UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Northeast Fisheries Center
Woods Hole, Massachusetts 02543
January 31, 1984 F/NEC: JAG

To: Marine Fisheries Interests

From: Allen E. Peterson, Jr., Center Director

Subject: 1983 End-of-Year Report

1983 was a year of change for the Northeast Fisheries Center. In August, I transferred from the position of Regional Director of the Northeast Regional Office in Gloucester, Mass., to my current position. In November, I appointed Dr. George J. Ridgway, the Center Planning Officer, as Acting Deputy Center Director to handle the day-to-day operation of the Center. Also in November, I appointed Dr. Michael P. Sissenwine, the Deputy Division Chief of the Resource Assessment Division, as a Special Assistant to the Center Director to advise me on scientific affairs. More personnel changes will likely occur in 1984.

In October, the Center held a four-day review of its scientific program. Reviewers came from our own agency, state marine fisheries agencies, regional fishery management councils, and universities. The reviewers' comments were thorough, perceptive, and candid. As a result, I expect some changes in the Center's scientific program and the reviewers' comments will help shape those changes.

Throughout 1983, the Center began significant research on Atlantic salmon, largely because of the federal government's responsibilities under the new treaty-based North Atlantic Salmon Conservation Organization (NASCO). The Center awarded 100,000 dollars in contracts among universities, state marine fisheries agencies, and federal fisheries agencies for research on the number of U.S.-spawned Atlantic salmon caught in the high-seas fishery off West Greenland and in the coastal fisheries off Canada and the United States. During December, I also hired a staff assistant to serve as liaison between the Center's scientific program and the three U.S. Commissioners to NASCO, and to assist the U.S. Commissioners to coordinate their participation in NASCO.

During late 1983, the Center geared up for a regionwide program of sampling commercial fishermen's catches at sea aboard cooperating fishing vessels. Beginning in January 1984, this sea-sampling program will conduct at least 26 trips out of most major and many minor fishing ports between Rockland, Maine, and Hampton, Virginia. Fishermen will now see their observations quantified by Center scientists and used by the scientists to develop fish population assessments.

The Center is also attempting to improve its communications with its constituents. Beginning on the next page you will find a concise description of the Center's major research activities during 1983. At the end of each description you will find a name and telephone number to contact for more information. If you have suggestions on how the Center can improve these communications, please let me know.

NORTHEAST FISHERIES CENTER

END-OF-YEAR REPORT

United States Department of Commerce
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1983

STOCK ASSESSMENT IMPROVEMENTS: Assessed the status of 40 finfish and invertebrate stocks. Significant advances were made in assessment quality for several species, including redfish, long-finned squid, and butterfish, through development of new models and/or application of more powerful analytical techniques. Significant contributions were also made to assessment of large pelagic species, including completion of a study on shark catches, and investigation of newly developed assessment techniques for bluefin tuna stocks in cooperation with scientists from the Southeast Fisheries Center. (Dr. Vaughn Anthony, FTS-840-1304 or 617-548-5123)

STOCK ASSESSMENT PUBLICIZING: Disseminated information on stock assessments more widely. Significant increases were made in submitting articles to commercial and recreational fisheries trade papers (e.g., *Commercial Fisheries News*), exhibiting at commercial and recreational shows (e.g., New York National Sportsmen's Exposition), and mailing news releases directly to commercial and recreational fishermen.

