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- PÉREZ FARFANTE, I.; IVANOV, B. G. A new species of Mesopenaeus shrimp (Penaeoidea, Solenoceridae), the first record of the genus in the Indo-West Pacific. J. Crustac. Biol. (S and A)

ATLANTIC ENVIRONMENTAL GROUP

Ocean Monitoring and Climatology Task

The cooperative Ship of Opportunity Program obtained 10 expendable bathythermograph (XBT) transects and two continuous plankton recorder (CPR) transects in January-February: two XBT transects in the Gulf of Maine, two XBT transects off Southern New England, four XBT and two CPR transects across the shelf and slope off New York, and two XBT transects across the Gulf of Mexico.

The announcements appearing on pages 49 and 50, and summarizing eddy conditions in the Georges Bank-Middle Atlantic Bight area, were sent to the Commander of the Atlantic Area for the U.S. Coast Guard for publication, respectively, in the February and March 1982 issues of the Atlantic Notice to Fishermen.

A description of satellite information received by AEG was prepared by Lee Crist and distributed to the local marine science community. The summary, titled "Remote Sensing Products at the Atlantic Environmental Group," describes GOES and Polar Orbiter imagery received by telephone facsimile link from the National Earth Satellite Service (NESS), and a weekly modified version of NESS's SST Analysis Chart which is mailed by AEG to interested fishermen and scientists.

Publications

- 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. Counc. Res. Doc. 81/IX/123. 15 p. (P)
- CHAMBERLIN, J. L. Shoreward transfer of kinetic energy by Gulf Stream rings and by their interactions with the Stream: What are the limits? EOS J. 63(3): 59;1982. (Abstract No. 32E-4). (P)
- CRIST, R. WYLIE; CHAMBERLIN, J. L. Bottom temperatures on the continental shelf and slope south of New England during 1980. Ann. Biol. 37. (A)
- FITZGERALD, J. L.; CHAMBERLIN, J. L. Anticyclonic warm core Gulf Stream eddies off the northeastern United States during 1980. Ann. Biol. 37. (A)
- HESS, J. Rapid cooling on western Georges Bank. Coast. Oceanogr. Climatol. News. (S)
- HILLAND, J. E. Variation in the shelf water front position in 1980 from Georges Bank to Cape Romain. Ann. Biol. 37. (A)

