Northwest Atlantic Fisheries Organization

Serial No. N4847 **NAFO SCS Doc. 03/15**

SCIENTIFIC COUNCIL MEETING – JUNE 2003

United States Research Report for 2002

by

K.A. Sosebee and W.L. Gabriel
NOAA/NMFS, Northeast Fisheries Science Center
Woods Hole, MA 02543, USA

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 2002 were 13 091 mt, a 13% decrease from 2001 landings of 15 012 mt.

USA cod landings from the Gulf of Maine (Div. 5Y) in 2002 were 4 083 mt, an 8% decrease from 4 422 mt landed in 2001. Discards remain a source of substantial additional mortality on this stock due to the continuation of relatively low trip limits in 2002. Fishing mortality on this stock remained high during the1980s and early-1990s, averaging about 1.0 between 1983 and 1996. Fishing mortality has since gradually declined to 0.47 in 2001. Spawning biomass declined from over 24 000 mt in 1990 to about 10 600 mt in 1997 and 1998 but has since increased to over 20 000 mt in 2001. Northeast Fisheries Science Center (NEFSC) research vessel survey biomass indices have shown a gradual increase through 2001 following the 1993 record low. The sharp increase in the autumn 2002 index cannot be explained by the dynamics of this stock, and was largely driven by an extremely large catch at one station (Fig. 1).

USA cod landings from Georges Bank (Div. 5Z and SA 6) in 2002 were 9 008 mt, a 15% decrease from 10 590 mt landed in 2001. Fishing mortality reached a record high of 1.5 in 1994, subsequently declined to a record low of 0.35 in 2000, but has since increased to 0.38 in 2001. Spawning stock biomass reached an historical low in 1995 but has since gradually increased due primarily to growth rather than recruitment. The NEFSC research vessel survey biomass indices have remained near record low levels during 1991-2001. The sharp increase observed in the 2002 index is due primarily to a large catch at one station (Fig. 2).

2. Haddock

USA landings of haddock (*Melanogrammus aeglefinus*) increased 37% from 5 827 mt in 2001 to 8 011 mt in 2002. Georges Bank (Div. 5Z) landings increased 38% from 4 637 mt in 2001 to 6 421 mt in 2002, while Gulf of Maine (Div. 5Y) landings increased by 34% from 1 190 mt in 2001 to 1 590 mt in 2002. Landings from both stocks remain below historical levels even though the stock is rebuilding due to constraint 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 (Fig. 3 and 4). Spawning stock biomass of Georges Bank haddock continued to increase in 2002 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 Acadian redfish (*Sebastes fasciatus*) were essentially unchanged between 2001 (360 mt) and 2002 (368 mt). Research vessel survey biomass indices have continued to increase since 1996 (Fig. 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*) declined by 13% from 4 108 mt in 2001 to 3 580 mt in 2002. Research vessel survey indices indicate that pollock biomass in Subarea 5 has increased in the past few years due to improved recruitment (Fig. 6).

5. White Hake

USA landings of white hake (*Urophycis tenuis*) decreased 6% from 3 482 mt in 2001 to 3 259 mt in 2002. Research vessel survey indices declined during 1995-1999, increased in 2000 and 2001 due to good recruitment of the 1998 year-class, and then declined slightly in 2002 (Fig. 7).

6. Yellowtail Flounder

USA landings of yellowtail flounder (*Limanda ferruginea*) decreased 25% from 7 335 mt in 2001 to 5 507 mt in 2002. 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 (Fig. 8 and 9).

7. Other Flounders

USA commercial landings of flounders (other than yellowtail flounder) from Subareas 3-6 in 2002 totaled 18 871 mt, 3% lower than in 2001. Summer flounder (*Paralichthys dentatus*) (34%), winter flounder (*Pseudopleuronectes americanus*) (31%), American plaice (*Hippoglossoides platessoides*) (18%) witch flounder (*Glyptocephalus cynoglossus*) (17%), and windowpane flounder (*Scophthalmus aquosus*) (<1%) accounted for virtually all of the 'other flounder' landings in 2002. Compared to 2001, commercial landings in 2002 were higher for summer flounder (+29%), and witch flounder (+6%), but lower for winter flounder (-17%), American plaice (-23%), and windowpane flounder (-46%). Research vessel survey indices in 2002 increased for summer flounder and winter flounder, but decreased for American plaice, witch flounder and windowpane (Fig. 10-14).

8. Silver hake

USA landings of silver hake (*Merluccius bilinearis*) declined sharply from 12 926 mt in 2001 to 7 434 mt in 2002. 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 (Fig. 15). Survey indices for the Southern Georges Bank - Mid-Atlantic stock declined between 1989 and 1996, remained very low during 1997-2000, markedly increased in 2001, but sharply declined in 2002 (Fig. 16).

9. Red Hake

USA landings of red hake (*Urophycis chuss*) declined 53% from 1 672 mt in 2001 to 794 mt in 2002. 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 (Fig. 17). Indices for the Southern Georges Bank - Mid-Atlantic stock, however, continue to remain at record-low levels (Fig. 18) despite low fishing mortality on the stock.

10. Atlantic herring

Total USA landings of Atlantic herring (*Clupea harengus*) decreased from 108 436 mt in 2001 to 91 275 mt in 2002. 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 decreased from 34 510 mt in 2001 to 15 217 mt in 2002. Hydroacoustic surveys of the Georges Bank component during autumn 1999-2001 indicate that spawning stock biomass is high. A noticeable drop in stock size occurred during autumn 2002, but it is believed that spawning occurred prior to the 2002 survey.

