November 18, 1986

MEMORANDUM FOR: Distribution*

FROM: Jon A. Gibson JAG

SUBJECT: Center Brochure

In cooperation with the NMFS Scientific Publications Office, the Center will soon publish a new brochure describing itself. The brochure will have a format and style similar to the attached brochure on the Southeast Fisheries Center. (Unlike the latter brochure, though, our brochure will be presented on a programmatic basis, not a laboratory basis.)

I want each of our research and support programs to prepare the first draft of the description of its respective program. The writeups for the three Divisions should be about 750 words in length; the writeup for the National Systematics Laboratory should be about 500 words in length; and the writeups for the Research Planning & Coordination, Program Support, and Data Management Support Staffs should each be about 250 words in length. Each writeup should cover -- at a minimum -- three topics:

1. What do you do and how do you do it?

2. Why do you do it? (i.e., who uses the information and why is it important to them.)

3. How are you organized, located, equipped, and staffed?

Please provide your draft writeup to me by December 31.

Attachment (12 pp.)

*Vaughn C. Anthony
 Michael P. Sissenwine
 Robert A. Murchelano
 Bruce B. Collette
 Richard C. Hennemuth
 Mary G. Laird
 Eugene G. Heyerdahl

c:
John B. Pearce
Jack M. McCormick

NORTHEAST FISHERIES CENTER

The Northeast Fisheries Center (NEFC) plans, develops, and manages a multidisciplinary program of basic and applied research to: (1) better understand the living marine resources of the Northeast Continental Shelf Ecosystem and the marine environmental quality needed for the existence and productivity of those resources; and (2) provide information and advice to government, industry, and the public on the conservation and utilization of living marine resources, and on the restoration and maintenance of marine environmental quality.

The stakes are high for properly managing the Northeast Continental Shelf Ecosystem's living marine resources and marine environmental quality. Each year, 100 thousand U.S. commercial fishermen harvest 1.5 billion pounds of fisheries resources from the region worth 700 million dollars in dockside value. Other occupations -- fishing vessel suppliers, fish processors, seafood retailers, etc. -- also depend on the abundance and wholesomeness of these resources. Although the region's commercial fisheries exploit over 100 fish, mollusk, crustacean, echinoderm, and annelid species, only about 40 species regularly and significantly contribute to the harvest. Important commercial species are Atlantic cod, silver hake (whiting), pollock (Boston "bluefish"), yellowtail flounder, winter flounder (lemon sole), summer flounder (fluke), haddock, American plaice (dab), Atlantic herring, butterfish, Atlantic menhaden, Atlantic surfclam, ocean quahog, sea scallop, longfin squid, northern shortfin squid, various crabs, and American lobster.

Recreational fishermen in the region number more than four million and annually catch more than 170 million fish, 40 percent of which are released alive. This recreational activity also supports many commercial endeavors -- resort motels, charter boats, bait & tackle shops, etc. Important recreational species are bluefish, winter flounder (flounder), summer flounder (fluke), scup (porgy), spot, black sea bass, Atlantic croaker, and weakfish (squeteague). Whale watching, scuba diving, and other marine-related recreational pursuits are also affected by resource abundance and environmental quality.

Mandates for the NEFC carrying out its research come from federal laws, including those enabling international treaties and federal judicial decisions. Important laws to the NEFC include: the Magnuson Fishery Conservation & Management Act; Anadromous Fish Conservation Act; Marine Mammal Protection Act; Fish & Wildlife Act; and Marine Protection, Research, & Sanctuaries Act. Important treaties to the NEFC include those creating the International Council for the Exploration of the Sea and the North Atlantic Salmon Conservation Organization.

To fulfil the mandates of these various laws, the U.S. Department of Commerce, the National Oceanic & Atmospheric Administration (NOAA), and the National Marine Fisheries Service (NMFS) establish, respectively, an increasingly specific set of short-term and long-term goals. To attain NMFS's goals for managing the Northeast Continental Shelf Ecosystem's living marine resources and marine environmental quality, the NEFC conducts the research, acquires the knowledge, and provides the information and advice needed by resource and environmental managers.