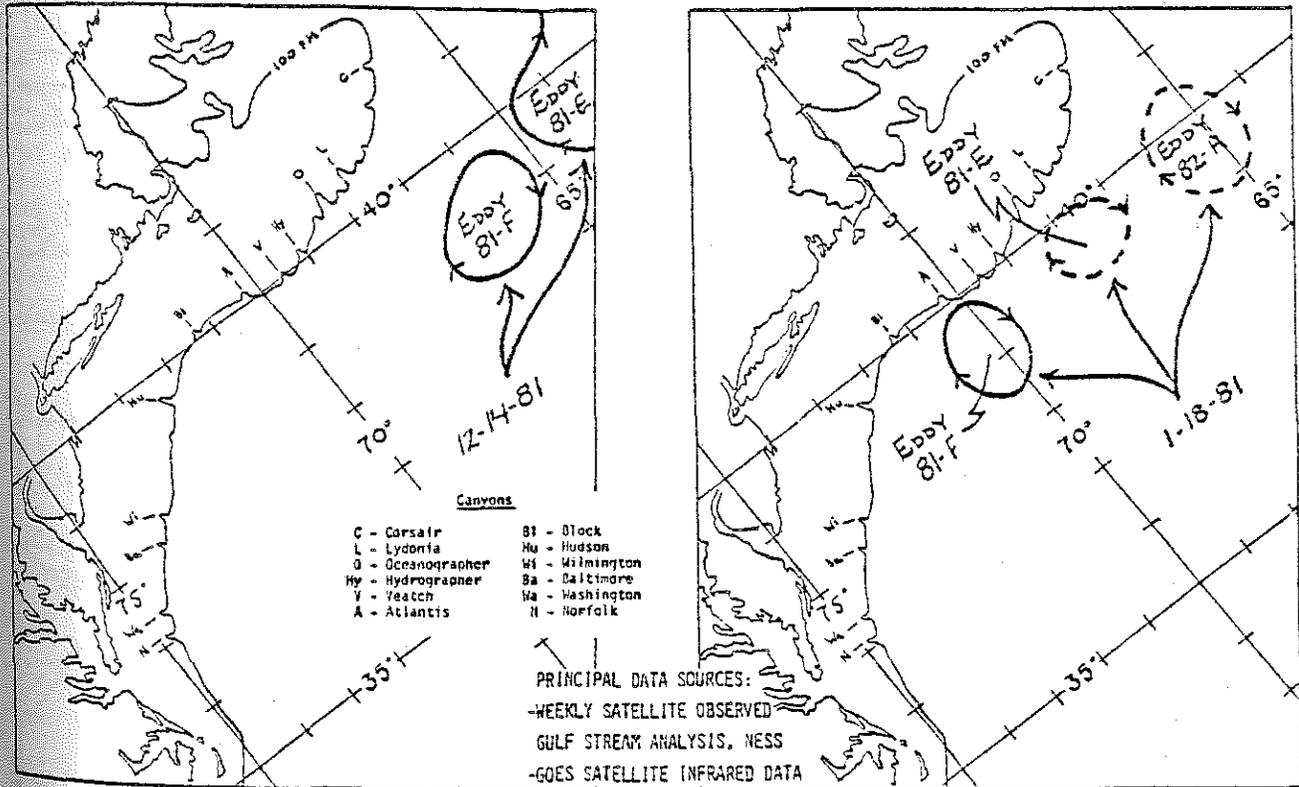
GULF STREAM EDDY LOCATIONS

The Atlantic Environmental Group of the National Marine Fisheries Service reports that three warm core Gulf Stream eddies may have been present off the northeast coast of the United States in mid-January.

Persistent cloud cover during the last 30 days continued to hide the ocean surface. Eddy 81-E moved west about 350 km (189 nm) to a center position near 39.2°N 70.2°W. Eddy 81-E may have travelled west about 360 km (194 nm) to a center position near 39.6°N 67.7°W. Eddy 82-A may have formed in mid-January near 39.7°N 65.2°W. The rapid westward movement of eddies 81-E and 81-G is unusual, and may be a result of incorrect positioning during the mid-December analysis. Furthermore, the mid-January positioning of eddies 81-E and 82-A is extrapolated from early January imagery and may be incorrect.

During the next 30 days Eddy 81-E may travel west to a center position south of Veatch Canyon; Eddy 81-F may move west and southwest to a center position southeast of Hudson Canyon; Eddy 82-A may travel west to a center position south of Lydonia 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).