11. Atlantic Mackerel

USA commercial landings of Atlantic mackerel (*Scomber scombrus*) increased from 12 335 mt in 2001 to 26 158 mt in 2002. Recreational catch declined slightly from 1 538 mt in 2001 to 1 286 mt in 2002. Total stock biomass remains relatively 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*) decreased from 4 396 mt in 2001 to 824 mt in 2001, most likely due to reduced market demand. 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*) declined from 4 009 mt in 2001 to 2 723 mt in 2002. Landings during 2002 were at the lowest level since 1988. The autumn survey abundance indices were near record lows during 2000-2002 (Fig. 19).

USA landings of longfin inshore squid (*Loligo pealii*) during 2002 were about 16 000 mt, 14% greater than in 2001 (14 000 mt). The autumn 2002 survey abundance index (corrected for day-night changes in catchability) was the second highest on record (Fig. 20).

14. Sea Scallops

USA sea scallop (*Placopecten magellanicus*) landings in 2002 were a record-high 23 320 mt (meats), 12% above the previous record-high attained in 2001 (20 806 mt). The bulk of the 2002 landings (74% or 17 344 mt) was harvested from the Mid-Atlantic region where landings reached new record levels for the third consecutive year. The high landings are due to a combination of good recruitment and reduced fishing mortality that improved yield per recruit.

Research vessel surveys in 2002 indicated continued high biomass levels in both the Georges Bank and Mid-Atlantic regions (Fig. 21 and 22). Much of the scallop biomass is located in the three groundfish closed areas on Georges Bank and Nantucket Shoals, and in the two Mid-Atlantic areas that were closed to scalloping from April 1998 to April 2001. However, increases in biomass outside these areas have also been observed.

Recruitment in 2002 was strong in the southern portion of the Mid-Atlantic (Delmarva region) but poor on Georges Bank and in the northern Mid-Atlantic (New York Bight).

B. Special Research Studies

1. Environmental Studies

a) Hydrographic Studies

During 2002 over 1 600 CTD (conductivity, temperature, depth) profiles were made on NEFSC cruises. The data were processed and made available via an anonymous FTP site. A report on the oceanographic conditions indicated by these observations has been issued and is available via http://www.nefsc.noaa.gov/nefsc/publications/crd/crd0305/. Similar reports have been issued for each year since 1991.

b) Plankton Studies

The Georges Bank GLOBEC program is now in a synthesis phase in which the 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 in progress focusing on both the zooplankton populations and the early life stages of the cod and haddock stocks on the Bank.

c) Benthic Studies

The NEFSC=s James J. Howard and Woods Hole laboratories, working with the US Geological Survey and University of Rhode Island, continued studies (begun in 1999) to describe habitats and determine habitat effects of mobile fishing gears in New England and Mid-Atlantic waters. Off New England, a two-week cruise in August 2002 was used to 1) continue a study of juvenile cod associations in trawled and untrawled gravel habitats on northeastern Georges Bank, and evaluate recovery of trawled habitats; 2) continue mapping of the mobile/stable sand boundary on the southeastern Bank and south of Great South Channel, and determine habitat affinities of demersal species in these areas; 3) characterize the extent and fauna of mussel beds west of Great South Channel using video transects and trawling; and 4) groundtruth, via video transects, reported gravel habitats west of the Channel. In the Mid-Atlantic, an October-November cruise marked the second year of sampling to characterize habitats of tilefish (*Lopholatilis chamaeleonticeps*), scup (*Stenotomus chrysops*) and black sea bass (*Centropristis striatus*) in 100-200 m depths near the head of the Hudson Canyon, and to examine habitat effects of a winter trawl fishery there. Three poster papers on the New England work and one on the Mid-Atlantic studies were presented at an international symposium on gear effects on benthic habitats (Tampa FL, November 2002). Also, a paper on the Georges Bank studies was submitted for publication in the symposium proceedings. Benthic research in local estuaries included continuing studies to 1) monitor success in restoration of an oyster (*Crassostrea virginica*) reef; 2) characterize habitats and predators of hard clams (*Mercenaria mercenaria*); 3) determine effects of hand raking for hard clams on their habitats and recruitment; and 4) examine effects of a winter blue crab (*Callinectes sapidus*) fishery in lower New York Harbor.

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 2002, studies continued to identify habitat associations of estuarine species and to investigate habitat effects on survival. As indicated in previous research using tethered young-of-the-year winter flounder, shallow water areas serve as predator refugia for small fishes. The tethering study was expanded in 2002 to include habitats throughout the Navesink River/Sandy Hook Bay. Predator encounter rates for young-of-the-year winter flounder (20-35 mm SL) were measured during the morning crepuscular period in shallow and deep habitats. The probability of survival of tethered flounder appears to be

significantly higher in shallow habitats (<1.5 m) than in deepwater areas. Potentially important predators including summer flounder, sea robins, and blue crab were more abundant in deep water samples.

2. Biological Studies

a) Fish Species

Flatfish: Field studies with young-of-the year (YOY) winter flounder in the Navesink River, New Jersey, revealed that individuals use shallow water habitats and shift their distribution in accordance to the tidal cycle. YOY winter flounder were predominantly found in waters between 1.5 and 2.3 m deep, though few were found in waters less than 1 meter deep. Tidal shifting of distribution seems to afford some measure of protection from predation.