MULTISPECIES FINFISH MANAGEMENT: Continued multispecies fisheries research, including definition of ecological and fishery management units, and development and application of appropriate assessment techniques (e.g., multispecies yield-per-recruit models). (Dr. Wendy Gabriel, FTS-840-1317 or 617-548-5123)

STRIPED BASS STATUS: Prepared a draft report for Congress summarizing four years of research under the Emergency Striped Bass Study. (Dr. John Boreman, FTS-840-1225 or 617-548-5123)

APEX PREDATOR BIOMASS: Provided estimates of the minimum biomass of apex predators (6,000 metric tons of tunas, swordfish, and sharks) and their food consumption (8,500 metric tons) for Georges Bank and contiguous waters. (John Casey, FTS-838-7142 or 401-789-9326)

SPAWNING POPULATION LEVELS: Demonstrated that the accuracy of MARMAP ichthyoplankton surveys is sufficiently high to detect major changes in spawning-stock levels of fish populations off the northeastern United States. (Dr. Michael Pennington, FTS-840-1285 or 617-548-5123)

SILVER HAKE BIOMASS: Derived fishery-independent estimate of the adult spawning biomass of silver hake from eggs collected on seven MARMAP plankton surveys in 1979. The center of spawning activity was on Georges Bank where 39.6 percent of the eggs were spawned. Southern New England contributed 33.8 percent, followed by Gulf of Maine and Middle Atlantic Bight waters with 18.6 percent and 8.1 percent, respectively. On the basis of this calculation and length-frequency data of adults obtained from NEFC bottom-trawl surveys, the spawning biomass was estimated at 468 million pounds. (Wallace Smith, FTS-342-8260 or 201-872-0200)

FISHERIES BIOLOGICAL SAMPLING: Increased biological sampling of commercial landings by 20 percent over 1982 levels. Since 1981, the intensity of dockside sampling has been increased by over 120 percent. A sea-sampling program was also developed to collect finfish discard data and other fishery-related information. (Thurston Burns, FTS-840-1309 or 617-548-5123)

GHOST GILL-NET IMPACT: Developed and conducted the first systematic survey to locate and assess the impact of ghost gill nets in the Cape Ann-Stellwagen Bank area. (Joseph Uzmann, FTS-840-1280 or 617-548-5123)

SUMMER FLOUNDER SELECTIVITY: Completed a cooperative mesh-selectivity study for summer flounder with the State of New York to evaluate the short-term and long-term impacts of an increase in codend mesh size to 5.5 inches. Study results will be used in the development of the Summer Flounder Fishery Management Plan. (Dr. Emory Anderson, FTS-840-1251 or 617-548-5123)

RECREATIONAL SHARK CATCHES: Estimated recreational catch of large sharks in the Atlantic and Gulf of Mexico at 22 million pounds. (John Casey, FTS-838-7142 or 401-789-9326)

RECREATIONAL BLUEFISH DATA: Began a voluntary bluefish data collection system through the continued cooperation and encouragement of angling clubs. To date, information has been received on almost 1,000 individual fishing days. (Stuart Wilk, FTS-342-8236 or 201-872-0200)

RECREATIONAL FISHERIES PROJECTS: Improved capabilities for addressing recreational fisheries problems through implementation of a voluntary party-boat logbook system, study of interactions between the gill-net fishery and party-boat operations, and development of a five-year plan for NEFC activities on recreational fisheries. (Dr. Fredric Serchuk, FTS-840-1245 or 617-548-5123)

NORTHERN SHRIMP SURVEYS: Completed cooperative research-trawl development studies for northern shrimp with the States of Maine, New Hampshire, and Massachusetts, and initiated a cooperative shrimp survey in the western Gulf of Maine. (Dr. Stephen Clark, FTS-840-1312 or 617-548-5123)

SURVEY ABUNDANCE INDICES: Developed an analytical technique which significantly improves the statistical precision of abundance indices from bottom-trawl surveys. (Dr. Michael Pennington, FTS-840-1285 or 617-548-5123)

ATLANTIC SALMON TAGGING: Provided support for tagging Atlantic salmon, and evaluating methods for distinguishing U.S. stocks of Atlantic salmon on the high seas. (Dr. John Boreman, FTS-840-1225 or 617-548-5123)

COOPERATIVE SHARK TAGGING: Continued the NMFS Cooperative Shark Tagging Program with 2,000 fishermen and scientists tagging over 5,000 sharks and teleosts representing 35 species, and returning tags from 18 species, some after 17 years at liberty and over trans-Atlantic distances of 3,000 miles. (John Casey, FTS-838-7142 or 401-789-9326)