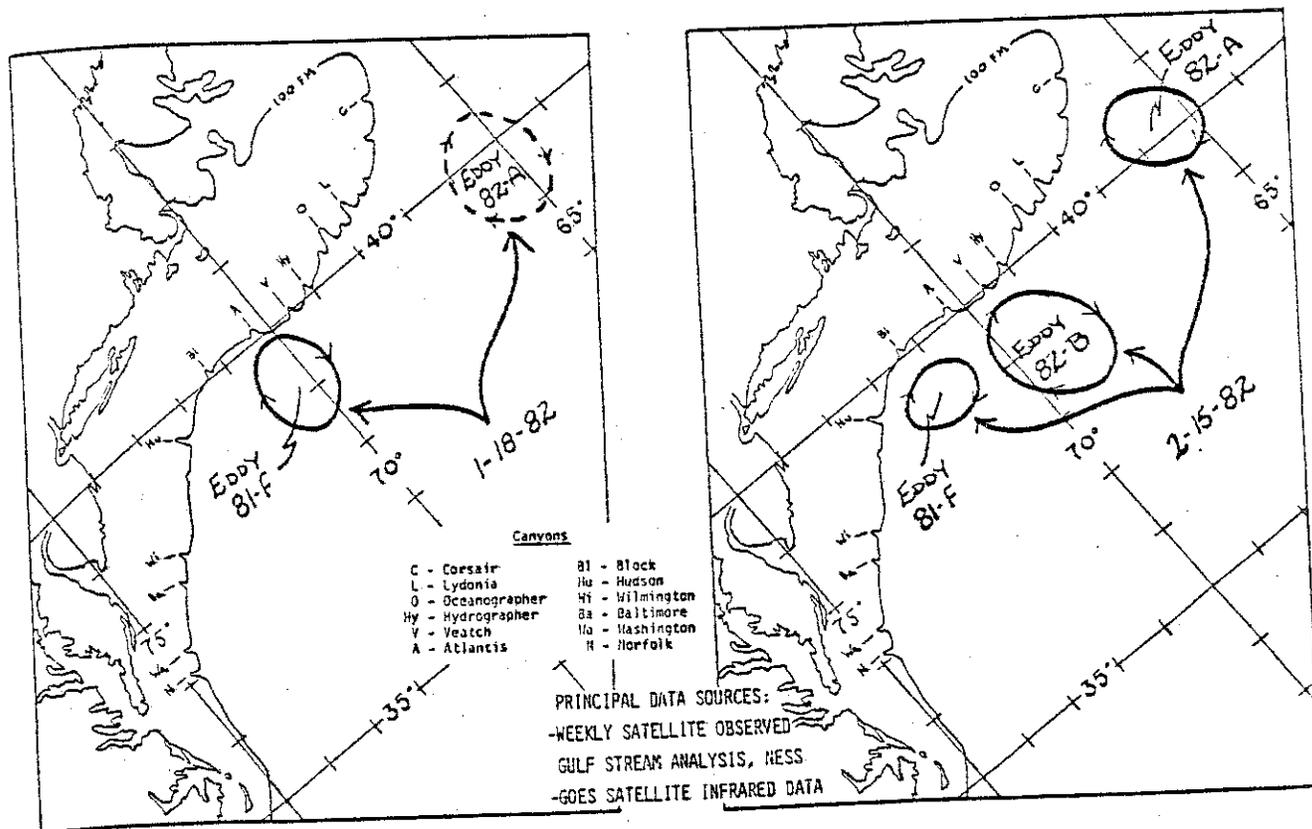
GULF STREAM EDDY LOCATIONS

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

Eddy 81-F travelled west about 104 km (56nm) to a center position near 39.4°N 71.3°W, south of Block Canyon. Eddy 82-B formed in mid-February near 38.8°N 69.3°W, south of Veatch Canyon. This eddy detached from the Gulf Stream further west than most eddies and probably has strong anticyclonic currents. The existence of Eddy 82-A was confirmed by satellite imagery in mid-January. Eddy 82-A moved northwest about 60 km (32nm) to a center position near 40.2°N 65.7°W, south of Corsair Canyon and offshore of the 100-fm line. Eddy 81-E, which was tentatively reported in the mid-January analysis, was apparently resorbed in early January and has been eliminated from the analysis.

During the next 30 days Eddy 81-F may move southwest to a center position east of Baltimore Canyon; Eddy 82-B may travel west to a center position southeast of Hudson Canyon; Eddy 82-A may move west to a center position south of Lydonia 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, RR7, 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).



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)

HUGHES, M. M. Thermocline erosion in the Middle Atlantic Bight outer continental shelf -- Fall 1981. *Coast. Oceanogr. Climatol. News.* (S)

INGHAM, M. C. Impacts of climate on marine fisheries. In *Outlook '82* (Proceedings of the Agricultural Outlook Conference, Session #25). 1981:520-523. (P)

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)

INGHAM, M. C.; McLAIN, D. R. Sea-surface temperatures in the northwestern Atlantic in 1980. *Ann. Biol.* 37. (A)

TRAVEL, MEETINGS, AND PRESENTATIONS

Manned Undersea Research and Technology Program

MURT personnel attended the Northeast Monitoring Program's 1981 annual workshop in Milford, Connecticut. Hulbert and Cooper gave presentations.

Cooper delivered a presentation to Lease Sales No. 52 Public Hearing in Boston on submarine canyon fauna, habitats, etc., as regards possible impacts from gas and oil drilling operations on Georges Bank.

Several meetings were held with Dr. Larry Harris of the University of New Hampshire and Dr. James Sears of the University of Southeastern Massachusetts concerning cooperative studies at Pigeon Hill, Gulf of Maine, and Rhode Island Sound.

Hulbert presented talks to: (1) the International Echinoderm Conference, and (2) the American Society of Zoologists, on "Asteriod Populations as Environmental Indicators."

Cooper summarized 2 yr of biological monitoring of Georges Bank and its submarine canyons to the Georges Bank Biological Task Force, the Provincetown Center for Coastal Studies, the Bigelow Laboratory of Ocean Sciences, and the Maine Department of Marine Resources.

Cooper served with 10 other diver scientists on a science review board to make recommendations to NOAA management on the future direction of the National Underwater Laboratory Program at St. Croix, Virgin Islands.

Marine Ecosystems Division

On 26 January, Carolyn Griswold attended a meeting of the Georges Bank Biological Task Force in Boston, Massachusetts.

On 29 January, Carolyn Griswold attended an open house at Applied Science Associates, Inc.

During 15-19 February, the following presentations were given by the authors while attending the AGU/ASLO-sponsored meeting, "Ocean Sciences," at San Antonio, Texas:

Busch, D.; Mountain, D. Phytoplankton biomass and physical conditions on Georges Bank in an area of larval cod and haddock concentrations.

Houghton, R. W.; Schlitz, R. J. Summer evolution of the Middle Atlantic Bight cold pool from analysis of the temperature structure during 1979.

Lough, G. Observations on the impingement of Warm Core Eddy 81-C on Georges Bank.

Lough, G.; Busch, D. Effect of spring thermal stratification in the Georges Bank in an area of larval cod and haddock concentrations.

Mountain, D. G.; Cohen, E. B. The effect of water residence time on the plankton population levels of Georges Bank.

Ramp, S. R.; Beardsley, R.; Legeckis, R. An observation of frontal wave development on a shelf-slope/warm core ring front near the shelf break south of New England.

Schlitz, R. J.; Mountain, D. G. Description of the hydrographic features of shelf water entrained by Warm Core Ring 81-D.

Schlitz, R. J.; Cohen, E. B. A nitrogen budget for the Gulf of Maine and Georges Bank.

During 24-27 February, Mike Fahay participated in an E. H. Ahlstrom Memorial Symposium Steering Committee meeting in Ocean Springs, Mississippi.