Flatfish: Analyses and report writing continue on studies of summer flounder, *Paralichthys dentatus*. Four themes are being addressed: 1) the effects of winter temperature regimes on growth, developmental, and mortality rates of eggs, larvae, and juveniles; 2) the role of time and location of spawning on the winter survival and ingress of larvae, and the spring-summer growth of juveniles; 3) mortality risks of recently settled juveniles due to predation by bay shrimp, *Crangon septemspinosa*, blue crab, *Callinectes sapidus*, and conspecifics; and 4) rates of change of stable isotope ratios as indicators of consumed prey, and the potential of this tool for evaluation of fish habitat usage in nature.

Bluefish: A combined field and laboratory study to examine hooking mortality of bluefish was initiated in fall 2001. Fall-captured adult bluefish were subjected to either >good= or >poor= hooking and handling treatments and then returned to the laboratory for post-release observation. Bluefish hooking mortality did not vary by type of treatment (>good= vs. >poor=) but appeared to be significant. Higher hooking mortality rates were recorded in this study than in two previous studies; however, post-release observation periods used previously are believed to be too short (less than 3 days). In the current study, post-release mortalities of bluefish were monitored for three weeks. Mortality was associated with the presence of bleeding and prolonged air exposure times. Mortality was also related to age, such that younger fish had a lower probability of survival. Studies continue with this species in an effort to eliminate the possible additional stressors associated with confinement in laboratory tanks.

Gadids: Field and laboratory research continues on Atlantic tomcod, *Microgadus tomcod*, a locally abundant inshore gadid. Tomcod has a 1-yr life cycle, is an important forage fish, and serves as a sentinel of habitat and fish community health in the Hudson River Estuary (New York, USA). Two concurrent projects on tomcod are underway that address ecological and toxicological themes. Regarding ecological themes, estimates are being obtained for: 1) maternal effects on offspring quality; 2) ontogenetic rates of eggs, larvae, and juveniles; 3) time of settlement, behavioral transitions with respect to habitat structure, and movement of juveniles in nature; and 4) risk of predation. Regarding toxicological themes, two source populations (Hudson River and Miramichi River, New Brunswick, Canada) that differ in contaminant histories are being compared with respect to: 1) uptake and depuration rate of dioxin and locally occurring (Hudson River) congeners of PCBs; 2) sublethal toxic responses to graded doses of local PCBs congeners using captive (F_2) tomcod populations; and 3) interactions between environmental stressors, i.e., PCBs and high summer temperatures.

Goosefish: Analyses and report writing continue on studies of goosefish, *Lophius americanus*. Three themes are being investigated: 1) seasonal and inter-annual patterns of variation in body components with emphasis on the relationship between gonad size (reproductive effort) and liver size in the previous year; 2) temperature-dependent growth, developmental, and survival rates of early life-stage goosefish from captive-spawned egg veils; and 3) movement, feeding, and spawning behavior of captive, wild-caught adult goosefish.

b) Age and Growth

Approximately 47 400 age determinations were completed in 2002 by Woods Hole Laboratory staff for 12 species of finfish and shellfish in support of resource assessment analyses and other research. In addition to aging Atlantic cod (5 715), haddock (4 725), and yellowtail flounder (7 321), 6 780 scup, 5 501 winter flounder, 5 316 American plaice, 3 696 witch flounder, and 1 243 surfclams were also aged.

Cod, haddock, and yellowtail flounder age structures were exchanged with Canadian age readers; and aging materials for Atlantic herring, yellowtail flounder, and scup were exchanged with readers from US state laboratories in a continuing effort to maintain comparability of age determinations between laboratories. A report of the 2000 US/Canada yellowtail flounder age reading workshop was published in 2002 (<http://www.nafo.ca/publications/studies/no35/pdf/walsh.pdf).

Research projects initiated or continued in 2002 included an age validation study of monkfish, *Lophius americanus*, a compilation of information related to stock reproductive potential, a study of the biology of offshore populations of cunner, *Tautogolabrus adspersus*, and a study of the biology and origin of witch flounder, *Glyptocephalus cynoglossus*, in deep water habitats. A portion of the witch flounder research results was published in 2002.

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 2002 winter survey, 4 643 stomachs from 40 species were examined, while 7 240 stomachs from 48 species, and 6 842 stomachs from 49 species were examined during the spring and autumn 2002 surveys, respectively. Diet sampling emphasized small pelagics, elasmobranchs, gadids, flatfishes, and lesser known species.

The 30 year time series (1973-2002) 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 350 000 stomach samples. The processing of the 2001 and 2002 bottom trawl survey food habits data is scheduled for completion in 2003.

A study examining of cod trophic ecology in cooperation with the commercial industry continued in 2002. This study emphasizes meso-scale localized sampling, three times per month, year-round. During 2002, 64 trips were completed and a total of 1 630 stomachs collected. Additional sampling for ovaries, livers, blood, and tissue was also accomplished.

Staff published several papers and reports on a wide range of trophic ecology issues including feeding dynamics, consumption models, and species interactions among cod, flatfish, elasmobranchs, other gadids, and sculpin in the NW Atlantic ecosystem. Other published papers addressed the theoretical and practical implications and implementation of ecosystem-based fisheries management. Since trophic interactions are central to food web and ecosystem considerations, research continues with respect to fish production, fisheries reference points, system-wide productivity, and essential fish habitat.

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. Members of the Cooperative Shark Tagging Program (CSTP), involving over 6,500 volunteer recreational and commercial

fishermen, scientists, and fisheries observers continued to tag large coastal and pelagic sharks and provide information to define essential fish habitat for shark species in US waters in 2002.

