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United States Research Report for 2001

by

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A. Status of the Fisheries (Subareas 3- 6 Inclusive)

Brief summaries are provided on the status of fisheries for major species of finfish and shellfish.

Revised sampling and reporting protocols were implemented in the Northeast Region in 1994. New auditing and allocation procedures have been developed to prorate total reported landings by species among areas.

1. Atlantic Cod

USA commercial landings of Atlantic cod (*Gadus morhua*) in 2001 were 15,003 mt, a 32% increase over 2000 landings of 11,347 mt.

USA cod landings from the Gulf of Maine (Div. 5Y) in 2001 were 4,434 mt, a 19% increase from 3,730 mt landed in 2000. Discards remain a source of substantial additional mortality on this stock due to the continuation of relatively low trip limits in 2001. Fishing mortality on this stock has remained high since the early 1980s, averaging about 1.0 between 1983 and 1997. Fishing mortality declined slightly in 1998 and has since fluctuated between 0.7 and 0.8. Spawning biomass declined from over 24,000 mt in 1990 to about 9,900 mt in 1998 but has since slowly increased. Northeast Fisheries Science Center (NEFSC) research vessel survey biomass indices have increased since the 1993 record low, but remain low compared to earlier periods (Figure 1).

USA cod landings from Georges Bank (Div. 5Z and SA 6) in 2001 were 10,569 mt, a 39% increase from 7,617 mt landed in 2000. Fishing mortality reached a record high of 1.5 in 1994 but subsequently declined to a record low of 0.22 in 2000. Spawning stock biomass was at an historical low in 1994 but has since gradually increased since due primarily to growth rather than recruitment. Since 1991, NEFSC research vessel survey biomass indices have remained near record low levels (Figure 2).

2. Haddock

USA landings of haddock (*Melanogrammus aeglefinus*) increased 46% from 4,001 mt in 2000 to 5,823 mt in 2001. Georges Bank (Div. 5Z) landings increased 50% from 3,310 mt in 2000 to 4,968 mt in 2001, while Gulf of Maine (Div. 5Y) landings increased by 24% from 691 mt in 2000 to 855 mt in 2001. Landings from both stocks remain below historical levels and continue to be constrained by management measures.

Research vessel survey biomass indices have increased in recent years for both the Gulf of Maine and Georges Bank stocks but remain below historical levels (Figures 3 and 4). Spawning stock biomass of Georges Bank haddock continued to increase in 2001 and is expected to increase further due to relatively low fishing mortality rates and recruitment of the relatively strong 1998 and 2000 year classes.

3. Redfish

USA landings of redfish (*Sebastes* spp.) increased by 13% from 319 mt in 2000 to 360 mt in 2001. Research vessel survey biomass indices increased in 1996 and have continued to remain relatively high (Figure 5). The initial increase in abundance first detected in 1996 was due to improved survival of fish from the 1991 and 1992 year classes, and stock biomass has since remained high due to growth and survival of these year classes, as well as the 1984, 1985 and 1986 cohorts

4. Pollock (4VWX + 5 stock)

USA landings of pollock (*Pollachius virens*) in 2001 were 4,106 mt, about the same as in 2000 (4,045 mt). Research vessel survey indices indicate that pollock biomass in Subarea 5 has increased in the past few years due to improved recruitment (Figure 6).

5. White Hake

USA landings of white hake (*Urophycis tenuis*) increased 15% from 2,984 mt in 2000 to 3,441 mt in 2001. Research vessel survey indices declined during 1995-1999 but increased in 2000 and 2001 due to good recruitment of the 1998 year class (Figure 7).

6. Yellowtail Flounder

USA landings of yellowtail flounder (*Limanda ferruginea*) increased 3% from 7,056 mt in 2000 to 7,256 mt in 2001. Research vessel survey indices suggest that the Georges Bank stock (Div. 5Z, E of 69E) is at a high biomass level, while the Southern New England stock (Div. 5Z, W of 69E) remains at an historic low (Figures 8 and 9).

7. Other Flounders

USA commercial landings of flounders (other than yellowtail flounder) from Subareas 3-6 in 2001 totaled 19,427 mt, 9% higher than in 2000. Summer flounder (*Paralichthys dentatus*) (25%), winter flounder (*Pseudopleuronectes americanus*) (35%), American plaice (*Hippoglossoides platessoides*) (23%) witch flounder (*Glyptocephalus cynoglossus*) (16%), and windowpane flounder (*Scophthalmus aquosus*) (1%) accounted for virtually all of the 'other flounder' landings in 2001. Compared to 2000, commercial landings in 2001 were higher for witch flounder (+24%,) winter flounder (+18%), and American plaice (+5%), but lower for summer flounder (-3%) and windowpane flounder (-35%). Research vessel survey indices in 2001 increased for summer flounder and witch flounder and remained relatively constant for American plaice, winter flounder and windowpane (Figures 10 - 14).

8. Silver hake

USA landings of silver hake (*Merluccius bilinearis*) in 2001 were 12,139 mt, almost the same as in 2000 (12,294 mt). Research vessel survey biomass indices for the Gulf of Maine - Northern Georges Bank stock varied without trend during 1990-1997, sharply increased in 1998, but have since declined (Figure 15). Survey indices for the Southern Georges Bank - Mid-Atlantic stock declined between 1989 and 1996, remained very low during 1997-2000, but markedly increased in 2001 (Figure 16).

9. Red Hake

USA landings of red hake (*Urophycis chuss*) slightly increased from 1,581 mt in 2000 to 1,604 mt in 2001. Landings have remained low since 1980. Research vessel survey biomass indices for the Gulf of Maine - Northern Georges Bank stock have increased since the early 1970s, and are presently near record-high levels (Figure 17). Indices for the Southern Georges Bank - Mid-Atlantic stock, however, continue to remain at record-low levels (Figure 18) despite low fishing mortality on the stock.

10. Atlantic herring

Total USA landings of Atlantic herring (*Clupea harengus*) increased from 103,178 mt in 2000 to 118,028 mt in 2001. Spawning biomass of the coastal stock complex has increased since 1982 and is currently well above the high levels observed in the late 1960s. Stock size has increased due to both strong recruitment and reduced fishing mortality on both adult and juvenile herring. There is strong evidence of stock recovery on Georges Bank (Div. 5Ze) based on research vessel trawl catches. Commercial landings from Georges Bank increased from 12,884 mt in 2000 to 34,510 mt in 2001. Hydroacoustic surveys of the Georges Bank component during autumn 1999-2001 indicate that biomass is high.