AMERICAN LOBSTER TAGGING: Began an offshore Gulf of Maine American lobster tagging program in collaboration with the State of Maine, with preliminary results showing a high rate of exploitation and significant shoaling in autumn months. (Joseph Uzmann, FTS-840-1280 or 617-548-5123)

MIDDLE ATLANTIC FISHES: Published a monograph on the ecology of 43 major species of fish and shellfish in the Middle Atlantic Bight, including current information on life history, population abundance, fisheries, and an evaluation for the relative importance of pollution, fishing, and natural environmental factors in controlling fish abundance in the region. (Dr. Marvin Grosslein, FTS-840-1252 or 617-548-5123)

TUNA & MACKEREL CATALOG: Published (by FAO) a catalog of the 49 species of mackerels, bonitos, and tunas, enabling a wide variety of users to identify these fishes and learn about their distribution, biology, and importance to fisheries. (Dr. Bruce Collette, FTS-357-2524 or 202-357-2524)

SPANISH MACKEREL DESCRIPTIONS: Prepared a monograph describing and distinguishing the 18 species of Spanish mackerels (*Scomberomorus*) of the world. (Dr. Bruce Collette, FTS-357-2524 or 202-357-2524)

RARITAN BAY HABITAT USE: Completed an expanded second-year bottom-trawl study of habitat utilization in Raritan Bay-Lower New York Harbor. Winter flounder, windowpane, and red hake were principal finfish; rock and lady crab the principal macroinvertebrates. (Dr. Carl Sindermann, FTS-342-8201 or 201-872-0200)

STOMACH-CONTENT SAMPLES: Completed the processing and computerization of stomach-content samples gathered during an eight-year study (1973-80) to document the food consumed by 28 species of fish and squid common to Northwest Atlantic waters from Cape Hatteras to western Nova Scotia. A detailed report was prepared on 17 species for the 1973-76 period. (Ray Bowman, FTS-840-1324 or 617-548-5123)

BLUEFISH FEEDING BEHAVIOR: Determined in the laboratory that daily consumption rates for age 3+ bluefish change from 5.11 percent of body weight in summer to 1.01 percent in winter. (Anne Studholme, FTS-342-8277 or 201-872-0200)

JUVENILE BLUEFISH DIET: Demonstrated year-to-year variation in the diet of age 0+ bluefish, which may influence differences in growth rate and condition. (Anne Studholme, FTS-342-8277 or 201-872-0200)

STRIPED BASS STARVATION: Discovered that starvation in newly hatched striped bass larvae results in a rapidly degenerating condition of the retina which may prevent the larvae from catching their prey. (Dr. Aaron Rosenfield, 301-226-5193)

SWORDFISH FOOD CONSUMPTION: Estimated daily ration (an average of 1.1 percent of body weight per day) for swordfish in the western North Atlantic. Food consumption at this feeding level is 214-363 kilograms per year for an average swordfish weighing 58 kilograms. (John Casey, FTS-838-7142 or 401-789-9326)

SANDBAR SHARK FEEDING: Provided estimates of daily feeding rates for young sandbar sharks (an average of 0.9 percent of body weight per day) which prey primarily on the commercially important blue crab (67 percent occurrence in stomachs). (John Casey, FTS-838-7142 or 401-789-9326)

ATLANTIC HERRING RECRUITMENT: Completed a study of environmental impacts upon Atlantic herring recruitment and stock-recruitment relationships. (Dr. Vaughn Anthony, FTS-840-1304 or 617-548-5123)

RED HAKE GROWTH: Established laboratory growth rates for juvenile red hake of 3.38 percent per day when consuming an average food ration of 7.4 percent of body weight per day. (Anne Studholme, FTS-342-8277 or 201-872-0200)