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. Staff co-convened a symposium at the 2002 American Fisheries Society Annual Meeting on shark essential fish habitat and initiated work on a report summarizing Atlantic and Gulf of Mexico coastal shark nursery ground and habitat studies.

A cooperative US/Canada research program on the biology of the porbeagle shark, *Lamna nasus*, continued in 2002. Manuscripts on the population dynamics and the reproduction of the porbeagle in the western North Atlantic were published in 2002. A manuscript on feeding ecology was also completed and accepted for publication. Re-examination of the age and growth of the shortfin mako, *Isurus oxyrinchus*, and studies of the thresher shark, *Alopias vulpinus*, and white shark, *Carcharodon carcharias*, continued. Vertebrae, length-frequency data, and tag/recapture data collected between 1962 and 2001 for these species are being analyzed to obtain growth function parameters. In addition, bomb radiocarbon dating techniques are being used to validate band periodicity in association with the Moss Landing Marine Laboratory. Predator-prey research continued in 2002 to quantify whether the level of dependence of shortfin mako and other shark species on bluefish, *Pomatomus saltatrix*, has changed from historic levels.

A collaborative program to examine the biology and population dynamics of the blue shark, *Prionace glauca*, in the North Atlantic continued in 2002. A manuscript describing age and growth is in press and a manuscript on feeding ecology of the blue shark is under revision. Population dynamics research on blue shark focused on constructing a time series of catch rates (CPUE) from research surveys, estimation of migration and survival rates, and the development of an integrated tagging and population dynamics model for use in stock assessment.

e) Marine Turtles

The NEFSC and the NMFS Northeast Regional Office (NERO) developed a monitoring plan, using an alternate platform procedure, to monitor sea turtle entanglements and mortalities in the Virginia state waters of the Chesapeake Bay. Pound net leaders have been identified as contributing to turtle mortalities in the late spring and early summer. The work in 2002 located seven entangled turtles, of which two were Kemp=s ridley and five loggerheads.

3. Studies of Fishing Operations

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

The NEFSC deployed observers on 718 commercial fishing trips totaling 740 days in the New England and Mid-Atlantic gillnet fisheries. Primary objectives were to monitor the incidental by-catch of harbor porpoise and bottlenose dolphin in these fisheries, as well as to monitor the incidental capture of sea turtles. A total of 28 marine mammals were caught, including (in order of highest occurrence) harbor seals, harbor porpoise, whitesided dolphin, and unidentified seals and dolphin. From many of the animals, biological samples were collected including body weight measurements, tissue samples, and/or samples of the entire animal. A total of 31 seabirds were also caught, which included northern gannets (14), greater shearwater (4), common loon (3), sooty shearwater (2), red-throated loon (2), loon (unknown) (2), seabird, (unknown) (2), northern fulmar (1), and gull (unknown) (1).

b) Float Drift Gillnet Fisheries

The closure of the pelagic swordfish drift gillnet fishery continued in 2002. Six days were observed in 2002 on coastal drift gillnet vessels targeting bluefish. Kept and discarded finfish were weighed or estimated for a portion of the observed sets. Length frequencies and age structures were also obtained ffrom the finfish. No protected or endangered species, or seabirds, were reported taken in this fishery.

c) Otter Trawl Fisheries

A total of 458 trips were made in 2002 totaling 1 354 days. Kept and discarded catches were weighed or estimated. Length frequencies and age structures were obtained for age and growth studies. In 2002, nine marine mammals and nine turtles were incidentally caught in the otter trawl fisheries. The marine mammals were harbor seals, common dolphin, whitesided dolphin, and seals (unknown). There were also five seabirds taken (three black backed gulls and two greater shearwaters).

d) Sea Scallop Fisheries

In 2002, sea scallop fisheries were observed in two forms, the traditional sea scallop fishery and the closed area scallop fishery. Twenty-nine trips (255 days) were observed in the traditional fishery. One loggerhead turtle was observed taken as were two seabirds (one greater shearwater and one shearwater (unknown)).

In the closed area scallop fishery, 75 trips were observed (849 days). In this fishery, 23 turtles were taken: 17 were identified as loggerheads and the other six as unknown. There was a single unknown seabird taken.

In both fisheries, the scallop catches were measured and weighed. The finfish by-catch was also weighed, and size frequency and age structure data collected from a portion of the hauls.

e) Conch Pot Fishery

Only two trips comprising two sea days were observed in this fishery in 2002. No takes of marine mammals or seabirds were reported. Finfish were measured and weighed as well as finfish by-catch and discard documented.

f) Scottish Seine Fishery

Observers covered six days in the Scottish seine fishery in 2002. 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.

g) Sink Drift Gillnet

NEFSC observers covered 68 days on 49 trips in 2002. One marine mammal (harbor seal) was observed taken. 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.

h) Midwater Paired Otter Trawl

One trip (1 day) was observed in 2002. 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.

i) Bottom Longline Fishery

Nine trips over nine days were observed in 2002. 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.

j) Beach Anchored Gillnet

Six trips over six sea days were observed in this fishery in 2002. 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; however, four northern gannets were observed entangled (dead).

k) Float Anchored Gillnet

Five trips over five days at sea were observed in this fishery in 2002. 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.