On 8 January, David Potter met with Dr. Harold Edgerton at the Massachusetts Institute of Technology to discuss current developments in silhouette photograph

On 11 January, Ken Sherman, Marv Grosslein, Ed Cohen, and Donna Busch participated in a mini workshop at the Woods Hole Oceanographic Institution (WHOI) on Georges Bank phytoplankton and its chemical environment.

On 26 January, Marv Grosslein met with Richard Hennemuth, Brad Brown, and R. Mann (WHOI) to discuss a proposed workshop on bivalve life history.

On 25 February, Ed Cohen and Ron Schlitz gave a seminar at WHOI on a nitrogen budget for the Gulf of Maine.

Wes Pratt presented a noontime lecture on "The Age and Growth of the Mako Shark" at the URI Bay Campus.

Resource Utilization Division

Fred King and Kurt Wilhelm participated in a seminar at the U.S. Army's Natick Laboratories in Natick, Massachusetts, on 11 February. The speaker was Dr. Tyre Lanier of the Department of Food Sciences at North Carolina State University in Raleigh. His topic was "surimi" which is a Japanese style of fish block.

Fred King participated in a meeting of the New England Fisheries Institute on 23 February. The speaker was Mr. Robert Learson and his topic was recent research and development activities at the Gloucester Laboratory.

Donald Gadbois attended the First Annual Northeast Monitoring Program Workshop and the Synthesis of Monitoring Results Meeting and made a presentation on our PCB and PAH work.

Joe Licciardello presented a seminar on handling fresh fish to a group of seafood brokers and restaurateurs at M. F. Foley, Inc., in Dorchester, Massachusetts.

Perry Lane attended the January meeting of the New England Fisheries Steering Committee, a meeting of the New England Marine Advisory Service Long-Range Planning Committee, and participated in a meeting of the Food Science & Nutrition Advisory Board of the Essex Agricultural & Technical Institute.

Division of Environmental Assessment

On the evening of 15 January, Dr. Pearce gave a public lecture on "The Seas, Their Use in Future Decades." This lecture emphasized recent NEFC and ICES findings and their implications for the utilization of the seas for seafoods during the coming decades.

On 19 January, Dr. Pearce chaired a meeting of the management group for the Northeast Monitoring Program. The meeting, held in Philadelphia, was to organize the workshop to be held in February. Bob Reid and Frank Steimle also attended.

Bob Reid participated in a Hudson-Raritan Estuarine Program workshop to identify priority pollutants in that system, held in Newark, New Jersey, on 20 January.

During 23-30 January, Dr. Pearce participated in meetings of the ICES Working Group on Marine Pollution and Baselines in the North Atlantic. During this session, the aforementioned Working Group also met with the ICES/SCOR (Standing Committee on Oceanographic Research) Baltic Sea Working Group. Principal items discussed included: continuation of intercalibration programs for trace metals, petroleum hydrocarbons, PCB's, and other organic substances; biological-effects monitoring, emphasizing the reporting of disease and disease syndromes; plankton biomass and eutrophication; contaminant input to the marine environment; and regional assessment studies. The agenda and proceedings of the meeting are available by writing to Dr. Pearce.

Anthony Calabrese participated in a site review of the New Jersey Sea Grant Program held in Princeton, New Jersey, during 25-27 January.

On 2 February, Dr. Pearce participated in an EPA hearing in New York City concerned with ocean disposal of industrial acid wastes from the National Lead Company plant located in Sayreville, New Jersey. Numerous environmental groups, the fishing community, and several government agencies participated in the hearing.

Frank Steimle met with EPA personnel from Narragansett on 3 February to discuss implementation of the Mussel Watch Program in the New York Bight apex this summer.

On 19 February, Frank Steimle met with the Organizing Committee of the American Littoral Society Division Section to outline further cooperative efforts.

John Graikoski participated in a progress review on the evaluation of vacuum-packaged fresh fish being done by Cryovac Corp. The meeting was held in Atlanta, Georgia, on 5 February.

On Monday, 8 February, Dr. Pearce participated in an NEFC-EPA meeting concerned with site-characterizations of the 12-, 65-, and 106-mi and Philadelphia dumpsites. The meeting was held principally to update the generic outline which had been developed and to elaborate further on the content of site characterizations.

During 23-26 February, Dr. Pearce chaired a workshop for the Northeast Monitoring Program. Over 40 presentations were made indicating the progress that NEMP and OPP have made during the past 12-18 mo. This workshop brought together all participants in the Ocean Pulse Program, as well as observations from several federal agencies and the academic community. Discussions held during plenary sessions are being used to develop the second annual report for the Northeast Monitoring Program, as well as for future guidance in terms of redirection of NEMP and OPP. Bob Reid, Frank Steimle, Fred Thurberg, Edith Gould, and John Graikoski also participated.

Al Matte and Ingro Desvouges attended a Technician Symposium on Automated Analyses which was held in Saddle Brook, New Jersey, on 26 February.