To carry out its research most effectively and efficiently, the NEFC has organized itself into four research divisions and three support staffs. Two of the divisions, the Environmental Processes Division and National Systematics Laboratory, develop essential basic information on physical, chemical, and biological characteristics of the Northeast Continental Shelf Ecosystem. A third division, the Fisheries Ecology Division, uses such basic information, along with additional information it independently develops, to better understand the ecological processes that affect the composition, distribution, abundance, and productivity of the shelf's living marine resources. The fourth division, the Conservation & Utilization Division, uses all of the aforementioned information, along with additional information it also independently acquires, to develop applied information and provide advice on the effects of various fishing, fish habitat alteration, and fisheries management activities on the status, harvests, and wholesomeness of living marine resources.

The three support staffs serve all four research divisions. The Research Planning & Coordination Staff plans, coordinates, and evaluates the NEFC's research program, and maintains liaison with the NEFC's scientific and technical constituents. The Data Management Support Staff implements and coordinates the NEFC's automated data processing systems. The Program Support Staff manages the NEFC's facilities, personnel, and finances, and performs the NEFC's library, publication, information, and education functions. (Detailed descriptions of these divisions and staffs appear later in this brochure.)

The NEFC's personnel conduct their research activities at seven laboratories and 13 field stations. The laboratories -- located in Gloucester and Woods Hole, Mass.; Narragansett, R.I.; Milford, Conn.; Sandy Hook (Highlands), N.J.; Washington, D.C.; and Oxford, Md. -- employ about 300 permanent personnel. The field stations -- located between Rockland, Maine, and Hampton, Va. -- employ about 20 permanent personnel.

A large ocean-going research ship, NOAA's 155-foot _Delaware II_, and several small coastal research vessels provide at-sea platforms for NEFC research. The NEFC also has a combination research-information-education aquarium in Woods Hole which annually attracts 250 thousand visitors.

The final product of the NEFC's activities -- information and advice -- takes several forms and serves many constituents. The major media for the NEFC's information are its scientific and technical publications, reports, and presentations. Annually, NEFC scientists produce about: (1) 100 anonymously-peer-reviewed scientific publications which focus on methods of study and analyses of results; (2) 200 technical reports which focus on the current status of the region's living marine resources, marine environmental quality, and commercial & recreational fisheries; and (3) 50 oral presentations which span the range of NEFC research findings. The major media for NEFC's advice are memoranda prepared for, and discussions held with, a variety of management, regulatory, legislative, and judicial bodies. Several thousand such communications come from NEFC scientists and officials each year. The NEFC also uses the news media to disseminate information and advice, including frequent news interviews, news releases, and popular magazine & newspaper articles.

Principal recipients of the NEFC's information and advice are: (1) fisheries resource and habitat managers, including NMFS's Northeast Regional Office, the New England and Mid-Atlantic Fishery Management Councils (established by the Magnuson Act to prepare marine fishery management plans for their respective regions), and the Atlantic States Marine Fisheries Commission (established by federal law to coordinate interstate coastal fisheries management); (2) marine commercial and recreational fishing interests; (3) marine conservation and environmental organizations; (4) scientific peers within the international, national, and academic communities; (5) seafood consumers; (6) marine advisory and extension services; and (7) general and specialized news media.

For information on any aspect of the Northeast Fisheries Center, write: Information Services Section, Northeast Fisheries Center, Woods Hole, MA 02543, or call (508) 548-5123.

CONSERVATION & UTILIZATION DIVISION

What is the status of the Northeast's commercially, recreationally, ecologically, and aesthetically important living marine resources?

What kinds, numbers, and sizes of these resources can we harvest without overexploitation?

How wholesome are these resources and the various seafood products made from them?

To answer these and similar questions, the Conservation & Utilization Division collects and analyzes data on: (1) the populations of living marine resources; (2) the fisheries and other uses of these resources; (3) the catching, processing, and consumption of seafood; and (4) the economics of living-marine-resource-based activities. From this data collection and analysis, the Division develops information and provides advice needed by fisheries resource and habitat managers at the regional, national, and international levels for enhancing, conserving, and allocating living marine resources. The Division accomplishes its work through four branches: Population Biology, Fisheries Statistics & Economics, Population Dynamics, and Resource Utilization.