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 stock status updates 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 [TRAC]; 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. Four such areas are highlighted:

a) Atlantic Salmon Research

Atlantic salmon in eight small rivers of eastern Maine have been formally listed as endangered under the USA Endangered Species Act. Spawning populations have dwindled over the years, and both smolt escapement and ocean survival rates have declined. Research programs conducted by the NEFSC, in conjunction with various agency and private partners, are designed to better understand the factors contributing to these declines. Research activities include a variety of field projects in natal rivers in estuaries, and at sea. Routine run re-construction data are used extensively in support of ICES/NASCO stock assessments. Field research has emphasized smolt production estimates, telemetry studies of out-migrating fish, monitoring of fishery removals on the high seas, and most recently, fishery-independent sampling through smolt trawling surveys. Data from these studies have identified significant smolt mortality when fish enter the marine environment. Potential sources of this mortality (poor physiological condition, predation) are being evaluated through follow-up studies. Additional work on habitat quality and utilization will be conducted in 2003. All of these studies will contribute to recommendations for additional measures to be considered to halt the decline and restore the resource.

b) Cooperative Research with the Fishing Industry

In 2002, a pilot study was initiated to collect fishery data electronically directly from commercial *Illex* squid vessels using a satellite-based email system. Tow-based information was gathered using a macro developed to collect the start and end times and locations of the tows. Catch data were then entered and sent to the NEFSC via email. A web page was developed which allowed the captains of the fishing vessels to access their data and make any needed changes. This also allowed the captains to plot their data and see where their highest catch rates occurred.

Cooperative research was also conducted with the surf clam and ocean quahog industry to determine the efficiency of both commercial fishing vessels and the RV Delaware II. A new sensor package was deployed on all tows to determine actual tow time and bottom contact.

A cooperative research program was initiated to develop modern Astudy fleets@ to collect high-quality fishery-dependent data for scientific applications. Three pilot projects, involving various fleet sectors were identified and contracts let to develop technology, reporting procedures and database structures. A critical element of these pilot projects will be to eliminate, to the extent possible, the recording of data in paper form. These efforts should allow greater spatial resolution of data, and near-real time evaluation of fishery trends.

The Cooperative Black Sea Bass Tagging Project was designed to examine the population size, exploitation rate and seasonal movements of the northern Atlantic coast population of black sea bass, *Centropristis striata*. This project is conducted in collaboration with state fishery agencies, and with commercial and recreational fishermen. During the autumn of 2002, federal and state fishery employees began tagging and releasing black sea bass from Cape Cod, MA to Cape Henry, VA. The program will tag fish through 2004, with recaptures monitored for the next several years.

Cooperative fish tagging programs for yellowtail flounder were also initiated, with a goal to better understand the interrelationships between the three main yellowtail stock groups identified in USA waters: Gulf of Maine-Cape Cod, Georges Bank, and Southern New England-Middle Atlantic. The goal of this study will be to release ~30,000 tagged animals, with about 200 fish tagged with data storage tags. Cooperators include fishermen, state fisheries agencies and private research institutions.

c) Stock Assessment Methods Development

Many national and international studies have concluded that stock assessments should consider evaluating resource status using a number of approaches applied to the same stock. This provides some indication of the robustness of conclusions regarding stock status. To this end, NEFSC researchers have been collaborating on a standardized suite of methods collected into a software Atoolbox@. The NOAA Fisheries Toolbox (NFT) incorporates classical methods such as ADAPT -VPA, reference point estimation, surplus production and forward-projection methods into a stable environment with tested software products. The NFT will be used for most routine assessment tasks. Work on the package continues to incorporate more modules, to test software for reliability and to make the NFT more user friendly.

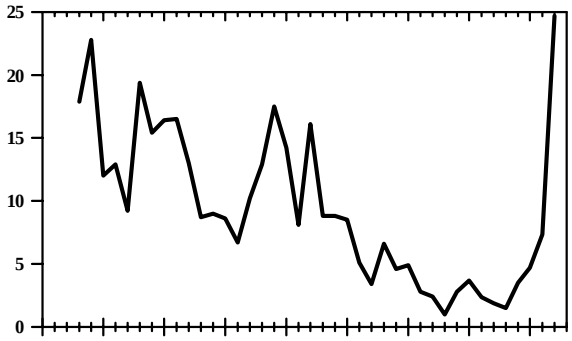

Figure 1. NEFSC autumn bottom trawl survey biomass indices for Gulf of Maine cod.

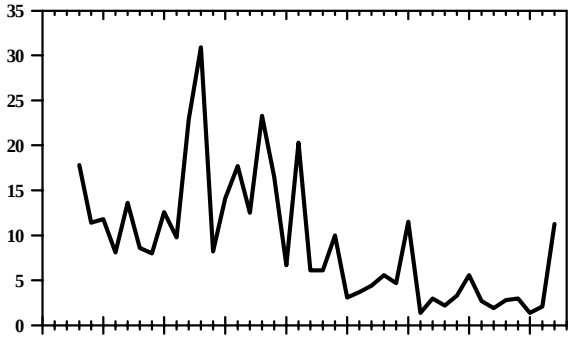

Figure 2. NEFSC autumn bottom trawl survey biomass indices for Georges Bank cod.

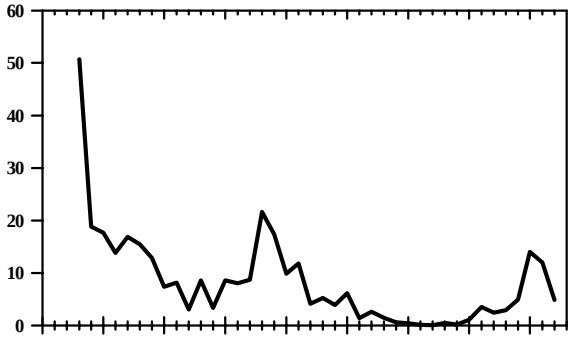

Figure 3. NEFSC autumn bottom trawl survey biomass indices for Gulf of Maine haddock.