11. Atlantic Mackerel

USA commercial landings of Atlantic mackerel (*Scomber scombrus*) increased from 5,645 mt in 2000 to 11,521 mt in 2001. Total stock biomass remains very high. Stock rebuilding since 1981 has resulted from very low fishing mortality rates and the recruitment of several good year classes (1982, 1987, 1988, 1991, and most year classes from 1993 to present).

12. Butterfish

USA landings of butterfish (*Peprilus triacanthus*) increased from 1,422 mt in 2000 to 4,140 mt in 2001. Research vessel survey biomass indices increased during the late 1970s, fluctuated during the 1980s, and are presently at the long-term average.

13. Squids

USA landings of northern shortfin squid (*Illex illecebrosus*) in 2001 were 3,939 mt, 56% less than in 2000, and the second lowest annual harvest since 1970. The autumn 2001 survey abundance index was the second lowest since 1986 (Figure 19).

USA landings of longfin inshore squid (*Loligo pealii*) on 2001 were nearly 18,000 mt, 6% greater than in 2000 (16,976 mt). The autumn 2001 survey abundance index (corrected for diel changes in catchability) was the second highest on record. (Figure 20).

14. Sea Scallops

USA sea scallop (*Placopecten magellanicus*) landings in 2001 were a record-high 20,817 mt (meats), 44% greater than the previous record-high attained in 2000 (14,478 mt). The bulk of the 2001 landings (75% or 15,646 mt) was harvested from the Mid-Atlantic region where landings reached record levels for the second consecutive year. About 21% of the Mid-Atlantic landings in 2001 came from two areas that were reopened to fishing after a three year closure.

Research vessel surveys in 2001 indicated continued high biomass levels in both the Georges Bank and Mid-Atlantic regions (Figures 21 and 22). Much of the scallop biomass is located in the two groundfish closed areas on Georges Bank, and in the two Mid-Atlantic areas that were closed to scalloping from April 1998 to April 2001. However, increases in biomass outside the these areas have also been observed. Recruitment in both Georges Bank and Mid-Atlantic areas in 2001 was above average.

B. Special Research Studies

1. Environmental Studies

a) Hydrographic Studies

During 2001 more than 1900 CTD (conductivity, temperature, depth) profiles were made on NEFSC cruises. These data have been processed and made available via an anonymous FTP site. A report on the oceanographic conditions in 2001 is in review and expected to be released by mid-2002. Similar reports

have been issued each year since 1991 including the report for 2000 that was issued in early 2001 (see http://www.nefsc.nmfs.gov/nefsc/publications/crd/crd0208/)

b) Plankton Studies

The Georges Bank GLOBEC program has begun a synthesis phase in which results from the various components of the program will be integrated to provide a greater understanding of how environmental variability influences the Bank=s ecosystem, particularly the plankton populations. A number of studies are underway focusing on both the zooplankton populations and the early life stages of the cod and haddock stocks on Georges Bank. The synthesis effort is scheduled to continue for four years. Laboratory studies have been completed evaluating the growth, metabolism, and growth efficiency of larval and juvenile cod and haddock at different temperatures and the results reported in a Ph.D. dissertation.

c) Benthic Studies

The NEFSC=s James J. Howard and Woods Hole laboratories, in cooperation with the US Geological Survey, continued studies to describe habitats and determine habitat effects of mobile fishing gears in New England waters. A June 2001 cruise concentrated on assessing recovery of several areas that had been closed to groundfishing and scalloping for 4.5 years, and then opened on a limited time/area basis to scallop fishing. Data collected on the June cruise was also used to demarcate the boundary between mobile and stable sand environments on Georges Bank and to identify habitat relationships of various species. In October-November 200, studies were initiated of habitat types and gear effects in the Middle Atlantic region. Otter trawl tows, benthic grab samples, side-scan sonar and photography were used to examine habitats of tilefish and associated species in 100-200 m depths near Hudson Canyon (off New Jersey). Manuscripts on several aspects of these habitat/gear effect studies are being prepared for presentation at an international symposium on gear effects to be held in Tampa FL in November 2002. Benthic research was also conducted in local estuaries, and included studies: (1) monitoring success of an effort to restore an oyster (*Crassostrea virginica)* reef; (2) characterizing habitats and predators of hard clams (*Mercenaria mercenaria*); and (3) determining effects of hand raking for hard clams on their habitats and recruitment.

d) Other Environmental Studies

Habitat Relations of Estuarine Species: The Navesink River/Sandy Hook Bay estuarine system in New Jersey serves as a nursery ground for important coastal species such as winter flounder, summer flounder, and blue crabs. In 2001, studies were conducted to identify habitat associations of estuarine species and investigate habitat effects on survival. Shallow water habitats are thought to serve as important refugia from predators for young fishes, but this has rarely been tested in the field. To evaluate this, tethering devices were used to measure predator encounter rates for young-of-the-year winter flounder (30-50mm SL) during the morning crepuscular period in paired shallow (<0.5 m) and deep habitats (>1.5 m) less than 30 m apart in the Navesink River. Survivorship and survival times of tethered flounder were significantly higher in shallow habitats than in adjacent deep water areas, but did not vary with tide stage. Potentially important predators including summer flounder were more abundant in deep water trammel-net collections, and mortality for tethered fish was positively correlated with predator abundance. The study findings indicate that shallow water areas serve as predator refugia for small fishes and that shoreline alterations that eliminate shallow water habitats may reduce survivorship of young-of-the-year winter flounder.

In another study, the role of sediment grain size in habitat selection by young winter flounder was investigated. A synoptic field survey of winter flounder and sediments in the Navesink River/Sandy Hook Bay estuarine system indicated that winter flounder distribution was related to sediment grain size. Results from a generalized additive model indicated that small winter flounder (<50 mm SL) had a higher probability of capture on sediments having a mean grain size < 0.5 mm, while larger young-of-the-year fish were more commonly taken on sediments with a grain-size near 1.0 mm. In laboratory studies, the same sediment grain size /winter flounder size relationship was observed. In the laboratory work, the presence of live prey was found to over-ride the sediment preference of winter flounder (50-68 mm SL).