LITTLE SKATE GROWTH: Completed a study on age, growth, and mortality of little skate. (Dr. Ambrose Jearld, FTS-840-1317 or 617-548-5123)

ATLANTIC MACKEREL AGING: Completed an age validation study for Atlantic mackerel. (Dr. Ambrose Jearld, FTS-840-1317 or 617-548-5123)

AGING TECHNIQUE IMPROVEMENTS: Improved aging techniques and procedures for several species, including witch flounder, winter flounder, and black sea bass. (Dr. Ambrose Jearld, FTS-840-1317 or 617-548-5123)

SHORTFIN MAKO GROWTH: Determined the age and growth of the shortfin mako which grows to maturity in 4.5 years and attains a maximum weight of 1,200 pounds in 12 years. (John Casey, FTS-838-7142 or 401-789-9326)

WHITE SHARK DISTRIBUTION: Summarized 100 years of white shark data to provide a comprehensive report on white shark distribution in the western North Atlantic. (John Casey, FTS-838-7142 or 401-789-9326)

SANDBAR SHARK GROWTH: Determined the age and growth of the sandbar shark, a slow-growing species which reaches maturity in 13-14 years and may live for 30-50 years. (John Casey, FTS-838-7142 or 401-789-9326)

BIVALVE ABUNDANCE & DISTRIBUTION: Published a monograph on the abundance and distribution of all species of bivalve mollusks of the East Coast from Florida to Nova Scotia. (Roger Theroux, FTS-840-1253 or 617-548-5123)

MARINE DECAPOD GUIDE: Completed preparation of a major book on "Shrimps, Lobsters, and Crabs of the Eastern United States" to be published by the Smithsonian Institution Press in 1984. (Dr. Austin Williams, FTS-357-2639 or 202-357-2639)

ROCK SHRIMP DESCRIPTIONS: Prepared a paper describing the 12 species of rock shrimps (*Sicyonia*) of the eastern Pacific. (Dr. Isabel Canet, FTS-357-1417 or 202-357-1417)

MUD CRAB SPECIES: Analyzed variation in the *Panopeus herbstii* (mud crab) complex, determining that six different species exist. (Dr. Austin Williams, FTS-357-2639 or 202-357-2639)

HYDROTHERMAL VENT CRUSTACEANS: Continued studies on the crustacean fauna of the hydrothermal vents along the eastern Pacific rise. Published the description of a new species of galatheid crab (*Munidopsis*) and prepared a paper describing the zoeal larval stage of a vent crab. (Dr. Austin Williams, FTS-357-2639 or 202-357-2639)

AMERICAN LOBSTER ECOLOGY: Completed the first submersible survey of American lobster habitat ecology in the central Gulf of Maine. (Joseph Uzmann, FTS-840-1280 or 617-548-5123)

SEA SCALLOP RESOURCES: Completed studies on biological characteristics of Gulf of Maine sea scallops, seasonal variation in scallop meat weights, and associated management implications. (Dr. Fredric Serchuk, FTS-840-1245 or 617-548-5123)

ICELANDIC SCALLOP RESOURCES: Developed baseline data on Icelandic scallop resources from bottom-trawl surveys. (Dr. Fredric Serchuk, FTS-840-1245 or 617-548-5123)

SEA SCALLOP METABOLISM: Acquired baseline information on the seasonal metabolic patterns of sea scallops. (Dr. Anthony Calabrese, FTS-642-5205 or 203-783-4200)

BIVALVE HISTOLOGICAL TECHNIQUES: Completed a manual on "Gross and Histological Techniques for Bivalve Mollusks." (Dr. Aaron Rosenfield, 301-226-5193)

EGG & LARVA GUIDE: Completed a guide to the eggs and larvae of fishes found in continental shelf and oceanic waters of the western North Atlantic. The guide presents egg and larval descriptions of 290 species of fishes likely to be collected in plankton and neuston sampling operations. It also provides direct comparisons of confusing pairs. (Wallace Smith, FTS-342-8260 or 201-872-0200)