Aquaculture Division

A. Longwell attended a Northeast Monitoring Program-Ocean Pulse Program meeting at Narragansett, Rhode Island, on 21 February. During 28-30 February, she attended an annual review of these two programs in Milford, Connecticut, and made a presentation of experimental work and field findings.

An aquaculture genetics paper (by S. Stiles and J. Choromanski, presented by J. Choromanski) entitled, "Crossability and Genetic Experiments on Long Island Sound and Other Oyster Populations: Implications for Transplantations," won the Best Poster Paper Award at the World Mariculture Society meeting in Charleston, South Carolina held during 1-4 March.

E. Rhodes made on-site visits to shellfish hatcheries in Maine and Massachusetts during 16-18 February to discuss research requirements.

Pathobiology Division

Dr. Blogoslawski attended a New York State Sea Grant meeting in Riverhead, Long Island, and presented a seminar on "Bacterial Control in Shellfish Hatcheries" at the 1982 New York Fishermen's Forum on 21 and 22 January.

On 25 and 26 January, Drs. Rosenfield and Sindermann met with Mr. Jensen of the Maryland Department of Natural Resources in Annapolis to discuss property presently at the Oxford Laboratory but owned by the State.

Dr. Blogoslawski attended an EPA meeting in Orlando, Florida, during 25-28 January.

Dr. Rosenfield, Mr. Farley, and Mr. Kern attended a meeting of the Northeast States Shellfish Transport and Disease Control Working Group at Woods Hole during 2-5 February.

Dr. Rosenfield participated in a Maryland Sea Grant Advisory Board meeting on the evening of 5 February at College Park.

On 5 February, Dr. Blogoslawski attended the Connecticut Chapter of the American Society for Microbiology meeting held at Quinnipiac College in Hamden, Connecticut, where his student, Phyllis Hoikala, presented a paper entitled, "Characterization of a Marine Vibrio Pathogenic to Oyster (Crassostrea virginica) Larvae." The authors of the work are P. L. Hoikala, W. Blogoslawski, and A. Repak. This research completed the thesis requirement for a master's degree at Quinnipiac College.

Dr. Blogoslawski attended the Long Island Sound Environmental Leaders Conference on Saturday, 6 February; it was sponsored by the Long Island Sound Task Force of the Oceanic Society.

Dr. Rosenfield presented a lecture on "Marine Biology and Fisheries" on 6 February to the National Science Foundation's Science Teachers Group.

On 8 February, Dr. Rosenfield and Dr. Sawyer attended an NMFS/EPA planning meeting.

Dr. Rosenfield chaired and Dr. Sawyer attended the Helminthological Society meeting on 12 February in Washington, D.C.

Mr. Newman picked up cells at College Park, Maryland, and attempted to isolate virus at the U.S. Fish and Wildlife Service's National Fish Health Research Laboratory in Leetown, West Virginia, on 18 and 19 February.

Dr. Blogoslowski presented seminars at the Florida Department of Natural Resources in St. Petersburg, and the Mote Marine Laboratory at Sarasota, during 18-24 February.

During 24-26 February, Dr. Rosenfield, Dr. Murchelano, Dr. Sawyer, Dr. Johnson, Mr. Farley, Mr. Newman, Ms. MacLean, and Mr. Kern attended the first annual Northeast Monitoring Program/Ocean Pulse Program workshop at Milford.

National Systematics Laboratory

On 24 February, Austin Williams participated in an organizational meeting of the American Fisheries Society's Committee on Scientific and Common Names of Invertebrates, held at the Page Building in Washington, D.C.

While in Port-au-Prince, Isa Canet discussed with Mr. F. Vilsaint (Haitian Institute de Developpement Agricole et Industriel) the possible expansion of the Haitian shrimp fisheries through the exploitation of new grounds and introduction of shrimp trawls.

Atlantic Environmental Group

Steve Cook visited Sippican Corporation in Marion, Massachusetts, on 5 January for a HP-85/MK-9 digitizer demonstration.

Woody Chamberlin, Lee Crist, and Peter Celone attended meetings of the warm-core ring study group at the Woods Hole Laboratory on 7 and 8 January.

Mert Ingham went to Stony Brook, Long Island, New York, on 12 and 13 January to confer with scientists of the NOAA Office of Marine Pollution Assessment's Northeast Region.

On 19 January, Woody Chamberlin went to the University of Massachusetts at Amherst to attend a meeting of the Steering Committee of the Northeast Area Remote Sensing System.

Bob Benway attended a Guildline Technical Seminar at Woods Hole Oceanographic Institution on 20 and 21 January.

On 26 January, Bob Benway and Peter Celone visited the Sandy Hook Laboratory to inspect facilities at the Sandy Hook Tide Station.

On 8 February, Mert Ingham attended a meeting of the Northeast Monitoring Program at Milford, Connecticut.