2. Biological Studies

a) Fish Species

Flatfish: Laboratory experiments evaluating growth rates of newly settled winter flounder revealed that under constant temperature conditions, growth of late settlers can differs from earlier settlers. In 2001, a study was initiated to assess the effect of food quality on the growth of newly settled winter flounder in central New Jersey estuaries.

In another study involving young-of-year winter flounder, growth rates were evaluated with respect to dissolved oxygen concentrations to assess the impacts of hypoxic conditions (which are becoming more frequent in urban estuaries). The laboratory results showed that the young-of-year fish moved to more oxygenated water when dissolved oxygen concentrations declined to about 100 µM (3.2 mg/L). At oxygen concentrations between 100 µM and at least 160 µM, fish did not move to more oxygenated waters even though their growth was impaired.

Studies continued on summer flounder, *Paralichthys dentatus*, with the objective of evaluating the effects of temperature on growth, development, and mortality of eggs, larvae, and juveniles. Experiments have been conducted to evaluate the role of time and location of spawning, and to characterize the thermal environments experienced by eggs and larvae. Mortality risks of recently settled juvenile flatfish have also been evaluated, using winter flounder and summer flounder as prey and bay shrimp, *Crangon septemspinosa*, blue crab, *Calinectes sapidus*, and summer flounder as predators. Size-specific risk of predation was estimated for various sizes of prey and predators.

Bluefish: Seasonal patterns in the spatial distributions of pelagic fishes within the Navesink River/Sandy Hook Bay estuary were investigated using multi-panel gillnets fished bi-weekly at 13 fixed stations during May-November of 1998 and 1999. During both years, juvenile (age-0 and age-1+) bluefish were the most abundant piscivores captured and Atlantic menhaden was the most abundant species captured.

Gadids: Research efforts continued on evaluating ontogenetic rates, habitat use, and the effects of contaminants (PCBs) on a locally abundant inshore gadid, Atlantic tomcod (*Microgadus tomcod*). Tomcod is of local interest because: (1) it serves as a sentry of habitat and fish community health; (2) it is an important forage fish in the estuarine systems in the New Jersey and New York area; and (3) it reaches reproductive maturity within 1 year in New Jersey-New York waters and thus can readily be used in modeling gadid ecology and life history. In the laboratory, large numbers of tomcod have been successfully reared from egg to reproductive maturation within 11 months.

Goosefish: Research on goosefish, *Lophius americanus*, is proceeding along three lines. First, in collaboration with local commercial fishermen, adult goosefish have been collected and processed on a monthly basis during May -August and November-February. Data have been obtained on age, gender and length; weights of body (gutted), liver, and gonads; reproductive status; and prey consumed. Seasonal and inter-annual patterns of variation in body components are being evaluated with emphasis on the inverse relationship between gonad size (reproductive effort) and liver size in the previous year. Second, growth, development, and survival of the early life stages are being assessed in the laboratory. Commercial fishermen are providing egg veil fragments that are used as a source of hatching larvae. Third, the behavior (movement, feeding, and spawning) of live adult goosefish is being monitored in the laboratory.

Lobsters: In both 1998 and 1999, significant mortalities of lobsters occurred in western Long Island Sound (LIS), and an increasing prevalence of shell disease was also reported in lobsters from eastern LIS. The environmental causes of these conditions are unknown. These problems were reviewed at a Long Island Sound Lobster Health Symposium in April 2000 and work plans were developed to address research needs. Two of the seven objectives recommended in the Pathology/Toxicology Section of the LIS Lobster Work Plan are: (1) conduct controlled laboratory studies to determine whether known environmental stressors can increase susceptibility to microbial pathogens, and (2) develop tools/indices to define immunological, reproductive, and metabolic health in lobsters. A project now underway at the NEFSC Milford and James J. Howard Laboratories directly addresses these objectives. The study examines the effects of four interrelated habitat quality variables (hypoxia, sulfide, ammonia, and temperature) in

reducing the resistance of lobsters to bacterial diseases caused by *Aerococcus viridans* var homari and *Vibrio pluvialis*. Also being examined are the effects of the four variables on several immunological indices in lobster (phagocytosis, cell cytotoxicity, serum bactericidal capacity, and serum bacterial agglutinins). The four habitat quality variables are associated with cultural eutrophication, which is intense in the western portion of LIS. Individually, each variable has the potential to cause mortality directly and, at sublethal concentrations, the variables are thought to increase the susceptibility of lobsters to microbial infections through immune system suppression.

Field experiments are underway (the first year completed in 2001) to evaluate lobster health in relation to ambient water and sediment quality conditions in Long Island Sound. Also being investigated is whether Mn accumulation in LIS lobster gills can be used as an indicator of exposure to natural biogeochemicals, such as hydrogen sulfide and ammonia.

b) Age and Growth

Approximately 46,650 age determinations were completed in 2001 by Woods Hole Laboratory staff for 13 species of finfish in support of resource assessment analyses and other research. In addition to Atlantic cod (6,964), haddock (2,666), and yellowtail flounder (5,777), 7,957 summer flounder, 5,630 silver hake, 4,071 white hake, 2,875 monkfish, and 4,180 redfish were aged.
Cod, haddock, and yellowtail flounder age structures were exchanged with Canadian age readers, and aging materials for Atlantic herring, winter flounder, and scup were exchanged with readers from USA state laboratories in a continuing effort to maintain comparability of age determinations between laboratories. A workshop on the aging of winter flounder was held in Woods Hole, MA involving federal, state, and Canadian scientists.

Research projects initiated or continued in 2001 included: (1) a monkfish age validation study ; (2) a juvenile monkfish growth study conducted in collaboration with Rutgers University; (3) a cunner age verification study; and (4) a study of the biology of witch flounder in deep water habitats.

c) Food Web Dynamics

The NEFSC continued studies of trophic dynamics based on an integrated program of long-term (since 1963) monitoring and process-oriented predation studies. Modeling and analytical efforts focused on species interactions among flatfish, elasmobranchs, larval gadids, and principal pelagics. Food habits samples were collected during NEFSC winter, spring, and autumn surveys on the northeastern and Mid-Atlantic continental shelf. Estimates of prey volume and composition were made at sea for selected species. During the winter survey, 4,625 stomachs from 44 species were examined, while 5,986 stomachs from 49 species, and 6,234 stomachs from 47 species were examined during the spring and autumn surveys, respectively. Diet sampling emphasized small pelagics, elasmobranchs, gadids, flatfishes, and lesser known species.