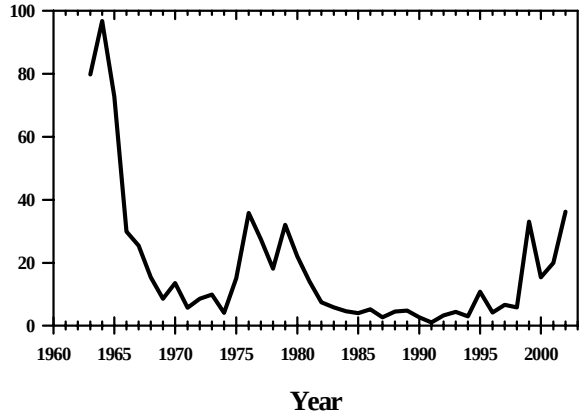

Figure 4. NEFSC autumn bottom trawl survey biomass indices for Georges Bank haddock.

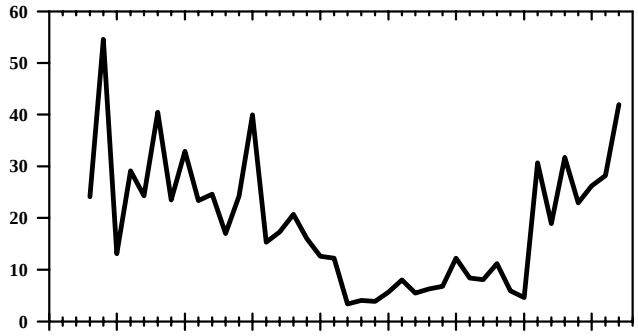

Figure 5. NEFSC autumn bottom trawl survey biomass indices for redfish.

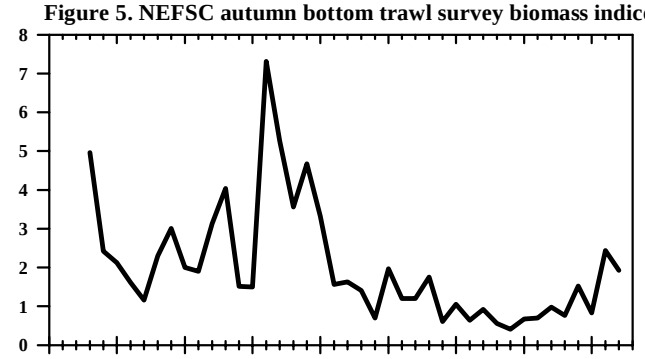

Figure 6. NEFSC autumn bottom trawl survey biomass indices for pollock.

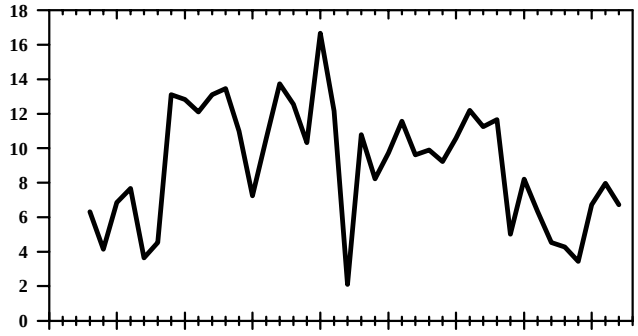

Figure 7. NEFSC autumn bottom trawl survey biomass indices for white hake.

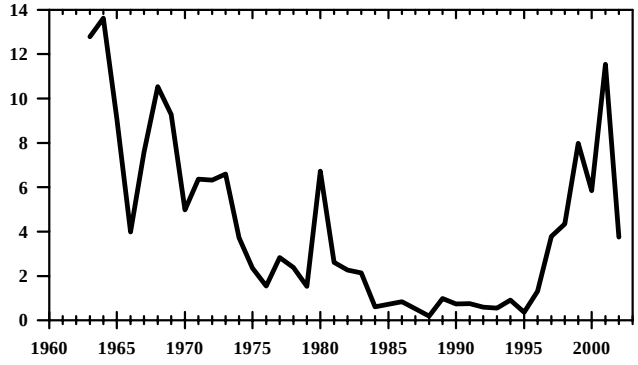

Figure 8. NEFSC autumn bottom trawl survey biomass indices for Georges Bank yell

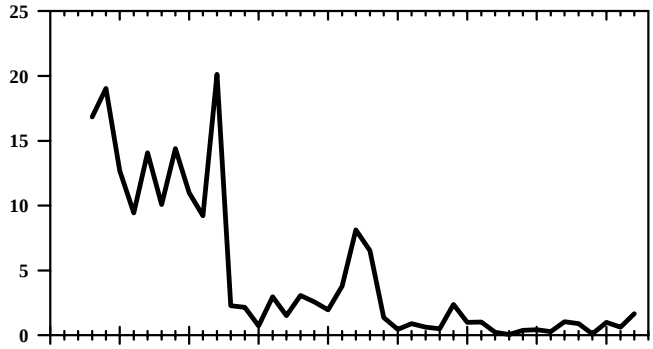

Figure 9. NEFSC autumn bottom trawl survey biomass indices for Southern New England yellowtail flounder.

