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United States Research Report for 1984

by

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A. Status of the Fisheries (Subareas 4-6 inclusive)
Brief summaries are provided on the status of fisheries for major species of finfish and shellfish. More detailed information on these and other species is included in a report entitled "Status of the Fishery Resources off the Northeastern United States" which is prepared annually by the Northeast Fisheries Center of the NMFS.

1. Haddock

USA landings from Subareas 4-6 were about 11,800 mt in 1984, a decrease of 19% from 1983. Landings from Subarea 4 totalled only 205 mt in 1984. Landings from Georges Bank increased about 2% from 1983 to 8,806 mt in 1984. Poor recruitment since 1979 and high fishing mortality have kept this stock at low levels of abundance. Landings from the Gulf of Maine dropped 50% from 1983 to 2,793 mt in 1984. This stock has been declining since 1979.

2. Atlantic cod

USA commercial landings declined 14% from 51,023 mt in 1983 to 43,886 mt in 1984, the lowest annual total since 1978. Compared to 1983, landings in Subarea 4 declined 4% (276 mt vs. 287 mt), landings in Subarea 5 declined 14% (43,248 mt vs. 50,360 mt), and landings in Subarea 6 declined 6% (352 mt vs. 376 mt).

Landings in 1984 from the Georges Bank fishery (Div. 5Z) totalled 32,453 mt, an 11% decrease from 1983. Gulf of Maine landings (Div. 5Y) in 1984 were 10,805 mt, 23% less than in 1983. In both fisheries, otter trawl effort during 1984 increased to record high levels. Commercial CPUE indices, however, declined by over 30% from 1983 values. CPUE in 1984 Georges Bank fishery was the lowest in the 1965-84 time series, while CPUE in the 1984 Gulf of Maine fishery was the lowest in the 1965-84 time series, while CPUE in the 1984 Gulf of Maine fishery was the lowest since 1973. Research vessel catch-per-tow indices show comparable trends; the 1984 indices for both stocks were among the lowest observed.

For the past three years, landings from Div. 5Z have been dominated by a strong 1980 year class. Although the 1983 year class on Georges Bank is above-average in strength, it is not as strong as the 1971, 1975, and 1980 year classes. Accordingly, despite this modest inmprovement in recruitment, landings in 1985 are expected to further decline if current levels of fishing mortality are maintained.

3. Redfish

USA landings from Div. 4X increased 8% from 810 mt in 1983 to 872 mt in 1984. Landings continued to be dominated by 1971 year-class finsh, although approximately 5% of the males in 1984 were recent recruits.

USA landings from Subarea 5 declined from 5,215 mt in 1983 to 4,721 mt in 1984, marking the fifth consecutive year of decline. Commercial CPUE and bottom trawl survey abundance indices also declined in 1984 and are currently the lowest on record. The 1971 year class continued to dominate the landings, although there has been an increasing proportion of small (20-25 cm) redfish, particularly males, in the landings since 1983. Examination of commercial and bottom trawl survey length frequency data suggest that these fish are from the 1977 or 1978 year class.

4. Pollock

USA commercial landings from Div. 4X increased slightly from 532 mt in 1983 to 561 mt in 1984. Landings from Subarea 5, after declining in 1982 and 1983, increased substantially in 1984 to 17,200 mt. Commercial landings for 1984 were thus equivalent to the 1978-81 peak of 17,210 mt. Commercial CPUE indices and stock biomass continue to remain high relative to the early 1970's, although recent NEFC bottom trawl survey catch-per-tow indicies are considerably below levels evident during the mid-to-late 1970's.

5. Yellowtail flounder

USA landings of yellowtail flounder from Subareas 5 and 6 declined from 33,100 mt in 1983 to 17,800 mt in 1984. NEFC survey indices have declined substantially since 1982, and in autumn of 1984 were at or near record low levels. Fishing mortality has remained well above F_{max} in recent years. A general increase in abundance and biomass occurred during the early 1980's due to improved recruitment from the 1979-81 year classes. The 1980 year class was by far the strongest of the three and dominated landings during 1982 and 1983. Current declines in landings and abundance are due to intense fishing pressure on the 1980 year class and poor recruitment from subsequent year classes. Survey indices of age 1 (1983 year class) yellowtail in the autumn of 1984 were among the lowest on record suggesting that the current declining trend will continue.