Revisions to the 28 year time series (1973-2000) of food habits data collected during NEFSC bottom trawl surveys continued. The majority of the time series is now available for analysis, including data from over 300,000 stomach samples. The processing of the 2000 and 2001 bottom trawl survey food habits data is scheduled for completion in 2002.

d) Apex Predators Program

Apex Predators research focused on determining migration patterns, age and growth, feeding ecology, and reproductive biology of highly migratory species, particularly large Atlantic sharks. The Cooperative Shark Tagging Program (CSTP) conducted since 1962 and involving over 6,500 volunteer recreational and commercial fishermen, scientists and fisheries observers continued to tag large coastal and pelagic sharks and provided information to define essential fish habitat for shark species in US waters in 2001.

A cooperative US/Canada research program on the biology of the porbeagle shark, *Lamna nasus*, continued in 2001. A published paper (Fish. Bull. 100: 266-278) on the validated age and growth of the porbeagle shark in the western North Atlantic Ocean resulted from this research). Two other manuscripts on the

population dynamics and the reproduction of the porbeagle were completed and accepted for publication. In addition, porbeagle tagging and recapture data were quality controlled and preliminary analysis was begun on information from US, Canadian, and Norwegian sources.

Reproductive dynamics and nursery ground studies also continued, focusing on the identification and characterization of mating, pupping, and nursery areas of small and large coastal sharks along the Atlantic coast of the US. Studies in 2001 included : (1) conducting a stratified random sampling design based on depth and geographic location to estimate the abundance of neonate and juvenile sandbar sharks in their pupping grounds in Delaware Bay; (2) a post-release survivorship study; and (3) in conjunction with biologists from five U.S. coastal states, the mapping and collection of baseline catch and relative abundance data for shark species utilizing the coastal zone.

e) Marine Mammals

Small Cetaceans: Since 1992, the Northeast Fisheries Science Center has chartered the R/V *Abel-J* to conduct ship-based harbor porpoise and pelagic cetacean abundance surveys. In 2001 the vessel was sold and is no longer available for charter. In July 2001 the NEFSC Protected Species Branch (PSB) conducted a small cetacean survey in the Gulf of Maine to evaluate the NOAA *R/V Delaware II* as a suitable platform to conduct future line transect abundance surveys. Concomitantly, a NOAA Twin Otter airplane was used to conduct replicate aerial surveys along the same track lines. Inter-platform comparisons between the NOAA aircraft and the *R/V Abel-J* had been conducted in prior years. The *R/V Delaware II* survey was also used to evaluate the feasibility of conducting a passive acoustic survey conducted in association with the visual sighting survey. Although the vessel evaluation indicated that the *R/V Delaware II* was not an optimal platform to replace the *R/V Abel-J*, the *R/V Delaware II* was deemed to be a useful platform for conducting acoustic surveys in both coastal waters (at medium speeds) and in deep waters (at full speed). The acoustic and visual data from the July 2001 cruise are still being analyzed.

Processing was completed of common dolphin and Atlantic spotted dolphin stomachs obtained from incidentally caught animals, and the results are expected to be published in 2002.

Large Cetaceans: During April-July 2001, the NEFSC and the NMFS Northeast Regional Office (NERO) conducted aerial sighting surveys for right whales in the Great South Channel, Gulf of Maine, and Georges Bank areas. In August, the NEFSC conducted aerial surveys in the Bay of Fundy to obtain photogrammetric length measurements for use in determining health and condition of individual whales.

The NEFSC conducted a six week research cruise in the Bay of Fundy during summer July-August 2001 to continue studies of right whale habitat.

Scarification analyses of right and humpback whales continued in 2001. These analyses are useful in monitoring interactions between whales and fishing gear.

The North Atlantic Right Whale Individual ID catalogue and database (NE Aquarium and URI) were updated through December 2001.

Scientists at the Woods Hole Oceanographic Institute continued to investigate the reactions of right whales to ships. Acoustic tags were used to record acoustical stimuli and to archive data on dive behavior and water column orientation of right whales. Preliminary study results indicate that right whales show little reaction to vessels as close as 100m.

Pinnipeds: In spring 2001, staff from the NEFSC and the University of Maine conducted a cooperative field program to live capture and radio tag harbor seals (*Phoca vitulina*) off the coasts of Chatham, Massachusetts and Rockland, Maine. A total of 39 seals were captured and 29 were double tagged (one radio tag was mounted on a flipper tag and a second was glued to mid back). The primary goal of the tagging work was to obtain a sighting correction factor for the coastwide (New Hampshire to Canada) aerial abundance survey conducted during the harbor seal pupping season (mid-May to early June 2001). Two aircraft were used to survey the entire area twice, and high density areas were surveyed three times. A

third aircraft was used to track the radio tagged animals. The survey results should be available during summer 2002.

The University of Maine initiated a multi-year research project to evaluate harbor seal impacts at a salmon aquaculture site in eastern Maine. Project goals include: (1) documenting the frequency and pattern of harbor seal depredations at pen sites; (2) determining whether the frequency, pattern and extent of seal depredations are related to the number of seals at nearby haul out sites; and (3) determining whether repeated depredations at a site are the result of the same seal or different seals.

f) Marine Turtles

The NEFSC and the NMFS Northeast Regional Office (NERO) developed a monitoring plan to obtain information on annual sea turtle mortalities in Virginia state waters. Pound net leaders were identified as a significant factor affecting turtle mortalities.

NEFSC staff continued involvement in pelagic longline fishing experiments on the Grand Banks, including the development of a satellite telemetry project to investigate movements and behavior of loggerhead turtles (*Caretta caretta*) on the Grand Banks. NEFSC and NERO staff developed leatherback disentanglement guidelines and equipment in cooperation with large whale disentanglement experts. Implementation of these guidelines should reduce turtle mortalities in fixed gear fished in New England waters.