On 11 and 12 February, Steve Cook visited the National Weather Service's Regional Headquarters in Garden City, New York; met with the Bermuda Container Lines personnel in New York City, conferred with the Academy Training Representative at Kings Point, New York, and visited the Moore MacCormack Lines in Brooklyn, New York.

Steve Cook traveled to Boston, Massachusetts, on 16 February to confer with personnel of the M/V Bakkafoss relative to the Ship of Opportunity Program.

Woody Chamberlin attended a joint meeting of American Geophysical Union and the American Society of Limnologists and Oceanographers in San Antonio, Texas, during 16-19 February. He presented a paper, "Shoreward Transfer of Kinetic Energy by Gulf Stream Rings and By Their Interactions with the Stream: What Are the Limits?".

On 18 February, Grayson Wood boarded the M/V Oleander at Port Newark, New Jersey, to make the transect to Bermuda to collect environmental data and plankton. He returned to Narragansett on 25 February.

SEMINARS

Marine Ecosystems Division

On 24 February, Cabell Davis presented a noon seminar on the results of his Ph.D. thesis, undertaken through the Marine Biological Laboratory/Boston University Marine Program, on "Processes Controlling Zooplankton Abundance on Georges Bank."

Division of Environmental Assessment

On 3 February, personnel of the Division, as well as other Sandy Hook Laboratory staff, participated in the monthly Brown Bag Lunch sponsored by the Sandy Hook Laboratory and the New Jersey Marine Sciences Consortium. The principal topic of the seminar was concerned with metal and organic contaminant uptakes by mussels which had been placed near, and at various distances from, the dredged material disposal site in the New York Bight.

On 7 February, Bori Olla presented a seminar to the Woods Hole scientific community on the behavior of the red hake. The seminar emphasized the relationships between early life history stages of hake and selected habitats, including the shells of sea scallops.

Pathobiology Division

Dr. Murchelano presented a seminar and lab demonstration on fish diseases to Resource Surveys Investigation personnel at the Woods Hole Laboratory on 12 February.

VISITORS

Marine Ecosystems Division

On 14 January, Tony Bocelle of the Northeast Regional Office met with the Narragansett Laboratory's Solar Committee.

On 21 January, Ken Sherman met with Bob Cannon and the General Service's Administration's representative regarding telephones and space problems at the Narragansett Laboratory.

On 23 February, Luther Bivins of the NOAA Office of Technology and Engineering Services met with Ken Sherman regarding the image scanner.

On 25 February, Tony Bocelle of the Northeast Regional Office and Steve Strong of Solar Designs, Inc., met with Narragansett Laboratory staff in a pre-bid meeting for contractors interested in bidding on the solar modifications to the Laboratory.

Ed Cohen, Mike Pennington, and Dr. Saul Saila (URI) met at Woods Hole with Dr. Chen of the National Institute of Oceanography in the People's Republic of China to discuss ecosystem research activities.

Donna Busch coordinated a visit to the Narragansett Laboratory for three biologists (Roxanna Viquez, Freddy Pacheco, and Eduardo Zamura) from the Universidad Nacional of Costa Rica. Their visit was part of a curriculum planning workshop. Larry Buckley, Jack Casey, and Mert Ingham made presentations about larval dynamics, apex predators, and the Atlantic Environmental Group, respectively.

Resource Utilization Division

Ms. Barbara Smucker of the North Shore (Massachusetts) Girl Scout Council visited the Gloucester Laboratory with a group of girl scouts to discuss career requirements and options.

Mr. Harold Xavier of Rockport (Massachusetts) High School visited to obtain materials for a career day display.

Captain and Mrs. James Kerwin visited to discuss gillnetting.

Members of the Rockport (Massachusetts) Lobstermen's and Fishermen's Association went to Narragansett for a day to visit the NMFS/URI Cooperative Fisheries Engineering Unit and to observe model trawls being towed in the URI tow tank and to discuss trawling on hard bottom.

Aquaculture Division

Stephen Fowler of the King Shrimp Co., Inc., visited the Milford Laboratory on 28 January.

Pathobiology Division

Visitors to the Oxford Laboratory during the reporting period were Dr. and Mrs. Markus Bischof from Flüeli-Ranft, Switzerland; Dr. Richard Stone from NMFS in Washington, D.C.; Mr. Tim Cole from the Horn Point Environmental Laboratories in Cambridge, Maryland; Ms. Sara Otto of the Maryland Department of Natural Resources in Annapolis, Maryland; and members of a National Science Foundation Study Group: Dario Valcarcel of Kettering Junior High School in Upper Marlboro, Maryland; Emmett Wright of the University of Maryland at College Park; Tish McKinstoy of Jefferson High School in Falls Church, Virginia; Linda Jacoly of Marley Junior High in Glen Burnie, Maryland; Kathy Weis of MacArthur Middle School in Ft. Meade, Maryland; Ben Wallace of the Bragg Nature Center in Baltimore, Maryland; George Radcliffe of Mace's Land Middle School in Cambridge, Maryland; Donna Young; Elizabeth Cain; Mary Jane Wright; Elizabeth Wharton; and Fielding Gentry.

