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by

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A. Status of the Fisheries

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.

Subarea 4

1. Haddock

USA landings from Subarea 4 totaled 480 mt in 1983, compared to 852 mt in 1982.

2. Atlantic cod

USA landings were 287 mt in 1983, a 22% increase from 1982. All landings were from Div. 4X.

3. Redfish

USA landings decreased 50% from 1,611 mt in 1982 to 810 mt in 1983. Landings have averaged less than 1,000 mt annually since 1978 when USA vessels were excluded from waters claimed by Canada. Recent landings have originated from the unclaimed region of Div. 4X north of Georges Bank. The strong 1971 year class has dominated recent landings.

4. Pollock

USA landings from Subarea 4 increased 100% from 265 mt in 1982 to 532 mt in 1983. Landings since 1979 have averaged about 500 mt per year.

Subarea 5

1. Haddock

USA landings from Subarea 5 declined from 18,271 mt in 1982 to 14,285 mt in 1983.

USA landings from the Georges Bank fishery were 8,669 mt in 1983 compared to 12,577 mt in 1982. High fishing

mortality, the passage of the strong 1975 and 1978 year classes through the fishery, and poor 1981-83 year classes have resulted in declining landings. Stock abundance will continue to decline until recruitment improves. Landings in 1984 are expected to decline further. USA landings from the Gulf of Maine fishery remained nearly the same in 1983 (5,593 mt) as in 1982 (5,648 mt). The 1975, 1978-80, and 1982 year classes have all been moderately strong. Stock abundance appears to have declined since 1979, with fishing mortality increasing. If fishing effort and recruitment follow recent patterns, stock abundance will likely stabilize at the present level. Landings in 1984 are expected to remain at about the 1982-83 level.

2. Atlantic cod

USA commercial landings were 50,360 mt in 1983, a 4% decrease from 1982. Landings from Div. 5Z totaled 36,379 mt, a 7% decrease from 1982. Landings from Div. 5Y were 13,981 mt in 1983, a 3% increase from 1982. Commercial CPUE indices in both areas in 1983 remained at the high levels characteristic of recent years. Age composition data indicate several above-average year classes contributing to fishery yields, with the strong 1980 year class dominant in the 1983 landings.

3. Redfish

USA landings from Subarea 5 declined from 6,739 mt in 1982 to 5,214 mt in 1983 marking the fourth consecutive year of decline. The 1983 total was less than 40% of the 1977-79 average, and represented the lowest level landed since the directed fishery began in the mid-1930's. Commercial CPUE and bottom trawl survey abundance indices are currently the lowest on record. Total stock size also declined from over 500 million fish in 1969 to less than 200 million in 1980; the 1984 stock size is projected to be less than 100 million fish. The 1971 year class continued to dominate the catch. The combination of decreasing overall stock size and increased fishing effort directed towards the 1971 year class in the late 1970's produced fishing mortality rates that were 50% greater than F_{max} and three times higher than $F_{0,1}$. Recruitment prospects are expected to remain poor for the foreseeable future.

4. Pollock

USA landings from Subarea 5 declined to 14,091 and 13,439 mt in 1982 and 1983, respectively, from the 1978-81 average of 17,210 mt. Commercial CPUE indices have remained relatively steady since 1979, whereas survey catch-per-tow indices have declined since 1981. The 1979 and 1982 year classes are among the strongest observed in the fishery. Total stock biomass (Divs. 4VWX and Subarea 5) currently remains substantially above the mid-1970's level.

5. Yellowtail flounder

USA landings from Subarea 5 increased from 14,942 mt in 1981 to 31,066 mt in 1983. Commercial CPUE for the Southern New England fishery increased in 1982 to its highest level since 1968, but declined 20% in 1983. CPUE for the Georges Bank fishery remained steady in 1982-83 at the highest level observed since 1973. Discarding of small fish in 1982-83 was estimated to be as high as 30-40% (by weight) of the landed catch. Stock biomass in Southern New England in 1982-83 was the highest observed since 1972, whereas biomass on Georges Bank has been declining since 1980. Increases in landings from both areas in the last several years have been supported by a strong 1980 year class.