6. Other flounders

USA landings of flounders other than yellowtail from Subarea 4 remained unchanged from 1983 to 1984 at about 290 mt. Landings from Subarea 5 decreased 8% from 37,370 mt in 1983 to 34,230 mt in 1984. Landings from Subarea 6 remained about the same in 1984 as in 1983 at about 10,500 mt.

Winter flounder (33% of total), summer flounder (25%), American plaice (23%), and witch founder (15%) comprised 95% of the other flounder landings. Winter flounder landings decreased 5% from 1983 to 1984, summer flounder landings declined 4%, American plaice landings dropped 23%, wereas landings of witch flounder increased 11% from 1983 to 1984. Survey indices for all of these founder species indicate declines or imminent declines in abundance as a result of recent landings being at or near record high levels.

7. Silver hake

USA commercial landings from Subarea 5 in 1984 were 14,111 mt, a 24% increase from 1983, continuing the steady increase since 1980. Current landings are still well below the levels

reported in the mid-1970's. Recruitment levels during 1978-81 were only average; however, the 1982 year class appears to be strong. Fishing effort in Subarea 5 has remained at a reduced level and, as a result, it is unlikely that stock biomass will undergo any major decline in 1985 if landings remain at current levels.

In Subarea 6, USA landings were 6,751 mt in 1984, a 23% increase from 1983 and only slightly less than the 1979-81 average. While recruitment in the last several years has been of only average strength, decreased fishing effort from distant water fleets has helped to steadily increase stock biomass from the low levels of the mid-1970's.

8. Red hake

USA commercial landings from Subarea 5 were only 1,173 mt in 1984, a 19% decrease from 1983, continuing a decline begun in 1982. Recruitment in the past several years has been of only average strength, but decreased fishing effort has resulted in an increase in stock biomass from low levels in the mid-late 1970's. Biomass should continue to steadily increase if landings remain at their current level.

In Subarea 6, 1984 USA landings were 1,098 mt, a rather dramatic 49% increase from the 1982-83 average. Landings since 1980 have been quite low due to decreased fishing effort as well as reduced stock abundance. Recruitment in recent years has been only average, but, like Subarea 5, reduced effort has helped to slowly increase stock biomass from the very low level reached in the late 1970's.

9. Atlantic herring

USA landings from Subarea 5 in 1984 were 33,356 mt, a 44% increase from 1983 (23,211 mt) and a 3% increase from 1982. Landings in the coastal Maine fixed gear fisheries (stop seines and weirs) were 380 mt, the lowest on record. Purse seine landings by Maine vessels in 1984 were 19,073 mt, among the highest on record for the mobile gear fishery. The overall decline in landings by the fixed gear fisheries, which traditionally accounts for most of the catch, appears to be attributable to both decreased abundance and decreased availability. Landings from Div. 5Z were 58 mt in 1984, primarily from Subdiv. 5Zw. There has been no directed herring fishery in Subdiv. 5Ze since the collapse of the fishery in 1977. Herring landings from Subarea 6 were 27 mt in 1984.

Results of trawl surveys conducted by the NEFC and by the State of Massachusetts Division of Marine Fisheries indicate that recruitment prospects during 1985 may be improved. Factors related to apparent changes in availability are not well understood, however, and possible effects on the inshore fixed gear fishery cannot be quantified.

10. Atlantic mackerel

USA commercial landings from Subareas 5 and 6 increased about 16% from 3,805 mt in 1983 to 4,406 mt in 1984. Nearly 70% of the 1984 landings were from Subarea 6. The 1984 landings were the highest since 1952. Total stock biomass (Subareas 2-6) was estimated to be nearly 1.2 million mt at the beginning of 1985, a 150% increase from a recent low in 1980. This increase is due to improved recruitment since 1980, expecially from the strong 1982 year class.

11. Butterfish

USA landings increased 140% from 4,915 mt in 1983 to 11,825 mt in 1984. About 73% of the 1984 total was from Subarea 5. This increase reflected a strong demand for butterfish by the export

market. The high landings in 1984 were accompanied by equally high discard rates (30-50%) of age 0 butterfish. Recruitment in recent years has been strong; however, the intensive fishing effort in 1984 very likely will result in reduced abundance in 1985.