Over 300 turtle biopsy samples were collected from the Northeast Region Sea Turtle Stranding and Salvage Network. These samples will be sent for genetic analysis to the NMFS National Sea Turtle Molecular Genetics Center at the Southwest Fisheries Science Center in La Jolla, California.

g) Fish Culture

The NEFSC finfish culture group at the Milford Laboratory successfully conditioned tautog and black sea bass, out of season, through manipulation of light and temperature. Tautog spawned in mid-March, three months ahead of the normal spawning season and black sea bass were in ripe condition in late- March, ready for injection with egg releasing hormone (LHRH). The black sea bass spawned in May 2001 continue to grow well, averaging 7.7mm of growth every two weeks (8.09g /2 weeks)

3. Studies of Fishing Operations

The NEFSC operated an Observer Program that placed fisheries observers on fishing vessels in 12 different categories of fisheries in 2001. All of these fisheries operated in NAFO Subareas 5 and/or 6.

a) New England and Mid-Atlantic Sink Anchored Gillnet Fisheries

The NEFSC deployed observers on 1,044 commercial fishing trips totaling 1,084 days in the New England and Mid-Atlantic gillnet fisheries. Primary objectives were to monitor the incidental bycatch of harbor porpoise and bottlenose dolphin in these fisheries, as well as to monitor the incidental capture of sea turtles. A total of 40 marine mammals were caught, including (in order of highest occurrence) harbor seals, unidentified seals, harbor porpoise, bottlenose dolphin, grey seal, harp seal, whitesided dolphin and unknown dolphin *spp*. From many of the animals, biological samples were collected including body weight measurements, tissue samples, and/or samples of the entire animal. Four loggerhead sea turtles were also caught in the gillnet fisheries. A total of 49 seabirds were also caught, with loons (35), northern gannets (4), sooty shearwater (3) and cormorants (3) the dominant birds taken.

b) Float Drift Gillnet Fisheries

The closure of the pelagic swordfish drift gillnet fishery continued in 2001. Thirteen days were observed in 2001on coastal drift gillnet vessels targeting other species. Kept and discarded finfish were weighed or estimated for a portion of the observed sets. Length frequencies and age structures were also obtained from the finfish. No protected or endangered species were reported taken in this fishery.

c) Otter Trawl Fisheries

A total of 330 trips were made in 2001 totaling 835 days. Kept and discarded catches were weighed or estimated. Length frequencies and age structures were obtained for age and growth studies. In 2001, eight marine mammals and two turtles (one leatherback; one loggerhead) were incidentally caught in the otter trawl fisheries. The marine mammals were harp seals, common dolphin, whitesided dolphin, pilot whale, and harbor porpoise. There were also six seabird taken (four gulls and two northern gannets).

d) Sea Scallop Dredge Fisheries

In 2001, sea scallop fisheries were observed in two forms - the traditional sea scallop fishery and the closed area scallop fishery. Only 4 trips (comprising a total of 52 days) were observed in the traditional fishery. No incidental catches of any protected species were recorded during these trips, although four seabirds were taken (two greater shearwaters and two gulls).

In the closed area scallop fishery, 105 trips were observed (comprising 1,029 sea days). In this fishery, 13 turtles were taken; two were identified as loggerheads and the other 11 as unknowns (the closed area scallop observers were not trained in turtle identification and hence without photographic evidence the animals remain unidentified). There was only a single take of a seabird, a greater shearwater.

In both fisheries, the scallop catches were measured and weighed. The finfish bycatch was also weighed, and length frequencies and age structure data collected for a portion of the hauls.

e) Purse Seine Fishery

Four trips were observed on purse seine vessels totaling 19 days. Kept and discarded catches were weighed or estimated for a portion of the hauls. Individual weights and measurements were collected from the targeted bluefin tuna. No protected or endangered species takes were observed in this fishery.

f) Scottish Seine Fishery

Observers covered six days in the Scottish seine fishery in 2001. Kept and discarded finfish were weighed or estimated for a portion of the observed set. Length frequencies and age structures from the finfish catch were also obtained. No protected or endangered species takes were observed in this fishery.

g) Sink Drift Gillnet

NEFSC observers covered 185 days on 143 trips in 2001. Thirteen marine mammals were taken in these trips (11 harbor seals, one hooded seal, and one grey seal). Kept and discarded finfish were weighed or estimated for a portion of the observed sets. Length frequencies and age structures were also obtained from the finfish catch. One seabird was taken in the fishery, a greater shearwater.

h) Shrimp Trawl

Three days were covered in the shrimp trawl fishery in 2001. No protected or endangered species takes were observed in the fishery. Shrimp catch was weighed or estimated, and the finfish bycatches were weighed and measured and length frequencies and age structure data collected.

i) Midwater Otter Trawl

One trip (three days in duration) was observed in 2001. Kept and discarded finfish were weighed or estimated for a portion of the observed sets. Length frequencies and age structures were also obtained from the finfish catch. No protected or endangered species takes were observed in the fishery.

j) Troll Fishery

One trip (comprising one day) was observed in 2001. Kept and discarded finfish were weighed or estimated for a portion of the observed sets. Length frequencies and age structures were also obtained from the finfish catch. No protected or endangered species takes were observed in the fishery.

k) Clam Dredge Fishery

One trip (comprising one day) was observed in 2001. Kept and discarded finfish were weighed or estimated for a portion of the observed sets. Length frequencies and age structures were also obtained from the finfish catch. No protected or endangered species takes were observed in the fishery.

l) Float Anchored Gillnet

Ten trips (comprising a total of 10 days) were observed in 2001. Kept and discarded finfish were weighed or estimated for a portion of the observed sets. Length frequencies and age structures were also obtained. No protected or endangered species were reported taken in this fishery. However, 20 seabirds were taken (19 loons and one cormorant).