Population Biology Branch scientists annually conduct about 20 surveys of living marine resources on the continental shelf from Browns Bank, N.S., to Cape Hatteras, N.C. On each survey, branch scientists gather distribution, abundance, and size data for populations of commercially, recreationally, ecologically, and aesthetically important living marine resources. They also collect biological samples (fish scales for age-and growth studies, fish stomachs for food habits studies, etc.) for later study by themselves and by others. Each year, branch scientists study more than 60,000 of these survey-collected samples to estimate the ages, growth rates, maturation stages, fecundity levels, and/or survival rates of more than 30 species of fish and invertebrates, as well as to identify and distinguish any separate spawning stocks of the same species.

These resource surveys use the NOAA fisheries research vessel _Delaware II_ towing special bottom trawls and shellfish dredges to sample a wide array of species and sizes of fish and invertebrates. The branch also designs, builds, and/or tests much of its sampling gear, and evaluates hydroacoustic sensing systems for use in surveying midwater fishes. These gear activities allow reliable comparisons of survey results from year to year, survey to survey, and tow to tow.

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Data and information provided by the branch are the only significant data on those fish and invertebrate species/stocks which are not sought-after by fishermen, and on the small sizes and/or young ages of sought-after species/stocks which are not yet vulnerable to regular fishing gear. The data and information are also the bases for detecting changes in resource populations, faunal communities, and marine ecosystems as a result of natural (water temperatures, currents, etc.) and human (fishing, pollution, etc.) influences. The branch distributes its survey data and biological information not only to fisheries researchers and managers, but also to interested commercial and recreational fishermen.

Fisheries Statistics & Economics Branch scientists collect basic data and develop basic and applied information on the Northeast's commercial and recreational fisheries. Data collection for commercial fisheries involves both in-port and at-sea operations. For in-port operations, the branch assigns agents to 16 commercial fishing ports from Rockland, Maine, to Hampton, Va. These port agents collect: (1) fishing effort and catch data from fishing vessel captains; (2) landings data from fish processors and dealers; (3) biological samples of landings at the docks; and (4) economic data on fishing vessels & gear, landings, fish processing plants, seafood production, and related employment.

For at-sea operations, the branch employs about 25 observers who are on board for 100 percent of the foreign fishing activity off the Atlantic and Gulf Coasts. These foreign fisheries observers: (1) monitor the compliance of foreign fishing vessels with U.S. fishing regulations; (2) collect biological samples of the foreign catch, including the discards (what's caught but not kept); and (3) provide communications and liaison between foreign and U.S. fishing interests to avoid gear conflicts, assist technology sharing, etc. In other at-sea operations, the branch contracts to have sea samplers on board U.S. fishing vessels for about 400 fishing trips annually. This domestic sea sampling yields fishing effort and catch data, biological samples, and economic data on vessel efficiency.

Recreational fisheries data are gathered by branch personnel engaged in dockside and at-sea sampling of the shark, tuna, and billfish fisheries, and by contract personnel in dockside and telephone interviewing of both big-game and small-game recreational fishermen.

These basic data are provided directly to fisheries researchers and managers, and are also used by branch economists to develop information on: (1) the status and trends in commercial and recreational fishing industries; (2) the effects of imported seafood on commercial fisheries and the U.S. seafood market; and (3) the economic effects of different fisheries management

regulations.

Population Dynamics Branch scientists develop information and provide advice to fisheries resource managers on the current status and future trends in distribution, abundance, and productivity of the Northeast's living marine resources. Additional information and advice deals with: (1) the performance of fishery management plans in achieving the resource-based aspect of their objectives; (2) the effects of multispecies fisheries upon individual species/stocks, upon the fisheries ecosystem as a whole, and upon fisheries management regimes; (3) the interactions of various fisheries; and (4) the interactions of marine mammals with various human endeavors (fishing, dumping, etc.). Special studies focus on the biology and/or fisheries of recent concern, such as striped bass, Atlantic salmon, and right whales.

To accomplish these species/stock assessments, the branch integrates the data provided by the two aforementioned branches in this division. The integrated resource survey data and fisheries data then undergo statistical analyses and computer modelling to yield the assessment information. Branch scientists produce stock assessment information throughout the year, and subject the information to peer review during one or both of the branch's semiannual stock assessment workshops. To improve the accuracy and precision of its stock assessments, the branch develops and/or evaluates new stock assessment methods and fisheries modelling techniques.