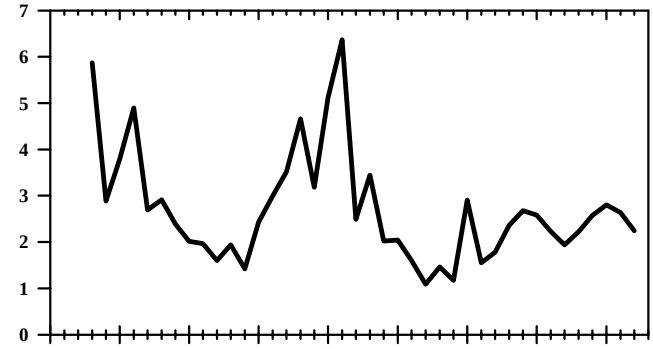

Figure 10. NEFSC autumn bottom trawl survey biomass indices for American plaice.

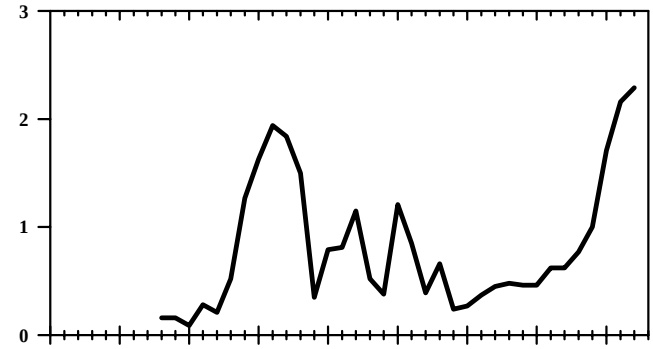

Figure 11. NEFSC spring bottom trawl survey biomass indices for summer flounder.

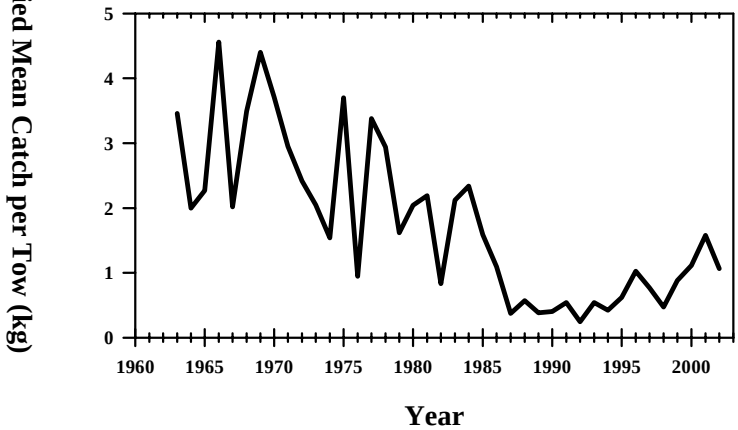

Figure 12. NEFSC autumn bottom trawl survey biomass indices for witch flounder.

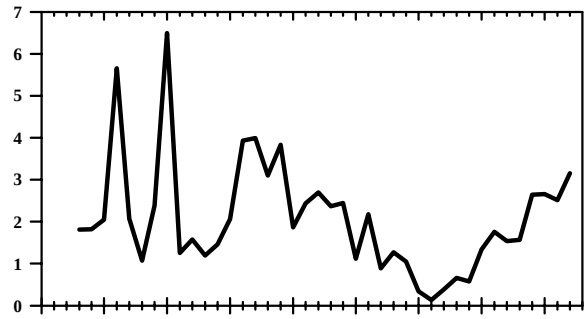

Figure 13. NEFSC autumn bottom trawl survey biomass indices for Georges Bank winter flounder.

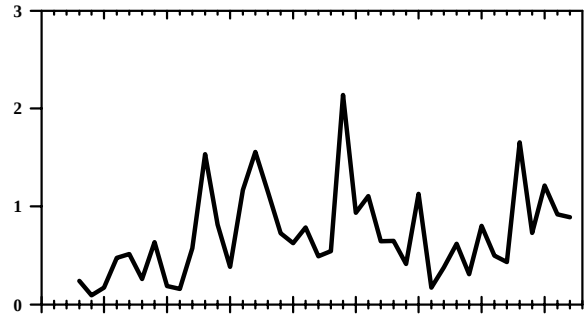

Figure 14. NEFSC autumn bottom trawl survey biomass indices for northern windowpane flounder.

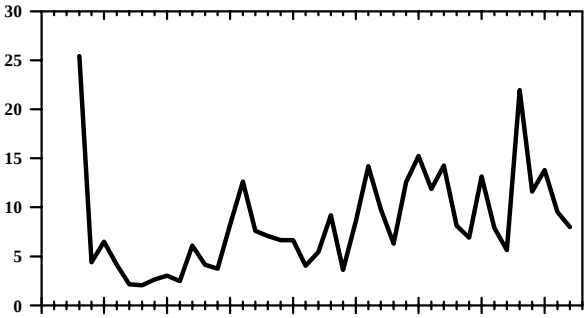

Figure 15. NEFSC autumn bottom trawl survey biomass indices for northern silver hake.

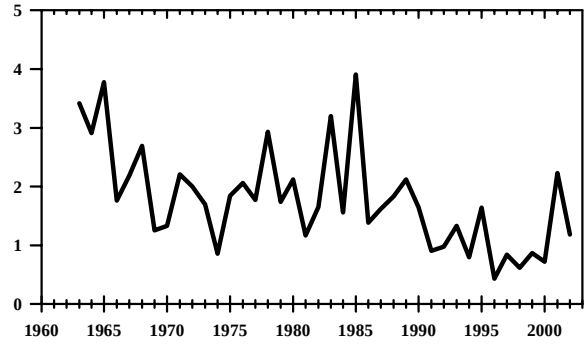

Figure 16. NEFSC autumn bottom trawl survey biomass indices for southern silver hake.