4. Population Dynamic Research

Population dynamics research conducted within the Northeast Fisheries Science Center supports a number of domestic and international fisheries management authorities. Within the United States northeast region, management plans are developed by the New England (states of Maine through Connecticut) and Mid-Atlantic (New York through North Carolina) Fishery Management Councils, and the Atlantic States Marine Fisheries Commission (ASMFC, primarily for species located within 3 n miles of the coast). There are about three dozen managed species; most require annual updates of stock status as a basis for fishery management. Stock assessments are routinely reviewed in a domestic peer review process termed the Stock Assessment Workshop (SAW). Two such workshops are conducted annually, with the focus of the workshops being the review of Abenchmark@ assessments (*e.g.*, those using new analytical approaches, or for species that have never been assessed quantitatively or for which peer reviewed assessments have not occurred for several years). The SAW reviews about 10 stock assessments each year. However, not all assessments conducted by the NEFSC are vetted at the SAW. Some are reviewed in international fora (*e.g.*, US/Canada Transboundary Resources Assessment Committee; ICES; etc), while others are vetted in regional bodies (*e.g.*, ASMFC science boards; Management Council Plan Development Teams, etc).

Apart from stock assessment research for management purposes, population dynamics research in 2001 focused on a number of other management and scientific issues. Three such areas are highlighted:

a) Atlantic Salmon Research

Eight rivers in Maine possess wild-run populations of Atlantic salmon that have been declared endangered under the USA Endangered Species Act (ESA). In 2001, research was focused on quantifying sources of mortality of various life stages of salmon. NASCO (North Atlantic Salmon Conservation Organization) related activities included participation in stock assessment activities, monitoring of catches of migratory salmon at Greenland, development of data indexing of smolt production, and enumeration of spawner returns to various rivers. Research projects in fresh water and near coastal environments included evaluating methods for determining stage-specific mortality rates in order to identify the factors responsible for low and declining return rates of adults. A significant achievement in 2001 was the successful development and deployment of a pair-trawl system to sample post-smolts in the marine environment. This trawling system was deployed off Penobscot Bay, Maine in May 2001 and sampled smolts during their seaward migration. Numerous other research projects were developed in 2001 to further evaluate mortality rates and the effects of various stocking and rehabilitation measures.

b) Cooperative Research with the Fishing Industry

An increasingly important component of fisheries research in the northeast USA involves projects jointly conducted with the fishing industry. These include collaborative surveys, enhanced fishery-dependent data collection, and acquisition of biological and economic data. During February-April 2001, a major cooperative industry-based research survey was conducted for monkfish (*Lophius americanus*) using commercial monkfish trawlers. Data derived from the survey provided new information on age, growth, maturity and food habits of monkfish , and allowed the derivation of swept-area population abundance estimates. As well, the survey provided new distributional data on the relatively rare congeneric species *Lophius gastrophysus* (blackfin monkfish). Additional collaborative research with the fishing industry will include industry-based surveys of cod and yellowtail flounder, tagging programs for cod and other species, and the development of long-term study fleets for enhanced fishery-dependent information.

c) Stock Assessment Methods Development

A continuing activity supported by NEFSC is the development and distribution of stock assessment methods and tested software to support assessments. As part of a NMFS-wide effort to improve and disseminate stock assessment tools, the NEFSC has been refining the Fisheries Assessment Computational Toolbox (FACT). FACT is used as a standard package for age-based VPA, yield per recruit and forecasting, and employs modules of standard assessment packages operating under a visual BASIC shell. During 2001 a number of enhancements were added to the FACT software, and new modules are under development, including forward-projection assessment methods, age-based production methods and size-based applications.

ACKNOWLEDGMENTS

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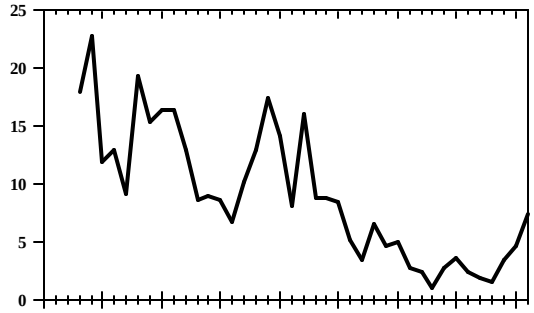

Figure 1. NEFSC autumn bottom trawl survey biomass indices for Gulf of Maine cod.

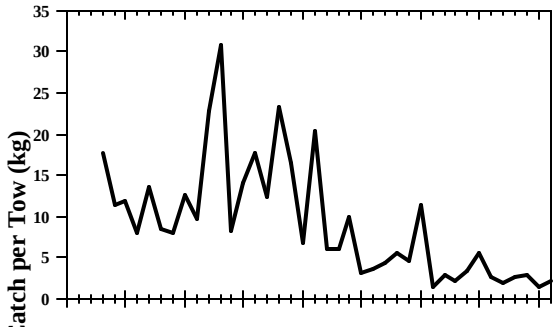

Figure 2. NEFSC autumn bottom trawl survey biomass indices for Georges Bank cod.

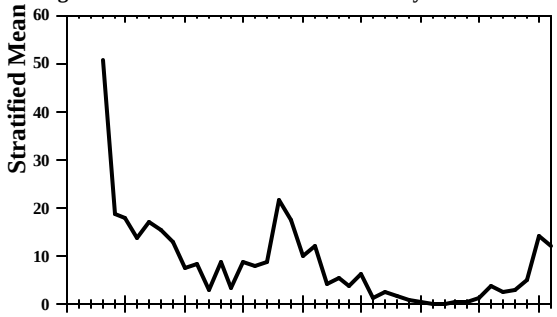

Figure 3. NEFSC autumn bottom trawl survey biomass indices for Gulf of Maine haddock.

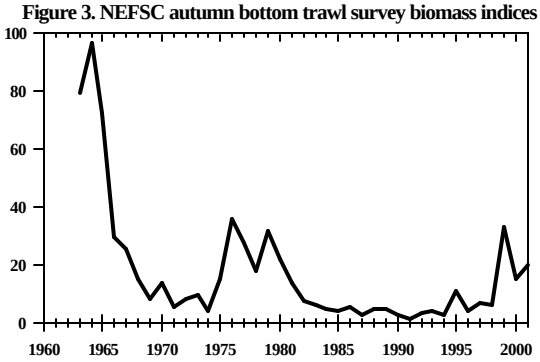

Figure 4. NEFSC autumn bottom trawl survey biomass indices for Georges Bank haddock.