At the conclusion of the aforementioned stock assessment workshops, the branch releases a report on the consensus of the workshop participants on the status of those species/stocks that have been reviewed. Also, the branch issues a comprehensive publication of stock assessments each year -- Status of the Fishery Resources Off the Northeastern United States. Numerous fisheries management organizations use these publications and reports to enhance, conserve, and allocate living marine resources. Key user organizations include the NMFS Northeast Regional Office, the New England and Mid-Atlantic Fishery Management Councils, the Atlantic States Marine Fisheries Commission, and the North Atlantic Salmon Conservation Organization.

Resource Utilization Branch scientists seek to conserve living marine resources indirectly, not by decreasing resource harvests, but by increasing the seafood yields from those harvests. There are a couple of ways to accomplish this. First, usage can be increased of those species/sizes that have been traditionally discarded at sea -- often dead -- because of no market for them, or because of no technology to handle, process, preserve, or store them for the market. Second, a greater amount of edible flesh can be extracted from each landed fish and invertebrate. Developing information and technology to solve these two conservation problems are the goals of the Resource

Utilization Branch.

The branch is involved in five areas of research and development to produce its information and technology. First, it looks at the safety of seafood species and seafood products by testing selected tissues of fish and invertebrate species collected from both polluted and unpolluted sites for the presence of polychlorinated biphenyls (PCB's) and petroleum hydrocarbons. Second, the branch promotes seafood quality by: (1) establishing flavor and texture characteristics of both traditional and nontraditional seafood species; (2) measuring the effects of handling, processing, preservation, and storage on the seafood quality characteristics of appearance, texture, taste, and smell; and (3) developing or applying technology -- including low-dose radiation -- to preservation and storage. Third, the branch develops standards for the descriptive labelling of seafood products, as well as biochemical and immunological methods to determine the species -- and proportions of different species -- contained in various seafood products. Fourth, the branch develops nutritional information on fresh and frozen seafoods -- especially the levels of omega-3 fatty acids and cholesterol, and develops methods to effectively and efficiently produce pure and enriched fractions of omega-3 fatty acids from fish oils. Fifth, the branch determines the productivity and efficiency of the harvesting and processing sectors of the fishing industry, evaluates new technology to promote these sectors' productivity and efficiency, and experiments with new ways to use or otherwise dispose of the wastes from processing operations.

These activities of the Resource Utilization Branch produce information used by the fishing industry, fisheries development organizations such as the New England and Mid-Atlantic Fisheries Development Foundations, health and safety organizations such as the Food and Drug Administration and the Environmental Protection Agency, and consumers and consumer groups.

FISHERIES ECOLOGY DIVISION

If we harvest from a population of a given marine resource species, how many spawning sized/aged individuals must be left unharvested to ensure the population replenishing itself?

If we significantly decrease the population of a given species by overharvesting, will less-harvested or nonharvested species fill the partially empty niche and increase their populations in response?

How does long-term, nonlethal pollution of fish habitats by various contaminants affect the reproduction, growth, and/or maturation of marine resource species?

To answer these and similar questions, the Fisheries Ecology Division conducts research in the lab and in field to: (1) understand all living components -- from phytoplankton to white sharks -- of the Northeast Continental Shelf Ecosystem, as well as the processes (predation, competition, etc.) that link them together; (2) understand how natural factors (water temperatures, currents, etc.) and human actions (fishing, pollution, etc.) influence ecosystem components and processes; and (3) develop mathematical models of ecosystem functioning to predict changes in the composition, distribution, abundance, and productivity of living marine resources, as well as the effects on these resources of different fisheries management decisions. This information is used by a diverse constituency, including fisheries researchers, fisheries resource & habitat managers, fishermen, and aquaculturists. The division accomplishes its work through two branches: Experimental Biology and Ecosystem Dynamics.

<u>**Experimental Biology Branch**</u> scientists study the effects of biotic and abiotic factors on various marine resource species. Five factors dominate the branch's studies: nutrition, disease, pollutants, environmental stress, and genetics. Nutrition studies focus on phytoplankton because it is the base of marine food webs, is the ecosystem component where bioaccumulation of pollutants normally begins, and is the sole nutrient source for economically important bivalve mollusks (scallops, clams, etc.). Nutritional levels directly affect the growth, maturation, and reproductive capacity of the consuming organism.