LARVAL DISTRIBUTION PATTERNS: Completed a report describing the spatial and temporal distribution patterns of larval fishes in relation to circulation, phytoplankton production, and pulses in abundance of zooplankton in continental shelf waters between Cape Hatteras and Cape Sable. (Dr. Kenneth Sherman, FTS-838-7142 or 401-789-9326)

SAND LANCE ABUNDANCE: Determined that populations of sand lance off the northeastern United States remain at or near record high levels. Spawning biomass was estimated at 2.7 million metric tons in 1981 and 1.1 million metric tons in 1982. Although sand lance occurred throughout coastal waters from Cape Hatteras to Nova Scotia, the center of the larval population is located off Southern New England, followed by secondary concentrations in the Middle Atlantic Bight and on Georges Bank. The principal spawning grounds are located on and around Nantucket Shoals. (Wallace Smith, FTS-342-8260 or 201-872-0200)

LARVAL COD & HADDOCK STARVATION: Completed studies on starvation and predation of Atlantic cod and haddock larvae on Georges Bank, indicating that starvation-caused mortality is not population limiting or the single catastrophically controlling mortality factor under normal prey densities. (Dr. Geoffrey Laurence, FTS-838-7142 or 617-548-5123)

GEORGES BANK NITROGEN BUDGET: Developed a nitrogen budget for Georges Bank, estimating the magnitude of various sources needed for the high primary production on the bank. (David Mountain, FTS-840-1271 or 617-548-5123)

GULF OF MAINE PLANKTON: Finished a data base on monthly abundance of zooplankton and phytoplankton in the central Gulf of Maine. (Dr. Merton Ingham, FTS-838-7142 or 401-789-9326)

PLANKTON SAMPLE ANALYSIS: Developed a prototype image-analysis system for counting, measuring, and identifying zooplankton as a joint research effort with the University of Rhode Island. The system can analyze up to four samples per hour (faster than human processing), identifying plankton to major taxonomic group. (Dr. Kenneth Sherman FTS-838-7142 or 401-789-9326.

PHYTOPLANKTON ABUNDANCE & PRODUCTION: Continued phytoplankton studies to understand the link between phytoplankton production and fish production. A paper was jointly published with Old Dominion University on the seasonal distribution and species composition of phytoplankton on the Northeast's continental shelf. Also, an algal assay assessment showed nitrogen to be the most frequently limiting nutrient for phytoplankton in these waters. (Dr. James Thomas, FTS-342-8246)

GEORGES BANK FISH PRODUCTION: Compared the productivity of Georges Bank with other high-latitude continental shelf ecosystems. Production per unit of area for fish on Georges Bank is higher than other North Atlantic regions, and comparable to fish production estimates for the eastern Bering Sea. Most of the fish production on Georges Bank is consumed by natural predators, including other fish, squids, whales, and birds; only about 10-15 percent appears to be available to man on a sustainable basis. (Dr. Marvin Grosslein, FTS-840-1252 or 617-548-5123)

CURRENT/WIND RELATIONSHIP: Determined a relationship between the transport of water through the Northeast Channel and the wind field over the Gulf of Maine. (David Mountain, FTS-840-1271 or 617-548-5123)

UPWELLING/WIND RELATIONSHIP: Demonstrated the link between the wind field and summer upwelling of cold water off the central New Jersey coast. (Dr. Merton Ingham, FTS-838-7142 or 401-789-9326)

SURFACE TEMPERATURE INFORMATION: Began a cooperative project with the University of Rhode Island's Marine Advisory Service and Remote Sensing Laboratory to provide fishermen with computer-enhanced pictures of satellite infrared data depicting the sea-surface temperature field off Southern New England and on Georges Bank. (Dr. Merton Ingham, FTS-838-7142 or 401-789-9326)