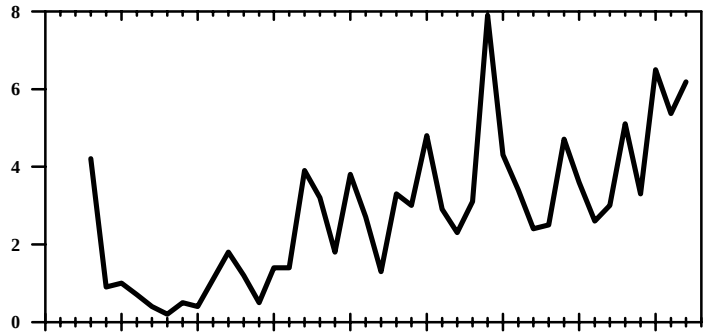

Figure 17. NEFSC autumn bottom trawl survey biomass indices for northern red hake.

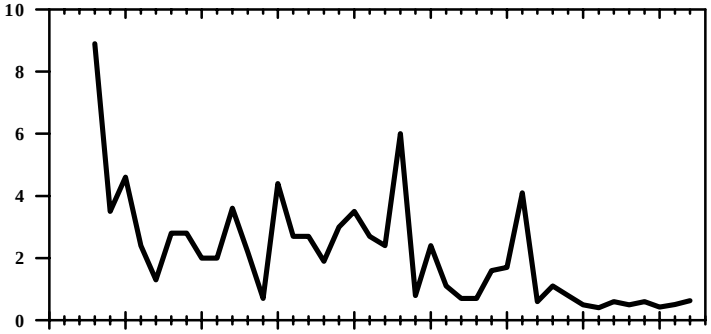

Figure 18. NEFSC autumn bottom trawl survey biomass indices for southern red hake.

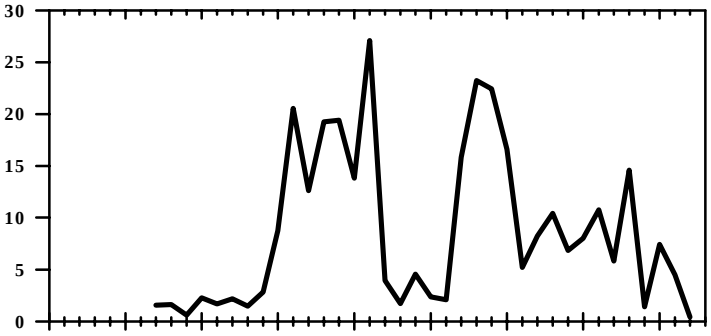

Figure 19. NEFSC autumn bottom trawl survey abundance indices for *Illex*.

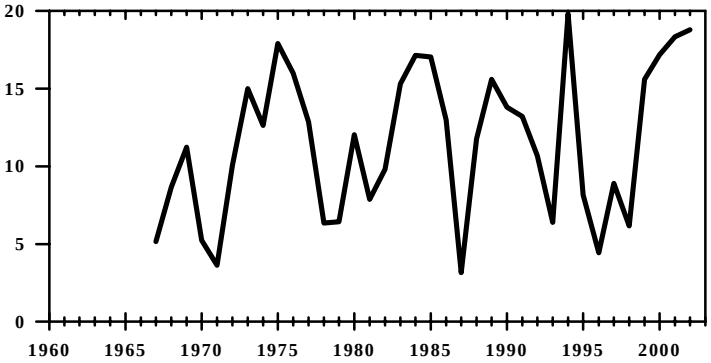

Figure 20. NEFSC autumn bottom trawl survey biomass indices for *Loligo*.

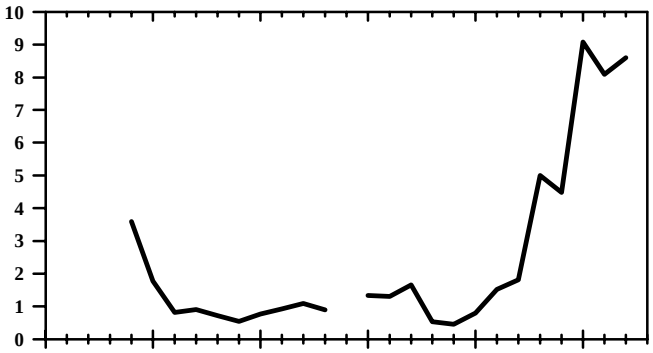

Figure 21. NEFSC scallop survey biomass indices for Georges Bank sea scallops.

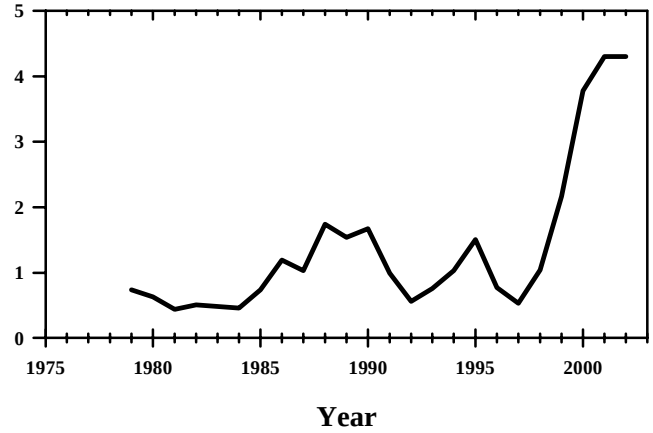

Figure 22. NEFSC scallop survey biomass indices for Mid-Atlantic Bight sea scallops.