12. Squid

USA landings of long-finned squid (Loligo pealei) from Subareas 5 and 6 decreased from a record high of 15,943 mt in 1983 to 10,825 mt in 1984, 4,915 mt from Subarea 5 and 5,910 mt from Subarea 6. Reductions occurred in both the shoreside and joint venture fisheries. Landings during 1984 were, however, much greater than in any year prior to 1983. Catch-per-tow indices from the NEFC 1984 autumn research vessel trawl survey indicated that abundance in 1985 may be lower than the 1968-83 average level.

USA landings of short-finned squid (Illex illecebrosus) from Subareas 5 and 6 declined slightly from 9,900 mt in 1983 to 9,300 mt in 1984. Shoreside landings were more than double the 1983 level, while joint venture landings declined by about 28% reflecting an increase in shore-based processing. Virtually all of the 1984 landings were taken from Subarea 6. Catch-per-tow indices from the 1984 autumn survey were lower than in recent years of high abundance (1975-81 average), but were over twice as high as those from the prior period of low abundance (1968-74).

13. Sea scallops

USA landings declined 11% from 8,707 mt (meats) in 1983 to 7,761 mt in 1984, marking the sixth consecutive year of decline. The 1984 total was the lowest in ten years. Div. 5Z landings (3,260 mt) declined 29% from 1983, while Div. 5Y landings (679 mt) declined by 24%. Subarea 6 landings (3,822 mt) increased 18% from 1983 due to a 50% increase in effort in the Mid-Atlantic sea scallop fishery. For the first time since 1979, USA Subarea 6 landings exceeded those from Georges Bank (Subdiv. 5Ze: 3,082 mt).

Commercial CPUE indices in 1984 in both the Georges Bank and Mid-Atlantic fisheries declined to record low levels. Total USA scallop effort reached an historical high due to increases in both the number and length of fishing trips. Catch-per-tow values from the NEFC 1984 sea scallop survey indicated that, with the exception of the Northeast Peak of Georges Bank and the Long Island-New Jersey region in the Mid-Atlantic, current scallop abundance is at an all-time low. Recruitment is generally poor except on the Northeast Peak and off Long Island-New Jersey where the strength of the 1981 year class is exceptional and fair, respectively. The absence of significant recruitment in most offshore grounds, coupled with high fishing mortality levels, will impede resource recovery. Landings in 1985 are expected to be lower than in 1984.

B. Special Research Studies (Subareas 4-6 inclusive)

1. Environmental Studies

a) Hydrography. Physical oceanographic measurements were made on three surveys of the shelf from Cape Hatteras to the Gulf of Main in January, May/June and November/December.

Analysis of a number of earlier projects continued during 1984. The results of curent measurements along a line across the shelf south of Nantucket Shoals was completed and accepted for publication. Box models of the advection and mixing within the Gulf of Maine were developed to account for the observed changes in the bottom water properties of the interior basins of the Gulf.

Hydrographic and current meter measurements of the entrainment of water from the continental shelf by warm core Gulf Stream rings are being analyzed to estimate the volume of entrained water and the variability of the entrainment process.

A study was completed on the seasonal and inter-annual variations of the cold pool in the continental shelf waters of the Mid-Atlantic Bight along the U.S. east coast from collectins of expendable bathy thermograph data for the five years 1977-1981. A climatological analysis of ten years (1974-1983) of water temperatures on the bottom across the continental shelf off southern New England was begun and examined in association with the water column thermal structure, wind driven circulation, solar radiation, the position of the shelf water front and passage of warm-core, Gulf stream rings.

b) Plankton Studies. Nine MARMAP ichthyoplankton surveys were completed in coastal waters from Cape Hatteras to the Gulf of Maine in 1984. We occupied more than 1100 stations, collected in excess of 2500 plankton samples and made nearly 20,000 ancillary observations and measurements in support of our marine ecosystems research. Survey efforts were intensified in the Middle Atlantic Bight during the spring/summer period to establish an appropriate data base for estimating the adult spawning biomass of bluefish, a popular recreational species thought to be at a record high level of abundance. Abundance estimates of sand lance larvae in 1984 were nearly double the highest level recorded during the past seven years, a period when we observed a 50-fold increase in adult spawning biomass, but the once productive spawning beds of Atlantic herring on Georges Bank remained largely barren.