6. Other flounders

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USA landings of flounders other than yellowtail from Subarea 5 were nearly the same in 1983 (37,366 mt) as in 1982 (37,788 mt). The two most important species in 1983 were winter flounder (37% of total) and American plaice (35%). Landings of winter flounder remained about the same in 1983 as in 1982, whereas American plaice landings declined about 13% from 1982 to 1983. Witch flounder landings (16% of total in 1983) increased from 4,803 mt in 1982 to 5,807 mt in 1983. Summer flounder landings (8% of total in 1983) increased 15% from 1982 to 1983. Abundance of winter flounder, American plaice, and witch has declined in the last several years following relatively high levels; however, summer flounder abundance has increased.

7. Silver hake

USA commercial landings from Subarea 5 were 11,367 mt in 1983, up slightly from 11,229 mt in 1982, and continuing the steady increase since 1980. Current landings are still well below the levels reported in the mid-1970's. While recruitment in recent years has only been average, decreased fishing effort have resulted in increases in stock biomass from record low levels in the late 1970's. It is unlikely that stock biomass will undergo any major change in 1984 if landings remain at approximately the 1982-83 level.

8. Red hake

USA commercial landings from Subarea 5 were only 1,443 mt in 1983, an 8% decrease from 1982. The decrease was due primarily to a decrease in industrial catches and to a low food fish market for this species. Recruitment, which in 1980 and 1981 appears to have been above average, and decreased fishing effort has resulted in an increase in stock biomass from low levels in the mid-late 1970's. Biomass should continue to increase in 1984 if landings remain at about the 1982-83 level.

9. Atlantic herring

USA landings from Subarea 5 totaled 23,211 mt in 1983, a 28% decrease from 32,272 mt in 1982. Landings in the coastal Maine fishery declined to 18,187 mt in 1983, a 24% decline from 1982 and 62% lower than in 1981. The decline in landings apparently reflects both decreased abundance and decreased availability to the fixed gear fisheries. Similar declines were noted in the western Gulf of Maine adult herring fishery which decreased from a recent peak of 36,175 mt in 1980 to only 4,280 mt in 1983. Market constraints were a factor in this decline in addition to reduced abundance. No directed fishing activity has occurred on Georges Bank since the collapse of the fishery there in 1977. Herring larvae were obtained on eastern Georges Bank in 1984 for the first time since 1978, possibly indicating some recovery of the stock.

10. Atlantic mackerel

USA commercial landings from Subarea 5 increased 60% from 1,013 mt in 1982 to 1,622 mt in 1983, the highest level since 1970. Following very weak 1976, 1977, and 1979 year classes, a relatively strong 1982 year class and fairly good 1980 and 1981 year classes have resulted in about a 90% increase in spawning stock biomass from 1981 to 1984 (Subareas 2-6).

11. Butterfish

USA landings from Subarea 5 declined from a record high of 8,141 mt in 1982 to 3,581 mt in 1983. Landings in 1981 were 4,165 mt. The decrease resulted from reduced abundance of age 1 and older fish following the intensive fishery in 1982. The 1983 year class appears to be the strongest ever observed. During August-December 1983, the catching and discard of age 0 fish increased from the previous annual rate of about 10% of the landed catch to about 50%. A discard rate of 30-40% has persisted into the first half of 1984. Age 1 and older stock biomass increased about 25% from 1983 to 1984. Landings in 1984 are expected to increase to about the 1982 level.

12. Squid

USA landings of long-finned squid (Loligo pealei) from Subarea 5 increased from 2,154 mt in 1982 to a record high of 8,589 mt in 1983. This increase was due primarily to above-average availability in inshore waters in Subdiv. 5Zw. Catch-per-tow indices from the 1983 autumn research vessel trawl survey conducted by the NEFC indicated that abundance in 1984 should be at least equal to the 1967-82 average level.