Disease studies seek to identify the kinds of diseases and disease-causing agents, monitor their occurrence and prevalence, and determine their severity in limiting the distribution, abundance, and productivity of marine resource species.

Pollution studies deal largely with consequences of heavy

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metal and PCB contamination on the growth, maturation, and reproductive capacity of marine resource species. Bivalve mollusks are the subject of much of our pollution studies because their limited mobility prohibits them from easily fleeing contaminated sites, and their (for most bivalves) long lives permit large accumulations of contaminants.

Environmental stress studies often deal with the interactions of two or more environmental factors. For example, extreme temperatures can make some marine organisms more susceptible to disease and/or pollution. At the same time, increased pollution levels can decrease the temperature tolerance and disease resistance of some organisms. Further, when an organism is diseased, it usually shows less tolerance to temperature extremes and pollutant levels

Genetic studies seek to understand how the genetic composition of marine populations affects each population's ability to cope with environmental factors. Fishing could, depending on the circumstances, remove those members best suited to coping with disease, pollution, etc.

Although the above studies involve a variety of fish, mollusk, and crustacean species, most of the research uses just a few species to make it easier to compare results among studies and from year to year. A key fish species is the inshore- and offshore-occurring winter flounder. A key crustacean species is the inshore- and offshore-occurring American lobster. Key mollusk species are the offshore-occurring sea scallop and the inshore-occurring softshell (soft clam) and northern quahog (hard clam). An emphasis is also placed on using small/young specimens in these studies since such sizes/ages are usually the most vulnerable life stages.

Ecosystem Dynamics Branch scientists ultimately aim to develop mathematical models of ecosystem functioning which can predict changes in the recruitment of given marine resource species in response to changes elsewhere in the ecosystem. To develop these models, branch scientists focus on four areas: zooplankton, larval fish, apex predators (fish at the top of the food web), and the predatory and competitory relationships among marine species. Zooplankton studies include seasonal surveys of zooplankton composition, distribution, and abundance on the Northeast Continental Shelf, and seek explanations for the seasonal and annual variations in this food source for nearly all larval fish.

Larval fish studies feature similar surveys for similar purposes, but also include field and lab tests of the causes of larval fish mortality — the principal determinant of subsequent recruitment to the fishery.

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Apex predator studies include all aspects of the life
histories of sharks, tunas, and billfishes, with an emphasis on
sharks. Our tagging program for large, pelagic sharks has shown
these species to be -- for the most part -- slow growing, late
maturing, and with limited reproductive capacity, making them
especially vulnerable to overfishing.

Since predation and competition are major forms of interac-
tion within the fish community of the ecosystem, we are monitoring
what each species in that community is eating by analyzing the
stomach contents of fish sampled during the NEFC's bottom trawl
surveys. We are also determining the role of seabirds, marine
mammals, and sea turtles in the marine food web.

ENVIRONMENTAL PROCESSES DIVISION

Are there long-term (decade or more) changes in the aquatic climate (water temperatures, currents, etc.) of the Northeast Continental Shelf Ecosystem, and if so, what are the effects on the composition, distribution, abundance, and productivity of resource species?

What are the kinds and amounts of contaminants found in the sediments of fish habitats and the tissues of seafood species?

To what extent and how quickly can an oceanic dumpsite recover -- physically, chemically, and biologically -- if dumping is halted at the site?

To answer these and similar questions, the Environmental Processes Division conducts research in the lab and in the field to discover, describe, monitor, and evaluate the natural and human-induced environmental conditions which affect marine resource species. This information is used primarily by: (1) marine environmental managers who regulate the types, degrees, locations, and timing of human uses (waste dumping, navigational dredging, etc.) of fish habitats; (2) public health officials who establish tolerances, regulate commerce, and advise consumers with respect to seafood contaminants; and (3) researchers in the Fisheries Ecology Division and similar organizations who seek to relate basic environmental conditions to the composition, distribution, abundance, and productivity of resource species. The division accomplishes its work through three branches: Physical Oceanography, Chemical Processes, and Environmental Assessment.

Physical Oceanography Branch scientists measure, document, and analyze both short-term and long-term changes in the physical environment (water temperatures, currents, etc.) which can affect: (1) the survival of young/small fish until they reach the age/size of recruitment to the fishable population; and (2) the fates and severities of pollutants in coastal and offshore habitats. Changes and trends in oceanographic and meteorological conditions are determined by routine sampling on board research and merchant vessels, use of bottom-moored oceanographic instruments, use of environmental satellite observations, and study of oceanographic data archives.