National Systematics Laboratory

Dr. Collette was visited by L. A. Maugé of the French National Museum of Natural History in Paris, and Dr. J. Tyler of the National Science Foundation.

Dr. Canet was visited by Dr. Marea Hatzios of the Department of Biological Sciences at Yale University, Dr. Clemencia Gonzalez of C. W. Post College (Greenvale, New York), and Mr. Fequiere Vilsaint of the Haitian Institut de Developpement Agricole et Industriel.

Dr. Williams was visited by Dr. Charles Jenner of the University of North Carolina at Chapen Hill and Dr. Elliott A. Norse of the Center for Environmental Education in Washington, D.C.

UNIVERSITY AFFAIRS

Marine Ecosystems Division

On 6 January, Ken Sherman attended a meeting with Dean John Knauss of the University of Rhode Island (URI), Robert Edwards, and others at URI concerning the fisheries program at URI's Graduate School of Oceanography (GSO).

On 29 January, Ken Sherman and Jack Green met with Dr. Howard Winn (URI) regarding joint research.

On 4 February, Ken Sherman and Julien Goulet met with representatives from NMFS, EPA, Naval Underwater Systems Center, and URI to attend a presentation by Peter Cornillon at GSO on the objectives of the Northeast Area Remote Sensing System (NEARSS).

On 9 February, Peter Cornillon (GSO) visited Julien Goulet to discuss the status of the NEARSS image analysis software and its future links to the Marine Ecosystem Data Base and application packages such as the Statistical Analysis System and the Yale Mapping Package.

On 17 February, Ken Sherman and Robert Edwards met with Dean Knauss regarding the fisheries program at GSO.

Nancy Kohler presented a talk on "The Stomach Evacuation Rate in the Blue Shark" as part of a graduate student seminar series held at the URI Bay Campus.

Division of Environmental Assessment

On 8 January, Dr. Pearce lectured at the comparative pathobiology class at the Marine Biological Laboratory in Woods Hole. His two lectures indicated the relative health of the Baltic Sea and the North Sea and compared these with environmental conditions on the continental shelf of the United States between the Canadian border and Chesapeake Bay.

Aquaculture Division

Two university graduate students have requested training in cytogenetic and cytologic procedures for study of fish eggs. Manuscripts have been reviewed for journals, as have grant applications to various funding agencies.

E. Rhodes met with Representatives of the John B. Pierce Foundation, Yale University, on 28 January, to discuss shellfish sanitation experiments.

Pathobiology Division

Mr. Farley served as instructor-lecturer in the Marine Biological Laboratory course on Comparative Pathology of Marine Invertebrates, held in January in Woods Hole; 17 students from several countries from a wide range of experiences participated. Seven students chose research projects in molluscan pathology and five investigated pathologic effects of such pollutants as drilling muds and heavy metals. The course was highly successful and is to be continued next year.

On 25 and 26 January, Drs. Rosenfield and Sindermann discussed our cooperative agreement with the University of Maryland with Dr. David Sparks, Vice President of the University of Maryland, Dr. Ian Morris, Director of the University of Maryland Center for Estuarine & Environmental Studies, and Dr. Rita Colwell, with the University at College Park. They also met with Dr. Irving Gray of the Department of Biology at Georgetown University to discuss interactive research programs.

On 29 January, Dr. Phyllis Cahn of Long Island University discussed potential research in fish immunology with Drs. Robohm and Blogoslawski.

National Systematics Laboratory

Dr. Canet reviewed a Master's thesis on variation in shrimps by Mr. Scott E. Horton of Texas A&M University: "Intraspecific Variation in the Marine Shrimps *Penaeus (Litopenaeus) stylirostris* and *Penaeus (Litopenaeus) vannamei*."

Research is in progress with Jan R. Factor and Cindy Van Doren of Cornell University on the morphology of the feeding apparatus in *Bythograea thermydron*, the Galapagos Rift crab.

PUBLIC AFFAIRS

Marine Ecosystems Division

On 22 January, Roger Theroux met with Mr. Eugene Tong of the American Asiatic Development Corporation in Newton, Massachusetts, who was seeking information on underutilized invertebrate species.

PERSONNEL

Marine Ecosystems Division

On 18 January, David Potter received a \$200 NOAA Special Achievement Award for his development of a net-bar locking mechanism for our multiple opening-closing net and environmental sensing system.

On 25 January, Philip LeBlanc reported for duty at the Woods Hole Laboratory as a Biological Laboratory Technician (Fisheries) in the Larval Dynamics Investigation (replacing Randolph Goodlett).

In January, Lorretta Sullivan transferred to the NMFS Galveston Laboratory.