USA landings of short-finned squid (<u>lllex illecebrosus</u>) from Subarea 5 were only 77 mt in 1982 and 26 mt in 1983, compared to 618 mt in 1981. This decline in landings was due to reduced abundance and availability. Catch per tow from the 1983 autumn trawl survey was well below recent levels and similar to the low levels observed prior to the increase in <u>lllex</u> abundance in the mid-1970's.

13. Sea scallops

USA landings from Subarea 5 totaled 5,480 mt (meats) in 1983, a 25% decline from 1982 and the lowest level since 1977. Div. 5Z landings (4,585 mt) declined 31%, while Div. 5Y landings (895 mt) increased 34%. Commercial CPUE indices in both areas decreased to historically low levels. Increased landings in Div. 5Y reflected substantially increased fishing effort and a redirection of effort toward inshore scallop beds along the coast of Maine.

Subarea 6

1. Atlantic cod

USA commercial landings increased 50% from 1982 to 377 mt in 1983, the largest annual yield since 1976.

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2. Yellowtail flounder

USA landings from Subarea 6 increased from 1,250 mt in 1982 to 2,000 mt in 1983. Abundance has declined sharply since 1981.

3. Other flounders

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USA landings of flounders other than yellowtail increased from 7,787 mt in 1982 to 10,428 mt in 1983. Summer flounder landings, which comprised 83% of the total in 1983, increased 38% from 1982 to 1983. Most of the remaining landings in 1983 (16%) consisted of winter flounder, which increased 20% from 1982 to 1983. Abundance of summer flounder has improved in the last several years.

4. Silver hake

USA landings from Subarea 6 were 5,473 mt in 1983, slightly more than in 1982 but 34% less than the 1979-81 average. Decreased fishing effort from distant water fleets has helped to steadily increase stock biomass from the low levels in the late 1970's. Biomass will likely continue to increase in 1984 if landings remain at about the 1983 level.

5. Red hake

USA landings were only 716 mt in 1983 compared to 762 mt in 1982. Landings have been quite low since 1980 due to decreased fishing effort as well as reduced abundance. Even though recruitment in 1980-82 was only of average strength, reduced landings have helped to slowly increase stock biomass from the very low level reached in the late 1970's.

6. Atlantic herring

USA landings in Subarea 6 were only 42 mt in 1983 compared to 53 mt in 1982.

7. Atlantic mackerel

USA commercial landings were 2,183 mt in 1983, down 6% from 2,317 mt in 1982. Landings in both years were higher than any since 1952. Stock biomass has been increasing since 1980.

8. Butterfish

USA landings increased from 742 mt in 1982 to 1,334 mt in 1983. The increase is attributed to increased effort in response to expanding markets for butterfish. As in Subarea 5, discard of age 0 fish has been high in the last several years.

9. Squid

USA landings of long-finned squid (<u>Loligo pealei</u>) increased from 3,300 mt in 1982 to a record 7,400 mt in 1983. High availability during the spring and early summer of 1983 in inshore waters as well as market demand resulted in the increase.

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USA landings of short-finned squid (<u>lllex illecebrosus</u>) increased 85% from 1982 to 1983 (9,900 mt). Joint venture fisheries accounted for 8,300 mt of the 1983 total. However, abundance indices from the 1983 autumn research vessel trawl survey are the lowest since 1973 suggesting that abundance/availability may be low in 1984.

10. Sea scallops

USA landings were 3,227 mt (meats), a 90% increase from 1982. The increased landings reflected a large increase in effort as CPUE in 1983 was only 9% higher than in 1982 and was among the lowest observed. Transfer of vessels from scallop beds on Georges Bank to Mid-Atlantic grounds resulted in the increase in effort in 1983.