The first MARMAP data base, NEFC scientists have concluded that the major source of interannual variability in the abundance of fish stocks results from heavy fishing mortality and predation of post larval and juvenile stages.

c) Benthic and Environmental Quality Studies. (shelf from Hatteras-Canada) Semiannual sampling of sediments and benthic macrofauna was continued at 25 stations on the Northeast shelf, as part of the Northeast Monitoring Program. An intensive annual survey of the New York Bight was also completed. Long term (6-10 yr) data indicate the benthos of both the Bight and the entire shelf has generally been stable over time.

A manuscript was completed on effects of waste dumping in the New York Bight Apex on biomass and production of benthic macrofauna, including species commonly eaten by fish and lobsters. Except for a samll area near the sewage sludge dumpsite, biomass and estimated production were not reduced, but perhaps enhanced. This leads to the problem of this persistent biomass as a source of contaminants for predators.

A history of the Raritan Bay (NJ) oyster industry was compiled. The report describes the depletion of the natural beds following the heavy harvesting that started in the early 1700's. By 1825, a major industry based on transplanted seed oysters had begun. The industry had essentially died by 1925, after increasing pollution lead to typhoid outbreaks. Man's other adverse impacts included siltation, dredging and increased salinities, but the Bay could again support an oyster industry if pollution were reduced.

A report was issued on biomass and density of macrobenthic invertabrates in relation to environmental factors on the continental shelf off Martha's Vineyard, Massachusetts.

The Federal Survey of PCBs in Bluefish was initiated. This congressionally mandated interagency research program is being conducted to determine the nature and scope of the problem and any associated public health risks. To date, an interagency oversight committee has been formed, a sample strategy statistically formulated based on the life history of the bluefish as well as the historical levels of PCBs found in the species; and collection, biological sampling, and disseminaiton protocols established.

d) Pathobiology Studies. Isolated and identified a pathogenic bacterium which adversely affects development of clam and oyster embryos in a commercial Long Island clam hatchery. The microbe is unusual in that it is a nonmotile Vibrio sp. capable of surviving a 30-minute exposure to 65°C.

A field study comparing a Stratford and a New Haven (Connecticut) shellfish bed has shown that oyster shells possess bacteria that cause significant mortality in oyster larvae. Twice as many disease-causing organisms were collected at Stratford than at New Haven. Four of the seven pathogens isolated were identified as Vibrio.

Ozone gas disinfection has been found to eliminate three disease-producing shellfish pathogens at doses between 0.65 and 1.4 mg/liter of dissolved ozone. In some instances, bacteria surviving these and higher doses showed morphological changes via mutation.

A cooperative project between NMFS and Fairfield University has shown that the PSP toxin from shellfish extracts can be identified by chemical methods as well as by mouse bioassay.

Identification of pathogenic bacteria by their biochemical reactions is a useful step in tracing the source of disease in marine animals. A computer program was developed which uses biochemical similarity levels to sort bacteria and can match an unknown bacterium with its nearest relative. The program is expected to increase speed and reliability in recognizing pathogens of marine animals.

Monoclonal Antibodies were used to detect Neoplastic Cell Disease in Soft Shell Clams (Mya arenaria). Two cell fusion experiments have been conducted, fusing b-cells from mice immunized with haemocytes taken from clams with Neoplastic Cell Disease with mouse myeloma cells. Over 150 hybridoma cells were then screened for presence of monoclonal antibody reactive with clam sarcoma cells. Thus far, we have isolated one stable hybridoma cell line which secretes a IgM antibody reactive with haemocytes taken from clams previously diagnosed as having Neoplastic Cell Disease. An additional series of cell fusion experiments is in progress to derive additional monoclonal antibodies which recognize additional antigenic determinants on the clam sarcoma cells.