In January, Lt. j.g. Brian Hayden (NOAA Corps) spent 2 wk with John Hauser as part of a 5-wk assignment with the Ecosystem Dynamics Investigation in Woods Hole, assisting with conversion of programs and familiarizing himself with the new VAX computer, in preparation for the start of a 3-yr assignment later this fiscal year. On 25 February, Lt. j.g. Hayden completed his temporary duty in Woods Hole; he will return to sea duties aboard the NOAA R/V Researcher until next November-December, when he will begin his billet in the Ecosystem Dynamics Investigation.

On 2 February, the Narragansett Laboratory staff welcomed Debbie Delgado who is temporarily filling in for Chris Philpott.

Aquaculture Division

Mr. Henry Hawkes, a student at the University of Bridgeport, started work on a part-time temporary appointment.

Pathobiology Division

Ms. Joyce Bowling worked as a student trainee at the Milford Laboratory program during her semester break, 21 December 1981 to 8 January 1982.

Ms. Roe began a part-time 6-mo training course in January at St. Agnes Hospital in Baltimore on "Histology Technicians and Histotechnologists."

Ms. Lisa Petti began a part-time tour of duty (30 hr) during her school semester at the Milford Laboratory on 25 January.

Ms. Hines participated in a training program on 3 and 4 February at the Oxford Laboratory given by a representative of the Federal Library Committee in use of the Online Computer Library Center, Inc., system.

National Systematics Laboratory

Dr. Collette was reappointed as a Research Associate in the Department of Vertebrate Zoology at the Smithsonian Institution.

EEO ACTIVITIES

Marine Ecosystems Division

On 2 January, Peter Donnelly attended an EEO meeting in Woods Hole.

On 5 January, Ray Bowman, Secretary of the Woods Hole EEO Committee, attended the monthly EEO meeting.

On 11 January, Roz Cohen attended a Federal Women's Program (FWP) meeting at the Woods Hole Laboratory.

On 13 January, Donna Busch attended an FWP-sponsored career day at the Woods Hole Laboratory.

On 14 January, Marv Grosslein and Ray Bowman attended an EEO Executive Committee meeting in Woods Hole to plan a special EEO meeting for supervisors.

On 27 January, Donna Busch attended a meeting of managers of the NEFC's FWP at the Milford Laboratory.

On 2 February, Marv Grosslein, Greg Lough, and Ray Bowman attended an EEO meeting for supervisors.

On 10 February, Roz Cohen attended an FWP meeting at the Woods Hole Laboratory.

On 11 February, Greg Lough attended a special EEO Committee meeting for supervisors in Woods Hole.

Ray Bowman conducted the 1982 election for new EEO Committee members in Woods Hole; Marv Grosslein and Cheryl Windsor were elected for 2-yr terms.

The 1982 Narragansett Laboratory EEO Committee consists of Tom Halavik, Chairman; Peggy Lamoureux, Secretary; Donna Busch, FWP Manager; Jackie Frisella, Center Committee Alternate; Jack Green, Pat Hadfield, and Joe Kane. The monthly meeting was held to discuss the upcoming Center meeting. Tom Halavik and Donna Busch attended the Center meeting and briefed the Narragansett EEO Committee on their return. An upcoming visit in March by Kathy McArthur of the Northeast Regional Office to address the Narragansett Laboratory staff on personnel-related matters is being sponsored. The Committee is also looking into a summer apprenticeship program in conjunction with the EPA's Narragansett Laboratory. Also, we are organizing other EEO-related training for the Narragansett Laboratory.

Division of Environmental Assessment

Myra Cohn traveled to the Milford Laboratory to attend a Centerwide FWP managers meeting. Prior to the meeting, several days were spent with Suellen Craik in working up a statistical profile of women employed at the Sandy Hook Laboratory. In January, two U.S. Office of Personnel Management films were shown at lunch hour in conjunction with a bake sale to benefit the Sandy Hook Day Care Center. The films were on time management and listening skills and were titled respectively, "A Perfectly Normal Day" and "The Power of Listening."

A. Calabrese participated in the Milford Laboratory EEO Committee meeting on 19 February.

Pathobiology Division

Ms. MacLean conferred with Mr. Sissenwine on Center EEO programs on 27 and 28 January at the Milford Laboratory.

Dr. Carolyn Brown chaired the Center's Federal Women's Program meeting on 28 January at the Milford Laboratory.

On 9 February, Dr. Carolyn Brown presented a report to the Center Board of Directors on FY 1982 goals of the Center's Federal Women's Program, and on 11 February, sat in on the Center Promotion Review Board meeting.

On 25 February, Dr. Carolyn Brown attended a Federal Women's Program workshop in Boston sponsored by the Boston Federal Executive Board; while there she talked with Ms. Carol Harvey, Deputy Director of the Federal Women's Program for the U.S. Office of Personnel Management on ways to include affirmative action considerations during a reduction in workforce.