Chemical Processes Branch scientists monitor and evaluate the distributions and concentrations of nutrients and contaminants in estuarine, coastal, and offshore waters. Excessive amounts of nutrients -- common in waters subjected to sewage-contaminated dumping, discharge, or runoff -- can fuel the excessive abundance of phytoplankton (algal blooms). When these blooms undergo

bacterial decomposition, the heavy bacterial activity can consume so much dissolved oxygen that little is left (hypoxia) for higher organisms, including resource species.

Contaminants, operating alone or combination with other factors such as hypoxia, can harm the survival, feeding, and growth of resource species. Especially vulnerable are demersal finfish and shellfish which live in close association with contaminated sediments and hypoxic bottom waters.

Environmental Assessment Branch scientists meld the information gained by the previous two branches along with information they gain through their own research in the field and in the lab to assess the various natural factors and human influences as limiting factors to the composition, distribution, abundance, and productivity of resource species. To assist in this environmental assessment, the branch identifies and uses indicator species, particularly shallow-water, sessile shellfish such as northern quahogs and eastern oysters, to measure the degree and rate of environmental change.

Much of the assessment work is directed at the ability of dumpsites to recover after dumping is halted, since these sites are among the most polluted with nutrients and contaminants in the Northeast. If dumpsites can recover, then most other polluted sites should be able to recover as well.

NATIONAL SYSTEMATICS LABORATORY

The National Systematics Laboratory is administered by the NEFC, but serves NMFS as a whole. It conducts taxonomic research (describing and naming new species and revising existing descriptions and names based on new information) on fishes, squids, crustaceans, and corals of economic or ecological importance to the United States. Because some important species are highly migratory and many exotic species are introduced into U.S. waters or markets, the laboratory's research is worldwide.

Major products of this research are worldwide and regional taxonomic publications and identification guides. Major services are requested reviews of the taxonomic research of other institutions or individuals, and expert identifications of marine animals collected throughout the world. Correct identifications are essential for describing a species' biological characteristics, studying its population dynamics, understanding its ecological relationships, and preparing fisheries statistics on it.

The laboratory is located within the Smithsonian Institution's National Museum of Natural History in Washington, D.C., where laboratory scientists have access to one of the world's best systems of biological collections, libraries, equipment, and facilities for taxonomic research. In turn, laboratory scientists expand the Smithsonian's scientific capabilities and help build and curate its collections.

SUPPORT STAFFS

To provide necessary scientific, technical, and administrative support to its four research divisions, the NEFC has created three support staffs: Research Planning & Coordination, Data Management Support, and Program Support. The **Research Planning & Coordination Staff** has two basic functions -- planning/evaluation and coordination/communication. It fulfils the former function by: (1) appropriately balancing the often short-term information needs of NEFC constituents with the necessarily long-term scientific continuity of NEFC research; (2) effectively and efficiently applying NEFC research resources (facilities, equipment, personnel, and funds) to research operations; and (3) serving as liaison to the planning/evaluation staffs at NMFS's Washington and Northeast Regional Offices. It fulfils the latter function by assuring that the information needs of NEFC constituents are incorporated into the NEFC research program and addressed in NEFC research products and services, and that studies and data bases produced by other research institutions which can augment NEFC research are identified and integrated into NEFC programs.

The **Data Management Support Staff** coordinates the development and maintenance of automated data systems throughout the NMFS's Northeast Region. Major activities include: (1) establishing contracts for regionwide mainframe computer services; (2) reviewing purchase requests for personal computer hardware, software, and services to assure compatibility with federal government standards and with existing automated data systems; and (3) helping NEFC research programs develop and maintain regionally coordinated data bases, data standards, and computer programs.

The **Program Support Staff** manages the NEFC's facilities, personnel, and finances, and performs the NEFC's scientific library, scientific & technical publication, and public information & education functions. Widely distributed information media produced by the staff include the NOAA Technical Memorandum NMFS-F/NEC series, Northeast Fisheries Center Reference Document series, Monthly Highlights, End-of-Year Report, and News Releases.