- B. Special Research Studies (Subareas 4-6 inclusive)
 - 1. Environmental Studies
 - a) <u>Hydrography</u>. Physical oceanographic measurements were made on three surveys of the shelf region from Cape Hatteras to the Gulf of Maine as Part of the MARMAP program in January, June and November/December.

Four research-monitoring cruises were conducted in shelf waters of the Middle Atlantic Bight during April-September, studying the development of low dissolved oxygen concentrations in sub-pycnocline waters and the factors influencing them.

Analysis of daily coastal wind records and nearshore water temperatures revealed a functional relationship between alongshore winds and water temperature changes in the following 24 hours, during summer months off Atlantic City, New Jersey, through offshore or onshore transport of surface water (upwelling/downwelling).

Investigation of a two-year segment of phytoplankton and zooplankton data collected by continuous plankton recorders on a cross-shelf and slope transect southeast from New York Harbor entrance showed occasional occurrence of tropical or subtropical forms in the nearshore end of the Hudson Shelf Valley, apparently as a consequence of slope water and Gulf Stream water being injected into the Hudson Shelf Valley by warm core rings (Gulf Stream eddies).

A study of the Antarctic ice edge zone was conducted in cooperation with various researchers funded by the National Science Foundation as part of the AMERIEZ project. The purpose was to investigate the effect of the retreating ice edge on the water properties and biological productivity.

Analysis of earlier projects continued in a number of areas during 1983. The variations in the transport of water into the Gulf of Maine through the Northeast Channel was found to be related to the wind forcing over the Gulf of Maine as a compensation to divergence in the surface wind driven current regime. The MARMAP hydrographic data has been analyzed to describe the variability in the properties of the bottom waters of the Gulf of Maine over a six year period and to identify the processes that determine the formation of the water properties. The entrainment of shelf water by warm core Gulf Stream rings was analyzed from data in five entrainment features. The estimated rate of entrainment varied from near zero to over 1 x 10⁶ m⁸s⁻¹.

- b) <u>Plankton Studies</u>. Six plankton surveys were completed in coastal waters between Cae Hatteras, North Carolina and Cape Sable, Nova Scotia. For the seventh consecutive year sand lance, <u>Ammodytes</u> spp., larvae were themost abundant taxon. Dense concentrations of larvae occurred on Nantucket Shoals, over the shoals on Georges Bank, and over Browns Bank in February. After being at a 6-year low in the spring of 1982, Atlantic cod and haddock larvae returned to normal abundance levels on Georges Bank during the 1983 spawning season. Atlantic herring larvae were observed in samples taken over the once productive spawning beds on eastern Georges Bank for the first time since 1979. Survey information was used to derive estimates of adult spawning biomass for haddock and silver hake.
- c) <u>Benthic Studies</u>. A report on the distribution and <u>abundance of 225</u> taxonomic groups of U.S. east coast bivalve mollusks resident in the NMFS/NEFC Woods Hole Speciment Reference Collection was completed in June 1983. Area includes the continental shelf and slope from Nova Scotia to Florida.

Collection data were tabulated for 199 taxonomic groups of U.S. east coast gastropod mollusks resident in the Woods Hole Reference Collection. Data from 3,583 separate samples from 1,451 sampling sites on the continental shelf and slope between Nova Scotia and Florida are included. Report issued in September.

Collection data were tabulated for U.S. east coast cerianthids (burrowing anemones) obtained by NMFS/NEFC Woods Hole between 1955 and 1969. Data from 446 samples obtained at 378 sampling sites on the continental shelf and slope from Nova Scotia to 35°N latitude are included. Report issued in March.