ANTARCTIC ECOSYSTEM FUNCTIONING: Completed observations in the Antarctic ice-edge zone to determine the effect of the ice edge and its retreat on the local biological productivity. (David Mountain, FTS-840-1271 or 617-548-5123)

FISH DISEASE PREVALENCE: Completed analysis of bottom-trawl survey data on the prevalence of skin lesions and pigmentation/skeletal abnormalities in economically important Northwest Atlantic bottom fishes. The analysis showed in one case--fin rot in winter flounder--significantly higher disease prevalence in inshore polluted waters. In related work, 500 internal lesions from eastern and western North Atlantic bottom fishes were examined to see if such lesions were significantly affecting the health of these fishes. No debilitating diseases were detected in this limited sampling. (Dr. Robert Murchelano, 301-226-5193)

MSX DISEASE OUTBREAKS: Completed two cooperative studies with the University of Maryland on MSX disease in American oysters, showing the environmental conditions best suited for epidemics of this disease. (Dr. Aaron Rosenfield, 301-226-5193)

MARINE INVERTEBRATE VIRUSES: Completed a book reviewing all viruses reported to occur in marine invertebrates. When fisheries managers and commercial aquaculturists are confronted with mass invertebrate mortalities, the book should help determine if viruses are a cause, thus permitting managers and aquaculturists to take timely counter measures if possible. (Dr. Phyllis Johnson, 301-226-5193)

IPN VIRUS STRAINS: Discovered that several fishes from the Middle Atlantic are infected with at least two strains of infectious pancreatic necrosis (IPN) virus; one lethal, one not. (We have implicated IPN virus in Atlantic menhaden mass mortalities; others are associating it with larval striped bass mass mortalities in hatcheries). Now, in mass mortalities in which IPN virus is found, scientists will know by the strain involved if the virus is the cause. (Martin Newman, 301-226-5193)

DREDGE SPOIL DISPERSION & TOXICITY: Determined dispersion of contaminated dredge spoil during dumping activity at the central Long Island Sound dumpsite. Also determined that the dumping caused stress in caged American lobsters. (Dr. Anthony Calabrese, FTS-642-5205 or 203-783-4200)

DEEPWATER DUMPSITE CHARACTERISTICS: Completed characterization of the nutrient and chlorophyll distributions and variability in continental shelf waters next to the 106-mile deepwater dumpsite. (John O'Reilly, FTS-342-8251 or 201-872-0200)

PHILADELPHIA-CAMDEN DUMPSITE RECOVERY: Evaluated presence of microbial pathogens in bottom sediments of the now idle (three years) Philadelphia-Camden ocean dumpsites, supporting the decision to recommend reopening the area for commercial shellfishing. (Dr. Aaron Rosenfield, 301-226-5193)

SEABED OXYGEN CONSUMPTION: Determined that the seabed oxygen consumption rate--a measure of the decomposition of organic matter--for the New York Bight has not changed significantly since 1974-75, despite a general trend of declining consumption rates during this period. Seabed oxygen consumption has lowered significantly in response to decreased dredge-spoil dumping, but has been offset by increased sewage-sludge disposal. (William Phoel, FTS-342-8215 or 201-872-0200)

RED HAKE VULNERABILITY: Demonstrated size-related differences in the ability of red hake to detect and avoid waters with low dissolved oxygen concentrations. (Anne Studholme, FTS-342-8277 or 201-872-0200)

COASTAL MAINE POLLUTANTS: Completed a survey of toxic polyaromatic hydrocarbons (PAH's) and polychlorinated biphenyls (PCB's) in sediments of Maine waters. The survey showed high PAH's due to oil spills and fuel-oil discharges, but PCB levels were moderate. (Donald Gadbois, FTS-837-9286 or 617-281-3600)

OIL DRILLING IMPACTS: Continued documentation of ecological conditions at site-specific stations on Georges Bank before, during, and after exploratory gas and oil drilling. (Joseph Uzmann, FTS-840-1280 or 617-548-5123)