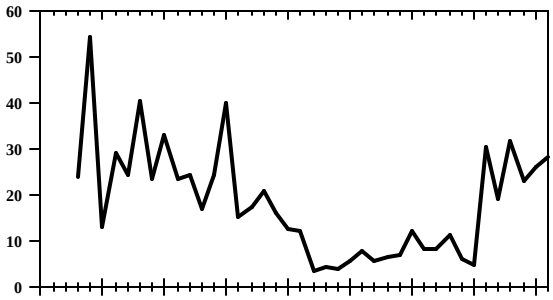

Figure 5. NEFSC autumn bottom trawl survey biomass indices for redfish.

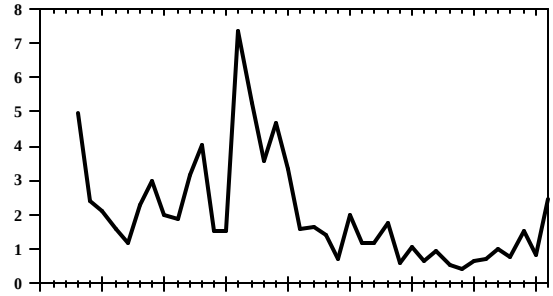

Figure 6. NEFSC autumn bottom trawl survey biomass indices for pollock.

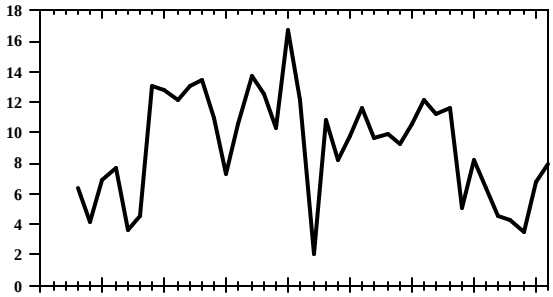

Figure 7. NEFSC autumn bottom trawl survey biomass indices for white hake.

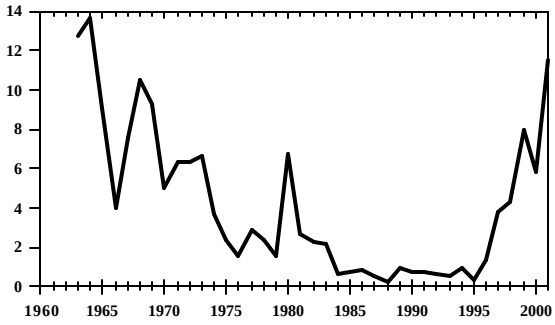

Figure 8. NEFSC autumn bottom trawl survey biomass indices for Georges Bank yellowtail flounder.

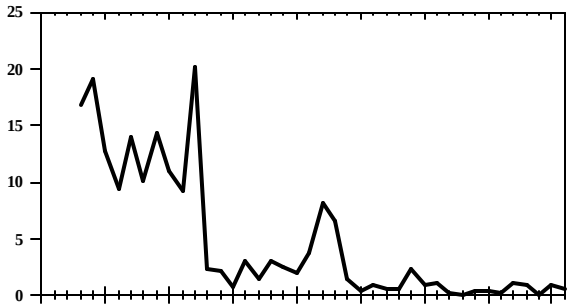

Figure 9. NEFSC autumn bottom trawl survey biomass indices for Southern New England yellowtail flounder.

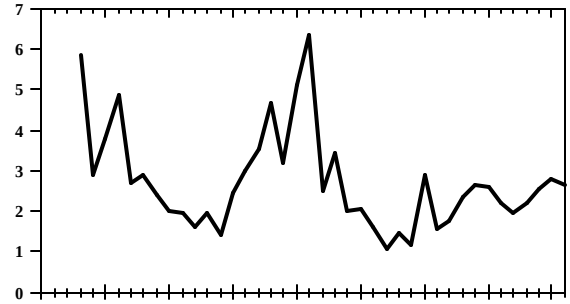

Figure 10. NEFSC autumn bottom trawl survey biomass indices for American plaice.

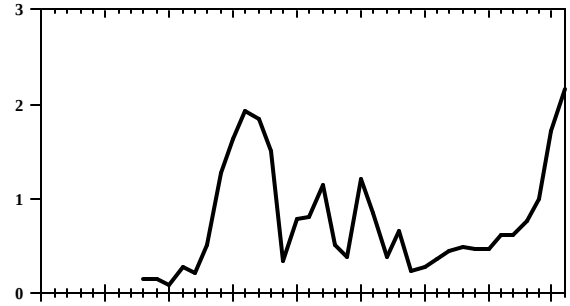

Figure 11. NEFSC spring bottom trawl survey biomass indices for summer flounder.

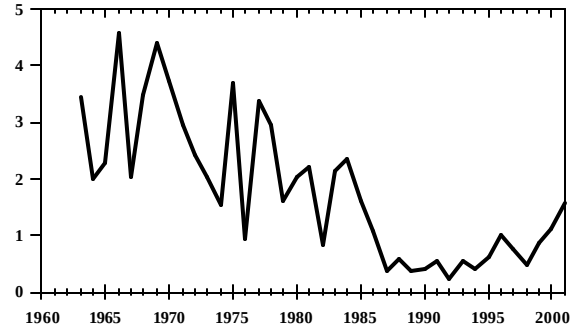

Figure 12. NEFSC autumn bottom trawl survey biomass indices for witch flounder.

Stratified Mean Catch per Tow (kg)

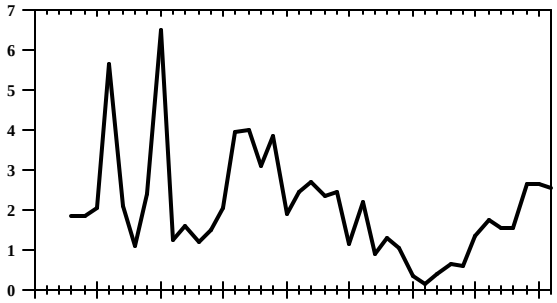

Figure 13. NEFSC autumn bottom trawl survey biomass indices for Georges Bank winter flounder.

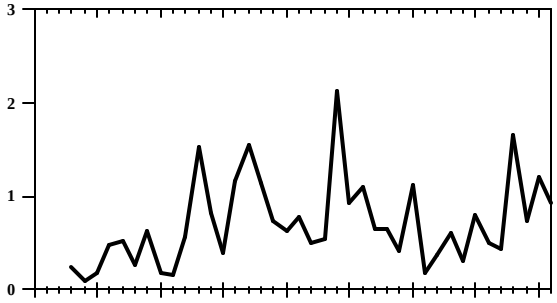

Figure 14. NEFSC autumn bottom trawl survey biomass indices for northern windowpane flounder.