2. Fish Biology Studies

a) Age/Growth. About 50,500 final age determinations were completed for 19 species of finfish and shellfish. An age determination and validation study was completed for black sea bass which compared growth patterns observed on otoliths, spine sections, and scales. Studies of otolith pattern recognition of larval and young-of-the-year winter flounder were conducted.

b) Stock Definition. Stock discrimination studies are being conducted on Atlantic herring in cooperation with the University of Massachusetts using morphometric and electrophoretic techniques. Methods of stock identification of Atlantic salmon and striped bass were

evaluated by the University of Rhode Island under contract to the NEFC. Support was provided by the NEFC to the Atlantic salmon tagging program conducted by the Maine Sea Run Salmon Commission and the United States Fish and Wildlife Service. A stock discrimination study of silver hake was completed which used morphometric data subjected to discriminant function analysis. An automatic optical Fourier transfer analysis was completed which compared haddock scales from two geographic areas.

c) Population Studies. A report was prepared for Congress which evaluated a coastwide management plan for striped bass in terms of its capability to conserve and restore the migratory stocks along the Atlantic coast. Pollock growth data for 1970-84 were analyzed to detect possible differences among years and between sexes. Maturity data for pollock for 1977-83 were examined and maturity ogives constructed for each sex. New CPUE indices were developed for pollock for 1964-83.

d) Research Vessel Surveys. The NEFC conducted routine spring and autumn bottom trawl surveys from Cape Fear, South Carolina to Nova Scotia during February-April and September-November, respectively, and a sea scallop dredge survey and a surf clam/ocean quahog dredge survey during July and August. In addition, the NEFC conducted a trawl and hydroacoustic survey for Atlantic herring and Atlantic mackerel during March-April from southern New England to the Bay of Fundy. A trawl survey for herring and mackerel was conducted during March-April from southern New England to Georges Bank aboard the R/V WIECZNO in cooperation with the Polish Sea Fisheries Institute.. A research fishery for mackerel was conducted during January-April from Cape Hatteras to Georges Bank in cooperation with Poland using two factory trawlers (ADMIRAL ARCISZEWSKI and KNIAZIK). A trawl survey for northern shrimp was conducted in August in the western Gulf of Maine in cooperation with the States of Maine, New Hampshire, and Massachusetts.

A series of juvenile gadoid surveys on Georges Bank was conducted in 1984 covering the period June through November. In June the bank was surveyed with the 10m MOCNESS trawl and vertical distribution of juvenile (o-group) haddock and cod was determined in several aggregations. From August to November a series of fine cruises was conducted with bottom trawls to document the demersal distribution of juveniles on Georges Bank; the only significant aggregation of o-group gadoids during this period was on northeast Georges. Midwater sampling was also done in August with an IGYPT trawl (on loan from Canada) and a Boothbay Depressor trawl; virtually no juvenile gadoids were taken in midwater during August.

e) Food habits. Approximately 20,000 fish were sampled for food studies. Primary species sampled were silver hake, spiny dogfish, Atlantic cod, yellowtail and winter flounder, and Atlantic makerel and herring. Spiny dogfish were feeding intensively on Atlantic mackerel and American sand lance during 1984.

Reports on the diet of spiny dogfish, Atlantic mackerel, American sand lance, and a summary of seventeen species were completed.

A preliminary study was conducted to determine if the isoelectric focusing technique could be used to identify the species of partially digested prey taken from stomach content samples of various predators. It was found that isoelectric focusing could resolve digestion resistant proteins into a protein pattern characteristic of the

species. This preliminary work has shown that isoelectric focusing can biochemically identify prey species which have been digested past the point of reliable visual identification and thus enable scientists to make more precise estimates of prey species mortality.

3. Gear and Selectivity Studies.

A study to investigate the differences in selectivity and catch rates of NEFC standardized survey scallop dredges, rigged with and without rockchains, was conducted during August 26-31, 1984 aboard R/V ALBATROSS IV.

An experiment to evaluate the effects of the use of different trawl doors on the performance and catch rates of NEFC standardized survey bottom trawls, was conducted during October 5-26, 1984 aboard R/V DELAWARE II, and during November 3-9, 1984 aboard R/V ALBATROSS IV.

A study to investigate the effects on selectivity and catch rates of two NEFC survey bottom trawls one rigged with a roller sweep, and the other rigged with a rubber disk covered chain sweep, was conducted during February 13-17, 1985 and April 15-19, 1985 aboard R/V ALBATROSS IV.