2. Fish Biology Studies

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- a) <u>Age/Growth</u>. About 48,600 age determinations were completed for 18 species of finfish and shellfish. An age validation study was completed for Atlantic mackerel. An age, growth, and mortality study for little skates was completed.
- b) Stock Definition. Stock discrimination studies on Atlantic herring using morphometric and electrophoretic tehcniques are being conducted in cooperation with the University of Massachusetts. The use of parasites as natural tags is being investigated for Atlantic herring by the NEFC in cooperation with Canada and the State of Maine. Research on evaluating methods of stock identification for Atlantic salmon has been contracted by the NEFC to the University of Rhode Island and the University of Maine. Support was provided by the NEFC to the Maine Sea Run Salmon Commission for additional tagging of Atlantic salmon for estimating the proportion of high seas caught fish originating from USA rivers.
- c) Population Studies. A report was prepared for Congress summarizing four years of research under the Emergency Striped Bass Study. A study was completed evaluating environmental impacts on Atlantic herring recruitment and stock-recruitment relationships. Studies were completed on biological characteristics of Gulf of Maine sea scallops, seasonal variation in scallop meat weights, and associated management implications. Baseline data on Icelandic scallop resources was developed from NEFC bottom trawl survey results.

- d) <u>Research Vessel Surveys</u>. In addition to routine spring and autumn trawl surveys from Cape Fear, South Carolina to Nova Scotia, a winter herring trawl survey, and sea scallop and surf clam/ocean quahog dredge surveys in the summer, the NEFC participated in several other special surveys. A trawl survey for yellowtail flounder was conducted during the first week of January aboard a commercial trawler in Southern New England waters in cooperation with the State of Rhode Island and the Pt. Judith Fishermen's Cooperative. A trawl survey for Atlantic mackerel was conducted during 25 January-24 February from Cape Hatteras to Georges Bank in cooperation with the Polish Sea Fisheries Institute aboard the R/V WIECZNO. A research fishery for Atlantic mackerel was conducted during 2 February-10 May from Cape Hatteras to Georges Bank in cooperation with Poland using two commercial trawlers (ADMIRAL ARCISZEWSKI and KUNATKA). A dredge survey for surf clams and ocean quanogs was conducted in cooperation with Canada from southeastern Georges Bank to Cape Breton Island during 13-28 September. A research-trawl development study for northern shrimp was completed in cooperation with the States of Maine, New Hampshire, and Massachusetts, and a cooperative shrimp survey was initiated in the western Gulf of Maine.
- e) Food Web. Approximately 12,000 stomachs were excised for fish and squid feeding studies; they represented species such as Atlantic cod, haddock, winter flounder, spiny dogfish, silver hake and long-finned squid.
- f) Disease. The monitoring of integumental lesions and pigmentation/skeletal anomalies in commercially important bottom fishes sampled on stock assessment cruises continued. Collation and statistical evaluations of prevalence data acquired since 1979 has shown that the distribution of fin rot disease in winter flounder is discontinuous. The prevalence of the disease is higher in fishes obtained from coastal environments adjacent to large urban centers than it is in fishes from ecological uncompromised environments.
- g) Ecosystem Studies. The energy budget for Georges Bank was updated and expanded to include productionbiomass-consumption by birds, mammals and large pelagics (sharks, et.c). A report was issued on ecology of fishes of the middle Atlantic area involving effects of fishing, natural environmental factors and pollution.
- 3. Gear and Selectivity Studies. A study of codend mesh selectivity in the Long Island spring trawl fishery for summer flounder and associated species was conducted during 16 May-5 June to estimate length selection curves and evaluate the effects of using a 5 1/2-inch mesh codend in that fishery.

A gear testing cruise was conducted by the R/V DELAWARE II during 17-27 October principally to evaluate the effects on trawl performance and catches of different otter trawl doors.

A low cost data acquisition system which accepts 10 digital and 10 analogue inputs was developed for the gear research vessel GLORIA MICHELLE. Under the National Marine Fisheries Service/University of Rhode Island cooperative fisheries engineering agreement, an acoustic system was developed to measure the opening of model trawls in the URI tow tank.

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