SANDWORM OIL VULNERABILITY: Demonstrated that the sandworm *Nereis virens*, an important prey species, burrowed abnormally into and emerged from sediment contaminated with oil, leading to decreased survival due to increased predation risk. (Anne Studholme, FTS-342-8277 or 201-872-0200)

GENETIC MUTATION TESTS: Established bases for applying rapid tests of mutation to field collections of fish blood, hematopoietic tissue, and sperm. (Dr. James Hanks, FTS-642-5240 or 203-783-4240)

BENTHIC INDICATOR SPECIES: Developed a statistical procedure for selecting sensitive benthic indicator species. (Sukwoo Chang, FTS-342-8267 or 201-872-0200)

SUBTIDAL CAGE CULTURE: Developed an intensive, subtidal cage-culture system for the field grow-out of surf clams and hard clams. (Dr. James Hanks, FTS-642-5240 or 203-783-4240)

SOUTHEAST/WINTER GROW-OUT: Found rapid growth of the surf clam in the southeastern United States during the winter months, and explored the biological carrying capacity of land-based nursery culture systems in that region. (Dr. James Hanks, FTS-642-5240 or 203-783-4240)

SELECTIVE SHELLFISH BREEDING: Demonstrated that scientific breeding of American oysters can produce faster growing juveniles after only two generations. (Dr. James E. Hanks, FTS-642-5240 or 203-783-4240)

ALGAL NUTRITIONAL VALUES: Determined the comparative nutritional value of eight algal species for juvenile American oysters. Also determined that the seawater composition in which algae grow will affect their nutritional value. (Dr. James Hanks, FTS-642-5240 or 203-783-4240)

MOLLUSCAN DISEASE SUSCEPTIBILITY: Developed an improved technique for counting the protective blood cells of mollusks to aid in their examination for disease susceptibility. (Dr. James Hanks, FTS-642-5240 or 203-783-4240)

SHELLFISH-PATHOGEN REQUIREMENTS: Determined the nutritional requirements for toxin production by a shellfish-pathogenic *Vibrio* sp. (Dr. James Hanks, FTS-642-5240 or 203-783-4240)

SHELLFISH DISEASE/PREDATOR CONTROL: Began developing a shellfish health and inspection plan with the Pacific States Marine Fisheries Commission and the Atlantic States Marine Fisheries Commission to prevent and control the spread and introduction of shellfish pathogens, pests, and predators. (Dr. James Hanks, FTS-642-5240 or 203-783-4240)

FROZEN SHELF LIFE: Demonstrated through frozen-storage studies that fresh one-day-old Atlantic cod fillets, when frozen and held at 10°F, have a shelf life of only two months. (Joseph Mendelsohn, FTS-837-9282 or 617-281-3600)

SEAFOOD SPOILAGE MEASUREMENTS: Developed a simple gas chromatographic method to quantify the levels of chemical compounds (i.e., dimethylamine and trimethylamine) associated with seafood spoilage. (Ronald Lundstrom, FTS-837-9277 or 617-281-3600)

SORBATE VS. IRRADIATION PRESERVATION: Compared preservative effects of irradiation and potassium sorbate on one-day-fresh Atlantic cod fillets. Sorbate treatment provided a shelf-life extension as good or better than irradiation. (Elinor Ravesi, FTS-837-9287 or 617-281-3600)

SEAFOOD STANDARDS DEVELOPMENT: Completed revisions of U.S. Standards for grades of various fish blocks, and instructions for using them, that are now being reviewed and tested by industry. (John Ryan, FTS-837-9248 or 617-281-3600)

LOBSTER TAIL KEY: Prepared an illustrated key to tails of spiny and slipper lobster species being sold in the United States. The key most assists U.S. Customs officials checking fisheries products imports. (Dr. Austin Williams, FTS-357-2639 or 202-357-2639)

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