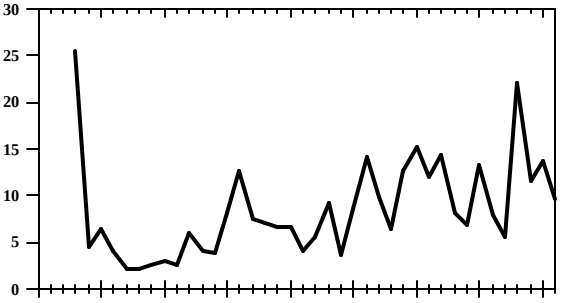

Figure 15. NEFSC autumn bottom trawl survey biomass indices for northern silver hake.

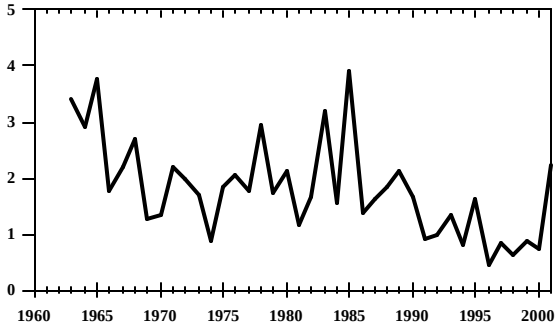

Figure 16. NEFSC autumn bottom trawl survey biomass indices for southern silver hake.

Stratified Mean Catch per Tow (kg)

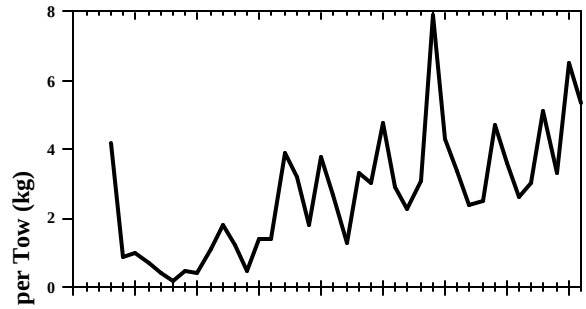

Figure 17. NEFSC autumn bottom trawl survey biomass indices for northern red hake.

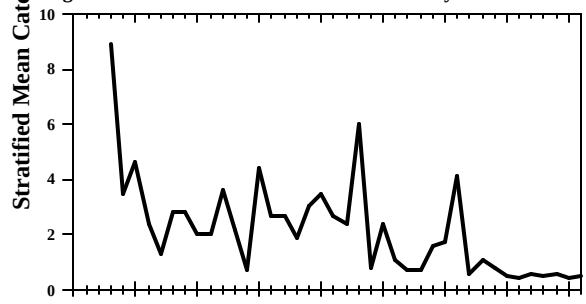

Figure 18. NEFSC autumn bottom trawl survey biomass indices for southern red hake.

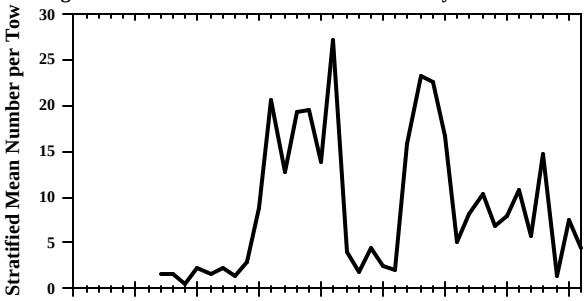

Figure 19. NEFSC autumn bottom trawl survey abundance indices for *Illex.*

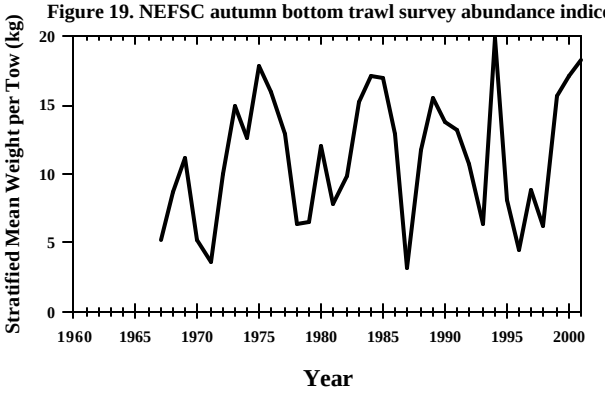

Figure 20. NEFSC autumn bottom trawl survey biomass indices for *Loligo*.

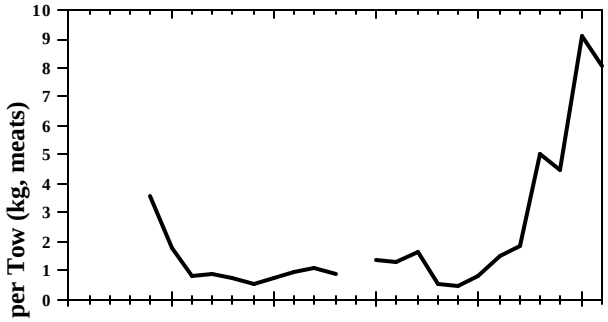

Figure 21. NEFSC scallop survey biomass indices for Georges Bank sea scallops.

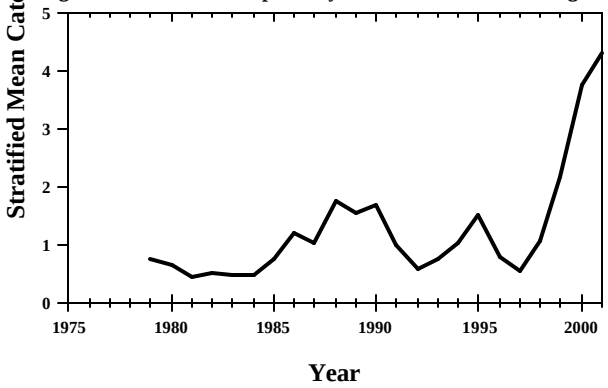

Figure 22. NEFSC scallop survey biomass indices for Mid-Atlantic Bight sea scallops.